COMPUTER NAVIGATED TKA WITH MIS OR A CONVENTIONAL APPROACH. RCT COMPARING CLINICAL, RADIOLOGICAL AND FUNCTIONAL RESULTS

This multicenter study compared computer-navigated TKA using either MIS or conventional surgical technique, using a CR fixed bearing knee, Stryker Navigation system and dedicated MIS instrumentation. It was hypothesized that patients would benefit from the MIS technique by shorter recovery periods, less blood loss, faster wound healing and improved mobility during early rehabilitation.

A prospective multicentre double-blind controlled trial included 69 patients matched for age, gender, BMI (MIS n=36, CONV n=33). Assessments at pre-op, 1 week, 3 and 6 months post-op included surgery time, bloodloss , range of motion, Knee Society Score (KSS) and WOMAC, Chair rise test and quadriceps strength. Radiographic analysis included radiographs for lucencies and CAT scans for alignment,

Four patients were lost to follow-up. The MIS group had significantly more prolonged surgery time and blood loss at 24 hours p<0.05. At 6 months mean flexion values for MIS (106,7°±12,91) and CONV 105,92 ±11,58) with no significant differences in flexion ROM between both groups at any time point. KSS scores showed a significant improvement (p<0,01) over time in both groups but no statistical significance between groups. WOMAC score also improved significantly (p<0,01) over time in both groups without reaching statistical significance. A significant decrease of anterior knee pain score was observed over time with no significant difference between both groups. Quadriceps strength recovery was not significant between groups but trended toward faster recovery in the MIS group. X-rays showed stable implants with no progressive radiolucent lines in all patients.

The hypothesis that patients benefit from the MIS technique in the short term was not confirmed by the results of this study. The MIS surgery technique resulted in more blood loss intra-op and in the first 24hours post op as well as an elongated surgery time. The MIS surgery technique also failed to generate clear advantages in clinical or functional outcome that persisted over time.
CORRELATION OF INTRAOPERATIVE NAVIGATION DATA AND POSTOPERATIVE OUTCOME MEASURES IN TOTAL KNEE ARTHROPLASTY

Introduction: Computer assisted surgical navigation has played an increasingly central role in total knee arthroplasty (TKA). Given the recognized importance of subtle component position changes in knee function, navigation has emerged as a promising tool for reducing the occurrence of significant malalignment. The ability of this technology to reliably measure multiple parameters intraoperatively allows analysis to possibly identify a correlation between intraoperative computer assisted surgical navigation data and functional outcomes of patients undergoing elective total knee arthroplasty.

Material and Methods: Intraoperative navigation data was collected for 121 patients undergoing cemented, posterior stabilized TKA. Three forward stepwise regression analyses were performed to associate intraoperative coronal alignment correction, tibiofemoral external rotation, and alignment under varus and valgus stress with one year outcomes, including range of motion, Oxford and SF-36 scores.

Results: Postoperatively the knees demonstrated significantly less varus, greater maximum flexion and reduced flexion contracture and external tibiofemoral rotation. In addition, the between-patient variability of the alignment measures was considerably reduced. A partial least squares regression model identified age, BMI, and preoperative maximum flexion as predictors of one year SF-36 (R²=45%), Oxford Score (R²=16%) and maximum flexion (R²=12%). A second model identified age, BMI, and post-procedure flexion as predictors of one year SF-36 (R²=36%) and Oxford Score (R²=14%).

Conclusion: Navigation is an instrument in the surgeons’ armamentarium, but data obtained at the time of surgery only have limited capacity to explain the variance in functional outcome at one-year. Intraoperative flexion has a greater ability to explain ROM at 1 year than other patient self-reported outcome measures. Intraoperative data in this study provide some small, but significant, explanation of the variability in functional outcomes. While alignment and component position can be precisely measured intraoperatively, intrinsic patient factors are dominant in the regression models reported here.
COMPUTER NAVIGATION VERSUS CONVENTIONAL TOTAL KNEE REPLACEMENT: A PROSPECTIVE, RANDOMISED CONTROL TRIAL SHOWING NO DIFFERENCE IN FUNCTIONAL RESULTS AT FIVE YEARS

We previously compared component alignment in total knee replacement using a computer-navigated technique with a conventional jig based method. Improved alignment was seen in the computer-navigated group (Beaver et al. JBJS 2004 (86B); 3: 372-7.). We also reported two-year results showing no difference in clinical outcome between the two groups (Beaver et al. JBJS 2007 (89B); 4: 477-80). We now report our five-year functional results comparing navigated and conventional total knee replacement. To our knowledge this represents the first Level 1 study comparing function in navigated and conventional total knee replacement at five years.

An original cohort of 71 patients undergoing Duracon (Stryker Orthopaedics, St. Leonards, Australia) total knee replacement without patellar resurfacing were prospectively randomised to undergo operation using computer navigation (Stryker Image Free Computer Navigation System (version 1.0; Stryker Orthopaedics))(n=35) or a jig-based method (n=36). The two groups were matched for age, gender, height, weight, BMI, ASA grade and pre-operative deformity. All operations were performed by a single surgeon. All patients underwent review in our Joint Replacement Assessment Clinic at 3, 6 and 12 months and at 2 and 5 years. Reviews were undertaken by senior physiotherapist blinded to participant status using validated outcome scoring tools (Knee Society Score, WOMAC Score and Short Form SF-36 Score). All patients underwent CT scanning of the implanted prosthesis as per Perth CT Knee Protocol to assess component alignment.

After 5 years 24 patients in the navigated group and 22 patients in the conventional group were available for review. At 5 years no statistically significant difference was seen in any of the aforementioned outcome scores when comparing navigated and conventional groups. No statistically significant difference was seen between 2- and 5-year results for either group.

Due to the relatively low numbers in each group these data were compared with retrospective cohorts of navigated (n=100) and conventional (n=70) Duracon total knee replacements performed outwith this study over the same 5-year period. Within the retrospective cohorts no statistically significant differences were found when comparing any of the aforementioned outcome scores. In addition, when comparing parallel scores between prospective and retrospective groups again no statistically significant differences were identified.

At 5-years post-operatively the functional outcome between computer navigated and conventional total knee replacement appears to be no different despite the better alignment achieved using navigation.
MINIMUM 20-YEAR FOLLOW-UP OF A CRUCIATE RETAINING MODULAR TRAY TKR WITH CEMENT

Introduction: Modular tray TKR designs are the most commonly used designs in total knee arthroplasty today. To our knowledge, there are no studies evaluating the minimum 20-year results using these designs. The purpose of this study was to evaluate the minimum 20-year results of total knee arthroplasty using a modular tibial tray cruciate-retaining total knee arthroplasty design.

Materials & Methods: The first 101 posterior cruciate retaining modular tibial components of a single design performed by a single surgeon in 75 patients were evaluated at a minimum 20-year follow-up. All components were fixed with cement. These patients had been prospectively followed at five-year intervals and evaluated clinically using Knee Society ratings and documenting any need for reoperation. Serial radiographs were evaluated for radiolucencies, osteolysis or component migration until the time of patient death or at minimum 20-year follow-up.

Results: At minimum 20-year follow-up, five knees (5%) had required a revision operation. All revisions occurred greater than 10 years following the index procedures. Benefits of modularity (i.e. retention of the tibial tray) were utilized in three of five cases in this closely followed cohort. Survivorship from any revision was 90.8% at 20 years. For the 16 living patients with 22 knees, the average Knee Society Clinical and Functional scores were 91 and 59, respectively, and the average range of motion was 115 degrees.

Conclusions: When considering gamma irradiated in air polyethylene and a first generation locking mechanism were utilized, these results encourage the authors to continue to use modular tibial trays.
FACTORS AFFECTING POLY WEAR

No abstract has been provided for this presentation.
EVIDENCE-BASED KNEE ARTHROPLASTY: A CENTRAL INTAKE APPROACH WITH MEASUREMENT AND FEEDBACK

No abstract has been provided for this presentation.
ACCURACY OF REGISTRATION OF KNEE IMPLANT MODELS TO FLUOROSCOPY FOR 3D DYNAMIC KINEMATIC ANALYSIS

2D/3D image registration techniques have supplanted RSA for kinematic analysis as they are faster, non-invasive and enable pre and post op studies. Improved algorithms have solved the problem of accuracy of out-of-plane translation [1,2]. The aim of this study is to apply these new algorithms to the post op case.

In this study, Computer-Aided Design (CAD) models of the femoral and tibial components were registered to fluoroscopic images. The prosthesis (RBK knee, Global Orthopaedic Technology), was implanted into a sawbones knee. A perspex cage held the knee static while simultaneous fluoroscopy and dual X-rays were taken from 0 and 90 degrees flexion. Translations orthogonal to the fluoroscope were simulated by sliding the cage at 5 mm intervals. The CAD models were then registered with the fluoroscopy frames. Registration information was used to perform kinematic analysis.

This study has demonstrated greater accuracy for the post operative than pre-operative registration applications. The standard deviation of error for flexion/extension was 0.23° with respect to RSA. The average standard deviation of error for out-of-plane rotations (i.e. abduction/adduction and internal/external rotation) was 0.46°. Translations such as anterior-posterior drawer, compression/distraction and medio-lateral shift had errors of 0.16 mm, 0.17 mm and 0.59 mm, respectively. Both the registration and kinematic analysis accuracies for prosthesis components were superior to those for registration of natural (e.g. cadaver) bones [1]. While rotation accuracies improved about 0.1°, improvement in translation was substantial. In particular, medio-lateral translation accuracy has improved from 1 mm (in our previous study) to 0.59 mm, which is promising. It is worth noting that the best reported accuracy for out-of-plane or medio-lateral translation has been 1.03 mm [2]. Hence, this technique is competitive with other 3D/2D registration methods reported in the literature.

Our experiments show that our 3D CAD to 2D fluoroscopy registration method is sufficiently accurate to produce confident and reliable analysis of prospective kinematics studies.

References

NAVIGATED TOTAL KNEE ARTHROPLASTY – VARIATION IN THE POSTERIOR CONDYLAR AXIS AND CORRELATION OF INTRAOPERATIVE VS. POSTOPERATIVE CORONAL ALIGNMENT

Computer assisted total knee arthroplasty may have advantages over conventional surgery with respect to component positioning. Femoral component mal-rotation has been shown to be associated with poor outcomes, and may be related to posterior referencing jigs. We aimed to determine the variation between the transepicondylar axis (TEA) and posterior condylar axis (PCA) in a series of knees undergoing navigated total knee arthroplasty, and to determine the correlation between final intra-operative coronal alignment and post-operative radiographic functional alignment.

Method: A review of 170 consecutive patients undergoing primary total knee arthroplasty between June 2007 and August 2010, using Precision navigation and Triathlon implants (Stryker). The difference between the TEA and PCA was measured as was the initial coronal alignment. Referencing of the TEA had been previously validated against computerised tomography in a previous study. During arthroplasty, neutral alignment was aimed for, and the final alignment after implant insertion was recorded. Pre- and 1 year post-operative flexion was measured. A standing four foot alignment radiograph was obtained 6 weeks after surgery to determine the weight-bearing mechanical axis.

Results: The mean difference between the TEA and PCA was 3.94 degrees (-2.80 to 11.59) and median difference was 3.6 degrees. (A positive value implies the PCA is internally rotated with respect to the TEA). The median pre-operative flexion was 120 degrees (80-130) and the median post-operative flexion was 125 (85-145). The mean change in flexion was -2.5 degrees (-40 to 40; p=0.001). The mean intra-operative alignment was 0.75 degrees (-3 to 6, SD 1.9) and the mean radiographic alignment was 1.24 degrees (-6.5 to 6.5, SD 1.6).

Taking -3 to +3 to be neutral, the outlier rate intra-operatively was 6.5% and radiographically was 16.5%. The intra-operative and radiographic alignment showed correlation (coefficient 0.289). There was poor correlation between pre-operative deformity and degree of difference between intra-operative and radiographic alignment (coefficient -0.1).

Conclusion: There is a wide variation in the difference between the TEA and PCA, and there is not a good relationship with coronal alignment. Although most valgus knees had a bigger difference, such a difference was also seen in many varus knees. This should alert the surgeon when using posterior referencing jigs when determining the femoral component size and rotation. Although these patients achieved good post-operative flexion, this was determined by the pre-operative range. There was reasonable correlation between the final intra-operative mechanical alignment and the weight-bearing alignment as determined by a standing radiograph.
AN MRI STUDY OF THE ROTATIONAL FEMORAL ALIGNMENT IN TOTAL KNEE ARTHROPLASTY

The relationships between the transepicondylar axis (TEA), Whiteside’s line (WL), and posterior condylar axis (PCA) are commonly used to determine the rotational alignment of the femur in total knee arthroplasty (TKA). It has been previously reported that there may be gender differences in the rotational and mechanical anatomy of the distal femur. The aim of our study was to examine the distal femur in a large number of patients to report on any gender differences within the group.

The MRIs of a large cohort of prospectively chosen patients (n= 217) were examined retrospectively in order to determine the rotational femoral alignment. Varus/valgus relationship of their knees prior to prosthesis insertion was also examined. Measurements pertaining to femoral rotation (relationships between WL, TEA and PCA) and varus/valgus alignment were calculated directly from MRI studies by a single observer. Gender differences were examined using an unpaired students t-test. Averages and standard deviations are reported to within two significant figures.

The posterior condylar axis was $2.6 \pm 1.5$ degrees relative to the transepicondylar axis and $91.8 \pm 1.7$ degrees relative to Whiteside’s line. The varus to valgus ratio was $4.6 \pm 5.9$. Males in the group had a PCA of $2.4 \pm 1.6$ degrees relative to TEA compared to females in the group ($2.8 \pm 1.4$ degrees). There was no significant difference between both groups ($p=0.06$). The PCA relative to WL was $92.1 \pm 1.6$ degrees for males compared to $91.6 \pm 1.9$ degrees for females with no significant difference between both groups ($p=0.06$). Finally, the varus to valgus ratio was $5 \pm 5.7$ for males compared to females ($4.3 \pm 6.2$) with no statistical significance achieved between both groups ($p=0.39$).

Our results show that there is no significant difference in the rotational anatomy and varus/valgus alignment between men and women in a large cohort. Interestingly, the large standard deviation for values pertaining to femoral rotational anatomy (>3 degrees) suggest a significant degree of variability between patients. Thus, operative planning embracing our findings may prove to be of great clinical benefit by advocating individualising operative treatment in TKA surgery.

A PROSPECTIVE COMPARISON OF TRANSEPICONDYLAR AXIS AND FUNCTIONAL FLEXION AXIS OF THE KNEE FOR ROTATIONAL ALIGNMENT OF THE FEMORAL COMPONENT IN TOTAL KNEE ARTHROPLASTY

Introduction: Computer navigation has been shown to improve the accuracy of total knee replacement (TKR) when compared to intra or extra osseous referencing. Currently the surgical transepicondylar axis (TEA) is used to help determine femoral component rotation. This relies on the surgeon identifying medial and lateral epicondyles intra-operatively. This process has been shown to have a high variability and operator dependency. The functional flexion axis (FFA) of the femur is a kinematically derived reference axis which has previously been shown in a cadaveric model to correspond well with the transepicondylar axis. This study was therefore designed to evaluate its accuracy in vivo.

Methods: 50 patients undergoing total knee replacement under the care of the three senior authors were prospectively recruited. A preoperative CT scan was obtained and the TEA evaluated by 2 independent clinicians. TKR was undertaken in the standard fashion using Stryker navigation. The FFA was derived at 3 time points during the procedure: pre-incision, post osseous registration and following component implantation. The deviations of the FFA and surgical TEA (surTEA) to the CT-derived TEA (ctTEA) was calculated and comparisons drawn between the 2 methods with respect to validity, as well as within and between-patient reproducibility.

Results: While the FFA results were highly correlated between pre and post-arthroscopy (r = 0.89), the post-incision FFA (-1.60+/−3.7) was significantly internally rotated (p<0.01) relative to the pre-incision FFA (-2.50+/−3.4). In addition the surgical TEA (-0.40+/−3.6) was significantly internally rotated (p = 0.02) relative to the post-incision FFA (1.80+/−3.7) for the combined data from all 2 surgeons. However, when examined individually, 1 of the 2 surgeons showed no significant difference between the FFA and TEA. In addition, the two methods demonstrated comparable between-patient variability in the knee axis, although surgeon-dependent patterns remained.

Conclusion: The FFA has been shown to be of equivalent accuracy to the surgical TEA but surprisingly does not avoid its operator-dependency. Further evaluation of the FFA method with possible adjustments to the algorithm is warranted.
CORONAL STABILITY OF THE KNEE AFTER TOTAL KNEE ARTHROPLASTY WITH GAP-BALANCING TECHNIQUE

The two distinct surgical techniques for total knee arthroplasty (TKA) are gap-balancing technique (GB) and measured resection technique (MR). The aim of this study was to compare coronal stability of the knee after TKA with GB or MR.

A total of 80 TKA cases with at least 6 months follow up (average 34.4 months) were evaluated. The MR group comprised of 33 patients with an average age of 73.1 years, while the GB group comprised of 47 patients with an average age of 74.4 years. Zimmer NexGen LPS Flex was used for all cases. Coronal stability of the knee was examined by varus-valgus stress X-ray at full extension and in the 90 degree flexed position as reported by Kanekashu et al (CORR 2005). X-ray measurement was performed using the FUJI diagnostic imaging system FS-V673.

The varus-valgus stress X-ray test at full extension showed a laxity of 4.7 ± 2.1 degrees in the MR group and 3.9 ± 1.9 degrees in the GB group. No significant difference was detected between the two groups. On the other hand, the varus-valgus stress X-ray in the 90 degree flexed position revealed a laxity of 8.7±4.1 degrees in the MR group and 5.3 ± 2.7 degrees in the GB group (p<0.01, Student's t-test). Of the 11 knees that showed laxity of >11 degrees in the 90 degree flexed position, 10 were from the MR group and only one from the GB group (p<0.01, Fisher's exact probability test). Furthermore, the postoperative clinical score assessed by Japanese Orthopaedic Association criteria was significantly better in knees with a coronal laxity of <10 degrees in the 90 degree flexed position compared to those with >10 degrees (82.7 + 6.8 and 77.3 + 8.5 in the GB and MR groups, respectively).

In conclusion, GB may contribute to improved functional performance after TKA by providing better coronal stability of the knee in the 90 degree flexed position.
THE NEW ZEALAND ROTATOR CUFF REGISTRY

Introduction & aims of the study: The Rotator Cuff Registry is a unique initiative of the New Zealand Shoulder & Elbow Society. The aim of the study was to enroll nationwide all patients undergoing rotator cuff repair over a 22 month period to provide best practice guidelines for management of rotator cuff tears.

Method: To qualify for the Registry patients have to undergo surgical repair of either a partial or full thickness rotator cuff tear. Prior to surgery patients fill out a registration document as well as a pain score and Flex-SF function score. The Surgeon completes an operating day questionnaire detailing operative findings and repair methods. Follow-up is by pain and Flex-SF function scores returned at six, twelve and twenty-four months from surgery.

Results: By the 31st December 2010 3000 patients had been recruited. Analysis of the first 2684 patients for the purpose of this abstract showed 70% Male and 30% female. The dominant arm was involved in 65%, 19% of patients were in high demand occupations, 27% in medium demand and 33% low demand occupations. 16% of patients were treated with all arthroscopic repair, 40% were mini-open and 44% open. Comparing pre-op and one year post-op activity scores by surgical approach the Flex-SF improved by 12.97 points in the arthroscopic group, 13.3 in the mini-open and 12.72 in the open (NSS). Pre-op, 6 mth and 12mth pain scores were arthroscopic 4.60, 1.81 and 1.57, mini-open 4.34, 2.15 and 1.52 and open 4.82, 2.27 and 1.86. Preoperatively, the open approach had statistically more pain than the mini-open. At 6 months the arthroscopic group had statistically less pain than the open and at twelve months the mini-open had statistically less pain than the open group. For all tear sizes significant improvements in Flex-SF were seen both from preoperative levels to 6 month followup and from 6-12 month followup. A labral tear was present in 12% and repaired in 25% of these. No difference was seen in outcome between these groups. Biceps tenolysis was undertaken in 27% and tenodesis in 23%. A single row repair was selected in 44% and a double row in 56%. Double row repair resulted in better Flex-SF scores in the large tears.

Conclusion: Six, twelve and some twenty-four month data will be presented. Outcome was unaffected by the surgical approach with arthroscopic, mini-open and open results essentially identical.
THE ARTERIAL SUPPLY OF THE TENDINOUS ROTATOR CUFF INSERTIONS: AN ANATOMIC STUDY

Introduction and Aims: Confirming the presence of arteries crossing the osteotendinous junctions of the rotator cuff may explain why the rates of avascular necrosis (AVN) of the humeral head vary between 3 and 4-part fractures of the proximal humerus. It is hypothesised that the humeral head remains better vascularised in a 3-part fracture because one tuberosity with its inserting rotator cuff tendons is attached to the articular fragment and supplying it with blood.

Methodology: Shoulder girdles of 20 cadavers (68-94yrs) were harvested. The anterior (ACHA) and posterior circumflex humeral arteries (PCHA) were injected with ink and the extra and intraosseous courses of the dyed vasculature dissected through the soft tissues and bone to the osteotendinous junctions of the rotator cuff. The ink injection and bone dissection method was newly developed for the study.

Results: Rates of cross-over at the osteotendinous junction were 75% in the supraspinatus, 67% in subscapularis, 33% in infraspinatus and 20% in teres minor. The supraspinatus and subscapularis insertions were vascularised by the arcuate artery, a branch of the ACHA. The insertions of the infraspinatus and teres minor were supplied by an unnamed terminal branch of the PCHA.

Conclusion: The insertions of the rotator cuff receive an arterial supply across their OTJ’s in 50% of cases. This may explain observed rates of AVN in comminuted proximal humeral fractures. The terminal branch of the PCHA supplying the infraspinatus and teres minor insertions was named the “Posterolateral Artery”. Finally, the new method employed for this study which allowed for direct visualisation of intraosseous vasculature, will enhance our understanding of skeletal vascular anatomy and have clinical applications in orthopaedic and reconstructive surgery.
LOW-INTENSITY PULSED ULTRASOUND INCREASES GROWTH FACTOR EXPRESSION IN EXTRA-ARTICULAR SHEEP ROTATOR CUFF MODEL

Introduction & Aims: Animal studies examining tendon-bone healing have demonstrated that the overall structure, composition, and organization of direct type entheses are not regenerated following repair. We examined the effect of Low-Intensity Pulsed Ultrasound (LIPUS) on tendon-bone healing. LIPUS may accelerate and augment the tendon-bone healing process through alteration of critical molecular expressions.

Methods: Eight skeletally mature wethers, randomly allocated to either control group (n=4) or LIPUS group (n=4), underwent rotator cuff surgery following injury to the infraspinatus tendon. All animals were sacrificed 28 days post surgery to allow examination of early effects of LIPUS. Humeral head – infraspinatus tendon constructs were harvested and processed for histology and immunohistochemical staining for BMP2, Smad4, VEGF and RUNX2. All the growth factors were semiquantitative evaluated. T-tests were used to examine differences which were considered significant at p < 0.05. Levene’s Test (p < 0.05) was used to confirm variance homogeneity of the populations.

Results: The surgery and LIPUS treatment were well tolerated by all animals. Placement of LIPUS sensor did not unsettle the animals. Histologic appearance at the tendon-bone interface in LIPUS treated group demonstrated general improvement in appearance compared to controls. Generally a thicker region of newly formed woven bone, morphologically resembling trabecular bone, was noted at the tendon-bone interface in the LIPUS-treated group compared to the controls. Structurally, treatment group also showed evidence of a mature interface between tendon and bone as indicated by alignment of collagen fibres as visualized under polarized light. Immunohistochemistry revealed an increase in the protein expression patterns of VEGF (p = 0.038), RUNX2 (p = 0.02) and Smad4 (p = 0.05) in the treatment group. There was no statistical difference found in the expression patterns of BMP2. VEGF was positively stained within osteoblasts in newly formed bone, endothelial cells and some fibroblasts at the interface and focally within fibroblasts around the newly formed vessels. Expression patterns of RUNX2 were similar to that of BMP-2; the staining was noted in active fibroblasts found at the interface as well as in osteoblast-like cells and osteoprogenitor cells. Immunostaining of Smad4 was present in all cell types at the healing interface.

Conclusion: The results of this study indicate that LIPUS may aid in tendon to bone healing process in patients who have undergone rotator cuff repair. This treatment may also be beneficial following other types of reconstructive surgeries involving the tendon-bone interface.
ISOLATED GREATER TUBerosITY FRACTURES: COMPARISON OF OUTCOMES

Background: Isolated Greater Tuberosity (GT) fractures were described as separate entities from proximal humeral fractures more than 100 years ago. However, there is limited literature available about the functional outcome of the two different types of GT fractures: avulsed and comminuted.

Aim: To compare functional outcomes of the 2 different types of Greater Tuberosity fractures; simple and comminuted and to determine how these outcomes were affected by associated injuries such as shoulder dislocation and rotator cuff tear. We also looked at the acceptable post fixation displacement of GT fracture and when to consider it mal-reduction (malunion due to over or under reduction) and the acceptable time frame to delay the fixation and still get satisfactory results.

Methods: We looked at Greater Tuberosity fractures of the humerus in Waikato Hospital between 1999-2009. Radiographs were reviewed by senior Author to classify them into simple and comminuted. Measurements were done by senior Author for post fixation displacement. Operative notes checked by the authors, when in doubt, double-checked by senior author. Outcome scores used: UCLA, ASES and oxford scores to compare functional outcome. We also measured the time off work and time on ACC (Physiotherapy), as well as period of follow up.

Results: A total of 35 patients were included in the final analysis were treated operatively. Mean age of the patients was 51 years. M/F ratio was 3/2. Mechanism of injury was predominantly direct force applied to that shoulder. Shoulder dislocation was found in around 77% of patients.

Methods of fixation included tension band wiring with or without screws, rotator cuff repair and one T-plate. Follow up time was shorter for simple v comminuted fractures (22 v 44 weeks respectively). Outcome scores for patients who sustained simple fractures were slightly higher than those with comminuted fractures but the difference did not reach statistical significance. The groups with dislocation and rotator cuff tear did worse than the other groups in all aspects of the study. Post fixation displacement of GT of less than 5 mm led to a significantly better outcome than displacement of 5mm plus. Better results were obtained when the time between injury and operation was less than 2 weeks.

Conclusion: The comminuted group had similar functional outcome to the other group but required much longer follow up. Worse outcome should be expected with dislocation and rotator cuff tear associated with GT fracture. Satisfactory results relate to degree of displacement post fixation of <5 mm. Delay of fracture fixation of >2 weeks results in a less favorable outcome.
SYMPTOMATIC OS-ACROMINALE- FUNCTIONAL OUTCOME AFTER ORIF/BONE GRAFTING

Introduction: The term os-acromiale denotes the failure of fusion of acromial apophysis to the scapular spine. The prevalence of os is considered to be about 8% in the general population with higher prevalence in African Americans and males. The treatment options for a symptomatic os acromiale range from arthroscopic excision to decompression to ORIF and bone grafting. In this study, we reviewed retrospectively patients who had undergone ORIF and bone grafting for a painful os acromiale.

Materials and Methods: Patients surgically treated for os acromiale from 1998 to 2009 were included in the study. All patients were diagnosed to have a symptomatic os acromiale clinically and radiologically. A pre operative MRI of the affected shoulder was done in all patients. All patients had failed conservative management. The surgical technique was standard in all patients. The rotator cuff was repaired if it was torn. Patients were followed up at 3, 6 and 12 months postoperatively. Post operative X-rays were done at 3 months to assess healing. An ASES scoring was done at the final follow up at a mean of 30.5 months post op.

Results: 16 patients with 17 shoulders which included 10 males and 6 females were available for the last follow up. 11 shoulders involved dominant hand, 15 shoulders had a history of trauma. Surgery was performed after an average of 7.2 months of conservative management. 11 out of the 17 shoulders had associated rotator cuff tears. Out of the 6 patients with intact cuff, 2 had associated clavicle fractures and 1 patient had an Acromio clavicular joint dislocation. A clinical and radiographic union was achieved in all patients. Mean ASES score in patients without rotator cuff tear was 89 whereas patients with associated rotator cuff tear had an ASES score of 74. Pain score and percentage ADL score were better in patients without rotator cuff tear (92 and 1.3) as compared to those with a cuff tear (83 and 2.2). There was no significant difference in scores in patients who had second surgery at final follow up. 15 of the 16 patients were satisfied with the surgery and would have the surgery on the other side for a similar problem.

Conclusion: Open reduction and internal fixation of symptomatic os acromiale yields predictable clinical outcome. Bigger studies randomising treatment methods in similar group of patients may be needed to find out the superiority of one methods over the other.
ETIOLOGY AND CLASSIFICATION OF CONGENITAL SKELETAL LIMB REDUCTION ANOMALIES

Development of the limbs commences at end of fourth week with formation of mesodermal buds on flanks of the embryo. The period till eighth week sees a rapid growth of these buds to full differentiation into limb segments. Various etiological factors have been proposed for the failure of proper development of the limbs. Chemical factors have also been included.

The author has carried out extensive survey of Congenital Skeletal Limb reduction anomalies in a district in Central India. An incidence of 2.31 per 10,000 population was found. Clustering of cases were found in areas where insecticides were arbitrarily sprayed for various crops indicating that ingestion of neurotoxic substances by expectant matters may be an important causative factor. Further, research on this is required.

The Frantz and O'Rahilly's classification factor has been found to be very simple for teaching and documentation. However, it fails to address complex anomalies. No classification has been found to address multiple anomalies in the same limb.
MODELS OF NF1 AND CONGENITAL PSEUDARTHROSIS OF THE TIBIA

CPT is a uniquely difficult condition, often associated with Neurofibromatosis (NF1), where bone healing is compromised. Although rare, the severity of this condition and the multiple procedures often entailed in treating it, warrant research attention. As study material is limited, animal models of the disorder are desirable for testing new treatments.

We sought to create a model of CPT where both copies of the NF1 gene were ablated at the fracture site, as has been found in some clinical specimens. NF1 floxed mice had fracture surgery, both closed fracture and open osteotomy were performed. Either a Cre- or control GFP-adenovirus was injected into the fracture site at day zero. Recombination was confirmed in ZAP reporter mice. Additionally, cell culture studies were used to examine the possible responses of NF1+/+ (wild type) NF1+/- or NF1-/- to drugs which may rescue the dysregulated Ras/ MAPK pathway in NF1.

In closed fractures, radiographic bridging was 100% in NF1+/+ calluses and <40% in NF1-/- calluses (P<0.05). In open fractures, radiographic bridging was 75% in NF1+/+ calluses and <30% in NF1-/- calluses (P<0.05). In both fracture repair models the NF1-/- state was associated with a significant up to 15-fold increase in fibrotic tissue invading the callus by week 3. In NF1-/- fractures, large numbers of TRAP+ cells were observed histologically in the fibrotic tissue. Closed fractures also showed a significant increase in BRDU labelled proliferating cells in the callus. In cell culture models of NF1 deficient osteogenesis, NF1-/- progenitors were found to be significantly impaired in their capacity to form a calcified matrix as measured by Alizarin Red S staining and osteogenic markers (Runx2, Osteocalcin, Alp expression). However, when differentiated calvarial NF1 floxed osteoblasts were treated with Cre adenovirus, mineralization was not affected, suggesting that NF1 impacts on osteogenic differentiation rather than mature cell function. Treatment with MEK inhibitor PD0325901 was found to rescue the NF1-/- progenitor differentiation phenotype and permit robust mineralization. Treatment with the JNK inhibitor SP600125 was also able to improve ALP activity and mineralization in NF1+/+ osteoprogenitors compared to control cells.

This model of NF1-/- induction at a fracture or osteotomy site closely replicates the clinical condition of CPT, with lack of bone healing and fibrous tissue invasion. Underlying defects in bone cell differentiation in NF1 deficiencies can be at least partially rescued by JNK and MEK inhibitors.
SCLEROSTIN ANTIBODY ENHANCED HEALING DURING DISTRACTION OSTEOREGENESIS 
IN RATS

Sclerostin is a negative regulator of osteoblast differentiation and bone formation. Expressed by osteocytes, it acts through antagonising the Wnt/β-catenin pathway and/or BMP activity. Distraction osteogenesis, used for limb lengthening and reconstruction, can be complicated by disuse osteopenia and poor healing response, both of which would benefit from pro-anabolic therapy.

We examined the effects of Sclerostin Antibody (Scl-AbIII, Amgen Inc.,) in a rat model of distraction osteogenesis. A femoral osteotomy was stabilized with an external fixator in male Sprague Dawley rats. After a week of latency, the gap was distracted twice daily for 14 days to a total of 7 mm. Saline or Scl-Ab was administered twice weekly throughout the distraction period and up to 4, 6 or 8 weeks post commencement of distraction. Three groups were examined: Saline, Continuous Scl-Ab throughout the study (C Scl-Ab), and Delayed Scl-Ab with commencement of Scl-Ab after distraction (D Scl-Ab).

Regenerate bone mineral content (BMC), determined by DEXA, was increased 36% at 4 weeks and 86% at 6 weeks with C Scl-Ab, resulting in a 65% increase in bone mineral density (BMD) at 6 weeks, compared with Saline (p<0.01). D Scl-Ab treatment showed a 41% increase in BMC and a 31% increase in BMD compared with Saline at 6 weeks (p<0.05). By 8 weeks, C Scl-Ab remained significantly increased over Saline (72% in BMC; 60% in BMD). Micro-CT scans of the regenerate revealed increases in bone volume of 88% with C Scl Ab and 65% with D Scl-Ab compared with Saline at 6 weeks (p<0.05). By 8 weeks, these increases were 36% for C Scl-Ab (p<0.05) and 37% for D Scl-Ab compared with Saline (p<0.01). Importantly, mean moment of inertia was increased over two-fold in both Scl-Ab groups at 6 weeks compared with Saline (p<0.05). Histology at 6 weeks confirmed micro-CT data with 85-88% increases in bone volume/tissue volume (BV/TV) in the regenerate with both C Scl-Ab and D Scl-Ab compared with Saline (p<0.05). Analysis of bone formation at 6 weeks revealed increases in mineral apposition rate of 56% in C Scl-Ab and 52% in D Scl-Ab compared with Saline (p<0.05).

Scl-Ab treatment increased bone formation in this model of distraction osteogenesis, resulting in a larger regenerate callus (increased BMC and BV/TV). We expect further studies to reveal increases in mechanical strength. Scl-Ab may hold promise as a therapeutic to accelerate regenerate formation and consolidation in distraction osteogenesis for limb reconstruction.
POSTERIOR SLOPING ANGLE AS A PREDICTOR OF CONTRALATERAL SLIP IN SLIPPED UPPER FEMORAL EPIPHYSIS

Introduction: Slipped upper femoral epiphysis (SUFE) is an uncommon condition with potentially severe complications including avascular necrosis (AVN) and chondrolysis. Children with a 'slip' are at a significantly higher risk of a contralateral slip. Controversy remains as to when to undertake prophylactic pinning. The primary aim of this study was to assess the Posterior Sloping Angle (PSA, as described by Barrios et al in 2005) as a predictor for contralateral slip in a large, multi ethnic cohort.

Methods: All consecutive patients treated for SUFE presenting to Waikato Hospital between January 2000 and December 2009 were identified via medical coding. Patients without radiographs and those with bilateral slips on presentation were excluded. Clinical records were reviewed to document demographic data, slip characteristics and follow up outcomes. Radiographic analysis of the PSA in the unaffected hip was performed by a single author. Statistical analysis was performed using a student's t-test with Microsoft Excel 2003.

Results: 182 patients were identified, 50 were excluded [26 bilateral slips, 24 no radiograph available] to total a study population of 132 patients. 93 patients were male [72%]. Mean age was 11.8 years [6.2-15.6 years]. 72% were of Maori ethnicity and 26% were of New Zealand European descent. 90 patients [69%] had a unilateral slip, 42 [32%] had a contralateral slip. 48% were not followed until physeal closure and 50% did not attend at least one scheduled appointment.

Mean PSA of those with a unilateral slip was 10.8° [2-21°]. Patients who subsequently developed a contralateral slip had a statistically significantly higher mean PSA of 17.2° [6-36°] [p<0.0001]. Children with a contralateral slip were significantly younger 11.1 years than those with a unilateral slip 12.2 years (p<0.0001). No significant differences in PSA were found between Maori and NZ European children.

If a PSA of 14° was used as an indication for prophylactic fixation in this population 35/42 [83.3%] of contralateral slips would have been prevented. 19/90 hips would have been pinned unnecessarily. The number needed to treat demonstrates that 1.79 hips are prophylactically pinned to prevent one slip in this population.

Conclusion: This large retrospective cohort study demonstrates that a PSA of 14° in an unaffected hip after one sided SUFE could warrant prophylactic pinning in an unaffected hip to prevent subsequent slip and the complications associated with this, potentially protecting a population that can be difficult to follow up.
EARLY EXPERIENCE WITH THE SUBCAPITAL RE-ALIGNMENT OSTEOTOMY VIA SURGICAL HIP DISLOCATION AND MODIFIED FIXATION TECHNIQUE FOR SEVERE SCFE (SLIPPED CAPITAL FEMORAL EPIPHYSIS): 29 CASES

Anatomic reduction (subcapital re-alignment osteotomy) via surgical hip dislocation – popularised by Leunig, Slongo, Ganz, Kim – is becoming increasingly popular. While the reported AVN rates are very low, experiences seem to differ greatly between centres. We present our early experience with the first 29 primary cases and a modified fixation technique.

We modified the fixation from threaded Steinman pins to cannulated 6.5mm fully-threaded screws: retrograde guidewire placement before reduction of the head ensured an even spread in the femoral neck and head. The mean PSA (posterior slip angle) at presentation (between 12/2008 and 01/2011) was overall 68° (45-90°). 59% (17/29) were stable slips (mean PSA 68°), and 41% (12/29) were unstable slips unable to mobilise (mean PSA 67°). The vascularity of the femoral head was assessed postoperatively with a bone scan including tomography.

The slip angle was corrected to a mean PSA of 5.8° (7° anteversion to 25° PSA). We encountered no complications related to our modified fixation technique. All cases with a well vascularised femoral head on the post-operative bone scan (15/17 stable slips and 8/12 unstable slips) healed with excellent short term results. Both stable slips with decreased vascularity on bone scan (2/17, 12%) had been longstanding severe slips with retrospectively suspected partial closure of the physis, which has been described as a factor for increased risk of avascular necrosis (AVN). One of these cases was complicated by a posterior redislocation due to acetabular deficiency. In the unstable group, 4/12 cases (33%) had avascular heads intra-operatively and cold postoperative bone scans, 3 have progressed to AVN and collapse.

Anatomic reduction while sparing the blood supply of the femoral head is a promising concept with excellent short term results in most stable and many unstable SCFE cases. Extra vigilance for closed/closing physes in longstanding severe cases seems advisable. Regardless of treatment, some unstable cases inevitably go on to AVN.
THE TECHNOLOGY-PEDAGOGY INTERFACE: EDUCATIONAL TRANSFORMATION IN A DIGITAL AGE

The fact that conventional classroom-based approaches to teaching and learning will not be capable of meeting the escalating demand for higher education and continuing professional development is not widely acknowledged and represents a major leadership challenge. The need for innovative pedagogical practices supported by new technologies to improve the productivity of teachers and learners has never been greater. The presentation will cover such issues as the significant forces driving change in higher education, five generations of flexible learning technologies, the importance of digital learning literacies, the role of open educational resources in the transformation of higher education and the need for increased investment in systemic innovation.
DEVELOPING DOCTOR AND PATIENT E-LEARNING RESOURCES: ORTHOFRACS AND ORTHOANSWER

Online resources are becoming an important part of surgical education, information and training. Orthofracs is a not-for-profit orthopaedic educational resource that was created by integrating registrar training presentations into website content development. Orthoanswer is a multi-disciplinary patient information website written at 5-6 English level.

Orthofracs started as an online repository of fellowship examination notes but has evolved and developed into a collaborative resource, utilising modern multimedia tools. As well as an online textbook, it contains case studies and type-X multiple choice question generator. Registrars at Western Health present on a weekly basis on selected review topics and at the monthly journal review club, which are live broadcast on the web with the ability for internet users to log in and interact. In addition, the Victorian Tasmanian AOA Bone School is broadcasted using this technology and hosted on Orthofracs. All the Webinars are recorded and uploaded to the site for future registrar reference.

Orthoanswer was created as a multidisciplinary not-for-profit easy-to-understand orthopaedic patient educational and information resource. Online resources are becoming an important source of patient information and education. However, most of the resources are often inadequate or deficient due to the quality of information, the readability of the language or the trustworthiness of the source.

The educational material was complied in a multidisciplinary collaborative effort between orthopaedic surgeons, physiotherapist, occupational therapists, plaster technicians, anaesthetists, nurses and administrators. Medical students followed the patients throughout their care, from their first presentation through to management from the different health professionals to final discharge. Their experiences, concerns and feedback were recorded and used to develop the educational resource.
OUTCOME AFTER KNEE DISLOCATIONS: A 2 - 9 YEAR FOLLOW-UP OF 85 CONSECUTIVE PATIENTS

Background: Dislocation of the knee is a relatively rare injury; with modern arthroscopic techniques, operative reconstruction has become the standard of care. The primary aim of this study was to prospectively follow a large, consecutive series of knee dislocations to document associated injuries, surgical treatment, knee function and knee osteoarthritis (OA) at a minimum two years follow-up.

Methods: Hundred-and-twenty two consecutive patients with a traumatic knee dislocation (Schenck II-IV) were treated at the Ullevaal University Hospital between May 1996 and Dec 2004. Follow-up evaluation of 85 patients consisted of the Tegner activity level score, the Lysholm score and the IKDC2000 form. Knee joint laxity was evaluated using the KT1000, the Lachman test, the pivot shift test, the reversed pivot shift, the posterior drawer test, the dial test and varus/valgus test compared to the uninjured limb. Knee function was evaluated using four single leg hop tests. Radiographic evaluation was performed using the Kellgren-Lawrence system.

Results: There was no significant difference between the early and late surgery for the cohort for Lysholm, Tegner or the IKDC2000 scores. Tegner activity score, Lysholm, IKDC2000, and functional knee tests disclosed lower knee function for those patients with KD-IV compared to KD-II and III. Lysholm and the functional scores were significantly lower in the high energy injury group. 87% had Kellgren Lawrence grade 2-4 on the injured knee compared to 35% on the uninjured knee.

Conclusions: This study showed that injuries resulting from high energy trauma, and those involving all four major ligaments resulted in significantly worse outcomes. The presence or absence of a neurovascular injury did not affect the eventual outcome. A significant number of patients had osteoarthritis based on a Kellgren-Lawrence analysis at follow up.

Level of Evidence: Prospective cohort study: Level II.
KNEE CARTILAGE DEFECT PATIENTS ENROLLED IN RANDOMIZED CONTROLLED TRIALS ARE NOT REPRESENTATIVE OF PATIENTS IN ORTHOPEDIC PRACTICE

Objective: Knee cartilage defects represent a socioeconomic burden and may cause lifelong disability. Studies have shown that cartilage defects are detected in approximately 60% of knee arthroscopies. In clinical trials, the majority of these patients are excluded.

This study investigates whether patients included in randomized controlled trials (RCTs) represent a selected group compared to general cartilage patients.

Design: Published randomized clinical trials on cartilage repair studies were identified (May 2009) and analysed to define common inclusion criteria that in turn were applied to all patients submitted to our cartilage repair center during 2008. Patient-administered Lysholm knee score was used to evaluate functional level at referral. In addition, previous surgery and size and location of cartilage detect were recorded.

Results: Common inclusion criteria in the referred patients and patients included in the published RCTs were single femoral condyle lesion, age range 18 - 40 years, and size of lesion range 3.2 - 4.0cm squared. Six of 137 referred patients matched all the seven RCTs. Previous cartilage repair and multiple lesions were associated with decreased Lysholm score (P is less than 0.002). Lysholm score was independent of age, gender, and time of symptoms from the defect.

Conclusion: The heterogeneity of the referred cartilage patients and the variation in inclusion criteria in the RCTs may question whether RCTs actually represent the general cartilage patients. The present study suggests that results from published RCTs may not be representative of the gross cartilage population.
WHAT I HAVE LEARNED ABOUT KNEE MOTION FROM 'DYNAMIC MRI'

No abstract has been provided for this presentation.
ARE OUR TREATMENT METHODS IN ORTHOPAEDICS SPORTS TRAUMATOLOGY EVIDENCE BASED?

This talk will highlight the current situation for evidence based medicine in orthopaedic sports traumatology. By using examples from my own research I will tell you why I became interested in this field. Then we will go through new studies and current status in the fields of cartilage treatment, ligament reconstruction with a specific eye towards non surgical and surgical treatment and the relatively new field of prevention of sports injuries. These slides will highlight our current short comings and suggest improvement. The talk will be summarised with an example of perfect design, implementation and publication in hip surgery and with the rules of randomized controlled studies.

1. Studies should be prospective with a clearly defined hypothesis and one clearly defined primary end point. They should be randomized controlled trials with an adequate randomization procedure and power analysis for the primary end point. Secondary end points should only be used as supportive evidence to the primary hypothesis.

2. Patient inclusion and exclusion criteria should be clearly established and reported. The recruitment rate should be reported, and attempts should be made to account for eligible patients who are not included and those who are lost follow-up.

3. The outcome measure should be validated for use on patients with the injury being researched.

4. Outcome assessment should be made by an independent investigator. The assessment should be in a written form and ideally be completed by the patient without investigator assistance.

5. The timing of the outcome assessment should be clearly stated. Results from various time-points after surgery should not be reported as one outcome. Assessments should be both clinical and functional. The minimum duration of follow-up should be more than twenty-four months.

6. Detailed rehabilitation protocols should be established and reported. Attempts should be made to monitor compliance. The protocols should be applied in a standardized manner to both patient cohorts.
RIVAROXABAN (XARELTO) VS. ENOXAPARIN (CLEXANE): A COMPARISON OF ACUTE POSTOPERATIVE MORBIDITY FOLLOWING TOTAL KNEE REPLACEMENT

Background: Rivaroxaban is an oral anticoagulant which has the potential to replace subcutaneous Clexane in post operative prophylaxis of venous thromboembolism following knee replacement. Rivaroxaban has been shown to be at least equivalent to Enoxaparin in the prevention of deep venous thrombosis and pulmonary embolism with a similar rate of major bleeding. However, the morbidity associated with the new product has yet to be fully examined. Our own anecdotal evidence suggests that Rivaroxaban may be associated with poorer knee range of motion, and greater bruising and haemarthrosis. This pilot study aimed to compare these outcomes as well as knee pain and length of hospital stay in patients receiving Rivaroxaban and Enoxaparin following total knee replacement.

Methods: A controlled before and after study with single blinding was performed. Patients in the ‘Before’ group were given Rivaroxaban (our current protocol). Patients treated in the ‘After’ group were subjected to our previous protocol (Enoxaparin). Patients were followed up to 6-weeks post surgery. Blinded assessors reviewed range of motion and wound outcomes using a photographic method. Swelling was measured using a standardized technique. Bleeding, pain and length of stay were prospectively recorded.

Results: Data analysis is due to be completed in April 2011. Complete results will be available after this time.

Discussion: Rivaroxaban was introduced to lessen patient burden as oral administration is presumed to be more acceptable than self-injection of Enoxaparin. It is yet to be determined comprehensively whether the benefits of oral administration outweigh any associated risks. Surgeons must carefully consider the risks and benefits of their choice of venous thrombosis prophylaxis following total knee replacement.
USING A COMBINATION OF TRANEXAMIC ACID AND RIVAROXABAN IN TOTAL KNEE REPLACEMENTS REDUCES TRANSFUSION REQUIREMENTS: A PROSPECTIVE COHORT STUDY

The risk of venous thrombo-embolism (VTE) is high in orthopedics. Oral direct factor Xa inhibitors have been introduced to help reduce the incidence of VTE. To reduce post-operative bleeding antifibrinolytics are used. We aimed to ascertain the effect of two drugs on post operative bleeding and transfusion requirements.

We prospectively recorded patient demographics, operative details, complications, transfusion incidence and VTE incidence in TKR patients. We also sent out questionnaires to patients asking about wound bleeding and VTE. All patients were given 10mg Rivaroxaban 8 hours post operatively and then OD for 14 or 35 days. Patients given tranexamic acid were given 500mg IV, 5 minutes prior to wound closure at the discretion of the surgeon. VTE was Deep Vein Thrombus or Pulmonary Embolism confirmed by Doppler or CTPA. Minor bleed was categorized as dressing soakage or reported wound leakage, major bleed as hematoma requiring revision within 30 days.

509 patients underwent TKR: 200 (39%) received Rivaroxaban only (Group 1), 296 (58%) also received tranexamic acid (Group 2). 13 (3%) patients had no data available. Five patients had a VTE: 4 (2%) in Group 1, 1 (0.3%) in Group 2 [P<0.05]. 39 patients had a minor bleed: 17 (8.5%) in Group 1, 22 (7.4%) in Group 2 [P=0.5]. 2 patients had major bleeds: 1(0.5%) in Group 1 and 1(0.33%) in Group 2 [P=0.69]. There were 30 blood transfusions: 21 (10.5%) in Group 1, 9 (3%) in Group 2 [P<0.0001].

We have demonstrated a reduced requirement for blood transfusions in the tranexamic acid group. However our results, whilst they show a trend towards decreased minor and major bleeding rates, are not significant and require larger studies looking at wound bleeding and leakage.
TEN-YEAR SURVIVORSHIP OF PRESS FIT CONDYLAR SIGMA TOTAL KNEE ARTHROPLASTY IN YOUNG PATIENTS

We set out to demonstrate the 10-year survivorship of the PFC sigma TKA in a young patient group.

Demographic and clinical outcome data were collected prospectively at 6 months, 18 months, 3 years, 5 years and 8-10 years post surgery.

The data were analysed using Kaplan Meier survival statistics with end point being regarded as death or revision for any reason.

203 patients were found to be < 55 years at the time of surgery. Four patients required revision and four patients died. Another four patients moved away from the region and were excluded from the study.

A total of 224 knees in 199 patients (101 male and 98 females.) 168 patients had a diagnosis of Osteoarthritis and 28 with inflammatory arthritis. Average age 50.6 years range 28-55 years (median 51).

Ten-year survivorship in terms of revision 98.2% at ten years 95% confidence interval.

Our results demonstrate that the PFC Sigma knee has an excellent survival rate in young patients over the first 10 years.

TKR should not be withheld from patients on the basis of age.
THE OUTCOME OF TOTAL KNEE REPLACEMENT IN YOUNG PATIENTS: A 10 YEAR MATCHED CASE CONTROL STUDY

The aim of this study was to compare the long-term outcome from total knee replacement (TKR) in young versus old patients in terms of pain and functional outcome.

We used our arthroplasty database which recorded prospectively pain and American Knee Society scores at regular intervals over ten years after TKR. The procedures used a modern, cemented resurfacing type cruciate retaining prosthesis. A cohort of young patients (< 55 years) were identified. A control group of patients > 56 was identified, matching for ASA, body mass index and underlying condition. Change over time was analysed using a factorial repeated measures ANOVA test, which allowed for investigation of difference between groups.

40 Knees in 26 patients were identified. 2 patients died prior to follow up, 2 were revised within the study period. (1 for infection at 2 years and one for change of poly at 7 years) and a further 4 were lost to follow up. 7 knees could not be matched and were excluded. This left a study group of 24 young and 24 older knees.

Pain scores (p=0.025) and American Knee Society “Knee” (p<0.001) and “Function” (p<0.001) scores changed significantly over time. There were however no statistical differences over the 10 year period in pain (p=0.436) and knee performance (0.618) but overall function was higher throughout the period in the younger group (=0.004).

Knee replacement in younger patients produces similar outcomes in terms of pain and function compared with older patients and TKR should not be withheld purely on account of age.
PATELLOFEMORAL CREPITUS FOLLOWING LCS RPS TOTAL KNEE ARTHROPLASTY WITHOUT PATELLA RESURFACING

The LCS RPS knee system is based on the successful LCS mobile bearing prosthesis, and has been introduced with the intention of improving post-operative knee flexion. The aim of this study is to report a high incidence of significant patellofemoral crepitus when this prosthesis is used without patella resurfacing. A successful arthroscopic technique to treat this complication will be described.

We present a retrospective review of a single surgeon series of LCS RPS knee arthroplasty. All procedures were performed using a standard technique with cemented components. The patella was not resurfaced in any of the presented cases. The knee society score, patellofemoral score (Baldini et al, 2006), BMI, range of motion, and post-operative radiographs were obtained for all patients. In addition the presence of patellofemoral crepitus was assessed and rated as either none, mild (for limited ROM), moderate (throughout entire ROM), or severe (catching/clunk). An arthroscopic technique to treat this complication was developed.

A total of 56 patients were reviewed at a mean follow-up of 16 months (range 9-22). The mean age at time of operation was 70 (range 50-87), and mean BMI was 29 (range 18-42). A lateral release was performed in 7 cases (12%). Mean knee society score was 77 (range 35-92), patellofemoral score 73 (range 25-100), and ROM 115 degrees (range 85-135). Significantly, patellofemoral crepitus was severe in 12 (21%) patients, moderate in 21 (37%), mild in 15 (26%), and absent in 9 (16%). In 4 patients arthroscopic resection of the proximal pole of the patella has resulted in complete resolution of severe crepitus with increases in patellofemoral (mean 25) and knee society (mean 7) scores, and, ROM (mean 15 degrees). One of these patients at 6 month follow-up has reported return of moderate crepitus. Similar resolution of crepitus has been seen in 3 cases which were revised to resurface the patella. As part of this ongoing study a non-randomised comparison group who received patellar resurfacing at the primary procedure has produced no cases of moderate or severe crepitus.

In conclusion patella resurfacing is required when using the LCS RPS prosthesis to prevent an unacceptably high rate of moderate to severe patellofemoral crepitus. Both arthroscopic patelloplasty and revision to resurface the patella have resulted in resolution of this problem. Potential biomechanical causes for this problem will be presented.
DO DIGITAL IMAGES DETECT PERIPROSTHETIC OSTEOLYSIS AROUND TOTAL KNEE REPLACEMENTS BETTER THAN PLAIN RADIOGRAPHS?

Aims: To examine the performance of film compared to DICOM (Digital Imaging and Communications in Medicine) images in the detection and volume appreciation of periprosthetic osteolysis around total knee replacements.

Simulated osteolytic lesions were created around 3 cadaveric total knee replacements and fluoroscopic-assisted radiography as well as Computed Tomography derived imaging taken. 3 Arthroplasty surgeons then reviewed the hard images (AP, Lateral, Paired Obliques and Computed Tomography) on 2 separate occasions regarding the presence and size of lesions. With a minimum of 2 months since the last assessment, DICOM images taken from the same knees were then assessed by the same 3 arthroplasty surgeons in the same manner using Syngo™ Pictured Archive Communication System on hospital computer monitors.

Area under the ROC for lesions detection and kappa statistic for volume appreciation derived from the DICOM assessments were not superior with statistical significance to film assessments. Combinations of imaging that incorporated Paired Oblique views had superior performance in both hard-copy and DICOM imaging.

Digital imaging in this study has not clearly demonstrated superiority to film images for detection and volume appreciation of periprosthetic osteolysis around total knee replacements. The value of the addition of the oblique view to routine assessment is again demonstrated.
INDIRECT REDUCTION TECHNIQUES IN THE MANAGEMENT OF PAEDIATRIC ODONTOID FRACTURES

Odontoid synchondral fractures are considered the most common type of fracture, amounting TO 10% of all subaxial injuries in the under 7 demographic. This injury occurs as typically the result of hyperflexion. Most odontoid fractures in children below 7 years of age involves the odontoid synchondrosis

The following is a report of the management of paediatric synchondral fractures in 2 patients who presented to the Children's Hospital Westmead in 2010. Both patients had displaced synchondral odontoid fractures which were managed by indirect reduction and halo traction.

In both patients an anatomical alignment was achieved and maintained. Follow-up was 6 and 9 months respectively and the patients were assessed both clinically and radiologically.

We feel the use of the "double mattress" technique is a valuable tool, as a means of achieving and maintaining occipitocervical extension, necessary, in the treatment of odontoid synchondral fractures
FACTORs THAT PREDICT POOR OUTCOMES IN PATIENTS WITH TRAUMATIC VERTEBRAL BODY FRACTURES

Study design: Prospective cohort study.

Objective: To identify factors that predict poor patient-reported outcomes in patients with traumatic vertebral body fracture(s) of the thoracic and/or lumbar spine without neurological deficit.

Summary of background data: There is a paucity of information on factors that predict poor patient-reported outcomes in patients with traumatic vertebral body fracture(s) of the thoracic and/or lumbar spine without neurological deficit.

Methods: Patients were identified from the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR). VOTOR includes all patients with orthopaedic trauma admitted to the two adult Level 1 trauma centres in Victoria, Australia. Patient-reported outcomes and data on possible predictive factors, including demographic details, injury-related and treatment-based factors, were obtained from the VOTOR database. Patient-reported outcomes were measured at 12 months post-injury using the 12-Item Short-Form Health Survey (SF-12), a Numerical Rating Scale (NRS) for pain, global outcome questions and data was collected on return to work or study. For the identification of predictive factors, univariate analyses of outcome vs. each predictor were carried out first, followed by logistic multiple regression.

Results: 344 patients were eligible for the study and data were obtained for 264 (76.7%) patients at 12 months follow-up. Patients reported ongoing pain at 12 months post-injury (moderate–severe: 33.5%), disability (70.1%) and inability to return to work or study (23.3%). A number of demographic, injury-related and treatment-based factors were identified as being predictive of poor patient-reported outcomes. Patients who had associated radius fracture(s) were more likely to have moderate to severe disability (odds ratio (OR) = 3.85, 95% confidence interval = 1.30–11.39), a poorer physical health status (OR = 3.73, 1.37–10.12) and moderate to severe pain (OR = 3.23, 1.22–8.56) at 12 months post-injury than patients without radius fracture. Patients who did not receive compensation for work-related or road traffic-related injuries were less likely to report moderate to severe pain (OR = 0.45, 0.23–0.90) or have a poorer mental health status (OR = 0.17, 0.04–0.70) at 12 months post-injury than those who received compensation.

Conclusions: The prognostic factors identified in this study may assist clinicians in the identification of patients requiring more intensive follow-up or additional rehabilitation to ultimately improve patient care.
BALLOON-ASSISTED KYPHOPLASTY WITH CALCIUM-PHOSPHATE CEMENT IN THE TREATMENT OF ACUTE BURST THORACO-LUMBAR FRACTURES

Introduction: The progressive kyphosis and pain in patients with acute thoracolumbar burst fractures treated conservatively so as the recurrent kyphosis after posterior reduction and fixation were associated to disc collapse rather than vertebral body compression. It depends on redistribution of the disc tissue in the changed morphology of the space after fractures of the endplate.

The aim of this study is to evaluate the safety and the efficacy of balloon kyphoplasty with calcium phosphate, alone or associated to short posterior instrumentation, in the treatment of acute thoracolumbar burst fractures.

Materials and Methods: eleven fractures in ten consecutive patients with an average age of 48 years who sustained acute thoracolumbar traumatic burst fractures without neurological deficits were included in this study. The fractures were A1.2 (3), A3.1 (4) and A3.2 (4), according to AO classification. In 7 fractures (A1.2 and A3.1) the kyphoplasty was performed alone in order to make the most of efficacy in fracture reduction, anterior and medium column stabilization and, as much as possible, segmental kyphosis correction. In the A3.2 fractures (4), that are unstable, the kyphoplasty was associated to a short posterior instrumentation. To avoid the PMMA long run complications in younger patients, we used a calcium phosphate cement. VAS, SF-36, Roland-Morris questionnaire (RMQ) and Oswestry low back pain disability questionnaire (ODQ) were used to evaluate pain, state of health, functional outcomes and spine disability.

Results: To the average follow-up time of 15.5 months (range 8-31) we didn’t observe statistically significant differences in 7 of 8 SF-36 domains in comparison to general healthy population of same sex and age. At the same follow-up, the spine disability questionnaire showed a functional restriction of 18% (ODQ) and 29.6% (RMQ) being 100% the maximum of disability. No bone cement leakage, no implant failure and no height correction loss was observed in any case.

Conclusion: Our data confirm the safety and the efficacy of balloon kyphoplasty with calcium phosphate in the treatment of acute thoracolumbar burst fractures. In this way we can reduce the possible complications resulted from discal space collapse and obtain an early functional restoration. When performed alone, this mini invasive surgical technique offer the advantage of almost immediate return to daily activities. When associated to a posterior instrumentation, it decreases the long run complications and allows to reduce the number of stabilized levels, maintaining, in part, the thoracolumbar junction movement.
FUNCTION PROGNOSIS FOLLOWING THORACOLUMBAR TRAUMA: A SYNTHESIS OF SYSTEMATIC LITERATURE REVIEWS AND CONSENSUS EXPERT OPINION

Introduction: The aim of this study is to determine evidence-based guidelines on functional outcomes following common thoracolumbar injuries using a synthesis of systematic literature reviews and consensus expert opinion.

Method: A questionnaire was created comprising five cases representative of common thoracolumbar injuries (a thoracic compression fracture, a flexion distraction injury and burst fractures each with varied location, patient demographics and treatment strategies). For each scenario 5 questions about expected functional outcomes were posed. Questionnaires were distributed to the Spine Trauma Study Group. Responses were combined with available data from a systematic review of the same injuries and outcomes to create consensus evidence based guidelines.

Results: The survey was completed by 31 (57%) of 53 surgeons representing 20 centers across North America. The systematic reviews identified 49 appropriate studies. One year following a L1 burst fracture, a heavy laborer, treated with protective mobilization (cast or brace) has a 40% chance of being pain free, 70% chance of regaining pre-injury range of motion, can expect to be re-employed within 4-6 months and be able to participate in high impact exercise and contact sport with no or minimal limitation. Length of inpatient stay averages 4-5 days. One year following posterior short segment stabilization of a L1 burst fracture in a college football player, there is an expected 45% chance of being pain free and 55% chance of regaining pre-injury ROM. While an ultimate return to high impact exercise and contact sports is anticipated, 32% of experts expect the injury to end a college football career.

Results for the other trauma scenarios are included.

Conclusions: This combination of literature and expert opinion represents the best available evidence on functional prognosis after thoracolumbar trauma. By providing consistent, accurate information surgeons and other care path providers will help patients develop realistic expectations, which may shape and improve their ultimate outcome.
MRI IN SPINAL TRAUMA – A PREDICTOR OF NEUROLOGICAL RECOVERY

Introduction: This is a study to investigate the diagnostic and prognostic value of MRI in spinal cord injury.

Methods: We performed this prospective study on sixty two patients of acute spinal trauma. We evaluated the epidemiology of spinal trauma & various traumatic findings by MRI. MRI findings were correlated with clinical findings at admission & discharge according to ASIA impairment scale. Four types of MR signal patterns were seen in association with spinal cord injury - cord edema / non haemorrhagic cord contusion (CC), severe cord compression (SCC), cord hemorrhage (CH) and epidural hematoma (EH). Isolated lesion of cord contusion was found in 40%. All other MR signal patterns were found to be in combination. In cord contusion we further subdivided the group into contusion of size < 3 cm and contusion of size > 3 cm to evaluate any significance of length of cord contusion. In cord haemorrhage involving >1cm of the cord, focus was said to be sizable

Results: On bivariate analysis, there was a definitive correlation of cord contusion (CC) involving <3cm & > 3cm of cord with sensory outcome. In >3cm, chances of improvement was 5.75 times lesser than in patients with CC involving <3cm of cord (odds ratio = 5.75 (95% CI: 0.95, 36), Fisher’s exact p = 0.0427 (p<.05). In severe cord compression (SCC) the risk of poor outcome was more (odds ratio 4.3 and p=0.149) however was not statistically significant. It was noted that the patients in which epidural hematoma (EH) was present, no improvement was seen, however, by statistical analysis it was not a risk factor and was not related with the outcome (odds ratio – 0.5 and p = 0.22). Presence of cord edema / non haemorrhagic contusion was not associated with poor outcome (odds ratio 0.25 and p=0.178). On multiple logistic regression / multivariate analysis for estimating prognosis, sizable focus of haemorrhage was most consistently associated with poor outcome (odds ratio -6.73 and p= 0.32) however it was not statistically significant. The risk of retaining a complete cord injury at the time of follow up for patients who initially had significant haemorrhage in cord was more than 6 fold with patients without initial haemorrhage (odds ratio 6.97 and p = .0047).

Conclusion: Besides being helpful in diagnosis, MRI findings may serve as a prognostic indicator for clinical, neurological and functional outcome in acute spinal trauma patients.
286 OPERATIVELY TREATED MIDSHAFT CLAVICLE FRACTURES: A RETROSPECTIVE REVIEW COMPARING THE OUTCOME OF SIMPLE TO COMPLEX FRACTURE PATTERNS

Introduction: Midshaft clavicle fractures can be classified into simple or complex/comminuted. The hardest fracture to treat is the severely comminuted and displaced fracture. We retrospectively compared 286 consecutive operatively treated simple (2 and 3 part) fractures with the more complex comminuted (>=4 part) midshaft clavicle fractures, looking at outcome, complication rate and union rate.

Materials and Methods: Between 2008 and 2010 the senior author operated on 286 displaced midshaft clavicle fractures using a plate and screws. In this cohort there were 173 simple (2 and 3 part) fractures and 99 complex (>=4 part) fractures. The operation was performed through a limited incision technique and was standardized. All fractures were fixed with at least 3 screws on either side of the comminution. All patients were followed up until radiological and clinical union. A standardized questionnaire was used to assess patient satisfaction, return to work, sport and outcome at each postoperative visit. All complications were documented.

Results: All fractures eventually went onto union. There were 242 males and 44 females with the average age being 33. The complex fractures had a larger scar, took longer to return to normal motion, work and sport, and took on average 10 weeks to unite compared to 6 weeks in the simple fractures. The infection rate in the simple fractures was 1% and in the complex fractures was 2%. The big difference was the incidence of non union in the complex fractures of 10% compared to 1%; the other main difference was postoperative shoulder stiffness of 3% at 3 months in the complex fractures compared to 1 % in the simple fractures. Plate elevation/irritation was also more prevalent in the complex fractures of 10% compared to 3%.

Conclusion: This study clearly shows there is a higher complication rate in complex fractures. Particular attention must be placed on surgical technique and anatomical reduction of these difficult fractures followed closely by postoperative rehabilitation. Future studies of clavicle fractures should specify the type of fracture being treated to give a better understanding of the potential outcome.
4D CT SCANS IMPROVE PRE-OPERATIVE PLANNING IN SNAPPING SCAPULAR SYNDROME

Introduction: The purpose of this study was to determine if the use of a new 4 Dimensional CT scan aids the clinician in defining the size and area of the scapular bone to be removed arthroscopically in patients with Snapping Scapular Syndrome.

Materials and Methods: From January 2009 - January 2011 nine consecutive patients with Snapping Scapular Syndrome were included. In six patients, (mean age 21±5 years, range 15-27) conservative treatment failed. These patients were positioned prone and demonstrated their snapping motion during the 7 seconds duration of the scan. The 4D CT machine scans 16 cm volumes in 0.3 seconds. It also scans motion, allowing a 3D reconstruction of the scapulothoracic joint, its' movements and the dynamic area of impingement of the scapula on the surrounding structures. This scan has already improved arthroscopic removal of the supero-medial angle of the scapula.

Results: The scan showed in one case not only snapping of the superior medial angle of the scapula on the 2nd rib, but also extra bone impinging on the 3rd rib. Another case showed no real impingement but movement of the 2nd and 3rd rib by a tethering structure and a third case demonstrated impingement of the lateral third of the clavicle on the 2nd rib.

Conclusion: The images provided by this new 4D CT scan offer greater pre-operative insight on the pathology in each individual patient with Snapping Scapular Syndrome. Therefore, we feel that it is a valuable addition to the assessment and treatment of these patients.
THE NEW 4D CT SCANNER ALLOWS DYNAMIC VISUALIZATION AND MEASUREMENT OF NORMAL ACROMIO-CLAVICULAR JOINT MOTION

Introduction: The purpose of this study was to determine the motion pattern of the Acromio-Clavicular (AC) joint in a normal shoulder with the use of the new 4 Dimensional CT scan.

Materials and Methods: From April 2010 till January 2011 fourteen healthy volunteers (4 female, 10 male)(mean age 42±11 years) with no previous history of shoulder complaints participated in this study. The 4D CT machine scans motion, allowing a 3D reconstruction of the shoulder joint and its movements. Patients were positioned supine with their arm elevated 90° in the sagittal plane. During the 7 seconds duration of the scan they adducted their arm at that level and then elevated their arm upwards resisted by the gantry for 4 seconds, in this way simulating the clinical Bell-van Riet test for AC pathology.

Results: In the transverse plane the mean AC joint space measured in the neutral position is 1.8±0.5 mm. While adducting the arm the AC joint narrows 0.0±0.4 mm (with a positive value being narrowing and a negative value widening). On resisted elevation the joint space is narrowed 0.2±0.6 mm. The mean antero-posterior (AP) translation in this same plane is 0.2±2.2 mm on adduction (with a positive value being posterior translation of the clavicle and a negative value anterior translation) and 0.4±2.9 mm on resisted elevation.

Conclusion: The new 4D CT scan demonstrates that the AC joint in a normal shoulder mainly translates in an AP direction, rather than being narrowed or widened, when the arm is adducted (with or without resisted active elevation).
SUBSCAPULARIS TENOTOMY VERSUS LESSER TUBEROSITY OSTEOTOMY DURING TOTAL SHOULDER REPLACEMENT-A COMPARISON OF PATIENT OUTCOMES

Introduction: Subscapularis function following Total shoulder joint replacement has been a concern in recent literature. It has been postulated that lesser tuberosity osteotomy approach may have better Subscapularis function than transtendonous approach.

Aim: To assess whether lesser tuberosity osteotomy vs. subscapularis tenotomy is better for post-operative function of subscapularis in total shoulder replacements done by a single surgeon in a District general hospital.

Method: 117 shoulder replacements performed by the senior author (TH) at Waikato district general hospital between years January 2002 to January 2010 were reviewed retrospectively. Revision replacement, inverse shoulder replacement & acute traumatic hemiarthroplasty were excluded. Patients with previous rotator cuff problems, previous surgery to subscapularis, rheumatoid arthritis and post-trauma sequelae were also excluded from the study. Inclusion criteria were normal subscapularis function and intact subscapularis on MRI pre-operatively.

Results: 41 shoulders were eligible to participate in study of which 1 pt died (bilateral TSR), 1 pt unfit to participate due to cervical disc problems. Of remaining 38 shoulders 11 shoulders had transtendonous and 27 shoulders had lesser tuberosity osteotomy approach. 37 shoulders were reviewed clinically for range of motion of the shoulder and subscapularis strength. Range of motion and subscapularis strength was significantly higher in the osteotomy group. All osteotomies were united on axillary radiograph.

Conclusion: Lesser tuberosity osteotomy approach result in better subscapularis function than transtendonous approach.
RECONSTRUCTION OF MASSIVE UNCONTAINED GLENOID DEFECTS USING A DUAL BIOLOGY ALLOGRAFT-AUTOGRAFT TECHNIQUE WITH REVERSE SHOULDER ARTHROPLASTY

Massive uncontained glenoid defects are a difficult surgical problem requiring reconstruction in the setting of either primary or revision total shoulder arthroplasty. Our aim is to present a new one-stage technique that has been developed in our institution for glenoid reconstruction in the setting of massive uncontained glenoid bone loss.

We utilise a modified delto-pectoral approach to perform our dual biology allograft-autograft glenoid reconstruction. The native glenoid and proximal femoral allograft are prepared and shaped to create a precisely matched contact surface, which permits axial compression to secure fixation. The surface of the glenoid is lateralised to at least the level of the coracoid. The central cancellous femoral allograft is removed and impaction autografting is performed prior to implantation of a glenoid base plate with 25-mm long centre peg. Two screws are inserted into the best quality native scapular bone available to ensure compression. A reverse shoulder arthroplasty is implanted.

We have performed our dual-biology reconstruction of the glenoid in combination with reverse total shoulder arthroplasty in 8 patients to date. The technique has been performed in the setting of massive uncontained glenoid defects without prostheses as well as in revisions from failed hemiarthroplasties and total shoulder arthroplasties. Our post-operative follow-up is now up to 32 months. CT scanning as early as 6 months demonstrates incorporation of the graft. There has been no evidence of loosening. None of our cases have been complicated by infection or peri-prosthetic fracture and there have been no dislocations. One patient sustained an acromial stress fracture at 9 months post-operatively after lifting a 100-pound gas cylinder. This was diagnosed on bone scan, had no impact on the construct and was managed in a sling for comfort. Another patient has developed Nerot grade I notching which has not progressed. Post-operative visual analogue pain scores have improved substantially in all patients, with an average improvement of 6.6 on a 10-point scale.

Our dual biology allograft-autograft reconstruction is a useful and elegant technique in the setting of massive uncontained defects of the glenoid, which permits the implantation of a reverse total shoulder arthroplasty. We believe this technique to be reproducible and uses materials that are both readily available and familiar.
SOFT TISSUE SARCOMA (STS) OF THE EXTREMITIES IN 65’S AND OVER - A RETROSPECTIVE CASE STUDY FROM THE NZ TUMOUR REGISTRY

Introduction and Aim: STS are rare malignant tumours of mesenchymal origin giving a wide array of histological types and behaviour. Common sites of involvement include the extremities which are of most relevance to orthopaedic surgeons. Like almost all other malignancies, STS become more common with increasing age with median age of 65 years.

Methods: All patients aged 65 and over with STS of the extremities referred to the NZ Tumour Registry at Middlemore Hospital between 1967 and 2010 were included in the study. Data collected include baseline demographics (age, sex), diagnosis, site, time of referral, definitive treatment, adjuvant therapy, surgical margins (if applicable), local recurrence, survival, and cause of death.

Each patient was staged according to AJCC (1997, 5th edition) and Enneking’s staging systems. Primary outcomes were measured in terms of 5-year survival alongside with cause of death.

Results: A total of 116 patients. 21 upper extremities, 95 lower extremities. Average age of 74 with a 1.2:1 female to male ratio.

Stage 1 disease was uncommon, accounting for only 5 cases (4%). 3 patients died within 5 years (1 due to metastatic disease and 2 from non-sarcoma related disease). 2 patients were still alive in 2010 with 1 of them surviving >5yrs.

Stage 2 disease was found in 41 patients (35%). Common histologies included malignant fibrous histiocytoma (MFH), liposarcomas, or leiomyosarcomas (LMS). 44% (N=18) had greater than 5-year survival. 20% (N=8) died within 5 years succumbing to metastatic disease. 11 were under 5-yr follow up.

Stage 3 disease was found in 48 patients (41%). MFH was by far the most common diagnosis accounting for 63% of patients. 5-year survival 25% (N=12). 5-year mortality 56% (N=27) mainly from advanced disease and metastases. Rest (N=9) are still within 5-yr follow up.

Distant metastases at presentation were seen in about 10% of all patients (12 cases) with the most common site of involvement being the lung. 9/13 died of metastatic disease within 5 yrs while others are still within the 5 yr follow up period.

Conclusions: STS are most commonly observed in the elderly and prognosis depends on several factors. Management should ideally be carried in a specialised centre with early referral and combined multidisciplinary approach to optimise patient outcome.
RAS/RAF/MEK/ERK PATHWAY IS ASSOCIATED WITH LUNG METASTASIS OF OSTEOSARCOMA IN AN ORTHOTOPIC MOUSE MODEL

Aims and Purpose: To set up an osteosarcoma mouse model with spontaneous lung metastasis and to identify a marker of osteosarcoma metastasis and to inhibit the marker against the invasive ability of an osteosarcoma cell line.

Method: A human osteosarcoma orthotopic mouse model was set up by injecting 143B human osteosarcoma cells into mouse tibia. Type I insulin-like growth factor receptor (IGF-1R) and its downstream signalling factors were measured in samples from the primary tumor and the lung secondaries by immunohistochemistry. Human Alu mRNA expression was tested using in situ hybridization assay. A Matrigel assay was used to assess cell invasion ability under the interference of a MEK/ERK pathway specific inhibitor, U0126.

Results: All fifteen mice showed tumour mass at the left tibia and lung metastasis. Human Alu expression in the primary and secondary tumours confirmed human origin of the tumour cells. Total IGF-1R, MEK, Akt, p38 and phosphorylated MEK (p-MEK), but not p-Akt and p-p38, were positive in both local tumours and lung secondaries. Leiomyosarcoma controls expressed p-Akt and p-MEK, but not p-p38. The 143B cells treated with U0126 had significantly lower in vitro invasion ability compared with controls.

Conclusion: The IGF-1R-MEK signalling pathway, particularly Ras/Raf/MEK/ERK, may play an important role in osteosarcoma lung metastasis, and the targeting MEK/ERK by its specific inhibitor may have a potential use in the effective treatment of osteosarcoma.
GIANT PARA-ARTICULAR AND INTRACAPSULAR SOFT TISSUE OSTEOCHONDROMA OF THE KNEE: A CASE REPORT AND REVIEW OF LITERATURE

Intracapsular and para-articular osteochondromas are a rare subtype of soft tissue chondroma occurring in and around joints. We report a giant 5.5cm x 5.5cm x 3.0cm mass occurring in the knee of a 45 years old lady and examine previous cases to update our understanding of para-articular soft tissue osteochondromas.

Clinicopathological data were obtained from medical records for the case report whilst a multi-database literature search was conducted for the literature review. 27 articles containing 39 cases were identified in the English literature under our strict inclusion criteria. Along with our data, 40 cases were collated and analysed to provide a set of reference characteristics. These included: age, male-female ratio, spatial location, time of onset, tumour size, clinical symptoms, mechanism of injury, investigations used, treatment received, histopathology features, follow-up and recurrence characteristics. Statistical analysis was performed on data to elicit any discernable pattern of tumour formation.

Median age of patients was 50 years old with a male to female ratio of 1:1.11. Most commonly occurs in the 40s, 50s and 60s accounting for two-thirds of all cases. Majority of tumours were located within or adjacent to a fat pad structure. 33 were located in the infra-patellar region, 3 in the suprapatella/pre-femoral region and 4 in other para-articular locations. Average time of onset to diagnosis was 5.81 yrs with a mean volume of 87.5 cubic centimetres. No discernable correlation between time of onset to diagnosis and tumour size was found (spearman correlation co-efficient 0.534, p=0.007). The main symptom reported was pain in 29 cases, whilst 5 were pain free, 6 cases were unspecified. X-Rays, CT and MRI have become the core imaging modalities in investigation. En bloc excision is the choice of treatment, whilst arthroscopic techniques have also been used with similar success. Histologically, 35 cases had a typical description of a cartilage capped lesion with central trabecular bone and areas of endochondral ossification. 3 cases had a histological appearance of predominantly bone whilst 2 cases had predominantly cartilage. All tumours analysed were benign. No recurrences were reported with an average follow up period of 1.91 years.

We have provided the latest set of data for the characterisation of para-articular and intracapsular soft tissue osteochondromas. These tumours are benign entity with an invariably good outcome following simple excision. Recognition of this entity is important to prevent over investigation and the performance unnecessarily invasive and radical procedures.
THE DIAGNOSTIC ACCURACY OF PERITUMORAL OEDEMA ON MAGNETIC RESONANCE IMAGING IN DETERMINING THE HISTOLOGICAL GRADE OF SOFT TISSUE SARCOMAS

Introduction: The use of peritumoral oedema on magnetic resonance (MR) imaging to predict soft tissue tumour grade is controversial. The clinical significance of oedema visualised on MR scans is poorly defined in the literature. We undertook this study to ascertain a diagnostic relationship between peritumoral oedema surrounding soft tissue sarcomas and the histological grade of the tumour.

Methods: One hundred and ten consecutive soft tissue tumours were extracted from the New Zealand Bone and Soft Tissue Tumour Registry. Key inclusion criteria were tumours deep to fascia, measuring more than 5cm in any dimension. Both benign and malignant sarcomas were included. MR scans and histology were reviewed, separately and in random order by a single author. Histology was graded as benign, low or high grade (based on the American Joint Committee on Cancer grading system).

Peritumoral oedema was defined as the increased signal intensity, on T2 or STIR images, immediately surrounding a discrete lesion. It was measured on two or more planes with the largest value used in diagnostic calculations. Oedema greater than or equal to 20mm was defined as a positive test result. Twenty five random scans were double read to ensure inter-observer reliability.

Results: Data was obtained for 83 tumours, 36 benign and 47 malignant (34 high grade and 13 low grade). The tumours in all groups were matched for size. The mean peritumoral oedema was 10.5mm for benign tumours, 20.6mm for low grade sarcomas (p<0.1), 28.1mm for high grade tumours (p<0.01) and 26.1mm if all malignant tumours were included as a single group (p<0.01).

Using peritumoral oedema as a diagnostic test for tumour grade resulted in a specificity of 72%. The highest diagnostic ability was found when comparing benign to high grade tumours which yielded sensitivity of 59% and a positive likelihood ratio of 2.1. This data suggests a high false negative rate and that the test adds little to the diagnostic process.

Conclusion: To our knowledge this is the first study which assesses the diagnostic accuracy of peritumoral oedema to predict the histological grade of soft tissue sarcomas. Our results show a statistically significant difference, in surrounding peritumoral oedema, exists when comparing benign to high grade sarcomas and to all malignant tumours. This relationship is not apparent for low grade tumours. As a diagnostic test, using only peritumoral oedema to predict histological grade is unreliable.
18F-FDG PET RESPONSE TO NEOADJUVANT CHEMOTHERAPY FOR EWING SARCOMA AND OSTEOSARCOMA ARE DIFFERENT

Introduction: Ewing sarcoma (ES) and Osteosarcoma (OS) are the 2 most common malignant primary bone tumors. A patient's response to neoadjuvant chemotherapy has important implications in subsequent patient management and prognosis, as a favorable response to chemotherapy allows orthopedic oncologists to be more aggressive in pursuing limb-sparing surgery. An accurate and non-invasive pre-operative marker of response would be ideal for planning surgical margins and as a prognostic tool.

Objective: ES and OS have differing biological characteristics and respond differently to chemotherapy. We reviewed 18F-FDG PET imaging characteristics of ES and OS patients at baseline and following treatment to determine whether this biological variation is reflected in their imaging phenotype.

Materials and Methods: A retrospective review of ES and OS patients treated with neoadjuvant chemotherapy and surgery was done, correlating PET results with histologic response to chemotherapy.

Results: Change in the maximum standardized Uptake Value (SUVmax) between baseline and post- treatment scanning was not significantly associated with histologic response for either ES or OS. Metabolic tumor volume (MTV) and the percentage of injected 18F-FDG dose (%ID) in the primary tumor were found to be different for ES and OS response subgroups. A 50% reduction in MTV (MTV2:1 < 0.5) was found to be significantly associated with histologic response in OS. Using the same criteria for ES incorrectly predicted good responders. Increasing the cut-offs for ES to a 90% reduction in MTV (MTV 2:1 < 0.1) resulted in association with histologic response.

Conclusion: Response to neoadjuvant chemotherapy as reflected by changes in PET characteristics should be interpreted differently for ES and OS.
TOTAL KNEE ARTHROPLASTY PROCEDURE LENGTH VS. OXFORD KNEE SCORE AND REVISION RATE: A NEW ZEALAND REGISTRY STUDY

A long surgical procedure length has been well associated with worse clinical outcomes, also in an economic climate where in the theatre, time is money, surgical procedures are done very rapidly. Few studies have documented the clinical outcomes of procedure speed.

Using the New Zealand Registry we reviewed the operation time of 41,560 primary knee joint replacements. These were split into groups of time slots for the surgery from less than 40 minutes, 40-59, 60-89, 90-119, 120-179 and greater than 180mins. This was referenced to the oxford knee scores obtained and the revision rate.

For operations done in less than 40 or greater than 180 minutes, the oxford knee score was lower by 5 years. The revision rate was also increased in these same groups.

Operations done in greater than 180 minutes are generally the more complex non-osteoarthritic and tumour cases and have a higher revision rate reflecting their complexity. Procedures done less than 40 minutes are more straight forward, but there is a relationship shown between this speed and revision rate and poorer outcome. The cause is likely multifactorial, but begs the question, does speed kill?
EVALUATION OF THE VISIONAIRE INSTRUMENTATION FOR TOTAL KNEE ARTHROPLASTY USING COMPUTER NAVIGATION

Purpose: Patient-matched instrumentation is advocated as the latest development in arthroplasty surgery. Custom-made cutting blocks created from preoperative MRI scans have been proposed to achieve perfect alignment of the lower limb in total knee arthroplasty (TKA). The aim of this study was to determine the efficacy of patient-specific cutting blocks by comparing them to navigation, the current gold standard.

Methods: 25 TKA patients were recruited to undergo their surgery guided by Smith & Nephew Visionaire Patient-Matched cutting blocks. Continuous computer navigation was used during the surgery to evaluate the accuracy of the cutting blocks. The blocks were assessed for the fit to the articular surface, as well as alignment in the coronal and sagittal planes, sizing, and resection depth. Actual postoperative alignment was then assessed by detailed CT scans following the Perth protocol, comparing the results with intraoperative measurements.

Results: All patient-matched cutting blocks were a good fit intra-operatively. Significant differences (p<0.05) in the resection depths of the distal femur and tibial plateau were observed between the cutting blocks and computer navigation for the medial compartment. Cutting block alignment of the femur and tibia in the coronal and sagittal planes also differed significantly (p<0.05) to navigation measurements. In addition, intraoperative assessment of sagittal femoral alignment differed to planned alignment by an average of 4.0 degrees (+/-2.3).

Conclusion: This study suggests the use of patient-matched cutting blocks is not accurate, particularly in the guidance of the sagittal alignment in total knee arthroplasty. Despite this technique creating well fitting cutting blocks, intraoperative monitoring, validated by postoperative CT scans, revealed an unacceptable degree of potential limb mal-alignment, resulting in increased outliers particularly when compared with standard computer navigation.
THE ACCURACY OF IMPLANT POSITIONING USING THE VISIONAIRE PATIENT MATCHED KNEE ARTHROPLASTY SYSTEM

Introduction: There has recently been a proliferation of image-based knee arthroplasty systems which utilize pre-operative radiological analysis of a patient’s anatomy to identify the bone cuts required to correct their mechanical alignment. The aim of this was to assess the accuracy of one such system (Visionaire™, Smith and Nephew Inc.)

Methods: Eleven cadavers were imaged using the Smith and Nephew Visionaire® MRI protocol to enable the production of cutting blocks individualized to the various specimens. These cutting blocks were then used to perform knee replacements on all cadavers. Post-operatively the validated Perth CT protocol was used to assess the position and rotational profile of each implant. These measurements were then compared to the pre-operative plan in order to assess the accuracy of implant placement.

Results: Relative to the pre-operative target parameters, the femoral components were aligned in a mean 0.048° valgus (95% CI - 0.36° to 1.32°) with 1.8° extension (95% CI -0.1° to 4.5°) and externally rotated by a mean 0.66° (95% CI 1.08° internal rotation to 2.4° external rotation.) The tibial components were in a mean 0.29° of varus (95% CI - 0.68° to 1.27°) with a posterior tibial slope of 90.5° (95% CI 89.6° to 92.6°) and internally rotated by a mean 1.7° (range 10.1° internal rotation to 1.1° external rotation.)

Conclusions: The findings of our study suggest that the Visionaire system can produce accurate coronal implant alignment. The sagittal and rotational alignment was not as reliable although these parameters may have been more prone to adverse influence by the limitations of the cadaveric model. Patient-matched knee arthroplasty technology offers significant potential benefits to both patient and surgeon and warrants further clinical investigation.
EARLY RESULTS FOR TKA USING THE SIGNATURE PATIENT SPECIFIC JIGS

In an effort to improve alignment in total knee arthroplasty (TKA), more recent prosthetic devices adapt computerised sculpting technologies based on preoperative MRIs to individualize surgical treatment. This is achieved by creating patient-specific surgical positioning guides for prosthetic alignment. Our study reports on the early clinical and functional outcomes and CT measured alignment of patients undergoing surgery with the Signature patient specific knee system.

We have reviewed the first one hundred patients selected to have a TKA using the patient specific knee system by a single surgeon over the last two years. Clinical and functional outcomes were assessed using the Western Ontario and McMaster Universities (WOMAC) index, the American Knee Society Scores (AKSS) and range of flexion at 6months. All data was analysed using a two tailed paired students t-test with statistical significance accepted at p<0.05. Post-operative CT scans were analysed to report on overall mechanical axial limb alignment, axial prosthetic tibial alignment, posterior tibial slope and femoral component rotation from the epicondylar axis.

Preoperative versus postoperative WOMAC scores for patients were 80.4 ± 2.2 and 45.2 ± 2.1 respectively. This was statistically significant at p=1.3×10-14. The AKSS pre- and postoperatively were 85.1 ± 4.6 and 151.9 ± 4.6 respectively with statistical significance reached at p =1.3×10-13. Specifically, the pre- vs postoperative knee scores were 33.6 ± 2.8 and 75.1 ± 2.6 (p=3.9×10-12) while the function scores were 51.5 ± 2.8 and 75.8 ± 4 (p=3.4×10-7) respectively. Range of flexion preoperatively was 110.8 ± 2.8 while postoperatively was 122.1 ± 2.6 (p=0.0003).

Postoperative CT scans revealed that the tibial axial alignment was 90.5 ± 7.7 degrees while the posterior tibial slope was 5.5 ± 0.3 degrees on average. In terms of femoral rotation, the epicondyllar axis was found to be 0.56 ± 0.1 degrees externally rotated with respect to Whiteside’s line. The mechanical axis was 0.84 ± 0.1 on average. With all these measured parameters the number of outliers outside the accepted +/-3 degree range are small.

Our data demonstrates that the early results for knee replacements performed using the Signature patient specific jigs are very satisfactory delivering good clinical outcomes and an improved level of prosthetic alignment when compared to published data for standard instrumented knees.
THE FAILED TOTAL KNEE REPLACEMENT - A SECOND OPINION

Somewhat sadly, about 15% of total knee replacement patients are unhappy with the outcome of their arthroplasty surgery. Factors for this failure can be of an extrinsic or intrinsic nature.

Implant wear, aseptic loosening, instability and sepsis are the four most common problems encountered. Arthrofibrosis and malalignment, along with extensor mechanism rupture and patellar issues account for approximately one quarter of all cases.

It is imperative that the treating Orthopaedic Surgeon possesses sufficient investigatory tools to initially make the diagnosis and then formulate an appropriate therapeutic regimen. Sepsis, instability and ongoing soft tissue problems present the greatest challenges. Newer modalities such as sonication, polymerised chain reaction sequencing, pro-calcitonin testing and functional MRI scanning can all be of significant use. If it is a second opinion that you are providing, always remember to be courteous, non-judgemental and supportive of the previous therapeutic team.
REVISION OF FAILED UNICOMPARTMENTAL KNEE REPLACEMENT TO TOTAL KNEE REPLACEMENT

Introduction: Multiple reports suggest good outcome results following unicompartmental knee replacement (UKR). However, several authors report technically difficult revision surgery secondary to osseous defects. We reviewed clinical outcomes following revision total knee replacement for failed UKR and analysed the reasons for failure and the technical aspects of the revision surgery.

Methods: Between 2003 and 2009, thirty three revisions from unicompartmental knee replacement to total knee replacement were performed in thirty two patients at a single centre. Demographics, indications for the primary and revision procedures, details of the revised prosthesis including augments and any technical difficulties or complications were noted. Patient assessment included range of motion and the functional status of the affected knee in the form of the Oxford knee score questionnaire. Statistical analysis was performed with the Student t test.

Results: All 33 revision knees were available for prospective clinical and radiological follow-up. The minimum duration of follow-up after revision surgery was 1 year (mean 3 years, range 1 –7 years). The median interval between the original unicompartmental knee replacements to revision surgery was 19 months (range 2 - 159 months). The predominant cause of failure was aseptic loosening (50%). Other reasons included persistent pain (21%), dislocated meniscus (18%), mal-alignment (7%) and progression of symptomatic osteoarthritis in another compartment (4%). 18 of the 33 revision procedures required additional augments. During the revision surgery, 11 knees required a long tibial stem while 1 required a long femoral stem. 10 knees required medial tibial wedge augmentation; bone graft was used in 6 knees while a metal wedge augment was used in 4 to fill significant osseous defects.

At the time of follow-up, range of movement averaged 103 degrees (range 70 – 120). The mean one year Oxford knee score, was 29 compared to 39 for primary total knee replacements performed during the same period in a comparable sample group of patients at our institute (p < 0.001). Three patients continued to have pain and two required re-revision; one for infection and one for loosening.

Conclusion: Aseptic loosening was the commonest mode of failure. Of the UKRs revised to TKRs, 90% were revised within 5 years. The majority of revisions required additional constructs. Oxford Knee Scores after revision surgery were inferior to those for primary TKR. The role of UKR needs to be more clearly defined.
CHANGE IN PROXIMAL TIBIAL BONE DENSITY FOLLOWING UNICOMPARTMENTAL KNEE ARTHROPLASTY

Introduction: Proximal tibial bone mineral density (BMD) has been shown to decrease following Total Knee Arthroplasty (TKA) by both dual-energy x-ray absorptiometry (DEXA) and quantitative computed tomography (qCT)-assisted osteodensitometry. Little is known about changes in BMD following unicompartmental knee arthroplasty (UKA). Additionally, there are proposed differences in stress transmission between cemented metal and polyethylene (PE) components. We proposed two hypotheses. First, that proximal tibial BMD decreases following UKA. Second, that BMD loss would be greater below metal tibial components.

Method: We performed a prospective clinical trial of 50 consecutive UKAs in 49 patients performed by two surgeons at one institution. There were 25 mobile bearing Oxford and 25 fixed bearing Accuris arthroplasties, all were medial. BMD was assessed with qCT-assisted osteodensitometry scans prior to discharge and then at 1 and 2 years post surgery. Each CT slice was divided into medial and lateral halves and cortical and cancellous bone was analysed separately. The six 2mm slices immediately beneath the tibial implant were analysed using previously validated software to create a three-dimensional assessment of BMD. The lateral half was used as a control.

Results: There were a total of 30 females (60%), with an average age of 70 (49-84). One patient was lost to follow-up and another was unable to be analysed due to failure requiring revision before follow-up was complete. Preliminary results showed no significant change in BMD at either 1 or 2 years follow-up. There was no difference in BMD change between the mobile and fixed bearing prostheses, between the medial and lateral halves nor between cortical and cancellous bone. Final results will be presented at the AONZOA conference.

Conclusion: This trial shows that UKA does not result in significant change to BMD at 2 years. The preservation of BMD may indicate that UKA is better at maintaining physiologic stress transfer than a TKA, which has been shown to be associated with a reduction in BMD.
BONE MINERAL DENSITY AND THE UNCEMENTED OXFORD MEDIAL COMPARTMENTAL ARTHROPLASTY

Introduction: Bone mineral density (BMD) and bone mineral content (BMC) have not been previously assessed in unicompartmental knee replacement (UKR). We studied the early bone changes beneath the uncemented Oxford medial UKR. Our hypothesis was that this implant should decrease the shear stresses across the bone-implant interface and result in improved BMD and BMC beneath the tibial component.

Methods: Using the Lunar iDXA and knee specific software we developed 7 regions of interest (ROI) in the proximal tibia and assessed 38 patients with an uncemented Oxford UKR at 2 years. We measured the replaced knee and contralateral unreplaced knee using the same ROI and compared the BMD and BMC. The initial precision study in 20 patients demonstrated high precision in all areas.

Results: There were 12 males and 16 females with an average age of 65.8 years (46-84 years). ROI 1 and 2 were beneath the tibial tray and had significantly less BMC (p=0.023 and 0.001) and BMD (p=0.012 and 0.002). ROI 3 was the lateral tibial plateau and this area also had significantly less BMC (p=0.007) and BMD (p=0.0001). ROI 4 and 5 immediately below the tibial keel had no significant change. These changes were independent of gender and age.

Conclusions: These results were surprising in that the universal loss of BMC and BMD suggested that bone loading of the proximal tibia was not improved even after a UKR. The better BMD and BMC adjacent to the keel confirms other studies that show improved bone ingrowth around keels and pegs in the uncemented tibial component. A prospective longitudinal study has been developed to compare BMD and BMC changes over time to see whether these changes are dynamic.
C-TYPE NATRIURETIC PEPTIDE: A PREDICTOR OF SPINAL CORD HEALING?

Introduction: C-type natriuretic peptide is the most abundant natriuretic peptide in the central nervous system. It has been implicated in neurogenesis and may have a significant role in spinal regeneration. We postulated that the spinal concentration of CNP would be reflected in the plasma concentrations of both CNP and the pro-hormone (NTproCNP) and this may be an indicator of repair potential in spinal injuries.

Methods: Concurrent plasma and CSF concentrations of CNP forms were measured in 51 subjects undergoing spinal anaesthesia for elective total hip and knee replacement. Associations with CNP activity and metabolism in CSF were sought by measuring CSF levels of cGMP and neprilysin respectively.

Results: Elevated concentrations of NTproCNP (1045±359 pmol/L) were found in CSF and greatly exceeded those of CNP (7.9±3.2 pmol/L). The ratio of NTproCNP to CNP in CSF (145±55) was much higher than in plasma (31±27). A significant inverse relation was found between plasma and CSF CNP concentrations (r=-0.29, p<0.05). cGMP and neprilysin were unrelated to CNP levels in CSF.

Conclusions: Despite markedly elevated levels of NTproCNP in CSF, it is unlikely that these contribute to systemic levels in healthy adults. Identifying NTproCNP as the dominant CNP form in CSF opens up the possibility of its use in future studies exploring CNP regulation within the CNS and possible applications in diagnosis and monitoring of healing in patients with spinal cord injury.
UNRAVELLING THE STRUCTURAL COMPLEXITIES OF INTERVERTEBRAL DISC-ENDPLATE INTEGRATION

Introduction: The spinal motion segment relies critically on there being a mechanically robust integration between the compliant disc tissues and the rigid vertebral bone. Achieving such integration represents a major structural challenge. This study explores in detail the microstructural mechanisms involved in both the nucleus-endplate and annulus-endplate regions.

Methods: Vertebra-nucleus-vertebra samples were obtained from mature ovine lumbar motion segments and subjected to a novel ring-severing technique designed to eliminate the strain-limiting influence of any remaining annular elements. These samples were loaded in tension and then chemically fixed in order to preserve the stretched fibre arrangement, and then decalcified. Annulus-vertebra samples were similarly treated but without any loading prior to fixation. Differential interference contrast optical microscopy was then used to image at high resolution cryosectioned slices of the still integrated disc-vertebral endplate regions while maintained in their fully hydrated state.

Results: Structural continuity across the nucleus-endplate junction was sufficient for the samples to support, on average, 20 N before tensile failure occurred. Microscopic examination revealed fibres inserting into the endplates and extending continuously from vertebra to vertebra in the central nuclear region. While the fibres in the nucleus possess a significant level of structural integration with the endplates their role is not primarily a tensile one: rather, in combination with their convoluted geometry, they confer on the nucleus a form of ‘tethered’ mobility. This permits a high degree of shape change in the nucleus during normal disc function in which hydrostatic loading plays an essential role. The annular fibre bundles on entering the endplate are shown to subdivide into sub-bundles to form a 3-D multi-leaf morphology with each leaf separated by cartilaginous endplate matrix. This branched morphology increases the interface area between bundle and matrix in proportion to the number of sub-bundles formed.

Conclusions: Our study challenges previously published views on nucleus-endplate relationships. We also show that the robust integration of the annular fibres in the endplate is achieved via a branched morphology exploiting a mechanism of shear-stress transfer, with the anchorage strength optimised over a relatively short endplate insertion depth.
THE ARTERIAL SUPPLY OF THE CERVICAL AND THORACIC SPINAL MUSCLES AND THE OVERLYING SKIN: AN ANATOMICAL STUDY WITH IMPLICATIONS FOR SURGICAL WOUND COMPLICATIONS

The posterior midline approach used in spinal surgery has been associated with a significant rate of wound dehiscence. This study investigates anatomical study of the arterial supply of the cervical and thoracic spinal muscles and overlying skin at each vertebral level. It aimed to provide possible anatomical basis for such wound complications.

A dissection and angiographic study was undertaken on 8 cadaveric neck and posterior torso from 6 embalmed and 2 fresh human cadavers. Harvested cadavers were warmed and hydrogen peroxide was injected into the major arteries. Lead oxide contrast mixture was injected in stepwise manner into the subclavian and posterior intercostal arteries of each specimen. Specimens were subsequently cross-sectioned at each vertebral level and bones elevated from the soft tissue. Radiographs were taken at each stage of this process and analysed.

The cervical paraspinal muscles were supplied by the deep cervical arteries, transverse cervical arteries and vertebral arteries. The thoracic paraspinal muscles were supplied by the superior intercostal arteries, transverse cervical arteries and posterior intercostal arteries. In the thoracic region, two small vessels provide the longitudinal connection between the segmental arteries and in the cervical region, deep cervical arteries provide such connection from C3 to C6. The arterial vessels supplying the paraspinal muscles on the left and right side anastomose with each other, posterior to the spinous processes in all vertebral levels. At cervical vertebral levels, source arteries travel near the surgical field and are not routinely cauterised; Haematoma is postulated to be the cause of wound complications. At thoracic levels, source arteries travel in the surgical field and tissue ischemia is a contributing factor to wound complications, especially in operations over extensive levels.

Post-operative wound complications is a multi-factorial clinical problem, the anatomical findings in this study provide possible explanations for wound dehiscence in the posterior midline approach. It is postulated that drain tubes may reduce the incidence of haematoma in the cervical level.
MODULATION OF COLLAGEN ALIGNMENT BY SILVER NANOPARTICLES RESULTS IN BETTER MECHANICAL PROPERTIES IN WOUND HEALING

Our previous study has revealed that silver nanoparticles (AgNPs) have potential to promote wound healing by accelerated re-epithelization and enhanced differentiation of fibroblasts. However, the effect of AgNPs on the functionality of repaired skin is unknown. The aim of this study was to explore the tensile properties of healed skin after treatment with AgNPs. Immunohistochemical staining, quantitative assay and scanning electron microscopy (SEM) were used to detect and compare collagen deposition, and the morphology and distribution of collagen fibers. Our results showed that AgNPs improved tensile properties and led to better fibril alignments in repaired skin, with a close resemblance to normal skin. Based on our findings, we concluded that AgNPs were predominantly responsible for regulating deposition of collagen and their use resulted in excellent alignment in the wound healing process. The exact signaling pathway by which AgNPs affect collagen regeneration is yet to be investigated.
A CROSS SECTIONAL SURVEY OF LOW BACK PAIN IN JUNIOR AUSTRALIAN FOOTBALLERS

Low back pain in junior Australian Rules footballers has not been investigated, despite findings that adolescent back pain is a strong predictor for adult back pain. The aim of this study was to determine the prevalence, intensity, quality and frequency of low back pain in junior Australian Rules footballers.

A cross-sectional survey of male non-elite junior (n = 60) and elite junior players (n = 102) was conducted along with a convenience sample of non-footballers (school children) (n = 100). Subjects completed a self-reported questionnaire on low back pain incorporating the Quadruple Visual Analogue Scale and McGill Pain Questionnaire (short form), along with additional questions adapted from an Australian epidemiological study.

For current, average and best low back pain levels, elite junior players had higher pain levels (p < 0.001), with no difference noted between non-elite juniors and controls for average and best low back pain. For low back pain at worst, there were significant differences in the mean pain scores. The difference between elite juniors and non-elite juniors (p = 0.040) and between elite juniors and controls (p < 0.001) was significant, but not between non-elite juniors and controls. The chance of suffering low back pain increases from 45% for controls, through 55% for non-elite juniors to 66.7% for elite juniors. The chance that a pain sufferer experiences chronic pain is 16% for controls and 41% for non-elite junior and elite junior players. Elite junior players experienced low back pain more frequently (p = 0.002), with no difference in frequency noted between non-elite juniors and controls. Over 25% of elite junior and non-elite junior players reported that back pain impacted their performance some of the time or greater.

This study demonstrated that when compared with non-elite junior players and non-footballers of a similar age, elite junior players experience back pain more severely and frequently and have higher prevalence and chronicity rates.
PREDICTING THE TRANSITION FROM ACUTE TO PERSISTENT LOW BACK PAIN

Introduction: Most people experience low back pain (LBP) at least once in their lifetime. A minority goes on to develop persistent LBP causing significant socioeconomic costs. Aim of this study was to identify factors that influence the progression of acute to persistent LBP at an early stage (Hilfiker et al. 2007).

Methods: Prospective inception cohort study of patients attending a health practitioner for their first episode of acute LBP or recurrent LBP after a pain free period of at least six months. Patients were assessed at baseline addressing occupational and psychological factors as well as pain, disability, quality of life and physical activity, and followed up over six months. Baseline and follow-up questionnaires were based on the recommendations of the Multinational Musculoskeletal Inception Cohort Study (MMICS) Statement (Pincus et al. 2008). Variables were combined to the three indices ‘working condition’, ‘depression and maladaptive cognitions’ and ‘pain and quality of life’.

Results: The index ‘depression and maladaptive cognitions’ comprising of depression, somatisation, a resigned attitude towards the job, fear-avoidance, catastrophizing and negative expectations on return to work was found to be a significant baseline predictor for persistent LBP up to six months (OR 5.1; 95%CI 1.04-25.1). The diagnostic accuracy of the predictor model had a sensitivity of 0.54 and a specificity of 0.90. Positive likelihood ratio was moderate with 5.3, negative likelihood ratio 0.5. Overall predictive accuracy of the model was 81%. The area under the curve in receiver operating characteristic (ROC) analysis of the index was 0.78 (CI95% 0.65-0.92), demonstrating a satisfactory quality of discrimination.

Conclusion: Psychological factors in patients with acute LBP in a primary care setting correlated with a progression to persistent LBP up to six months. The benefit of including factors such as ‘depression and maladaptive cognition’ in screening tools is that these factors can be addressed in primary and secondary prevention.

A RANDOMISED CONTROLLED TRIAL OF STRENGTHENING VERSUS POSTURAL RE-EDUCATION FOR AGE-RELATED THORACIC HYPERKYPHOSIS

Introduction and Aims: Thoracic kyphosis increases with age. The resultant increase in compression forces on the anterior vertebral bodies leads to further kyphotic deformity and, an increased likelihood of vertebral collapse. This study aimed to determine the relative efficacy of two therapeutic strategies commonly used to treat hyperkyphosis.

Methods: 69 subjects (26 male: 43 female) were randomised into 4 groups: strengthening, postural re-education (PEd), both and control. The strengthening group attended a gym 3 times a week for 12 weeks to perform seated extension exercises. The PEd group had 3 physiotherapy sessions within a 12 week period in which they received postural assessment and a home exercise programme. The combined group received both interventions while the control group received neither. Outcome measurements were assessed at baseline and 12 weeks. They included static (inclinometer) and 6-hour angular measurements (using flexible electrogoniometer (FEG)) and physical function tests.

Results: There were no significant differences between the marginal means of the angular measurements for any of the intervention groups. However, the group which received both interventions demonstrated reduced kyphosis as measured by the FEG angles (apex of the curve between T3 and T11), while the strengthening group showed reduced inclinometer angles (between T1 and T12). The strengthening group showed improvement in back extensor strength (BES) (0.6 +/- 0.2 N/kg, p < 0.01), time to walk 10 metres (-0.3 +/- 0.6 s, p < 0.05), and time to stand and sit 5 times (-0.9 +/- 0.6 s, p < 0.05).

However, there was no relationship between change in BES and change in kyphotic angle. The PEd group showed the greatest improvement in the timed up and go test but this was not significant. Improvement in inclinometer angle over the 12 weeks was associated with degree of kyphosis at baseline (upright inclinometer r = -0.47, p=0.0001) but this relationship was not apparent in the FEG measurements. Both the FEG and inclinometer angles showed a marked decrease in degree of improvement in subjects aged >70.

Conclusions: A combination of strengthening and PEd was most effective at reducing hyperkyphosis. BES was improved with resisted strengthening but not with home-based postural exercises. However, increased BES was not associated with decreased kyphosis. Larger baseline kyphosis was associated with greater angular improvement. Subjects aged >70 were less likely to improve.
OUTCOMES OF ANTERIOR SACROILIAC JOINT FUSIONS IN PATIENTS WITH PAIN SECONDARY TO SACROILIAC JOINT ARTHROSIS

Introduction & Aim: Sacroiliac joint (SIJ) fusion is a controversial yet last resort operative technique to address SIJ pain. The current study aims to determine the patient outcomes of SIJ fusions, in a single surgeon series utilising an anterior approach with 2 DC plates across the joint and iliac crest autograft.

Method: Retrospective case series involving 11 patients who had 13 SIJ fusions performed over an 8 year period (2002-2010). Patients were identified by electronic key word search from databases at Middlemore hospital and the private sector. Dictated clinic letters and operation notes were reviewed to obtain demographic data and outcomes data including complications. Postoperative radiology reports were reviewed to document radiographic fusion status. Telephone interviews were conducted to measure clinical outcome scores via the Majeed Pelvic Score and the 12-item Short-Form Health Survey (SF-12).

Results: 10 out of 11 patients (entailing 12 SIJ fusions) responded and participated in the study, equating to over 90% follow up. 2 cases were managed at Middlemore Hospital, with the remainder in the private sector. All cases but one had a ‘post-traumatic arthritis’ etiology. Diagnosis was made by CT guided local/ steroid injection into the joint in conjunction with CT/ bone scan/MRI imaging. The Majeed score improved markedly for 9 of 12 SIJ fusions (75%). 10 of 12 patients stated they would have the procedure again. 7 of 12 fusions (58%) had postoperative complications including blood loss, haematoma, nerve injury (including one case of permanent foot drop), non-union, infection of the joint/metal ware, hernia and urinary retention. 5 of 12 fusions (42%) experienced altered sensation over the lateral femoral cutaneous nerve distribution. All except one patient eventually had Xrays or CT scans postoperatively that reported radiographic fusion of the joint.

Conclusion: In appropriately selected patients with SI joint arthrosis, 3/4 patients reported significant improvement in function and pain level after SIJ fusion. Chronic pain (from other sources) and major complications were a feature amongst those failing to benefit. Lateral femoral cutaneous nerve palsy has high incidence with the current operative technique.
TRAINEE DUTY HOUR LIMITS, ATTAINMENT OF COMPETENCY, AND PROFESSIONALISM: WHAT IS THE FUTURE OF SURGICAL EDUCATION?

The Accreditation Council of Graduate Medical Education (ACGME) has formalized a limit of 16 consecutive duty hours for first year and 20 hours for intermediate level trainees, while maintaining a maximum of 80 duty hours per week despite social pressure to further reduce this limit. Deterioration in cognitive and technical performance secondary to fatigue is the basis for the 16 hour rule, along with the notion that "strategic napping" be strongly encouraged for trainees that must remain for longer shifts. For more senior trainees, graduated independence and responsibility are recognized as important to prepare for the independent practice of medicine.

Yet, a reduction of nearly 7000 hours, or the equivalent of 2 years of surgical education and experience, results from the 80-hour duty limitation compared to surgical training of two decades ago. The contention is that duty hours must be constrained to optimize patient safety and the learning environment, but it is unclear whether mastery of the necessary cognitive and technical competencies can be achieved in such a constricted time period.

Another worrisome byproduct of legislated duty hour limitations is the unintended encouragement of a "shift worker" mentality and erosion of the ethos of professionalism among trainees. Effective mentoring takes on critical importance in this challenging environment, yet productive mentoring may be counter to learned adaptive behaviors and instinctive personality traits of some accomplished surgeon educators. Fostering effective mentors in academic surgery requires us to develop behaviors that are conducive to the mentoring process.

As our trainees struggle to achieve mastery of a surgical discipline within a prescribed and constricted time period, we must consider a competency-based system of surgical education rather than one that is time-defined. Likewise, the personal and professional growth of our trainees in this system, as well as the succession planning for our specialty, are dependent upon the creation of an environment conducive to effective mentoring in academic orthopaedics.
DOES ORTHOPAEDIC TRAINING COMPROMISE THE OUTCOME IN TOTAL HIP JOINT REPLACEMENT?

Introduction and Aims: There has been limited research examining the effect training of orthopaedic trainees may have on patient outcomes. This paper aims to determine if there is a difference in revision rate and functional outcomes of total hip joint replacement performed by consultants compared to those performed by supervised and unsupervised trainees.

Methods: We reviewed all patient data since 2000 from the New Zealand National Joint Registry in patients undergoing total hip joint replacement (THJR) comparing the outcomes with the experience of the primary surgeon. The outcome measures were revision hip replacement and the Oxford Hip score at six months. We compared the reason for revision controlling for factors such as ASA, age and the index diagnosis. We also compared the six-month Oxford scores with the experience of the primary surgeon.

Results: There were 35415 patients who underwent elective THJR, 30344 of which were performed by a consultant, 2982 by a supervised registrar and 1067 by an unsupervised registrar. There was an overall revision rate (RR) of 0.77 per 100 component years. The RR was 0.75 (95% CI 0.67-0.82) for consultants, 0.97 (95% CI 0.72 – 1.28) for supervised trainees and 0.70 (95% CI 0.36 – 1.22) for unsupervised trainees. There was no significant difference in revision rates between consultants and supervised trainees (p<0.077) or unsupervised trainees (p< 0.30).

The most common cause for revision surgery was dislocation, occurring in 39% of cases. This was more common in supervised and unsupervised trainees (48% and 50%) however there was no significant difference between the three groups (p-value 0.24). The other causes for revision were; loosening of the acetabular or femoral component, deep infection, pain and fracture with no significant difference between the three groups. The mean OHS was higher for consultants at 40.7 compared to 38.95 and 38.23 for supervised and unsupervised trainees respectively (p <0.001)

Conclusions: The results of this study show no significant difference in the revision rate of THJR performed by trainees when compared to their consultants. Orthopaedic consultants do appear to have slightly better (1-2 points) OHS. These results are reassuring and show orthopaedic training does not adversely compromise patient outcomes.
CLOSED FRACTURE MANAGEMENT: A LOST SKILL?

Purpose: The closed management of fractures and the application of plasters remains a core component of orthopaedic trauma management. A prospective audit was undertaken to analyse the quality of plasters presenting from various sources to the Fracture Clinic Plaster Technicians.

Methodology: A prospective audit was conducted of 120 consecutive cases that presented to the Plaster Technicians at Western Health which had plasters applied by other institutions or other departments. The plasters were assessed on a number of criteria for adequacy and appropriateness using a standardised questionnaire and set guidelines.

Results: 63% of plasters applied were found to be deficient, inadequate or needed improvement. Of those applied by Theatre doctors, only 20% were appropriate. Of plasters applied by Emergency doctors only 10% were appropriate and those applied by General Practitioners were consistently deficient. Only trained plaster technicians had an acceptable rate of >90%. A large portion of the errors were due to incorrect moulding, joint position and fracture alignment.

Conclusions: Improperly applied plasters lead to increased morbidity, require reapplication or unnecessary operative procedures due to loss of position. Ongoing education and review is critical to address this situation, and a national online database is being designed and implemented to monitor this situation nationally.
MENTORING IN SURGICAL RESIDENCY EDUCATION

A mentor serves as role model, counselor, and advocate for an understudy or protégé. The art and science of mentoring have been investigated most thoroughly in the educational literature, yet there are unique situational and individual considerations in the surgical arena that may warrant special consideration. The general attributes of successful mentors are not foreign to academic surgeons but may require deliberate cultivation to optimize mentorship in the context of academic medicine. Moreover, the stages of productive mentoring may be counter to the learned adaptive behaviors and instinctive personality traits of some accomplished surgeon educators. Indeed, examples of failed mentorship are common in our medical centers and, specifically, in surgical training programs. The behavioral adaptation that supports surgical decision-making under conditions of incomplete data and unusual stress often devalues succession planning and the derivation of satisfaction from the success of other members of the team. Accordingly, fostering effective mentoring relationships in academic surgery requires a concerted effort to develop appropriate behaviors that are conducive to the mentoring process.

The personal and professional growth of our residents as well as the succession planning for our specialty are dependent upon the successful creation of an environment conducive to mentoring in academic orthopaedics and require a concerted effort by senior surgeons to learn effective mentoring styles.
TRICKS AND TRAPS IN TEACHING ARTHROSCOPIC TECHNIQUES IN THE KNEE

No abstract has been provided for this presentation.
TIBIAL TUBERCLE OSTEOTOMIES (TTO) FOR VALGUS KNEES IN TOTAL KNEE ARTHROPLASTY

Introduction and Aims: Safely obtaining adequate exposure is an integral step in successfully performing a Total Knee Arthroplasty. In this study, we look at approaching the valgus knee through a lateral arthrotomy and tibial tubercle osteotomy.

Methods: 20 knees in 19 consecutive patients with valgus deformities are included in this study (2006 to 2010). LCS mobile bearing prostheses were implanted by a single senior surgeon (GF). Navigation was used for all the knees. The knee is approached through a skin incision 5-10mm more lateral than the standard midline incision. The lateral arthrotomy is made to Gerdy’s tubercle 7-10cm distal to Tibial Tendon insertion. 7cm long and 2cm wide osteotomy is performed. Richards staples are used to fix the osteotomy once the prosthesis is fixed. All patients were followed up by the operating surgeon.

Results: All osteotomies united. 2 postoperative complications were encountered during follow up. One patient had a postoperative haematoma that was washed out. A second patient had a fall 6/52 post-op and sustained a minimally displaced fracture at the navigation pin site (Tibia). This was treated in a cylinder cast and went onto full union.

Conclusions: Our technique of lateral arthrotomy and TTO in the valgus knee is safe and predictable. It delivers wider exposure, facilitates soft tissue management, preserves viability of the extensor mechanism and allows some movement of the tibial tubercle for improved patella tracking. We recommend planning this procedure preoperatively for best results.
COMPARING OUTCOMES OF MEDIAL PARAPATELLAR AND SUBVASTUS APPROACHES IN TOTAL KNEE ARTHROPLASTY. A RANDOMIZED CONTROLLED TRIAL

Introduction and aims: The medial parapatellar approach in total knee arthroplasty is arguably the most common approach, but the subvastus approach is less insulting to the quadriceps mechanism.

Method: A single centre, randomized controlled trial was conducted in a metropolitan hospital to investigate whether the subvastus approach afforded better outcomes than the medial parapatellar approach. Ninety participants with knee osteoarthritis were randomized to either the subvastus or medial parapatellar approach. The primary outcome was the American Knee Society Score and secondary outcomes reported included pain, extension and flexion range of motion, quadriceps lag, girth, Oxford Knee Score, 3 meter timed up and go test, days to straight leg raise, surgeon perceived difficulty, operation duration, tourniquet duration and length of stay. Data were collected preoperatively, intra-operatively, days 1,2,3, discharge, 6 weeks and 6, 12 and 18 months post operatively.

Results: Analysis was undertaken on 76 participants revealing no significant difference with the primary outcome (p=0.076; MP 167.3±36.6; SV 153.1±36.6) or any other outcome except for surgeon perceived difficulty, which favored the medial parapatellar approach (p=0.001; MP 3.3/10±1.9; SV 5.4/10±2.3) and days to straight leg raise, which favored the subvastus approach by 0.9 days (p=0.044; MP 2.8±1.9; SV 1.9±1.6).

Conclusion: The subvastus approach is technically more difficulty and offers no clinical benefit over the medial parapatellar approach.
JOINT UNLOADING TO TREAT OA OF THE KNEE: A PRACTICAL OPTION

Objective: Joint load reduction is effective for alleviating OA pain. Treatment options for joint unloading include braces and HTO, both of which may be impractical for patients. The purpose of the present study was to examine the biomechanical rationale of a practical, partial unloading implant (KineSpring® System, Moximed) for knee OA.

Methods: Device durability was tested by cyclically loading bone-implant constructs through simulated use for at least 10 million cycles. Joint load reduction with the implant was quantified by measuring changes in medial and lateral knee compartment loads generated by cadaver knees in simulated gait. Safety of the device was tested by 3, 6, and 12 month follow-up of implants in an in vivo ovine model. Surgical technique and device safety and efficacy were assessed in human clinical studies.

Results: The unloader device survived over 15 million cycles of simulated use without failure. In the simulated gait cadaver model, the unloading device significantly reduced medial compartment (29 ± 13 lbs, p<0.05) and overall knee joint loads during the stance phase of gait testing but did not significantly increase lateral compartment loading. Chronic ovine implants demonstrated good tolerance of the implant with normal wound healing and secure device fixation. Clinical experience (n=49) demonstrated uneventful device implantation. Unlike HTO, the implantation technique for the unloader does not alter joint alignment. This surgical technique avoids removal of bone, ligament, and cartilage, thus preserving future primary arthroplasty, if required. Early-term clinical experience also demonstrates good outcomes for patients, the earliest of whom are beyond 2.6 years with the implant.

Conclusions: This unloading device offers a practical and attractive treatment option for patients with medial knee OA: load reduction without load transfer, durability, preservation of downstream treatment options, safety, and early-term efficacy.
A MODEL FOR INVESTIGATING THE MEDIAL KNEE JOINT CONTACT FORCE DURING GAIT FOLLOWING HIGH TIBIAL OSTEOTOMY

Introduction: High tibial osteotomy is a well established joint preserving procedure for the treatment of unicompartamental knee osteoarthritis. Of particular interest are the alterations in knee loading compartments during dynamic activities such as locomotion. Computer modelling can indirectly assess contact and muscle forces in the patient. This study aimed to develop a valid model representative of high tibial osteotomy to assess the medial joint contact force at the knee during gait.

Methods: Software for Interactive Musculoskeletal Modelling (version 2, SIMM Inc, USA) was used to develop a model to replicate the effects of high tibial osteotomy surgery on tibial alignment. The program was then used to perform a detailed analysis on gait data collected from two high tibial osteotomy patients preoperatively and 6 months post operatively. Inverse dynamics simulations were conducted to investigate knee joint contact force on the medial compartment of the two patients during the stance phase of their operated limbs.

Results: Significant decreases (p<0.05) in the medial joint contact force were observed during both early and late stance for both patients. Force generated in muscles crossing the knee was found to be the major contributor to the joint contact force. Total muscle force was found to increase significantly (p<0.05) following surgery, however decreased loads were calculated for the medial compartment. The pattern and magnitude of joint reaction force was found to be consistent before and after surgery and replicated the results of previous studies. The HTO-specific model was valid and sensitive to changes in joint reaction force, medial joint contact force and muscle forces crossing the knee.

Conclusion: High tibial osteotomy reduced the medial joint contact force at the knee as a result of the coronal realignment of the limb. Osteoarthritis symptoms were relieved in terms of knee pain and function. Finally, a difference in compensatory strategies was observed between patients. This novel technique allows non-invasive assessment of the mechanical effect of procedures such as HTO. This should allow more accurate planning and assessment of such surgical procedures.
REGIONAL DELIVERY OF PROPHYLACTIC ANTIBIOTICS IN TOTAL KNEE ARTHROPLASTY BY THE INTRAOSSEOUS ROUTE. A RANDOMIZED CONTROLLED TRIAL

Despite modern surgical techniques, reported rates of deep infection following Total Knee Replacement (TKR) persist between 1-2.5%. Coagulase-negative staphylococcus (CNS) has become the most common causative organism, and while growth of CNS is more indolent than staphylococcus aureus, it has a relatively higher minimum inhibitory concentration (MIC) against cephalosporins. Tissue concentrations of prophylactic antibiotics may fall below this level during TKR with conventional ‘systemic’ dosing.

Regional administration of prophylactic antibiotics via a foot vein following tourniquet inflation has been shown to provide tissue concentrations approximately 10 times higher than systemic dosing, however cannulation of a foot vein is difficult, time consuming, and may compromise sterility.

Intraosseous cannulation offers an alternative method of accessing the vascular system, and the aim of this study was to assess its effectiveness in administration of prophylactic antibiotics. 22 patients undergoing primary total knee arthroplasty were randomised into two groups. Group 1 received 1g of cephazolin systemically 10 minutes prior to tourniquet inflation. In Group 2 the EZ-IO tibial cannulation system was used, and 1g of cephazolin was administered intraosseously in 200ml of normal saline following tourniquet inflation and prior to skin incision. Subcutaneous fat and femoral bone samples were taken at set intervals during the procedure, and antibiotic concentrations measured using High Performance Liquid Chromatography (HPLC).

There were no significant differences in patient demographics, comorbidities, or physical parameters between groups. The overall mean tissue concentration of cephazolin in subcutaneous fat was 185.9 ug/g in the intraosseous group and 10.6 ug/g in the systemic group (p<0.01). The mean tissue concentration in bone was 129.9 ug/g in the intraosseous group and 11.4 ug/g in the systemic group (p<0.01). These differences were consistent across all sample time points throughout the procedure. No complications occurred in either group.

Intraosseous regional administration can achieve tissue levels of antibiotic over an order of magnitude higher than systemic administration. Further work is required to determine if there is clinical benefit in preventing infection, particularly against CNS. This novel mode of drug administration may also have other applications, allowing ‘surgical site delivery’ of medication while minimising systemic side effects.
TOURNIQUET APPLICATION DURING CEMENT FIXATION ONLY IN TOTAL KNEE ARTHROPLASTY: A DOUBLE-BLIND, RANDOMISED CONTROLLED TRIAL

Tourniquet use in TKA is common practice. A recent meta-analysis concluded that whilst early release (prior to closure of the quadriceps mechanism) increases blood loss, it protects patients from complications. However, there has been no research evaluating tourniquet use during cement fixation only. This study proposed to establish whether tourniquet application during cement fixation only (Short Duration) was associated with better functional recovery compared to standard tourniquet (Long Duration) application during TKA.

We planned to randomise 230 patients to receive Short or Long Duration tourniquet application. The primary outcomes were in-hospital donor transfusion rate and the Oxford Knee Score at 10 weeks post-surgery. Serial measures (pre-operative, day 4 then 2, 10, 26 and 52 weeks post-operation) of knee range and function were undertaken. Pre- and post-operative Doppler ultrasounds were obtained. The trial was discontinued after randomisation of 65 patients.

Interim analysis indicated the risk of transfusion (odds ratio 7.38, P = 0.015) was higher in the Short Duration group. At 10 weeks post-surgery, no significant difference was observed in Oxford Knee Score. There were no between-group differences in rate of recovery up to 26 weeks for any outcome.

We conclude that restricting tourniquet application to the period of cementing is associated with a significantly higher risk of transfusion. This approach is impractical if it is not offset by very impressive gains in functional recovery.
CLINICAL VALIDITY OF THE NERVE ROOT SEDIMENTATION SIGN FOR THE DIAGNOSIS OF LUMBAR SPINAL STENOSIS

Introduction: The Nerve Root Sedimentation Sign in transverse magnetic resonance imaging has been shown to discriminate well between selected patients with and without lumbar spinal stenosis (LSS), but the performance of this new test, when used in a broad patient population, is not yet known (Barz et al. 2010).

Methods: We conducted a retrospective study of consecutive patients with suspected LSS from 2004-2006, before the sign had been described, to assess its association with health outcomes. Based on clinical and radiological diagnostics, patients had been treated with decompression surgery or conservative treatment (physical therapy, oral pain medication). Changes in the Oswestry Disability Index (ODI) from baseline to 24 month follow-up were compared between Sedimentation Sign positives and negatives in both treatment arms.

Results: Of the 146 included patients (52% female, mean age 59 yrs), 71 underwent surgery. Baseline ODI in this treatment arm was 52%, the sign was positive in 44 patients (mean ODI improvement 25 points) and negative in 27 (ODI improvement 24), with no significant difference between groups. In the 75 patients of the conservative treatment arm, baseline ODI was 44%, the sign was negative in 45 (ODI improvement 17), and positive in 30 (ODI improvement 5). Here a positive sign was associated with a smaller ODI improvement compared with sign negatives (t-test, p=0.003).

Conclusion: This study allowed an unbiased clinical validation of the Sedimentation Sign by avoiding it influencing treatment selection. In the conservative treatment arm a positive sign identifies a group of patients who are less likely to benefit. In these cases, surgery might be effective; however, this needs confirmation in prospective studies.

LONG-TERM OUTCOMES FOLLOWING LUMBAR SPINE FUSION FOR ADULT ISTHMIC SPONDYLOLISTHESIS: A COMPARISON OF POSTERIOR LUMBAR INTERBODY FUSION WITH POSTEROLATERAL FUSION

Introduction: Posterior lumbar interbody fusion (PLIF) has the theoretical advantage of optimising foraminal decompression, improving sagittal alignment and providing a more consistent fusion mass in adult patients with isthmic spondylolisthesis (IS) compared to posterolateral fusion (PLF). Previous studies with only short-term follow-up have not shown a difference between fusion techniques.

Methods: An observational cohort study was performed of a single surgeon’s patients treating IS over a ten year period (52 patients), using either PLF (21 pts) or PLIF (31pts). Preoperative and 12-month data were collected prospectively, and long-term follow-up was by mailed questionnaire. Preoperative patient characteristics between the two groups were not significantly different. Average follow-up was 7 years, 10 months, and 81% of questionnaires were returned. Outcome measures were Roland Morris Disability Questionnaire (RMDQ), Low Back Outcome Score (LBOS), SF-12v2 and SF-6D R2. The SF-6D R2 is a “whole of health” measure.

Results: PLIF provided better short- and long-term results than PLF. The PLIF group had significantly better LBOS scores in the long term, and non-significantly better RMDQ scores in the long term. As measured by RMDQ Minimum Clinically Important Difference (MCID) short term set at 4, RMDQ MCID set at 8, the LBOS MCID set at 7.5 points and by SF-12v2 physical component score (PCS), PLIF patients performed better than PLF patients. When analysing single level fusions alone, the difference is more pronounced, with PCS, mental component scores and SF-6D R2 all being significantly better in the PLIF group rather than the PLF group.

Discussion: This paper strongly supports the use of PLIF to obtain equivalent or superior clinical outcomes when compared to PLF for spinal fusion for lumbar isthmic spondylolisthesis. The results of this study are the first to report to such long-term follow-up comparing these two procedures.
OUTCOMES OF LOCAL BONE VERSUS AUTOGENOUS ILIAC CREST BONE GRAFT IN SINGLE LEVEL DEGENERATIVE SPONDYLOLISTHESIS

Aim: To compare the clinical outcomes of instrumented fusion for single level degenerative spondylolisthesis with local bone versus iliac crest bone graft

Method: Fifty patients (32 female, 18 males) operated on by the author over a 3 year period were reviewed. All cases had a single level decompression and instrumented fusion for a degenerative spondylolisthesis. 25 patients had iliac crest graft and 25 had morcelised local bone graft. Patients were followed up for 6 months. Pre and postoperative visual analogue pain scores and Roland disability scores were recorded. Inpatient notes were reviewed for duration of surgery and duration of stay.

Results: There was no difference in age, sex and severity of pre operative symptoms between the two groups. There was no significant difference in improvement in Roland score between the two groups but pain scores were lower in the local graft group although this was not statistically significant. Duration of surgery (140 vs 175min) and hospital stay (4.3 vs 5.1 days) were lower in the local bone graft group. 6 patients in the iliac crest graft group complained of donor site pain vs none in the local graft group at 6 months.

Conclusion: Usage of morcelised local bone graft resulted in clinical outcomes comparable to iliac crest bone graft in patients undergoing decompression and fusion for a single level degenerative spondylolisthesis. Duration of surgery, hospital stay and donor site pain are reduced when local bone was utilised.
IN VIVO EVALUATION OF THE OSTEOINDUCTIVITY OF GAMMA IRRADIATED AND NON-IRRADIATED DEMINERALISED BONE MATRIX IN NUDE RATS

Aims and Purpose: To understand the effects of terminal sterilisation and residual calcium on human demineralised bone matrix (DBM) in ectopic bone formation in nude rat.

Method: The intramuscular implantation of human DBM prepared by the Queensland Bone Bank (QBB) from four donors into eight male athymic rats was used to assess osteoinductivity. The DBM contained different levels of residual calcium and treated with or without gamma-irradiation at 11kGy. At 6 weeks post-implantation, calcium deposition was assessed by manual palpitation and radiological imaging. Tissue morphology and cellular interactions was analysed using various histological staining methods whilst protein expression of anabolic and catabolic biomarkers were examined through immunohistochemistry. All results were then analysed in qualitative, semi-quantitative and quantitative manners and tested for statistical significance.

Results: Bone formation was observed in all specimens at the gross level. This was confirmed by histology which revealed bony capsules surrounded by soft tissue in the muscle pockets and differences in tissue components. On a cellular level, variations in osteoclast expression were found between the two groups as well as amongst individual donors through statistical analysis which resulted in an imbalance of the expression of anabolic and catabolic markers. Furthermore, a positive relationship between residual calcium and new bone formation in gamma irradiated DBM samples was found. To date, no studies have compared the effect of calcium in gamma irradiated DBM.

Conclusion: Our results suggest that gamma irradiation even at low doses and residual calcium may affect new bone formation. Taken together, this study stresses the importance of selecting ideal conditions for graft processing and the need to identify an optimal level of irradiation and remaining calcium levels that confers a balance between osteoinductivity and sterility.
RADIOSTEREOMETRY ANALYSIS (RSA) VS FINE CUT HELICAL COMPUTED TOMOGRAPHY IN ASSESSMENT OF SPINAL FUSION USING SHEEP AS A MODEL

Purpose of the study: Anterior lumbar inter-body fusion (ALIF) is a surgical procedure that is available to chronic lower back pain patients who fail to respond to conservative treatments. Failure to achieve fusion may result in persistence of pain. Fusion of the lumbar vertebral segment is more accurately assessed using fine-cut helical Computed tomography (CT) scans (0.25 mm thickness slices). Unfortunately this technique exposes the body to high radiation dose with hazard of increase risk of late malignancy. An alternative imaging tool is radiostereometry (RSA) which developed as a means to determine the magnitude of relative motion between two rigid bodies. In this study we used RSA to detect movement at the fused lumbar segment (ALIF site) during flexion and extension and compare the results obtained with fine-cut helical CT scan using histopathology as final gold standard assessment tool.

Method: ALIF of three levels of lumbar spine (L1-L2, L3-L4, and L5-L6) was done in 9 sheep. The sheep divided into three groups (3 sheep each). The first group had RSA assessment immediately, 3, and 6 months after surgery. The second group had RSA immediately, 3, 6, 9 months after surgery. The third group had an RSA immediately, 3, 6, 9, 12 months after surgery All the animals were humanly killed immediately after having the last scheduled RSA (group1, group2, and group 3 sheep were killed 6 month, 9month and 12 months after surgery respectively). This followed by in vitro fine cut CT and histopathology after the animals are scarified. Micro CT scan has been also used to identify the area where histopathology slide should be made to pick up fusion. Fine cut CT scan assessment for all sheep were done. The CT scan has been reported by two independent radiologists. Histopathology has been started and will finish in 2 weeks.

Results: RSA showed there was significant increasing stiffness of the spine though the fused segments as the time pass on compare to immediate postoperative assessment. CT scan were done and showed variable fusion though out the spinal segments.

Histopathology of all sheep has been started and the results will be available in 2 weeks which will be followed by statistical assessment to decide how accurate RSA compare to CT scan in assessment of fusion. I am confident that, should this paper is accepted; I will present the result of this original work for the first time in COMBINED MEETING ROTORUA, 2011.
POST-OPERATIVE CT ASSESSMENT OF INTERBODY FUSION TWO YEARS AFTER THORACOSCOPIC SCOLIOSIS SURGERY

The relationship between radiologic union and clinical outcome in thoracoscopic scoliosis surgery is not clear, as apparent non-union does not always correspond to a poor clinical result. Our aim was to evaluate CT fusion rates 2yrs after thoracoscopic surgery, and explore the relationship between fusion scores and; (i) rod diameter, (ii) graft type, (iii) fusion level, (iv) implant failure, and (v) lateral position in disc space.

Between 2000 and 2006 a cohort of 44 patients had thoracoscopic scoliosis correction. Discectomies were performed and defect was packed with either autograft (n=14) or allograft (n=30). Instrumentation consisted of either 4.5mm (n=24) or 5.5mm (n=20) single titanium anterior rod and vertebral body screws. Fusion quality and implant integrity were evaluated 2yr following surgery using low-dose CT. At each disc space, left, right and mid-sagittal CT reconstructions were generated and graded using the Sucato 4-point scale (Sucato, 2004) which is based on calculated percentage of fusion across disc space.

Fusion scores were measured for 259 disc spaces in 44 patients. Rod diameter had a strong effect on fusion score, with a mean score of 2.12±0.74 for 4.5mm Ti rod, decreasing to 1.41±0.55 for 5.5mm Ti rod, and to 1.09±0.36 for 5.5mm Ti-alloy rod. Mean fusion scores for autograft and allograft subgroups were 2.13±0.72 and 2.14±0.74 respectively. Fusion scores were highest in the middle of implant construct, dropping off by 20-30% toward the ends. Fusion scores adjacent to the rod (2.19±0.72) were significantly higher than on the contralateral side of the disc (1.24±0.85). Levels where rod fracture occurred (n=11) had lower fusion scores than those without fracture (1.09±0.67 vs 1.76±0.80). Levels where top screw pullout occurred (n=6) had lower CT fusion scores than those without (1.25±0.60 vs 1.83±0.76).

Rod diameter (larger), intervertebral level (proximal or distal), lateral position in disc (further from rod) and rod fracture or screw pullout all reduce fusion scores, while graft type does not affect scores. The assumed link between higher fusion score and better clinical outcome must be treated with caution, because rod fractures did not necessarily occur in patients with lower fusion scores. It is possible that with a stiffer rod, less bony fusion mass is required for a stable construct. We propose that moderate fusion scores secure successful clinical outcomes in thoracoscopic scoliosis surgery.
FOUR JOINTS BEFORE LUNCHTIME - RUNNING A HIGH THROUGHPUT JOINT REPLACEMENT UNIT

No abstract has been provided for this presentation.
REDUCING COSTS OF ELECTIVE SURGERY

Introduction and Aims: Waitemata District Health Board (WDHB) is contracted through public funding to achieve approximately 500 total hip arthroplasties per year. A pilot was established to increase productivity and reduce costs in these surgical procedures.

Current barriers to efficiency in elective surgery are:
- Slow patient turnover
- Increase in costs of consumables
- Staff employment issues.

Methods: This pilot introduced:
- A change in drivers and incentives so remuneration and rewards were related to productivity (replaced medical salaries)
- An alliance contracting concept
- Encouraged productivity
- Contained costs (consumables)
- Increase surgeon and anaesthetist involvement in overall patient care (reduce need for additional medical staff)
- Reduced length of hospital stay
- Shortened patient journey
- Established surgeon/anaesthetist/nurse team

Inclusion criteria:
1. Hip replacements in DRG103C: Hip replacement W/O catastrophic or severe CC.
2. ASA grade <4
3. Cases July to November 2010

Results: Comparison of baseline data was then carried out between this pilot and compared with data from the main campus (both sites had dedicated elective operating lists). Theatre time was reduced from 167.5 to 97 minutes (42%), length of stay 5.58 days to 3.46 days (38%), OR costs $3830 to $2708 (29%). There was an increase in medical costs but a 12% saving was achieved overall.

Conclusion: The pilot has shown that it is possible to significantly reduce costs in elective surgery through an increase in productivity. To reduce costs of elective surgery, the culture/environment needs to change to encourage the individual surgeons, anaesthetists, and other members of the team to increase productivity and decrease costs.
THE SWING ROOM MODEL IN PRIMARY ARTHROPLASTY
No abstract has been provided for this presentation.
THE TIME OUT PROCEDURE: HAVE WE CHANGED OUR PRACTICE?

Introduction: The aim of this study was to prospectively assess the results of a preoperative surgical safety checklist by comparing the initial phase of implementation of the Time Out Procedure (TOP) to the results four years later. We compared the accuracy and acceptance of the TOP to determine whether surgical practice had changed.

Methods: The TOP was initiated for all elective surgical procedures performed in Christchurch in 2004. An initial audit from September 2004 – April 2005 (Phase 1) was compared to one from October 2008-September 2009 (Phase 2) looking for an improvement in completion of the procedure. Variances were recorded and analysed within the categories of 1 System and process 2 Consent and limb marking 3 Incorrect details and 4 Near miss. A questionnaire was also sent to all the surgeons to determine their attitude towards the TOP.

Results: Although the TOP was completed more often in Phase 2 (98%, p<0.001) there were more variances (9%, p<0.001). The commonest variance was due to the surgeon and assistant not being present at the TOP which was significantly worse than in Phase 1 (p<0.0001). The results of the surgeon questionnaire showed that only 88% agreed that the TOP was valuable in preventing wrong site surgery.

Conclusions: This surgical indifference to the TOP is difficult to explain especially when National and International agencies have stressed its role in preventing surgical error. The recent introduction of the expanded WHO Checklist should be ‘surgeon led’ to be effective.
ACUTE CERVICAL SPINAL INJURIES IN RUGBY AND THE LAW

Spinal Cord Injury in Australian Footballers was initially reviewed from 1960 to 1985 by Professor Tom Taylor and Myles Coolican and it was subsequently reviewed by the same authors and David Carmody for the years 1997 to 2002.

There were 52 football related spinal cord injuries reported in Rugby Union and Rugby League players, in the latter paper showing a change in trends in acute cervical spinal cord injury. There have been no scrum injuries in Rugby League since 1996 when scrums stopped being contested and in Rugby Union in the latter series, there were 6 due to injuries occurring at scrum engagement and one at scrum collapse. In an earlier series during the period of 1986 to 1996 40% of the players injured in scrums were not in their regular positions and in the series 1997 to 2002 only one of the scrum injuries occurred to a forward not in his usual position. The remaining injuries in Rugby were due to tackling either to the ball carrier or to the tackler and some were due to gang tackles. Six injuries in the more recent series took place in rucks or mauls and there was evidence that the change in laws for the breakdown, introduced in 1994, have not resulted in a decreased risk of acute spinal injuries.

A National Register of such injuries has been promoted as, although scrum engagement has been modified and dangerous tackling policed by the referees, the front row forwards, particularly the hooker, remain at risk of ASCI in the scrum, and gang tackles continue.

This paper looks at the legal position based on precedent, noting that ASCI continue to occur. In sport, players owe each other a duty of care. Sporting injuries may involve negligence when they are caused by careless disregard for the safety of an opponent, and coaches may also have a duty of care to both their own players and to the opposition. The paper by Carmody et al (2005) showed in a five year period there were four school boy injuries in Rugby Union, and that three injuries had been sustained in Rugby Union training sessions. There has been a decrease in injuries due to scrum collapse but some injuries are still occurring on scrum engagement. Despite the sequence of "crouch-touch-pause-engage" there has been a gradual return to forceful scrum engagement with most ASCI injuries being due to those in the front row.

In the more recent series of the Rugby Union players, there have been Frankel grade A, B, or C, injuries and under existing player insurance cover, the maximum award for quadriplegia is $300,000.00. This is insufficient for permanent care.

It seems more effort will be required to provide preventative measures such as further de-powering of the scrums on engagement and the policing of tackling such as gang and spear tackles.

The paper looks at the medico-legal aspects of spinal injuries and potential player, coaching, and club liabilities.
VERTEBROPLASTY/KYPHOPLASTY - CURRENT STATUS

Vertebroplasty/Kyphoplasty represents a potentially promising intervention for chronic and disabling pain resulting from insufficiency thoracolumbar fractures secondary to osteoporosis. The techniques involve percutaneous transpedicular insertion of cement to provide stability following compression fracture of the thoracolumbar spine. Initial reports suggested that vertebroplasty was effective in providing rapid reduction in pain along with increased mobility and quality of life. With increasing acceptance of the technique it became clear that some complications were associated with the procedure, but prospective non blinded comparison studies comparing either vertebroplasty or balloon kyphoplasty with traditional ‘conservative’ care clearly demonstrated benefit to the patients undergoing the intervention, supporting increasing use of these procedures.

In 2009 two papers were published reporting prospective RCTs that included comparison of vertebroplasty with a sham intervention procedure, in a small population of patients agreeing to randomization, and both failed to demonstrate any advantage of vertebroplasty over the sham intervention. This resulted in editorials and viewpoints questioning the value of the intervention - in medically oriented journals, and editorials questioning the methodology and results of these RCTs - predominantly in surgical journals! Additional concerns have resulted from several perspectives including - industry sponsorship/support in clinical research; third party payer restriction of reimbursement on the basis of the above mentioned RCTs; realistic levels of evidence required to support introduction of new technologies; and the relevance of highest level evidence based medicine to clinical practice. The purpose of this presentation is to review the current status of the procedure of vertebroplasty, and provide a viewpoint on the issues noted above and other relevant aspects of this evolving technology.
THE ACC AND THE ASSESSMENT REPORT AND TREATMENT PLAN (ARTP)

The ACC (Accident Compensation Corporation as it was originally named) is a system of no-fault support and rehabilitation for people who suffer a personal injury caused by an accident (PICBA).

It came into being in 1974 and has been through a number of iterations and legal refinements since then. The current legislation was enacted in 2001.

The ARTP is the document used to request ACC funding for elective surgery. It has certain requirements to be satisfied and these and the pitfalls will be discussed.

The legislative considerations associated with ACC’s decisions on funding can be a source of confusion and frustration and will also be discussed.
OUTCOMES REPORTED BY THE AUSTRALIAN ORTHOPAEDIC ASSOCIATION NATIONAL JOINT REPLACEMENT REGISTRY 2011

This Paper reports the latest data from AOA NJRR.

In particular, the declining use of uni-compartmental knee replacement, hip resurfacing and metal on metal hip replacements is discussed with possible reasons considered.

ASR hip replacement is discussed with reasons for failure.

Can the regulators prevent another similar episode as the ASR?
DOES PREVIOUS HIP ARTHROSCOPY NEGATIVELY INFLUENCE THE OUTCOME OF TOTAL HIP REPLACEMENT?

Introduction: The risk that hip preserving surgery may negatively influence the performance and outcome of subsequent total hip replacement (THR) remains a concern. The aim of this study was to identify any negative impact of previous hip arthroscopy on THR.

Methods: Out of 1271 consecutive patients who underwent primary THR between 2005 and 2009, eighteen had previously undergone ipsilateral hip arthroscopy. This study group (STG) was compared with two control groups (CG: same approach, identical implants; MCG: paired group matched for age, BMI and Charnley categories). Operative time, blood loss, evidence of heterotopic bone and implant loosening at follow-up were compared between the SG and the MCG. Follow-up WOMAC were compared between the three groups.

Results: Blood loss was not found to be significantly different between the SG and MCG. The operative time was significantly less ($p>0.001$) in the SG. There was no significant difference in follow-up WOMAC between the groups. No implant related complications were noted on follow-up radiographs. Two minor complications were documented for the SG and three for the MCG.

Conclusion: We have found no evidence that previous hip arthroscopy negatively influences the performance or short-term outcome of THR.
FEMORAL NECK FRACTURES AFTER ARTHROSCOPIC OSTEOCHONDROPLASTY FOR FEMOROACETABULAR IMPINGEMENT: RATE, RISK FACTORS, AND EARLY OUTCOME

Femoral neck fractures following arthroscopic osteochondroplasty of the femoral head-neck junction for femoroacetabular impingement have been observed in our practice and anecdotally reported in the literature. The aim of the present study was to assess the rate of fracture, identify risk factors, and determine the impact on short-term patient outcome.

Our prospectively recorded database of 431 consecutive hip arthroscopies was retrospectively analyzed to identify patients who had suffered a postoperative femoral neck fracture. Seven cases were found and comprised the study group (SG). For evaluation of potential risk factors, the SG was compared with all 376 cases that had undergone femoral osteochondroplasty (OG) for age, gender, height, weight and BMI. Additionally, the bony correction in the SG was measured on conventional radiographs as well on either an MRI or CT scan and compared with a reference group (RG). Clinical outcomes were determined from analysis of preoperative and postoperative WOMAC scores and compared between SG and RG.

Results: 1.9% (7 males) sustained a fracture after minor trauma that occurred at an average of 4.4 weeks postoperatively. The SG had a significantly higher mean age (p=0.01) when compared with the OG. The postoperative alpha angles were significantly (p=0.006) lower on radial reformations scans in the SG then in the RG. The resection depth ratios measured in the SG were significantly higher on both x-rays (p=0.022) and scans (p=0.013). Using receiver-operating characteristic (ROC) curves cut-off values for age and resection depth ratio on standard x-rays were found to be 44 years and 18%, respectively. After a mean follow-up 20 months there was a significant lower WOMAC (p=0.030) in the SG and no gain pre to postoperatively.

Conclusion: Male gender, older age (>44 years) and depth of bony resection (>18% head radius) were found to be independent risk factors for fracture. Femoral neck fracture has a negative impact on patient’s short-term outcome. We are now more conservative with the post operative rehabilitation protocol for at risk patients.
COMPLICATIONS RELATED TO THERAPEUTIC ANTICOAGULATION IN TOTAL HIP ARTHROPLASTY

Introduction: Bleeding related wound complications including deep infection, superficial infection and haematoma cause significant morbidity in lower limb joint arthroplasty surgery. It has been observed anecdotally that patients requiring therapeutic anti-coagulation within the peri-operative period have higher rates of bleeding related complications and those requiring intravenous heparin particularly appear to do poorly.

The aim of this study is to investigate the relationship between post-operative bleeding and wound complications in the patient requiring therapeutic warfarin, plus or minus heparin, in total hip arthroplasty surgery.

Methods: This is a retrospective cohort study reviewing 1047 primary total hip replacements performed in a single centre over a five year period and comparing outcomes of the patients on warfarin (89) with a double-matched control group of patients not on warfarin (179). Outcomes included rates of deep infection, excessive wound ooze or haematoma, superficial infection, return to OT for washout and need for revision operation. The study group was then sub analysed comparing those on IV heparin plus oral warfarin, to those on warfarin alone.

Results: The warfarin group had significantly higher risk of deep joint infection (9% vs 2.2% \( p = 0.023 \)), haematoma/ wound ooze (28% vs 4% \( p < 0.001 \)) and superficial infection (13.5% vs 2.2% \( p < 0.001 \)) compared to the control group. In the sub analysis of the study group, those on IV heparin had significantly higher risk of haematoma/ wound ooze (44% vs 28% \( p = 0.023 \)) than those on warfarin alone.

Discussion: The requirement of therapeutic anti-coagulation in the peri-operative period is a tenuous balance between the complications of thrombo-embolic disease and bleeding-related morbidity. In the past, perhaps the full burden of bleeding related complications has not been appreciated, but now improved understanding will enable the both the surgeon and the patient to make more informed decisions regarding therapeutic anticoagulation in elective arthroplasty surgery.
USE OF TRANEXAMIC ACID TO REDUCE BLOOD LOSS IN PRIMARY CEMENTLESS TOTAL HIP ARTHROPLASTY

Introduction: Tranexamic acid is an inhibitor of fibrinolysis that blocks the lysine-binding site of plasminogen to fibrin, and thereby decreases blood loss in patients undergoing surgery.

Aims and Objectives: A prospective, randomized, double-blind study was done on 50 patients undergoing primary cementless total hip arthroplasty to determine the effect of tranexamic acid on intra- and postoperative blood losses and on the transfusions requirements.

Material and Methods: 50 patients were randomized to tranexamic acid (15 mg/kg) given as a bolus intravenous injection or placebo (normal saline) given intravenously, 15 minutes before the incision.

The intraoperative and postoperative blood loss (at removal of the drain 24 hours after the operation) and the number of blood transfusions required were recorded. The patients were screened for deep venous thrombosis with bilateral compression Ultrasonography using Colour Doppler imaging on the tenth postoperative day. The Hemoglobin level was measured preoperatively and on the 3rd postoperative day. The D-dimer levels were measured preoperatively and 24 hrs postoperatively.

Results: Patients receiving tranexamic acid had a mean intraoperative blood loss of 410 ml (range, 300-510 ml) versus 615 ml (range, 515-750 ml) (p value<0.05) in patients receiving placebo, a postoperative blood loss of 210 ml (range, 150-325 ml) versus 490 ml (range, 370-540 ml) (p value<0.05), and a total need for 8 blood transfusions versus 30. Only 6 out of 25 patients in tranexamic acid group required blood transfusion whereas 18 out of 25 patients in the placebo group required transfusion.

In the group receiving placebo the mean fall in hemoglobin was 2.9 g/dl (range, 2.5-3.2) and in the group treated with tranexamic acid 1.6 g/dl (1.3-2) (p<0.05). At 24 hrs postoperatively, mean plasma D-dimer concentration in the Tranexamic group was half of that in the control group. No patient in either group had any evidence of deep vein thrombosis on bilateral compression Ultrasonography using Colour Doppler imaging done on the tenth postoperative day.

Conclusion
Tranexamic acid 15 mg/kg given as a single preoperative bolus dose reduces peroperative and postoperative and total blood loss, and transfusion requirements in primary cementless total hip replacement surgery without any increased risk of thrombus formation.
11 YEAR EXPERIENCE WITH BIRMINGHAM HIP RESURFACING. A PERSONAL JOURNEY

My experience with Birmingham Hip Resurfacing began in July 2000 and continues to this day for selected cases including OA, AVN, CDH and also following old fracture deformity and Femoral/ Pelvic osteotomy. Early on, the criteria for patient selection expanded with increasing experience and positive acceptance by patients but then moderated as adverse reports including those from our National Joint Replacement Registry suggested a need for caution with Surface Replacement.

Over 10 years, (July 2000 — July 2010), a personal series of 243 BHRs were followed (169 male — 74 female) with only one return to theatre in that time (4 days post op. to revise a poorly seated acetabular cup in a dysplastic socket). There were no femoral neck fractures in that 10 year period but 3 femoral cap/stem lucencies were known (2 female-1 male) with insignificant symptoms to require revision. The complete 10 year series of cases were then matched in the Australian National Joint Replacement Registry. No other revisions were identified by the Registry for all 243 cases.

Soon after completing this encouraging outcome study however 3 revision procedures have been necessary (2 for sudden late head/neck failure including one of the three with known cap/stem lucencies and one for suspected pseudotumour/ALVAL). One healing stress fracture of the femoral neck and another further cap/stem loosening have also presented recently but with little in the way of symptoms at this stage. Surprisingly, there is little indication which case is likely to present with problems even in the presence of many cases done earlier where one would be cautious now to use a BHR but which have ongoing good outcomes. (e.g.,AVN or the elderly osteoporotic patient).

My journey therefore with Birmingham Hip Resurfacing over that first 10 years has been very positive and I believe it retains an important place for the younger patient with good bone quality. However it has become only recently apparent in my series of 243 cases that late onset unpredictable problems can arise which is likely to further narrow my selection criteria for this procedure. The likely outcome will be that it will have a more limited place in my joint replacement practice despite the very positive early experience.
OPERATIVE VERSUS NON-OPERATIVE MANAGEMENT OF DISTAL RADIUS FRACTURES IN THE ELDERLY- A REVIEW OF CLINICAL AND FUNCTIONAL OUTCOMES

There is ongoing debate regarding the optimal management of displaced distal radius fractures in the elderly. The aim of this review was to compare outcomes of operatively versus non-operatively managed displaced extra-articular or undisplaced intra-articular distal radius fractures in patients 65 years and older.

All patients over the age of 65 years with displaced extra-articular or undisplaced intra-articular fractures seen in Tauranga Hospital between 1st January 2009 and 31st December 2009 were included in the study. Patients from out of town, with incomplete radiographs or who had since passed away were excluded as were patients with comminuted intra-articular or undisplaced/minimally displaced extra-articular fractures. Patients attended follow-up where clinical assessment was carried out by a single Hand Therapist who was blinded to the side of injury and previous management, completed the Patient Rated Wrist Evaluation (PRWE) and DASH questionnaires and a visual analogue satisfaction score.

There were 91 distal radius fractures in patients 65 years and older seen in Tauranga Hospital over this 1 year period. 44 were excluded leaving 47 patients. 6 declined follow-up and 5 failed to attend. 36 patients (3 males, 33 females, average age 74.7 years) were included in the study- 23 had been treated non-operatively with casting +/- manipulation while the remaining 13 patients had undergone open reduction and internal fixation. Comparing the injured with the uninjured wrist in the operatively managed group there was an average loss of 5.8 degrees flexion, 1.2 degrees extension, 1.7 degrees ulnar deviation and 3.8 degrees supination with a gain of 0.7 degrees radial deviation, no change in pronation and a loss of 1.2kg in grip strength. These operatively managed patients had an average PRWE score of 6.5, DASH score of 31.5 and satisfaction score of 8.8. Conversely, in the non-operatively managed group there was an average loss of 17.5 degrees flexion, 9.4 degrees extension, 11.3 degrees ulnar deviation and 10.9 degrees supination with a gain of 0.1 degrees radial deviation, no change in pronation and a loss of 4.7kg in grip strength. These non-operatively managed patients had higher PRWE (42.5) and DASH (56) scores and were in general less pleased with their outcomes (mean satisfaction score- 5.6).

Patients in the operatively managed group at 12-24 months post-injury had less significant loss of function as well as lower PRWE and DASH scores and higher satisfaction outcome scores.
RADIUS MORPHOLOGY AND ITS EFFECTS ON ROTATION: WITH CONTOURED AND NON-CONToured PLATING OF THE PROXIMAL RADIUS

Background: The radius has a sagittal and coronal bow. Fractures are often treated with volar anterior plating. However, the sagittal bow is often overlooked when plating. This study looks at radial morphology and the effect of plating the proximal radius, with straight plates then contoured plates bowed in the sagittal plane. We report our findings and their effect on forearm rotation.

Method: Morphology was investigated using fourteen radii. Attention was made to the proximal shaft of the radius and its sagittal bow, from this 6, 7 and 8 hole plates were contoured to fit this bow. A simple transverse fracture was then made at the apex of this bow. Supination and pronation was then compared when plating with a straight plate and a contoured plate. Ten cadavers had the ulna plating at the same level. The effect on rotation of fractures plated in the distal third shaft was also measured.

Results: A significant reduction in rotation was found, when a proximal radius fracture was plated with straight plate compared to a contoured plate: 10.8, 12.8, 21.7 degrees (p<0.05 for 6, 7, 8 hole plates). Forearm rotation was decreased further when a longer plate was used. Ulna or distal shaft plating, did not reduce rotation.

Conclusion: This study has shown a significant sagittal bow of the proximal shaft of the radius. Plating this with contoured plates in the sagittal plane improves rotation when compared to straight plates. Additional ulna plating is not a source of reduced forearm rotation.

Level of evidence: Basic science study
TRICEPS REFLECTING ANCONAEUS PEDICLE (TRAP) APPROACH VS. OLECRANON OSTEOTOMY FOR DISTAL HUMERUS FRACTURES

Introduction: Adequate exposure is a prerequisite for treatment of distal humeral fractures. In this study, we compared the clinico-radiological and functional outcome of TRAP approach with that of olecranon osteotomy for distal humerus fractures.

Material & Methods: 27 patients with distal humerus fractures were randomized into 2 groups: Group 1 (n=14, TRAP approach), Group 2 (n=13, Olecranon osteotomy). All patients were operated with bi-columnar fixation. All patients were mobilized from day 2. Follow-up evaluation was done at 1, 3, 6 and 12 months.

Results: All patients achieved union. The mean surgical time was higher in group 1 (120 min) as compared to group 2 (100 min). The final ROM was higher in group 1 (1160) as compared to group 2 (850). Two patients in group 2 needed posterior release. 5 patients in group 2 had hardware complications related to olecranon osteotomy and needed removal. Two patients in Group 1 had transient ulnar nerve paraesthesias. There was no difference in triceps power in both groups.

Conclusion: Our results demonstrate that TRAP approach is extensile and safe enough in treating these complex fractures with better final ROM and fewer complications.
ONGOING POSITIVE EFFECT OF PLATELET RICH PLASMA IN LATERAL EPICONDYLITIS. A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL: PRP VERSUS CORTICOSTEROID INJECTION WITH A 2 YEAR FOLLOW-UP

Context: Platelet Rich Plasma (PRP) has shown to be a general stimulation for repair and 1 year results showed promising success percentages.

Objectives: To determine the effectiveness of PRP compared with corticosteroid injections in patients with chronic lateral epicondylitis with a two-year follow-up.

Design: A double-blind randomized controlled trial was conducted between May 2006 and January 2008.

Setting: The trial was conducted in two Dutch teaching hospitals.

Patients: 100 patients with chronic lateral epicondylitis were randomly assigned to a leucocyte-enriched PRP group (n=51) or in the corticosteroid group (n=49). Randomization and allocation to the trial group were carried out by a central computer system.

Intervention: Patients received either a corticosteroid injection or an autologous platelet concentrate injection through a peppering needling technique.

Main Outcome Measures: The primary analysis included Visual Analogue Scale (VAS) pain scores and Disabilities of the Arm, Shoulder, and Hand Outcome (DASH) scores.

Results: The PRP group was more often successfully treated than the corticosteroid group (p<.0001). Success was defined as a reduction of 25% on VAS or DASH scores without a re-intervention after 2 years. When baseline VAS and DASH scores were compared with the scores at 2 years follow-up, both groups significantly improved across time (intention-to-treat principle). However, the DASH scores of the corticosteroid group returned back to baseline levels, while the PRP significantly improved (as-treated principle). There were no complications related to the use of PRP.

Conclusions: Treatment of patients with chronic lateral epicondylitis with PRP reduces pain and increases function significantly, exceeding the effect of corticosteroid injection even after a follow-up of two years. Future decisions for application of PRP for lateral epicondylitis should be confirmed by further follow-up from this trial and should take into account possible costs and harms as well as benefits.

Keywords: lateral epicondylitis, platelet rich plasma, corticosteroids, pain, disability

INCIDENCE OF CARPAL TUNNEL SYNDROME REQUIRING SURGICAL DECOMPRESSION: 
A 10.5 YEAR REVIEW OF 2309 PATIENTS IN A SINGLE REGION

Introduction: Carpal tunnel syndrome (CTS) is said to be a condition of middle-aged women. Our experience is that it more commonly occurs in older people and also in a younger working population. The aim of this study is to describe the epidemiology of CTS requiring carpal tunnel decompression (CTD).

Materials and Methods: Over a 10.5 year period 3073 CTD were performed on 2309 patients aged 15 – 93 years. This included all public, private and ACC funded cases in our region. During this period we had no restriction to access to CTD as all publicly funded cases were performed under local anaesthetic in a day surgery unit. Neurophysiological studies were performed pre-operatively by the same neurophysiologist. Population data from the national census (2006) was used to calculate the annual incidence of patients requiring CTD for each 5 year age band.

Results: There were 1418 females (61.4%) and 891 males (38.6 %). In contrast females comprised 116 of 306 (37.8%) patients who had their surgery funded by ACC. The mean age at surgery was 45 years for ACC cases compared with 56 years for non-ACC funded cases. The incidence of males having surgery funded by ACC was 1.7 times higher than females.

There was a biphasic pattern in females with an incidence of 3.0/1000 at age 50-54 years, and a second higher peak of 3.1 to 3.4/1000 from 70 to 85 years. Males had a linear increase in incidence peaking at 3.1/1000 for age 65-69 years declining slightly to 2.8/1000 for age 70-85 years. The incidence was significantly higher in females than males overall (1.8 v 1.1/1000) and in patients under 65 years (1.4 v 0.8/1000). In patients over 65 years there was no significant difference in incidence (female 2.8, male 2.5/1000).

Conclusions: Within our region, the incidence of surgically treated carpal tunnel syndrome increases with age. The highest rates are seen over the age of 70 in women and 65 years in men with no significant difference in rates between men or women over 65 years.
THE ROLE OF OCCULT INFECTION IN THE AETIOLOGY OF ASEPTIC LOOSENING USING ULTRASONIC SONIFICATION AND CONVENTIONAL SAMPLING TECHNIQUES

Aims: It has been suggested that occult infection of joint prostheses contributes to a proportion of aseptic loosening. The aims of the study were to determine the incidence of occult infection in a sample of patients undergoing revision surgery for aseptic loosening and examine the role of ultrasound sonication in its detection.

Methods: A prospective trial was conducted at Christchurch and Burwood Hospitals. At the time of revision surgery, intra-operative tissue and fluid samples were taken. The removed prosthesis was immersed in saline solution in a sterile plastic container, and then sonicated. The sonicate fluid underwent prolonged routine cultures (14 days) to increase the rate of detection of slow growing organisms. The cases were patients undergoing revision surgery for aseptic loosening or infection. The control group was comprised of patients having revision surgery for any other indication. These implants were subjected to the same protocol as the study group.

Results: A total of 122 patients were included in the study; 54 in the Aseptic Loosening [AL] group, 15 Infections and 53 controls. There were significantly more smokers in the AL group and less smokers in the control group (p=0.04 and p=0.04 respectively). The mean age for revision in the Infection and Periprosthetic fracture groups was less than those of other groups (p=0.007 and p=0.02) respectively. There were 18 cases with positive intra-operative cultures. Eight of those were in the aseptic group (i.e. 14.8% of the group). Conventional sampling techniques were positive in 17 of 18 cultures (94%). Sonication was only positive in 10 out of the 18 cultures (56%). Sonication was concordant with the conventional sampling techniques in half of the positive cultures in the AL group and overall. The only bacteria to be isolated from sonicate cultures were Staphylococcus Aureus and Coagulase Negative Staphylococci. Diabetes Mellitus was the only risk factor to have a significant association with having a positive culture result (p=0.03). There was also a significant association with having raised pre-operative Neutrophil differential count or inflammatory markers with having a positive culture (p=0.0001). However this association was not present when the AL group was examined separately.

Conclusion: There was a significant rate of positive culture results in the aseptic loosening group of around 15%. Ultrasound sonication was less sensitive than current sampling techniques with no apparent added benefit. This paper does not support the hypothesis that occult infection is a significant driver of aseptic loosening.
WIDE SPECTRUM OF MANAGEMENT FOR PROSTHETIC JOINT INFECTION - RESULTS OF STATEWIDE REVIEW

Prosthetic joint infection (PJI) remains a devastating complication of arthroplasty. There is significant heterogeneity in treatment approaches to these infections and information on their efficacy relies on single-centre studies. This is the first multi-centre study examining current treatment approaches to patients with PJI.

A retrospective cohort study was conducted over a 3-year period (January 2006 – December 2008) involving 10 hospitals in Victoria, Australia. Cases of prosthetic joint infections of hips and knees were identified using an established statewide nosocomial infection surveillance network. Individual medical records were accessed to describe the management and record the outcomes of these patients.

Interim analysis from seven hospitals revealed 121 patients with PJI. Staphylococcus aureus was isolated in half of the infections with equal representation of methicillin resistant and methicillin sensitive strains. Debridement and retention (DR) was the most common treatment modality (72%), followed by resection arthroplasty without reimplantation (10%), superficial debridement and antibiotics (9%), one-stage exchange (6%) and two-stage exchange arthroplasty (3%). The timing and number of surgical interventions was however highly variable. The majority of patients underwent arthrotomy with an average of 3 debridements of the infected joint (range 0-10, standard deviation 1.7). Two-thirds of the patients with staphylococcal infections received a rifampicin-containing regimen. The course of oral antibiotic therapy was prolonged with a median duration of 132 days (interquartile range 13-357) but ranged from no oral antibiotic therapy to 1032 days. Overall 72% of patients remained infection-free after a mean follow-up of 15 months, however there was marked variation in outcomes between hospitals with success ranging from 50%-95%.

This multi-centre study demonstrates that there is a wide spectrum of treatment approaches to PJI. In addition, DR is the favoured treatment modality, which differs to our European and Northern American counterparts. This study reports real-life management and outcomes from patients at several centres, including many that do not have dedicated research interest in PJI.
WHAT IS THE BEST TREATMENT FOR INFECTED ARTHROPLASTY: DEBRIDEMENT VERSUS 2 STAGE REVISION?

Aim: Determine if debridement, rather than staged revision is a more effective strategy in some patient subgroups with infected arthroplasty

Methods: We compiled a database comprising 154 proven infected knee replacements and 144 infected hip replacements in Christchurch over the last 10 years.

This has given us the largest series in the literature. Cross referencing this database with the joint registry enabled us to compare the treatment of both acute and chronic infection in hip and knee arthroplasty with regard to both functional outcome and re-revision rate.

Results: Patients treated with debridement had no statistically significant difference in re-revision rate or functional score when compared with patients undergoing staged revision.

Conclusion: Orthopaedic surgeons justifiably aim to eradicate infection in arthroplasty patients. A prosthesis retaining management strategy may be justifiable, especially in certain patient groups in whom multiple operations are best avoided.
ROLE OF ANTIBIOTIC CEMENT-IMPREGNATED INTRAMEDULLARY NAIL (ACIIN) FOR CONTROL OF INFECTION IN CASES OF CHRONIC OSTEOMYELITIS OF LONG BONES

Background: In cases with chronic osteomyelitis of long bones all attempts are directed towards the removal of dead and infected tissues including sequestrum and systemic route of antibiotics is preferred. But treatment of chronic osteomyelitis is not that much simple as per the pt satisfaction scales. In spite of long treatment and many surgical interventions most of the pt left with discharging sinuses and symptomatic recurrences and remissions. Most of the authors agrees with the fact that in chom antibiotic concentration to eradicate the infection is difficult to achieve in the bone or its surroundings that makes the treatment of chom difficult to overcome above fact antibiotic impregnated cement beads were used after saucerisation and resection of infected bone which was effective in controlling infection by raising local antibiotic conc to @ 1000 times to which was possible by systemic route but has left with the complications like pathological fracture at saucerisation site and chances of getting the remote location osteomyelitic changes in the same bone. The use of antibiotic impregnated nail in chom after removal of sequestrum can provide structural support as well as provides uniform concentration of antibiotics to whole medullary cavity . Release of antibiotics from the bone cement at a high concentration and its penetration to the surrounding tissues, including cortical and cancellous bone, prompted the use of antibiotic cement in the control of bone infection. The aim of this study is to summarize our experience with the use of antibiotic cement-impregnated intramedullary nail (ACIIN) for control of infection in cases of chom.

Materials and Methods: We prospectively studied 25 cases of chom (15 femora and 10 tibia). There were 24 males and one female, with the mean age being 33 years (range, 21-58 years). All patients had radiological evidence of chronic osteomyelitis with osteolysis, cortical thinning, sequestration, involucrum, and both medullary and soft tissue swelling. All patients had culture-documented chronic osteomyelitis. The clinical records, radiographs, bone repair, sedimentation rate, and functional outcome using the Enneking/ Musculoskeletal Tumor Society System were evaluated.5 ACIIN was used in all cases after adequate debridement. Patients were classified according to the amount of bone defect present after debridement. Infection control was judged on the basis of discharge through the wound and laboratory parameters. All patients were followed-up, with an average follow-up time of 32 months (range, 18-40 months). The mean duration of retention of the intramedullary rod was 8 weeks (range, 6-12 weeks).

Results: The mean preoperative sedimentation rate was 43 mm (range 22 to 105). The local antibiotic used was gentamycin (18 patients) and gentamycin plus vancomycin (7 patient). The mean follow-up was 32 months (range 18 to 40). The mean sedimentation rate at most recent followup was 10 mm. The defect size at most recent followup was 2.1cc, thus making the bone repair 89%. The mean functional score at follow-up was 27 out of 30 points. The one patient with a mixed infection ended up with a functional score of 20. This patient scored 3 points for pain, 3 points for function, 2 points for emotional acceptance and 2 points for gait. There were no fractures, infection relapses, or additional surgery to date.

Conclusion: ACIINs are useful for infection control in cases of chom of long bones.
CLINICAL PRESENTATION, MANAGEMENT AND OUTCOME OF SPINAL EPIDURAL ABSCESS IN A TERTIARY REFERRAL HOSPITAL

Introduction and Aims: The optimal management of patients with the diagnosis of a spinal epidural abscess (SEA) remains controversial. The purpose of this study was to describe the clinical characteristics of patients presenting with spontaneous SEA and to correlate presentation and treatment with clinical and neurological outcome.

Methods: A retrospective review of the medical records and radiology of patients with a diagnosis of SEA, treated between September 2003 and December 2010, at a tertiary referral hospital was performed. A total of 46 patients were identified including 27 males and 19 females. Mean age was 61 years (range, 30 – 86 years).

At presentation, all patients had axial pain and 67% had a neurological deficit, out of which one third had paraplegia or quadriplegia. 32% patients were febrile. Diabetes was the most common risk factor (30%) followed by malignancy (17%), intravenous drug use (6%) and alcoholism (2%).

Results: Organisms were cultured in 44 patients with Methicillin Sensitive Staphylococcus Aureus most common (68%), followed by Methicillin Resistant Staphylococcus Aureus (14%). The epidural abscess was located in the lumbar spine in 24 patients, thoracic spine in 11 patients and cervical spine in 11 patients. 61% of patients had a concurrent source of septic focus on presentation, including psoas abscess (24%), facet joint septic arthritis (15%), pneumonia (11%), infective endocarditis (7%) and urosepsis (4%).

26% of patients were treated non-operatively, with computed tomography-guided aspiration and/or intravenous antibiotics based on cultures, whereas 74% underwent surgical decompression with or without fusion in combination with antibiotics. The mean inpatient hospital stay was 42 days (range, 2 – 742 days) and 34% of patients required an average of 40 days of Intensive Care Unit admission. At time discharge from hospital, of the patients managed nonoperatively, 33% had improved neurological function, 17% had worsened neurological function, 17% died and data was unavailable in 33%. Of the patients treated with surgery, 74% had improved neurological function, 6% remained unchanged, 6% had worsened neurologic function, 6% died and data was unavailable in 9% at time of discharge.

Conclusion: SEA remains a severe condition associated with multiple septic foci and significant morbidity. Surgical decompression combined with antibiotics is associated with superior neurologic recovery compared with non-operative management, however a significant proportion of patients still deteriorate or die. Early diagnosis and management may prevent or reduce permanent neurologic deficit.
John CALLAGHAN

Medico-legal

Declaration:  No Funding

Medico Legal - Thursday Early Morning

13/10/2011  0900  0924

Session Room 4

Authors  * Presenting Author

John J Callaghan *

AAOS PROFESSIONAL COMPLIANCE PROGRAM: EXPERT MEDICO-LEGAL TESTIMONY

No abstract has been provided for this presentation.
ASSESSING RISK IN ARTHROPLASTY: ACCEPTABLE AND UNACCEPTABLE LEVELS OF RISK AND COMPLICATION IN LOWER LIMB ARTHROPLASTY SURGERY

Assessing risk is a key skill for all surgeons, playing a vital role in such diverse settings informed consent, audit and surgical planning. We undertook this study to define what is an acceptable level of risk for orthopaedic surgeons undertaking lower limb arthroplasty in today’s medicolegal climate.

We surveyed all consultants and trainees registered with the NZOA and asked them what change in their complication rate would cause them to consider changing their practice. We also asked them how certain they would have to be that this change was real and not simply due to chance (the so-called “cluster effect”). The specific complications we considered were DVT/PE, dislocation of total hip replacement or deep infection in lower limb arthroplasty patients. This allowed us to calculate with 95% accuracy the levels of complication surgeons would deem unacceptable.

Using Cochrane’s criteria for statistically valid survey results we obtained a greater than 95% representative sample. From these responses we calculated levels of complication which would worry the “average” surgeon (median value), the “vast majority” (95%) of surgeons and a change in complication rate which would be required to satisfy “statistical significance” (i.e. the level set literature proof with p<0.05 and power of 0.8). When considering deep infection following hip or knee arthroplasty: using a baseline of 0.9% as an average published rate, the average surgeon would consider changing their practice if their rate reached 2.5% and 95% of surgeons would consider changing if their rate reached 5%. For hip dislocation the baseline was set at 2.5% with the average surgeon intervening if their rate rose to 4% and the vast majority of surgeons intervening at 10%. For fatal PE the baseline was given as 0.2% with the average surgeon auditing their practice at 0.8% and the vast majority of surgeons concerned with a rate of 2.2% or higher. No difference was found in consultant/trainee responses except in the reason given for use of thromboprophylaxis where consultants used it for prevention of fatal PE and registrars for non-fatal PE.

These results could be used both as a potential guide for trainees and consultants in audit and also in guiding the use of, for instance, thromboprophylaxis where the “number needed to treat” for low molecular weight heparin to prevent one fatal pulmonary embolus in a year would necessitate national use/guidelines.
MOBILE BEARING KNEE JOINT REPLACEMENT

No abstract has been provided for this presentation.
DOES THE OPERATIVE APPROACH USED IN TOTAL HIP REPLACEMENT SURGERY INFLUENCE PATIENT DISCHARGE TIMING?

Introduction: Total hip replacement can be performed successfully via a number of approaches. A patient’s time to discharge following a THR is influenced by many factors. The anterior hip approach has recently been popularised as a true muscle sparing approach. This study looked at the association between operative approach (anterior, lateral or posterior), and length of hospital stay.

Methods: A retrospective review was conducted at Western Health, Victoria of 113 consecutive THRs performed at 3 hospitals (Footscray, Sunshine and Williamstown) by 16 surgeons over a 12 month period. The data was collected from the prospective information entered into the digital database ‘Sunray’ and a review of the postoperative notes in order to perform a retrospective audit. Statistical analysis included analysis of variance and pairwise comparisons. Surgeons performed the surgery as clinically warranted, and no alteration was made of standard postoperative care or physiotherapy.

Results: Of the 113 patients audited, the anterior approach for THR was found to be associated with a shorter length of stay in hospital when compared to both posterior approach (p=.0039) and lateral approach (p = .0512). The average length of stay after elective THR replacement was 6.9 days. The average length of stay for each approach was 4.3 days, 8.4 days and 6.4 days for anterior, posterior and lateral approach respectively. No significant difference was associated between operative approach and age.

Conclusion: Anterior approach to THR was associated with a shorter length of hospital stay.
EARLY COMPLICATIONS ASSOCIATED WITH MINIMALLY INVASIVE ANTERIOR APPROACH TOTAL HIP REPLACEMENT

There has recently been an increase in the number of hip replacement procedures performed through an anterior approach. Every procedure has a risk profile, and in the case of a new procedure or technique it is important to investigate the incidence of complications. The aim of this study is to identify the complications encountered in the first 100 patients treated with the minimally invasive anterior approach.

This is a case series of the first 100 hips treated and were assessed for complications. These were classified according to the severity and outcome [1]. The 100 hip comprised of 98 patients; 46 males and 52 females with an average operation age on 70.1 (±9.38) years. There were 2 bilateral procedures. Specific patient selection criteria were used. All complications occurred within one month of surgery. Complications such as fracture, deep vein thrombosis (DVT), cup malposition, femoral stem malposition, retained screw, excessive acetabular reaming and skin numbness were noted. Complications associated with fracture were characterised as either periprosthetic or trochanteric. Clinical outcome scores of SF36v2, WOMAC, Harris Hip and Tegner activity score were analysed at pre-operative, 6 months, 12 months, 24 months and 36 months intervals.

A total of 13 early complications occurred. Of these 13 complications the most common complications were trochanteric fracture, 3 instances (3.00%), periprosthetic fracture, 2 (2.00%), DVT, 2 (2.00%), numbness, 2 (2.00%) and loosening. Other complications recorded were cup malposition, 1 (1.00%), femoral stem malposition, 1 (1.00%), retained screw, 1 (1.00%) and excessive acetabular reaming, 1 (1.00%). All fractures occurred in patients over the age of 60 years. There were no dislocations.

Significant differences (p<0.05) were observed between all clinical outcomes measures pre-operatively and postoperatively (6, 12, 24 and 36 months). The unfamiliarity of the approach, however, increased operating time, and exposure problems, lead to trochanteric fracture.

A CADAVER STUDY VALIDATING CT ASSESSMENT OF ACETABULAR COMPONENT ORIENTATION: THE PERTH CT HIP PROTOCOL

Aim: In order to avoid complications of hip arthroplasty such as dislocation, impingement and eccentric liner wear accurate acetabular orientation is essential. The three-dimensional assessment of acetabular cup orientation using two-dimensional plain radiographs is inaccurate. The aim of this study was to develop a CT-based protocol to accurately measure postoperative acetabular cup inclination and anteversion establishing which bony reference points facilitate the most accurate estimation of these variables.

Methods: An all-polyethylene acetabular liner was implanted into a cadaveric acetabulum. A conventional pelvic CT scan was performed and reformatted images created in both functional and anterior pelvic planes. CT images were transferred to a Freedom-Plus Graphics software package enabling an identical, virtual, three dimensional model of the cadaveric pelvis to be created. Using a computer interface this model could be 'palpatied', bony landmarks accurately identified and definitive acetabular cup orientation established. Using original CT scans, acetabular cup inclination and anteversion were measured on five occasions by eight radiographers using differing predetermined bony landmarks as reference points. The intra- and inter-observer variation in measurement of acetabular cup orientation using varying bony reference points was assessed in comparison to the previously elucidated definitive cup position. Statistical analysis using appropriate ANOVA models was performed in order to assess the significance of the results obtained.

Results: Virtually derived definitive acetabular cup orientation was measured showing cup inclination and anteversion as 41.0 and 22.5 degrees respectively. Mean CT-based measurement of cup inclination and anteversion by eight radiographers were 43.1 and 20.8 degrees respectively. No statistically significant difference was found in intra- and inter-observer recorded results. No statistically significant differences were found when using different bony landmarks for the measurement of inclination and anteversion (p= 0.255 and 0.324 respectively).

Conclusions: CT assessment of acetabular component inclination and anteversion is accurate, reliable and reproducible when measured using differing bony landmarks as reference points. We recommend measuring acetabular inclination and anteversion from the inferior acetabular wall/teardrop and posterior ischium respectively. The Perth CT hip protocol is easily reproducible in the clinical setting both in the routine assessment of hip arthroplasty patients and as research tool. In our unit its initial application will be to validate commercially available hip navigation systems.
TOTAL HIP ARTHROPLASTY IN PATIENTS WITH DEVELOPMENTAL DYSPLASIA OF THE HIP COMPARED TO PATIENTS WITH OSTEOARTHRITIS. A REGISTRY-BASED FOLLOW UP STUDY

Introduction: Developmental dysplasia of the hip (DDH) may lead to premature degenerative arthritis requiring total hip arthroplasty (THA). There is general concern that THA survival in DDH is inferior to that of the general population. We have investigated the results of primary THA performed in patients with DDH in New Zealand.

Methods: Through the New Zealand Joint Registry we identified all patients with DDH undergoing primary THA (n = 1205) and all patients with primary osteoarthritis (OA) undergoing primary THA (n = 40589) between 1 January 1999 and 31 December 2008. Postoperative outcomes (including six month Oxford Hip Score (OHS), revision rate, and six month mortality) were analysed and compared between the DDH and the OA groups. Baseline information and operative characteristics were also compared between the two patient groups.

Results: There was no statistically significant difference in six month OHS between the DDH and OA groups from the uncorrected comparison (mean 41.5 vs. 40.8, p=0.056) and from the comparison corrected for known confounding variables (p=0.54). There was no statistically significant difference in revision rate between the DDH and OA groups from the uncorrected comparison (0.79 vs. 0.61 revisions per 100 component years, p=0.121) and from the comparison corrected for known confounding variables (p=0.674). There was no statistically significant difference in six month mortality between the DDH and OA groups from the uncorrected comparison (0.5% vs. 0.8%, p=0.284), however the corrected comparison identified a higher mortality rate in the DDH group (p=0.016).

The DDH group was significantly younger (49.3 years vs. 67.6 years, p<0.001), more often female (74% vs. 52%, p<0.001) and had a lower ASA class (p<0.001) than the OA group. The right hip was involved most often (51% DDH, 54% OA, p=0.03). Bone grafting (4% vs. 0.9%, p<0.001) and uncemented implants (68.3% vs. 28.1%, p<0.001) were more common in the DDH group. Surgical approach did not differ substantially between groups. The DDH group required a longer operative time than the OA group (mean 94.4 minutes vs. 79.7 minutes, p<0.001).

Conclusions: THA in patients with DDH patients is demanding. Despite the complexities inherent to THA in these patients, comparable functional outcomes and revision rates to patients with OA can be expected. Our results supports THA as a successful surgical option for the management of degenerative hip arthritis in patients with DDH.
RESULTS OF CEMENTLESS TOTAL HIP REPLACEMENT FOR BONY ANKYLOSIS IN PATIENTS WITH ANKYLOSING SPONDYLITIS

Introduction: The occurrence of bony ankylosis in ankylosing spondylitis (AS) is not precisely known. Bony ankylosis, especially in stiff spine may present several exclusive challenges in its management. The current study is an endeavor to evaluate the clinical and the radiological results of cementless THA in patients with bony ankylosis of hip due to ankylosing spondylitis.

Materials and Methods: We retrospectively reviewed 54 patients (92 hips) who underwent cementless total hip arthroplasty for bony ankylosis in ankylosing spondylitis between September 1988 and 2002. Clinical assessment was done at follow-up, which envisages assessment of the pain, function, deformities and range of motion using the Harris Hip Score. Radiographic analysis was done. Kaplan-Meier survivorship analysis was done at 5 and 8.5 years using the revision for the removal of femoral component, acetabular component or both due to any cause as the end point.

Results: The mean age of the patients was 25.5 years. The mean duration of follow up was 8.5 years. The average preoperative Harris Hip Score of 49.5 improved to 82.6 post operatively. Post operatively 10 hips had mild to moderate pain. Anterior dislocation occurred in four hips (4.3 %) and sciatic nerve palsy in one hip. Heterotopic ossification was seen in 12 patients, reankylosis rate was 0%. Thirteen arthroplasties were revised due to aseptic loosening. Kaplan-Meier survivorship analysis with revision as end point revealed 98.8% survival at 5 years and 85.8% survival at 8.5 years 11 follow up.

Discussion: Cementless THA in osseous ankylosis in ankylosing spondylitis is a worthwhile surgical intervention in bony ankylosis. Newfound mobility, maneuverability and improved ability to sit comfortably were the outcomes, which alleviated the patients' daunted morale. However, the technically demanding nature of the procedure should not be underestimated.
OPTIMAL BEARING SURFACES FOR TOTAL HIP REPLACEMENT IN THE YOUNG PATIENT: A META-ANALYSIS

Introduction: The most appropriate bearings in young patients remain highly debated. The aim of this metaanalysis was to summaries the best available evidence on relative success of the three most popular bearings [metal-on-poly (MOP), metal-on-metal (MOM) and ceramic-on-ceramic (COC)] used in total hip replacement (THR) in young active patients.

Methods: All the relevant studies published in the English language were retrieved. Studies with THR in patients with mean age less than 55 years of age were selected. The survivorship analysis for the three important bearings at 10 years was evaluated.

Results: Ten-year survival rates suggest that MOM bearings performed significantly better than MOP (p=0.01) and COC (p=0.001). MOP revealed higher survival rates than COC bearings (p=0.05).

Conclusion: Our findings support the use of MOM bearings in the management of the young arthritic hip. These findings, largely based upon observational studies should be taken in context to the limitations of such non-randomized study designs.
TOTAL HIP REPLACEMENTS IN OBESE PATIENTS: FIVE YEAR OUTCOME

Current literature comparing the effect on body mass index (BMI) on the outcome of total hip replacements (THR) is inconclusive.

To describe the effect of BMI on THR over the first five years.

We prospectively recruited 1,617 patients undergoing primary THR for osteoarthritis and followed them up at 5 years, recording, dislocations, revisions, deep and superficial infections, Harris Hip scores (HHS) and SF-36. A multivariate analysis was performed to identify if BMI is an independent predictor of adverse outcome.

148 (9%) patients had a BMI >35. 6.8% of patients with a BMI >35 had a dislocation by 5 year post op compared with 3.2% BMI 30-34.9, 2% BMI 25-29.9 and 1.5% BMI <25 (p=0.03) Superficial infections 14.2% BMI >35, 4.4% BMI <25. In SF 36 scores only Mental Health and change in health had no significant differences with an increase in BMI having a statistically significant decrease in all other SF scores. HHS had a mean improvement of 45.1 at five years with an expected loss of 0.302 HHS points (95% CI 0.440-0.163) per 1 point BMI increase. There was no significant difference in deep infections, mortality <3 months, revision rates or length of stay.

The most significant risk in increasing BMI is the dislocation rate, possibly representing increased technical difficulty in larger patients. Whilst increasing BMI has a reduced HHS and SF16 score, the overall benefit is still positive.
RESULTS OF SHORT METAPHYSEAL CEMENTLESS STEM IN YOUNG PATIENTS

Introduction—There has been an introduction of short femoral stems with the aim of conserving bone. We present the short term results of short metaphyseal cementless stem (Proxima®, Depuy). Material and methods—25 patients in age group (25-40yrs), 15 males, 10 females were implanted with a short metaphyseal cementless stem (Proxima®, Depuy) and cementless acetabular cup. The average follow up was 2.3 years (1.4-2.5 yrs). Clinical evaluation using Harris Hip Score, Radiological evaluation and Bone Mineral Density were evaluated at 2 weeks, 6 months, 12 months and yearly thereafter. A new zonal method suitable for short stem was used for radiological evaluation. Results—The mean Harris Hip score improved from 44 to 95 at final follow up. There was no evidence of any radiolucent lines or osteolysis around the stems. All the stems showed evidence of osseointegration at one year follow up. There was no decrease in bone mineral density around the stems. Discussion—The Short Metaphyseal cementless femoral stem is a bone conserving as well as bone preserving option for young patients especially in those in whom surface replacement is not an option.
A BIOMECHANICAL EVALUATION OF SHAPE MEMORY STAPLES

Background: Shape memory staples have several uses in both hand and foot and ankle surgery. There is relatively little data available regarding the biomechanical properties of staples, in terms of both the compression achieved and potential decay of mechanical advantage with time. An understanding of these properties is therefore important for the surgeon.

Methods: Two blocks of synthetic polyurethane mimicking properties of cancellous bone were fixed in jigs to both the actuator and 6 degree-of-freedom load cell of an MTS servohydraulic testing machine. With the displacement between the blocks held constant the peak value and subsequent decay in compressive force applied by both the smooth and barbed version of the nitinol OSStaple (Biomedical Enterprises), Easyclip (LMT), Herbert Bone Screws (Martin) and the Headless Compression Screw (Synthes) was measured. Nitinol staples were energised once only. A second experiment was conducted to assess the effects of repeated energisation on these parameters.

Results: The Easyclip staples achieved a mean peak force of 5.2N, whilst the smooth and barbed OSStaples achieved values of 9.3N and 5.7N, respectively. The Herbert screws achieved a mean peak force of 9N and the headless compression screws 23.9N. The mean peak force achieved with 2 Easyclip staples in parallel was 8.1N. Following the application of a single energisation the OSStaples exhibited a significant reduction in compressive load, losing up to approximately 70% of the peak value attained. The repeated energisation of these nitinol staples produced progressive increases in both peak and trough loads, the positive effects exhibited a plateau with time.

Conclusion: Performance of both OSSStaples was comparable to the Herbert screw with regard to reduction load applied across a simulated fracture plane. The maximum load applied by the OSSStaples diminished with time. Staples provide fixation without violating the fracture plane which has the potential to offer some benefits from a healing perspective.
MINIMALLY INVASIVE CHEILECTOMY (MIS): FUNCTIONAL OUTCOME AND COMPARISON WITH OPEN CHEILECTOMY

Introduction: Open cheilectomy is an established surgical treatment for hallux rigidus. Cheilectomy is now being performed using minimally invasive (MIS) techniques. In this prospective study we report the outcome of minimally invasive cheilectomy comparing the results with a matched group who had cheilectomy using standard open procedure.

Methods: Prospective study of 47 patients. 22 patients had MIS cheilectomy between March 2009 and September 2010. We compared the outcome with a matched group (25 patients) who had open cheilectomy. Functional outcome was assessed using the Manchester Oxford Foot and ankle questionnaire (MOXFQ). The MOXFQ is a validated 16-item, patient-generated questionnaire designed to be self-completed and used as an outcome measure for foot surgery. It comprises three domains: foot pain, walking and standing problems and social interaction. Total score ranges from 0 (best score) to 64 (worst score). Patients completed preoperative and postoperative questionnaires. Patients’ satisfaction and complications were recorded.

Results: In the MIS group, the median follow-up was 11 months (4-23). The median preoperative MOXFQ score was 34/64 (23) and the median postoperative score was 19/64 (p value <0.02) In the open group the median follow up was 17 months (9-27). The median preoperative MOXFQ score was 35/64 and the median postoperative score was 7.5/64 and this difference was statistically significant (<0.0001). There were three failures in the open group (Fusion) compared to none in the MIS.

Conclusion: MIS cheilectomy is an effective alternative procedure with satisfactory functional outcome and high patient satisfaction. Results are comparable to the standard open cheilectomy with a lower apparent failure rate. The results of our randomised controlled trial comparing MIS cheilectomy to open cheilectomy are awaited.
Background: Symptomatic flexion deformity of proximal interphalangeal joint (PIPJ) is one of the most common foot deformities and usually treated with arthrodesis. In general, percutaneous K-wires are used to stabilize the joint after excision of cartilage. K-wires projecting out of the toe need special care and can occasionally be dislodged accidentally. Furthermore issues such as cellulitis, pin tract infections, rarely osteomyelitis and need for removal make alternative fixation methods desirable. Smart toe is an intra-osseous titanium memory implant, which is stored frozen. It expands on insertion and does not require removal.

Methods: 18 consecutive K-wire PIPJ arthrodesis were compared with 18 Smart toe PIP fusions with a mean follow up of 6 months. Post operative forefoot scores and complications were documented.

Results: Patient satisfaction was higher and complications were lower with Smart toe fusions than with K-wire arthrodesis.

Conclusions: Fusion of PIP joints with smart toe is an effective and safer alternative to using K-wires. Although more expensive, higher patient satisfaction and lower complication rate may offset the extra cost of the implant.
LARS LIGAMENT REPAIR OF ACUTE TENDO-ACHILLES RUPTURE

The Achilles tendon is the most commonly ruptured tendon in the body and yet its management remains controversial due to potential surgical complications. We believe that primary repair using LARS ligament augmentation, combined with early mobilisation will significantly reduce all these potential problems and lead to improved functional outcomes.

Nine patients with acute Achilles tendon ruptures underwent primary repair using augmentation with a Ligament Augmentation and Reconstruction System (LARS) ligament. Day one postoperatively each patient was started on active range of motion exercises. Clinical parameters, isokinetic strength and outcome measurements (The American Orthopaedic Foot and Ankle Society (AOFAS) ankle and hindfoot score and Lower Extremity Functional Scale (LEFS) was utilised to assess pain and function, Tegner score to evaluate activity) were evaluated at an average followup of 17 months. Complications, if any, were also recorded.

There were no re-ruptures and all patients returned to normal work (average time 9.2 weeks) and all but one returned to their previous level of recreational sporting activity (average time 20.8 weeks). The postoperative performance testing showed positive results with the mean decrease in calf circumference of affected leg was 1.0 cm (range, -0.5 to 2.0), and every patient was able to perform at least one heel-raise with the mean heel raise difference being -3.8 repetitions (range, -1 to -10 reps) when compared to the other leg. In terms of functional outcomes, all patients reported very good results. The mean AOFAS score postoperatively was 83.4% (range, 74% to 100%) and the mean LEFS score was 82.5% (range, 45 to 100%). The mean preoperative Tegner score was 4.75 (range, 2 to 8) and the postoperative score was 3.75 (range, 2 to 7).

The results of our preliminary clinical series indicate that LARS ligament repair of acute Achilles tendon ruptures provides a reliable and effective technique for repair. It eliminates the need for graft harvesting, it decreases postoperative complications, but most importantly, patients have improved functional outcomes.
Weight Bearing in the Non-Operative Treatment of Acute Achilles Tendon Ruptures: A Randomised Controlled Trial

Acute achilles tendon ruptures are increasing in incidence and occur in 18 per 100 000 people per year, however there remains a lack of consensus on the best treatment of acute ruptures. Randomised studies comparing operative versus non-operative treatment show operative treatment to have a significantly lower re-rupture rate, but these studies have generally used non-weight bearing casts in the non-operative group. Recent series utilizing more aggressive non-operative protocols with early weight-bearing have noted a far lower incidence of re-rupture, with rates approaching those of operative management. Weight bearing casts may also have the advantages of convenience and an earlier return to work, and the purpose of this study was to compare outcomes of traditional casts versus Bohler-iron equipped weightbearing casts in the treatment of acute Achilles tendon ruptures.

Methods: 83 patients with acute Achilles tendon ruptures were recruited from three Auckland centres over a 2 year period. Patients were randomised within one week of injury to receive either a weight-bearing cast with a Bohler iron or a traditional non weight-bearing cast. A set treatment protocol was used, with a total cast time of eight weeks. Patients underwent detailed muscle dynamometry testing at 6 months, with further follow up at 1 year and at study completion. Primary outcomes assessed were patient satisfaction, time to return to work, and overall re-rupture rates. Secondary outcomes included return to sports, ankle pain and stiffness, footwear restrictions, and patient satisfaction.

Results: There were no significant differences in patient demographics or activity levels prior to treatment. At follow up, 1 patient (2%) in the Bohler iron group and 2 patients (5%) in the non weight bearing group sustained re-ruptures (p=0.62). There was a trend toward an earlier return to work in the weight bearing group, with 58% versus 43% returning to work with in 4 weeks, but the difference was not significant. 63% of patients in the weight bearing group reported freedom from pain at 12 months compared to 51 % in the non weight bearing group.

There were no statistically significant differences in Leppilahti scores, patient satisfaction, or return to sports between groups.

Conclusion: Weight-bearing casts in the non-operative treatment of Achilles tendon ruptures appear to offer outcomes that are at least equivalent to outcomes of non-weight bearing casts. The overall rerupture rate in this study is low, supporting the continued use of initial non-operative management in the treatment of acute ruptures.
PROXIMAL RELEASE OF GASTROCNEMIUS

Proximal Release of Gastrocnemius (PROG) is a procedure which can be performed to treat various disorders of the foot and ankle. Gastrocnemius contracture/tightening is a condition which can lead to many chronic debilitating foot conditions like Metatarsalgia, Hallux Valgus, Plantar Fascitis, Diabetic foot ulcers etc, which in turn can significantly affect patient's quality of life. In this study we present eight cases who presented with forefoot pain, were treated with PROG and showed a complete resolution of their condition.

The test used to determine Gastrocnemius contracture is the "Silfverskiold Test". It measures the dorsiflexion (DF) of the foot at the ankle joint (AJ) with knee extended & flexed to 90 degrees. The test is considered positive when DF at the AJ is greater with knee flexed than extended.

We studied eight patients who presented to the Orthopedic outpatients between 2005 and 2010 with diverse foot conditions and having relative equinism. Six out of eight patients suffered from forefoot pain, out of which three had associated diabetic neuropathy and one out of these three had a diabetic foot ulcer. One was in association with arthritis of Talonavicular & Transmetatarsal joint, another had callosity under the head of second metatarsal. One patient had claw toes with associated Rheumatoid Arthritis. One of our patients presented with spasticity in his left calf, severe Hallux Valgus & dislocated MTPJ. He had an unsuccessful Strayer procedure on the same leg in the past. The final case had Achilles tendonitis & spurs. A finding common to all of them pre operatively was a positive Silfverskiold test, all having ZERO degree DF at the AJ with knee extended. Surgical release of the aponeurotic head of gastrocnemius was performed in prone position through a transverse incision. A cam walker was used for two weeks in those patients who were permitted to weight bear, else a plaster for two weeks. No surgical complications occurred. Success was measured both in returning the ability to dorsiflex and resolution of related condition.

DF in extension improved from an average of zero to 16(sixteen) degrees. Seven out of eight patients (including the patient with planter ulcer) had resolution of associated condition. One failure was a patient who continued to experience neuropathic pain. None of the patients complained of any weakness as a result of release.

PROG is a straightforward procedure and should be considered in patients where gastrocnemius tightening is likely to be the contributing factor. This seems to improve the success of related procedures.
FUNCTIONAL OUTCOME OF MATRIX INDUCED AUTOLOGOUS CHONDROCYTE TRANSPLANTATION IN THE ANKLE

Introduction: The technique of Matrix Induced Autologous Chondrocyte Transplantation (MACI) is well established with satisfactory outcomes up to five years in the knee. Fewer series describe the outcomes of this technique in the ankle. We present the functional outcomes of the technique for a single surgeon series in a general hospital setting.

Materials and Methods: Twenty-seven patients, mean age 41, were reviewed at 3.7 (range, 1 to 5) years. Patients were assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) hind-foot scale, Tegner activity score and University of California lower extremity activity scale. MRI findings were also reviewed.

Results: While most patients report a significant improvement in symptoms with full return to activities of daily living, 36% of those under 40 and 78% of those over 40 reported restricted recreational activity. Of the patients under 40 years of age, 86% were able to run compared with 23% of those over 40. Of patients over 40, 64% continued to have moderate or severe pain.

Conclusion: Careful preoperative counseling is required for patients of all ages regarding likely outcomes. In patients over 40 the procedure is unlikely to give good pain relief and alternative options should be considered.
NEW INSIGHTS INTO THE MICROSTRUCTURE OF THE LIGAMENT-BONE SYSTEM

In the treatment of ligament injuries there has been much interest in the restoration of the actual ligament anatomy, and the extent to which the original enthesis may be re-established. This study therefore seeks to uncover new information on ligament microstructure and its insertion into bone.

Five bovine medial collateral ligaments (MCL) and five ovine anterior cruciate ligaments (ACL) were used in this study. All ligaments were harvested with the femoral and tibial bony insertions still intact. The bone ends were clamped and the MCL stretched to about 10% strain while the ACL underwent a 90° twist. The entire ligament-bone system, under load, was fixed in 10% formalin solution for 12 hours, following which it was partially decalcified to facilitate microsectioning. Thin 30 μm-thick sections of the ligament-bone interface and ligament midsubstance were obtained. Differential Interference Contrast (DIC) optical microscopy was used to image the ligament and bone microarchitecture in the prescribed states of strain.

Fibre crimp patterns were examined for the prescribed loading condition and showed distinct sections of fibre recruitment. Transverse micro-imaging of the ligament showed a significant variation in the sub-bundle cross-sectional area, ranging from 100μm to 800 μm. Those bundles closer to the central long axis of the ligament were numerous and small, while moving towards the periphery, they were large and singular. Both classifications of entheses, direct and indirect, were observed in the MCL insertions into the femur and tibia respectively. Of interest was the indirect insertion where the macro-level view of the near parallel attachment of fibres to bone via the periosteum was revealed, at the microscale, to involve a gradually increasing orthogonal insertion of fibres. This unique transition occurred closer to the joint line. In the ACL the anterior-medial (AM) and posterior-lateral (PL) bundles were easily discernable. All insertions into bone for the ACL were of the direct type. Fibres were thus seen to transition through the four zones of gradual mineralization to bone. However the manner in which the AM and PL bundles insert into bone, and the lateral soft tissue transition between these two bundles, revealed a structural complexity that we believe is biomechanically significant.

This ‘mechano-structural’ investigation, using novel imaging techniques, has provided new insights into the microstructure of the ligament bone system. The images presented from this study are aimed to aid new approaches for reconstruction, and provide a blue-print for the design of ligament-bone systems via tissue engineering.
THE EFFECT OF ACL GRAFT ORIENTATION AND TUNNEL PLACEMENT ON ROTATIONAL EXCURSION OF THE KNEE DURING FUNCTIONAL ACTIVITIES

ACL reconstruction is successful in restoring sagittal stability of the knee but has been less consistent in restoring rotational stability. Increasing coronal graft obliquity improves rotational constraint of the knee in cadaveric biomechanical models. The purpose of this study was to determine whether there is a correlation between coronal graft alignment and tibial rotation during straight line activities.

Seventy-four patients who had undergone ACL reconstruction using a transtibial technique were evaluated. They came from three distinct time periods during which the operating surgeon had deliberately changed the position of the femoral tunnel to progressively achieve a more oblique graft alignment in the coronal plane. Post-operative radiographs were analyzed for the coronal graft orientation and femoral and tibial tunnel positions. Tibial rotation was measured during level walking (n=74) and single-limb landing (n=42) tasks using a motion analysis system. Radiographic measurements of graft and tunnel orientation were correlated with rotational excursion of the knee recorded during these tasks.

No correlations were found between knee rotational excursion and either the coronal tibial tunnel angle or the coronal graft angle during level walking. For the single-limb landing task, a significant negative correlation was observed between the coronal angle of the tibial tunnel and rotational excursion ($r=-0.3$, $p=0.05$) i.e. increasing tunnel obliquity was associated with decreasing rotational excursion. For the coronal angle of the ACL graft, the correlation was also negative, but was not significant ($r=-0.24$, $p=0.12$).

Increases in graft obliquity in the coronal plane were associated with reduced tibial rotational excursions during single limb landing. These findings support the notion that ACL graft orientation may play a role in rotational kinematics of the ACL reconstructed knee, particularly during higher impact activities.
RETURN TO SPORT OUTCOMES AT 2 TO 7 YEARS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION SURGERY

Most people have not returned to their pre-injury level of sports participation 12 months following anterior cruciate ligament (ACL) reconstruction surgery. Twelve months may be too early to assess return to sport outcomes accurately. The purpose of this study was to evaluate the mid-term return to sport outcomes following ACL reconstruction surgery.

A self-report questionnaire was used to collect data from people at 2 to 7 years following ACL reconstruction surgery regarding pre-injury sports participation, post-operative sports participation and subjective knee function. The main inclusion criteria were participation in regular sports activity prior to surgery and the attendance of routine surgical follow up appointments.

A total of 314 people were included at a mean 39.6 ± 13.8 months following ACL reconstruction surgery. At follow up, 45% of people were playing sport at their pre-injury level and 29% were playing competitive sport. Of those playing competitive sport prior to injury, 46% were playing competitive sport at follow up. Ninety three percent of people had attempted sport at some time following their ACL reconstruction surgery. People who had not attempted their pre-injury level of sport by 12 months following surgery were just as likely to have returned to pre-injury level by 39 months after surgery as those who had played sport by 12 months (risk ratio, 95% CI = 1.1, 0.76-1.6).

Less than 50% of people had returned to either their pre-injury level of sport or competitive sport when surveyed at 2 to 7 years following ACL reconstruction surgery. Sporting activity at 12 months was not predictive of participation at 2 to 7 years, suggesting that people who return to sport within 12 months may not maintain their sports participation.
ORIENTATION OF ACL GRAFT VIA TRANSTIBIAL OR TRANSPORTAL TECHNIQUE: AN MRI COMPARATIVE STUDY

Transportal technique of femoral drilling allows the femoral tunnel to be placed in anatomic location. The study was conducted to evaluate the orientation of ACL graft performed by two different techniques and compared to orientation of native ACL.

50 patients (Group A) underwent ACL reconstruction with transtibial technique using transfix on the femoral side and 30 patients (Group B) underwent ACL reconstruction with transportal technique using endobutton. We used quadrupled hamstrings graft and tibial fixation was achieved with bioabsorbable screws. All patients were evaluated with 3 Tesla MRI at 6 months post-operatively and femoral tunnel angle in coronal plane (FTA), tibial tunnel angle (TTA) in sagittal plane, graft angle in coronal plane (GA coronal), graft angle in sagittal plane (GA sagittal), and graft-Blumensaat line angle (GBLA) were measured. A control group of patients (Group C, n=50) was also included to evaluate the orientation of native ACL.

Results: The femoral tunnel angle (FTA) was significantly lower in group B as compared to group A, 54.03±5.05 vs 71.6±6.02, p<0.05. The tibial tunnel angle (TTA) was similar in group A and B, 65±5.2 vs 62.9±4.5, p>0.05. Graft angle in coronal plane (GA coronal) was significantly lower in group B when compared to group A, 62.4±5.6 vs 72.5±5.5, p<0.05, and there was no significant difference between group B and C. Similarly, graft angle in sagittal plane (GA sagittal) in group B was found to be significantly lower as compared to group A and similar to group C, 51.2±4.3 vs 65.3±3.6, p<0.05. The graft-Blumensaat line angle (GBLA) was significantly lower in group B as compared to Group A, 8.6±1.4 vs 13.5±1.2, p<0.05.

The orientation of the reconstructed ligament was found to be closer to the native ACL in transportal technique of femoral drilling.
DISPLACED INTERCONDYLAR EMINENCE FRACTURES

Introduction: Tibial eminence fractures were historically thought of as a condition of skeletal immaturity. Increasingly this injury has been recognized in adults. The aim To report on the demographics, mechanism, treatment and outcomes of this injury in adult and paediatric patients.

Method: A retrospective review of all patients presenting to Dunedin Hospital, for management of a displaced tibial eminence fracture, between 1989 and 2009.

Results: 19 cases were identified, 10 skeletally mature and 9 skeletally immature. Alpine skiing with a forced flexion and rotation injury accounted for 7 cases, primarily adult females (5 cases). A hyper-extension and rotation injury accounted for 7 cases, primarily in skeletally immature males (4 cases), while direct trauma accounted for 5 cases, primarily males (4 cases).

Associated injuries were more commonly seen in adults and those with high energy trauma. Stiffness was the most common complication (10 cases).

Conclusion: Tibial spine fractures are more common in adults than previously thought. Female skiers appear to be a group at particular risk. Our most common complication was stiffness. Early range of motion is essential to reduce the problem of stiffness and extension impingement.

Laxity is an infrequent problem in adults and children.
OUTCOME OF ANATOMIC TRANSPHYSEAL ACL RECONSTRUCTION IN TANNER STAGE 1 AND 2 PATIENTS WITH OPEN PHYSES

Background: Anterior cruciate ligament (ACL) injuries are being seen with increasing frequency in children. Treatment of the ACL deficient knee in skeletally immature patients is controversial.

Objectives: To determine the outcome of anatomic transphyseal ACL reconstruction in tanner stage 1 and 2 patients with open growth plates at a minimum of 2 years after surgery.

Methods: Between 2007-2008, 16 prepubescent skeletally immature patients underwent anatomic transphyseal ACL reconstruction using soft tissue grafts. All patients were tanner stage 1 and 2 and all had open growth plates. Outcomes were assessed at a minimum of 2 years after surgery and included: limb alignment, limb length, instrumented testing with KT-1000 and International Knee Documentation Committee (IKDC) score.

Results: Mean age at the time of surgery was 12 years (8-14). Graft choices included: living-related donor hamstring tendon allograft (n=14), hamstring tendon autograft (n=1) and fresh frozen allograft (n=1). Mean IKDC subjective score was 96 (84-100). Sixty-two percent of patients had <3mm side-to-side difference on instrumented KT-1000 testing and 88% had a negative pivot shift. At 2 years after surgery, all patients had returned to strenuous activities and normal or nearly normal overall IKDC score was documented in 94% of patients. There were no cases of limb malalignment or growth arrest.

Conclusions: We present a large series of anatomic transphyseal ACL reconstruction in tanner stage 1 and 2 patients with open growth plates at a minimum of 2 years following surgery. Excellent clinical outcomes were obtained with high levels of return to desired activities. Importantly, no growth disturbances were seen in this series of patients.
BIOABSORBABLE VERSUS TITANIUM SCREWS IN ANTERIOR CRUCIATE RECONSTRUCTION USING HAMSTRING AUTOGRAFT: A PROSPECTIVE RANDOMISED CONTROLLED TRIAL WITH 5 YEAR FOLLOW UP

Background: Bioabsorbable screws for anterior cruciate ligament reconstruction (ACLR) have been shown to be associated with femoral tunnel widening and cyst formation.

Purpose: To compare a poly-L-lactide–hydroxyapatite screw (PLLA-HA) with a titanium screw with respect to clinical and radiological outcomes over a 5 year period.

Methods: 40 patients were equally randomized into 2 groups (PLLA-HA vs titanium) and ACLR performed with a 4 strand hamstring graft with femoral tunnel drilling via the anteromedial portal. Evaluation at 2 and 5 years was performed using the International Knee Documentation Committee assessment (IKDC), Lysholm knee score, KT 1000 arthrometer, single-legged hop test. Magnetic resonance imaging was used to evaluate tunnel and screw volume, ossification around the screws, graft integration and cyst formation.

Results: There was no difference in any clinical outcome measure at 2 or 5 years between the 2 groups. At 2 years, the PLLA-HA femoral tunnel was significantly smaller than the titanium screw tunnel (p=0.015) and at 5 years, there was no difference. At 2 years the femoral PLLA-HA screw was a mean 76% of its original volume and by 5 years, 36%. At 2 years the tibial PLLA-HA screw mean volume was 68% of its original volume and by 5 years, 46%. At 5 years, 88% of femoral tunnels and 56% of tibial tunnels demonstrated a significant ossification response. There was no increase in cyst formation in the PLLA-HA group and no screw breakages.

Conclusion: The PLLA-HA screw provides adequate aperture fixation in ACLR with excellent functional outcomes. It was not associated with femoral tunnel widening or increased cyst formation when compared with the titanium screw. The resorption characteristics appear favorable and the hydroxyapatite component of the screw may stimulate osteoconduction, contributing to these results. The PLLA-HA screw is a good alternative to a titanium screw in ACLR, which may aid revision procedures and allow for imaging without artifact.
Joint Replacement Reviews Conducted by Physiotherapists - A Safe and Effective Model

Aim: A Physiotherapist-led Joint Replacement Surgery (JRS) Clinic was pioneered at the Royal Melbourne Hospital (RMH) Australia to improve the efficiency of the review process following hip and knee arthroplasty surgery and improve outpatient access to orthopaedic consultation. A credentialed physiotherapist conducted specified post-operative reviews in place of orthopaedic surgeons.

Method: A protocol for the JRS Clinic was developed collaboratively by the Orthopaedic Surgery and Physiotherapy Departments at RMH. The orthopaedic surgeons conducted the initial 6 week post-operative review and the physiotherapist conducted subsequent reviews at 3, 6 and 12 months, and annually thereafter. Routine radiological imaging occurred immediately post-operatively, and at 1 year, 5 years, 10 years and then annually. Radiological credentialing allowed the physiotherapist to assess and manage patients independently. Collocation with the orthopaedic clinic facilitated immediate surgical input when required.

Results: Between October 2009 and January 2011, 156 patients were offered a total of 246 appointments in the JRS clinic. This included 174 primary joint replacements (99 hip and 75 knee), 19 revisions (16 hip and 3 knee), and 3 re-surfaced hips. The attendance rate for the clinic was 82.9%. The physiotherapist discussed 20 cases with the surgeons with only 6 patients requiring transfer back to the Orthopaedic unit for ongoing management. Two of these patients have been wait-listed for revision surgery, 2 are undergoing further investigations and the remaining patients are yet to attend their scheduled review. Four patients declined further follow up in the JRS clinic. There were no adverse outcomes reported and no nursing input for wound issues was required. A patient survey demonstrated high levels of satisfaction with the service particularly related to improved access and time efficiencies.

Conclusion: Physiotherapist-led JRS Clinics in partnership with the Orthopaedic Surgery Department are an efficient and effective alternative model of care for the long term review of patients following arthroplasty surgery. The clinics assist in addressing the growing demand for arthroplasty services by increasing the surgeons’ capacity to manage new referrals.
LONGTERM METAPHYSEAL STEM FIXATION IN PRIMARY THA USING FULLY HA COATED STEMS AND PROXIMAL AUTOLOGOUS BONE IMPACTION

Introduction: Femoral stress shielding in cementless THA is a potential complication commonly observed in cementless distally loading press-fit stems. Longterm metaphyseal fixation and proximal load transfer is desired. Is routine autologous metaphyseal bone impaction and proximal primary stability an answer to this goal?

Methods: This prospective study describes long-term femoral bone remodeling and load transfer in cementless THA at a mean of 17 years (range: 15 to 20 years) in 208 consecutive fully HA-coated stems (Corail). All primary THA were performed by one group of surgeons between 1986 and 1991. The concept of surgical technique included impaction of autologous metaphyseal bone using bland femoral broaches until primary stability was achieved without distal press-fit.

Results: Radiographic evaluation revealed a total of five (2.4%) stems with periprosthetic osteolysis, which were associated with eccentric polyethylene wear. They were either revised or awaiting revision. The remaining 97.6% stems revealed desired proximal load transfer in the metaphysis (52%) or in both metaphysis and diaphysis (48%). Distal stress shielding was not observed and was considered to be related to: impaction of metaphyseal bone, bland broaches, HA coating, and prosthetic design.

Conclusions: Biological autologous bone impaction of the metaphysis provides both primary stem stability and successful longterm osteointegration with the Corail stem after 20 years. The surgical technique of proximal autologous bone impaction rather than extraction of cancellous bone material and the use of a fully HA coated stem without distal press-fit show encouraging longterm results in THA.
COLLARLESS POLISHED TAPERED STEM (CPT) CLINICAL AND RADIOLOGICAL RESULTS AT 15 YEARS’ FOLLOW-UP

We have prospectively followed up 191 consecutive primary total hip replacements utilising a collarless polished tapered (CPT) femoral stem, implanted in 175 patients between November 1992 and November 1995.

At a mean follow-up of 15.9 years (range 14 - 17.5) 86 patients (95 hips) were still alive (25 men and 61 women) and available for routine follow up. Clinical outcome was determined from a combination of the Harris (HHS) and Oxford (OHS) hip scores. Radiological assessment was with antero-posterior radiographs of both hips and a lateral radiograph of the operated hip. The radiographs were evaluated using well-recognised assessment techniques.

There was no loss to follow up, with clinical data available on all 95 hips. Five patients were too frail to undergo radiographic assessment, therefore radiological assessment was performed on 90 hips (95%). At the latest follow-up, the mean HHS was 78 (range 28 - 100) and the mean OHS was 36 (range 15 - 48). Stems subsided within the cement mantle, with a mean total subsidence of 2.1mm (range 0.4 -24). Higher grades of heterotopic bone formation were significantly associated with males (p<0.001) and hypertrophic osteoarthritis (p<0.001). Acetabular wear was associated with increased weight (p=0.001) and male sex (p=0.005). Amongst the cohort, only 1 stem (1.1%) has been revised due to aseptic loosening. This patient required reaming of their canal prior to implantation, as a result of a previous femoral osteotomy. The rate of stem revision for any cause was 7.4% (7 stems), of which 4.2% (4 stems) resulted from infection following revision of the acetabular component. Twenty patients (21.1%) required some sort of revision procedure, all except 3 of these resulted from failure of the acetabular component. Cemented cups had a significantly lower revision burden (2.7%) than Harris Galante uncemented components (21.8%) (p<0.001).

The CPT stem continues to provide excellent radiological and clinical outcomes at 15 years following implantation. Its results are consistent with other polished tapered stem designs. Cup failure remains a problem and is related in part to inadequate bearings and biological abnormalities.
SUBSIDENCE IN UNCEMENTED THJR IN PATIENTS OVER 75 YEARS; DOES IT RESULT IN POORER FUNCTION?

Background: Uncemented femoral components of hip arthroplasty are believed to have a higher risk of subsidence in older patient groups. This has not been conclusively related to a poorer outcome of the arthroplasty over time.

Our aim is to measure prevalence of subsidence in uncemented femoral components in a population of patients over 75 years of age and correlate with clinical outcome measures.

Method: Patients over 75 years of age from Jan 2002 to Aug 2009 had uncemented THJR at the discretion of the senior surgeon (RF). Pre-operative Charnley Hip Classification and Harris Hip Scores were recorded, as were HHS at 6 weeks and 1 year post-operatively for all patients. Post-operative radiographs were retrospectively reviewed and presence of subsidence quantified at 1 year and subsequent follow-ups.

Results: 83 patients had 92 uncemented THJR in the designated time frame. 5 pts were lost to follow-up or died within 12 months after operation leaving 78 patients and 87 hips for assessment. Average pre-op HHS 40.6 (13.1-64.6) and Charnley Classification noted (A 55.4 % : B 30.4% : C 14.1%). 12/87 (13.8%) hips had subsidence > 2mm (2 -18mm) noted at 1 year radiographs. Average HHS for those with >2mm subsidence was 89.4 (69.7- 100 ; median 93.9 ) compared to 90.7 (64.7 – 100 ; median 91.9) for those with < 2mm subsidence. 4 patients underwent revision procedures during follow-up period, all for periprosthetic fracture following falls.

Conclusion: In appropriately selected patients over 75 years of age, the presence of subsidence in uncemented femoral components does not seem to result in poorer outcome measures.
A PROSPECTIVE RANDOMIZED CONTROLLED TRIAL COMPARING THREE ALTERNATE BEARING SURFACES IN PRIMARY TOTAL HIP ARTHROPLASTY

Aim: This prospective randomised controlled trial aims to compare the clinical and radiological outcomes of ceramic on ceramic, cobalt chrome on ultra-high molecular weight polyethylene, and cobalt chrome on highly cross-linked polyethylene bearing surfaces at a minimum of five years.

Methods: One hundred and two primary total hip replacements were performed in ninety one patients between February 2003 and March 2005. All patients were younger than 65 (mean 52.7, 19-64). They were randomised to receive one of the three bearing surfaces. All patients had 28mm articulations with a Reflection un cemented acetabular component and a Synergy stem (Smith & Nephew, Memphis, Tennessee). Patients were followed up periodically up to at least sixty months following surgery. Outcome measures included WOMAC and SF12 scores. Radiological assessment included implant position, evidence of osteolysis and measurement of linear wear.

Results: Ninety seven hip replacements in eighty seven patients were available for review at a minimum of five years. Two hips were revised (one for infection and one for periprosthetic fracture), leaving a total of ninety four hips available for final review. There were no differences in age, gender, body mass index, diagnosis, level of activity, and comorbidities between the three groups. At a minimum of five years there were no statistical differences in the clinical outcomes using the WOMAC or SF12 scores. Three patients in the ceramic group reported squeaking. Radiological evaluation revealed mean annual wear rates in the ceramic group of 0.006mm/yr, standard polyethylene of 0.151mm/yr and highly cross linked polyethylene of 0.059mm/yr. ANOVA analysis revealed these differences in wear rates to be significant (p<0.0001).

Conclusions: In the mid term there are no differences in clinical outcome between ceramic on ceramic, cobalt chrome on ultra-high molecular weight polyethylene, and cobalt chrome on highly cross-linked polyethylene bearing surfaces in total hip arthroplasty. Ultra high molecular weight polyethylene has a significantly greater annual linear wear rate than highly cross-linked polyethylene.
FUCTIONAL AND CLINICAL OUTCOME OF THA USING 4TH GENERATION LARGE DIAMETER CERAMIC BEARING COUPLES

Introduction: To report the clinical, functional and radiological outcome of consecutive primary hip arthroplasties using large diameter (36mm and above) ceramic bearing couples. We believe this to be one of the first independent series.

Methods: We prospectively reviewed 519 consecutive primary THA using fully HAC coated acetabular shell and fully HAC coated stem (JRI Ltd) in 502 patients, with minimum follow-up of 32 months. A Biolox-Delta ceramic liner with an 18 deg taper and Biolox-Delta ceramic head (36mm and 40mm) were used in all cases, by 3 surgeons. None were lost to follow-up. Clinical outcome was measured using Harris, Charnley Oxford, EuroQol EQ-5D scores. Radiographs were systematically analysed for implant position, loosening, migration, osteolysis. Return to sports and hobbies were recorded.

Results: Mean age was 64.9 yrs (11-82yrs). There were no dislocations. 50- 62mm acetabular shells were used. 36 mm head was used in 92% of cases. No acetabular revisions were performed for aseptic loosening. Other re-operations were for infection (1), peri-prosthetic fractures (1). The mean Harris and Oxford scores were 95 (88- 97) and 14.1 (12-33) respectively. Harris and Oxford scores were 95 (88- 97) and 14.1 (12-33) respectively. The Charnley score was 5.7 (5-6) for pain, 5.8 (4-6) for movement and 5.9 (4-6) for mobility. There was a significant improvement in the range of movement of the hip. There was no migration of acetabular component. Acetabular radiolucencies were present around one shell. No acetabular liner wear was demonstrated in CT Scans. Mean inclination was 7.4deg(37-65). Mean EQ- 5D description scores and health thermometer scores were 0.84 (0.71-0.92) and 88 (66-96). With an end point of definite or probable loosening, the probability of survival was 100%. Overall survival with removal or repeat revision of either component for any reason as the end point was 99.1%

Discussion and Conclusion: The results of this study show an excellent clinical and functional outcome and support the use of a fully coated prosthesis with ceramic bearing couples. We envisage to monitor and prospectively report the long-term outcome of this series of patients.
OUTCOME AFTER MODULAR NECK HIP ARTHROPLASTY: LESSONS FROM THE REGISTRY

Introduction: Femoral stems with exchangeable necks are a recent development in hip arthroplasty. They are proposed to be better in restoring offset and leg length while not compromising the fixation in the femoral canal. Few studies have been published on the clinical and functional outcome of modular neck hip system.

Materials and Methods: The Australian Joint registry data was analysed to evaluate the outcome after modular neck hip arthroplasties with the diagnosis of primary osteoarthritis. Only prostheses with data for more than 50 patients were studied. The indications for revision were identified. A comparison of outcomes with conventional hip arthroplasties was done.

Results: The analysis confirmed that femoral stems with exchangeable necks have a significantly higher risk of revision compared to all other primary total conventional hip replacement (adj HR=2.13; 95% CI (1.88, 2.42), p<0.001). With the exception of three, all femoral stems with exchangeable necks have a higher rate of revision compared to primary total conventional hip replacement. The three exceptions have a short follow up. There is an increased incidence of revision for loosening and dislocation.

Conclusion: The recent registry data suggests that with end point being revision, the outcome of exchangeable neck hips are worse than conventional hips in patients with primary osteoarthritis of hip.
OUTCOMES OF LOW ENERGY HIP FRACTURES IN A MAJOR TRAUMA CENTRE

Introduction and aims: International and national predictions from the late 1990s warned of alarming increases in hip fracture incidence due to an ageing population globally. Our study aimed to describe contemporary, population-based longitudinal trends in outcomes and epidemiology of hip fracture patients in a tertiary referral trauma centre.

Methods: A retrospective review was performed of all patients aged 65 years and over with a diagnosis of fractured neck of femur (AO classification 31 group A and B) admitted to the John Hunter Hospital, Newcastle, New South Wales between 1st January 2002 and 30th December 2009. Data was collated and cross referenced from several databases (Prospective Long Bone Fracture Database, Operating Theatre Database and the Hospital Coding Unit). Mortality data was obtained via linkage with the Cardiac and Stroke Outcomes Unit, Planning and Performance, Division of Population Health. Main outcome measures were 30-day mortality, in-hospital mortality, length of stay.

Results: The JHH admitted (427 ± 20/year, range: 391- 455) patients with hip fractures over the 9 year study period. The number of admissions per year increased over the study period (p = 0.002), with no change in the age-standardised incidence (p = 0.1). The average age (83.5 ± 0.2) and average percentage female (73.7%) did not change. There was an overall trend to decreased 30-day mortality from 12.4% in 2002 to 7% in 2009 (p = 0.05). The factors that were associated with increased mortality were age (p < 0.0001), male gender (p = 0.0004), time to operating theatre (p = 0.0428) and length of stay (p < 0.0001).

Conclusions: In accordance with national and international projections on increased incidence of geriatric hip fractures, the incidence of fractured neck of femur in our institution increased from 2002-2009, reflecting our ageing population. 30-day mortality improved and longer length of stay corresponded with increased 30-day mortality.
PERIOPERATIVE BLOOD TRANSFUSION PRACTICE IN GERIATRIC HIP FRACTURES:
GIVING LESS, ACHIEVING MORE

Introduction: Geriatric hip fracture patients have a 14-fold higher 30-day mortality than their age matched peers. Up to 50% of these patients receive blood transfusion perioperatively. Both restrictive and liberal transfusion policies are controversial in this population. Aim: The longitudinal description of transfusion practice in geriatric hip fracture patients in a major trauma centre.

Methods: An 8-year (2002-2009) retrospective study was performed on patients over the age of 65 undergoing hip fracture fixation. Yearly transfusion rate; the influence of transfusion on 30-day, 90-day and 1-year mortality and length of stay (LOS) was investigated. On admission haemoglobin (Hb), pre-transfusion Hb and post-transfusion Hb and their effect on transfusion requirement and mortality was also reviewed. The yearly changes in on-admission and pre-transfusion Hb were also examined. The influence of comorbidities, timing, procedure performed and operation duration on transfusion requirement and mortality was also studied.

Results: From the 3412 patients, 35% (1195) received transfusion during their hospital stay. There was no change in age, gender and co-morbidities during the study. Thirty-day mortality improved from 12.4% in 2002 to 7% in 2009. The transfusion rate showed a gradual decrease from the highest of 48.3% (2003) to 22.9% (2009) (Pearson correlation - R² = -0.707, p=0.05). There was no change during the study period in on-admission and pre-transfusion Hb. The mortality for non-transfused and transfused patients was [9.6% vs. 10.3%(30-day)], [17.2% vs. 18.4%(90-day)] and [27% vs. 30.5%(1-year), p=0.031]. LOS was 11±9 for non-transfused patients and 13±10 (p<0.001) for transfused patients. Patients with more comorbidities experienced a higher transfusion rate, (0 - 31%, 1 - 38%, 2 - 46%, 3 - 57%), (Pearson Chi-squared, p<0.001). The need for transfusion by different procedures in decreasing order was 47.6% intramedullary device, 44.0% DHS, 25.2% cemented hemiarthroplasty, 23.6% Austin-Moore, and 5.5% cannulated screws. The length of the operation increases the chance of transfusion (<1hrs – 33%, 1-2hrs – 35%, 2-3hrs – 41%, >3 hours – 65%), (Pearson Chi-squared, p=0.010). Preoperative waiting time had no influence on transfusion frequency (<24hrs – 36%, 24-48hrs – 34%, 48-96hrs – 36%, >96hrs – 33%), (Pearson Chi-squared, p=0.823).

Conclusions: The percentage of transfused geriatric hip fracture patients halved during the eight-year period without changes in demographics and co-morbidities. Perioperative transfusion of hip fracture patients is associated with higher 1-year mortality and increased LOS. A more restrictive transfusion practice has been safe and may be a factor in the improved 30-day mortality.
SHORT PROXIMAL FEMORAL NAIL ANTIROTATION VS. DYNAMIC HIP SCREW FOR UNSTABLE TROCHANTERIC FRACTURES

Introduction: A prospective, randomized, controlled trial was performed to compare the outcome of treatment of unstable fractures of the proximal part of the femur with either a sliding hip screw or a short proximal femoral nail antirotation (PFNA-XS, Synthes).

Material & Methods: Eighty one patients (April 2007- May 2008) presenting with unstable fracture of the proximal part of the femur were randomized, at the time of admission, to fixation with use of either a short proximal femoral nail antirotation (n=42) or a sliding hip screw (n= 39). The primary outcome measure was reoperation within the first postoperative year and mortality at the end of one year. Operative time, fluoroscopy time, blood loss, and any intra-operative complication were recorded for each patient. Follow-up was undertaken at 3, 6, and 12 postoperative months and yearly thereafter. Plain AP and lateral radiographs were obtained at all visits. All changes in the position of the implant, complications, or fixation failure were recorded. Hip range of motion, pain about the hip and the thigh, walking ability score and return to work status were used to compare the outcomes.

Results: There was no significant difference between 1 year mortality rates for the two groups. Mean Operative time was significantly less in PFNA group (Mean 25 min, range 19- 56 min) than DHS group (Mean 38 min, range 28- 70 min). Patients treated with a PFNA experienced a shorter fluoroscopy time and less blood loss. 6 patients in DHS group had implant failure as compared to none in PFNA group. The functional outcome was also better in PFNA group.

Conclusion: When compared to DHS, PFNA-XS provides better functional outcome for unstable trochanteric fractures with less operative time, less blood loss and less complications, however one year mortality rate remains the same.
A PROSPECTIVE RANDOMISED CONTROL TRIAL COMPARING THE LONG GAMMA NAIL WITH THE SLIDING HIP SCREW FOR THE TREATMENT OF AO/OTA 31 A2 FRACTURES OF THE PROXIMAL FEMUR

Introduction: Controversy exists whether to treat unstable pertrochanteric hip fractures with either intra-medullary or extra-medullary devices. A prospective randomised control trial was performed to compare the outcome of unstable pertrochanteric hip fractures stabilised with either a sliding hip screw or long Gamma Nail. The hypothesis was that there is no difference in outcome between the two modes of treatment.

Methods: Over a four year period, 210 patients presenting with an unstable pertrochanteric hip fracture (AO/OTA 31 A2) were recruited into the study. Eligible patients were randomised on admission to either long Gamma Nail or sliding hip screw. Follow-up was arranged for three, six, and twelve months. Primary outcome measures were implant failure or ‘cut-out’. Secondary measures included mortality, length of hospital stay, transfusion rate, change in mobility and residence, and EuroQol outcome score.

Results: Five patients required revision surgery for implant cut-out (2.5%), of which three were long Gamma Nails and two were sliding hip screws (no significant difference). There were no incidences of implant failure or deep infection. Tip apex distance was found to correlate with implant cut-out. There was no statistically significant difference in either the EuroQol outcome scores or mortality rates between the two groups when corrected for mini mental score. There was no difference in transfusion rates, length of hospital stay, and change in mobility or residence. There was a clear cost difference between the implants.

Conclusion: The sliding hip screw remains the gold standard in the treatment of unstable pertrochanteric fractures of the proximal femur.
RANDOMISED CONTROL TRIAL COMPARING LONG CEPHALOCONDYLIC NAIL VS COMPRESSION HIP SCREW FOR THE TREATMENT OF INTERTROCHANTERIC FEMORAL FRACTURES

Prospective Randomised Control trial of 300 patients over a period of 3 years, 1 year post op follow up. Local ethic approval was attained for the study.

Inclusion criteria
1. Age > 60
2. Consented to Participate in the study
3. Unstable Intertrochanteric fracture a) Sub trochanteric B) Medial Comminution C) Reverse Obliquity D) Severe Osteoporosis

Patients selected were randomized to Intra medullary Nail vs Hips screw.

Variety of markers have been assessed

Pre OP : - Mechanism of injury , Mobility status, Pre OP ASA, Pre Op haemoglobin, living Conditions.
Intra OP:- I.I Time, Time taken, Surgeon experience, Intra OP complications
Post OP :- Haemoglobin, mobility, radiographic analysis- Fracture stability and Tip Apex Distance, Thrombo embolic Complications
Follow up:- 6 weeks , 3 , 6,12 month follow up.

There is considerable debate in literature regarding superiority of Compression Hip screw over Intra medullary nail for fixation of stable per trochanteric fractures of the femur. Biomechanical studies have shown superiority of Intra medullary device over a Compression Hip screw.

Tenser et all showed an advantage over combined bending and compression failure. Mohammad et al found unstable subtrochanteric fractures with a gamma nail were stiffer. Kerush- Brinker showed that gamma nail had significantly greater fatigue strength and fatigue life. In unstable fractures Baumgartner etall found less intra op complications and less fluoroscopic time for a compression hip screw compared to a short intra medullary nail. There have been significant reports of fracture at the Tip of a short intra medullary nail. We think this complication can be avoided by using a long intra medullary device.

Both in Australia and abroad the choice of which device to use depends largely on the preference of the surgeon.
OSTEOBLAST CELL CYCLING IN POLYNESIAN AND EUROPEAN BONE. IS THERE A DIFFERENCE?

Orthopedic surgeons are astounded with the strength of bone found in polynesians. Furthermore the rate at which new polynesian bone over-grows metal fixation of a recent fracture is impressive. Studies demonstrate that polynesians have a higher Bone Mineral Density (BMD) than age- and weight- matched Europeans in NZ (1, 2). In addition, polynesians have a lower incidence of hip fractures when compared to other ethnic groups (3). This suggests that the higher BMD or other inherent differences must account for the lower incidence of hip fractures in polynesians.

The aim of this study was to identify (if any) a difference in osteoblast mitosis between european and polynesian bone. Samples were collected from 13 patients that had joint replacements in accordance with the MCNZ ethics approval. The bone is processed and osteoblasts cultured in the lab to 50% confluence. The cells are then tagged with Propidium Iodide. Using Fluorescence-Activated Cell Sorting (or FACS) the number of osteoblasts in the different phases of the cell cycle are counted. The percentage of cells in G0/G1, S and G2/M phase can be determined by entering the FACS data into a program called mod-fit. This study shows that polynesians have a greater proportion of cells undergoing replication (i.e S-phase) than their european counterparts.

Incidentally we have also shown that the proportion of cells undergoing mitosis lowers with age irrespective of ethnicity.
DIPHOSPHONATE RELATED PROXIMAL FEMORAL FRACTURES - THE LAUNCESTON EXPERIENCE

Introduction: Diphosphonates remain among the most common drug treatments for osteoporosis. Recent evidence has implicated diphosphonate therapy—specifically, alendronate—with low-energy fractures of the subtrochanteric region of the femur. The general conclusion is that prolonged suppression of bone remodelling with alendronate may be associated with a new form of insufficiency fracture of the femur.

Methods: Three case reports of patients with alendronate related insufficiency are discussed here with their treatment modalities and lessons learnt. One of the three patients had bilateral subtrochanteric stress fracture. A comprehensive review of the literature is presented with the best evidence for investigating, treating and preventing these fractures

Results: Our experience in Launceston has increased awareness amongst the local medical community regarding the long term use of Diphosphonates and the fractures they may cause. Changes to our practice have included
• Increased suspicion of patients with hip pain on diphosphonate therapy.
• Imaging the contralateral femur to rule out stress fractures
• Reassuring GP’s and Patients that benefits of Diphosphonate therapy far outweigh the potential risks

Conclusions: There are many unresolved questions about the prolonged use of diphosphonates, but there is sufficient evidence to show subtrochanteric stress fractures do occur. We, as Orthopaedic Surgeons, must be able to recognize this new entity and educate our medical colleagues appropriately.
THE RELATIONSHIP BETWEEN CHRONICITY OF ACL DEFICIENCY AND INTRA-ARTICULAR INJURY. AN ANALYSIS OF 5086 PATIENTS

Objective: To determine the relationship between advancing months from ACL rupture and the incidence of intra-articular meniscal and chondral damage.

Method: From a prospectively collected database 5086 patients undergoing primary ACL reconstruction, using hamstring graft, carried out between January 2000 and August 2010 were identified. Data collected included the interval between injury and surgery, type and location of meniscal tears (requiring meniscectomy) and location and severity of chondral damage (ICRS grading system). Patients were grouped according to time interval and age.

Results: The median time from ACL injury to ACL reconstruction was 3 months (range 0.25 to 480). Overall, an increasing incidence of medial meniscal injury and chondral damage occurred with advancing chronicity of ACL deficiency. The incidence of medial meniscal injury requiring meniscectomy increased from 18% of patients undergoing ACL reconstruction within 4 months of injury to 59% of patients if ACL reconstruction was delayed more than 12 months (p<0.001). The incidence of lateral meniscal tears did not increase significantly over time.

The increasing incidence of secondary pathology with advancing chronicity was more pronounced in the younger age groups. The risk of a medial meniscal tear requiring resection was significantly less if surgery was performed before 5 months in the <17 years group (Odds Ratio 2) and 17-30 years group (OR 1.9), but less so in the 31-50 years group (OR 1.5) and >50 years group (OR 1.5). Advancing age was associated with a greater incidence of chondral damage and medial meniscal injury, but not lateral meniscal injury. Males had a greater incidence of lateral meniscal tears (34% vs. 20%), but not medial (28% vs. 25%) or chondral damage (35% vs. 36%), compared to females.

Conclusions: The incidence of chondral damage and medial meniscal tears increases with advancing time after ACL injury. Particularly in younger patients, ACL reconstruction should be performed within 4 months of ACL injury in order to minimise the risk of irreversible damage to meniscal and chondral structures.
EFFECT OF SURGICAL TIMING ON ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Introduction: The question of whether to reconstruct an ACL-deficient knee as early as possible following injury or to delay surgery remains unanswered. Early reconstruction potentially reduces the risk of secondary damage. However, there is also concern regarding the risk of arthrofibrosis if surgery is undertaken too soon. The aim of this study was to investigate whether injury-to-surgery delay determines ACL-reconstruction outcomes at up to 2 years post-operatively.

Methods: A retrospective analysis of prospectively collected data from 211 knees with isolated primary ACL ruptures was performed. Patients were examined preoperatively, at 6 months, 1 year, and 2 years post-operatively using International Knee Documentation Committee (IKDC) and Lysholm scores. Side to side differences in knee laxity were also measured with a KT1000 arthrometer. Spearman’s rho correlations were used to associate injury-to-surgery delay with outcome scores.

Results: Outcomes scores significantly increased for both IKDC (p<0.05) and Lysholm (p<0.05) questionnaires. Significant positive correlations (p<0.05) were also found between injury-to-surgery delay and IKDC and Lysholm subjective scores. Strongest correlation coefficients were noted at the 2yr follow-up for both IKDC and Lysholm scores (r = 0.79 and 0.8 respectively). Side-to-side laxity measures also showed significant positive correlations with injury-to-surgery delay at 1 year (r = 0.17) and 2 year (r = 0.41) follow ups. The positive correlation suggests that delayed surgery is positively related to subjective outcomes, as well as objective measures of knee laxity.

Conclusions: However, this relationship also suggests that other factors such as the patient’s functional status at time of surgery, may play a role in their post-operative function. For example, those who can compensate for the ruptured ligament may function well following delayed surgery. These findings highlight the need for more detailed investigation of the interaction between functional status, injury-to-surgery delay and post-operative recovery.
NOVEL IMAGING METHODS FOR DETECTING CARTILAGE TISSUE QUALITY VIA MARS-MICRO COMPUTED TOMOGRAPHY

Aims: Articular cartilage has a limited regeneration capacity, and damage of cartilage often results in the onset of degenerative disease such as osteoarthritis (OA). MRI and CT imaging of cartilage and subchondral bone are becoming increasingly important in early detection and treatment of OA as well as for quantifying quality of tissue-engineered samples. Non-invasive CT scanners have been used to image cartilage tissue with the help of contrast agents. However, since only one energy source is available, imaging information of multiple soft and hard tissues is lost given that the overall x-ray attenuation is measured. Medipix All Resolution System (MARS) CT offers the possibility of applying more than one energy source. It is able to measure the energy of each photon individually and therefore determines the characteristics of attenuation.

Methods: In this study, an ionic contrast agent (Hexabrix) was used to image the negatively charged extra-cellular matrix component, glycosaminoglycan (GAG), which is abundantly found in the middle and lower layers of healthy cartilage tissue. GAG distribution in the cartilage tissue could be imaged using an inverse relationship with Hexabrix signal (i.e. high signal represents low GAG content). Eight bovine cartilage-bone explants (3mm x 5mm) were incubated in 4 different Hexabrix concentrations ranging from 20% to 50% in PBS. Sections were imaged using the MARS scanner at high and low energies (13.32 keV and 30.84 keV). Images were pre-processed, reconstructed and colour-coded using different enhancement techniques and virtual experimental software. Histological (Safranin-O) staining and quantitative biochemical analysis of GAG content (DMMB dye assay) was performed to correlate GAG distribution and content with MARS-CT images.

Results: High resolution images of both cartilage and bone regions were obtained, with contrast enhanced CT of cartilage correlating well with histological staining. X-ray attenuation was high in regions poor in GAG content, whereas attenuation was low in GAG rich regions. Furthermore, there was a direct inverse correlation between Hexabrix signal and GAG content as measured in superficial (2.9 µg/mg) and middle/deep regions (10.6 µg/mg) in cartilage explants.

Conclusions: It can be concluded that the MARS technique can be used to image GAG distribution and GAG content, and therefore could be used clinically to assess quality of healthy or osteoarthritic cartilage, as well as non-destructive imaging of GAG content in engineered tissues.
NEXT GENERATION CARTILAGE TISSUE ENGINEERING STRATEGIES BASED ON 3D TISSUE ASSEMBLY

Aims: Cell-scaffold based cartilage tissue engineering strategies provide the potential to restore long-term function to damaged articular cartilage. A major hurdle in such strategies is the adequate (uniform and sufficient) population of porous 3D scaffolds with cells, but more importantly, the generation of engineered tissue of sufficient quality of clinically relevant size. We describe a novel approach to engineer cartilage grafts using pre-differentiated micro-mass cartilage pellets, integrated into specifically designed 3D plotted scaffolds.

Methods: Expanded (P2) human nasal chondrocytes (HNCs) or bone marrow-derived mesenchymal stem cells (MSCs) from 3 donors (age 47-62 years) were micro-mass cell pellet cultivated at 5x10^5 cells/pellet for 4 days. Subsequently, pellets were integrated into degradable 3D Printed polymer (PEGT/PBT) scaffolds with 1mm fibre spacing. Constructs were cultured dynamically in spinner flasks for a total of 21 days. As a pellet-free control, expanded HNCs were spinner flask seeded into PEGT/PBT fibre plotted scaffolds. Constructs were assessed via histology (Safranin-O staining), biochemistry (glycosaminoglycan (GAG) and DNA content) and collagen type I and II mRNA expression.

Results: After 4 days, micro-mass cultured pellets could be successfully integrated into the fibre plotted scaffolds. DNA content of pellet integrated constructs was 4.0-fold±1.3 higher compared to single seeded constructs. At day 21, cartilage tissue was uniformly distributed throughout pellet integrated scaffolds, with minimal cell necrosis observed within the core. GAG/DNA and collagen type II mRNA expression were significantly higher (2.5-fold±0.5 and 3.1-fold±0.4 respectively) in pellet versus single cell seeded constructs. Furthermore, compared to single cell, the pellet seeded constructs contained significantly more total GAG and DNA (1.6-fold±0.1 and 3.1-fold±1.0 respectively).

Conclusions: We developed a novel 3D tissue assembly approach for cartilage tissue engineering which significantly improved the seeding efficiency (~100%), as well as tissue uniformity and integrity compared to more traditional seeding approaches using single cell suspensions. Furthermore, the integration of micro-mass cell pellets into 3D plotted PEGT/PBT scaffolds significantly improved the amount and quality of tissue engineered cartilage.
EFFECTS OF DEMINERALIZED BONE ON INTRA-ARTICULAR TENDON-BONE HEALING IN A NUDE RAT

Introduction & Aims: Fibrocartilaginous entheses are formed through endochondral ossification and characterized by four zones morphologically separated into tendon, uncalcified fibrocartilage, calcified fibrocartilage and bone [1]. These zones are not successfully regenerated following surgical repair. Demineralized Bone (DBM) presented at the tendon-bone interface may improve healing between tendon and bone.

Methods: Fifty six female nude rats were randomly allocated into either a control reconstruction or treatment group (DBM at the tendon-bone healing site). A modified rodent model of anterior cruciate ligament reconstruction was adopted [2]. Animals were sacrificed at 2, 4 and 6 weeks following surgery. Four rats per group were prepared for histology at each time point while eight rats were culled for biomechanical testing at 4 and 6 week time points. ANOVA and post hoc tests were used to examine differences which were considered significant at p < 0.05.

Results: The surgical procedure was well tolerated. Macroscopic dissection did not reveal any infection and all joint surfaces appeared normal. An intra-articular graft between the femur and tibia was present in all specimens. Mechanical differences were noted between groups. Peak loads were significantly higher in treatment group at 4 and 6 weeks (6.0 ± 3.6N and 9.1 ± 2.6 N, respectively) compared to controls (2.9 ± 1.9 N and 5.8 ± 2.7 N). No statistical differences were found in graft stiffness between the groups at 4 or 6 week time points. Histology showed an initial influx of inflammatory cells coupled with formation of a loose disorganized fibrovascular interface layer between tendon and bone in both groups. By the 6 weeks the interface layer in the DBM group fused into the newly formed bone to create a continuum between the tendon and bone, in an interdigitated fashion, containing Sharpy’s like fibres. In the control group the continuum was less apparent with evidence of large areas of discontinuity between the two zones. A thicker region of newly formed woven bone with increased osteoblast activity along the bone tunnel was evident in the DBM group.

Conclusion: DBM has the potential to increase the quality of repair following surgical procedures involving reattachment of tendon to bone.

References:
OSTEOARTHRITIS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Introduction: An ACL reconstruction is designed to restore the normal knee function and prevent the onset and progression of degenerative changes such as osteoarthritis. However, contemporary literature provides limited consensus on whether knee degeneration can be attenuated by the reconstruction procedure. The aim of this pilot study was to identify the presence of early osteoarthritis after ACL reconstruction using MRI analysis.

Methods: 19 patients who had undergone an ACL reconstruction (9 isolated ACL rupture, 8 ACL rupture and meniscectomy, 2 ACL rupture and meniscal repair) volunteered for this study. MRI’s were collected preoperatively and postoperatively for analysis with a mean follow up of 23 months. The Boston-Leeds Osteoarthritis Knee Score (BLOKS) was used for the analysis of the articular cartilage by a consultant orthopaedic surgeon. Scores ranged from 0-3, with 0 being total coverage and thickness of the cartilage and 3 being no coverage. Qualitative analysis was then conducted on each patient to determine if the articular cartilage improved, degenerated, or did not change between preoperative and follow-up scans.

Results: All patients with isolated ACL rupture were found to either have no change or improved articular cartilage scores in their follow up scans compared preoperatively. In contrast, patients with a meniscal repair displayed worse cartilage scores postoperatively. Lastly, of the patients who had an associated meniscectomy, 6 had worse follow-up results, with the remaining patients showing no change or improved cartilage scores.

Conclusions: The present results indicate that patients with an isolated ACL rupture have a reduced risk of developing OA compared to those with associated meniscal injuries. This has implications for analysing the outcome of current ACL reconstruction techniques and in predicting the likelihood of patients developing OA after ACL reconstruction. Future work will involve confirming this pattern in a larger patient sample, as well as exploring additional factors such as time to surgery delay and rehabilitation strategy.
CLINICAL RESULTS AND RISK FACTORS FOR REINJURY 15 YEARS AFTER ACL RECONSTRUCTION. A PROSPECTIVE STUDY OF HAMSTRING AND PATELLAR TENDON GRAFTS

Introduction: This prospective longitudinal study compares the results of isolated endoscopic ACL reconstruction utilizing 4-strand hamstring tendon (HT) or patellar tendon (PT) autograft over a 15-year period with respect to reinjury, clinical outcomes and the development of osteoarthritis.

Method: 90 consecutive patients with isolated ACL rupture were reconstructed with a PT autograft and 90 patients received HT autograft, with an identical surgical technique. Patients were assessed at 2, 5, 7, 10 and 15 years. Assessment included the IKDC Knee Ligament Evaluation including radiographic evaluation, KT1000, Lysholm Knee Score, kneeling pain, and clinical outcomes.

Results: Subjects who received the PT graft had significantly worse outcomes compared to those who received the HT graft at 15 years for the variables of radiologically detectable osteoarthritis (p=0.03), motion loss (p=0.01), single leg hop test (p=0.002), participation in strenuous activity (p=0.05), and kneeling pain (p=0.04). There was no significant difference between the HT and PT groups in overall IKDC grade (p=0.31). ACL graft rupture occurred in 16% of HT group and 8% of the PT group (p=0.07). ACL graft rupture was associated with non-ideal tunnel position (odds ratio 5.0) and males (odds ratio 3.2). Contralateral ACL rupture occurred in significantly more PT patients (24%) than HT patients (12%) (p=0.03), and was associated with age < 18 years (odds ratio 4.1) and the patellar tendon graft (odds ratio 2.6). Radiologically detectable osteoarthritis at 15 years was associated with the PT graft (odds ratio 2.3).

Conclusion: Significant differences have developed in the groups at 15 years after surgery which were not seen at earlier reviews. Compared to the HT Group, the PT group had significantly worse outcomes with respect to radiological osteoarthritis, extension loss and functional tests but no significant difference in laxity was identified. There was a high incidence of ACL injury after reconstruction, to both the reconstructed and the contralateral knee.
GREATER TROCHANTERIC PAIN SYNDROME IS AS PAINFUL AND FUNCTIONALLY DEBILITATING AS SEVERE OA OF THE HIP, A PROSPECTIVE CASE CONTROL STUDY

Introduction: Greater trochanteric pain syndrome (GTPS) is common, yet the impact on function and quality of life has not been measured. The aim of this study was to quantify the impact on function and quality of life, comparing the results to people with severe hip osteoarthritis and an asymptomatic control group.

Methods: Forty two people with GTPS – including 11 not actively seeking treatment and 11 seeking surgical treatment, 20 with severe hip osteoarthritis (OA), and 23 age and sex matched asymptomatic participants (ASC) where recruited from public and private hospitals, and the community. Upon confirming meeting inclusion and exclusion criteria participants were interviewed. Exclusion criteria included lumbar nerve root signs; inflammatory, neoplastic and metabolic disorders. Measured used were the Harris hip score (HHS); the Oswestry disability index (ODI); the Australian quality of life instrument (AQoL); the Functional co-morbidity index (FCI); and fulltime work assessments.

Results: No difference was found between the GTPS and the OA group on the HHS, ODI, AQoL or the FCI measures. Both symptomatic groups were significantly more disabled than the ASC group on the HHS and ODI (p<0.001). The GTPS and OA groups had lower AQoL than the ASC group (p<0.001); and higher FCI results than the ASC group (GTPS vs ASC, p=0.005; OA vs ASC, p=0.019). GTPS participants were least likely to be in full time work; full time work participation probability (95% C.I.): GTPS Prob=0.288 (0.160 to 0.463), OA Prob= 0.518 (0.273 to 0.753); ASC group of Prob=0.676 (0.439 to 0.847).

Conclusions: People with GTPS have similar levels of pain, disability and quality of life, but are less likely to be in full time employment than people with severe hip OA which puts them at risk of economic hardship. Research on conservative and surgical treatments should measure pain, disability and work participation.
RESULTS OF TOTAL HIP REPLACEMENT IN PATIENTS HAVING POST TRAUMATIC ARTHRITIS FOLLOWING ACETABULAR FRACTURES

Introduction: Total hip arthroplasty is a treatment option for patients who present with symptomatic post-traumatic arthritis following acetabular fractures.

Materials and Methods: Twenty total hip arthroplasty were performed with use of a cementless cup in 17 patients and cemented cup in a cage in 3 patients for the treatment of posttraumatic osteoarthritis following acetabular fracture. The average age of the 4 women and 16 men was 49 (range, 26 to 86 years) at the time of the arthroplasty. The median interval between the time of injury and the total hip arthroplasty was 37 months (range, 8 to 144 months). The average operative time was 120 minutes and average intraoperative blood loss was 700 ml. Eight patients had previous open reduction and internal fixation of the acetabular fracture and twelve had been treated nonoperatively. Following total hip replacement, each patient was evaluated clinically and radiographically at six weeks, three months, six months and twelve months, and then yearly following total hip replacement. The average duration of clinical and radiographic follow-up was 40 months (range, 26 to 60 months).

Results: At the time of final follow-up, of twenty acetabular components, 10 had no evidence of periacetabular radiolucency, 7 components had a partial radiolucency that was <1 mm wide, 2 had a complete radiolucency <1 mm wide and 1 component was surrounded by a complete radiolucency of >2 mm in width without showing component migration. According to Engh's criteria, 16 (80%) femoral stems had bony ingrowth and 4 (20%) stems had stable fibrous ingrowth. The average preoperative Harris hip score improved from 35 points to 78 points at the time of final followup.

Conclusion: Total hip arthroplasty for arthritis following acetabular fractures, technically difficult because of extensive scarring, heterotopic bone, retained internal fixation devices, and residual deformity of the acetabulum.
MEDIUM TERM OUTCOME OF PFM/REVITAN UNCEMENTED MODULAR TITANIUM FEMORAL COMPONENTS IN TOTAL HIP REVISION

Aim: Revision total hip replacement may be technically challenging, with component selection being one of the challenges. Modular titanium femoral components have some advantages, and our aim was to assess the medium term outcome of the use of such a component [Revitan or PFM].

Method: We reviewed 323 patients undergoing revision with one of these femoral stems. We applied the Oxford Hip Score, the Charnley Class, and the Devane Patient Activity Level to each patient.

Results: The average follow up time was 6.58 years. The mean Oxford score was 35.74. 39.8% of the patients were Charnley Class B. 52.4% of patients had an activity score indicating a moderate level of activity ie they could participate in gardening, swimming and other leisure pursuits.

Conclusion: The overall outcome was good with this prosthesis. The Oxford scores were comparable with the national mean for revision THR on the NZ National Joint Register.
BIG BALLS - THE CERAMIC EXPERIENCE IN REVISION TOTAL HIP REPLACEMENTS

Aim: To discuss the rationale, selection criteria, indications, and results of using large diameter ceramic heads in revision hip arthroplasty.

Patients and Methods: We routinely use Biolox family of ceramic heads and acetabular liners in patients undergoing revision total hip replacements. We present our experience in using ceramic articular bearings over the last 20 years and the switch to larger diameter ceramic heads. We also present our rationale for using a large diameter ceramic head instead of a large metal head.

Results: We reviewed a total of 689 revision arthroplasties over this time period and we report the outcome of large bearing couples with case examples in primary and revision scenarios. Furthermore we compared a subset of patients (110) with large diameter ceramic heads – Biolox Delta 36mm to patients who had metal on metal (large head 42 mm and above) bearing couples. The performance of the ceramic bearing couples will be discussed along with the functional outcome of these patients. We found no difference in the functional, clinical sports activities (UCLA and Tegner scores) between patients who had large metal bearing couples and large ceramic couples. Complication rate was less with the ceramic bearing revision arthroplasties, as was patient satisfaction.

Conclusion: Ceramic bearing couples have stood the test of time and have demonstrated an excellent long term wear properties. The recent introduction of the large diameter couples proves to be an excellent alternative if not the first choice in young, complex primary and revision case scenarios.
EDGE LOADING WEAR RATES OF LARGE DIAMETER METAL FEMORAL HEADS VERSUS ALUMINA FEMORAL HEADS

Introduction: Edge loading commonly occurs in all bearings in hip arthroplasty. The aim of this study compares metal bearings with edge loading to alumina bearings with edge loading and to metal bearings without edge loading.

Method: Seventeen failed large diameter metal-on-metal hip bearings (8 total hips, 9 resurfacings) were compared to 55 failed alumina-on-alumina bearings collected from 1998 to 2010. The surface topography of the femoral heads was measured using a chromatically encoded confocal measurement machine (Artificial Hip Profiler, RedLux Ltd.).

Results: The median time to revision for the metal hip bearings and the alumina hip bearings was 2.7 years. Forty-six out of 55 (84%) alumina bearings and 9 out 17 (53%) metal bearings had edge loading wear (p<0.01). The average volumetric wear rate for metal femoral heads was 7.87 mm³/yr (median 0.25 mm³/yr) and for alumina heads was 0.78 mm³/yr (median 0.18 mm³/yr) (p=0.02).

The average volumetric wear rate for metal heads with edge loading was 16.51 mm³/yr (median 1.77 mm³/yr) and for metal heads without edge loading was 0.19 mm³/yr (median 0 mm³/yr) (p=0.1). There was a significant difference in gender, with a higher ratio of females in the alumina group than the metal group (p=0.02).

Conclusions: Large diameter metal femoral heads with edge loading have a higher wear rate than smaller alumina heads with edge loading. Metal-on-metal bearings have low wear when edge loading does not occur.
THE EPIDEMIOLOGY OF FEMORAL SHAFT FRACTURES IN AN INCLUSIVE TRAUMA SYSTEM

Background: Femur shaft fractures (FSF) are markers of high energy transfer after injury. The comprehensive, population based epidemiology of FSF is unknown. The purpose of this prospective study was to describe the epidemiology of FSF with special focus on patient physiology and timing of surgery.

Methods: A 12-month prospective population-based study was performed on consecutive FSF in a 600,000 population area including all ages and prehospital deaths. Patient demographics, mechanism, injury severity score (ISS), shock parameters (SBP, BD and Lactate), transfusion requirement, fracture type (AO), co-morbidities, performed procedure and outcomes were recorded. Patients were categorized: Stable, borderline, unstable and in extremis.

Results: A total of 125 patients (20.8/100,000/year) with 134 femur fractures. (62% male, age 37±28 years, ISS 20±19, 51% multiple injuries) were identified in two hospitals. 69 patients (55%) sustained a high energy injury (MVA, MBA, train related, high fall) with 16 (23%) of these being polytrauma patients (ISS 28±12, SBP 98±39, BD 6.5±5.8, Lactate 4±2), 15 (94%) required massive transfusion (12±12 URBC, 8±5 FFP, 1±0.4 PLT, 13±8 Cryo). Of the 125 patients 69% were stable (14.5/100,000/year), 9% borderline (1.8/100,000/year), 4% unstable (0.8/100,000/year) patients and 2% (0.3/100,000/year) were in extremis. 2 borderline, 1 unstable and 2 extremis patients died of severe CHI. One patient in extremis died due to uncontrollable hemorrhage from a pelvic fracture. 20 patients (16%) (3.3/100,000/year) with FSF were prehospital deaths and died due to the severity of their multiorgan injuries or CHI. The overall LOS was 18±15 days and the ICU LOS was 5±6 days. All high energy patients went to theatre within 6±13 hours.

56 patients (45%) sustained a low energy injury. Of these patients 85% had multiple co-morbidities. 8 patients needed 3±1 transfusions and none of the patients died. Time to surgery was 25±37 hrs and LOS was 15±11 days.

There were 29 paediatric FSF, 20 of these were low and 9 high energy injuries. Only 3 patients required surgery.

Conclusion: LE-FSF are as frequent as HE-FSF. 73% of the femur fractures are complicated (open, compromised physiology, multiple injured, bilateral, elderly with co-morbidities etc.) requiring major resources and highly specialized care.
PREDICTORS OF MORTALITY FOLLOWING SEVERE PELVIC RING FRACTURE: RESULTS OF A POPULATION-BASED STUDY

Introduction: Traumatic disruption of the pelvic ring has a high risk of mortality. These injuries are predominantly due to high-energy, blunt trauma and severe associated injuries are prevalent, increasing management complexity. This population-based study investigated predictors of mortality following severe pelvic ring fractures managed in an organised trauma system.

Methods: Cases aged >15 years from 1st July 2001 to 30th June 2008 were extracted from the population-based statewide Victorian State Trauma Registry for analysis. Patient demographic, prehospital and admission characteristics were considered as potential predictors of mortality. Multivariate logistic regression was used to identify predictors of mortality with adjusted odds ratios (AOR) and 95% confidence intervals (CI) calculated.

Results: There were 348 cases over the 8-year period. The mortality rate was 19%. Patients aged > 65 years were at higher odds of mortality (AOR 7.6, 95% CI: 2.8, 20.4) than patients aged 15-34 years. Patients hypotensive at the scene (AOR 5.5, 95% CI: 2.3, 13.2), and on arrival at the definitive hospital of care (AOR 3.7, 95% CI: 1.7, 8.0), were more likely to die than patients without hypotension. The presence of a severe chest injury was associated with an increased odds of mortality (AOR 2.8, 95% CI: 1.3, 6.1), while patients injured in intentional events were also more likely to die than patients involved in unintentional events (AOR 4.9, 95% CI: 1.6, 15.6). There was no association between the hospital of definitive management and mortality after adjustment for other variables, despite differences in the protocols for managing these patients at the major trauma services (Level 1 trauma centres).

Conclusions: The findings highlight the importance of the need for effective control of haemodynamic instability for reducing the risk of mortality. As most patients survive these injuries, further research should focus on long term morbidity and the impact of different treatment approaches.
VTE IN TRAUMA ORTHOPAEDIC PATIENTS WITH LOWER LIMB INJURIES

Introduction: Trauma patients have the highest risk of VTE among hospitalised patients, with a reported 13-fold increase of risk. Due to the heterogeneity of injuries, the true incidence of VTE in trauma patients is difficult to obtain. This study examines the incidence of VTE and associated complications in trauma patients with lower limb injuries.

Methods: Between 2005 and 2009, patients over 18 years of age with lower limb injuries and/or fractures that were either isolated or a part of multi-systemic injuries were included in the study. Further stratification was performed according to the Injury Severity Score: an ISS greater than 15 was a major (trauma); less than 15, a minor. The mode of VTE prophylaxis, type of surgery, and bleeding complications were also examined.

Results: There were 5528 patients in the minor trauma group, and 509 in the major trauma group.

Minor trauma: the mean age was 58.1 years (range: 18-104). The VTE incidence was 1.2%: 0.67% for DVT, and 0.5% for PE. The readmission rate within a three-month period was 11%, of which 2.8% were due to VTE with 13 cases of DVT, and 5 cases of PE. The 30-day mortality rate was 2.2%. Seven patients died from PE during admission, while one died from PE within three months after discharge.

Major trauma: the mean age was 42.5 years (range: 18-95). The overall VTE incidence was 7.8%: 5.9% for DVT, and 0.9% for PE. The readmission rate within a three-month period was 7.6%, of which 5% were due to VTE with 2 cases of DVT. The overall 30-day mortality rate was 11.1%, and there was no formally-diagnosed fatal PE during admission or post-discharge.

Conclusion: Major trauma patients had a 7-fold increased risk of developing VTE during admission when compared to minor trauma patients, although minor trauma patients had more fatal PEs. Additionally, major trauma patients had a 10-fold increased risk for DVT, and a 3-fold risk for PE, when compared with minor trauma patients. No significant difference was detected between the two groups for the 30-day readmission rate due to VTE.
INCIDENCE OF VENOUS THROMBOEMBOLISM (VTE) IN ORTHOPAEDICS WARD PATIENTS AND ITS RELATION TO LOW MOLECULAR WEIGHT HEPARIN (LMWH) PROPHYLAXIS AND OTHER RISK FACTORS

The purpose of the present study is to determine the incidence, location and rate of VTE following routine mechanical, chemical prophylaxis in trauma/elective patients and to understand what factors are responsible for the continuing high frequency of thromboembolic complication despite the fact that low molecular-weight heparin (LMWH) is now widely used for prophylaxis.

All of the inpatients at the orthopaedics ward, Princess Alexandra Hospital (level one trauma centre, Brisbane) between the first May 2009 and 30th of April 2010 with the diagnosis of DVT/PE were included in this study. Patients were chosen based on the diagnosis of DVT with ultrasound or PE with CTPA during their admission in this period which was performed whenever clinical signs indicated DVT or PE.

64% of the included patients had DVT and 42% had PE which was developed during their admission. Included patients had a mean age +/- SD age of 56 years +/- 23 years. 68% were men and 72% suffered trauma. The 18% of patients had previous history of PE or DVT. The incidence of VTE was significantly higher in men at ages between 20-40. 29% of the patients had ICU admission during their stay in hospital. 28% had spinal cord injury, 21% with head trauma, and 36% with multiple bone fractures. Most of the patients had lower limb injury or operation and just one patient was with isolated upper limb injury. The mean period of hospitalization for the included patients were 29 +/- 19 days (range, 6-77). DVTs occurred 8 days +/- 7 days (range, 1-31) post admission. PEs occurred 10 days +/- 8 days (range, 3-30) after admission. Location of DVT was available for 14 patients: 9 (64%) lower and 6 (43%) upper, with one (0.07%) having both. Twelve of 28 patients with VTE were started on prophylactic clexane (40mg once daily), and six patients were on heparin (5000 unit twice daily). All of the patients with PE had lower limb injury.

Considering the number of orthopedics ward patients during our study period our data show the incidence of VTE in one year is lower than that of literature and the common standard prophylaxis with early mechanical prophylaxis after admission and following pharmacological prophylaxis when it is safe has acceptable results.
VTE PROPHYLAXIS IN PATIENTS WITH PELVIC AND ACETABULAR FRACTURES TREATED WITH VARIABLE DOSE HEPARIN VERSUS FIXED DOSE HEPARIN OR ENOXAPRIN

Introduction: Patients with pelvic and acetabular fractures have a high risk of developing thromboembolic complications. Despite routine screening, the risk of PE remains high and may develop in patients with negative DVT screening. The search for a means to identify the patient ‘at risk’ has been elusive.

Methods: 537 consecutive patients, referred to Royal Adelaide Hospital over a 20 year period for treatment of pelvic and acetabular fractures, were evaluated prospectively for pulmonary embolus (PE). 352 patients referred directly to the author were treated with variable dose heparin as prophylaxis to venous thromboembolic (VTE) disease. 184 patients primarily admitted under the general surgeons or to ITU, prior to referral to the author, were treated with fixed dose heparin or Enoxaparin. All patients were followed prospectively to determine the rate of pulmonary embolus. The heparin dosage requirements of those who developed pulmonary emboli were compared to those who did not. Patients were also identified for whom a clinical diagnosis of deep venous thrombosis (DVT) was made during the study and their heparin dosage requirements were determined.

Results: 7 of 352 patients treated with variable dose heparin developed PE (1.98%). 13 of 184 patients treated with fixed dose heparin, Enoxaparin, or combinations, developed PE (7.06%). An incidental finding of DVT was made in 36 patients. Of these, 10 patients (2.8%) were treated with variable dose heparin and 26 patients (14.1%) with fixed dose heparin or Enoxaparin.

The average Injury Severity Score was higher in patients treated with variable dose heparin than those treated with fixed dose regimes. Patients treated with variable dose heparin who developed PE showed a progressively increasing heparin requirement. The majority of patients who did not develop PE (72%) showed a progressively decreasing heparin requirement (suggesting reversal of a prothrombotic state). 21% showed an initial increasing heparin requirement followed by a decreasing requirement (suggesting a prothrombotic state that was reversed, e.g. a DVT successfully treated by the increasing heparin dose provided by a variable dose regime). 4% manifested a static heparin requirement (suggesting maintenance of a prothrombotic state).

8 patients treated with variable dose heparin developed DVT. 6/8 patients manifested a phase of progressively increasing heparin requirement, followed by a decreased requirement, and 2/8 patients manifested a sustained level of heparin requirement.

Conclusion:
- Patients with pelvic and acetabular fractures treated with variable dose heparin showed a rate of PE (1.98%). This is remarkably low compared with published rates of PE in such patients, and particularly compared with those patients treated only with chemoprophylaxis.
- The rate of PE was 3.5x higher and the rate of DVT was 5x higher in patients treated with fixed dose heparin or Enoxaparin.
- Patients who developed PE or DVT manifested an increasing heparin requirement.
- An increasing dosage of heparin may protect the ‘at risk’ patient from venous thromboembolism.
- Fixed dose unfractionated heparin/LMWH may be insufficient to treat the ‘at risk’ patient.
- An increasing heparin requirement may identify the patient ‘at risk’.
APOA FUTURE HORIZONS

No abstract has been provided for this presentation.
REGULAR OUTREACH VISITS HELPING EMPOWER THE LOCAL ORTHOPAEDIC FRATERNITY - LESSONS LEARNED

Aim: We propose a model of care where Regular scheduled outreach visits by a Single team provides more dependability of care and understanding of the local needs and cultural practices. Thereby titrating the care to meet local needs rather than enforcing the Western model of care to a very different cultural background.

I have been fortunate as a SET 4 Registrar to be involved with an Outreach team to Latouka Hospital. Spear headed by Dr M McAuliffe over the last 3 years the annual visit has taken shape as a dependable way of providing care to the community of Latouka. The team has evolved over the years to involve Dr Brazel, Dr Tetsworth, Dr Bansi, and our scrub staff. The team consists of 2 teams which visit Latouka every 6 months and help institute a multimodal care plan.

1. Regularity of visits helps build confidence locally and engraves the foundations of dependability of care.
2. Difficult and complex cases are discussed in specially earmarked clinics held every 6 months providing a brainstorming sessions to the local clinicians and helping them achieve the best care for the patients under the restrictions of the local infrastructure.
3. Regular teaching sessions/practical workshops are held for the Registrars and Junior doctors empowering them to carry the baton once the visiting team leaves.
4. Regular follow up of the patients operated upon is attained to titrate care to the locals based upon the local needs and cultural practices.
5. Helping the surgical teams, nurses, radiographers, physiotherapists formulate protocols of care and comparing them to the protocols used in Australia/ NZ.
6. Creating an educational fund for the local registrars enabling them to attend observer ships and courses in Australia/ New Zealand.

We think that this model of care provides a much more organised and long term benefit to the local community compared to erratic visits by volunteer teams.

Conclusion: A similar model of care if instituted over many divisional hospitals of the South Pacific will be vital in improving the health care needs of the locals and provide the local staff with the much needed support they deserve.
STRESS PATTERNS IN BONES OF THE LOWER LIMB: A STUDY OF INTERNAL ARCHITECTURE

Introduction: Our knowledge of the trabecular framework is restricted to a two dimensional study of trabecular framework of the proximal femur. The author has been studying the trabecular pattern of all bones of the lower limb, including the pelvis, for the past 25 years.

Material and Methods: The material for the study included cadaveric bones: 10 innominate bones, three hundred femora, 50 tibia, 30 talus, 30 calcanei. 5mm, sections in coronal, sagittal, transverse, (and in proximal femur - oblique) plane were obtained of the cadaveric bones. These were studied by naked eye observation, with a magnifying glass, after obtaining high resolution photographs, and radiographs of sections.

Observation: The most constant feature has been the arcuate arrangement of trabeculae as a reflection of joint mobility. In the proximal femur this was observed in three planes while around the knee, and ankle + foot it was observed only in the sagittal plane. The trabeculae are aligned in a fashion similar to the Meyer - Cullmann model of a loaded beam fixed at one end. This reflects response to movements in three planes in the hip, and in sagittal plane around knee and ankle. It was also observed that trabeculae are continuous across joints indicating lines of stress at individual joints.

Conclusion: The author concludes that it is essential to study trabeculae in three dimensional perspective in order to design implants for various regions. This study will also help in designing of components for joint replacement.
BEING AN ORTHOPAEDIC EXTERNAL EXAMINER IN SRI LANKA IN 2011

No abstract has been provided for this presentation.
EARLY RESULTS OF A MULTICENTRE LONGITUDINAL DENSITOMETRIC TRIAL ASSESSING PERIACETABULAR OSTEOINTEGRATION AND BONE REMODELLING OF TRABECULAR TITANIUM

Introduction: Trabecular TitaniumTM is a tri-dimensional material composed by multi-planar regular hexagonal cells and characterised by a highly open porosity that has been studied to optimise bone osteointegration. The aim of this study is to evaluate bone remodelling measuring BMD changes around an acetabular cup made from Trabecular TitaniumTM in primary total hip arthroplasty (THA).

Materials and Methods: Between February 2009 and December 2010, 89 patients (91 hip) underwent primary THA with a modular acetabular cup in Trabecular TitaniumTM (DELTA-TT cup, Limacorporate, Villanova di San Daniele, Italy). The average age was 63.5± 9.4 years, the average height and weight were 75.9± 12.9 kg and 168.8± 8.9 cm, respectively (av. BMI 26.8± 4.2). There were 46 (51.7%) males and 43 (48.3%) females affected by primary coxarthrosis in 80 (87.9%) cases, avascular necrosis in 5 (5.5%), posttraumatic coxarthrosis in 3 (3.3%), dysplasia in 2 (2.2) and oligoarthritis in 1 (1.1%) case. The study includes the clinical evaluation with Harris Hip Score (HHS) and SF-36, radiographic evaluation and dual-energy x-ray absorptiometry (DEXA) analysis preoperatively and postoperatively at 1 week, 3, 6, 12 and 24 months.

Results: Preliminary results are currently available for 47 patients at 12 months, 68 at 6 months and 80 at 3 months. The average HHS significantly improved from 48.7± 14.99 preoperatively to 93.8± 5.91 at 12 months, with a constant progression in the intermediate follow-ups. All patients showed a significant ROM increase, with an average flexion from 86.6°± 15.9° preoperatively to 105°±13.14 at 12 months. Sf-36 highlighted a satisfactory improvement of general health status from an average preoperative value of 50.8± 18.7 to 80.7± 12.9 at 12 months (from 42.9 to 80.1 for physical health; from 58.4 to 81.3 for mental one). All cups were stable at 12 months with no radiolucent lines. Preliminary DXA analysis reported an initial bone mineral density decrease from 1 week baseline values (BMD R1: 1.40± 0.37; R2: 1.20± 0.45; R3:1.16± 0.31) to 3 months (BMD R1: 1.31± 0.41; R2: 1.17± 0.3; R3: 1.06± 0.37) followed by BMD recovery up to initial values (BMD R1: 1.37± 0.3; R2:1.18± 0.34; R3: 1.12± 0.36) at 12 months.

Conclusions: Trabecular TitaniumTM demonstrates a good primary and secondary stability. Preliminary densitometric outcome confirms an optimal osseointegration of the DELTA-TT cup and early clinical and patient subjective results are very promising at a short term follow-up. However, the completions of follow-up evaluation are necessary to draw a conclusive analysis.
LOW METAL ION RELEASE IN PATIENTS AT UP TO 8 YEARS FOLLOWING TITANIUM NIOBIUM NITRIDE (TINBN) SURFACE TREATED METAL-ON-METAL HIP ARTHROPLASTY

This study examined whether TiNbN surface characteristics can reduce corrosion and wear of Chrome Cobalt Molybdenum Metal-on-Metal bearings.

Two series of patients had plasma concentrations of chromium and cobalt at intervals following surgery. The First Series comprised a retrospective analysis of 52 consecutive cases (49 patients, 73-96, "n"85, months; age: 33-78, "n"57) who had undergone an ACCIS (Implantcast, Germany) Modular Large Head hip replacement. The Second Series comprised a prospective, consecutive series of 125 cases (109 patients, 1-61, "n"30, months following operation; age at surgery: 24-75, "n"54) who had undergone an ACCIS Resurfacing Hip Replacement in whom pre-operative samples and periodic post-operative metal ion analysis was obtained. Cup inclination and anteversion angles, patient outcome and Harris hip scores at last follow-up were also recorded.

The first series revealed medians for [Cr] of 1.2 (range <0.5-2.4) micro ìg/l and [Co] of 3.3 (range <0.15-8.18) micro ìg/l. Four patients were not available for measurement. The second series gave one year [Cr] of 0.8 (range <0.5-1.6) micro ìg/l and [Co] of 0.2 (range <0.15-0.9) micro ìg/l and at two years [Cr] of 0.2 (range <0.5-1.5) micro ìg/l and [Co] of 0.8 (range <0.15-1.0) micro ìg/l. There was no correlation with cup inclination (38 degrees to 62 degrees) or anteversion (0 degrees to 32 degrees) in either group. Mean Harris Hip Scores were 80.9 and 92.3 respectively.

Low median levels of metal ions were found in the First Series (despite differing stem type usage). The low median ion levels were more consistent in the Resurfacing patients of the Second Series. The Titanium Niobium Nitride Ceramic Surface Engineering Metal-on-Metal bearing implants appear to protect against raised plasma [Cr] and [Co] both over time and with outlying cup positions. The Harris Hip Scores suggest a good patient outcome for the hip replacements in both series. Further study by a randomised controlled prospective analysis is suggested.
MAIL ION LEVELS AND FUNCTIONAL OUTCOMES OF CERAMIC-ON-METAL VERSUS METAL-ON-METAL TOTAL HIP ARTHROPLASTY: A PROSPECTIVE, RANDOMIZED, CONTROLLED TRIAL

Introduction: Despite a large body of literature the optimal choice of bearing surface for total hip arthroplasty (THA) remains controversial. To avoid the brittleness and squeaking noted with ceramic-on-ceramic and the metal ion release associated with metal-on-metal (MOM) articulations, a novel hybrid coupling of ceramic-on-metal (COM) has been introduced.

The purpose of this study was to compare changes in serum metal ion levels and the functional performance of COM and MOM bearing combinations.

Methods: Eighty-six patients (86 hips) undergoing THA between April 2009 and October 2010 were randomized to COM or MOM bearing couplings. All received identical uncemented acetabular shells and femoral components from two experienced surgeons using the same operative technique.

Demographic and peri-operative data were recorded. Serum cobalt and chromium levels, renal function and disease specific outcome scores (Oxford Hip, Harris Hip, UCLA activity) were assessed at baseline, 6 and 12 months post-operatively. Patients and outcome assessors remained blinded.

Results: Mean age of the total cohort was 62.5 years. Randomization successfully matched groups for age, Body Mass Index, baseline serum Cobalt and Chromium levels, and pre-operative functional performance scores.

One-year data is currently available for 25 of 44 COM and 26 of 42 MOM patients. No significant difference in serum cobalt (P value = 0.81) and chromium (P value = 0.66) levels between groups was noted. Improvements in outcome scores (Oxford Hip, Harris Hip, UCLA activity) were equivalent (P values 0.16 -0.46).

Conclusions: At 1-year, COM and MOM hip arthroplasty articulations appear equivalent in terms of function and serum metal ion levels. Data collection out to 5-years post-surgery continues.
THE EFFECT OF RADIOGRAPHIC OSSEOINTEGRATION OF GEOMETRIC VARIATIONS IN ACETABULAR COMPONENT DESIGN

Purpose: To review prospectively collected data on patients undergoing primary total hip arthroplasty utilizing two different cementless acetabular components.

Materials & Methods: All patients undergoing primary total hip replacement surgery at our institution are entered prospectively into a database which includes history and physical examination, radiology, WOMAC and SF-36 scores. The patients are re-examined, re-x-rayed and re-scored at 3 months, 6 months and 1 year after surgery and yearly thereafter.

Using this database we are able to identify patients who have undergone total hip replacement using one of two geometric variants of the acetabular component. The first design is hemispherical and the second design has a peripheral rim expansion designed to increase initial press-fit stability.

Results: Five hundred and twenty-seven consecutive primary total hip replacements were identified using either of the geometric variants of the acetabular component. Results at a mean of 7 years revealed a 95.6% survivorship with no significant difference between the two component designs with revision for aseptic loosening as the end point. Functional scores between the two groups of patients also demonstrated no statistically significant difference.

Radiologic assessment, however, showed a difference between the two designs. The hemispherical design which matches the reamer line-to-line had 80% complete osseointegration on final radiologic review while the second design with a peripheral rim expansion had only 57% complete osseointegration. This was statistically significant. The peripherally expanded components also had a greater number of screws inserted at the time of surgery, felt by us to be a reflection of initial surgeon dissatisfaction with component stability at the time of insertion of the component.

The difference in screw numbers was also statistically significant. This study demonstrates that a hemispherical design with line-to-line contact between the acetabular component surface and the acetabular bone is statistically superior in terms of bone ingrowth and probably statistically superior in terms of initial press-fit stability when compared to a peripherally expanded component.

Conclusion: Peripherally expanded components appear to offer no advantage over hemispherical components in terms of clinical outcome and are statistically inferior to hemispherical components in radiologic parameters at 7 years follow-up.
BIOLOX FORTE VERSUS BIOLOX DELTA STRIPE WEAR: 2 YEARS RESULTS

Introduction: Two types of ceramic materials currently used in total hip replacements are third generation hot isostatic pressed (HIPed) alumina ceramic (commercially known as BIOLOX®forte, CeramTec) and an alumina matrix composite material consisting of 75% alumina, 24% zirconia, and 1% mixed oxides (BIOLOX®delta, CeramTec). The aim of this study is to compare BIOLOX delta femoral heads to BIOLOX forte femoral heads revised within 2 years in vivo.

Method: Ceramic bearings revised at one center from 1998 to 2010 were collected (61 bearings). BIOLOX delta heads (n=11) revised between 1-33 months were compared to BIOLOX forte femoral heads with less than 24 months in vivo (n=20). The surface topography of the femoral heads was measured using a chromatically encoded confocal measurement machine (Artificial Hip Profiler, RedLux Ltd.).

Results: The median time to revision for BIOLOX delta femoral heads was 12 months, compared to 13 months for BIOLOX forte femoral heads. Sixteen out of 20 BIOLOX forte femoral heads and 6 out of 11 BIOLOX delta femoral heads had edge loading wear. The average volumetric wear rate for BIOLOX forte was 0.96 mm³/yr (median 0.13 mm³/yr), and 0.06 mm³/yr (median 0.01 mm³/yr) for BIOLOX delta (p=0.03). There was no significant difference (p>0.05) in age, gender, time to revision or femoral head diameter between the two groups.

Conclusions: Early results suggest less volumetric wear with BIOLOX delta femoral heads in comparison to BIOLOX forte femoral heads.
PRECLINICAL WORST-CASE TESTING OF A NOVEL VITAMIN-DOPED HXLPE

Introduction: The introduction of a new implant material is not without risk. A series of worst-case scenarios were developed and tested accordingly to answer questions such as: what will happen if the implant is not placed in a good orientation? What will happen to the material after a long implantation time, e.g. 20 or more years?

Methods: To reach a higher level of safety, a new approach for the preclinical testing has been taken. The vitamys® material (a novel vitamin-doped HXLPE) followed a severe pre-clinical testing protocol, including mechanical, tribological and biocompatibility testing. The testing includes a comparison of vitamys® vs. standard-UHMWPE and other HXLPE after accelerated ageing for periods equivalent to 20 and 40 years in-vivo. Hip simulator testing was done at inclination angles from 35° to 65° to assess the “forgiveness” of the material for mal-orientation.

Results: Comparing the test results to published data, it becomes evident that the vitamin addition and the sequence of the manufacturing steps both have a significant effect of the resulting mechanical, ageing and wear properties. In contrast to UHMWPE or HXLPE without antioxidant, the vitamys material behaves in a very “forgiving” manner: Hip simulator testing of vitamys at high inclination angles and even with severely aged material revealed no increase of wear rates. The vitamys material was first introduced in a monoblock polyethylene cup with a thin Ti-particle coating, the RM-Pressfit vitamys® acetabular cup (Mathys Ltd Bettlach, Switzerland). Its first implantation occurred in Sept. 2009. Since then, a total of nearly 500 implantations have been documented in a prospective multi-centre clinical study involving 11 clinics in 5 countries (CH, DE, FR, NL and NZ).

Conclusions: Based on the pre-clinical testing and its first clinical experience, we have reason to believe that the RM-Pressfit vitamys® possesses interesting and unique features such as high elasticity (no stress-shielding), high ageing and wear resistance combined with clinically proven biological anchorage – making it theoretically suitable for a whole range of patients, including the young and active.
THE TRENDS OF COMPUTER TOMOGRAPHY USE AND OPERATIVE MANAGEMENT IN UPPER LIMB ARTICULAR FRACTURES

Objective: The universal availability of CT scanners has led to lower thresholds for imaging despite significant financial costs and radiation exposure. We hypothesized that this recent trend increased the use of CT for upper limb articular fractures and led to more frequent operative management.

Methods: A 5-year retrospective study (01/07/2005-30/06/2010) was performed on all adult patients with upper extremity articular fractures (AO: 1.1, 1.3, 2.1 and 2.3) admitted to a Level-1 Trauma Centre. Patients were identified from the institutions prospectively maintained AO classification database.

Results: A total of 1651 patients with 1735 upper extremity articular fractures were identified. 1131 (65%) fractures were operated on. 556 (32%) fractures had CT imaging, 429 (77%) of these had operative management. 289 (17%) patients had multiple injuries and 168 (10%) received a scan of at least 1 other body region.

There was a gradual increase in CT use and operative management 1.1, 1.3 and 2.1 fractures. Operation rates for 2.3 fractures unchanged but CT imaging frequency declined.

In patients younger than 55 years operative management remained stable at 71% throughout the 5-year period considering all four regions. Overall CT use was stable at 38%, however scan rates for distal radius decreased but for proximal forearm increased.

The operative management of patients older than 55 years has increased significantly from 56% in 2005, to 70% in 2010. The most marked increase was observed in proximal humerus fractures. Except for 2.3 fractures, CT rates showed similar but less pronounced increases.

Conclusions: There is no increase in CT usage and operative management in younger upper limb articular fracture patients. CT utilization is even decreasing in distal radius fractures. Older patients are less likely to get CT scanned but there is a significant increase in operative management of their upper limb articular fractures.
MINIMISING THE RISK OF FUTURE PERI-PROSTHETIC FEMORAL SHAFT FRACTURE, A BIOMECHANICAL STUDY

Introduction & Aim: When fixing a mid or distal periprosthetic femoral fracture with an existing hip replacement, creation of a stress-riser is a significant concern. Our aim was to identify the degree of overlap required to minimise the risk of future fracture between plate and stem.

Method: Each fixation scenario was tested using 4th generation composite femoral Sawbones®. Each sawbone was implanted with a collarless polished cemented stem with polymethyl methacrylate bone cement and cement restrictor. 4.5mm broad Peri-loc™ plates were positioned at positions ½, 1 and 2 shaft diameters (SD) proximal and distal to the tip of the femoral stem. Uni-axial strain gauges (medial and lateral longitudinal gauges, anterior and posterior torsional gauges) measured microstrain at tip of the femoral stem with a standard load of 500N in axial, 3-point lateral and composite torsion/posterior loading using an Instron machine.

Results: With axial loading fixation with 2SD proximal resulted in the least amount of strain, in both tension & compression, at the tip of the femoral stem. Fixation with 4 unicortical screws was significantly better than 2 alternating unicortical screws (mean microstrain difference 3.9 to 15.3, p<0.0001). With lateral 3-point loading fixation with 2SD proximal overlap and 2 alternating unicortical screws resulted in the least amount of strain, in both tension and compression, at the tip of the femoral stem (p<0.0001). With torsion & posterior displacement 2SD proximal fixation resulted in the least amount of rotational strain. There was no significant difference between 4 unicortical screws compared to 2 alternating unicortical screws (p>0.05 in 3 of 4 gauges).

Conclusion: Fixation of midshaft or distal femoral fractures with a well-fixed total hip arthroplasty should have at least 2 shaft diameters of proximal overlap with a 4.5mm broad plate. It is not clear if 4 unicortical screws or 2 alternating screws are optimal.
THE USE OF THE INVERTED FEMORAL LISS PLATE AS A METHOD FIXATION OF PERI-PROSTHETIC HIP FRACTURES

Vancouver B type peri-prosthetic hip fractures are increasingly common and represent a very complex and challenging problem in terms of management. Plate fixation has not always succeeded, and revision hip arthroplasty on a suboptimal trauma list can be a daunting prospect.

Our technique is to use the opposite sided distal femoral LISS plate, inserted from proximally to distally in an inverted manner. Vastus lateralis is elevated off the trochanteric ridge, and a small amount of bone is removed from the ridge to get the plate to sit snugly. The fracture is opened only enough to achieve reduction, and fixation with locking screws are placed percutaneously distal to the fracture. Bone grafting or cable fixation can also be applied at the fracture site.

20 consecutive patients with Vancouver B peri-prosthetic hip fractures were reviewed. The average patient age was 78 yrs. 14 fractures occurred in cemented and 6 in uncemented femoral stems. 12 fractures occurred in primary THR and 8 in bipolar hip hemiarthroplasty. Six were managed using the inverted LISS plate, 6 using other methods of fixation, and 8 with revision THR.

In terms of mortality at 12 months, there was no difference between the treatment arms, with 1 death in the LISS and other fixation group respectively and 0 deaths in the revision THR group. From a morbidity perspective there was no difference with respect to post-op medical complications, weight bearing status and length of hospital stay. There was, however, a difference between the inverted LISS plate group and other fixation methods group compared with the revision THR group in terms of average transfusion requirement (2 units and 3 units vs 8 units) and average operative time (80 mins and 100 mins vs 465 mins). 1 LISS plate failed in the 12 month period, with 1 Revision THR and 2 from the other fixation group.

This study suggests that it is a stable method of fixation, particularly in the type B1 and B2 subtypes. It may also be used in patients with multiple co-morbidities who cannot undergo a revision procedure and in patients who are minimally/non ambulant. In one patient, we used it to stabilize the fracture before progressing to a later, more controlled, revision hip replacement situation. LISS fixation has a short operative time, low transfusion requirement, low failure rate and is technically easier to perform than revision surgery.
NECK RECONSTRUCTION (AIIMS BOX TECHNIQUE): AN ANSWER TO LARGE FEMORAL NECK DEFECTS

Background: Large femoral neck defects pose a great challenge for orthopedic surgeons and are frequently associated with neglected femoral neck fractures, post infective sequale and failed implants around femoral neck. We present our technique (AIIMS Box Technique) of neck reconstruction aiming to preserve the natural femoral head and restoring the function of hip in cases of large femoral neck defects.

Material and Methods: A total number of 52 patients (age range 20 to 56 years with an average of 38 years) with large femoral neck defects were treated from January 1990 to May 1997 and were followed for a minimum of 10 years (range 10 to 17 years). Neck defect was converted into a box using osteal flaps (Base from greater trochanter, Anterior wall from head, Quadratus Femoris muscle pedicle graft posteriorly). This box was filled with cancellous bone autograft along with three cancellous screw fixation.

Results: Union occurred in all patients in a mean time of 16 weeks (range 12-20 weeks). One patient in our series had avascular necrosis (AVN) of femoral head. Eighteen out of 52 results were classified as excellent, 28 good and 6 fair. No patient had poor result. Good functional mobility including squatting was seen in all but two patients. Complications included coxa vara in two patients, hardware problems in four patients.

Conclusion: Our study shows that large femoral neck defects can be managed successfully with preservation of vascularity of femoral head. This procedure can be considered an alternative to excisional or replacement arthroplasty, particularly in young adults.
TREATMENT OF MASSIVE SEGMENTAL DEFECTS IN LONG BONE WITH RESORBABLE MEMBRANES AND BONE GRAFT

Introduction: Massive segmental bone defects in long bones remain a considerable clinical challenge and are a source for significant morbidity and prolonged dysfunction for the patient. We demonstrate the successful use of resorbable polylactide membranes as a scaffold for autologous bone graft in the treatment of a 10cm traumatic femoral bone defect.

Method: A 28-year-old male was involved in a motorcycle accident vs. tree at 140k/hr. He sustained a Gustillo grade 3b intercondylar fracture of his right femur, and a 10cm piece of his femoral bone found at the scene was brought to Emergency in a sterile container. He was taken to theatre for debridement and ORIF of the intercondylar fracture, with vacuum dressing cover. Day 5 post injury the patient returned to theatre and the LISS plate was revised to correct the rotation and 3cm shortening. The 10cm cortical defect now present was filled with antibiotic cement (Palacos) and delayed primary closure was performed.

Day 21 post injury the cement spacer was removed and replaced with two polylactide membrane tubes, one within the medullary canal and the other around the outside of the bone. The “neocortical” space thus produced was grafted with cancellous autograft mixed with bone morphogenic protein (OP1,Stryker). The remainder of the post-operative course was uncomplicated and the patient was discharged home 5 days later.

Result: The patient was reviewed at the 6 week and 3 month mark post injury. The femoral defect demonstrated both radiological and clinical union at the 3 month mark and full weight bearing was permitted. His range of motion at that stage was 5 to 95 degrees with no sign of infection.

Conclusion: The use of polylactide membranes as a scaffold in the treatment of segmental long bone defects is an excellent and relatively straightforward technique. Forming a space between the 2 tubes controls cancellous graft to the site of the cortical area where it is required and the polylactide membrane then resorbs over years producing CO2 and water. This case demonstrates that the use of polylactide membranes is safe and effective in the management of segmental long bone defects.

References:
THE HEALING OF CRITICAL SIZED SEGMENTAL DEFECTS IN AN OVINE MODEL

Introduction: Treatment of large segmental defects in the extremities is challenging. A segmental tibial defect model in a large animal can provide a basis through which in vivo testing of materials and techniques for use in non-unions and severe trauma cases can be examined.

This study reports such a model.

Methods: Six aged ewes (> 5 years) were used following ethical approval. A 5cm piece of the mid diaphysis of the left tibia was removed including its associated periosteum. The tibia was stabilized with an 8mm stainless steel cross locked intramedullary nail and all tissues closed in their respective layers. Animals were euthanised at 12 weeks following surgery and evaluated using radiographic, micro-computed tomography (micro CT), soft tissue and hard tissue histology techniques.

Results: Three weeks post operatively one of the intramedullary nails failed through the first of the distal two cross locking screw holes, the sheep was euthanised and the tibia was harvested. Early signs of callus formation were evident at the osteotomy edges originating from the periosteal surface; the defect space was bridged by fibrous scar tissue.

The remaining 5 sheep were taken out to the 12 week time point then all relevant tissues were harvested. Gross dissection revealed a lack of bony union in the defect site and no evidence of infection. X-rays and micro CT showed a lack of hard tissue callus bridging in the defect region at 12 weeks. Histological sections of the bridging tissues revealed, callus originating from both the periosteal and endosteal surfaces, with fibrous tissue completing the bridging in all instances. One case had cartilaginous tissue developing; however this was incomplete at 12 weeks.

Conclusion: As none of the 12 week time point sheep achieved clinical union; this model may be effective as a basis for the investigation of healing adjuncts to be used in non-union cases, where severe traumatic injury has lead to significant bone loss such as blast injuries or following large tumour removal.
IS ENERGY TRANSFER THE KEY TO DETERMINING THE SEVERITY OF BALLISTIC FRACTURES

Introduction: It has been proposed that the amount of energy transferred to the bone during a high velocity projectile injury determines the extent of bony injury. We studied the validity of this theory.

Methods: Fresh rear skeletally mature deer femurs were subjected to progressively increasing velocity projectile injuries within a pneumatic ballistic chamber with non-deforming steel spheres capturing the energy transferred. Analysis of fracture severity was performed including micro computer tomography analysis of micro-fractures. The effect of projectile caliber size was then analyzed.

Results: Characteristic fractures patterns were observed with fracture lines extending radially from the impact site, often propagating longitudinally along the sample.

It was found that a greater energy transfer resulted in more severe fracture for a given projectile. However, fractures of differing severity were produced by different projectiles for similar energy transfer. Neither specific energy transfer nor energy density could explain this phenomenon.

Conclusion: Although energy transfer plays a role in ballistic fracture, it is not the sole determinant. Other factors such as contact surface area, projectile mass and angle of impact may need to be considered.
ANTI-PSYCHOTIC MEDICATIONS: EFFECTS ON BONE MICRO-ARCHITECTURE

Increased risk of fracture and osteoporosis in schizophrenic patients may be multi-factorial, but direct skeletal toxicity of antipsychotic drugs is a factor that has not been thoroughly investigated.

This study examined the skeletal effects of anti-psychotic drugs in rats receiving a high fat diet, which may more accurately reflect the human situation.

Six week old male Sprague-Dawley rats were administered intravenous clozapine, quetiapine, haloperidol or vehicle once daily for a period of 42 days with access to only high fat diet and their weight was monitored regularly. At the end of the study the rats were killed and the tibiae excised and bone mineral density (BMD) measured with dual X-ray absorptiometry and bone architecture assessed with micro-computed tomography (micro-CT) and associated software. Results were subjected to one-way ANOVA and post hoc Dunnetts multiple comparison test.

All treatment groups were compared to control. There were no significant differences in body weight between the different groups at completion of the study. Clozapine treated animals alone showed a significant reduction in bone mineral density (p<0.05) however no differences were seen with haloperidol and quetiapine. Both haloperidol and quetiapine, but not clozapine, treatment showed a significant reduction in the bone to tissue volume ratio (BV/TV) by approximately 23% (p<0.05) and an increase in trabecular number (TbN) by approximately 21% (p<0.05). Trabecular bone architecture parameters for haloperidol and quetiapine, but not clozapine, showed more rod like and disconnected structure as reflected in the increases in structure model index (SMI) of around 15% (p<0.05) and trabecular pattern factor (TbPf) by 22% (p<0.05).

This data demonstrates that in rats receiving a high fat diet, haloperidol and quetiapine have an adverse effect on bone micro-architecture without significant change in whole body bone mineral density.

Clozapine did not affect bony architecture in a significant manner as reported in our earlier study, though bone mineral density was reduced. Reasons for the different effect of clozapine in this study are still uncertain but may be related to the significant weight loss seen at the end point of the previous study.

Causes for osteoporosis and increased fracture risk in schizophrenia may include smoking history, malnutrition, limited sun exposure and compliance.

Long term administration of both typical and atypical anti-psychotics may have a negative effect on bone and is a further factor that can influence this risk. An awareness of this relationship is useful in the orthopaedic management of schizophrenic patients.