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Dear Colleague,

Welcome to Edinburgh and to the 2011 meeting of the British Association of Spinal Surgeons. I hope your journey was enjoyable, and that you are ready for a few days away from the hassles of work to contribute to a lively event.

It is a great honour to host this event, particularly after the excellent Sheffield meeting, which led to the merging of the British Cervical Spine Society and the British Association of Spine Surgeons, crossing specialty boundaries.

For the first time, at this meeting, we have designed our ‘training afternoon’ to cater for all of us. This was as a result of our findings at Britspine when small numbers of experienced surgeons in the audience significantly added to the educational value of the afternoon. See whether you think it works, and let the Executive know if you would like to continue this format at Norwich 2013.

We received 108 abstracts, which were blindly scored by the Executive. We have divided these up into podium and poster presentations trying to allow as many folk as possible an opportunity to deliver their work. We felt some highly scoring papers were best displayed as short summary presentations, but please don’t presume this means that your new-style ‘poster’ will generate less discussion, or signifies that the message is of lesser importance. Indeed, we intend, for the first time, that all accepted abstracts will be published. To promote the highest standards at our meetings, there will be prizes for the best original work, best paper leading to change of practice and the best short communications.

No meeting can happen without the generosity of the trade sponsors. Take the opportunity to look at their new ideas and equipment and ensure that they get a return on their significant investment! Look out for the breakfast and lunchtime trade sessions.

We welcome our Guest speakers who have travelled from the Far East, Europe and the US. They have all made extensive contributions to our spinal literature and we hope that you both enjoy their contributions and make new friends.

Finally, particular thanks are due to Belinda Wiacek and staff at Archer Yates Associates, to the BASS executive and to Denise Bond our PA, for their contributions to setting up this meeting.

Enjoy your visit to ‘our Dynamic Earth’, Edinburgh.

Patrick Statham, Alastair Gibson
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Congress programme

WEDNESDAY 2ND FEBRUARY 2011

12:00 Registration and Trade Exhibition Open

Consultant and Trainee Workshops:

14:00 - 14:30 Endoscopic Disc Surgery – Technical Aspects and Case Presentations
– Mr Alastair Gibson, Dr Menno Iprenburg, Dr Tom Raley

14:30 - 15:00 Intrinsic Spinal Tumours / Vertebral Tumours
– Mr Tim Piggot, Mr Alistair Stirling

15:00 - 15:30 Approaches to the Thoracic Disc
– Mr Rodney Laing, Dr Michael Wang

15:30 - 16:00 Refreshment Break / Trade Exhibition

16:00 - 16:30 Cervical Myelopathy – How Do I Treat It?
– Mr Patrick Statham, Professor Chris Shaffrey

16:30 - 17:00 Spinal Fracture Case Forum
– Professor Douglas Wardlaw, Mr Tim Germon

17:00 - 19:00 BASS Executive Meeting

19:00 - 21:00 Welcome Reception - The Earthscape Galleries, Our Dynamic Earth
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<tr>
<td>07:00</td>
<td>Registration and Trade Exhibition Open</td>
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<tr>
<td>07:45</td>
<td>Orthovita Satellite Symposium - The Salisbury Suite</td>
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<td>The use of a Bioactive Synthetic Bone Graft in Spinal Fusion.</td>
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<td><em>Stuart Clarke - Orthovita. Dr Tom Raley moderating.</em></td>
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<td>8:30</td>
<td>Welcome – Mr P. Statham</td>
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<td>Free papers – Cervical Spine</td>
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<td><em>Chairmen: Mr Tim Piggott, Mr Rodney Laing</em></td>
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<td>09:45</td>
<td>Guest Lecture: Cochrane Review of Surgery for Cervical Myelopathy</td>
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<td>– Mr Ioannis Fouyas. Edinburgh</td>
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<td>– Professor Chris Shaffrey. University of Virginia</td>
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<td>WHAT ARE THE RESULTS OF A SECOND DISCECTOMY COMPARED TO A PRIMARY DISCECTOMY?</td>
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<td>DISCS MASQUERADING AS TUMOURS – A DIAGNOSTIC CHALLENGE</td>
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AN ASSOCIATION BETWEEN THE CENTER OF ROTATION AND CLINICAL OUTCOME IN PATIENTS IMPLANTED WITH A VISCOELASTIC TOTAL DISC REPLACEMENT

DEGENERATIVE SPONDYLOLISTHESIS: A 5 TO 10-YEAR FOLLOW-UP OF PROSPECTIVE COHORT STUDY OF 79 PATIENTS TREATED BY MINIMALLY INVASIVE POSTERIOR LUMBAR INTERBODY FUSION USING HOLLOW MODULAR ANCHORAGE SCREWS AND PEDICLE SCREW FIXATION

DECOMPRESSION AND POSTERIOR DYNAMIC FLEXION-RESTRICTING STABILISATION IN PATIENTS WITH DEGENERATIVE SPONDYLOLISTHESIS – A SAFETY AND EFFICACY STUDY

PROSPECTIVE SERIES OF CLINICAL OUTCOMES OF COFLEX INTERSPINOUS DEVICE WITH 2 YEAR FOLLOW-UP

FIVE YEAR FOLLOW-UP OF DYNEYSYS SOFT STABILISATION FOR DISCOGENIC BACK PAIN IN 113 PATIENTS

Introduction: Mr Patrick Statham

12:30 - 13:00 Guest Lecture: Minimally Invasive Spinal Surgery – Dr M. Wang. Jackson Memorial Hospital, Miami

13:00 - 14:00 Lunch, Trade Exhibition and Sponsored Symposia

13:15 - 13:45 Globus Medical Satellite Symposium - The Biosphere. Complex Revision Surgery. Mr David Harrison FRCS, Mr Paul Davies FRCS.


14:00 – 15:30 Summary Slide Presentations – Rooms 1, 2, 3, 4

Room 1: Lumbar Spine. Chairman: Mr Tony Reece
Room 2: Lumbar & Thoracic Spine. Chairman: Mr Daniel Chan
Room 3: Scoliosis / other. Chairman: Mr Robert Crawford
Room 4: Cervical Spine / other. Chairman: Mr Roger Strachan

15:30 – 15:50 Refreshment Break / Trade Exhibition

15:50 – 16:40 Free papers – Tumours

Chairmen: Mr Justin Nissen, Mr Ashley Cole

SPINAL CAVERNOMAS

OUTCOME FOLLOWING COMBINED TREATMENT FOR OSTEOSARCOMA OF THE SPINE

INCIDENCE AND RECURRENT IN VERTEBRAL ANEURYSMAL BONE CYSTS
THURSDAY 3RD FEBRUARY 2011 continued

SURGICAL MANAGEMENT OF SACRAL TUMOURS: A RETROSPECTIVE ANALYSIS OF THE EXPERIENCE OF THE ONCOLOGY AND SPINAL UNIT

METASTATIC TUMOURS OF THE LUMBO-SACRAL JUNCTION AND SACRAL SPINE

Introduction: Professor Douglas Wardlaw

16:40 - 17:10 Presidential Lecture:
– Dr Premanand Ramani. Lilavati Hospital, Mumbai

17:10 - 17:15 Research and Development:
– Dr Brigitte Lavoie, SBNS

17:15 - 18:45 BASS AGM

19:30 Pre-Dinner Drinks – The Signet Library

20:00 Formal Gala Dinner – The Signet Library
Speaker: Mr Scott Hastings
FRIDAY 4TH FEBRUARY 2011

08:15 – 08:45 Registration and Trade Exhibition Open

Introduction: Mr Alastair Gibson

09:00 – 09:25 Guest Lecture: Technique of Endoscopic Disc Surgery
– Dr Menno Iprenburg. Spine Clinic Iprenburg, Veenhuizen, NL

09:25 – 09:50 Guest Lecture: Endoscopic Disc Surgery the American Experience
– Dr Tom Raley. Arlington Virginia

09:50 – 10:15 Guest Lecture: Endoscopy for Stenosis
– Dr Ralf Wagner. Wirbelsaulenchirurg, Frankfurt am Main

10:15 – 10:30 Discussion

10:30 – 11:00 Refreshment Break / Trade Exhibition

11:00 – 12:00 Free papers – Kyphoplasty

Chairmen: Mr Ray Ross, Mr David Sharp

TIMESCALE OF LEG PAIN RELIEF AFTER SURGERY

EVALUATION OF PERIFACET INJECTIONS AND SPECIFIC LUMBAR MULTIFIDUS RETRAINING PROGRAM IN TREATMENT OF LOW BACK PAIN (A PROSPECTIVE RANDOMISED CONTROLLED TRIAL)

COMPARISON OF MORTALITY RISK IN OPERATED (VERTEBROPALSTY OR BALLOON KYPHOPLASTY) VERSUS NON-OPERATED PATIENTS: 410,965 VERTEBRAL FRACTURE PATIENTS OF THE US MEDICARE POPULATION

INTRODUCTION OF EGGSHELL TECHNIQUE MINIMISED THE INCIDENCE OF CEMENT LEAK DURING PERCUTANEOUS BALLOON KYPHOPLASTY PROCEDURES

DETECTION OF THORACOLUMBAR VERTEBRAL FRACTURES ON TRAUMA SERIES CT SCANS MISSED BY CLINICAL EXAMINATION

DOES POSTERIOR PEDICLE SCREW SUPPLEMENTATION WITHOUT POSTEROLATERAL FUSION IMPROVE ANTERIOR LUMBAR INTERBODY FUSION WHEN USING ANTERIOR CAGE AND SCREW CONSTRUCTS? – A RADIOLOGICAL STUDY
FRIDAY 4TH FEBRUARY 2011 continued

12:05 – 13:10 Free papers – Lumbar Degenerative Disease

Chairmen: Mr John Fowler, Mr John Powell

PERCUTANEOUS L5-S1 INTERBODY FUSION AXIALIF: - REPORT OF INITIAL EXPERIENCE AND PRELIMINARY RESULTS

A PROSPECTIVE COHORT OF PATIENTS WITH NEUROGENIC CLAUDICATION SECONDARY TO DEGENERATIVE SPONDYLOLISTHESIS MANAGED WITH A TECHNIQUE OF LUMBAR DECOMPRESSION VIA SPINOUS PROCESS OSTEOTOMY

DOES UNTREATED FORAMINAL STENOSIS COMPROMISE PATIENT OUTCOME FOLLOWING LUMBAR SPINAL DECOMPRESSION FOR SPINAL STENOSIS

COMPARISON OF STANDARD OPEN VERSUS PERCUTANEOUS (MANTIS) POSTERIOR STABILISATION OF THE THORACIC AND LUMBAR SPINE

DOSE RESPONSE AND STRUCTURAL INJURY IN THE DISABILITY OF SPINAL INJURY

THE LITIGATION BURDEN TO THE NHS FROM SPINAL INJURIES AND SURGERY: ANALYSIS OF 236 CONSECUTIVE CLOSED CLAIMS

13:05 Prizes and Closing remarks
   – Mr Alastair Gibson / Mr Patrick Statham

13:15 Lunch and Depart

Forthcoming meetings

13th - 15th March 2013
St. Andrew's and Blackfriar's Hall
Norwich, Norfolk
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Welcome Reception

Wednesday 2nd February from 19:00

*The Earthscape Galleries, Our Dynamic Earth*

Come and meet this year’s speakers and sponsors in a relaxed and informal setting at the Welcome Reception. Enjoy a glass of wine and a few canapés whilst exploring the amazing Earthscape Galleries of Our Dynamic Earth.

The Earthscape Galleries will transport you through time, and show you how the Earth began and how it has transformed into what we know it as today. The Galleries to be used include the Tropical Rainforest, Polar Regions, Oceans Gallery, and Pre-historic Casualties and Survivors gallery. With the rainforest noises and the icy chill of the Polar Regions, you’ll be so captivated and absorbed in your surroundings, it will feel like you’ve stepped back in time and travelled half way around the world all without leaving Edinburgh!

This is a complimentary event, and all delegates and sponsors are welcome. If you haven’t already booked your place, please visit the registration desk and confirm your attendance.

Gala Dinner

Thursday 3rd February from 19:30

*The Signet Library, Parliament Square, Edinburgh, EH1 1RF*

The Signet Library is located in the centre of Edinburgh’s old town and is synonymous with prestige and Georgian elegance. The libraries were completed in 1822, in celebration of the King George IV’s visit to Edinburgh, and he once described the upper library as “the finest drawing room in Europe”. The Signet Library is owned by The Society of Writers to Her Majesty’s Signet - an association of Scottish lawyers.

This is a formal dinner (black tie or highland dress) with pre-dinner drinks reception from 19:30 and dinner being served at 20:00. The night will be one to remember, with guest speaker Scott Hastings – former Scotland and Lions international rugby player.

Tickets are priced at £75 + VAT per head and are limited to one ticket per person. Tickets for the dinner are sold on a first come first served basis, and are subject to availability. If you haven’t already booked your ticket, please visit the registration desk and check availability.
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25. DePuy Spine
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29. European Spine Society
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Don’t forget we will be running a symposium on Thursday 3rd February about “The use of a bioactive synthetic bone graft in spinal fusion” from 7.45am to 8.15am in the Salisbury Suite.
Abstracts from Podium Presentations

Cervical Spine
Thoracic & Lumbar Disc
Tumours
Kyphoplasty
Lumbar Degenerative Disease
TRENDS IN SPORTS RELATED SPINAL INJURIES IN SCOTLAND
Queen Elizabeth National Spinal Injuries Unit, Southern General Hospital, Glasgow, G51 4TF, United Kingdom

Spinal cord injury is an inevitable but rare occurrence in sports. Identifying trends and working to minimise risk is an integral part of sports management. All patients suffering a spinal cord injury in Scotland will be transferred to the Queen Elizabeth National Spinal Injuries Unit (QENSIU). Our records give an accurate account of trends in spinal cord injury. This study details the number of spinal cord injuries caused by sports and leisure pursuits in Scotland since 1992.

1451 patients have suffered a spinal cord injury in Scotland from 1992-2008. 142 (9.8%) arose from injuries during sport. The average age at injury was 32, and patients were predominantly male (91%). The commonest cause was diving (40, 28%) followed by cycling (29, 20%) climbing and hillwalking (15, 11%) and rugby union (12, 8%). Smaller numbers were seen in horse-riding (11), aerial sports (6), motor sports (6), snow sports (5), and football (5). Overall, there was evidence of an increasing trend in the number and severity of injuries in rugby and cycling.

The number of spinal injuries, caused by diving, rugby and cycling remains disproportionally high and the increasing trends identified merit further investigation.

CERVICAL SPINE INJURIES IN PATIENTS WITH ANKYLOSING SPONDYLITIS
Mathieson C, Jigajinni MV, McLean AN, Purcell M, Fraser MH, Allan DB, Brown J, Alakandy LM
Queen Elizabeth National Spinal Injuries Unit, Glasgow

Purpose: Patients with ankylosing spondylitis (AS) are vulnerable to cervical spine injury following relatively minor trauma. The authors present a retrospective review to determine the characteristics, treatment and outcome following cervical spine injury in these patients.

Methods: Retrospective analysis of case notes and images of patients with AS admitted to the Spinal Injury Unit over a 10-year period.

Results: Thirty-nine patients were identified. Records were available for 31 patients at the time of this analysis. The median age was 62 years (range 37-84). The male:female ratio was 7:1. Mechanisms of injury included falls (72%) and RTAs (7%), while 14% were unable to recall an injury. Alcohol was involved in 20% of the cases.

Fracture through an ankylosed disc in the mid to low cervical spine was the commonest injury. Concomitant non-contiguous bony injury was seen in 2 patients. More than half (55%) were Grade E on ASIA impairment scale (AIS), while 14% were Grade A and 31% Grade D. Two patients required skull traction. Most patients were successfully treated by external immobilisation. Halo crown and jacket was the most common orthosis used. Twelve patients underwent surgical stabilisation. The mean duration of external immobilisation in the non-surgical group was 13 weeks (range 10-32), whereas following surgery it was 6 weeks (range 2-8). Adequate radiological evidence of fusion was seen in all 22 patients for whom this information was available at a median of 22 weeks (range 12-32). Patients with AIS Grade A and E were unchanged at discharge, while 4 patients in AIS Grade D improved to E.

Conclusion: External immobilisation with halo in an effective first-line therapy in achieving fusion and stability. Surgical stabilisation can be reserved as a second-line treatment.
CLINICAL AND RADIOGRAPHIC OUTCOMES ON A SERIES OF 249 PATIENTS TREATED WITH SINGLE AND MULTILEVEL CERVICAL DISC REPLACEMENT AT 2-YEAR FOLLOW UP


1 Hopital Cantonal de Fribourg, Switzerland, 2 CHU Hopital Nord, Marseille, France, 3 Clinique du Parc Leopold, Bruxelles, Belgium, 4 Hospital Clinico Universitario de Valladolid, Valladolid, Spain, 5 Hopital Pasteur, Colmar, France, 6 Hopital Cantonal de Fribourg, Fribourg, Switzerland, 7 Clinique Saint Paul, Fort de France, France, 8 Clinique Saint Joseph, Liege, Belgium, 9 AHEPA University Hospital, Thessaloniki, Greece, 10 Hospital General de Mallorca, Palma de Mallorca, Spain

Purpose of the study: To compare safety and efficacy of cervical disc replacement (CRD) in single and multilevel DDD. Patients were followed up at 1, 3, 6, 12 and 24 months.

Methods: 249 patients were enrolled. 171 patients were treated at 1-level, 41 treated at 2 levels and 2 patients were treated at 3 levels. Implant was also used adjacent to a fusion with a cage in 35 patients. The diagnosis was cervical degenerative disc disease between C3 and C7 with symptomatic DH. Population was 106 male 143 female, average age 46 (25-71). Clinical assessment included VAS scores for arm and neck pain and Neck Disability Index (NDI). Range of motion (ROM) from flexion/extension lateral view were measured.

Results: Of all NDI scores recorded, 86,50 % demonstrated at least 15 points improvement at two years follow up from pre-op scores. 85,1% of VAS arm Pain scores demonstrated an improvement by ≥ 2 points from pre-op scores and 50,8% for VAS neck Pain scores. The breakdown by levels and adjacent to an interbody cage shown that 80% of reported NDI scores demonstrated at least a 15 point improvement post operatively for two level disc replacement. 82,4% demonstrated a greater than 2 points improvement in VAS arm pain and 53,3% for VAS neck pain. For patients that received both implant and an interbody cage, 72,7% demonstrated a greater than 2 point improvement in VAS arm pain and 41,7% for VAS neck pain. Three (1,8%) cases of subsidence and 4 cases of implant loosening/displacement due to inappropriate sizing were reported. Available radiographic findings show on average a ROM of 8,2° at 2 years and an overall change in cervical lordosis of 5° from pre-op.

Conclusion: Clinical outcomes demonstrated a significant improvement for both the total population (n=249) and for the single level total disc replacement population (n=171). Given these outstanding results single and multilevel TDR with this implant can be considered to be safe. No significant difference was observed between single and multilevel TDR groups regarding clinical, functional and radiological results. Follow up for this series need however to be extended for up to 5 years at least. The role of this implant in multilevel cases as well as in cases to a fused level still need further evaluation although these preliminary results are encouraging.
ANATOMICAL FEASIBILITY OF PEDIATRIC CERVICAL PEDICLE SCREW INSERTION BY COMPUTERISED TOMOGRAPHIC MORPHOMETRIC EVALUATION OF 376 PEDIATRIC CERVICAL PEDICLES

RM Kanna, AP Shetty, S Rajasekaran
Ganga Hospital, Coimbatore, India

Study Design: Prospective analysis of computerised tomogram images of 376 normal pediatric cervical pedicles

Objectives & Summary of Background Data: Although the usage of cervical pedicle screws (CPS) in adults has become established, the feasibility of its application in children has not been studied. There are no in-vivo studies that define the normal pediatric cervical pedicle morphometrics and its changes with growth and development of the child.

Methods: 376 normal pediatric cervical spine pedicles of thirty children (mean age of 6.7 ± 3.9) were analysed for: pedicle width (PW), pedicle height (PH), pedicle length (PL), pedicle axis length (PAL), transverse pedicle angle (TPA) and sagittal pedicle angle (SPA). The study population was categorised into three age groups (A: < 5, B: 5 – 10 and C > 10). The mean values of these parameters in the different age groups and the possibility of application pedicle screws was studied.

Results: The mean PW was lowest in the C3 vertebra and increased distally to be widest at C7. 60% of C3 pedicles had a width less than 4 mm making screw passage risky and unsafe. With growth, the PW increased at all levels but this increase was significant only up to the age of 10 years. More than 75% of adult pedicle dimensions were achieved by 5 years of age. The mean PL at all levels remained the same with no significant increase with growth. However, the PAL showed continuous increase with growth similar to pedicle width. The PAL also showed an increase from C3 to C7. The PH was always more than the PW at any level. Mild insignificant asymmetry was present between the right and left side pedicles in all values.

Conclusion: With growth, there was a gradual increase in pedicle width, pedicle height and pedicle axis length but was mainly before the age of 10. Except the C3 pedicles the pedicle morphometrics per se were adequate and do not restrict safe application of 3 mm pedicle screws.

A 3D MOTION ANALYSIS STUDY COMPARING THE EFFECTIVENESS OF CERVICAL SPINE ORTHOSES AT RESTRICTING PHYSIOLOGICAL RANGE OF MOVEMENT

N Evans1, G Hooper1, R Edwards2, G Whatling2, V Sparkes2, C Holt2 and S Ahuja2
1Cardiff School of Engineering, Cardiff University, 2Cardiff School of Healthcare Studies, Cardiff University,
3Cardiff Spinal Unit, University Hospital of Wales, Cardiff

Objective: To compare the effectiveness of the Aspen, Aspen Vista, Philadelphia, Miami-J and Miami-J Advanced collars at restricting cervical spine movement in the sagittal, coronal and axial planes.

Methods: Nineteen healthy volunteers (12 female, 7 male) were recruited to the study. Collars were fitted by an approved physiotherapist. Eight ProReflex (Qualisys, Sweden) infra-red cameras were used to track the movement of retro reflective marker clusters placed in predetermined positions on the head and trunk. 3D kinematic data was collected during forward flexion, extension, lateral bending and axial rotation from uncollared and collared subjects. The physiological range of motion in the three planes was analysed using the Qualisys Track Manager system.

Results: The Aspen and Philadelphia collars were found to be significantly more effective at restricting movement in the sagittal plane compared to the Vista (p<0.001), Miami-J (p<0.001 and p<0.001) and Miami-J Advanced (p<0.01 and p<0.05) collars. The Aspen collar was significantly more effective at restricting axial rotation than the Vista (p<0.001) and the Miami-J (p<0.05) collars. The Aspen, Philadelphia, Miami-J and Miami-J Advanced collars were comparable at restricting lateral bending but the Vista was significantly less effective than all the collars at restricting movement in this plane.

Conclusion: The Aspen collar was found to be superior to the other collars when measuring restriction of movement of the cervical spine in all planes, particularly the sagittal and transverse planes, while the Aspen Vista was the least effective collar.
**THE INFLUENCE OF PSYCHOSOCIAL FACTORS ON CLINICAL OUTCOME MEASURES FOLLOWING CERVICAL DISC REPLACEMENT**

*R Tararu, S Lakkol, S Aranganathan, C K Bhatia, G Reddy, T Friesem
University Hospital of North Tees, UK*

**Introduction:** This study aims to evaluate the impact of associated psychological co-morbidities (Depression/Anxiety), smoking history, gender, work benefits and employment status on the clinical outcome following anterior cervical disc replacement (ACDR).

**Materials & Methods:** We included in our study 100 patients who underwent ACDR in our Spinal Unit (between May 2006 – May 2010). We used as clinical outcome measures: Visual Analogue Score for neck pain (VAS-NP) and arm pain (VAS-AP), Neck Disability Index (NDI) and Bodily Pain (SF36-BP) component of the Short Form 36 questionnaire. Statistics were obtained using SPSS 16.0 for Windows (SPSS Inc, Chicago, IL). Independent sample t-test for normally distributed data and Man-Whitney U test for non-parametric data were used. Statistical significance was designated at p < 0.05.

**Results:** There were 48 males and 52 females. Average age at operation was 52.96 years (Range 38-80) for males and 49.79 years (Range 31-71) for females. Average duration of follow up was 14.4 months (Range 6-35). Out of 100 patients, 28 patients had a history of anxiety/depression, 19 patients were smokers, 47 were actively working and 23 were receiving work benefits. We found that gender, smoking status, associated co-morbidities, working and benefit status had no statistically significant contribution to clinical outcome measures in the follow up period. For example, in the sub-group of non-smokers versus smokers, there was no significant difference in NDI (p=0.78), VAS-AP (p=0.12), SF-BP (p= 0.83) and VAS-NP (p=0.08).

**Conclusion:** We conclude that in our study there was no statistically significant contribution of the associated psychosocial factors on the clinical outcomes following ACDR.
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WHAT ARE THE RESULTS OF A SECOND DISCECTOMY COMPARED TO A PRIMARY DISCECTOMY?

M S Patel, J Braybrooke, M Newey, P Sell
Leicester General Hospital

Aim: To compare outcomes of revision lumbar discectomy to primary surgery in the same patient cohort.

Methods: Prospective outcome data in 36 patients who underwent primary and subsequent revision surgery for lumbar disc herniation between 1995 and 2009. Outcome measures used were Visual Analogue Scores for back (VAB) and leg pain (VAL), the Oswestry Disability Index (ODI) and Low Back Outcome Score (LBO). 5 early recurrences within 3 months were excluded.

Results: Complete data was available in 31 patients 13F;18M. The average age was 39 years at index and 45 years at revision. Average interval between surgery of 39 months (range 6-122). Mean Pre op ODI 54 and VAL 73 primary procedure, final follow up of primary procedure ODI 33, VAL 43; prior to revision ODI 57, VAL 75; at last FU ODI 32 and VAL 40. There was no statistical difference between outcomes. In the primary discectomy group there was a statistically significant improvement in the VAL, ODI and LBO scores (P<0.05), with no significant improvement in the VAB (P=0.67). In the revision group there was a statistical significant improvement in all the outcomes (P<0.05). Overall, 45% of patients felt their outcome from revision discectomy was better/much better with 54% of patients rating their treatment as either good/excellent.

Conclusion: Primary discectomy produced significant improvement in leg pain, ODI and LBO. Revision discectomy did the same, but also a significant improvement in VAB scores. There was no statistically significant difference in comparing the preoperative and postoperative scores for both procedures. Revision discectomy is a procedure which yields clinically significant and patient perceived improvements in spinal outcome measures with an unexplained improvement in VAB scores as compared to the primary procedure. This may challenge the belief of some surgeons in the need for fusion at the time of revision.

RETROPLEURAL TRANSTHORACIC APPROACH FOR GIANT THORACIC DISCS PROLAPSE.


Object. Giant thoracic discs (occupying more than 40% of the spinal canal) are a difficult surgical pathology. They are increasingly being recognized as or particular subset of thoracic disc pathology. It has been recommended that an aggressive surgical approach of open 2 level verteberectomy and instruments should be utilized. However Retropleural thoracotomy provides the shortest direct route to the anterior thoracic spine and avoids pleural cavity entry making it an ideal if infrequently used approach to access ventral thoracic and thoracolumbar spine abnormalities. We present a detailed description of our experience utilising this approach, for the treatment of Giant Thoracic discs without the need for vertebrectomy or instrumentation.

Methods. A prospective cohort of patients with Giant thoracic discs operated on utilizing the mini open retropleural thoracotomy technique was used, intra-operative and post-operative complications and length of post-op stay. Functional outcome and pain scores, were also prospectively recorded using SF-36, Oswestry Disability Index (ODI), and visual analogue pain scores (VAS).

Results. 17 patients underwent a retropleural thoracotomy for Giant thoracic disc between 2001 and 2010. There were 8 male and 9 female patients with a median age of 50 years (range 35 – 70). The surgical level was T8/9 (58%) followed by T10/11 (33%) and finally T11/12 (8%). 1 patient had redo surgery following a failed primary discectomy at another institution. The mean post-operative length of stay was 12.8 days. Intra-operative complications included 5 pleural tears during the approach. Chest drain was placed post-op in one patient. The tears were primarily repaired and the approach did not have to be abandoned. 2 patients had an intra-operative CSF leak (1 had intradural disc erosion). Post-operative complications included 1 pleural effusion, 1 patient had pneumonia and a PE, 1 patient died from an unrelated respiratory tract infection of the lung (opposite to the side of the approach) 40 days after surgery.

Conclusion. Large calcified thoracic disc herniations can be a very challenging pathology. The retropleural transthoracic approach can be employed safely in this setting with acceptable morbidity for the patient.
Surgical Management of Giant Thoracic Discs with Mini Thoracotomy

G Balamurali, M Konig, B Boszczyk
Centre for Spinal studies and Surgery, Queens Medical Centre, Nottingham.

Aim: A retrospective review of the management of giant thoracic discs and report of their outcomes.

Method: Giant thoracic disc have been defined as disc compressing more than 60% of the canal diameter. Although discectomy may lead to improvement of clinical symptoms it can be complicated by approach related morbidity especially when discs are calcified. Between 2007 and 2010 there were a total of 7 patients treated with a giant thoracic disc. A retrospective review of demographic data, symptoms, details of surgery, pre and post operative radiology, pre and postoperative Nurick scores, ODI and pain score, length of stay, complications and follow-up data were collected in all patients.

Results: The average duration of symptoms was 8.5 months with a mean age of 58 years. Six patients (85%) presented with myelopathy, difficulty in walking and motor weakness. Discs were located at T5/6-2, T7/8-1, T8/9-1, T9/10-2 and T10/11-1 levels. Four (58%) discs were calcified and 3 (42%) were adherent to the dura. The average disc encroachment into the spinal canal was 81% (range: 67%-92%). All patients had a right mini thoracotomy and none of the patients were instrumented. All patients were followed up for a minimal of 24 months (range: 18 to 36 months). Improved Nurick, pain and ODI scores were seen in all patients. Average duration of stay was 4 days (range: 3-9 days). Only one patient had a dural leak and pseudo-meningocele with a calcified adherent disc. Successful dural reconstruction was done in 2 more patients with calcified disc. Two patients had post-operative thoracotomy pain needing pain management. No clinical deterioration was seen in any of the patients and all patients improved in their motor power and myelopathy.

Conclusions: Mini-thoracotomy for treatment of giant thoracic disc herniations is associated with improvement of motor power and myelopathic symptoms with an acceptable rate of complications. Experienced team and careful surgical planning leads to success. For a single level surgery no instrumentation is required as suggested in most series.

Figure 1: Calcified (A) disc with almost 90% canal encroachment (B&C) seen. Post operative pictures showing CSF signal around the cord (D) with no compression and a right thoracotomy approach (E).
ABSTRACTS

Podium presentations

Thursday 11:00 - 12:30
Thoracic & Lumbar Disc

DISCS MASQUERADING AS TUMOURS – A DIAGNOSTIC CHALLENGE

DS Jeyaretna, W Adams, T Germon
Southwest Neurosurgery Centre, Derriford Hospital, Plymouth.

Purpose: Distinguishing between sequestered disc fragments and tumours remains a diagnostic challenge, but one of paramount importance given the surgical management of these two clinical entities varies dramatically.

Methods: Our experience over the last 3 years in managing this clinical challenge was analyzed. Patients referred to the regional neurosurgical unit for evaluation of possible spinal tumours whose imaging and clinical findings were atypical, were prospectively identified and the medical notes, operative records and MR imaging reviewed.

Results: This is the single largest series of patients presenting as tumors that were later determined to be sequestered disc fragments. 17 patients (8 female and 9 male) were identified. The median age was 54 years (range 35-77) and the mean follow up time 20 months. The most common location (16/17) for discs mimicking tumours in our series was in the lumbar spine. The major differential diagnosis was of nerve sheath tumours, followed by metastasis. The signal characteristics of the lesions and contrast enhancement were variable. 35% of patients had the lesion surgically excised and the diagnosis of intervertebral disc made intraoperatively or on histology. The remainder were monitored clinically and with MR imaging, and required no surgical intervention in the follow up period. The features that favoured a diagnosis of disc rather than tumour included a rapid onset of symptoms and abatement of pain with time. Radiologically, sequestered disc was more likely if the lesion demonstrated contiguity with the disc space, the presence of other degenerate discs, no foraminal exit widening, and the absence of central enhancement.

Conclusion: Urgent surgery is not mandatory and in our series a “watch and wait” approach was utilized safely. When atypical clinical and imaging findings are present in patients referred for management of spinal tumours, sequestered disc fragments should be considered as a possibility.

AN ASSOCIATION BETWEEN THE CENTER OF ROTATION AND CLINICAL OUTCOME IN PATIENTS IMPLANTED WITH A VISCOELASTIC TOTAL DISC REPLACEMENT

M Newton Ede1, E R S Ross1, B Rischke2, B Joellenbeck3, J Hipp4, K Zimmers5
1Spire Hospital, Manchester, England, 2Center of Orthopaedic and Spine Surgery, Spine-Center-Rischke, Zurich, Switzerland, 3Otto-Von-Guericke University, Magdeburg, Germany, 4Medical Metrics, Inc., Houston, TX, 5AxioMed Spine Corp., Garfield Heights, OH

Purpose: To determine if clinical outcomes are correlated with center of rotation (COR) in patients implanted with a viscoelastic total disc replacement (VTDR).

Methods: Fifty patients with single-level, symptomatic lumbar DDD between L4 and S1 were enrolled in a clinical trial of a VTDR across three surgical centres. A comprehensive, independent review and statistical analysis of both clinical and radiographic outcomes was performed and analyzed for correlations. Data from preoperative through 2 years were available. The COR was calculated for the index levels and compared to data for an asymptomatic population. Each COR coordinate was classified as abnormal if outside of the 95% confidence interval for an asymptomatic population. Each COR coordinate was classified as abnormal if outside of the 95% confidence interval for an asymptomatic population. Each COR coordinate was classified as abnormal if outside of the 95% confidence interval for an asymptomatic population.

Results: At most recent follow-up, 69% of the patients had achieved at least a 15 point Oswestry Disability Index (ODI) improvement. 76% of the patients achieved at least a 10 point improvement. At most recent follow-up, 78% of cases had a normal COR-X and 92% had a normal COR-Y. Results from three statistical tests show the association between COR-X and outcomes. 1) Based on latest available time point for each patient, the improvement in ODI score was significantly better for patients with a normal anterior-posterior (AP) coordinate of the COR (P=0.03). 2) Anterior COR corresponded with anterior placement of the device in the disc space, and patients were almost 7 times less likely to achieve at least a 15 point improvement in the ODI score if the COR was positioned too anteriorly. 3) This effect was also seen in the average AP coordinate of the COR for patients who achieved a 15 point ODI improvement.

Conclusions: A viscoelastic TDR can restore a normal COR. This is the first study to show that restoration of a normal COR correlates with a significant and clinically relevant improvement in patient disability.
DEGENERATIVE Spondylolisthesis: A 5 to 10-Year Follow-Up of Prospective Cohort Study of 79 Patients Treated by Minimally Invasive Posterior Lumbar Interbody Fusion Using Hollow Modular Anchorage Screws and Pedicle Screw Fixation.

E Fawzy, E Harrison, S Lyle, M Mueller, J Shepperd.
Conquest Hospital, Hastings

Introduction: We report the outcomes of minimally invasive technique for posterior lumbar interbody fusion (PLIF) procedure using Hollow Modular Anchorage (HMA) screws supplemented by routine pedicle screw fixation (Dynesys).

Patients and Methods: Seventy-nine patients, who had undergone PLIF procedure using HMA screws supplemented by pedicle screw fixation, were included. Patients deemed suitable for surgery following discography under sedation, with Marcaine instillation establishing reducibility of the listhesis and temporary relief of symptoms. Clinical outcome included visual analogue scale scores for leg pain and back pain, Oswestry Disability Index (ODI) and SF-36 questionnaires.

Results: Average age was 59 (range: 27-85). Mean follow-up was 5 years (range: 1-10). All cases went into union. None were lost to follow-up. Average length of stay was 24 hours (18-72 hours). All clinical parameters improved except SF-36. Mean ODI improved from 54 (range: 44-89) preoperatively to 33 (17-55) postoperatively (statistically significant, p=0.004). Back pain relief improved in visual analogue scale from average of 68 (range: 60-100) preoperatively to 37 postoperatively (range: 8:46) (statistically significant, p= 0.022). Leg pain relief improved from 53 (range: 31-100) preoperatively to 28 postoperatively (range: 4:60) (statistically significant, p= 0.007). Although mean SF-36 score improved from 37 (range: 10-41) preoperatively to 47 (range: 53-94) postoperatively (statistically insignificant, p=0.592). Complications included: one infection required removal of implant; two temporary motor weaknesses related to L5 nerve root; four required removal of the pedicle screw due to pain or loosening.

Discussion: Our results are encouraging. Interbody HMA screws are porous hollow titanium screws with favourable biomechanical characteristics. Rather than square cages, they permit accurate placement of implant. Dynesys offers the option of extension and flexible support for the adjacent segment.

Conclusion: PLIF supplemented with pedicle fixation is a reliable and safe procedure for degenerative spondylolisthesis. SF-36 is less sensitive for assessing spinal surgery outcome.
DECOMPRESSION AND POSTERIOR DYNAMIC FLEXION-RESTRICTING STABILISATION IN PATIENTS WITH DEGENERATIVE SPONDYLOLISTHESIS – A SAFETY AND EFFICACY STUDY.

JNA Gibson, C Beadle, I Ahmed
The Royal Infirmary and University of Edinburgh, Little France, Edinburgh EH16 4SU

Background: Degenerative spondylolisthesis (DS) with stenosis is now typically treated by decompression and instrumented fusion. This treatment method does produce predictable results at the spondylolisthetic level, but later stenosis will occur commonly at the adjacent level due to the rigidity of the construct. Pedicle screw fusion may also be a significantly invasive procedure for an elderly patient.

Aim: To evaluate the clinical potential of a new, non-screw based, posterior dynamic flexion-restricting stabilization system (FRSS).

Method: 17 patients (15f, 2m; mean age 68 (45-78yr)) presenting with leg pain, with or without low back pain, and MR evidence of spinal stenosis with DS were treated by uni- or bilateral laminotomy and FRSS. Microdiscectomy was performed for one patient with a concomitant disc prolapse. The FRSS was placed at L4/5 in 13 patients and at L3/4 in four.

Results: Follow up data was available for 12 patients at 3 months and 9 patients at 6 months. At 3 months the mean pain scores (VAS) for both back and leg pain (p<0.05) and ODI (>10 point) had improved and 82% were satisfied. Three patients had adverse events unrelated to the device or procedure. At 6 months the improvements were maintained in 8 patients. One complained of transient leg neuralgia (78% overall group satisfaction). There was no evidence of vertebral translation on flexion radiography. Mean blood loss at surgery was 220ml (50-1400ml) and instrumentation time 23min (10-54min).

Discussion & Conclusion: Early data demonstrates good clinical outcomes in patients with DS treated with decompression and FRSS. Further follow up is necessary to evaluate whether stabilization with the FRSS can help to maintain the benefits of decompression over the longer-term.

PROSPECTIVE SERIES OF CLINICAL OUTCOMES OF COFLEX INTERSPINOUS DEVICE WITH 2 YEAR FOLLOW-UP

Mr. F. Altaf, Mr. C. Natali, Mr. A. Sivaraman.
Royal London Hospital

To evaluate the coflex dynamic interspinous device in clinical practice.

The sample population consisted of 34 patients with a diagnosis of single or two level lumbar spinal stenosis, predominantly lateral recess rather than central canal stenosis. Many of the patients had associated cardiovascular comorbidities. The diagnosis of spinal stenosis was confirmed on MRI. All patients had preoperative standing AP and lateral radiographs to evaluate for instability. The mean age of patients was 52 years. The patients had no previous surgery. Implantation was at L3/4 and L4/5 levels. The surgical implantation of the Coflex interspinous process device was performed using a midline posterior approach. All surgery was performed by the same two surgeons.

The outcome measures were recorded pre-operatively and at 6 weeks, 12 months and 24 months after surgery. Outcome measures included VAS and Oswestry Disability Index scoring and radiographs. All assessments were made prospectively. All complications were recorded.

The mean pre-operative ODI was 63% which improved significantly post-operatively to 23%. The mean pre-operative VAS for back pain was 8.8 which improved post-operatively to a mean of 2.4. The mean pre-operative VAS for leg pain was 7.8 which improved to a post-operative mean of 2.2. Eight out of the 34 patients had a non-significant improvement of symptoms as measured per ODI and VAS score measurements. There was one superficial wound infection which was treated successfully with a course of oral antibiotics. One patient had subluxation of the implant requiring revision. 2 patients had progression of central canal stenosis requiring intervention.

This study shows that the Coflex interspinous device was effective in the management of spinal stenosis particularly in patients with facetal arthritis and lateral recess stenosis. This procedure can produce a significant improvement in both back and leg pain symptoms in patients with one or two level spinal stenosis, with improvement of symptoms up to 2 years. The patients had a short length of stay in hospital and minimal blood loss. Despite its successes we also found that 24% of patients in our series had non-statistically significant improvements in clinical symptoms.
FIVE YEAR FOLLOW-UP OF DYNEYS SOFT STABILISATION FOR DISCOGENIC BACK PAIN IN 113 PATIENTS

S. Lau, M. Muller, A. Latiff, J. Shepperd
Department of Orthopaedics, Conquest Hospital, Hastings.

**Purpose of Study:** To review the medium-term results of the Dynesys stabilisation system used in 113 consecutive patients with discogenic back pain.

**Methods and Results:** 113 consecutive patients with discogenic back pain were treated with Dynesys as the sole intervention. Inclusion criteria included MRI proven disc degeneration and an improvement in symptoms following an injection into the disc with local anaesthetic and steroid (spinal disc probing). Patients were followed up for a minimum of 5 years, with outcome measures including SF-36, Oswestry disability index (ODI) and visual pain analogue scores (VPAS). Additional factors reviewed included previous spinal operations, complications, loosening and revision rates with subsequent outcomes. Mean pre-operative ODI was 49.5, SF-36 was 37.6 and VPAS back pain was 60.9. At one year postoperatively, these scores were 36.9, 49.4 and 39.8, at five years follow up, the scores were 33.3, 51.8 and 40.1 respectively. We note wide variations in our results. Several significant factors appear to contribute to the outcome of surgery. These include undergoing surgery before the age of 43, no more than 2-level disc degeneration, leg pain less than VPAS 4, and no previous spinal surgery.

19 patients had screw loosening evident on plain film x-rays (4 requiring removal), and 2 patients had screw breakages. 19 patients had implant removal for failure and 2 patients went on to have a fusion procedure.

**Discussion:** Dynesys has a role in the treatment of discogenic back pain. Patient selection is important to outcome and we have identified several pre-operative factors that increase the likelihood of success. The effects are present at 1 year postoperatively and are maintained for at least 5 years. There is a significant screw loosening rate and our series had a 17% revision rate.
SPINAL CAVERNOMAS
P. S. Ramani, S. Maheshwari
Department of Neurospinal surgery, Lilavati Hospital and Research Centre, Mumbai, India

Background: Cavernoma is a benign, cranial vascular hematoma. Spinal cavernomas occur most commonly in vertebrae and may extend into the extradural spinal canal. Intramedullary lesions are rare.

Aim: To study the pattern of clinical presentation and to evaluate their outcome with surgical and conservative management.

Material and methods: Fourteen cases of intramedullary cavernous malformations were retrospectively reviewed. M/F ratio was 6/8. Age ranged from 35 to 62 years. Thoracic spinal cord was involved in 8, cervical cord in 4 and lumbar region in 2. Nine underwent surgery and 5 were managed conservatively. Clinical, radiological and management features are discussed in the light of the follow-up and literature analysis.

Results: Among the operated patients 6 improved, 3 patients improved but had residual deficits with no improvement in bladder symptoms in one. Patients who were managed conservatively improved over a period of 3 months to 1 year with one patient having residual weakness.

Conclusion: Total surgical resection using microsurgical technique is a procedure of choice for the management of symptomatic intramedullary cavernomas. Clinical observation should be the choice of management for patients without new or progressive neurological deficits. Generally the outlook is good.

OUTCOME FOLLOWING COMBINED TREATMENT FOR OSTEOSARCOMA OF THE SPINE
H Sharma, R Reid, AT Reece
Department of Orthopaedic Surgery, Western Infirmary, Glasgow G11 6NT

Introduction: Spinal osteosarcomas are quite rare and the optimal treatment strategy is unknown. We report a series of 9 cases of osteosarcoma of the spine treated with intralesional resection and adjuvant combination therapy in order to evaluate their clinico-pathological correlation, recurrence rate and survival.

Materials and method: Between 1980 and 2009, nine histologically confirmed cases of primary conventional osteogenic sarcoma of the spine were identified from Scottish Bone Tumour Registry. This prospectively collected registry database was retrospectively reviewed.

Results: There were 9 cases with male predominance (77.7%) at a median age of 39 years (range, 16-73 years) and were anatomically distributed as 2-cervical, 6-thoracic, 1-lumbar and 1-sacral. Local and distant staging and histological grading was carried out in all. Seven patients underwent intralesional (including open biopsies) and 2 marginal resections. Seven patients received adjuvant chemotherapy and 8 adjuvant radiotherapy. The overall local recurrence rate was 66.6%. All but one patient died of the disease with a median length of survival of 30 months. The 2-year and 5-year survival rates were 66.6% & 22.2% respectively. Two patients who survived more than 5 years were male patients below the age of 40 years involving thoracic spine (one had a marginal resection without receiving any adjuvant therapy subsequently had a recurrence; other one underwent intralesional resection with adjuvant chemo- and radiotherapy, died with no evidence of disease).

Conclusions: Spinal osteosarcoma in Scottish patients showed a higher median age, thoracic spine and male gender predilection with overall poor prognosis. Local recurrence did not affect the survival adversely, however patients older than 40 years and metastases at presentation showed poor survival compared to age under 40 and non-metastatic presentations.
INCIDENCE AND RECURRENCE IN VERTEBRAL ANEURYSMAL BONE CYSTS

H Sharma, R Reid and A T Reece
Department of Trauma and Orthopaedic Surgery, Western Infirmary, Dumbarton Road, Glasgow, G11 6NT

Introduction: Aneurysmal bone cysts are uncommon lesions affecting the spinal column, mostly occur in lumbar spine and have a propensity to affect adjacent vertebrae. We describe 14 aneurysmal bone cysts affecting the spinal column using Scottish Bone Tumour Registry with regard to assess the incidence, demography, biological behaviour and recurrence rate.

Materials and Methods: We identified 14 patients with aneurysmal bone cysts affecting the spinal column. Casenotes and radiographs were retrospectively reviewed using Scottish Bone Tumour registry.

Results: There were 9 female and 5 male patients. The mean age at presentation was 24.5 years (range, 6 to 62 years). The spinal location consisted of cervical (3), thoracic (4), lumbar (6) and sacral (1). The treatment included curettage without bone grafting (3), excision (7) and surgical removal with biopsy in rest. Selective angiographic embolisation was carried out in one patient with a cervical cyst. There were two recurrences, of which one was treated with radiotherapy and other with repeat curettage with successful final outcome.

Conclusions: The incidence of aneurysmal bone cysts was 5.5% in our registry of all spine tumours. The recurrence occurred in 14% (2 of 14). In addition to surgery, one should be aware of the role of angiographic embolisation and radiotherapy in selected primary and recurrent ABCs.

SURGICAL MANAGEMENT OF SACRAL TUMOURS: A RETROSPECTIVE ANALYSIS OF THE EXPERIENCE OF THE ONCOLOGY AND SPINAL UNIT

SKL Chan, MZ Choudhury, RJ Grimer, MF Grainger, AJ Stirling
Spinal Unit, The Royal Orthopaedic Hospital, Birmingham, UK

Objective: To evaluate functional and oncological outcomes following sacral resection

Methods: Retrospective review of 97 sacral tumours referred to spinal or oncology units between 2004 and 2009.

Results:
61 males, 37 females (average age of 47 (range 3 – 82). Average duration of symptoms 13 months..17 metastatic disease, excluded from further discussion.

Of the remainder 36/81(44%) underwent surgery – 21 excision, 9 excision and instrumented stabilisation, and 6 curettage.

13(16%) patients were inoperable - 8 advanced disease, 3 unable to establish local control, 2 recurrence.

Colostomy was performed in 11/21(52%) patients who underwent excision. Deep wound infections in 6/21(29%). No difference in infection rates between definitive surgery with or without colostomy – 3/11(27%) vs. 3/10(30%). In the instrumented group, no colostomies were performed due to concerns about deep infection and none resulted (0/9).

Radiological failure of stabilisation was noted in 7/9(78%). However, functionally, 3/9(33%) were mobilising independently, 3/9(33%) crutches, 2/9(22%) able to transfer and 1/9(11%) undocumented.

Mean follow-up 25 months (range 0-70). Local recurrence in 9/36(25%) of operated patients. Metastasis occurred in 4/36(11%) and mortality 8/36(22%) although follow-up period was noted to be short.

Conclusions: Results are comparable with current literature. Mechanical stabilisation for extensive sacral lesions is challenging. Despite radiological failure in 7/9 instrumented stabilisations, patients were relatively asymptomatic and only 1/9 required revision stabilisation surgery. By design none had colostomies and there were no deep infections.
ABSTRACTS
Podium presentations

Thursday 15:50 - 16:40
Tumours

METASTATIC TUMOURS OF THE LUMBO-SACRAL JUNCTION AND SACRAL SPINE

N A Quraishi, K Giannoulis*
Centre for Spine Studies and Surgery, Queens Medical Centre, Nottingham, UK
*presenting author

Introduction: Metastatic involvement of the lumbo-sacral junction/sacrum usually signifies advanced disease. The aim of this study was to report our results on the management of patients with metastases referred to this anatomical region over the last 5 years (July 2006- July 2010).

Methods: Retrospective analysis from a comprehensive spinal oncology database.

Results: During this period, a total of 14 patients (mean age 65.6 years (58-87), 8 female, 6 male) were referred to our unit. The majority had symptoms of pain and neurological deterioration (11) with onset of pain considerably longer than neurology symptoms (296 days (7-1825) versus 7 days (1-28); 3 were non-ambulatory at presentation. The primary tumours were Renal cell (4), Breast (2), Prostate (2), GI (2), unknown primary (2), lung (1) and neuroendocrine (1). Operative procedures performed were decompression with lumbo-pelvic stabilisation (5), decompression with(out) biopsy (7), posterior decompression/reconstruction with anterior excision/stabilisation (1) and laminectomy with sacroplasty (1). There were 8/14 (57%) complications including neurological deterioration (2), wound infection (2) and metalwork revision (1). Post-operatively, 7 patients received radiotherapy, 3 improved one Frankel grade and the others remained stable. All patients were ambulatory. The mean survival was 412 days (105-1005) and most patients returned either back to their own home (8) or a nursing home (4).

Conclusion: The incidence of metastases in this region is relatively uncommon. Surgical intervention has a high complication rate (8/14, 57%) but can be important in restoring/preserving neurological function, assisting with ambulatory function and allowing patients to return to their previous accommodation.
Every challenge has a solution

**Seamless** Junctional Connections

**Unparalleled** Fixation Options

**Optimal** Control
TIMESCALE OF LEG PAIN RELIEF AFTER SURGERY

A Qureishi, N Johnson, B Robertson-Smith, P Basu
Northampton General Hospital

Purpose: Prospectively evaluate the timescale of leg pain resolution after lumbar discectomy and decompression, in the immediate post-operative period and identify possible risk factors for failure/delay in leg pain resolution.

Materials & Methods: A prospective observational study of 100 consecutive patients undergoing lumbar discectomy or decompression. Patients recorded their leg and back pain in VAS and disability in ODI preoperatively. Patients rated their leg pain relief just prior to discharge after surgery. Telephone follow-up at 1-2 week and 3-4 week post-op was followed by clinic review at 6 and 12 weeks, to assess the timescale of leg pain resolution and improvement in function (ODI score).

Results: Immediately before discharge from hospital 67% patients reported relief of leg pain. 33% reported no relief or were unsure. Of these, 26 (80%) reported pain relief subsequently. At 1-2 weeks, 81 patients reported pain relief. 14 reported persistent pain, but six of them (45%) improved subsequently. By six weeks 91% reported leg pain relief and only two of the unimproved nine patients subsequently experienced relief of leg pain. Failure to improve the leg pain was clearly associated with failure to improve disability by ODI score. But the ODI score did not improve in 11 patients reporting relief of leg pain. Decompression in older age and women had a relatively higher risk of poor result.

Conclusion: After lumbar discectomy and decompression, leg pain relief is immediate in 67%, in 81% by one week and in 91% by six weeks. Improvement is unlikely after this period. Non-resolution of leg pain resulted in persistent/worsened disability, but 11% patients did not improve functionally despite experiencing leg pain relief. Decompression, older age and female sex were negative risk factors.

EVALUATION OF PERIFACET INJECTIONS AND SPECIFIC LUMBAR MULTIFIDUS RETRAINING PROGRAM IN TREATMENT OF LOW BACK PAIN (A PROSPECTIVE RANDOMISED CONTROLLED TRIAL)

D F Kader, D Wardlaw, F W Smith,
Departments of Orthopaedics and Radiology, Centre for Spinal Research, Positional MRI Centre, Woodend Hospital, Aberdeen UK

Purpose: Lumbar paraspinal muscle dysfunction and low back pain are strongly correlated. Muscle atrophy is common in LBP and is recognised by MRI scan. Corticosteroid injections and physical rehabilitation programs are advocated for treatment of LBP. The purpose is to evaluate efficacy of specific lumbar multifidus muscle retraining exercises and perifacet multifidus injections in treatment of Low Back Pain (LBP) and referred leg pain.

Method: 63 patients with non-specific LBP, with or without leg pain, were randomised to three treatment groups. MR images of paraspinal muscle and the atrophy classified. A-Control group, standard physiotherapy for 10 weeks. B-Multifidus rehabilitation program for 10 weeks. C-Perifacet injection (multifidus injection) with methylprednisolone. ODI was primary outcome measure and the SF-36, modified Zung Depression Index and others were secondary outcome measures.

Results: 56 patients completed trial. ODI improved from a mean of 29.9 to 25.9, but there were no statistically significant differences between groups. 62% of patients were at risk/ had major psychological overlay. LBP improved most in group C (Perifacet injection) (P< 0.02), mean improvement in SF-36 bodily pain score was 21.2 (with a 95% CI of 2.1-44.0) while PF and SF were improved most in group B (multifidus rehabilitation) (P< 0.03).

Conclusion: Perifacet injection and a multifidus retraining program are more effective than standard physiotherapy in relieving pain and improving physical capacity respectively. Multifidus rehabilitation program is the recommended treatment for non-specific LBP, as the ultimate goal should be to restore function. Perhaps the combination of perifacet injection to relieve pain followed by multifidus retraining program is the best treatment option. No change in the multifidus muscle was seen over time.
COMPARISON OF MORTALITY RISK IN OPERATED (VERTEBROPALSTY OR BALLOON KYPHOPLASTY) VERSUS NON-OPERATED PATIENTS: 410,965 VERTEBRAL FRACTURE PATIENTS OF THE US MEDICARE POPULATION

N A Quraishi #, A Edidin *, S Kurtz °, K Ong °, E Lau §

#Queens Medical Centre, Nottingham; *Medtronic Inc, Sunnyvale US; °Exponent Inc., Philadelphia US; §Exponent Inc, 149 Menlo Park US

Introduction/Aims: An increased mortality associated with hip fractures has been recognized, but the impact of vertebral osteoporotic compression fractures (VCF) is still underestimated. The aim of this study was to report on the difference in survival for VCF patients following non-operative and operative [Balloon Kyphoplasty (BKP) or Vertebroplasty (VP)] treatments.

Methods: Operated and non-operated VCF patients were identified from the US Medicare database in 2006 and 2007 and followed for a minimum of 24 months. Patients diagnosed with pathological and traumatic VCFs in the prior year were excluded. Overall survival was estimated by the Kaplan-Meier method, and the differences in mortality rates (operated vs non-operated; balloon kyphoplasty vs vertebroplasty) were assessed by Cox regression, with adjustments for patient demographics, general and specific co-morbidities, that have been previously identified as possible causes of death associated with osteoporotic VCFs.

Results: A total of 81,662 operated (vertebroplasty or kyphoplasty) patients had a survival rate of 74.8% at 24 months following VCF diagnosis compared to 67.4% for the 329,303 non-operated patients. In operated (Vertebroplasty or kyphoplasty) patients there was 44% less mortality than in non-operated VCF patients (p<0.0001). The survival rates for VCF patients following vertebroplasty or kyphoplasty were 72.3% and 76.2% at 24 months, respectively. In kyphoplasty patients there was 12.5% more survival than in vertebroplasty patients (p<0.0001) after 2 years.

Conclusions: This retrospective analysis, in 410,965 patients diagnosed with a VCF confirmed the statistical significant decrease (43%, p<0.0001) in mortality between patients receiving minimally invasive surgery compared to non-operated patients. Additionally the present study confirmed a statistical significant decrease (12.5%, p<0.0001) in mortality in BKP patients compared to VP patients.

INTRODUCTION OF EGGSHELL TECHNIQUE MINIMISED THE INCIDENCE OF CEMENT LEAK DURING PERCUTANEOUS BALLOON KYPHOPLASTY PROCEDURES

R P Sidaginamale, M Gunaratne, P Fadero, M Kotrba
Mayday University Hospital NHS Trust

Purpose: To evaluate the complications following percutaneous balloon kyphoplasty and assess the advantage of introducing eggshell technique.

Methods and results: We performed 138 Balloon kyphoplasty procedures in 85 patients during august 2007 to march 2010. Data was collected and analyzed in all these cases. Gender distribution was 60 females and 25 males. Age distribution was 33 to 85 years, with an average age of 67.4 years. Indications of surgery were vertebral fractures due to osteoporosis in 81% of the procedures, trauma in 13% and malignancy in 6%. The most common vertebral levels of the kyphoplasty were at T12 in 32 procedures (23%) and L1 in 28 procedures (20%). Eggshell technique was introduced in 2009 where technical problems were encountered during cementing process.

All patients had reduced pain levels, which was assessed by visual analog score. The average length of hospital stay was 2.5 days. Complications were 9 (6.5%) cement leaks (all within one cm from the vertebral body) in procedures performed before the introduction of eggshell technique and no cement leak following the introduction of eggshell technique, 5 (3.6%) fresh fractures, 2 (1.4%) intra-operative fractures and 1 (0.73%) rupture of balloon. There were no complications of cord compression, motor deficit, infection, allergy to cement or pulmonary embolism noted. 30-day mortality rate was zero.

Conclusion: Our series had 6.5% incidence of cement leak compared to 11-21% quoted in current literature. Since the introduction of eggshell technique, cement leak rate was reduced to zero%.

Hence adopting of eggshell technique during percutaneous balloon kyphoplasty procedure may eliminates the risk of cement leak thereby minimizing complications.
DETECTION OF THORACOLUMBAR VERTEBRAL FRACTURES ON TRAUMA SERIES CT SCANS MISSED BY CLINICAL EXAMINATION

M Venkatesan, A Fong, P Sell
Department of Orthopaedics and Trauma, University Hospitals of Leicester, Leicester, UK

Background: Thoracolumbar fractures are the most common spinal injuries resulting from blunt trauma. Missed spinal injuries can have serious consequences.

Objective: Our objectives were to determine the utility of trauma series chest and abdomen computed tomographs for detecting clinically unrecognised vertebral fractures and to analyse those missed on clinical examination. The aim was to identify an ‘at-risk’ patient group with negative clinical examination warranting evaluation with CT screening.

Material & Methods: We evaluated all computed tomography of the chest and/or abdominal that was undertaken for blunt trauma at our trauma centre from April 2009 to April 2010. Data was gathered from both CT scans and medical notes to capture demographics, mechanism of injury, fracture site and configuration. Key points were the clinical suspicion of vertebral fractures prior to CT request and identifying ‘at-risk’ patient group with factors contributing to difficulty in clinical interpretation.

Results: There were a total of 303 patients in the year who underwent CT scan for blunt trauma. 51 (16.8%) had a thoracolumbar vertebral fracture. There were 8 women and 43 men a mean age of 45.2 years. There were 29 (56.8%) stable and 22 (43.2%) unstable fractures. Out of the 51 total fracture patients, only 17 (33.3%) had been clinically anticipated with a positive clinical examination. In the 22 unstable fractures, only 11 (50%) were expected and had clinically recorded correlating positive examination findings.

Conclusion: A combination of both clinical examination and CT screening based on mechanism will likely be required to ensure adequate sensitivity with an acceptable specificity for the diagnosis of clinically significant injuries of the TL spine.
DOES POSTERIOR PEDICLE SCREW SUPPLEMENTATION WITHOUT POSTEROLATERAL FUSION IMPROVE ANTERIOR LUMBAR INTERBODY FUSION WHEN USING ANTERIOR CAGE AND SCREW CONSTRUCTS?
– A RADIOLOGICAL STUDY

M J H McCarthy, L Ng, D Chan
Royal Devon and Exeter Hospital, Exeter, UK

Study Design: Single surgeon prospective cohort with radiological follow up.

Background: Anjarwalla et al. have shown that the addition of posterior pedicle supplementation without posterolateral fusion during an ALIF procedure significantly increases the rate of interbody fusion when using a carbon fibre / PEEK cage packed with autogenous iliac crest graft. Stand alone ALIF cages which utilise screws passing through the interbody cage and into the vertebral bodies were designed to obviate the need for a posterior procedure by increasing the anterior construct stability and fusion rate.

Objective: To assess the effect of posterior pedicle screw supplementation without posterolateral fusion on the fusion rate of ALIF when using anterior cage and screw constructs.

Method: Between 2003 and 2008 91 patients underwent ALIF procedure under a single surgeon for low back pain associated with degenerative disc disease or lytic spondylolisthesis. Routine CT was performed at around 1 to 2 years follow up to ensure union prior to discharge. It was noted that there was a significant number of locked pseudarthroses, especially in 2 level cases, and in 2006 the surgeon started to perform simultaneous supplementary posterior pedicle screw stabilisation without posterolateral fusion in the majority of cases.

Results: Of the 91 patients, 77 (85%) had CT follow up at mean 21 months. 45 patients had anterior surgery alone (26 single level and 19 two level) and 32 had front back surgery (15 single level and 17 two level). Pseudarthrosis was seen in 16 patients (36%) of the anterior alone group and 2 (6%) of the front back group. In the anterior alone group, pseudarthrosis occurred in 6 / 26 (23%) patients with single level surgery and 10 /19 (53%) of those with two level surgery. In this last group, the pseudarthrosis occurred in the upper fusion level in five patients and at both fusion levels in other five.

Conclusion: Posterior pedicle screw supplementation without posterolateral fusion improves the fusion rate of ALIF when using anterior cage and screw constructs. We would recommend supplementary posterior fixation especially in cases where more than one level is being operated.

PERCUTANEOUS L5-S1 INTERBODY FUSION AXIALIF: - REPORT OF INITIAL EXPERIENCE AND PRELIMINARY RESULTS

M A Bhutta, J Wilkinson, CE Cross, V Tandon, V Kapoor, B D Todd
Stockport NHS Foundation Trust

Introduction: Lumbar spinal pain can be a consequence of discogenic pain. After failure of conservative management, lumbar fusions are popular and considered the gold standard. However, these techniques are associated with significant morbidity. A percutaneous trans-sacral technique may address these for L4/L5 and/or L5/S1 alone spinal fusions. Our unit has adopted this technique and presents our initial experience of 51 patients and preliminary results.

Method: Patients with a confirmed clinical and radiological evidence of degenerate intervertebral disc with or without prior surgical intervention were selected. Patients with a history of pelvic surgery/radiotherapy were excluded. Data was collected prospectively using the Global Patient Outcome Scoring System and Oswestry Disability Index (ODI) scores at clinical follow-up.

Results: 51 patients received the procedure and 30 achieving a minimum of 6 months follow-up. Patients had a median age of 46 (range 20-78) and included 19 male and 32 females with on average 40 months of pain. The mean ODI score improved after surgery from pre-operative levels 52.9 (SEM 3.0) to 6 month scores of 38.4 (SEM 3.9), t(29)=4.2, p<0.0002. This difference remained statistically significant at 12 month follow-up with a mean ODI scores 34.3 (SEM 5.2), t(18)=4.37, P<0.0004 (Mean difference of 21.1 SEM 4.8). A sub-analysis of confounding factors identified patients with previous surgery, claiming state benefits, pursuing litigation, mainly leg pain and requiring pedicular fusion failed to achieve statistical significance. Patients receiving a 360 degree fusion with facet screws alone improved sooner and achieving a mean difference in ODI score of 27.6 (SEM 8.2)

Conclusion: Our initial results confirm this to be an effective alternative treatment modality for lumbar spine fusion in the management of primary discogenic back pain. Patients receiving 360 degree fusion and not claiming state benefits or pursuing litigation appear to have a better outcome.
A PROSPECTIVE COHORT OF PATIENTS WITH NEUROGENIC CLAUDICATION SECONDARY TO DEGENERATIVE SPONDYLolisthesis MANAGED WITH A TECHNIQUE OF LUMBAR DECOMPRESSION VIA SPINOUS PROCESS OSTEOTOMY

M. Al-Jumaily, J. Tang and M.J. Wilby
The Walton Centre for Neurology and Neurosurgery, Liverpool.

Purpose: To observe the safety and efficacy of a minimally destructive decompressive technique without fusion in patients with lumbar stenosis secondary to degenerative spondylolisthesis.

Methods: 30 patients with degenerative spondylolisthesis (DS) were consecutively managed by a single consultant spinal surgeon. All patients presented with neurogenic claudication secondary to DS. All patients were managed operatively with lumbar decompression utilising an approach technique of “spinous process osteotomy”(1). Briefly, this approach requires only unilateral muscle stripping with preservation of the interspinous ligament. A standard central/lateral decompression is then performed. Data consisting of VAS back and leg pain and ODI were collected pre and post-operatively.

Results: The majority of patients were women (23) with a median age of 66 years. 29 patients had grade 1 slip and 1 patient grade 2. The index level was predominantly L4/5 (25 pts; 83%) and L3/4 in the remainder (5 pts; 17%). 5 patients were noted to have a coronal plane deformity as well as DS. 3 patients underwent 2 levels of decompression. Median length of stay was 2 days (range: 1 to 13 days). 2 patients suffered a dural tear during surgery (both with scoliosis). Of these, one required a second operation to repair a pseudomeningocele.

All patients improved post op (Range: 3 months to 23 months; mean 8 months). ODI significantly improved post operatively (p < 0.05). One patient, however, developed a severe recurrence of symptoms at 3 months. Repeat imaging confirmed an increased slip and recurrent stenosis. This patient underwent re-decompression supplemented with instrumented fusion.

Conclusion: The technique described above facilitates a safe method of decompression alone without fusion in patients with DS, even in patients with scoliosis. The procedure is safe, successful and easy to learn. Post-operative recovery is rapid with a short hospital stay. In spite of preserving the interspinous ligament, 1/30 patients (3 %) progressed to a greater sagittal slip requiring fusion.

1. “Spinous process osteotomies to facilitate lumbar decompressive surgery”

DOES UNTREATED FORAMINAL STENOSIS COMPROMISE PATIENT OUTCOME FOLLOWING LUMBAR SPINAL DECOMPRESS ON FOR SPINAL STENOSIS

H R Budd, D R Wordsworth, D Sharp
Ipswich Hospital Department of Spinal Surgery

Purpose: To determine whether failure to treat foraminal stenosis in the presence of central and lateral recess lumbar spinal stenosis compromised patient outcome following lumbar spinal decompression.

Methods and Results: We reviewed the MR images for patients who had undergone lumbar decompression surgery by two senior orthopaedic spinal surgeons at a district general hospital spinal unit over a period of 18 months to determine the presence or absence of foraminal stenosis, as defined by complete loss of peri-neural fat signal on MRI, and correlated this with the change in back and leg VAS scores following surgery. Forty-four patients from a total of 60 had complete pre- and post-operative VAS scores at a follow-up of at least 1 year. 64% (14/22) of these patients had significant foraminal stenosis pre-operatively on MRI and continued to have leg pain without a normalisation of the VAS (leg) score at one year following lumbar decompression compared to 36% (8/22) of patients with foraminal stenosis on MRI who had resolution of leg pain following central and lateral recess decompression. We also noted that the foraminal vertical height for those with lumbar spinal stenosis and without foraminal stenosis was less (L3/4:14.7mm, L4/5:14.6mm, L5/S1 13.6mm) than the 15mm or less previously suggested as the threshold for significant nerve root compression, while those with symptomatic foraminal stenosis had a mean foraminal vertical height of <10mm for L3/4, L4/5 and L5/S1.

Conclusion: We suggest that the MRI is examined for evidence of co-existing foraminal stenosis in patients managed for central lumbar spinal stenosis and where present, as suggested by absence of peri-neural fat and a formainal height <10mm, a foraminal decompression is performed as part of the decompression procedure.
COMPARISON OF STANDARD OPEN VERSUS PERCUTANEOUS (MANTIS) POSTERIOR STABILISATION OF THE THORACIC AND LUMBAR SPINE.

M Venkatesan, N Yousaf, O Gabbar, J Braybrooke
Department of Trauma & Orthopaedics, University Hospitals of Leicester

Background: Minimally invasive surgery is an alternative therapeutic option for treating unstable spinal pathologies to reduce approach-related morbidity inherent to conventional open surgery.

Objective: To compare the safety and therapeutic efficacy of percutaneous fixation to that of open posterior spinal stabilisation for instabilities of the thoracolumbar spine.

Study Design: Comparison study of prospective historical cohort versus retrospective historical control at a tertiary care centre.

Methods: Patients who underwent open or percutaneous posterior fixation for thoracic-lumbar instabilities secondary to metastasis, infection and acute trauma were included. Minimally access non traumatic instrumentation system (MANTIS) was used for percutaneous stabilisation.

Outcome Measures: The differences in surgery-related parameters including operative time, blood loss, radiation exposure time, analgesia requirement, screw related problems and length of hospitalisation between the groups were analyzed.

Results: There were a total of 50 patients with 25 in each group. There were no significant differences concerning age, sex, ASA, pathology causing instability, level and number of segments stabilised between the groups. There were significant differences between the MANTIS and open group in terms of blood loss (492 versus 925 ml, p<0.0001), post-op analgesia requirement (33 versus 45 mg/day of morphine, p<0.0004) and length of hospital stay for trauma sub-group of patients (6.2 versus 9.6 days, p< 0.0008). Average operative time of the MANTIS group was 190.2 minutes, not significantly longer to that of the conventional open group (183.84 minutes, p>0.05) Open group patients had less radiation exposure (average of 0.6 minutes) compared to MANTIS cohort (3.1 minutes). There were 2 patients with screw misplacements comprising one from each group that needing revision.

Conclusion: Percutaneous spinal stabilisation using mini-invasive system is a good surgical therapeutic choice in thoracic-lumbar instabilities. It has the advantage of less trauma, quick recovery and shortened hospital stay with accuracy of screw placement as similar to those reported for other techniques. Indications and limitations of this technique must be carefully identified. Interest Statement: There was no commercial support or funding of any sort.

DOSE RESPONSE AND STRUCTURAL INJURY IN THE DISABILITY OF SPINAL INJURY

M S Patel, P Sell
Leicester General Hospital

Aim: To compare spinal outcome measures between patients reviewed for medico-legal compensation claims relating to perceived injury at work to those having sustained serious structural injury in the form of unstable thoraco-lumbar fractures requiring internal fixation.

Method: Two consecutive cohorts of 23 patients with healed spinal fractures and 21 patients with a perception of work related soft tissue injury were compared. Patient demographics and a range of outcome measures including Oswestry Disability Index (ODI), Low Back Outcome score (LBOS), Modified Somatic Perception (MSP) and Modified Žung Depression (MZD) indices were measured.

Results: 23 patients (8F; 15M) with spinal fractures (group 1) of average age 42 years (range 22-66) were followed up for a mean of 41 months (range 14-89, SD 23.3) post trauma and compared to 21 patients (6 females; 15 males) with self reported back pain (group 2) of average age 47 years (range 37-63), mean time since perceived injury of 42 months (range 12-62, SD 14.5). Both groups were comparable in terms of age and sex (P = 0.254 and 0.752 respectively).

The average ODI was 28% (SD 18.5) compared to 52% (SD 17.1) in group 1 and 2 respectively (P value: 0.000087); LBOS 40 Vs 20 (P=0.000189); MSP 4 Vs 10 (0.01069); and MZD 20 Vs 36 (P=0.000296).

Conclusion: Despite high energy trauma and significant structural damage to the spine, post-traumatic patients had better spinal outcome scores in all measures (ODI, LBO, MSP, MZD). This thereby defies 8 of the 9 Bradford Hill criteria of causation. The reasons for such differences are primarily psychosocial. Addressing obstacles to recovery may improve outcomes. There is no ‘dose-response’ curve to functional outcomes. In fact, uniquely the disability seems greater in the lower energy injury which is unique in trauma care.
THE LITIGATION BURDEN TO THE NHS FROM SPINAL INJURIES AND SURGERY: ANALYSIS OF 236 CONSECUTIVE CLOSED CLAIMS

CE Cross, V Kapoor, B Todd, MA Bhutta
Stockport NHS Foundation Trust

Background: Surgical patients have cost the NHS 1.3 billion GBP from 1995. Spinal pathologies can present diagnostic challenges, and the consequences of delayed diagnosis or surgical complications can be devastating and so creating high indemnity costs. We aim to highlight the spinal associated litigation patterns within the United Kingdom.

Method: Data was obtained from the NHS Litigation Authority from 2002 to 2010.

Result: From 236 claims, 144 were related to trauma or acute diagnostic issues and 92 from elective surgery. The financial burden to the NHS came to 60.5 million GBP. Of this sum 42.8 million GBP were paid in damages, and the remaining 29% in legal costs. The financial costs were similar for trauma and elective cases. The most frequent cause of successful litigation for trauma were, missed fractures(41.7%), missed cauda equina(23.6%) and spinal infection(11.8%). The emergency department(43.8%), orthopaedic surgery(28.5%) and Medicine(13.9%) bore the brunt of the claims. For elective surgery, Spinal Damage(19.8%), failure in Post-Operative Care(15.4%), Infection(11%) and Wrong Level Surgery, Cauda Equina and Surgical Failure(9.9% each). were likely to result in a successful claim, and the litigation burden was felt by the orthopaedic(60.4%), Neurosurgery(18.7%) and other surgical disciplines(11%).

Conclusion: Acute spinal fractures, cord compression and infection should be considered in patients in the emergency department setting, with appropriate examination and investigations for uncertainty. A lack of awareness of at risk cases increases the likelihood of a pay-out and sums involved. For elective spinal surgery, a failure in the consenting process and the technical skill of the surgeon are likely to result in a pay-out. A failure to identify post-operative complications such as infection and thromboembolism are also indefensible. Protecting patients intra-operatively and maintaining high technical expertise and vigilance post-operatively in an adequately consented patient may decrease litigation rates.
Abstracts from
Summary Slide Presentations
LONG-TERM OUTCOME OF LUMBAR SPINE SURGERY COMPLICATED BY UNINTENDED INCIDENTAL DUROTOMY

S Grannum, F Attar, M Newy
Leicester General Hospital, U.K

**Purpose:** to establish whether incidental durotomy complicating lumbar spine surgery adversely affects long-term outcome.

**Methods:** Data was collected prospectively. The study population comprised 200 patients. 19 patients who sustained dural tears (Group A) were compared to a control group of 181 patients with no tear (Group B). Outcomes were measured with the SF-36, Oswestry Disability Index (ODI) and visual analogue scores for back (VB) and leg (VL) pain. Scores for the 2 groups were compared pre-operatively, at 2 and 6 months post-op for all patients and at long-term follow-up (range 2-9 years) for patients in group A. In addition for patients in group A the patients satisfaction with the procedure, ongoing symptoms, employment status and analgesic intake were documented.

**Results:** pre-operative scores were similar between the 2 groups apart from significantly higher vb scores (63 –A vs 46-B). Results at 2 and 6 months showed no significant differences between the 2 groups. Outcome scores for group A at long-term follow-up do not show any significant decline.

**Conclusion:** our study demonstrates that incidental dural tears complicating lumbar spine surgery do not adversely affect outcome in the long-term

Ethics- none, Interest -none

MINIMALLY INVASIVE POSTEROLATERAL INSTRUMENTED FUSION IN TREATMENT OF LUMBAR DEGENERATIVE DISEASE

Saxena A, Alakandy LM
Institute of Neurological Sciences, Glasgow

**Purpose:** Posterior lumbar fusion using minimally invasive surgical (MIS) techniques are reported to minimise postoperative pain, soft tissue damage and length of hospital stay when compared to the traditional open procedure.

**Methods:** This is a review of patients who underwent MIS for posterolateral lumbar fusion in a single practice over a 2-year period.

**Results:** Twenty-eight patients underwent this procedure. The median age was 57 (range 34-80). Male:female ratio was 1:1. The most common symptom was radicular pain (n=26). Two patients had back pain without radicular symptoms. Primary degenerative spondylolisthesis was seen in 22 patients and post-laminectomy spondylolisthesis in 3 patients. Transforaminal interbody fusion (TLIF) with pedicle screw fixation was the commonest procedure (20) while the rest had pedicle screw fixation and inter-transverse fusion. Along with fusion, nerve root decompression alone was performed in 19, while 5 had decompression of the central spinal canal. Intra-operative navigation was used to assist screw placement in 5 patients. The typical hospital stay was 3 days. All but two patients were mobilised the same or the following day. Twenty-one patients with radiculopathy (80%) reported improvement in VAS at 6-months. One patient suffered irreversible nerve root injury (L5). Significant pedicle breach without nerve injury by a screw was seen in one patient.

**Conclusion:** Minimally invasive TLIF and pedicle screw fixation lumbar degenerative condition is a safe procedure with complications comparable to traditional open techniques. Minimal muscle dissection and soft tissue damage allows for earlier ambulation and reduced hospital stay. The procedure however required longer operative time and increased exposure to intra-operative x-rays.
SHOULD ANTERIOR LUMBAR INTERBODY FUSION BE TREATED AS MAJOR ABDOMINAL SURGERY FOR THROMBOEMBOLIC PROPHYLAXIS?

P Rao, S Pugh, S Ahuja,
Cardiff Spinal Unit, University Hospital of Wales, Cardiff.

Introduction: Reported incidence of DVT after spinal surgery ranges from 0-15% and PE 0.5-2.7%. Theoretically, manipulation of the vessels and venous stasis caused by retraction during anterior lumbar inter-body fusion may increase the propensity for thrombosis. The reported incidence of DVT and PE following major abdominal and pelvic surgery are high (up to 23%) and all these patients routinely receive chemical prophylaxis.

Aim: Should patients undergoing ALIF surgery receive chemical prophylaxis routinely?

Materials and methods: Retrospective review of ALIF procedures done between Jan 2007- Jan 2010. Review of case notes, radiology reports and telephone call to the patients to exclude DVT. Total of 76 patients underwent ALIF during this period. Forty six were female(60.5%) and 36 were 2 level fusions(47%). L5-S1 being commonly fused (76%) followed by L4-L5 (23%). Average surgical time from theatre records is 115 minutes(31-369 minutes). All patients received mechanical prophylaxis in the form of thigh length TED stockings. None of the patients were on treatment for DVT prior to surgery.

Results: Three patients (3.9%) had Doppler proved DVT which required anticoagulation treatment. There was no reported incidence of PE.

Discussion: There is no definite evidence in the literature to suggest ALIF surgery has higher incidence of thromboembolic complications, though theoretical possibility of increased risk. Current study suggests that incidence is 3.9% with mechanical prophylaxis alone which is very small when compared to incidence after major abdominal, pelvic or gynaecological procedures. Our small study sample suggests routine use of chemical prophylaxis to reduce the risk of DVT for anterior lumbar inter-body fusion is not justified.
IS SPINAL STENOSIS ASSESSMENT DEPENDENT ON SLICE ORIENTATION? A MAGNETIC RESONANCE IMAGING STUDY

L Henderson, G Kulik, D Richarme, N Theumann and C Schizas
Centre Hospitalier Universitaire Vaudois

Purpose of the study: The aim of this work was to study the influence of the slice orientation of T2 axial images in numerical measurements of DSCA and study the effect that this change of slice angle would have on the morphological grading assessment.

Methods and results: TSE T2 three dimensional acquisition MRI studies reconstructed with OsiriX DICOM viewer from 32 patients were used. Patients included were a series of consecutive cases with either suspected spinal stenosis or low back pain. A total of 97 disc levels were studied and axial reconstructions were made at 0˚, +10˚, +20˚, +30˚ relative to the disc space orientation. For each image, DSCA was digitally measured and a severity grade was assigned by two observers according to the recently-published 4-point (A-D) morphological grading system. Interobserver kappa score was 0.71. Statistical analysis of DSCA measurements was performed using kappa and t-tests. Comparing DCSA between 0˚ at each level and +10˚, +20˚ and +30˚ slice orientation, a significant increase in surface area was found in each case (P<0.0001). % change in DSCA combining all disc levels comparing 0˚ and +10˚: range -15.48% to +31.89% (SD 18.40%); 0˚ and +20˚: range -24.00% to +143.82% (SD 20.45%); 0˚ and +30˚: range -29.35% to +231.13% (SD 26.52%). At 13 disc levels, DSCA was <100mm² at 0˚, but changed to >100mm² in three cases by a +10˚ increase, in five cases by a +20˚ increase and in 10 cases by a +30˚ increase. In only two out of 97 levels studied did the morphological grading change as the angle increased, one of which was not amongst those above (change in DSCA from <100mm² to >100mm²).

Conclusion: MRI slice angle significantly affects DSCA, and thus potentially the decision taken regarding management whilst morphological grading is little affected by image acquisition technique.

POSTERIOR LUMBAR DYNAMIC STABILISATION FOR LOW GRADE DEGENERATIVE SPONDYLOLISTHESIS AND SPINAL STENOSIS: EARLY RESULTS OF A NEW DYNAMIC STABILISATION SYSTEM.

S.G. Lakkol, R. Taranu, K.K. Lingutla, S Hadgaonkar, M. Krishna, C. Bhatia
University Hospital North Tees, Stockton on Tees, United Kingdom

Introduction: We present our experience of 22 patients with low grade degenerative lumbar spondylolisthesis with stenosis (21 Grade I and 1 Grade II) who were treated using new stabilization systems {Scient’x IsoBar TTL Dynamic Rod Stabilization and the Inlign™ Multi-Axial pedicle Screws (Disc Motion Technologies - DMT)}.

Methodology and results: The pain intensity was evaluated using the Visual Analogue Score for back pain (VAS-BP) and leg pain (VAS-LP) and functional outcomes using Oswestry Disability Score (ODS). Overall improvement in general patient’s health was assessed using the Bodily Pain (SF36-BP) component of the SF -36 questionnaires. Data was analysed with the SPSS 16.0 for Windows (SPSS Inc, Chicago, IL). Statistical significance was designated at p < 0.05 and appropriate parametric (Paired sample t-test) and non-parametric tests (Wilcoxon signed-rank test) were used.

There were 3 male and 19 female patients and average age at operation was 68.95 years (57-79 years). The average duration of follow up was 16.18 months (8-37 months). Most common level of surgery was L4/5 (n=18). Decompression and instrumentation involved 1 level (7 cases), 2 levels (9 cases), 3 levels (1 case) and 4 levels (5 cases). There was statistically significant improvement in all clinical outcomes. The ODS improved from 49.45 ±14.35 pre-operatively to 22.91 ± 6.38 post operatively (p< 0.001). There was statistically significant improvement noted in VAS-BP (p< 0.001), VAS-LP (p<0.001) and SF36-BP (p=0.002).

Conclusion: The recent dynamic stabilisation systems were developed with an intention to stabilise the spondylolisthetic segment and preventing adjacent level degeneration. The study results clearly demonstrate that central decompression and dynamic stabilization using TTL/DMT system for degenerative lumbar spondylolisthesis is a safe, reliable method and offers excellent clinical outcomes. This technique obviates the need of bone graft and hence the graft site pain.
AN ASSESSMENT OF PERSISTING NEUROLOGICAL DEFICIT FOLLOWING DECOMPRESSION OF CAUDA EQUINA WITHIN 12 HOURS

JSH Gaskin, H. Rohan, S. Karmani

Introduction: Cauda Equina is a condition requiring urgent operative intervention to avoid debilitating long term neurological compromise. The recommended maximum time delay before lack of surgical decompression results in persisting neurological deficit has been suggested to be 24 hrs and more recent studies have even indicated 48 hours as acceptable. We wanted to assess if any persisting neurological deficit occurred in our practice when treated at 12 hours or less.

Aim: To assess if patients treated within half of the maximum recommended time for surgical decompression following cauda equina i.e. 12 hours, are still pre-disposed to persisting neurological compromise.

Methods: We reviewed all patients who underwent a spinal decompression for cauda equina, based on clinical presentation, examination and magnetic resonance imaging at our institution. Over a seven year period, seven patients were found to have operative findings consistent with cauda equina syndrome. The clinical presentation, time from presentation to operative decompression and type of procedure done, as well as the clinical review at follow up, were noted.

Results: The time from presentation to operation was 8 hours 30 mins to 11 hours 48 in 6 patients and 25 hrs in one patient. All seven patients had resolution of symptoms except for dermatomal sensory deficit. Two patients had some recurrence of sciatica, two of these patients having similar operations done at the same level within 18 months.

Discussion: Our study shows that urinary compromise resolves with early decompression but that persisting neurological symptoms in the form of sensory deficit can persist even when decompression is performed within 12 hours. We conclude that early decompression is necessary but it does not alleviate all neurological symptoms.

OUTCOME OF MANAGEMENT OF CHRONIC DISCOGENIC LOW BACK PAIN WITH PERCUTANEOUS NUCLEOPLASTY

P Goru, D Makki, V Prakash, AA Hussein
Princess Alexandra Hospital, Harlow, Essex, UK

Introduction: The management of chronic low back pain presents a formidable challenge to the spine specialist. This study was carried out to evaluate the efficacy of percutaneous nucleoplasty in patients affected by painful disc protrusions and contained herniations.

Materials and Methods: 64 Patient’s data collected from 2006 to 2009 in Princess Alexandra Hospital. Minimum duration of non-operative care with back pain was 6 months. Patients were considered potential candidates for the study if they reported a clinical syndrome defined by a primary report of low back pain with or without lower extremity referral pain.

Results: Out of 64 patients, 54 patient’s full data collected. In that 28 male and 26 female with average age of 40.21 and 43.11 yrs respectively. 40 patients underwent L45 level, 4 patients at L5S1, 9 patients at L4S, L5S levels and 1 patient at 3 levels. Average Pre Op back VAS( Visual Analog Score) score 6.66, Leg VAS score 6.14 and Oswestry disability score 45.51. At 6months follow up back VAS score 4.5, Leg VAS score 3.14 and Oswestry disability score 20.03. Longest follow up with average 22 months (range from 12-36 months) with Back VAS score 5.09, Leg VAS score 3.64 and Oswestry disability score 36.25. Average pain reduction is significant - 50%-55%, and patient satisfaction is high - about 90%.

Conclusion: By overcoming the limitations of prior methods of percutaneous discectomy, DISC Nucleoplasty has demonstrated the potential to produce equivalent, or even better, outcomes in a procedure that is simpler, quicker, and less traumatic and has faster recovery-times.
EARLY RESULTS OF STAND-ALONE ANTERIOR INTERBODY FUSION IN IATROGENIC SPONDYLOLISTHESIS PATIENTS

M A König, F V Ebrahimi, G Balamurali, B M Boszczyk
The Centre for Spinal Studies and Surgery, Queen’s Medical Centre, Nottingham

Introduction: Iatrogenic spondylolisthesis occurs infrequently after posterior decompression. Posterior surgery is challenging due to altered anatomy and scarring. Anterior lumbar interbody fusion (ALIF) allows indirect decompression, restoration of lordosis and fusion.

Material and Methods: Retrospective review of 6 patients (5 female, 1 male, mean age 64±5.8 years) with iatrogenic spondylolisthesis (5 L4/L5; 1 L4/L5) treated with stand-alone ALIF (Synfix, BMP2). Assessment of pelvic incidence, listhesis, pre- and post-operative ODI, VAS, global lumbar lordosis and segmental lordosis as outcome measurements.

Results: The slippage was grade II at L4/L5 in 3 patients and grade I in 2 patients at L4/L5 and 1 patient at L5/S1. Average ODI dropped from 49±11% pre-operatively to 30±9% at 6 and to 25±6% at 12 months follow-up. VAS average dropped from 7±1 to 3±1 at 6 and 12 months follow-up. Average pelvic incidence was 54.6±8.0°. Global lordosis of 44.6±5.2° increased to 49.0±8.6°; Segmental lordosis in L4/5 was increased from 12.1±8.2° to 22.4±3.7° at 6 and 20.5±7.9° at 12 months. Cage migration due to severe osteoporosis occurred in 1 case after 5 months.

Conclusion: Anterior interbody fusion offers good stabilization and restoration of lordosis in iatrogenic spondylolisthesis. In our group, ODI and VAS scores were improved. These early results encourage further investigations regarding long-term follow-ups and prospective studies in larger patient groups.

ANTERIOR LUMBAR SURGERY IN SENIOR PATIENTS FOR COMPLEX RECONSTRUCTIONS OF THE SPINE

M A König, G Balamurali, S Badhe, B M Boszczyk
The Centre for Spinal Studies and Surgery, Queen’s Medical Centre, Nottingham

Introduction: Due to co-morbidities in elderly like atherosclerosis and approach-related risks, anterior lumbar surgery is mainly recommended for younger patients. We reviewed approach-related complications in anterior lumbar surgery in senior patients for complex reconstructions.

Materials and Methods: Retrospective review of 12 patients (8 female and 4 male), mean age 65.5±4.9 years, treated with anterior fusion mainly for degenerative scoliosis and lumbar kyphosis in between 2007-10. 9(75%) patients had multilevel procedures. Most common co-morbidities were atherosclerosis (CT-proven in 7 patients), coronary heart disease and COPD. Renal impairment was present preoperatively in 3 patients.

Results: Mean duration of surgery was 260±120.8 min and mean blood loss 403.3±348.0 ml in the whole group (157±49.1 min and 240.0±162.0 ml in single ALIF; 334.0±100.0 min and 520.0±408.0 ml in multilevel procedures). Retractor related ischaemia occurred in 8 patients (27.3±29.1 min); perfusion of the leg returned immediately after release (confirmed via pulse-oxymetry). 2 patients had a direct vessel suture (2 common iliac veins); hypotension during surgery occurred in 1 patient due to anaesthetic problems. 5 patients needed ICU support after the procedure. Superficial wound infection was reported in one patient. One case of incisional hernia and one case of lymphocele was noticed.

Conclusion: In this retrospective review, no specific complications concerning age or co-morbidities occurred in senior patients. In this group, atherosclerosis was the most common co-morbidity. However, no arterial embolism or perfusion deficit occurred. In the future, more and more elderly are to be treated by spinal surgeons. Anterior lumbar surgery is an alternative treatment option even for complex cases in the elderly. This limited group of patients need further investigations and prospective studies regarding anterior lumbar surgery.
IMPACT OF KYPHOPLASTY TREATMENT OF VERTEBRAL COMPRESSION FRACTURES ON PAIN AND FUNCTION IN 105 PATIENTS

J.A. Clamp, Z. Klezl

Vertebral compression fractures are very common. 250,000 are diagnosed annually in the United States with 80% due to osteoporosis. Symptomatic relief with conservative therapy is often difficult to achieve. The consequence of significant pain is deterioration in quality of life and often in level of function. They independently increase mortality rate. Balloon kyphoplasty is a relatively new technique which stabilises the vertebral body and restores sagittal spinal alignment. Excellent pain relief and improved functional outcome is reported. We aim to confirm this.

All patients receiving balloon kyphoplasty treatment at Derby Hospitals NHS Trust from April 2006 to August 2010 were entered prospectively onto a database. Visual Analogue Score (VAS) for pain and Oswestry Disability Index (ODI) for function were recorded. Technical data including number of levels, cement volume, screening time and kyphosis correction was recorded. 198 patients underwent balloon kyphoplasty between April 2006 and August 2010. Some data was incomplete. 105 patients had sufficient data for meaningful analysis. 170 levels were operated on in 105 patients. 65% (n=68) of patients were female and the average age was 74.

The average pre-operative visual analogue score (VAS) was 8.2. This decreased to 4.0 in the immediate postoperative period. This dramatic improvement remained and was 4.1 at 6 weeks, 3.3 at 6 months and 3.6 at 1 year. The average pre-operative Oswestry disability index (ODI) was 58. This improved to 47 in the immediate post-operative period. At 6 weeks this had improved further to 40 and further improvements were seen at 6 months (ODI 37) and 1 year (ODI 38).

Balloon kyphoplasty should be considered in all patients with ongoing pain following an acute vertebral compression fracture that doesn’t respond to conservative treatment.

References:

PRIMARY CARE PERCEPTIONS OF THE PREVALENCE, DIAGNOSIS AND MANAGEMENT OF COCCYDYNA: RESULTS OF A WEB BASED SURVEY OF DEVON GENERAL PRACTITIONERS

P Hourigan, A Clarke, J Powell & M J Hutton
Work undertaken at The Peninsula Spinal Unit, Princess Elizabeth Orthopaedic Centre, Royal Devon and Exeter Hospital, Devon.

Purpose of the study: to take a snapshot opinion of General Practitioner understanding of the prevalence, diagnosis and management of coccydynia.

Methodology: We designed a simple 5 question survey to administer to our local GPs. The survey was sent to 107 GP practices in Devon whose details were provided by The Devon Access Referral Team. We received 128 electronic replies. We also submitted the survey to 50 GPs who attended a study day at our institution – and ensured they had not already completed the electronic format of the same work. Thus we received 178 replies which we believe to be a highly representative sample of our local GPs opinion.

Results: 53% correctly identified the prevalence of the condition. 42% believed the condition to be associated with an underlying psychological disorder. 58% believed there was no proven treatment for the condition. Less than 18% would consider referring the patient to any secondary care service that dealt with chronic spinal pain (Pain clinic, rheumatology or spinal surgery ) even if the symptoms persisted beyond 3 months duration. 73% believed surgery was madness or had a less than 20% chance of relieving symptoms.

Conclusion: coccydynia is a painful condition, causing significant distress for those suffering with the condition. Primary care physicians seem reluctant to recognise the problem as significant and reluctant to refer patients for treatment that may offer significant symptomatic relief. Education about the condition is required.
A BLINDED PROSPECTIVE RANDOMISED CONTROLLED TRIAL TO COMPARE FACET VS PERIFACET INJECTIONS FOR LOW BACK PAIN

Wardlaw D, Nandakumar A, Vadvha M, Smith F.
Departments of Orthopaedics and Radiology, Centre for Spinal Research, Woodend Hospital, Aberdeen

Objective: To identify any difference in clinical outcome between Intra-Capsular facet (IF) and Peri-facet (PF) injections in patients with low back pain (LBP). IF and PF joint steroid injections have been used for treatment of LBP with varied reports of pain relief for many years.

Methods: Patients randomised into IF and PF groups. Bilateral L4/S and L5/S1 levels injected. 40mg of Depo-Medrone with Lignocaine (total 1ml) in IF group. 80mg of Depo-Medrone with 1ml of 0.5% Chirocaine (total 3ml) in PF group. Pain visual analogue score (VAS) and analgesic chart – completed till six months.

Results: Eighty eight total, 14 withdrew, 69 with feedback available. Sixty-three (91%) had significant pain relief a week following injection, 86% and 94% in IF & PF groups. Mean duration of pain relief was 12.4 weeks (IF-12.2, PF-12.5). Mean change in VAS before & after injection was 4 (IF-4, PF-4). Mean change in analgesic use before & after injection was 2 tablets. (IF-2.9, PF-2.3). Radiation dose area product (DAP) for IF injections- 603 and PF- 45 mGy.cm². 45 (51%) came for repeat injections, 19 & 26 in IF & PF groups.

Conclusions:

> Majority of patients had pain relief with no statistically significant difference between 2 groups in change in pain severity, duration of pain relief or change in analgesic intake.
> Significant change in VAS after injection in both groups (from 7 to 3). Pain relief for a mean duration of 12.4 weeks.
> PF - technically easier - 9 patients randomised to IF group had to have PF injections (facet joint osteophytes).
> Radiation doses much higher for IF injections even in expert hands (P=0.007). It took double the time to perform IF injections compared to PF (30 and 15 minutes).

THE INFLUENCE OF OBESITY ON PRESENTATION AND OUTCOME OF CAUDA EQUINA SYNDROME

M Venkatesan, S Balasubramanium, J Braybrooke, M Newey
Department of Trauma & Orthopaedics, University Hospitals of Leicester, UK

Background: The relationship between obesity and cauda equina syndrome (CES) has not been previously evaluated or defined.

Aim: The purpose of this study was to determine the effect of body habitus on the presentation and outcome of cauda equina syndrome.

Study Design: Single-centre case series.

Methods: A retrospective analysis was performed on 40 patients admitted with cauda equina syndrome. Data was collected regarding patient demographics, body mass index (BMI), co-morbidities, onset & mode of presentation and speed of functional recovery following surgery.

Results: There were 18 males and 22 females with an overall average age of 38.9 years. The average height was 167 cm, and the average weight was 95.3 kg, giving an average BMI of 30.3 kg/m². There were 38% of patients who were overweight (BMI 25-29.5) and 41% of patients who were obese (BMI >30.)

The average duration of back or leg pain prior to presentation was 4.2 years for the obese group and 1.3 years for the non-obese group. Bilateral sciatica, urinary incontinence and dense peri-anal numbness were the predominant presenting features in the obese group. Onset of symptoms was fast and rapidly evolving in the obese group compared to the non-obese group.

In the non-obese group, 83% underwent surgery within 24 hrs as opposed to 42% in the obese group. There was no correlation between obesity and incidence of operative complications. Recovery of motor and sensory function appeared to occur more quickly in the non-obese compared to the obese group. Recovery of bladder continence was 90% in non-obese patients and 83% in the obese group at 6 months.

Conclusion: This is the first study exploring the impact of body mass index on CES presentation and outcome. Specific care in establishing an early diagnosis in obese individuals is imperative for timely intervention.
CAUDAL EPIDURAL STEROID INJECTIONS WITH EPIDUROGRAM:
A PROSPECTIVE STUDY USING VALIDATED OUTCOME MEASURES

R Pulavarti, M Vadhva, K Wellington, M Khatri
Lancashire Teaching Hospitals NHS Trust,
Royal Preston Hospital, Sharoe Green Lane, Preston

Aim: Assess efficacy of caudal epidural injection with epidurogram with validated outcome measures.

Introduction: The administration of local steroids and other drugs into caudal epidural space has been well established procedure in the management of low back pain with or without leg symptoms. Various studies have been done to assess the efficacy of the different routes of administration of epidural injections. However, only a few published prospective studies have been done on performing caudal epidural injections under fluoroscopic guidance with validated outcome measures.

Methods: Between 2007 and 2009, a total of 129 patients underwent caudal epidural injections under image intensifier guidance with epidurogram. The study included 69 males and 60 females ranging from 20 to 80 years of age. They were prospectively followed up using validated outcome measures at 6 weeks, 3 months, 6 months and 12 months.

Results: Out of 129 patients 120 patients were followed at one year. There was statistically significant improvement in mean Low Back Outcome Score (LBOS) and Oswestry Disability Index (ODI) Scores in these patients which was maintained at the end of one year as shown in the table 1 and 2.

Based on LBOS and ODI scores, 76% of patients at 6 weeks, 68% at 3 months, 55% at 6 months and 49% at 1 year had excellent and good results. Patients with less than two levels of degenerative disc disease, with predominant unilateral leg symptoms and with symptomatic duration of less than 6 months had a better outcome of results when compared with patients with predominant back symptoms, multi-level degenerative disc disease, bilateral involvement and history of previous lumbo-sacral spine surgery.

Discussion & Conclusion: Our study on caudal epidural injections done under fluoroscopic guidance indicate improved and predictable outcome in addition to the patient satisfaction.

Table 1

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</tr>
<tr>
<td>ODI 6wk post injection</td>
<td>32</td>
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<td>ODI 3m post injection</td>
<td>34</td>
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<tr>
<td>ODI 12m post injection</td>
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Table 2

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<td>30</td>
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**CADAVERIC STUDY IDENTIFYING DURAL ADHESIONS AT THE L5 LAMINA**

*V Prasad, T Bishop, J Bernard*

*St Georges Hospital, Tooting, London*

**Purpose:** To identify why anecdotally there is a high rate of dural tears when decompressing the lamina at the L5 level.

**Methods:** The initial study involved the dissection of five cadavers that had been preserved in soft-fix. In normal anatomy the dura is separated from the ligamentum flavum by epidural fat. A gross cross section was taken at the level of the L5 lamina and the samples were examined for any obvious adhesions between the dura and ligamentum flavum. An en-bloc resection was then taken by sharp dissection of the flavum from the under surface of the lamina including the opposing dural tissue. These sections were examined microscopically using Elastin Van Giesen staining to see if any connections were present between the two tissue layers. Dura which has predominantly collagen fibres stains pink while ligamentum flavum, which consists mainly of elastin, stains blue/green.

**Results:** Out of the five samples two did not show any adhesions, one showed early development of adhesions and two showed microscopic histological fusion between the dura and ligamentum flavum.

**Conclusion:** The rate of incidental durotomy during spinal decompression ranges from 3%-13%. We have identified that fusion can occur at a cellular level between the dura and ligamentum flavum at L5. This phenomena has not been described previously has significant implications when operating at this level. We are now undertaking a larger study at St Georges Medical School involving 30 cadavers in order to gain further evidence of this histological anomaly.

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**MEDIUM-TERM CLINICAL OUTCOME OF SECOND GENERATION WALLIS INTERSPINOUS IMPLANT**

*M Venkatesn, A Ahmed, K Vishwanathan, A Udwadia, J Doyle*

*Department of Trauma & Orthopaedics, Fairfield General Hospital, Bury, UK*

**Background:** Wallis implant was developed in 1986 to stiffen unstable operated degenerate lumbar segments while preserving some intervertebral mobility. The long-term results of first-generation Wallis implant from developers were promising. However, documentation pertaining to safety and efficacy of second generation Wallis implant is sparse in literature.

**Purpose:** The objective of this study was to assess the clinical outcome of the second generation Wallis interspinous device for degenerative lumbar disc disease.

**Study design:** Prospective consecutive single surgeon series.

**Methods:** Patients were selected according to recommendations by developers of Wallis implant. Oswestry Disability Index (ODI) and Visual Analogue Scale (VAS) were used to assess patient outcomes. Implant failure was determined by disc recurrence, implant removal and revision.

**Results:** 25 patients (13 male, 12 female) with mean age of 51 years (range 47-76) had Wallis implantation (22 one level and 3 two level). Clinical outcome data at average of 60 months (47-76) available for 24 patients (96% FU)

- Mean ODI scores decreased from 59.1% pre-operatively to 24.7 and 40.5% at 2 years and 5 years follow up, respectively. 34.4 points change from baseline at 2 years and 18.6 points at final follow-up.
- Mean VAS scores decreased from 7.2 to 3.0 and 4.8 cm for back pain at 2 and 5 years; from 6.8 to 3.8 and 4.2 cm for leg pain at 2 and 5 years follow-up, respectively.

Taking a 24 point change in ODI as representing good outcome 96% (24 patients) of study subjects achieved this at 2 years.

Taking a 16 point change in ODI as representing minimum change needed for clinical success 40% (10 patients) failed to achieve this at 5 years.

2 revisions have occurred so far (8% failure rate)

**Conclusion:** The results of our series indicate that the study device is safe and efficacious in the treatment of symptomatic lumbar degenerative discs. However, good clinical outcome obtained at early years is not maintained in medium-term.

**Interest Statement:** There was no commercial support or funding of any sort.
NOVEL FLEXION-RESTRICTING STABILIZATION SYSTEM RESTORES STABILITY IN FLEXION AND TRANSLATION AFTER SIMULATED INJURY

L C Fielding, T F Alamin, L I Voronov, R M Havey, B W McIntosh, A Parikh, P Tsitsopoulos, A G Patwardhan
Musculoskeletal Biomechanics Laboratory of the Loyola University Stritch School of Medicine and Hines VA (Hines, IL).

Statement of purpose: The purpose of this experiment was to characterize the biomechanical properties of a minimally-invasive flexion-restricting stabilization system (FRSS) developed to address flexion instability.

Background: Lumbar flexion instability is associated with degenerative pathology such as degenerative spondylolisthesis (DS) as well as resection of posterior structures during neural decompression. Flexion instability may be measured by increased total flexion/extension range of motion (ROM), as well as reduced stiffness within the high flexibility zone (HFZ, the range in which most activities occur). Flexion and segmental translation are known to be coupled; therefore increased flexion may exacerbate translational instability, particularly in DS.

Method: Five cadaveric lumbar spines were tested intact; after L4-L5 destabilization including nucleotomy and midline decompression; and following restabilization with the FRSS secured to the spinous processes. Specimens were loaded in flexion (8Nm) and extension (6Nm) under 400N compressive follower preload. Flexion stiffness in the HFZ and segmental translation were also measured.

Results: Destabilization increased L4-L5 flexion by 69%±31% (p<.01); decreased HFZ flexion stiffness 56%±12% (p=.01) and increased segmental translation 70%±49% from 1.5±0.4mm to 2.4±0.4mm (p<.01). With the FRSS segmental flexion was reduced by 45%±15% (p<.01); average HFZ flexion stiffness was increased by 232%±104% (p<.01); and segmental translation was reduced by 25%±9% to 1.8±0.2mm (p<.01). These values were not significantly different from the intact condition (p=.54, p=.21, p=.19).

Discussion & Conclusion: The destabilization modeled here simulated degenerative and iatrogenic destabilizations often seen clinically. Implantation of the FRSS on the destabilized segments restored flexion, stiffness and translation to intact levels. The segmental coupling of translation and flexion seen in this experiment indicates that translation may be manipulated by altering flexion kinematics. The FRSS represents a novel system for treating flexion and translational instabilities.

ASYMMETRIC OSTEOTOMY OF THE SPINE FOR CORONAL IMBALANCE

S Thambiraj, B Boszczyk
Centre for Spine Studies & Surgery, Queen’s Medical Centre, Nottingham, UK

Introduction / Aim: In rigid Sagittal and Coronal deformities of the spine Pedicle Subtraction Osteotomies (PSO) is preferred to achieve maximal correction. We describe successful Asymmetrical Pedicle Subtraction Osteotomies (APSO) performed on patients with symptomatic coronal imbalance.

Methods / Results: Case 1: 28yr old female with VATER syndrome with 25° coronal imbalance to her left with past h/o fusion from L3 – S1 for L5 hemi-vertebra. After APSO at L3 coronal imbalance was reduced to 0°.
Case 2: 49yr old male with post-traumatic coronal deformity of 35° at T6 and paraplegia affecting his sitting balance and respiratory function. Following APSO at T12 imbalance was reduced to 5°.

Osteotomy technique: After insertion of pedicle screws for the stabilisation, laminectomy of the proposed level of osteotomy was performed. Next, dissection lateral to the pedicle and vertebral body was performed bluntly with mastoids to reach the front of the anterior cortex and confirmed with fluoroscopy. Using osteotomes, curettes and Kerrison oblique osteotomy from the lateral cortex to reach opposite cortex was performed above & below the pedicle under imaging. The facets were resected at this level to facilitate mobility of the osteotomy site. The osteotomy site was closed after insertion of extra hard rods.

Conclusion: Satisfactory correction of coronal deformity can be achieved with asymmetrical pedicle subtraction osteotomy to improve cosmesis and also the sitting and standing balance. In contrast to Sagittal Osteotomies, blunt dissection to the anterior cortex is necessary in coronal Osteotomies to allow resection of anterior cortical bone for closure of the wedge.
THE SPINE TANGO. A FEASIBILITY STUDY: DESCRIBING ITS USE IN A UK HOSPITAL

R Rout, R J Mills, The Oxford Spine Research Group
Nuffield Orthopaedic Centre, Oxford.

Introduction: It is becoming increasingly more accepted that Patient Reported Outcome Measures (PROMs) should be used to assess surgical interventions. We report on a pilot study of a generic database with complete pre and post-operative data sets in a UK hospital.

Method: 19 cases undergoing lumbar surgery in our institution were prospectively reviewed between January and August 2010. Pre and post–operative data assessing pain, back pain specific function, generic health, work disability and patient satisfaction were collected using a core outcome measures index, EuroQol EQ-5D and Oswestry Disability Index (ODI). Details of surgery and assessment of treatment outcome by the operating surgeon was also assessed.

Results: There were 11 males and 8 females. 8 cases were coded as disc herniation, and 11 as spinal stenosis. Levels involved included L3/4 (4), L4/5 (8) and L5/S1 (6). ASA status was 1 (4/19), 2 (12/19) and 3 (3/19). The median operation time for all operations was between 1-2 hours and blood loss was under 500ml for all cases. Complications recorded were one dural tear and one wound infection. Post operatively the COMI score improved from 8.7 to 7 overall (p=0.028) and the leg pain score improved from 8 to 7 overall (p=0.009). The EQ-5D improved from 0.09 to 0.36. The ODI improved from 60 to 40 (p=0.03). Patients reported being satisfied in 73% of cases and the surgeon reported a good or excellent result in 65% of cases.

Conclusion: The Spine Tango is an effective and user friendly tool for data collection. Data entry and extraction is easy. It is security enhanced and no Patient identifiable data (PID) is transferred outside the host institution. Data retrieval can be done online with clear-cut graphs and data tables or by downloading data and importing into a statistical package for more complex, analyses.

HIGH INTENSITY FOCussed ULTRASOUND (HIFU) FOR RECURRENT SACROCOCCYGEAL CHORDOMA

M.J. Gillies, S. Bojanic, R. Ritchie, T. Leslie
The HIFU Unit, Churchill Hospital, Headington, Oxford, OX3 7LJ

Purpose: We present results of high intensity focussed ultrasound (HIFU) therapy on 2 patients with recurrent sacroccocygeal chordoma with the aim to promote recruitment of patients into a larger clinical trial

Method: Extracorporeal high intensity focussed ultrasound, outcome measure: radiological evidence of involution, clinical status at follow up.

Sacrococcygeal chordomas are rare, histologically benign tumours that tend to grow inexorably causing pain, and loss of function in the lower limbs and genitor-urinary symptoms. Results after surgical resection with conventional radiotherapy have been generally disappointing. Carbon ion therapy has been reported to be more successful, but this is not available in the UK. Both patients presented some years after surgical resection with recurrent sacral chordoma, causing intractable pain, and declining mobility. The patients underwent several (4 and 2) sessions of HIFU, using a protocol adapted for renal cell carcinoma and without any adverse events. Follow up MRI 2 weeks and 3 months post procedure showed reduction in tumour enhancement in targeted areas. This correlated with a patient-reported improvement in pain control and improving lower limb function sustained during a 3 month period.

We propose the establishment of a clinical trial examining the utility of HIFU on recurrent sacral/coccygeal chordoma in adults after surgical resection. The outcomes measured will be pain scores, functional status using validated scoring scales to allow systematic comparisons with other treatments, and survival. We aim to recruit at least 14 patients initially. Side-effects and complications of the treatment will be recorded. Treatment and follow up of patients will take place in the Churchill Hospital, Oxford, UK.
A NOVEL "PELVIC RING AUGMENTATION CONSTRUCT" FOR LUMBO-PELVIC RECONSTRUCTION IN TUMOUR SURGERY

S Thambiraj, B Boszczyk
Centre for Spine Studies & Surgery, Queen’s Medical Centre, Nottingham, UK

Introduction/Aim: Numerous lumbo-pelvic reconstruction methods based on posterior construct and anterior cages have been proposed for cases involving total sacrectomy and lumbar vertebrectomy. These constructs create long lever arms and generate high cantilever forces across the lumbo-sacral junction resulting in implant failure or breakage. Biomechanical studies have shown that placing implants anterior to lumbo-sacral pivot point provide a more effective moment arm to resist flexion force and improve the ultimate strength of the construct. As a result more emphasis is placed on screws in the pelvis.

We report a new and novel technique that allows for the placement of a pelvic ring construct to augment the posterior construct in a lumbo-pelvic reconstruction.

Method: In the prone position, two contoured hard rods are passed along the inner table of the pelvis under the iliac muscle from a minor posterior approach. The rods are connected to the posterior lumbo-pelvic construct with T-junction clamps. The patient is turned supine and the anterior ends of the rods are connected to a sub-cutaneously placed hard rod along the anterior abdominal wall with T-junction clamps. This in turn is fixed to the AIIS (anterior inferior iliac spine) with two poly axial screws. The whole construct resembles an oblong ring.

Results: At six months she is mobilising independently with a frame and X-rays show no failure of construct or implant.

Conclusion: The construct is technically less morbid and bio-mechanically sound to effectively neutralise the flexion to a greater degree than previous constructs described in the literature. It shares and tolerates the flexion moments at the lumbo-pelvic junction by its anterior placement to the sacral pivot point.

THE USE OF NON-METALLIC IMPLANTS TO FACILITATE POST-OPERATIVE PROTON THERAPY IN CHONDROSARCOMA OF THE SPINE. A CASE REPORT

N S Mangat, A Kotecha, A J Stirling
Department of Spinal Surgery, Birmingham Spine Centre, Royal Orthopaedic Hospital NHS Foundation Trust, Bristol Road South, Northfield, Birmingham, B31 2AP

Statement of purpose: We review the current state of development of proton therapy and the implications for beam therapy in the management of primary bone tumours.

Introduction: The principle of radiotherapy is to deliver a high dose, accurately, to the tumour. Conventional photon and proton therapy irradiates adjacent tissue significantly. This is reduced with intensity modulated proton therapy (IMPT). This has been demonstrably effective in treating tumours refractory to chemotherapy and conventional radiotherapy such as chondrosarcomas and chordomas.

Case Report: We present a patient with an isolated chondrosarcoma involving the anterior and posterior element of the L3 vertebral body with a significant soft tissue component displacing the IVC. The patient underwent a 2 stage en-bloc excision of the tumour: Stabilization was achieved by posterior L2-4 instrumented fusion with PEEK rods, an anterior PEEK cage and bone graft. Post-operatively the patient underwent 12 weeks of bed rest followed by rehabilitation. Due to pedicle involvement (giving a high risk of contamination) and the narrow clear margin found on histology the patient has been accepted for post-operative IMPT.

Discussion: The high risk of contamination and the narrow margins presented an ideal case for post-operative IMPT. However, conventionally the stabilization would have been metallic, distorting the treatment mapping and the delivery of the IMPT, reducing any possible benefit. Thus, we used PEEK as it is proven to maintain its properties when subjected to a wide range of conditions while also being tolerant of, and not interfering with, most forms of radiation including proton therapy, maximising the chance of a positive outcome. One concern is that PEEK is less biomechanically stable then metal, hence the prolonged period of bed rest.

Conclusion: This report discusses the current evidence for proton therapy while describing a successful technique for stabilization to facilitate delivery of proton treatment post-operatively.
TIMING OF RADIOLOGICAL DIAGNOSIS AND SURGICAL INTERVENTION IN PATIENTS WITH METASTATIC SPINAL CORD COMPRESSION

N A Quraishi, K Giannoulis, D Copas
Centre for Spine Studies & Surgery, Queen’s Medical Centre, Nottingham, UK

Introduction: Metastatic Spinal Cord Compression (MSCC) is a well recognised complication of cancer and a surgical emergency. We present the results of a prospective audit of process focusing on the timing of intervention for these patients from presentation/diagnosis to surgery.

Methods: Prospective audit of all patients referred to a tertiary spine unit over 6 months (April –September 2010). All data captured on an excel database.

Results: During the study period, 36 patients were referred to our unit with suspected MSCC. Thirty patients (mean age 64.9 years (46-89)) had confirmed MSCC, and of these 25 underwent decompression/stabilisation surgery (vertebroplasty/kyphoplasty (4), declined operation/unfit (7)).

The presenting symptoms in the MSCC group were pain and neurological deterioration (16), pain only (7) and progressive neurology (3). The mean duration of pain was 131 days (3 days-over 2 years), and neurological progression was 14 days (1-120 days; Frankel C (3), D (16), E (7)). Four patients were non-ambulatory and 3 had urinary incontinence.

The tumour histologies were Prostate (6), Renal (4), Breast (4), Haematological (4), Lung (3), Unknown (1), Others (3). The time from presentation to surgery was 12.9 hours (160mins- 36 hours) if the MRI was organised in our unit. But, if all patients with MSCC were included, together with those referred from other hospitals, the mean time from radiological diagnosis (MRI) to surgery was 29 hours (range 160 mins- >76 hours).

Conclusion: This audit of process over 6 months shows that if MSCC is suspected, then patients should be referred to a specialist centre with out of hours MRI provision and where definitive treatment can take place.

AN ASSESSMENT OF THE IMPACT OF THE IMPLEMENTATION OF A JOINT SPINAL ROTA ON REFERRAL PATTERNS TO A NEUROSURGICAL DEPARTMENT

S Metcalfe, K S Manjunath Prasad
James Cook University Hospital, Middlebrough, UK

Purpose: To assess the impact of implementing a joint Neurosurgical/Orthopaedic Spinal on-call rota on the referral patterns to the Neurosurgical Department at James Cook University Hospital, Middlesbrough.

Methods: A joint spinal rota was implemented at James Cook University Hospital in April 2008, to provide 24-hour on-call availability of a Spinal specialist. Using the Neurosurgical Referral Database (Microsoft Access), the referrals received for the 12 months prior to, and subsequent to, the implementation were analysed.

Results: There was a 13.4% increase in total spinal referrals in the 12 months post-implementation of the new spinal rota, compared with pre-implementation. Total admissions from these referrals increased by 11.7%. There was an increase of 5.5% in lumbar degenerative referrals (including cauda equina referrals), a 10.5% decrease in cervical degenerative referrals, and most significantly, a 42.9% increase in spinal injury referrals, including fractures, and spinal cord injuries.

Conclusions: The implementation of a joint Neurosurgical and Spinal Orthopaedic on-call rota for Spinal Surgery has resulted in the availability of a Spinal Consultant on-call 24hrs a day, 7 days a week to cover Spinal emergencies. The resulting change in referrals to the Neurosurgical Department has seen an increase in both referrals and admissions, although it is uncertain whether this is a result of a general increase in referral rate, or a direct result of the change in service provision.
DIAGNOSTIC YIELD AND MICROBIOLOGY TRENDS IN 125 PATIENTS WITH SPINAL INFECTIONS

Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Herries Road, Sheffield, S5 7AU

Introduction: Spinal infections constitute a spectrum of disease comprising pyogenic, tuberculous, nonpyogenic-nontuberculous and postoperative spinal infections. The aim of this study was to review the epidemiology, diagnostic yield of first and second biopsy procedures and microbiology trends from Sheffield Spinal Infection Database along with analysing prognostic predictors in spinal infections.

Materials & Methods: Sheffield Spinal Infection Database collects data prospectively from regularly held Spinal infection MDTs. We accrued 125 spinal infections between September 2008 and October 2010. The medical records, blood results, radiology and bacteriology results of all patients identified were reviewed. In patients with negative first biopsy, second biopsy is contemplated and parenteral broad spectrum antibiotic treatment initiated.

Results: There were 81 pyogenic, 16 tuberculous and 28 postoperative spinal infections. The mean age was 58.4 years (range, 19 to 88 years). There were 71 male and 54 female patients. There were 64 lumbar and 26 thoracic infections. Two level and multi-level spinal infections involving more than two segments occurred in 30 patients. Of sixty positive microbiology yields, the most common organism was methicillin sensitive staphylococcus aureus (n-23) followed by Streptococcal, E Coli and Coagulase negative staphylococcal and Pseudomonas infections. Second biopsy (done when first biopsy negative) was only positive in two patients.

Conclusions: Annual incidence of de novo spinal infection was 48 (pyogenic-40, tuberculous-8). The most frequently isolated pathogen was Staphylococcus aureus. Multi-level infection, diabetic patients, resistant TB and postop infection in elderly patients constituted the ‘difficult to treat’ group in our experience. An algorithm for the diagnostic work-up and management of spinal infections is proposed.

ONGOING AUDIT AFTER LUMBAR TOTAL DISC REPLACEMENT - ENSURING COMPLIANCE WITH NICE GUIDANCE

S Grannum and P Basu
Northampton General Hospital

Aim: NICE guidance on lumbar total disc replacement (TDR) recommends ongoing audit should be an integral part of disc replacement surgery. We present our ongoing audit data and the extent of problem of patients lost to follow up.

Method: 35 patients underwent lumbar TDR surgery over 4.5 years were followed prospectively. A database is maintained and ODI and VAS were collected prospectively, including patient satisfaction and any failures.

Results: At latest follow up full data was available for 30 out of 35 patients. The mean follow-up was 34 months (range 3-52 months). There were 13 males with a mean age 37.7 years (range 27-62) and 17 females with a mean age of 49.8 years (range 27-62). Surgery was single level in 24 cases and double level in 6 cases. 21 patients rated their outcome as good or very good and 7 as unsatisfactory. There were 2 failures, one secondary to late extrusion of the polyethylene liner (12 months post-surgery) and one early anterior migration of the prosthesis. ODI scores improved by a mean of 28 points (range -4 to 68) whilst VAS scores improved by a mean of 4.9 (range -1 to 9). Five patients had been lost to follow up. One patient migrated out of the area. Two came from out of the area and did not return for follow up after the initial period and two further patients DNAed multiple clinic appointments.

Conclusion: We conclude that lumbar disc replacement surgery can provide substantial improvement in pain relief and function. Continued audit of this cohort of patients is essential to comply with NICE guidance. 14% loss to follow up/audit is encountered despite our best effort.
THE PORTRAYAL OF BACK PAIN IN THE PRESS

SS Al-Nammari, BZ Saeed
Barnet Hospital

Purpose: To determine, for the first time, how back pain is portrayed in the United Kingdom press.

Methods & Results: LexisNexisTM Professional search engine was utilised to retrieve articles from all national newspapers over a six months containing the terms "back pain/backpain/back ache/backache" from May to October 2009. 284 relevant articles were retrieved. Of these tabloids accounted for 62% and broadsheets for 38%. Back pain was the sole topic in 7%, a main topic in 18% and mentioned in passing in 75%. 15% were essentially case reports and the tone was neutral in 95%, positive in 2.5% and negative in 2.5%. The cause of back pain was mentioned in 11% of articles- trauma accounted for 50% and disc disease and spinal deformity for 20% each. Only 0.3% of articles discussed litigation. Articles mentioned new physiotherapy regimes in 7%, new forms of alternative therapy in 7%, new surgical techniques/technologies in 2% and new medications in 1%. They were significantly more likely to mention new non-surgical techniques- Fishers’ Exact Test p=0.01. Articles were alternative therapy related in 3%, physiotherapist related in 2%, surgeon related in 1% and pain specialist related in 1%. 10% of papers included a quote from an “expert” of which 23% were Spine Surgeons, 16% GP’s, 13% Sports Physicians, 13% alternative therapists, 10% pain specialists and 7% physiotherapists. Overall, 98% of articles were of a neutral tone and 1% were of a positive tone or negative tone. Articles concerning physiotherapists or new surgical techniques/technologies were significantly more likely to be of a positive overall tone than the other articles- Fishers’ Exact Test p=0.04.

Conclusions: Back pain receives a considerable amount of attention in the United Kingdom press. Much of this currently concentrates on isolated case reports, the aetiology of back pain is poorly represented, quoted “experts” are frequently non-medical and new surgical treatments receive significantly less attention than new non-surgical treatments. The press play an important role in educating and informing the general public. The stories they cover and how they cover them have a powerful influence on public perceptions. We need to do more to engage with the press and positively influence their reportage.

LEVEL OF HEALTH RESOURCE UTILISATION AFTER LUMBAR DISC REPLACEMENT

S Grannum, P Basu
Northampton General Hospital

Aim: To Evaluate the level of health resource utilisation by patients after lumbar total disc replacement (TDR) for mechanical low back pain.

Method: At our centre, 35 patients underwent TDR and were followed prospectively from surgery. All surgery was performed by the senior author. Patients were followed routinely in clinic at yearly intervals. In addition, the patients and their GPs were contacted via telephone. Information gathered included ODI and VAS, satisfaction with surgery and return to work. We specifically established whether the patients continued to seek healthcare, for persistent back symptoms, from professionals (both NHS and private) including their GP, pain clinic, physiotherapist, acupuncturist, chiropractor or another spinal surgeon, and had any further interventions.

Results: We have complete dataset on 30 out of 35 patients and are the subject of this study. There were 13 men, with a mean age of 37.7 years (range 28-45 years), and 17 women with a mean age of 49.8 years (range 27-62 years). Surgery was single level in 26 and two levels in 6 cases. Patients were satisfied with the outcome of surgery in 21 cases (70%), not satisfied in 7. Two cases had implant failures. 25 patients were working pre-operatively and 26 were working postoperatively. Eighteen patients required no further healthcare input. Five had had pain clinic reviews, six had seen their GPs (1-6 visits) and one another spinal surgeon (after late liner extrusion). Seven had facet injections and two had epidurals. One patient underwent posterior fusion for implant migration.

Conclusion: In our series TDR is successful in 70% and 60% of the entire cohort needed no further healthcare input. After successful TDR there is almost no ongoing use of health resources.
INTRA-OPERATIVE LOCALISATION OF THORACIC SPINE LEVEL – A SIMPLE "‘K’ WIRE IN PEDICLE" TECHNIQUE

N A Quraishi, S Thambiraj
Centre for Spine Studies & Surgery, Queen’s Medical Centre, Nottingham, UK

Introduction/Aim: Intra-operative localisation of thoracic spine levels can be difficult due to anatomical constraints such as scapular shadow, patient’s size and poor bone quality. This is particularly true in cases of thoracic discectomies in which the vertebral bodies appear normal. We describe a simple and reliable technique to identify the correct thoracic spine level.

Methods: After induction of general anaesthesia, the patient is placed prone and the pedicle of interest is identified using fluoroscopy. A ‘K’ wire is then inserted percutaneously into this pedicle under image guidance (confirmed in the antero-posterior (AP) and lateral views). The ‘K’ wire is then cut flush and the patient is then positioned laterally and the intended procedure is performed.

Results: We routinely use this technique in all our thoracic discectomies. Placing the ‘K’ wire into a fixed point like the pedicle, facilitates rapid intra-operative viewing of the level of interest and is removed easily at the conclusion of surgery.

Conclusion: Per-operative placement of the ‘K’ wire avoids the patient undergoing two procedures as some of the other invasive techniques have described in the literature for correct level identification. Furthermore, this technique is simple and requires no more ability than placing an implant in the pedicle under fluoroscopy. It has the added advantage of reducing anaesthetic, surgery and fluoroscopy time.

THORACIC SPINE PAIN: A CAUSE FOR CONCERN?
A RETROSPECTIVE REVIEW OF PATIENTS PRESENTING WITH THORACIC SPINE PAIN

R.J Newsome, M Reddington, L.M Breakwell, N Chiverton, A.A Cole, ALR Michael
Sheffield Spinal Service, Sheffield Teaching Hospitals NHS Foundation Trust.

Purpose: To question the reliability of Thoracic Spine pain as a red flag and symptoms of a possible cause of Serious Spinal Pathology (SSP).

Methods: The clinical notes and Magnetic Resonance Imaging (MRI) results of patients presenting to the Sheffield Spinal Service with Thoracic spine symptoms but no signs were retrospectively reviewed over the period of 2 year (September 2008-August 2010). The clinical reason for request of Thoracic MRIs were noted and the patient notes were reviewed to determine their presentation, length of time of symptoms, age and also it was noted whether any other recognized red flag symptoms were present. Exclusion criteria consisted of patients referred with known SSP or myelopathic symptoms.

Results: 57 thoracic spine MRI requests were made in total by the orthopaedic spinal teams for patients presenting with thoracic spine pain in the time period. 8 patients were excluded as per criteria as they were referred with known SSP as were 4 other patients with a history of previous cancer. 45 patients presented with thoracic spine pain but no other red flag signs or symptoms. Of these none had MRI evidence of serious spinal pathology or indeed anything pathological indicating the cause of their symptoms.

Conclusion: The majority of those presenting to orthopaedic spinal clinic with thoracic spine pain alone with no other red flag signs have no pathological cause. Thoracic pain is a widely accepted indicator (red flag) of potential serious spinal pathology. The findings from this review would not support thoracic pain alone as an indicator of SSP.
THROMBOPROPHYLAXIS IN SPINE SURGERY: A SURVEY OF CURRENT PRACTICE IN UNITED KINGDOM AND COMPLIANCE WITH NICE GUIDELINES.

S. Bhagat, S. Lau, S. Ahuja
Cardiff and Vale University Hospital, Spinal Unit

Purpose of Study: To investigate current practice of thromboprophylaxis in major UK spinal centres for both trauma and elective surgery, and to assess compliance with NICE guidelines

Methods: A telephonic survey was carried out which comprised of questions relating to current practice of thromboprophylaxis in major spinal units across the UK. Questions probed practice with regard to trauma versus elective surgery, agents used, timing of prophylaxis, length of treatment and whether practice has changed since the introduction of NICE guidelines.

Results: Thirty specialised centres were contacted. Twenty eight centres followed NICE recommendations, with 2 centres using their own protocol. Four centres made changes to their existing protocols after the emergence of NICE guidelines. GCS (Graduated compression stockings) were uniformly used by all, with most centres using flowtron boots and/or foot in addition. The practices are differing within centres for elective versus trauma surgery. Of note, in patients with an acute cord injury, 20 centres used combined pre operative prophylaxis whereas 10 centres used only mechanical prophylaxis. Three units (10 %) describe a noticeable rise in complications related to chemoprophylaxis, whilst only one unit has reported a PE death within the last year.

Discussion: Our survey assesses compliance to the NICE guidelines by the UK’s spinal units. Mechanical prophylaxis appears to be the most common mode of prophylaxis understandably due to predictable safety profile. Use of chemo-prophylaxis varies amongst different surgeons and centres. Rather than a result of evidence based practice, the decision appears to be related to the previous experiences of that unit. Although the NICE guidelines provide a reasonable platform to the practice of thromboprophylaxis, more studies are required to evaluate the risks of thrombosis and bleeding events in spinal surgery.

REVIEW OF RADIATION EXPOSURE DURING FLUOROSCOPICALLY ASSISTED PEDICLE SCREW PLACEMENT IN SCOLIOSIS CORRECTIVE SURGERY.

D. Hughes, J. Hutchinson, I. Nelson & I. Harding
Frenchay Hospital, North Bristol NHS Trust

Computer assisted surgery is becoming more prevalent in spinal surgery with most published literature suggesting an improvement in accuracy and reduction in radiation exposure. This has been particularly highlighted in scoliosis surgery with regard to the placement of pedicle screws. Anecdotally this has been challenged with concerns with regard to the steep learning curve using this equipment and the high cost of purchasing said systems. The more traditional technique utilises the surgeon’s knowledge of anatomic landmarks and tactile palpation added with fluoroscopy to place pedicle screws. We retrospectively looked at 161 scoliosis corrections performed using this technique over three years by 3 main surgeons at the same centre (Frenchay). With an average of 10 levels per procedure and over 2000 pedicle screws inserted. We reviewed the radiation time exposure and dose of radiation given during each case. Our results compared favourably to published data using computer and robot assisted surgery with an average exposure time of 80 seconds and a mean dose of 144 mGy using a standard C-arm guided fluoroscopy. Our study suggests that armed with good surgical knowledge and technique it is possible to obtained low levels of radiation exposure of benefit to both patient and the operating team.
CONTEMPORARY MANAGEMENT OF SEVERELY DISPLACED ODONTOID PEG FRACTURES IN THE ELDERLY

J L Maggs, A J Clarke, M J Hutton, D Chan
Peninsula Spinal Unit, Princess Elizabeth Orthopaedic Centre, Royal Devon and Exeter Hospital, Barrack Road, Exeter, Devon, EX2 5DW

Purposes of the study: The most common fracture of the cervical spine in the elderly population is a fracture of the odontoid peg. Such fractures are usually not displaced and these are commonly treated non-operatively. Rarely though, peg fractures are displaced and then their management is less straightforward. This is in part because the group of patients who sustain them frequently have complex and pre-existing medical co-morbidities and in part because a new neurological injury may have been sustained as a result of the peg fracture itself.

Many options for the management of displaced peg fractures, both operative and non-operative have been described in the literature and discussion continues as to which technique is superior and in which patient population. The purpose of this study was to follow-up those patients who were managed operatively in our unit between 2007 and 2009.

Methods and Results: We present our case series of 4 patients who sustained significantly displaced fractures of the odontoid peg with accompanying neurological injury, who were treated with posterior stabilisation using the Harms technique.

Conclusions: We have found this method to be safe and reliable. It not only yields a good surgical outcome, but allows patients’ rehabilitation to be optimised, maximising functional improvement. We believe the technique is superior to anterior stabilisation in this patient population because it utilises superior posterior bone quality and mechanical fixation. The approach in our unit is to treat elderly patients with displaced odontoid peg fractures according to the same principles as would be followed in managing those that have disabling injuries such as fractures of the femoral neck; early stabilisation and early mobilisation in those patients whose co-morbidities allow it.

IS IT SAFE TO USE LONG SCREWS IN L5/S1 STAND-ALONE ANTERIOR INTERBODY FUSION?:
A REVIEW OF 38 PATIENTS

M A König, G Balamurali, F V Ebrahimi, M P Grevitt, H Mehdian, B M Boszczyk
The Centre for Spinal Studies and Surgery, Queen’s Medical Centre, Nottingham

Introduction: Recently published results suggest insertion of shorter screws in L5/S1 stand-alone anterior interbody fusion, fearing S1 nerve root violation. However, insertion of shorter screws led to screw fixation failure and new onset of S1 body fractures.

Material and Methods: Retrospective review of patients with L5/S1 stand-alone anterior interbody fusion, focussing on screw length, radiological outcomes (especially metal work failure, screw fixation and S1 body fractures) and new onset of S1 nerve root irritation.

Results: 38 patients were included (mean age 46.2±13.3 years, 21 females, 17 males). Fusion of the L5/S1 segment was performed in between 2003-2010; postoperative follow-up ranged from 2-24 months. 15 patients had multilevel surgery (7 multiple segmental fusion, 8 hybrid procedures). Screw length ranged from 20-30 mm.

No patient had new postoperative S1 nerve root irritation. Interestingly, 2 patients out of the hybrid group had a new onset of L5 radiculopathy, concordant to the level of disc-replacement.

Follow-up x-ray review showed no fracture of S1 body fractures in all patients. No evidence of screw loosening, migration or metal work failure was reported.

Conclusion: In our opinion, this review showed that insertion of longer screws for stand-alone anterior interbody fusion in L5/S1 is safe. Longer screws offer better stabilization and seem to minimize risks like S1 body fractures. Short and long-term follow-ups were satisfactory regarding screw placement, migration and positioning of implants in all patients.
Introduction: Lumbar spondylolysis is a fatigue fracture of the pars interarticularis and correlates with Spina Bifida Oculta (SBO) in 67%.

Hypothesis: Load is normally transferred across the arch in axial rotation. Bifid arch results in increased strain across the isthmus of the loaded inferior articular process.

Aim of investigation: Finite element (FE) analysis of altered load transfer in combined axial rotation and anteroposterior shear in SBO potentially predisposing to fatigue fracture of the pars interarticularis.

Methods: FE models of natural and SBO (L5-S1) including ligaments were axially load to 1kN and an axial rotation of 3° applied. Bilateral stresses and strains on intact and SBO lateral inferior lines of the L5 isthmus were assessed and compared.

Results: Under 1000N axial load: Maximum von Mises stress observed on left and right lateral inferior lines of L5 isthmus were 0.13 and 0.24 MPa, with maximum equivalent strain values of 1.56 and 2.91 \( \varepsilon \) strain, for natural spine and SBO, respectively. Combined with 3° axial rotation (rotation of spinal processes toward right lateral side): Left lateral L5 isthmus stresses increased to 0.49 and 0.77 MPa for natural spine and SBO, respectively. Right lateral L5 isthmus values increased to 0.67 and 0.95 MPa for natural spine and SBO, respectively. The percentage increase in SBO strains compared to the natural spine on the L5 isthmus were +57.9 and +40.2%.

Conclusion: Significant load transfer occurs through the vertebral arch in axial rotation. In SBO this load transfer is lost and mechanical demand on the isthmus is significantly increased. Strain increases across the L5 isthmus in axial rotation by +40.2% to +57.9% compared to normal and may predispose to fatigue fracture.
PERCUTANEOUS REDUCTION AND MINIMAL-INVASIVE TRANS-SACRAL SCREW FIXATION IN U-SHAPED FRACTURES OF THE SACRUM

M A König1, S Jehan1, G Balamurali1, U Seidel2, P Heini2, B M Boszczyk1
1 The Centre for Spinal Studies and Surgery, Queen’s Medical Centre, Nottingham
2 Department of Orthopaedic Surgery, Inselspital Bern, Switzerland

Introduction: Isolated U-shaped sacral fractures are rare entities, mostly seen in polytraumatized patients, and hence, they are difficult to diagnose. While the pelvic ring remains intact across S2/S3, the U-shaped fracture around S1 leads to marked instability between the base of the spine and the pelvis. As severe neurological deficits can occur, timely treatment of these fractures is crucial. We present a novel technique of percutaneous reduction and trans-sacral screw fixation in U-shaped fractures.

Material and Methods: 3 multiply injured patients with u-shaped sacral fractures (female, age 21.7±7.23). Two underwent immediate fracture fixation. In the third case delayed reduction and fixation was performed after referral 6 weeks following open decompression. In prone position, a pair of Schanz pins was inserted into pelvis at the PSIS. A second pair of Schanz pins was inserted into S1 or L5. All pins were inserted percutaneously. The fracture was reduced indirectly, using the Schanz pins as levers. After image intensifier control of the reduction result, two trans-sacral screws were inserted for finite fixation.

Results: In all three cases, this novel method of percutaneous reduction allowed an anatomical sacral alignment and stabilization with trans-sacral screws was initially sufficient. At 1 year follow-up, both immediately fixed fractures showed an anatomical sacral alignment. Both had no neurological deficits, no signs of screw-loosening and were pain free. Unfortunately the delayed fixation showed a new tilt and hence loss of sacral alignment. This might be due to posterior structural integrity loss after decompression.

Conclusion: U-shaped sacral fractures are rare, but correct and immediate treatment is paramount to achieve good outcome. Percutaneous reduction and screw fixation offers a less invasive treatment method. Anatomical alignment and stabilisation is possible and time of surgery can be reduced significantly.

Figure 1: CT-imaging of the U-shaped fracture, fracture reduction and postoperative result
AN AUDIT OF MANAGEMENT OF PRIMARY BONE TUMOURS OF THE SPINE IN A REGIONAL TUMOUR SERVICE

A L Khan, W M Oliver, D Fender, M J Gibson
Orthopaedic Spine Unit, Freeman Hospital, Newcastle upon Tyne

Aim: To identify patterns in referral and the management pathway of patients with primary bone tumours of the spine referred to the Orthopaedic Spine Unit in order to recommend ways to improve the service.

Methods and results: A retrospective notes and imaging review to evaluate the referral pathway undertaken by patients ending up in the orthopaedic spine unit over a 5 year period according to the recommendations for primary bone tumours. Significant events leading to potential improvement in outcomes were assessed. Recommendations for improvements are suggested. None of the 38 patients evaluated were referred within two weeks of presentation, and only 6 were referred directly to the bone tumour service. Almost half (15/32) of the patients who had an indirect referral pathway had a prior intervention. Five of these had non-surgical, while 10 had surgical interventions outside the tumour centre before their referral. Of these, seven had malignant tumours.

Conclusion: In order to optimise outcome, patients with potentially malignant primary tumours of the spine should be referred directly to tumour services. Prior procedures should be limited to biopsy procedures and discussed with the tumour service before this is undertaken having appropriate investigation and imaging available. Guidelines for this should be directed at streamlining the referral pathway and encouraging communication between stakeholders. Further research should assess the impact of patient-related delay in presentation contributes to overall delay in referral to tumour service; how early radiological assessment may augment timely referral; and how indirect referral and prior intervention affect patient outcomes.

SIGNIFICANCE OF THE PRESENCE OF THE INVERTED RADIAL REFLEX IN ASYMPTOMATIC SUBJECTS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

A D Iliadis, R Mansouri, A J Gibson
Royal National Orthopaedic Hospital NHS Trust, Stanmore, Middlesex, UK

Aim: The aim of this study is to identify the incidence of the presence of an Inverted Radial Reflex (IRR) in asymptomatic subjects with Adolescent Idiopathic Scoliosis and determine its significance.

Methods: Our study group consists of Adolescent Idiopathic Scoliosis patients who presented consecutively in our institution from June to September 2010. They were either seen in outpatient clinics or as elective admissions prior to operative correction of their spinal deformity. The presence of an idiopathic scoliosis deformity and the absence of any abnormal neurological symptoms were our inclusion criteria. They were examined by two clinicians for the presence of IRR using a tendon hammer. As part of their management all such patients routinely undergo an MRI scan in our Trust to investigate for the presence of intraspinal pathology. When the IRR was present we looked at their MRI scans to identify any relevant abnormalities.

Results: We identified 100 subjects. There were 72 females and 28 males with an average age of 15 years. The IRR was present in 12 cases and in 6 of them the sign was present bilaterally. There were no further associated signs or symptoms. All cases had recently undergone MRI of their whole spine and their investigations did not demonstrate any abnormalities in the lower cervical spine.

Conclusion: We have found an incidence of 12% for the presence of IRR in our study group. In all cases there were no abnormal cord signal changes in MRI scans and we can therefore conclude that in asymptomatic Adolescent Idiopathic Scoliosis patients the presence of IRR is of no clinical significance.
**THE INCIDENCE OF GRAM-NEGATIVE HAEMATOGENOUS VERTEBRAL OSTEOMYELITIS IN A TERTIARY REFERRAL SPINAL UNIT**

* S M Graham* A Fishlock* P Millner, J Sandoe,
* Both these authors contributed equal to the work carried out

Academic Department of Orthopaedic and Spinal Surgery, University of Leeds, School of Medicine, Clarendon Wing A, Leeds General Infirmary Teaching Hospitals NHS Trust, Great George Street, Leeds, LS1 3EX, UK

**Purpose of study:** The aim of this study was to identify the incidence of Gram negative bacterial vertebral osteomyelitis (VO) within our unit during a 3-year study period and evaluate if this corresponds to published evidence that the occurrence is increasing.

**Methods:** Between May 2007 and May 2010, all patients, over the age of 18 years, suffering from Gram-negative VO were identified and their microbiological diagnoses were evaluated. All patients were treated within a large tertiary spinal surgery unit in Leeds.

**Results:** This study identified 79 patients with haematogenous VO. Of these 79 patients, 10 patients (12.66%) had Gram-negative organisms isolated. These organisms included E.Coli (4), Pseudomonal aeruginosa (3), Klebsiella pneumonia (1), Haemophilus influenza (1) and Enterobacter cloacae (1). Four patients had the causative organism isolated on ≥2 positive blood cultures, three from biopsy and ≥2 positive blood culture, one from biopsy alone and two were diagnosed from 1 positive blood culture.

**Conclusion:** VO is a common manifestation of osteomyelitis in adults, representing 2-7% of all cases of osteomyelitis. Staphylococcus aureus is the most common causative aetiological agent in haematogenous spinal infections, accounting for between 40 - 60% of cases. Despite the fact that Gram negative bacteria infections represent a minor proportion of all cases of VO, around 15 - 23%, recent evidence suggests that the microbiology of this disease may be changing and the incidence of Gram-negative bacterial infections are increasing. This has been attributed a variety of factors including, an increasing proportion of individuals with predisposing risk factors such as advanced age, diabetes mellitus, malignancy and better diagnostic techniques. Results from our study show an incidence of Gram-negative VO of 12%, which is less than results quoted in the literature and does not confirm recent evidence that these types of spinal infections are increasing in incidence.

**HEIGHT CHANGE FOLLOWING CORRECTIVE SURGERY FOR ADOLESCENT IDIOPATHIC SCOLIOSIS**

K Aneiba, R Rout, J Fairbank, C Nnadi, The Oxford Spine Research Group
Nuffield Orthopaedic Centre & John Radcliffe Hospital, Oxford, UK.

**Introduction:** A common question posed by adolescents undergoing corrective scoliosis surgery is, “How much taller will I be after my operation?” This study aims to help answer this question, and quantify the gain in height that might be expected.

**Method:** Retrospective data was collected on 68 consecutive surgeries for adolescent idiopathic scoliosis (AIS). Data collected includes age, gender, height, Cobb angle and curve type (Lenke / King classifications). All cases had AIS and were treated by posterior instrumented fusion. Exclusion criteria were neuromuscular/syndromic conditions, anterior approach or revision surgery. Post-operative X-rays were assessed between 1 week and 1 year after surgery.

**Results:** The median age of the cohort was 15 years (range 12-17). There were 61 females and 7 males. Lenke type 1B was the most common curve (37%). All patients gained height post-operatively. The median gain in height, as a percentage of pre-operative height was 5.5% (range 0.5 – 21.4%). There was a statistically significant difference (p<0.001) between change in height and Lenke type (see figure). There was a progressive increase with a median gain in height in Lenke 1A of 3.4% up to 14.9% in a Lenke 6 curve. Surprisingly, this trend was not reproducible with the King’s classification. There was no significant relationship of change in height with either gender or age, but the pre operative Cobb angle had a moderate correlation (r=-0.65, p<0.001) with the change in Cobb angle.

In 44 patients who had x-rays at 6 months – 1 year, all showed continued growth. This was significantly greater (p=0.04) in the patients aged 12 and 13.

**Conclusion:** This study provides useful information for patients undergoing AIS surgery as to expected height gain based on their pre-operative Lenke grade. King’s classification however does not show a similar trend with change in height.
EVALUATION OF PELVIC MORPHOLOGY AFTER ADOLESCENT IDIOPATHIC SCOLIOSIS CORRECTION

N Pyrovolou, R Rout, C Nnadi, The Oxford Spine Research Group
Nuffield Orthopaedic Centre, Oxford

Aim: To evaluate the effect of corrective surgery for adolescent idiopathic scoliosis on pelvic morphology.

Introduction: Pelvic incidence increases linearly with age during childhood and adolescence before stabilising in adulthood. Most scoliosis surgery occurs before adulthood. We tested the hypothesis that during growth, scoliosis surgery alters the normal linear relationship between pelvic incidence and age.

Methods: One hundred patients with 200 radiographs who had undergone surgery for scoliosis were identified. Thirty-eight patients were excluded due to other diagnoses. All patients had posterior surgery for adolescent idiopathic scoliosis. Pre and post-operative lateral radiographs taken at 6 weeks were assessed. Spino-pelvic indices measured were Pelvic Incidence (PI), Sacral Slope (SS), Pelvic Tilt (PT) and the C7 plumb line.

Results: There were 62 patients: 58 females and 4 males. Median age was 14 (range 12-17).

Median pelvic parameters pre-operatively were 49, 39 and 11 degrees for PI, SS and PT respectively. Post operative median values were 48, 36 and 14 degrees for PI, SS and PT.

Statistical analysis showed no significant differences in pelvic incidence, pelvic tilt or the C7 plumbline between pre- and post-operative values. There was a significant decrease in sacral slope from a median of 39 degrees pre-operatively to 36 degrees post operatively (p=0.007).

There was no statistical difference between these variables when analysed by age or gender, nor were there any correlations between the change in variables.

All values fell within the normal ranges for age related spino-pelvic parameters.

Conclusion: Corrective surgery for adolescent idiopathic scoliosis does not alter pelvic morphology even in the growing adolescent group. Previous studies have documented the pre and post operative correlation between pelvic geometry and spinal alignment in normal and surgical subjects. This study investigates whether surgery affects pelvic morphology during its developmental stages. This to our knowledge has not been described previously.

HYDROXYAPATITE VERSUS NON-COATED PEDICLE SCREWS IN DYNAMIC POSTERIOR STABILISATION

M Mueller, S Hoskinson, J Shepperd
Orthopaedic Department, Conquest Hospital, Hastings, UK

Objective: From our series of 570 Dynesys flexible stabilisation procedures, we studied two prospective series of patients with a minimum one-year follow-up comparing uncoated and hydroxyapatite-coated (HA) screws.

Methods: Patients were entered prospectively and followed up at 6 weeks, 3, 6, and 12 months and annually thereafter. Plain radiographs were obtained annually. 58 patients who underwent Dynesys stabilisation with HA coated screws (312 screws) were evaluated. The data was compared with 71 patients who underwent Dynesys stabilisation with non-coated pedicle screws (366 screws). Outcome measures were screw loosening, breakage, implant removal or revision. Follow up was 96 %.

Results: In the HA coated group there were five screw breakages in three patients, all affecting S1 screws. There was evidence of loosening in one patient. In the non-HA coated group there were two cases of infection, both had their implants removed. Further 11 patients had screw loosening and required implant removal. There was a significant improvement of anchorage of the HA coated screws. There was no correlation between numbers of level stabilised, or previous surgery and screw loosening. Average time to revision surgery for loosening was 23 months in the non-coated group. Screw fractures occurred at 11 months in the HA coated group. There was no correlation between screw loosening or fracture and gender or age.

Conclusions: Change to HA coating was investigated because of high loosening in plain screws. Secure pedicle screw fixation is crucial in dynamic stabilisation as the implant remains under constant load. This study demonstrated the significant improved anchorage of HA coated pedicle screws in dynamic posterior stabilisation of the lumbar spine. HA coating has eliminated the problem of screw loosening irrespective of gender, age, number of level stabilised or whether there was previous lumbar surgery.
A SIMPLE TECHNIQUE TO IMPROVE THE ADMINISTRATION OF NERVE ROOT BLOCKS

M. S. Patel, A. Young, P. Sell
Leicester General Hospital

Aim: To identify a means to reduce the duration and radiation dose coupled with fluoroscopic guided nerve root blocks (NRB).

Method: Consecutive prospective two cohort comparative study. A similar method performed during CT guided NRBs was employed to guide needle placement for transforaminal nerve root injections with the aid of static MR images and fluoroscopy. Axial MR images at the level of the target nerve root were used. An angle of inclination of 60 degrees was created from the nerve root to the skin of the back, the apex of this to represent the site of needle introduction. Triangulation on the MRI enabled the lateral entry point to be determined.

The transforaminal injections were then performed with the simple expedient of a skin marker line at the appropriate lateral distance from the midline for needle entry. The radiation dose and fluoroscopic time as measured by the image intensifier were recorded. This method was performed for 20 patients and compared to the same parameters for 23 previous patients in whom the transforaminal injections were performed without such a technique.

Results: 20 patients in the navigated arm (group 1) and 23 in the non-navigated (group 2). Average fluoroscopic time (seconds) was 17.7 seconds (range 8-40) for group 1 and 16.4 seconds (range 6-45) for group 2 (P value 0.625). Radiation dose measured was 79.76 cGy/cm² (range 8-212) for group 1 and 63.05 cGy/cm² (range 8-260) for group 2 (P value 0.247).

Conclusion: This method of navigating nerve root blocks via fluoroscopy did not appear to reduce the duration of the procedure or radiation dose involved on objective data. Subjectively it was found to be a useful training aid for triangulation for those new to the technique but the available objective evidence was not obtained.

A SINGLE SITE AUDIT: COMPLIANCE OF THE METASTATIC SPINAL CORD COMPRESSION NICE GUIDELINES.

C L Berry, D Cumming, M Hutton
Spinal Unit, Royal Devon and Exeter NHS Foundation Trust

Aim: To assess whether oncologists are adhering to the NICE guidelines on MSCC.

Methods and Results: All patients who received radiotherapy for metastatic spinal cord compression from 1st June 2009 – 1st June 2010 were identified. This information was then compared to the data collected via the MSCC Coordinator. The notes and radiological investigations were reviewed by the spinal consultant.

34 patients received radiotherapy for MSCC, 15 patients were not referred to the spinal team prior to radiotherapy. On reviewing each individual case 2 patients may have potentially benefited from surgical intervention.

Conclusion: Many patients are still not referred for spinal opinion. The vast majority of these patients would not have been suitable for surgery, however, a small number may have potentially benefited.
Study Purpose: A systematic review of the current literature to address the debate of the optimal surgical approach for the treatment of adolescent idiopathic scoliosis (AIS).

Method: All studies comparing anterior open instrumented surgery with posterior instrumented surgery in patients with AIS, written in English and published up until February 2010 were included. Electronic databases searched included Medline, PubMed and the Cochrane database using “AIS” and “surgery” as key words. Outcome measures considered to be important were specifically identified in each paper included: Blood loss (ml); operation time (mins); hospital stay (days); curve correction (sagittal and coronal); number of fused levels; pulmonary function, and complications.

Results: Twenty one relevant papers were identified from a possible 399. Nine of these studies were performed prospectively with four involving more than one centre. The average total number of patients in each study was 246 with a mean pre-operative curve Cobb angle of 47 degrees in those patients treated via anterior surgical instrumentation and 52 degrees with posterior surgery. Three papers showed significant reduction in blood loss with anterior surgery while four studies observed a reduction in operative time and length of hospital stay with posterior surgery. Eleven papers analysed curve correction specifically and while comparable correction was achievable with both approaches the number of fusion levels was significantly fewer with anterior fixation in all. Three of the four studies evaluating lung function demonstrated that patients undergoing posterior fusion had better measures of pulmonary function than the anterior group. No significant difference was observed between the two approaches with regards to complications.

Conclusion: Both surgical approaches have their merits and disadvantages. Our study has not demonstrated one approach to be overall superior. Approach selection should be based on the advantages offered by each approach to the individual patient and the surgeon’s own experience in spinal deformity correction.
TRAUMATIC ATLANTOAXIAL ROTATORY SUBLUXATION (TAARS) IN ADULTS: A REPORT OF TWO CASES

M Venkatesan, M Newey
University Hospitals of Leicester, Leicester, UK

Background: Rotatory subluxation of the atlantoaxial joint has been thoroughly documented in children. However, pure traumatic atlantoaxial rotatory subluxation (TAARS) is a rare injury in adults with only a few cases reported in the English literature.

Aim: To report two cases of TAARS in adults.

Methods: A case note, clinical and radiological review.

Results: Both patients were female. There was a history of a motor vehicle collision in both cases. There was no neurological impairment at presentation in either case. The injury in both cases was identified by plain X-ray and confirmed by CT scan. Both were managed by conservative treatment, initially with halo traction, followed by immobilisation in a rigid collar. Final clinical reviews occurred at 7 years and 2.5 years following injury. Neither patient had signs of C1-C2 instability or impaired neurology. Both patients, however, suffered headaches and occipital neuralgia, with stiffness and reduction in cervical spine movement.

Conclusion: Traumatic rotatory subluxation in adults is a rare injury. It can pose a diagnostic challenge and CT scanning is mandatory for a correct evaluation of the C1-2 complex. Reduction and stability can be achieved through conservative treatment. However, it is evident from this short series that even early diagnosis and prompt reduction may not necessarily result in a good long term outcome in adult patients with TAARS.

PITFALLS FOR THE ATLS PROTOCOL FOR APPLICATION OF HARD CERVICAL COLLARS.

O Blocker, S Singh, S Lau, S Ahuja
Cardiff Spinal Unit, University Hospital of Wales, Cardiff

Aim of Study: To highlight the absence of an important pitfall in the Advanced Trauma Life Support protocol in application of rigid collar to patients with potentially unstable cervical spine injury.

Study Method: We present a case series of two patients with ankylosed cervical spines who developed neurological complications following application of rigid collar for cervical spine injuries as per the ATLS protocol. This has been followed up with a survey of A&E and T&O doctors who regularly apply cervical collars for suspected unstable cervical spine injuries. The survey was conducted telephonically using a standard questionnaire. 75 doctors completed the questionnaire. A&E doctors = 42, T&O = 33. Junior grade = 38, middle grade = 37. Trauma management frontline experience >1yr = 50, <1yr = 25. Of the 75 respondents 68/75 (90.6%) would follow the ATLS protocol in applying rigid collar in potentially unstable cervical spine injuries. 58/75 (77.3%) would clinically assess the patient prior to applying collar. Only 43/75 (57.3%) thought the patients relevant past medical history would influence collar application. Respondents were asked whether they were aware of any pitfalls to rigid collar application in suspected neck injuries. 34/75 (45.3%) stated that they were NOT aware of pitfalls. The lack of awareness was even higher 17/25 (68%) amongst doctors with less that 12 months frontline experience. When directly asked whether ankyllosing spondylitis should be regarded as a pitfall then only 43/75 (57.3%) answered in the affirmative.

Conclusion: We would like to emphasise the disastrous consequences of applying a rigid collar in patients with ankylosed cervical spine. The survey demonstrates the lack of awareness (~ 50%) amongst A&E and T&O doctors regarding pitfalls to collar application. We recommend the ATLS manual highlight a pitfall for application of rigid collars in patients with ankylosed spines and suspected cervical spine injuries.
CERVICAL SPINE INJURIES IN PATIENTS WITH ANKYLOSING SPONDYLITIS

Queen Elizabeth National Spinal Injuries Unit, Glasgow

Purpose: Patients with ankylosing spondylitis (AS) are vulnerable to cervical spine injury following relatively minor trauma. The authors present a retrospective review to determine the characteristics, treatment and outcome following cervical spine injury in these patients.

Methods: Retrospective analysis of case notes and images of patients with AS admitted to the Spinal Injury Unit over a 10-year period.

Results: Thirty-nine patients were identified. Records were available for 31 patients at the time of this analysis. The median age was 62 years (range 37-84). The male:female ratio was 7:1. Mechanisms of injury included falls (72%) and RTAs (7%), while 14% were unable to recall an injury. Alcohol was involved in 20% of the cases. Fracture through an ankylosed disc in the mid to low cervical spine was the commonest injury. Concomitant non-contiguous bony injury was seen in 2 patients. More than half (55%) were Grade E on ASIA impairment scale (AIS), while 14% were Grade A and 31% Grade D. Two patients required skull traction. Most patients were successfully treated by external immobilisation. Halo crown and jacket was the most common orthosis used. Twelve patients underwent surgical stabilisation. The mean duration of external immobilisation in the non-surgical group was 13 weeks (range 10-32), whereas following surgery it was 6 weeks (range 2-8). Adequate radiological evidence of fusion was seen in all 22 patients for whom this information was available at a median of 22 weeks (range 12-32). Patients with AIS Grade A and E were unchanged at discharge, while 4 patients in AIS Grade D improved to E.

Conclusion: External immobilisation with halo in an effective first-line therapy in achieving fusion and stability. Surgical stabilisation can be reserved as a second-line treatment.

OPERATIVE TREATMENT OF C2 FRACTURES OFTEN LEADS TO HEALING AT THE FRACTURE SITE

Royal Liverpool University Hospital

Purpose: The treatment of C2 fractures with collar, halo or surgery can all be justified depending on the patient. In our unit, primary treatment is with a halo: in a previous study presented at BASS we found an 85% fusion rate. In a follow on study, we wished to assess the outcome in those patients who underwent surgical treatment.

Methods: The discharge logbook was examined retrospectively to identify patients who had posterior instrumentation for C2 fractures from 2008-2010 inclusive. Discharge summaries, clinic letters and radiology images/reports from PACS were analysed to obtain data regarding primary treatment, outcome, necessity for delayed treatment and radiological evidence of union.

Results: Seven patients were identified who had surgery for C2 fracture. All 7 patients were treated with C1 and C2 lateral mass screws. In two of these patients additional lateral mass screws were inserted at C3. Due to patient preference, three of the seven patients underwent operative fixation without prior treatment in a halo. All three patients had evidence of bony union at the fracture site on subsequent radiological follow up. The remaining four patients were initially treated in a halo and had delayed surgery. After surgery two of these four patients had radiological evidence of bony union at the fracture site, one remained non-united and one patient has not yet been fully assessed.

Conclusions: In this small series, operative fixation for C2 fracture lead to bony union at the fracture site in 5 out of 6 cases where full follow up was available. Interestingly, bony union at the fracture site may be an achievable objective even when surgery has been delayed or is not the primary treatment.
Efficacy of Percutaneous Balloon Kyphoplasty as a Diagnostic Tool in Vertebral Compression Fractures.

M Gunaratne, R P Sidaginamale, M Kotrba
Mayday University Hospital NHS Trust, Croydon, UK

Purpose: To elucidate the efficacy of carrying out additional vertebral biopsy procedure during percutaneous balloon kyphoplasty as a tool in determining malignant etiology.

Methods and results: We performed 138 percutaneous balloon kyphoplasty procedures in 85 patients during August 2007 to March 2010. Gender distribution was 25 males and 60 females. Age distribution was 33 to 85 years, with an average age of 67.4 years. The senior surgeon attempted vertebral biopsy during percutaneous balloon kyphoplasty procedure only when there was a clinical/operative suspicion of malignancy. We did not routinely biopsy all vertebrae, as this would mean additional procedure adding to the cost and operating time. In 42 procedures vertebral biopsy was attempted, of which 5 samples were reported as insufficient specimen. 37 biopsies (88%) were successfully analyzed. 3 biopsies (8.1%) were positive for malignancy. There were no complications encountered in the cases where additional biopsy procedure was carried out.

Conclusion: There is not much literature supporting routine use and efficacy of biopsies during percutaneous balloon kyphoplasty procedures. Although the quality of bone could make vertebral biopsy challenging in all cases, we feel that improved technique of taking biopsies and maybe increasingly performing the additional biopsy procedure could detect more positive malignancies. Routine biopsies during percutaneous balloon kyphoplasty may be invaluable in diagnosing malignancies.

A Prospective Study Reviewing Patient Visual Analog Score Outcomes and Satisfaction Post Cervical and Lumbar Disc Replacement

JSH Gaskin, S. Karmani, M. Cass
Brighton and Sussex University Hospitals NHS Trust, East Sussex

Introduction: Disc Replacements, both cervical and lumbar, are indicated in disc herniation, degenerative disc disease, and patients whose neck or back pain respectively, fail to settle with conservative management over a period of time. The aim of the disc replacement is to act as a functional unit and reduce adjacent spondylitic change thus reducing pain.

Materials and Methods: Twenty-one disc replacement were done over a 3 year period between 2005 and 2008 in 20 patients, six cervical disc replacements (C5/6, C6/7) and fifteen lumbar disc replacements (L3/4, L4/5, L5/S1). There was one double level lumbar disc replacement (L3/4, L4/5) done. Four of the patients with lumbar disc replacements also had lower accompanying Anterior lumbar interbody fusion at the same time and two of the patients with cervical disc replacements had simultaneous upper intervertebral fusions. They were 12 males and 8 females, those having cervical procedures had a mean age of 39 (29-60) and those having lumbar procedures a mean age of 44 (40-64). Patients were followed up at 3 months, 9 months, 12 months and 18 months post op. Visual Analog Scores (VAS) and Satisfaction scores relative to their recovery were undertaken. Patients were also asked if they would recommend the procedure to others.

Results: All patients had pre-operative VAS scores of 10. The patients who underwent cervical disc replacements had VAS scores averaging 4-5 at 3 months, 4 at 9 months, but this increased to 7-10 from 1 year. Those patients who had lumbar procedures were more variable with VAS scores at 3 months between 2-7, at 6 months between 0-6, at 9 months around 4 and at 1 year between 3-9. Two thirds of the six patients having the cervical procedure were please while 60% of those having the lumbar procedure were please with their results despite their persisting pain albeit at a lesser intensity. Only one patient having lumbar disc replacement suggested that they would not recommend the procedure to others with similar symptoms. 95% of the patients suggested that they would recommend the procedure.

Discussion and Conclusion: Contrary to common belief, patients with cervical and lumbar disc replacements have some degree of moderate persisting pain. Despite persisting pain most patients had some degree of satisfaction with disc replacement. Despite persisting pain most patients would recommend a person with similar symptoms to have a disc replacement.
DOES Povidone-Iodine WASH REDUCE SURGICAL SITE INFECTION IN INSTRUMENTED SPINE SURGERY?

E C Maratos, A King1, T Jones, D Bell
Department of Neurosurgery, King’s College Hospital NHS Foundation Trust, Denmark Hill, London SE5 9RS
1Clinical Neuroscience, St George’s University of London, Cranmer Terrace, London SW17 0RE

Aim: To investigate the effect of intraoperative wound irrigation with povidone-iodine on surgical site infection.

Methods: Data were collected prospectively for all cases of instrumented thoracic and lumbar spine surgery undertaken by the senior author (DB) from 01/10/2008 to 1/10/2010. Variables recorded included patient factors (age, co-morbidities, drug history) and operative factors (type of operation, duration of operation, elective/emergency, in hours/out of hours, consultant/junior, perioperative antibiotic administration). Routine povidone-iodine application commenced on 1/06/2009. Surgical site infection was defined as wound infection confirmed on wound swab or blood cultures. Comparison was made between patients receiving povidone-iodine intraoperative wound irrigation and those who did not using Fisher’s exact test.

Results: Data from 91 consecutive patients who had undergone instrumented thoracic or lumbar fusions under the care of the senior author were analysed. Mean age was 58.0±16.9 years. There was no difference in age (Mean±SD) between those receiving povidone-iodine (59.1 ±16.9y) and those without povidone-iodine administration (55.3 ±16.9) (p=0.33). The number of wound infections was significantly reduced from 19% (5/26) in those without povidone-iodine to 0% (0/65) in those with application of povidone-iodine (p=0.001, Fisher’s exact).

Conclusion: Intraoperative povidone-iodine irrigation appears to be an effective method of reducing SSIs in instrumented spinal fixation surgery.
ADJACENT LEVEL CERVICAL DISC REVISION USING NEW ZERO-P CAGE DEVICE – TECHNIQUE AND OUTCOMES

G Balamurali, M Konig, B Boszczyk
Centre for Spinal Studies and Surgery, Queens Medical Centre, Nottingham.

Aim: A retrospective review of the management of adjacent level discectomy and fusion using a Zero-P (Synthes) cage and report of ease of technique and outcomes.

Method: Surgical approach to adjacent level cervical disc protrusion with previous anterior cervical discectomy and fusion (ACDF) can be difficult. We review 4 patients who had previous ACDF with cage and plate who developed new onset adjacent level cervical disc prolapses causing myelopathy. A retrospective review of demographic data, symptoms, details of surgery, pre and post operative radiology, pre and postoperative ODI and pain score, length of stay, complications and follow-up data were collected in all patients.

Results: Previous ACDF with plate was performed in all 4 patients an average of 11.6 years ago. Two patients had bilateral approaches previously and both had previous vascular injuries. The average duration of current symptoms was 9 months with a mean age of 65 years. All patients presented with myelopathy and two also had radiculopathy. Multiple level ACDF were operated in 2 patients previously. Revision surgery and dissection on the disc level was restricted by the previous plate. Screws from the previous plate fusion were removed adjacent to the level of surgery and discectomy was performed using distractor pins through the screw sites. Following discectomy a Zero-P cage was used to fusion with DBX under image intensifier guidance. The advantage was not to remove the previous plate and keep the dissection over the scar tissue to the minimal. All patients improved in their radicular symptoms with improvement of their hand function in the myelopathies. There was no complication and post operative radiographs were satisfactory.

Conclusions: Use of the Zero-P cage for adjacent level discectomy and fusion was safe without disturbing the previous cage and plate fusion or stability.

MEASURING COMPETENCIES WITHIN THE ORTHOPAEDIC SPINAL SERVICE; MRI REQUESTING RIGHTS BY SPINAL EXTENDED SCOPE PHYSIOTHERAPISTS WITHIN SECONDARY CARE ONE YEAR ON

R.J Newsome, M Reddington, L.M Breakwell, N Chiverton, A.A Cole, ALR Michael
Sheffield Spinal Service, Sheffield Teaching Hospitals NHS Foundation Trust.

Purpose: To evaluate the competencies of spinal extended scope physiotherapists (ESP) following the introduction of requesting rights for magnetic resonance imaging (MRI) one year later.

Methods: From September 2009 to August 2010 each MRI scan requested by the 2 spinal ESPs within the orthopaedic clinic was recorded along with their clinical diagnosis to ascertain why the scan was requested. This was indicated on a four point scale of likelihood of pathology which had been introduced to give evidence for MRI requesting rights. This was then audited to determine the total number of scans requested along with the accuracy or justification of the request.

Results: 589 patients in total were seen in the time period by 2 spinal ESPs and of these 193 (33%) were referred for MRI scans. The breakdown of figures for the diagnosis showed that 18% of scans were for possible serious spinal pathology (SSP). 66% for lumbar spine/radiculopathy, 11% for cervical spine/radiculopathy, 2% thoracic and 3% were consideration for surgery eg. possible fusion. The accuracy of diagnosis, as measured by the clinical impression within a 4 point scoring system and its concordance with the MRI result indicated that for the lumbar spine accuracy rate was 71%, for the cervical spine 62.5%, Myelopathy 50%, SSP 16%.

Conclusion: It is important that the requesting of MRIs by members of the orthopaedic team other than spinal consultants can be audited to demonstrate competency of clinical assessment and examination within the team. This results in cost effectiveness in requesting imaging appropriately according to patient needs rather than blanket referrals for scans which can be unnecessary. Data will continue to be collected and a report produced on an annual basis to ensure continuing competency.
SAFETY OF CERVICAL PEDICLE SCREW INSERTION IN CHILDREN
A CLINICO-RADIOLOGICAL EVALUATION OF 51 CERVICAL PEDICLE SCREWS IN 16 CHILDREN

S Rajasekaran, RM Kanna, AP Shetty
Ganga Hospital, Coimbatore

Study design: Prospective clinical and radiological analysis of children with complex cervical deformities for the safety of cervical pedicle screw insertion

Objectives: To analyse the possibility, safety and efficacy of cervical pedicle screw insertion in complex pediatric cervical deformities, where conventional stabilisation techniques would not have provided rigid fixation

Summary of Background Data: Although the usage of cervical pedicle screws (CPS) in adults has become established, the feasibility and safety of its application in children has not been described previously in the literature.

Methods: Sixteen children of mean age 9.7 ± 2.6 years (range: 3 - 13) requiring spinal stabilization for cranio-vertebral junction anomalies (n=10), cervico-thoracic kyphosis/kyphoscoliosis (n=5) and cervical tumor excision (n=1) formed the study group. Feasibility of CPS insertion was assessed by computerised tomography images. Standard 3.0 mm titanium pedicle screws were inserted using intraoperative Iso-C C arm based 3D computer navigation and the containment was post operatively evaluated with CT scan.

Results: Based on preoperative CT imaging, 55 pedicles were selected for screw fixation. Intra operatively CPS was successfully inserted at 51 levels and at four sclerosed pedicles (7.3%), screws could not be inserted. At 42 levels, the screws were inserted in the classical description of pedicle screw application and in nine deformed vertebra, the screws were inserted in a non-classical fashion, taking purchase in the three columns of the cervical vertebra. Forty five (88.3%) screws were fully contained, six (11.7%) had a non-critical breach and none had a critical breach. No perioperative complications related to pedicle screw insertion were noted.

Conclusion: Safe insertion of cervical pedicle screws is possible in children. Iso-C navigation provides real time virtual imaging and improves the safety and accuracy of successful pedicle fixation even in altered vertebral anatomy. Pedicle width morphometrics do not restrict screw insertion.

SURVIVORSHIP ANALYSIS FOLLOWING ODONTOID PEG FRACTURE IN ELDERLY POPULATION

J Northover, M Venkatesan, Wild B, J Braybrooke
Department of Trauma & Orthopaedics, University Hospitals of Leicester

Background: Fractures of the odontoid peg are one of the commonest spinal injuries in the elderly population. In this population there is a higher risk of morbidity and mortality as a result of the injury. The magnitude of this risk has not been quantified in the literature.

Aim: To show a survivorship analysis in a cohort of elderly patients with odontoid peg fractures.

Method & Materials: A 6-year retrospective analysis was performed on all patients >65 years old admitted to a spinal unit with an isolated odontoid peg fracture. Actuarial (Life-Table) analysis was used to estimate survivorship from the date of fracture.

Results: A total of 32 patients > 65 years of age with isolated odontoid peg fractures were identified. There were 17 male and 15 female. A low velocity mechanical fall was the commonest cause for the injury. The average age for the females was 86.7 years and for the males 78 years. The age distribution was unimodal in both sex, the greatest number occurring for the females in the 85-94 year age group and 75-84 years for the males.

Overall, it was estimated that only 62.5% would be alive by one year. The period of greatest mortality was within the first 12 weeks, a lesser contribution from then to one year, and had no impact on mortality thereafter.

Males appeared to suffer a heavier mortality than females within the first year. At one year the male survival rate had fallen to 58.8% compared with a female rate of 66.6%.

Conclusion: We observed that odontoid peg fractures in the elderly are not benign injuries and are a cause of high mortality rates within the first three months of the injury. Patients who survived to one year following the injury were observed to have their risk return to age and sex matched rates for this population.
ACCURACY AND CONSISTENCY OF COMMERCIALLY AVAILABLE TORQUE WRENCHES USED FOR TIGHTENING HALO PINS

Ranjit Pande, Sashin Ahuja,
Cardiff Spine Unit, University Hospital of Wales, Cardiff

Introduction: Halo traction, either on bed or with an accompanying vest is used commonly in Spine surgery, in a variety of clinical situations. The pins are inserted into the skull in safe anatomic zones, using wrenches that are either pre-torqued or exhibit a torque gauge to allow measurable torque application. A torque of 6 – 8 inch pounds is considered ideal for optimal pin tightening. Lesser torques may hypothetically lead to pin loosening and pin track infections, while, excessive torques could lead to pin penetration through the skull.

Aim: To test the accuracy and consistency of different torque wrenches used for Halo pin insertion, using a standardised calibration device.

Methodology: Three different types of torque wrenches were tested, using the MTS Systems 858 Mini Bionix II calibration device at the School of Engineering laboratory in Cardiff. Each type had four samples. Three more samples of one type, which were already in use at the Spine unit were also tested, making a total sample size of fifteen. The calibration device had a declared average error of 0.5 %. Each torque wrench was tested twenty five times to a pre set value of 6 inch pounds (0.67790897 N-m), resulting in 375 independent observations. Data was recorded electronically and was analysed for error, percentage of error and variability for each device.

Results: All wrenches, regardless of model or make, failed to deliver accurate torque at the pre set value on repeated testing. There were both negative and positive errors. The average torque delivered by all wrenches together at a pre set value of 0.67790897 N-m was 0.721337 (+/- 0.116919) N-m. The average percent error for individual wrenches ranged from 4 % to 34 %. When grouped by model, the average percent error (model specific) ranged from 5 % to 29 %. When assessed for consistency, the wrenches revealed a range of values over a minimum of 0.053303 N-m to a maximum of 0.846512 N-m. The variability of all wrenches of one model type was however similar, though not identical. The best performing model had an average variation over 0.165531 N-m while the value for the worst was 0.685794 N-m.

Conclusion: Torque wrenches used to tighten Halo pins appear to be neither accurate nor consistent. They deliver torques that are either less than or more than their pre set levels. Different wrenches of one model displayed a similar pattern of variability. While this study does not seek to relate this lack of accuracy and consistency to the development of specific complications like loosening or penetration, it does suggest that extreme care is advisable while using torque wrenches to minimise clinical mishaps.

Ethical committee permission: None required. No patient data / intervention involved.
Declarations of interest: No commercial interest for either author.

THE USE OF CERVICAL NERVE ROOT BLOCKS IN THE MANAGEMENT OF CERVICAL RADICULOPATHY – A MINIMALLY INVASIVE SUCCESS?

HS Dabasia, T Rajagopal, PJ McKenna, RW Marshall
Department of Orthopaedic Surgery, Royal Berkshire Hospital, Reading

Objective: Our aim is to assess the use of the cervical nerve root block (CNRB) in the treatment of radicular pain associated with degenerative cervical spine disease and its potential to limit the need for surgical intervention.

Methods: A retrospective review of consecutive CNRB procedures carried out between January 2008 and June 2010. All procedures were performed using a combination of local anaesthetic and steroid under fluoroscopic guidance. The inclusion criteria were brachialgia with MRI proven nerve compression and inadequate response to physiotherapy. Patients that underwent both a CNRB and facet joint injections were excluded. The outcome measures assessed were the response gained (complete/temporary/no relief) and the choice of further management.

Results: A total of 121 patients underwent CNRBs within our study period. 11 patients were lost to follow up. A cohort of 110 patients was studied (49 male and 61 female) with a mean age of 51.5 years (standard deviation 12.3 years). Following the initial CNRB, 49 patients (44.5%) had complete relief requiring no further interventions. Temporary symptom relief was achieved for 30 patients (27.3%) and no relief was gained in 31 patients (31.2%). A repeat CNRB was carried out in 19 patients who gained temporary or no benefit following the initial block. Of the 97 patients who have a complete follow up, complete resolution of symptoms was achieved in 53 patients (54.6%), 25 patients (25.8%) progressed to requiring surgery and no further treatment was offered to 19 patients (19.6%). No complications related to the procedure were identified.

Conclusion: Cervical nerve root blocks can be performed to treat patients suffering with cervical radiculopathy symptoms. It is a minimally invasive intervention that can reduce the need for operative intervention.
Preservation of Cervical Range of Motion Using a New PEEK on PEEK Articulation Cervical Disc Replacement: One Year Clinical and Radiological Outcomes

S. Lakkol, K. Lingutla, R. Taranu, J Kang, G. Reddy, T. Friesem
University Hospital North Tees, Stockton on Tees, United Kingdom

Background: We present the results of a single centre, prospective study to evaluate the clinical and radiographic outcomes of anterior cervical decompression and replacement (ACDR) using the NuNec™ Cervical Arthroplasty System (Pioneer Surgical Technology, Marquette, Mich., USA).

Methodology & results: 36 patients with radiculopathy/myelopathy, who failed to respond to conservative measures, were included. Pain and function were evaluated by Visual Analogue score for Neck pain (VAS-NP) and Arm pain (VAS-AP), Neck disability index (NDI) and SF-36 questionnaires. Radiological assessments include assessing overall range of movement (ROM) and at functional segment unit (FSU). Statistical analysis was completed using SPSS 16.0 statistical package (SPSS Inc, Chicago, IL). Appropriate parametric (A paired t-test) and non parametric tests (Wilcoxon signed-rank test) were used to assess the statistical significance (p<0.05).

The average age at operation was 51 years (range 35 - 77 years). 8 patients received ACDR at one-level, 15 had 2-level surgery, 12 had 3-level surgery and 1 had a 4-level surgery. At the time of final follow-up (Mean 14.25 months, Range 12- 22.5 months) the mean NDI improved from 49.35; to 33.78 (p< 0.001). There statistically significant improvement note in VAS-NP (Post-op 3.65, Pre-op: 8.16, p<0.001), VAS-AP (Post-op: 3.12, Pre-op: 7.32, p<0.001) and SF-36BP (pre-op: 29.15, post-op: 37.18, p<0.002). The overall global ROM movement was preserved (pre-op: 46.80±10.52, post-op: 45.04±11.53) and an improvement in ROM at FSU was observed (pre-op: 16.60±8.50, post-op: 20.22±12.22) at final follow-up.

Conclusion: Our results of ACDR using the NuNec™ disc show statistically significant improvement in the outcome measures that are comparable to other types of ACDR. In addition, preservation of global cervical spine ROM and improvement in FSU ROM was observed despite single or multiple levels ACDR. Furthermore, NuNec™ ACDR gives excellent quality MR image during post-operative period. In our preliminary results, we report that NuNec™ ACDR device is safe, effective and has added design benefits.

Magnetic Resonance Imaging Clarity of Cervical Disc Arthroplasty Using Titanium Devices and PEEK Devices: A Prospective, Blinded Randomised Study.

S Lakkol, R Taranu, PPJ Raju¹, M Trewhella¹, R Dennis², G Reddy, T Friesem
¹ - Consultant Radiologists, ² - Radiology systems manager
Spinal Unit, University Hospital North Tees,

Aim: The purpose of this study is to compare the pre and post-operative magnetic resonance image clarity of titanium and PEEK based cervical arthroplasty devices at the level of implantation and adjacent level discs.

Methodology and Results: This is a prospective, blinded, randomised study on imaging of cervical arthroplasty devices. The pre and postoperative MRI images of 16 patients who underwent cervical arthroplasty using Prestige LP® (Medtronic Sofamor Danek) and NuNec™ Cervical Arthroplasty System (Pioneer Surgical Technology, Marquette, Mich., USA) were assessed. Two independent radiologists who were blinded and provided with a sets of random images to score using a four point Jarvick grading system. Statistical analysis was completed using SPSS 16.0 statistical package (SPSS Inc, Chicago, IL) and analysis included comparing MR image quality before and after cervical arthroplasty at the operated and adjacent levels, and in between two types of implant.

The pre-operative MR image quality at operated and adjacent levels was excellent in both groups. In the post-operative images, the adjacent level visualisation was adequate in both groups without much difference in average scores. However, at operated level, the quality of MR images in the NuNec group (PEEK on PEEK articulating disc) was excellent and clear visualisation of the cord, central canal, foramen and disc.

Conclusion: Previous studies have shown that titanium devices allow satisfactory monitoring of adjacent and operated levels by providing good quality MRI images. Our studies confirm that using titanium based cervical arthroplasty implants provide clear visualisation of the adjacent level, however, provide less than satisfactory images at operated level. But the PEEK devices provide excellent quality images even at the operated level, with clear visualisation of neural structures and are valuable, if one wishes to assess the adequacy of neural decompression at operated level.
BASS 2011
British Association of Spine Surgeons

Sponsor Profiles
Taking Percutaneous Screw Fixation to the Next Level

- Streamlined Rod Replacement
- Minimal Muscle Trauma
- Simple Percutaneous Reduction Options
- One System For All Pathologies
  - Degenerative
  - Trauma
  - Deformity

Simple Percutaneous Reduction Options

- Expedium Viper™ 2
  - X-Tab Screw
- Pistol-Grip Reducer

Streamlined Rod placement

Viper™ is a trademark of DePuy International Ltd.
DePuy Spine is a trading division of DePuy International Limited.
This is not intended for distribution in the United States.

never stop moving™
Sponsor Profiles

**PLATINUM**

Globus Medical is the largest privately held spinal implant manufacturer in the world with a single-minded focus on advancing spinal surgery. Globus has a full portfolio of spinal fusion products, burgeoning initiatives in biomaterials development and minimally invasive approaches, and is a leader in motion sparing technology. More at: www.globusmedical.com.

Unit 3 Delta Business Park
Wilson Road
Alton
Hampshire
GU34 2RQ
Tel: 01420 83999
Web: www.globusmedical.com

**GOLD**

Medicrea is a fully-dedicated spinal implant company focused on introducing reliable and innovative technologies to the global marketplace. With over 15 years of experience, Medicrea provides a full range of patented products that are conceived, developed and manufactured to advance patient outcomes and support the work of medical professionals.

Granary Barn
Park End
Swaffam Bubeck
Cambridgeshire. CB25 0NA
Tel: 01223 813 725
Web: www.medicrea.com

**SILVER**

Surgi C Ltd is the UK’s leading independent spine company, who are proud to be exhibiting at this year’s BASS. Surgi C takes pride in ensuring that all customers benefit from first class customer service, where we continually strive to exceed customers’ expectations. Surgi C’s range full treatment options for the degenerate spine include Coflex, Coflex F, AxiaLIF, DSS, DCI, Rabea Cage, ATHLET, Incert-S, Gore, Mobis and Tetris, as well as the demineralised bone substitute range Grafton.

The Innovation Centre
Longbridge Technology Park
One Devon Way
Birmingham
B31 2TS
Tel: 0121 222 5692
Web: www.surgi-c.com

B. Braun Medical Ltd is a member of the B. Braun Group, one of the world’s leading health-care companies. B. Braun manufacture and distribute on a global basis, employing more than 38,000 people worldwide. Our global message – Sharing Expertise – clearly identifies our philosophy of the transfer of knowledge. In over 165 years of development, we have acquired a wealth of knowledge that we can share with those who bear the responsibility for health care and associated services.

Thorncliffe Park
Sheffield
S35 2PW
Tel: 0114 225 9000
Web: www.bbraun.co.uk

Biomet offers uniquely designed surgeon-focused systems for the treatment of spinal disorders. With an outstanding clinical heritage, we offer comprehensive surgeon education, bespoke products, and first-class customer support. At Biomet we are focused on successful clinical outcomes and cost effective solutions.

Waterton Industrial Estate
Bridgend
CF31 3XA
Tel: 01656 655 221
Web: www.biomet.com

DePuy Spine is one of the world’s leading designers, manufacturers, and suppliers of devices, supplies, and solutions for treating a wide range of spinal pathologies.

DePuy Spine provides you and your patients with the latest products and solutions in spinal care MIS, Cervical Degenerative, Deformity and Tumour/Trauma.

St. Anthonys Road
Beeston
Leeds
LS11 8DT
Tel: 0113 270 0461
Web: www.depuy.com

The leading and innovative medical technology company dedicates itself to combined surgical technologies (“joined minimal access technologies”), particularly in the area of spinal treatment. joimax® develops, produces and markets tried and tested user-friendly systems for endoscopic spinal surgery, always staying on top with the latest technology. joimax® considers itself a partner of operating physicians, bearing the motto “helping to treat patients”!

Amalienbadstr 41
Raumfabrik 61
76227 Karlsruhe
Germany
Tel: +49 (0) 721 2551 4516
Web: www.joimax.com

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K2M, Inc. is an innovative spinal device company committed to the research, development, and commercialization of simplified solutions for the treatment of complex spinal pathologies and procedures. The company is recognized as a worldwide leader in providing unique technologies for the treatment of deformity, degenerative, trauma, and tumor spinal patients. K2M’s complete portfolio of next generation products includes: spinal stabilization systems, minimally invasive systems, and other advancing technologies such as motion preservation, annular repair, and nucleus replacement.

751 Miller Drive SE
Leesburg VA 20175 USA
Tel: 703 777 3155
Web: www.k2m.com

Macromed is an independent medical device company specialising in implants treating chronic, acute and traumatic spinal conditions. Macromed are exclusive UK distributors for Ulrich Spinal Systems. Our portfolio includes distractable VBR cages, dynamic cervical plate, and a full range of occiput to sacral posterior screw-rod systems for degenerative and trauma indications.

Tuscany House
White Hart Lane
Basingstoke Hampshire RG21 4AF
Tel: 0845 034 5160
Web: www.macromed.co.uk

MBA UK is a dynamic company specialising in spinal implants. With over 25 years of experience in orthopaedics, MBA Incorporated has attained the position of the largest independent distributor in Europe. MBA UK is bringing the same values and principles to the UK Market and prides itself on service and innovation.

Chapelfield Barn
Old Bank
Ripponden
Halifax Yorkshire. HX6 4AG
Tel: 01422 825000
Web: www.mba.eu

Orthovita is an established leader in the product development, manufacturing and marketing of innovative Orthobiologics materials. The company portfolio includes proven safe and effective products for procedures in Spine and Orthopaedics, involving fusion, regeneration and fixation of human bone.

72 London Road
St. Albans
Hertfordshire
AL1 1NS.
Tel: 0808 101 2775
Web: www.orthovita.com

The single purpose of Zimmer Spine is to design, manufacture, and distribute medical devices and surgical tools that provide comprehensive spine care solutions to improve and enhance quality of life for patients with back pain, neck pain, degenerative disc conditions, and injuries due to trauma.

The Courtyard
Lancaster Place
South Marston Park
Swindon
Wiltshire. SN3 4FP
Tel: 01793 584 500
Web: www.zimmer.co.uk

Advance Health are UK distributors of innovative spinal implant ranges developed and manufactured by Spineart and Eurospin.

View their full range of fusion and motion implants, including the Eurospin HRCC Locking Cervical Cage and Baquera C, the world’s first MRI compatible, shock absorbing and pre-assembled cervical disc, on stand 16.

Unit 29
Essex Technology & Innovation Centre,
The Gables (off Fyfield Road)
Ongar
Essex. CM5 0GA
Tel: 0845 470 0001
Web: www.advancehealth.uk.com

Our purpose and responsibility is to shape our members’ skills and understanding of spine principles; to establish new values and incentives for the creation of knowledge, the sharing of wisdom, and the development of new tools and techniques that improve patient care, patient outcomes, and the cost effectiveness of spine surgery.

Stettbachstasse 6
Duebendorf 8600
Switzerland
Tel: +41 44 200 2408
Web: www.aospine.org
The CareFusion, Infection Prevention mission is to deliver clinically differentiated evidence-based products and services that support the global effort to reduce HAIs. ChloraPrep is illustrative of this focus. ChloraPrep is currently the only product licensed for cutaneous antisepsis, which allows healthcare professionals to comply with epic2: National Evidence-Based Guidelines for Preventing Healthcare Associated Infections.

New from Carl Zeiss - Experience the future of Surgical Microscopes with the new OPMI VARIO 700. The Vario 700 is a high-performance surgical microscope that provides uncompromising clinical versatility while meeting the challenges of spinal surgery. Carl Zeiss pioneered the concept of surgical microscopes and the new OPMI Vario 700 demonstrates why we are the worldwide leader in optical and digital visualization solutions for surgical applications.

Freedom Medical, independent specialist Spinal business with over 15yrs experience. Exhibiting: Mobi C® next generation cervical arthroplasty. Cerapedics I-Factor™, unique bone substitute featuring P-15™, small peptide attachment factor making it truly Osteoinductive. Reed pedicle screws, quality implants that could be a saving of up to 50% on basic lumbar fixation.

FzioMed specializes in absorbable, surgical biomaterials based on our patented polymer science. FzioMed products include Oxiplex/SP Gel, the leading adhesion barrier for spine surgery outside the U.S. with over 185,000 patients treated worldwide. The company has filed a PMA for U.S. approval of Oxiplex.

Lindare Medical are proud to sponsor this years BASS meeting. Please come and see us on Stand 4, where we will be more than happy to indulge you with our innovative range of Spinal implants and instruments.

Our Spinal and Biologics business is committed to advancing the treatment of spinal conditions, and as the global leader in today’s Spinal and Biologics market, we lead the way in innovative solutions to treating the Spine. A crucial element to this innovation and market leadership is that our business is committed to development of new technologies through collaboration. We work with world-renowned surgeons, researchers and other innovative partners to offer state-of-the-art products and technologies.

Mercian has been established for over 40 years with a reputation for High Quality Spinal Instrumentation. We have an extensive range of high quality Spinal Instrumentation for Lumbar, Cervical & Anterior Spinal Surgery. We will be exhibiting a specialist range of Spinal Retractor Systems for posterior & Lumbar Spinal Surgery including the McCulloch Micro Discectomy Retractor & Black belt Cervical Retractor System. Our Titanium Coated Kerrison Laminectomy Punches will also be on our stand with sizes 1mm through to 6mm bite.
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<thead>
<tr>
<th>Sponsor Name</th>
<th>Address</th>
<th>Contact Details</th>
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<tbody>
<tr>
<td>Össur</td>
<td>Building 3000 Manchester Business Park Aviator Way Manchester M22 BTG</td>
<td>Tel: 0161 490 8553 Web: <a href="http://www.ossur.co.uk">www.ossur.co.uk</a></td>
</tr>
<tr>
<td>Simpirica Spine, Inc.</td>
<td>1680 Bayport Avenue San Carlos CA 94070 USA</td>
<td>Tel: 650 592 6300 Web: <a href="http://www.simpirica.com">www.simpirica.com</a></td>
</tr>
<tr>
<td>Synthes</td>
<td>20 Tewin Road Welwyn Garden City Hertfordshire AL7 1LG</td>
<td>Tel: 01707 823 320 Web: <a href="http://www.synthes.com">www.synthes.com</a></td>
</tr>
<tr>
<td>Spinal News International</td>
<td>44 Burlington Road London SW6 4NX</td>
<td>Tel: 020 7736 8788 Web: <a href="http://www.spinalnewsinternational.com">www.spinalnewsinternational.com</a></td>
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<tr>
<td>Spinal Surgery News</td>
<td>Pelican Magazines Ltd. 2 Cheltenham Mount Harrogate HG1 1DL</td>
<td>Tel: 01423 569 676 Web: <a href="http://www.spinalsurgerynews.com">www.spinalsurgerynews.com</a></td>
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<tr>
<td>The Aesculap Academy</td>
<td>B. Braun Medical Ltd Thorncliffe Park Sheffield S35 2PW</td>
<td>Tel: 0114 225 9057 Web: <a href="http://www.aesculap-academia.co.uk">www.aesculap-academia.co.uk</a></td>
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Össur is a global leader in the development, manufacturing and distribution of Orthopaedic braces and supports, as well as an established pioneer in Prosthetics. The development of the Össur Bracing and Supports product range combines some of the most effective technologies available today with over 30 years of design experience.

Scient’x Alphatec Spine is a medical device company that designs, develops, manufactures and markets products for the surgical treatment of spine disorders, primarily focused on the aging spine. Founded in 1990, since then they have developed a full line of vertically integrated quality products for spine surgeons.

Simpirica Spine, Inc. was founded in 2006 to develop a new category of spinal implant: minimally invasive, flexion-restricting stabilization. The company’s lead product, the LimiFlex Spinal Stabilization System, is typically used in conjunction with a surgical decompression for the treatment of lumbar spinal stenosis with or without degenerative spondylolisthesis.

Synthes is a leading global medical device company with a 50 year history of working closely with surgeons to develop the best possible clinical solutions. Synthes develop and market instruments, implants and biomaterials for surgical fixation and correction of the human skeleton. Synthes support clinical education for improved patient outcomes.

Spinal News International is a quarterly newspaper going out to over 7,000 spine specialists in Europe and North America. It is a trusted news brand, with an internationally renowned editorial board, and contains the latest news, research, analysis, opinion, conference coverage, product news and industry updates.

Spinal Surgery News is distributed throughout the UK and Europe enabling medical and surgical personnel to keep up to date with new products and current topics of interest. The magazine provides a medium for hospital news, related company news, dates and details of major exhibitions, seminars and technical articles.

The Aesculap Academy enjoys a world-wide reputation as a leading forum for surgical and medical training and answers the demands of health-care professionals in all areas of practice. The course programme comprises a wide range of hands-on workshops, management seminars and international symposia. Aesculap Academy courses are of premium quality and are accredited by the respective medical societies, where appropriate.
BOA / IOA COMBINED MEETING
13 - 16 SEPTEMBER 2011
DUBLIN
With the participation of Specialist Societies
Training, Education and Revalidation

To be held at:
The Convention Centre, Dublin
Spencer Dock
North Wall Quay
Dublin 1
Ireland

Congress highlights

- Revalidation - Workshops and Seminars
- Instructional Sessions
- Free Papers
- Posters
- Opening Reception
- Craic Dinner at the Guinness Storehouse - Places are limited
- Golf
- Social Programme - A Visit to Dublin isn’t complete without a trip to the Guinness Storehouse, a stroll around Trinity College, taste the whisky at the world famous Jameson Distillery and visit the historic town of Wicklow. This is just a taste of what’s on offer.

Fantastic accommodation rates, please visit www.boa.ac.uk
or contact r.kaur@boa.ac.uk
Registration and a draft programme will be available from February 2011.
Hydrolift®

- **S4 CS**
  Percutaneous, Controlled Fracture Reduction

- **Hydrolift®**
  Continual Hydraulic Distraction in situ
  End-Plate Adaptation

- **Quintex®**
  Coming Soon, Rigid, Variable and Dynamic Fixation
  all in One Set

Aesculap – a B. Braun company