Inaugural Cardiff Spinal Surgery Research Symposium

Life Sciences Hub, Cardiff Bay
Friday July 15th 2022

Confirmed Attendees:
Mr M McCarthy Consultant
Mr A Jones Consultant
Mr S James Consultant
Mr N Moideen Consultant
Mr I Chopra Consultant
Mr S Ahuja Consultant
Mr F Brooks Consultant (On Call)
Mr J Howes (possible)
Ms L Jones SCP
Mr M Williams Research – Judging the Presentations
Ms E McGough Research – Judging the Presentations
Ms H Jarvis Research – Judging the Presentations
Mr D Dasic Fellow
Mr F Wong Fellow
Dr L Abdalla Fellow
Mr P Shah Fellow (On Call)
Ms A Stanley Medical Student
Ms H Keeling Medical Student
Ms LA Fox Medical Student
Mr T Jones Medical Student
Mr E Kimber Medical Student (not evening)
Mr J Allman Medical Student
Mr H Breen Medical Student
Ms C Sherpa-Blaiklock Medical Student
Ms S Jones Medical Student
Ms A Zahid Medical Student (Remote)
Ms L Baxter Medical Student
Mr A Matthew Medical Student
Ms N Joshaghani Medical Student
Ms H Hebbes Medical Student
Mr S Pugh (Globus Medical)
Mr S Meredith (Globus Medical)
Mr G Davies (Globus Medical) (evening only)
Mr K Jones (Nuvasive)

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Program

13:30 Meet at Life Sciences Hub, Cardiff Bay

14:00 Welcome

14:10 A Retrospective Comparison Of Cage-Alone Versus Cage-Plate Constructs Used In Anterior Cervical Discectomy And Fusion – Ms A Zahid (Virtual Zoom)

14:20 Does The Use Of Laminar Flow Ventilation Decrease The Incidence Of Surgical Site Infections In Trauma Theatres At The University Hospital Of Wales? - Mr A Matthew

14:30 Curve magnitude as a threshold for choosing surgical intervention of neuromuscular scoliosis – Ms H Hebbes

14:40 Long Term Outcome Following Thoracolumbar Fractures: Literature Review – Mr J Allman

14:50 Long Term Outcome Following Thoracolumbar Fractures: Demographic Data and Questionnaire Development – Mr E Kimber

15:00 Decompression in Thoracolumbar fractures - To Do or Not to Do? – Mr P Shah (on behalf of Mr T Thomas)

15:10 Radiological Analysis Of Posterior Cervical Fixation Using Lateral Mass Screws And A Modified Surgical Technique – Mr H Breen

15:20 Salmonella Discitis: A Rare Cause Of Spine Infection - Ms S Jones

15:30 An Audit Of Outcome Following New Spinal Outpatient Appointment During Covid 19 Recovery Phase – Ms C Sherpa-Blaiklock

15:40 Break for 20 mins

16:00 A Comparison Of Patient Outcomes Following The Use Of Dexamethasone 3.3mg Vs 6.6mg In Lumbar Nerve Root Block / Transforaminal Epidural Injections For The Management Of Radicular Pain – Ms LA Fox

16:10 Retrospective Study Into The Pain Experienced During Therapeutic Spinal Injections (Nerve Root Blocks And Foraminal Epidurals) And Subsequent Patient Outcome – Ms H Keeling

16:20 Analysis Of Out Of Area Non Major Trauma On Call Spinal Referrals In A Tertiary Major Trauma Centre – Dr L Abdalla (on behalf of Ms E Foo)

16:30 An Audit Of Spinal ATLS Management – Ms N Joshaghani

16:40 CT Study to Correlate the Interpedicular Distance and Maximum Length Pedicle Screw: Intraoperative Guide to Ensure Safe Pedicle Screw Insertion – Ms L Baxter

16:50 Anatomical Predictor For Safe Pedicle Screw Length In Scoliosis Surgery – Mr F Wong

17:00 Central Cord Syndrome Part 1: Five Year Mortality in Wales – Ms A Stanley

17:10 Central Cord Syndrome Part 2: Questionnaire Development for the Assessment of Long-Term Outcomes – Mr T Jones

17:20 Break for 20 mins and Judges Marking

17:40 Award for the Best Presentation and Runner Up

18:00 Depart for Drinks and Meal

19:00 Meal at Demiros Italian, Cardiff Bay

DOES THE USE OF LAMINAR FLOW THEATRE AFFECT THE RATE OF SURGICAL SITE INFECTIONS IN TRAUMA THEATRES WITHIN THE CARDIFF AND VALE CENTRE FOR SPINAL SURGERY?

Lynden Chiang, Charki Chun, Allen Mathew
Adnan Hussain, Daniel Lewandowski
Mr Sashin Ahuja

1

BACKGROUND

- Disruption of local trauma service due to the COVID pandemic
- Laminar flow ventilation is widely regarded as the gold standard for implant surgery
- Pre-Covid trauma operating was performed in laminar flow theatres. Since the Pandemic trauma operating has moved to non-laminar flow theatres.

2

STUDY OBJECTIVES

- Compare the rates of SSI for procedures performed in laminar flow theatres to non-laminar flow theatres.
- Compare the rates of SSIs in long bone fixations, arthroplasty
- Identify any other factors that may have affected SSIs.

3

METHODS

- Retrospective data collection.
- Bluespier – used to collect patient details
- Clinical Portal and Welsh Clinical Portal – carried out 90-day SSI surveillance
- 929 patients identified in laminar flow theatres
- 940 patients in non-laminar flow theatres were identified.
- Chi square and t-test were used to identify whether the results were significant.

4

RESULTS

	Laminar flow patients		Non-laminar patients		Significance (0.05)
Age	56.3		61.6		None
Gender (M:F) (%)	42	58	41	59	None
ASA grade	2.1		2.3		None
Co-morbidity – diabetes	9.0		9.0		None
Risk factor – smoking	8.4		9.8		None

5

RESULTS

	SSI rates in laminar flow patients (%)	SSI rates in non-laminar patients (%)	Significance (0.05)
Long bone & spinal fixations	3.1	2.3	None
Hemi-arthroplasties	2.0	1.2	None
Arthroplasties	0.0	3.3	None
Overall rates	2.8	2.1	None

6

DISCUSSION

Laminar flow ventilation does decrease bacterial count (CFU) at surgical sites

2012 systematic review and meta-analysis suggested laminar flow theatres are associated with a two-fold increase in the rate of SSIs. They suggested improper positioning of staff in theatres and lower intra-operative tissue temperatures was to blame

2017 systematic review (broader search criteria, evaluated more studies) showed that laminar flow systems did not reduce rates of SSIs

7

CONCLUSIONS

- Lower rates of SSI in non-laminar flow theatres
- Throughout the pandemic, clinicians provided good quality care for patients undergoing trauma surgery.
- Greater rates of SSIs in long bone & spinal fixations, and hemiarthroplasties undertaken in laminar flow theatres.
- However, there were lower rates of SSIs in arthroplasties undertaken in laminar flow theatres.
- Our data suggests that theatre ventilation does not affect rates of SSIs.

8

WHAT HAVE I LEARNT?

- During the SSC project, I developed my skills in data collection skills and familiarised myself with the different databases used within C&V.
- My interest in pursuing Orthopaedics as a career has grown. I was able to gain a deeper appreciation for the principles of trauma surgery and the measures used in practice to reduce the risk of SSIs.
- This project has enabled me to learn more about data analysis and statistical analysis. By undertaking a short statistics course, I have gained exposure to different statistical tests and learnt about their uses.
- I also expanded my understanding of study methodology and its importance.

9

CURVE MAGNITUDE AS A THRESHOLD FOR SURGICAL CORRECTION OF NEUROMUSCULAR SCOLIOSIS- A SYSTEMATIC REVIEW

Harriet Hebbes-Y3
Mr. Sashin Ahuja-Tutor

1

IDIOPATHIC VS NEUROMUSCULAR

Idiopathic

- scoliosis without an obvious cause

Non-Idiopathic

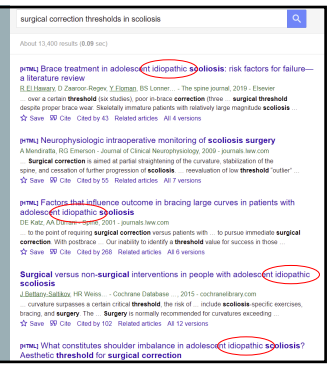
- scoliosis with a determined cause.
- Neuromuscular = scoliosis due to poor muscle control, neurological problems and other issues.

2

IDIOPATHIC VS NEUROMUSCULAR

Most research focuses on idiopathic scoliosis – the most common type of adolescent scoliosis (Letellier et al., 2007).

Idiopathic scoliosis surgical threshold = 40-50° (Weinstein, 1986; Bridwell, 1999; Trobisch, Suess and Schwab, 2010).



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STUDY OBJECTIVE

Perform a **systematic literature review** focusing solely on **neuromuscular paediatric scoliosis** to determine whether an **optimum cobb angle** for surgery an be identified.

LITERATURE SEARCH

- Medline
- Keywords like "curve magnitude", "cobb angle", "neuromuscular scoliosis", "surgical thresholds".

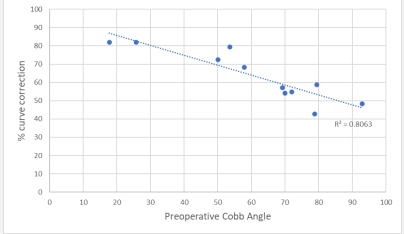
3000+ articles

Title / Abstract / Full text screen

25 articles

4

WHAT PREOPERATIVE COBB ANGLE OFFERS OPTIMAL POST-SURGICAL PERCENTAGE CORRECTION?



(Noordeen et al., 1997; Knoeller and Stueker, 2002; Arun, Srinivas and Mehdian, 2009; Master et al., 2011; Nordon et al., 2017; Sarwahi et al., 2022)

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POSTOPERATIVE COMPLICATIONS

- Respiratory
- Gastrointestinal
- Infection
- Cardiac
- Blood Loss

6

RISK FACTORS FOR POSTOPERATIVE COMPLICATIONS

Respiratory Function:

- FVC <39% and an FEV1 <40% predicted postoperative pulmonary complications (Kang, Lee and Suh, 2011)
- FVC <30% is associated with major respiratory complications (Jenkins at al., 1982)

Cobb Angle

- Preop cobb angle of >90° = more complications but those with an angle of <70° did not have significantly less complications than those in the 70-90° group (Hollenbeck et al., 2019)
- Preoperative cobb angle >100° = significant risk factor for complications (Sarwahi et al., 2001)

Motor Function

- GMFCS 4/5 were more likely to have extended hospital stays than those with a score of 1-3 (Fletcher et al., 2020)

Epilepsy

- Those with controlled or poorly controlled seizures had a longer stay in ITU than those without a seizure history (Abousamra et al., 2019)

Ambulatory Status

- Non ambulatory patients are 4x more likely to have a post surgical complication (Master et al., 2011)

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CONCLUSION

- Smaller preoperative cobb angle = greater total percentage curve correction.
- Neuromuscular scoliosis has greater surgical risks than idiopathic scoliosis
- Reduced respiratory function, epilepsy, non ambulatory status, reduced motor function and a larger cobb angle = predictive risk factors.

Future Research → could these parameters be used to create a scoring system?

8

LONG TERM OUTCOMES FOLLOWING THORACOLUMBAR FRACTURES: LITERATURE REVIEW

J Allman, E Kimber, MJH McCarthy, F Wong

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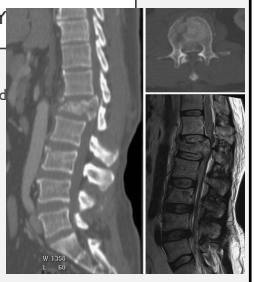
EPIDEMIOLOGY

- Most common form of spinal fracture worldwide
- Transition zone
- Burst fractures most common type



[1,2]

2

FUNCTIONAL OUTCOMES

- Neurological deficit impacts
- Surgical vs conservative

[3,4]

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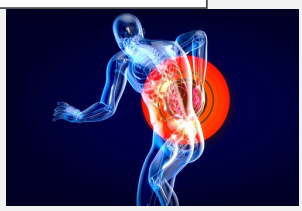
PAIN

- Not a common long-term issue
- Socio-economic status
- Co-morbidities



[5,6]

4

RETURN TO WORK

- Return to work rate
- Factors influencing return to work:
  - Working in year prior to injury, employment during injury/treatment and surgery
- Factors influencing inability to return to work
  - Financial compensation, higher level fracture and days in hospital

[7]

5

FUTURE RESEARCH

6

THANK YOU FOR LISTENING

7

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2. McLain RF. Functional outcomes after surgery for spinal fractures: return to work and activity. Spine. 2004;29(4):470-Z6.
3. Mukherjee S, Beck C, Yoganandan N, Rao RD. Incidence and mechanism of neurological deficit after thoracolumbar fractures sustained in motor vehicle collisions. Journal of Neurosurgery: Spine. 2016;24(2):323-31.
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7. Burnham RS, Warren SA, Sabo LA, Davis LA, Russell GG, Reid DC. Factors predicting employment 1 year after traumatic spine fracture. Spine (Phila Pa 1976). 1996;21(9):1066-71.

8

Long Term Outcome Following Thoracolumbar Fractures: Demographic Data and Questionnaire Development

14:50 EKIMBER

E Kimber, J Allman, F Wong and MJH McCarthy
Cardiff and the Vale

1

Aims

- Retrospective analysis of long-term employment and satisfaction outcomes post thoracolumbar fracture
- Comparison between operative and conservative treatment on long term outcomes

2

Materials and Method

1/1/2013-31/12/2017

Cardiff and the Vale Databases

- Spinal Orthopaedic surgical list – Bluespier
- Radiological CT/MRI spine reports – A&E, T&O, key word: 'Fracture', 'Dislocation', 'Cord Injury'

3

Inclusion

- Treated within Cardiff and Vale
- Acute or traumatic fracture/s and/or dislocation/s of the thoracolumbar spine
- Aged 18-50 years at time of injury (with a "normal" employment age including a 5 year follow up)
- Conservative and Surgical intervention

4

Exclusion

- Osteoporotic / insufficiency / stress fractures, infection, pathological fractures
- A0 fractures (AO classification)
- Cervical fractures without thoracolumbar involvement
- Sacral fractures without thoracolumbar involvement

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Results

Total number of scans 24,110
167 included in the study group

- Average age 35 years
- 111 (66 %) male , 56 (34)% female
- 92 (55%) conservative treatment
- 75 (45%) operative treatment

Radiological characteristics

- L1 was the most common fracture with 42
- 116 fractures above T11
- 133 fractures at T11-L2
- 47 fractures below L2

Table 1. Baseline Clinical and Radiological Characteristics

Characteristic	Conservative group (N=92)	Surgical group (N=75)	P
Clinical characteristic			
Age (SD) (y)	35 (10.0)	35 (9.3)	0.90
Male Sex [n(%)]	65 (71)	46 (61)	0.97
Female Sex [n(%)]	27 (29)	29 (39)	0.90
Radiological characteristics			
Total Fractures	163	124	
Level of fracture [n(%)]			
Above T11	73 (45)	43 (35)	
T11 – L2	71 (43)	62 (50)	
Below L2	19 (12)	19 (15)	
Single level fractures	61 (66)	59 (79)	
Multi-level fractures >1	31 (34)	16 (21)	

Baseline clinical and radiologic characteristics in surgical and nonsurgical groups

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The Questionnaire

- Employment – pre and post Injury
- Treatment of Injury
- Pain and Neurological problems – pre and post injury
- Manual activities and abilities – AO Spine PROST questionnaire
- Satisfaction with care

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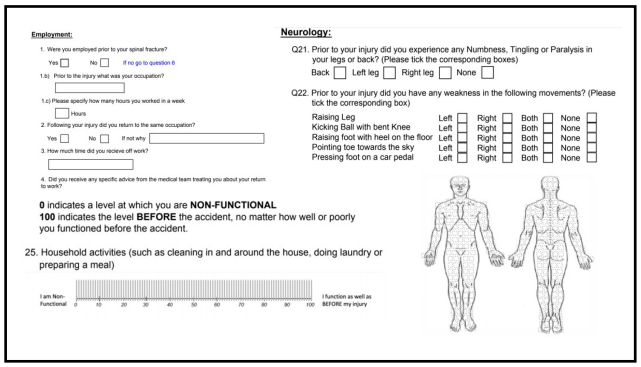

Employment:

1. Were you employed prior to your spinal fracture?
   Yes ☐ No ☐ If no go to question 6
1.b) Prior to the injury what was your occupation?
1.c) Please specify how many hours you worked in a week
   ☐ Hours
2. Following your injury did you return to the same occupation?
   Yes ☐ No ☐ If not why
3. How much time did you recieve off work?
4. Did you receive any specific advice from the medical team treating you about your return to work?

0 indicates a level at which you are **NON-FUNCTIONAL**
100 indicates the level **BEFORE** the accident, no matter how well or poorly you functioned before the accident.

25. Household activities (such as cleaning in and around the house, doing laundry or preparing a meal)

I am Non-Functional 0 10 20 30 40 50 60 70 80 90 100 I function as well as BEFORE my injury

Neurology:

Q21. Prior to your injury did you experience any Numbness, Tingling or Paralysis in your legs or back? (Please tick the corresponding boxes)
Back ☐ Left leg ☐ Right leg ☐ None ☐

Q22. Prior to your injury did you have any weakness in the following movements? (Please tick the corresponding box)

Raising Leg	Left ☐	Right ☐	Both ☐	None ☐
Kicking Ball with bent Knee	Left ☐	Right ☐	Both ☐	None ☐
Raising foot with heel on the floor	Left ☐	Right ☐	Both ☐	None ☐
Pointing toe towards the sky	Left ☐	Right ☐	Both ☐	None ☐
Pressing foot on a car pedal	Left ☐	Right ☐	Both ☐	None ☐

8

Next Steps

Distribute questionnaire
- Electronic copy
- Postal copy
- 2 week follow up phone call

Collate data
- Online questionnaire through input function to excel spreadsheet
- Handwritten questionnaire answers hand inputted

Analyse Data
- Quantitative data – SPSS
- Qualitative data – Identify common themes

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Thank You

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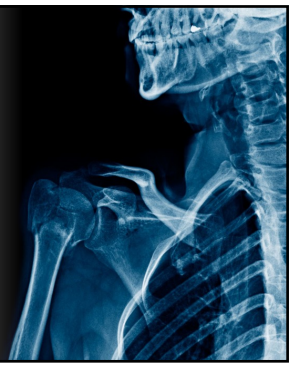
Spinal Decompression in Thoracolumbar Fractures: To Do or Not To Do?



Tom Thomas, Pranav Shah
Supervisor: Mr. Iqroop Chopra

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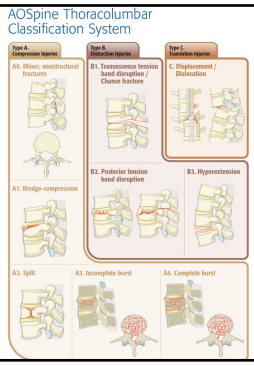
Decompression

- Spinal decompression alleviates pressure in the spinal canal that can occur through spinal trauma
- Unstable fractures commonly treated with fixation +/- decompression
- No official guideline outlining the indications of decompression



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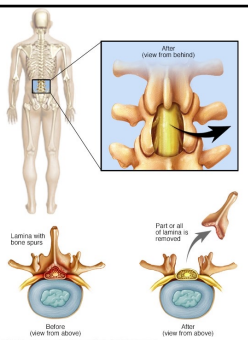
Direct

- Direct removal of a section of vertebrae providing more space for the canal and relieving pressure on the spinal cord
- Multiple methods available, e.g. posterior, anterior and anterolateral decompression



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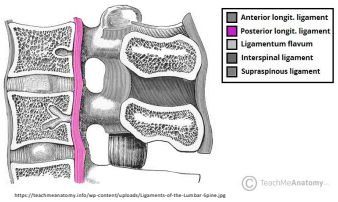
Indirect

- Also referred to as ligamentotaxis
- Longitudinal distraction force applied to the Posterior Longitudinal Ligament



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Methods

- Literature review using PubMed
- Key search terms: "Thoracolumbar fractures", "Ligamentotaxis" and "Spinal Decompression".
- Articles investigated either decompressive procedure, or compared both

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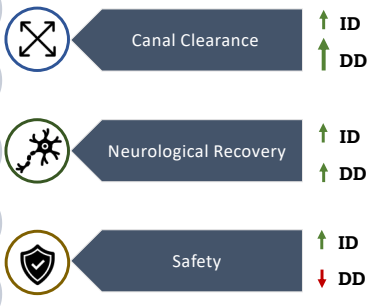
Results

16 Articles



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Significance

- Both indirect and direct decompression are effective methods of decompressing the spine in thoracolumbar fractures
- No one technique can be considered superior in all aspects
- Multiple factors can influence the efficacy of both decompressive techniques

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Peng et al.	**In ID:** The intra-canal fracture fragment needed to be less than 75% of the transverse diameter of the vertebral canal, along with the height of the fragment less than 47% of the vertebrae.
Jaiswal et al.	**In ID:** Fragments that rotate 180º whilst demonstrating a reverse cortical sign worsen neurological status
Mueller et al.	**In ID:** Significant spinal canal widening in fractures involving T10-L2. Canal area was not significantly increased in L3-4. Trapezoid fragments very difficult to reposition.
Wang et al.	**In ID:** If fragment displacement > 0.85 cm successful reduction was not achieved

8

Conclusion

- No one particular technique can be considered superior in all aspects.
- Type of decompression must be decided on a case-by-case basis.
- A scoring system to determine cases where a more invasive direct decompression should be undertaken instead of the safer indirect approach

9

References

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10

Radiological analysis of posterior cervical fixation using lateral mass screws and a modified surgical technique

H. Breen, M. Horner, M. McCarthy

1

Aims & Methods

- **Aims:** To evaluate the radiological outcomes of posterior cervical fixation implanted using a modified lateral mass screw insertion technique.
- **Methods:** A total of 47 patients requiring posterior cervical fixation were treated using Globus Ellipse lateral mass screws. The following parameters were analysed on post-operative radiology:
  screw pull-out, loosening, malplacement, need for revision surgery

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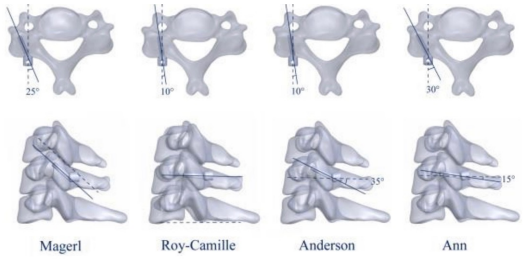

Figure 1. A schematic diagram extracted from Song *et al.*, showing the techniques of lateral mass screw insertion for posterior cervical fixation (7).

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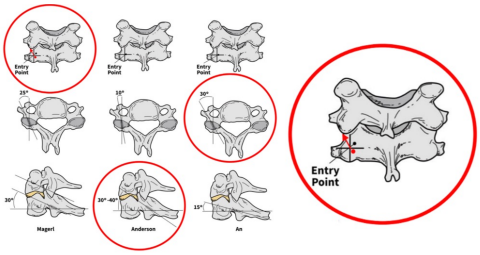

Figure 2. A schematic diagram illustrating the modified technique of posterior cervical fixation. The technique uses an entry point just below the point used in the Magerl method, medial and inferior to the midpoint of lateral mass as viewed from behind. The angle in the sagittal plane is similar to that used in the Anderson method and the angle in the transverse plane similar to that of An.

4

Results

- 2 screws out of 260 pulled out **(0.8%)** in 1 patient **(2.2%)**.
- 2 screws loosened out of 260 **(0.8%)** in 1 of the 46 patients **(2.2%)**.
- 9 screws **(3.5%)** were malplaced in 7 of 46 patients **(15%)**.
- Revision surgery due to malplaced screws was only required with 1 patient.
- There were **no infections**.

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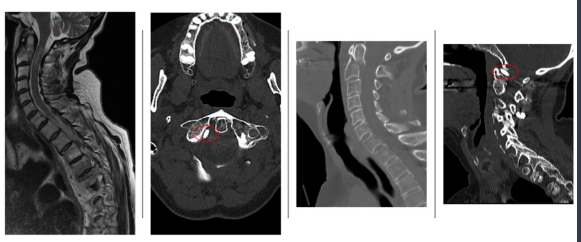

Figure 3. C1 lateral mass malplacement requiring removal of the metalwork due to pain.

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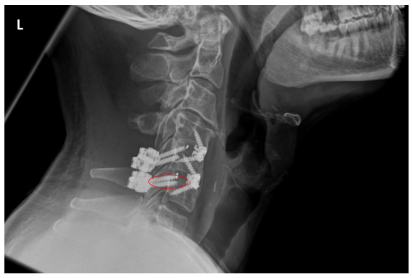

Figure 5. A plain radiograph showing intra-articular facet breach.

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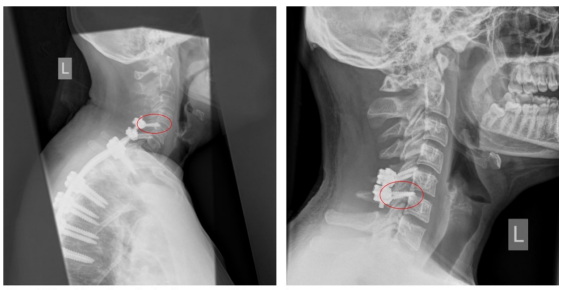

Figure 7. Two plain radiographs showing screws which are too long.

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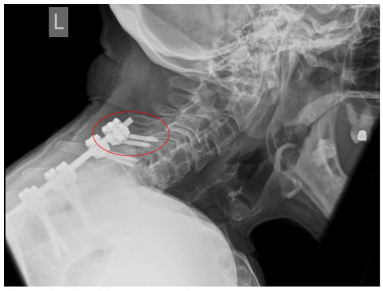

Figure 8. A plain radiograph showing upper screw pull out.

9

The Literature

- Katonis *et al.* - 1662 screw, 255 patient study of all four techniques
- Screw pull out was **1.3%** compared to **2.2%** in this study
- Both patients in both studies were elderly patients with poor bone quality [1]

10

The Literature

- Heller *et al.* - screw loosening in **1.1%** of a total of 654 screws (Magerl and Roy-Camille techniques were included)
- Compared to **0.8%** of screws in this study
- The modified technique has similar complication rates with regards to screw loosening (2)

11

The Literature

- Eldin and Hassan reported a **0.81%** rate of facet violation (370 screws)
- In this study, there were 2 facet violations out of 260 screws **(0.77%)** giving a lower but similar rate (3)

12

Conclusion

- The modified technique used on patients in this study shows similar safety and efficacy to those methods described in the literature.
- This method of lateral mass fixation can be used safely and effectively with low complication rates with respect to the parameters included.
- Screw pull-out, loosening and facet violation rates were similar when compared to the wider literature.

13

Thank you for listening

References

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14

Salmonella Discitis: A rare cause of spinal infection.

S Jones, Mr A Jones

1

Introduction

- Salmonella spondylodiscitis is an infection of the intervertebral disc and adjacent vertebral endplates.
- Occurs via haematogenous spread following the primary infection.
- Typical presenting features are back pain and a concomitant fever.
- Surgery reserved for cases where medical management fails.

2

Aims/ Objective:

- To produce a case report and perform a literature review of salmonella spondylodiscitis, its diagnosis and treatment.

3

Methods:

I reviewed the patient and his clinical records.

My literature review included the use of Pubmed and Medline databases. Only those with full text access and in the English language were used.

In my search, I used the following key words and phrases: ("paediatric" OR "children") AND ("spinal infection" OR "spine" OR "osteomyelitis" OR "spondylodiscitis" OR "salmonella" OR "salmonella enterica" OR "investigations" OR "management" OR "treatment" OR "salmonella osteomyelitis").

4

Findings of literature review:

- Osteomyelitis vs Spondylodiscitis.
- Bimodal distribution of age.
- Haematogenous spread following initial infection with complications being rare, e.g, only in immunocompromised.
- Difficult to diagnose, only 58% cases producing positive blood cultures for an organism. (11)
- Most cases resolve with medical management.

5

Case report of a 14 year old male.

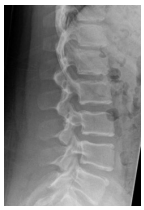

Figure 1: X-ray of lumbar spine

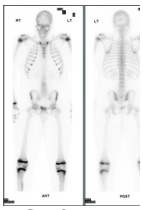

Figure 2: Bone scan

- Two year history of back pain.
- Investigations performed under rheumatologist showed no abnormalities.

6

Acute history:

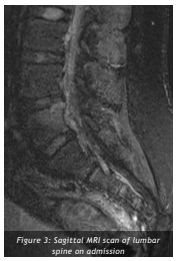

Figure 3: Sagittal MRI scan of lumbar spine on admission

- Presented with increasing back pain, on a chronic background, with a fever.
- Proximal leg weakness.
- Returned from Ghana 6 weeks prior with a history of diarrhoea and vomiting.
- Lumbar spine MRI showed high signal within the posterior half of the vertebral body of L5 as it abuts the L4/L5 disc.

7

Investigations

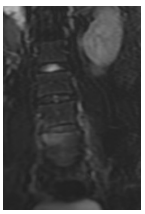

Figure 4: Coronal MRI scan of lumbar spine a week later on admission

- Positive venous blood and faecal cultures revealed salmonella enterica.
- Lack of improvement lead to a subsequent MRI performed a week later.
- Showed endplate destruction of the L5 superior endplate, more marked on the right, with associated marrow oedema in the inferior endplate of L4, on the right, with some inflammatory change in the epidural space, but no abscess collection.
- Compatible with spondylodiscitis with the source being salmonella enterica. Treatment commenced.

8

Treatment

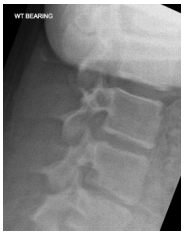

Figure 5: Standing X-ray following treatment.

- He was treated with maximum dose intravenous ceftriaxone for a six-week course.
- Blood parameters were monitored with improvement in his inflammatory mediators and WBC.
- X-ray at discharge showed narrowed disc space with suggestion of some sclerosis in the posterior aspect of L5.
- He DNA at follow up appointment.

9

Conclusion:

- Salmonella spondylodiscitis is a rare condition with limited published cases. Its diagnosis, particularly in the paediatric age group, is challenging. MRI scans are the 'gold standard' for radiological imaging.
- A history of salmonella infection with elevated CRP, ESR and WBC with an abnormal MRI scan is sufficient to diagnose salmonella spondylodiscitis.
- Treatment with IV antibiotics for at least 6 weeks has proven curative in the majority of cases, with surgery only being utilised in cases with failure of medical management.

Limitations:

- Limited publications, little quantitative data.
- Single case study.

10

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I would like to extend my gratitude to Mr Jones and the Spinal team for their support and this SSC opportunity.

11

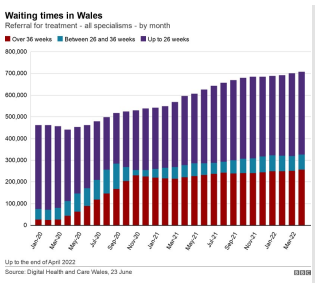
An Audit of Outcome Following New Spinal Outpatient Appointment During COVID-19 Recovery Phase

Charlotte Sherpa-Blaiklock
(Leena Abdalla, Pranav Shah, Mohammed Eissa)
Supervisor: Mr. Michael McCarthy

1

Introduction and background

- The NHS is under constant pressure
- Maximum waiting time for a routine outpatient appointment 3 **months**.
- A growing and ageing population with the additional pressure of COVID-19 makes meeting these targets is challenging



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Aim and Objectives

- To establish if up to date imaging facilitates a definitive management plan
- To calculate the percentage of referrals requiring up to date imaging
- To improve triage and diagnostic prior to the spinal appointment

3

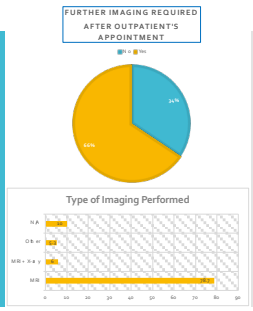
Method

- Retrospective study
- 156 new referrals to spinal surgical services
- Welsh Clinical Portal and Synapse software used to collect information

4

Results

- The average time between most recent MRI scan and outpatient's appointment was **15 months**.
- **49%** patients could not have a definitive plan as they required further imaging.
- **63.4%** of all patients needed further imaging following the outpatient appointment.
- **78.7%** of the imaging requested were **MRI** scans



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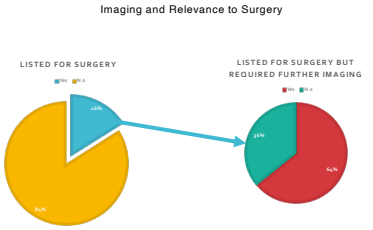
Results



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Discussion

- Paucity of literature presenting definitive criteria regarding up-to-date imaging.
- Not imaging enough- delay in management
- From our data- average time between most recent MRI scan and outpatient appointment was 15 months:

  This needs to change
- New strategy: scans that are over one year old in the six weeks before the outpatient assessment should be automatically updated

7

Discussion

- Excessive imaging is wastage of valuable resources.
- Patients often have expectations in appointments to have definitive treatment plan.
- Over 90% of people have no serious spinal pathology and should be managed with conservative treatments such as advice, reassurance, exercise, cognitive-behavioural therapy, or pain management.

8

Conclusion

- **Address waiting time line to see a spine surgeon.**
- **Effective re-triaging: Patients with scans over one year should be identified up to date diagnostics can be attached prior to their outpatients appointment.**

9

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10

A comparison of patient outcomes following the use of dexamethasone 3.3mg vs 6.6mg in lumbar nerve root block/transforaminal epidural injections for the management of radicular pain

Lesley Anne Fox, Holly Keeling, Mr Michael McCarthy
Cardiff University School of Medicine

1

Background

- Nerve root block (NRB) and transforaminal epidural injections (TfESIs) are used to treat radicular pain
- Dexamethasone (DXM) non-particulate steroid is used to theoretically reduce inflammation around the affected nerve roots
- ?3.3mg vs 6.6mg
- Previous studies have shown no difference in efficacy for different doses of dexamethasone (1) and no difference between using steroid vs local anaesthetic alone (2)

2

Objective

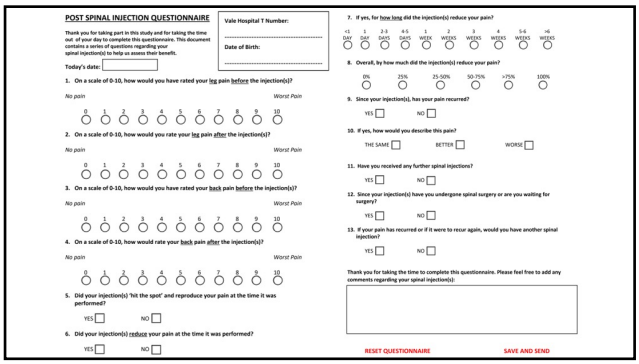
To evaluate whether the dose of DXM non-particulate steroid (3.3mg vs 6.6mg) used in a lumbar NRB / TfESI affects the efficacy of the injection, measured through patient reported outcome measures (PROMs).

3

Methodology

- 249 patients had a lumbar NRB or TfESI between 13/07/18 - 01/12/21
- Inclusion criteria: patients who received a lumbosacral NRB or TfESI with an injection of DXM 3.3mg or 6.6mg. Patients who had a facet injection were excluded
- Using questionnaires and patient notes, 165 data sets were collated which included the dose of DXM used and associated PROMs
- A further historic cohort of 26 patients (all with PROMs) who had received 3.3mg DXM was added to the cohort (n=191)
- SPSS (v.27) was used for statistical analysis

4



POST SPINAL INJECTION QUESTIONNAIRE

Vale Hospital T Number:

Date of Birth:

Thank you for taking part in this study and for taking the time out of your day to complete this questionnaire. This document contains a series of questions regarding your spinal injection(s) to help us assess their benefit.

Today's date:

1. On a scale of 0-10, how would you have rated your leg pain before the injection(s)?

No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain

2. On a scale of 0-10, how would you rate your leg pain after the injection(s)?

No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain

3. On a scale of 0-10, how would you have rated your back pain before the injection(s)?

No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain

4. On a scale of 0-10, how would rate your back pain after the injection(s)?

No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain

5. Did your injection(s) 'hit the spot' and reproduce your pain at the time it was performed?

YES NO

6. Did your injection(s) reduce your pain at the time it was performed?

YES NO

7. If yes, for how long did the injection(s) reduce your pain?

<1 DAY 1 DAY 2-3 DAYS 4-5 DAYS 1 WEEK 2 WEEKS 3 WEEKS 4 WEEKS 5-6 WEEKS >6 WEEKS

8. Overall, by how much did the injection(s) reduce your pain?

0% 25% 25-50% 50-75% >75% 100%

9. Since your injection(s), has your pain recurred?

YES NO

10. If yes, how would you describe this pain?

THE SAME BETTER WORSE

11. Have you received any further spinal injections?

YES NO

12. Since your injection(s) have you undergone spinal surgery or are you waiting for surgery?

YES NO

13. If your pain has recurred or if it were to recur again, would you have another spinal injection?

YES NO

Thank you for taking the time to complete this questionnaire. Please feel free to add any comments regarding your spinal injection(s):

RESET QUESTIONNAIRE SAVE AND SEND

5

Results

- Of the 191 patients, 61 had 3.3mg and 136 had 6.6mg DXM
- Injection outcome was quantified by whether the injection reduced pain within a six-week follow up period
- No significant difference in injection outcome between the 3.3mg and 6.6mg DXM doses (p=0.54)

	3.3mg DXM	6.6mg DXM	Total
Didn't work	12 (20.7%)	19 (14.3%)	31 (16.2%)
Worked; wore off within 6 weeks	24 (41.4%)	61 (45.9%)	85 (44.5%)
Worked >6 weeks	22 (37.9%)	53 (39.8%)	75 (39.3%)
Total	58	133	191

6

Results (cont.)

- No significant difference between the two doses for pain recurrence (p=0.72)
- No significant difference in the number referred for spinal surgery (p=0.24)

	3.3mg DXM	6.6mg DXM	Total
Pain recurred	44 (75.9%)	104 (78.2%)	148 (77.5%)
Pain did not recur	14 (24.1%)	29 (21.8%)	43 (22.5%)
Total	58	133	191

	3.3mg DXM	6.6mg DXM	Total
Listed for surgery	22 (37.9%)	39 (29.3%)	58 (30.4%)
Not listed for surgery	36 (62.1%)	94 (70.7%)	133 (69.6%)
Total	58	133	191

7

Conclusion

- No difference in injection outcome at six weeks between 3.3mg and 6.6mg doses of DXM
- No benefit to patient outcome by using the higher dose

8

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9

Any questions?

10

Analysis of out of area non major trauma on call spinal referrals in a tertiary major trauma centre

Eu Fang Foo, Leena Abdalla, Fabian Wong, Michael McCarthy
Cardiff University School of Medicine

1

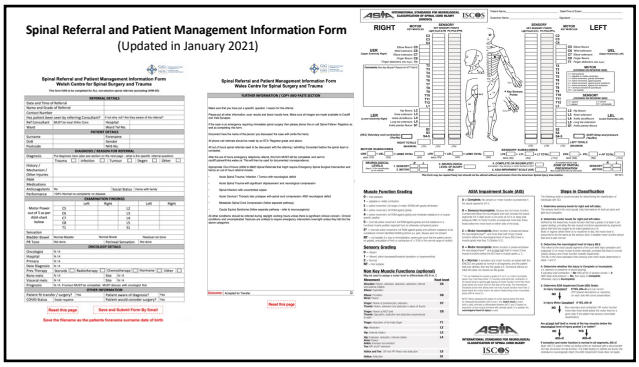
Background

- The necessity of appropriate spinal surgery referral interface between referring hospital and tertiary spinal unit for emergency spinal referrals lead to the creation of spinal Referral and Patient Management Information Form' to ensure high standard of referrals
- This form has to be completed for all non-elective spinal referrals to the on-call UHW spinal team

2

Spinal Referral and Patient Management Information Form

(Updated in January 2021)



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Aims

- Analysis of out of area non major trauma on call spinal referrals.
- Analysis of all out of area non major trauma cases transferred & admitted

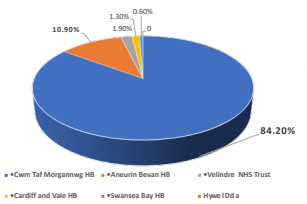
Methods

- Retrospective single-centre study of 469 referrals from Jan 2021 to May 2022
- Data extracted electronically
- Patients transferred and admitted to UHW identified and medical notes reviewed and compared to the referral form
- Data analysed using IBM *SPSS® Statistics* software (V28:2021)

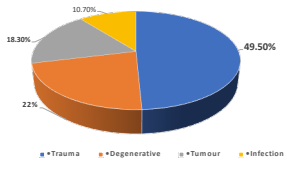
4

Results – Patient Demographics

Referral health board:



Reasons for referral



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Results – Examination Findings

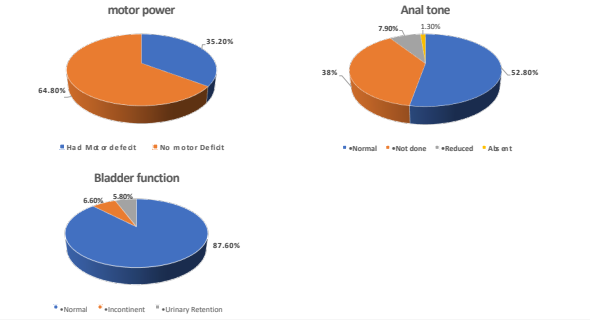
- Motor power assessed: C5 to T1 bilaterally, L2 to S1 bilaterally as per ASIA chart
- Sum of each individual's ASIA score ranged from 0-100 (Average:95.1 +/- 13.4; Median:100)
- 64.8% had no motor power deficit

Bladder and bowel function	n	%
Anal tone:		
• Normal	248	52.8
• Not done	178	38.0
• Reduced	37	7.9
• Absent	6	1.3
Saddle sensation:		
• Normal	277	59.1
• Not done	158	33.7
• Reduced bilaterally	15	3.2
• Reduced unilaterally	10	2.1
• Absent bilaterally	7	1.5
• Absent unilaterally	2	0.4
Bladder function:		
• Normal	411	87.6
• Incontinent	31	6.6
• Urinary Retention	27	5.8

- 2/9 (22.2%) patients with absent saddle sensation transferred
- 3/31 (9.7%) patients with urinary incontinence transferred
- 0/6 (0.0%) patients with absent anal tone transferred

6

Results – Examination Findings



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Results – Transferred and Admitted Patients

- 35 (7.5%) patients were transferred to UHW
- 92.5% of patients were manged in their respective Health boards without requiring transfer
- Referral to admission interval: **0-69** days
- Length of admission: **1-145** days
- Average admission length: 22 days; Median: 8 days
- 30/35 set of medical notes were available for review
- Diagnosis was accurate in 29 (96.6%) patients
- **50%** patients had mismatches in motor power examination
- No statistically significant difference in ASIA power score at referral versus transfer for 28 assessable patients (p=0.842)

8

Conclusion

- All referral forms were adequate and completed
- Majority of patients referred could be managed independently in their respective peripheral hospitals
- Only 35 out of 469 patients required transfer and admission to UHW
- 26 out of these 35 patients required surgical intervention

9

Thank you for listening

10

SPINAL ATLS MANAGEMENT-

AN AUDIT OF ADHERENCE TO THE SECONDARY SURVEY

NILOU JOSHAGHANI, MR FRANCIS BROOKS

1

SETTING THE SCENE

- **HOW MANY?**
  - WHO estimate **250,000-500,000** people suffer with SCI annually, across the world (1)
  - 90% traumatic (1)
- **COST?**
  - Significant physical burden on patient
  - £1.12 million per SCI patient (2)
  - Total: £1.43 billion UK (2)

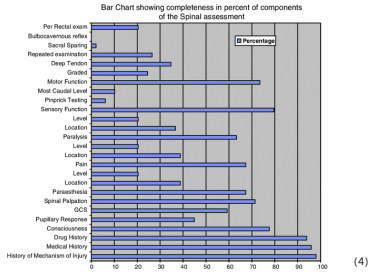
2

ATLS MANAGEMENT

1. Primary survey- ABCDE, vital signs, GCS, stabilisation
2. **Secondary survey- full history, head to toe physical examination and neurological exam (3)**

3

A multi-centred audit of secondary spinal assessments in a trauma setting: are we ATLS compliant?



(4)

4

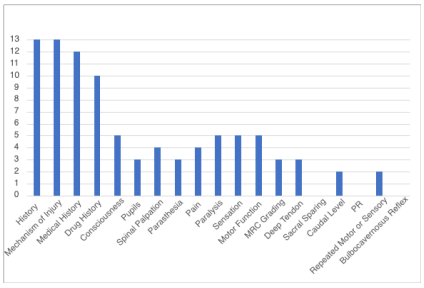
AUDIT-METHOD

Secondary Survey			
History obtained: Yes/ No	Mechanism of Injury: Yes/ No	Past Medical History: Yes/ No	Drug History: Yes/ No
Reasons Consciousness: Yes/ No	Reasons Pupillary Response: Yes/ No	Spinal Palpation: Yes/ No If Yes, What Level:	
Assessment of Paraesthesia: Yes/ No If yes, what location? What Dermatome?	Assessment of Pain: Yes/ No If yes, What Location? What Dermatome?	Assessment of Paralysis: Yes/ No If Yes, What Location? What Myotome?	
Exam of Sensation: Yes/ No If yes, pinprick testing? Yes/ No	Evidence of Motor Function exam: Yes/No MRC Grading: Yes/ No	Deep Tendon Assessment: Yes/ No	Sacral Sparing examined: Yes/ No
Most Caudal Level documented: Yes/ No	Per Rectal Examination performed: Yes/ No	Repeated Motor or Sensory exam: Yes/ No	Bulbocavernous Reflex examined: Yes/ No

- 13 patients- spinal or polytrauma
- Major trauma documentation
- UHW

5

RESULTS...



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7

QUESTIONS?

Thank you for listening!

8

CT Study to Correlate the Interpedicular Distance and Maximum Length Pedicle Screw: Intraoperative Guide to Ensure Safe Pedicle Screw Insertion

L.BAXTER, F.WONG, M.MCCARTHY, S.JAMES

1

Background

- Pedicle screws have evolved since 1970 (1)
- Gold-standard approach to surgical spinal fusion (2)
- Screw malplacement could lead to 'neurological and vascular damage' (3)
- Preoperative computer planning & intraoperative image guidance (4,5)

2

Objective

- To investigate whether there is a correlation between maximum screw length (PL) and the interpedicular distance (IPD)
- To assess whether IPD could be used as a safe template for pedicle screw length for the corresponding vertebral level, to help guide surgery

3

Null Hypothesis

- There is no correlation between PL and IPD

4

Method

- CT TAP scans of 20 male adults between the ages of 20-30 *(30/01/1992-30/12/2002)* were analysed using Synapse, radiological software
- Vertebrae T1 – L5 were analysed using mid-pedicle axial cuts
- For each vertebrae 3 measurements in millimetres (mm) were taken
- Microsoft Excel was used to collect anonymized data
- 2 sets of measurements
- Data was transformed for practicality
- Statistical analysis

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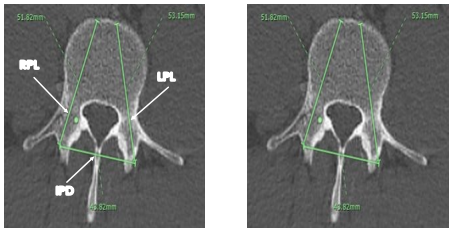

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Results

- A statistically significant positive correlation (Pearson's *r* value of 0.432, $p < 0.001$ & Spearman's *rho* = 0.467, $p < 0.001$)was found between PL & IPD
- Paired sample t-tests run on both the untransformed (student t-test) and transformed (Wilcoxon signed-rank test) dataset highlighted a statistically significant difference ($p < 0.001$) between PL and IPD between **T2-L4.**
- Intraclass coefficient (ICC) for both PL & IPD reflected little intra-observer variability (ICC= 0.983 and = 0.985 for PL and IPD retrospectively). Reliability between rounds of measurements was achieved.

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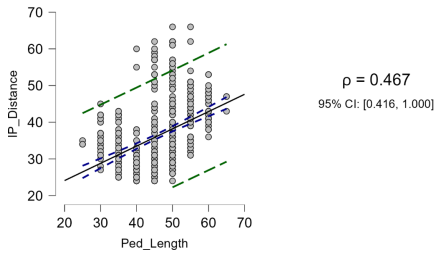

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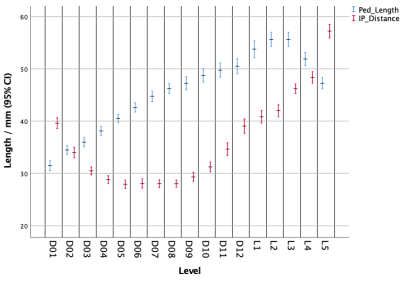

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Limitations:

- Consistency of exact measurements
- Sample size
- One data collector

10

Conclusion:

- As PL increases the IPD also increases
- Between T2-L4, PL is found to be greater in size than IPD
- IPD can be used as an intraoperative safe template for safe pedicle screw insertion

11

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12

Anatomical Predictor For Safe Pedicle Screw Length In Scoliosis Surgery

Presenter: Fabian Wong (Spine Fellow, UHW)

Authors: Fabian Wong, Laura Baxter, Stuart James, Michael McCarthy
(Welsh Centre for Spinal Surgery & Trauma, Cardiff)

1

Introduction

- Previous study shows feasibility to predict safe pedicle screw length
  - Adult Male
  - Normal Spine
- Ability to predict safe screw length intra-operatively
  - Useful
  - Should be simple and quick to do

2

Aim

- To assess whether Inter-pedicular Distance (IPD) is an anatomical predictor for safe Pedicle Screw Length (PL) in scoliosis correction surgery

3

Material and Methods

- All consecutive Paediatric and Young Adult (Age 0 to 30) patients
  - Single Centre
  - Had surgery for scoliosis correction between August 20 – June 22 (22 months)
  - Had pre-operative whole spine CT imaging
- Exclusion:
  - Previous surgery or insertion of growing rod system to spine evident on CT scan
  - Patients without CT imaging for the whole spine (T1 – L5)

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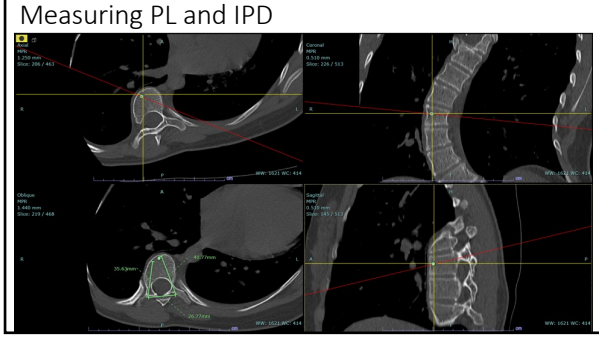
Measuring PL and IPD



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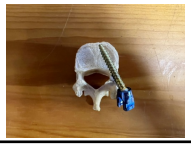
Measuring PL and IPD



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Material and Methods

- Measurements made on SYNAPSE
  - T1 to L5
  - Max. length for pedicle screw in expected trajectory without breaching anterior cortex
  - PL marked as "N/A" if no continuity of bone in the trajectory on axial imaging
- Analysed in JASP and SPSS

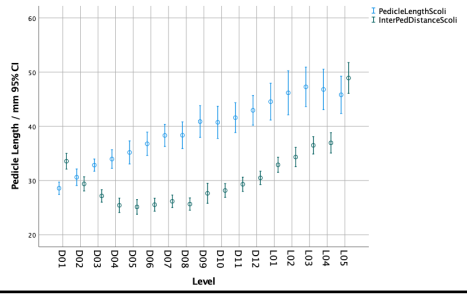
7

Results

- 130 patients (100 patients @ 16 or below)
- 13 patients with pre-op CT (10 patients @ 16 or below)
  - 2 patients CT inadequate
- Mean age at scan: 13.3 years (Range 21 months to 22 years)
- M:F = 3:8

8

Results



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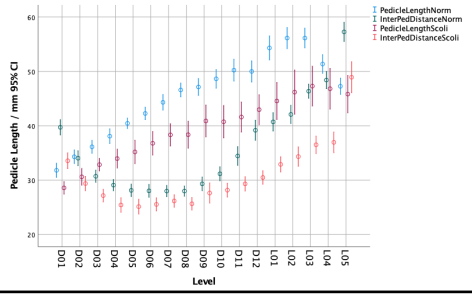
Results



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Results

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Mean Difference	SE Difference	95% CI for Mean Difference	
								Lower	Upper
PLT1	-	IPLT1	-4.000	10	0.999	-4.464	1.116	-6.486	∞
PLT2	-	IPLT2	1.366	10	0.101	1.273	0.932	-0.416	∞
PLT3	-	IPLT3	6.243	10	< .001	6.145	0.984	4.361	∞
PLT4	-	IPLT4	6.815	10	< .001	8.291	1.217	6.086	∞
PLT5	-	IPLT5	7.371	10	< .001	10.655	1.445	8.035	∞
PLT6	-	IPLT6	7.036	10	< .001	12.091	1.719	8.976	∞
PLT7	-	IPLT7	7.406	10	< .001	13.427	1.813	10.141	∞
PLT8	-	IPLT8	8.166	10	< .001	14.391	1.762	11.197	∞
PLT9	-	IPLT9	14.276	9	< .001	15.570	1.091	13.571	∞
PLT10	-	IPLT10	8.524	10	< .001	12.982	1.523	10.222	∞
PLT11	-	IPLT11	7.075	10	< .001	13.173	1.862	9.798	∞
PLT12	-	IPLT12	5.989	10	< .001	12.827	2.142	8.945	∞
PLL1	-	IPLL1	5.170	10	< .001	13.164	2.546	8.549	∞
PLL2	-	IPLL2	6.019	10	< .001	12.755	2.119	8.914	∞
PLL3	-	IPLL3	5.262	10	< .001	11.236	2.136	7.366	∞
PLL4	-	IPLL4	5.527	10	< .001	10.527	1.905	7.075	∞
PLL5	-	IPLL5	-1.200	10	0.871	-2.700	2.251	-6.779	∞

Note. For all tests, the alternative hypothesis specifies that Measure 1 is greater than Measure 2. For example, PLT1 is greater than IPLT1.
Note. Student's t-test.

11

PL and IPD on Bone Models

12

Discussion

- Results support that IPD is consistently wider than the maximum safe pedicle screw length (PL) when placed along the standard trajectory
  - Caveat in the upper thoracic (T1 & T2) and lower lumbar (L5)
- Easy to use anatomical landmark for double-checking when performing scoliosis correction surgery

13

Limitations

- Just because there is a pedicle, does not mean a screw is needed!
- There might not be a pedicle!
- Radiological study
  - Neurocentral synchondrosis ossification varies with age
- Small sample

14

Conclusion:

IPD is a valid and readily accessible anatomical landmark for estimating the maximum safe pedicle screw length in scoliosis correction surgery

Thank you!

15

Central Cord Syndrome: 5 Year Mortality in Wales

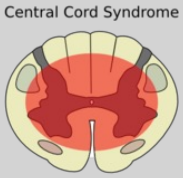
A L Stanley, T J Jones, D Dasic, M J H McCarthy

1

What is CCS?

- Incomplete cervical spine injury
- Upper limbs > Lower limbs
- +/- sensory loss or urinary retention

(Harrop, Sharan & Ratliff, 2006, Newey, Sen & Fraser, 2000)



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Aim

PRIMARY AIM to identify the **mortality rates** of **traumatic CCS** at a minimum of **five years** follow up

SECONDARY AIM to identify whether mortality was affected by **age group** or **management type**

3

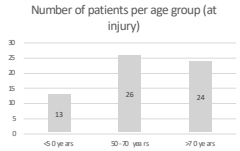
Methods

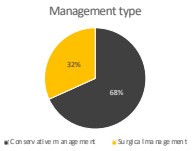
- Patients >18yrs treated for traumatic CCS at the Spinal Cord Injuries Centre Wales between January 2012 and December 2017
- All patients had:
  - Cervical spine injury
  - Motor impairment of upper limbs > lower limbs
  - +/- sensory impairment/urinary retention
- CCS secondary to non-traumatic cause were excluded

4

Results

- 63 patients; 42 (66%) male, 21 (33%) female, **mean age 68.8 years** (standard deviation (SD): 16.5, range: 26 to 105)
- Follow up period: minimum 5, maximum 9 years, **average 6.1 years**





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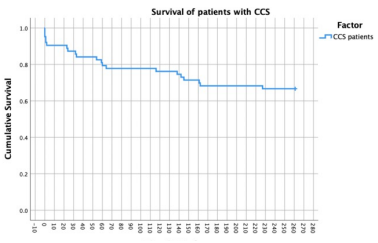
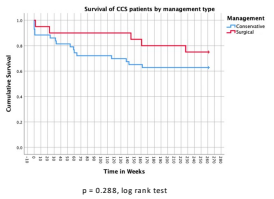


MORTALITY:

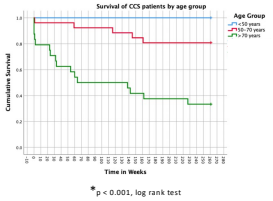
- **Five years: 22 (33.3%) patients**
- Within 31 days of injury: 6 patients (9.5%)
  - Mean age **81.7 years**
    - Independent samples t-test: 81.7±13.2 vs 61.9±17.3 years, **p<0.01**

6

Kaplan-Meier analysis



p = 0.288, log rank test



*p < 0.001, log rank test

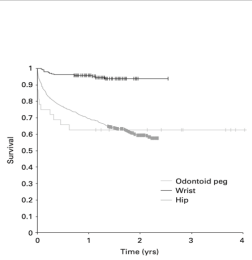
7

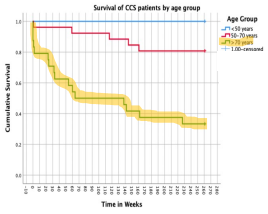
- Association of older age and increased mortality
  - Comorbidities and lower baseline

  (Segal et al., 2018, Brodell et al., 2015, Arul et al., 2019)
- OVERALL MORTALITY:

  33.3% vs 2.6% (Brodell et al., 2015, Jain et al., 2018)
- Why?
  - Longer follow up period
  - Welsh population 'sicker'
  - Only surgical patients

8





(Venkatesan et al., 2014)

9

Conclusions

- **66.7%** chance of survival at **five years**
- **9.5%** chance of dying within **31 days**
- **Age group** significantly affects mortality
  - <50 years – 100% survival
  - 50-70 years – 80.8% survival
  - **>70 years – 33.3% survival**
- Management type does not significantly affect mortality

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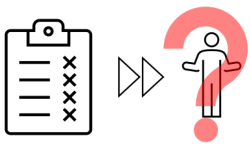
Future work



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Thank you

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12

2. Central Cord Syndrome:
Questionnaire Development for the Assessment of Long-Term Outcomes

T J Jones, A L Stanley, D Dasic, M J H McCarthy

1

Aim

PRIMARY AIM to develop a questionnaire to assess functional and psychological outcome of living patients at minimum 5 years after injury.

SECONDARY AIM to evaluate satisfaction with treatment provided whilst an inpatient.

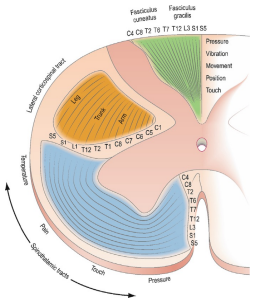
2

CCS: A Consequence of Somatotopy?

- Concept by Foerster et al. (1936)
- Reiterated by Schneider et al. (1954) – due to *Central haematomyelic cavity as a result of trauma*

Other evidence?

- Coxe et al. (1970) – NHP tracer
- Pappas et al. (1991) - NHP histopathology
- Marx et al. (2005) – Human MRI



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CCS: A Consequence of Somatotopy?

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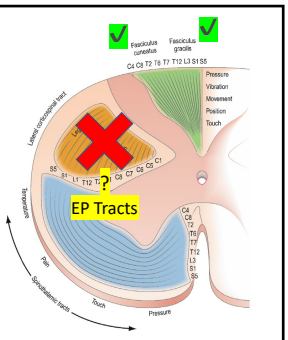
Other evidence?

- Coxe et al. (1970) – NHP tracer
- Pappas et al. (1991) - NHP histopathology
- Marx et al. (2005) – Human MRI

No somatotopy in CST



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Methods

- Explored existing literature to identify PROMs.
- Piloted, scrutinised and optimized by 2 spinal surgeons.

Physical Function

Spinal Cord Independence Measure – III

3 domains:
- Self-care: **0-20**
- Respiration and sphincter management: **0-40**
- Mobility: 0-40

Most widely used and superior sensitivity.

Pain

Visual Analogue Scale

2 aspects:
- Centrally – Neck and/or Back
- Peripherally - Arms and/or Legs

Most widely used.

No established system for pain currently.

Psychological Function

Patient Health Questionnaire - 9

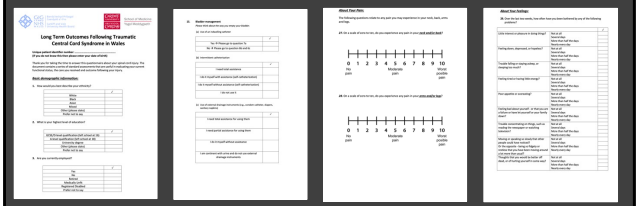
9 symptoms (DSM-IV) in last 14 days

Widely used depression screening tool.

Superior sensitivity to diagnostic interview.

5

Questionnaire



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Preliminary Results

- 49 questionnaires sent (13 completed responses at 3 weeks)

Preliminary cohort n = 13

- 7 (53.8%) male, 6 (46.2%) female,
- Age: mean ± SD : 69.8 years (range: 47-88)
- Follow up period: mean 6.2 years (min: 5, maximum 8.54 years)

(Demographics In line with wider cohort)

7

Physical Function

Mean Score / Total Score

Self-care: **Mean: 11.2 / 20** (Min. 0, Max. 20)

Respiratory and **Sphincter Management:** **Mean: 30.1 / 40** (Min. 17, Max. 40)

Mobility: **Mean: 23.8 / 40** (Min. 2, Max. 40)

Total: 63.8 /100

(Min. 20, Max. 100)

n = 13

8

Physical Function

- ASIA score recovery plateaus at ~2 years post-injury (Brooks 2017)
- Respiratory, sphincteric and mobility typically favourable.
- Self-care ADLs significantly worse than other SCIs.

Self-care:

Blasetti et al (2020) – Significantly lower self-care SCIM score than other SCIs at 1 year. Hand dysfunction?

9

Pain

Mean Score / Total Score

Neck and Back: **Mean: 5.9 / 10** (Min. 0, Max. 10)

Arms and Legs: **Mean: 5.4 / 10** (Min. 0, Max. 10)

Psychological Function

Mood (PHQ-9): **Mean: 10.2 / 27** (Min. 2, Max. 24)

n = 13

10

Satisfaction

11

Conclusions

Comprehensive outcome measure questionnaire designed and dispatched

Preliminary data:

At minimum 5 years, surviving CCS patients have;

(1) Non-recovery of self-care and mobility function,
Is ongoing therapy needed?

(2) Moderate depression,
Are psychological factors/comorbidities being addressed?

(3) Ongoing pain
Can medications be optimised?

12

Future work

13

Thank You

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