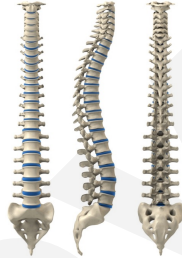


# Everything You Need to Know About the Spine

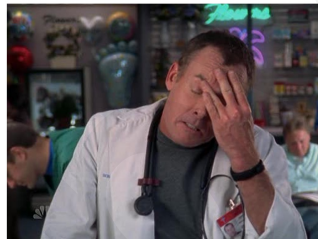


Mr M J H McCarthy  
Consultant Spinal Surgeon



## What do I need to know?...

- Anatomy / Physiology / History / Examination
- Trauma / Tumour / Infection
- Cauda Equina Syndrome
- Myelopathy
- DDD / Disc Prolapse
- Stenosis / Spondylolisthesis
- Scoliosis / Kyphosis
- Inflammatory Conditions
- Low Back Pain - Adult
- Low Back Pain - Child
- And more...





INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY (IRSCSCI)



Expert Name: \_\_\_\_\_  
 Exam Date: \_\_\_\_\_

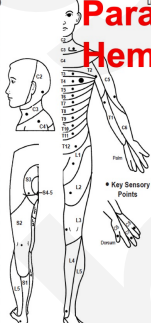
Date/Time of Exam: \_\_\_\_\_

## General Rule: Paraparesis = sPine Hemiparesis = Head

## LEFT

### RIGHT

| MOTOR<br>KEY MUSCLES | SENSORY<br>KEY SENSORY POINTS<br>(Light Touch/2/3, Pain/14/PP) |
|----------------------|----------------------------------------------------------------|
| C2                   | T1                                                             |
| C3                   | T2                                                             |
| C4                   | T3                                                             |
| C5                   | T4                                                             |
| C6                   | T5                                                             |
| C7                   | T6                                                             |
| C8                   | T7                                                             |
| T1                   | T8                                                             |
| T2                   | T9                                                             |
| T3                   | T10                                                            |
| T4                   | T11                                                            |
| T5                   | T12                                                            |
| T6                   | L1                                                             |
| T7                   | L2                                                             |
| T8                   | L3                                                             |
| T9                   | L4                                                             |
| T10                  | L5                                                             |
| T11                  | S1                                                             |
| T12                  | S2                                                             |
| L1                   | S3                                                             |
| L2                   | S4                                                             |
| L3                   | S5                                                             |
| L4                   |                                                                |
| L5                   |                                                                |
| S1                   |                                                                |
| S2                   |                                                                |
| S3                   |                                                                |
| S4                   |                                                                |
| S5                   |                                                                |



• Key Sensory Points

| MOTOR<br>KEY MUSCLES | SENSORY<br>KEY SENSORY POINTS<br>(Light Touch/2/3, Pain/14/PP) |
|----------------------|----------------------------------------------------------------|
| C2                   | T1                                                             |
| C3                   | T2                                                             |
| C4                   | T3                                                             |
| C5                   | T4                                                             |
| C6                   | T5                                                             |
| C7                   | T6                                                             |
| C8                   | T7                                                             |
| T1                   | T8                                                             |
| T2                   | T9                                                             |
| T3                   | T10                                                            |
| T4                   | T11                                                            |
| T5                   | T12                                                            |
| T6                   | L1                                                             |
| T7                   | L2                                                             |
| T8                   | L3                                                             |
| T9                   | L4                                                             |
| T10                  | L5                                                             |
| T11                  | S1                                                             |
| T12                  | S2                                                             |
| L1                   | S3                                                             |
| L2                   | S4                                                             |
| L3                   | S5                                                             |
| L4                   |                                                                |
| L5                   |                                                                |
| S1                   |                                                                |
| S2                   |                                                                |
| S3                   |                                                                |
| S4                   |                                                                |
| S5                   |                                                                |

**Comments (Numbered 1-22 Reason for IRT)**

**Reflexes**

1/2

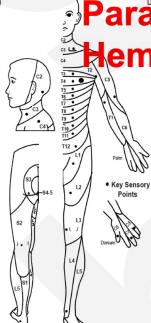
3/4

5/6

7/8

### LEFT

| MOTOR<br>KEY MUSCLES | SENSORY<br>KEY SENSORY POINTS<br>(Light Touch/2/3, Pain/14/PP) |
|----------------------|----------------------------------------------------------------|
| C2                   | T1                                                             |
| C3                   | T2                                                             |
| C4                   | T3                                                             |
| C5                   | T4                                                             |
| C6                   | T5                                                             |
| C7                   | T6                                                             |
| C8                   | T7                                                             |
| T1                   | T8                                                             |
| T2                   | T9                                                             |
| T3                   | T10                                                            |
| T4                   | T11                                                            |
| T5                   | T12                                                            |
| T6                   | L1                                                             |
| T7                   | L2                                                             |
| T8                   | L3                                                             |
| T9                   | L4                                                             |
| T10                  | L5                                                             |
| T11                  | S1                                                             |
| T12                  | S2                                                             |
| L1                   | S3                                                             |
| L2                   | S4                                                             |
| L3                   | S5                                                             |
| L4                   |                                                                |
| L5                   |                                                                |
| S1                   |                                                                |
| S2                   |                                                                |
| S3                   |                                                                |
| S4                   |                                                                |
| S5                   |                                                                |



• Key Sensory Points

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| C2                   | T1                                                             |
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| C7                   | T6                                                             |
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| T1                   | T8                                                             |
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| T3                   | T10                                                            |
| T4                   | T11                                                            |
| T5                   | T12                                                            |
| T6                   | L1                                                             |
| T7                   | L2                                                             |
| T8                   | L3                                                             |
| T9                   | L4                                                             |
| T10                  | L5                                                             |
| T11                  | S1                                                             |
| T12                  | S2                                                             |
| L1                   | S3                                                             |
| L2                   | S4                                                             |
| L3                   | S5                                                             |
| L4                   |                                                                |
| L5                   |                                                                |
| S1                   |                                                                |
| S2                   |                                                                |
| S3                   |                                                                |
| S4                   |                                                                |
| S5                   |                                                                |

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**Reflexes**

1/2

3/4

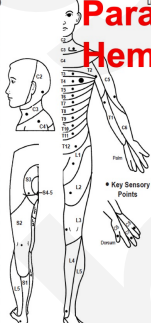
5/6

7/8

**NERV** Voluntary anatomic contractions

(1-5) Voluntary anatomic contractions

RIGHT TOTALS (MAXIMUM) (50) (50) (50) (50) (50)



• Key Sensory Points

**NERV** Voluntary anatomic contractions

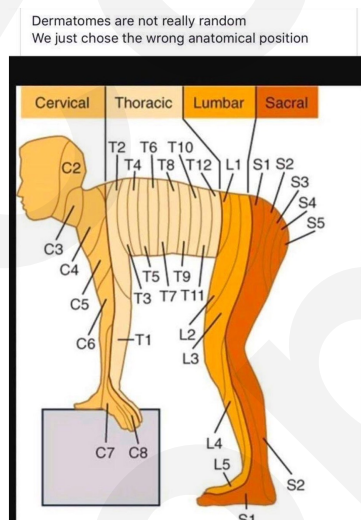
(1-5) Voluntary anatomic contractions

LEFT TOTALS (MAXIMUM) (50) (50) (50) (50) (50)

**NERV** Voluntary anatomic contractions

(1-5) Voluntary anatomic contractions

RIGHT TOTALS (MAXIMUM) (50) (50) (50) (50) (50)



## UMN vs LMN

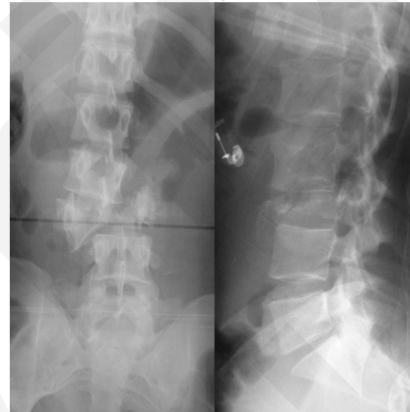
| Sign                    | UMN                             | LMN                             |
|-------------------------|---------------------------------|---------------------------------|
| Weakness                | More diffuse                    | More focal                      |
| Atrophy                 | Mild general                    | Severe focal                    |
| Atrophy vs Weakness     | Severe weakness<br>Mild atrophy | Severe atrophy<br>Mild weakness |
| Fasciculations          | Never seen                      | +/-                             |
| Muscle Tone             | Increased                       | Decreased                       |
| Muscle Stretch Reflexes | Increased                       | Decreased / Absent              |
| Clonus                  | +/-                             | Never present                   |
| Plantar Response        | +/-                             | Absent                          |

**AHC**

## Don't Forget This Slide...



## Orthopaedic Principles



Get  
Orthogonal  
Views



## Don't Forget This Slide...



## Goals of Spine Trauma

- Protection
- Detection
- Optimize conditions for neuro recovery
- Maintain / restore spinal alignment
- Minimize loss of spinal mobility
- Obtain healed and stable spinal column
- Rehabilitation
- **#s = Manage the ass soft tissue injury**

## Real Purpose of Surgery?



## Management Spinal Injury

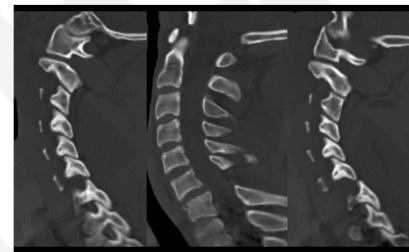
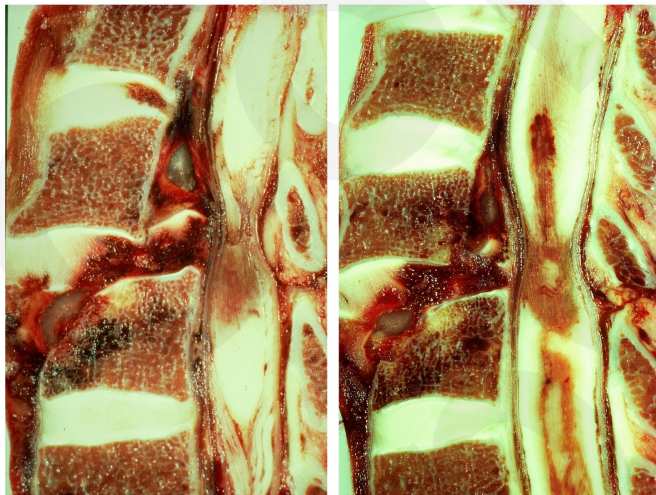
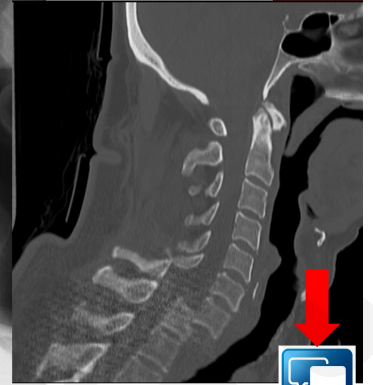
- ABCDE / ATLS Approach (not typical H&Ex)
- Protection - **THINK SPINAL CORD INJURY**
  - Maintain airway with spine control
  - Always aim to have a team of 6 for transfers (min 4 for log rolls)
- Detection
  - Level of injury
  - Complete or Incomplete cord injury
  - Spinal or Neurogenic shock
  - **Hx / Exam / XR / CT / MRI**
- Management
  - Conservative or Surgical treatment



## Clinical Instability

- The loss of the ability of the spine under **normal physiological loads** to maintain its pattern of displacement so that there is no initial or additional **neurological deficit**, no major **deformity** and no incapacitating **pain**

Stable  $\longleftrightarrow$  Unstable

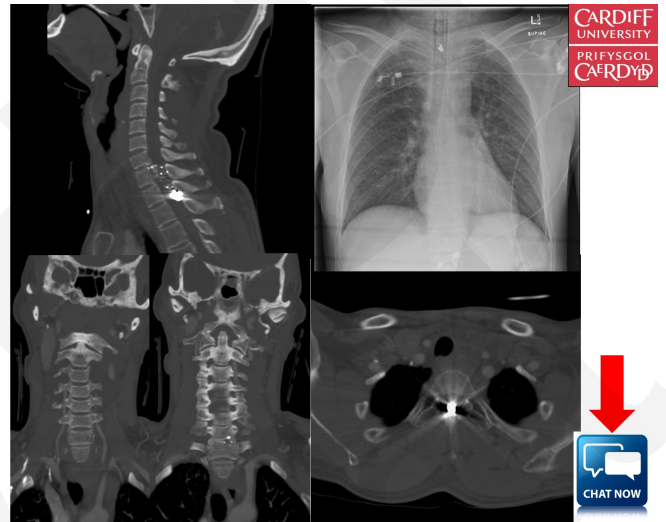
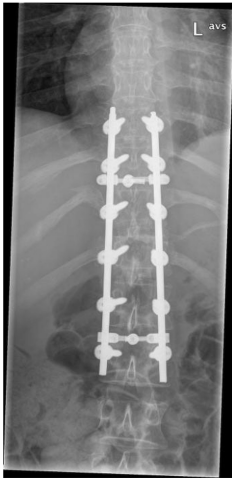


Think Stable or Unstable



Think Stable or Unstable



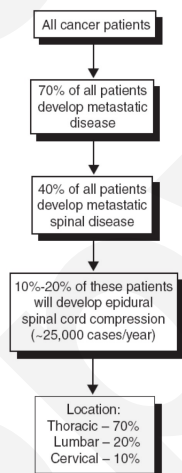


## Red Flags

- <16yrs or >50yrs with NEW onset pain
- Unwell / unexplained weight loss / unexplained fevers
- Past history of cancer, recent serious illness, recent significant infection, previous long standing steroid use, HIV / AIDS, end stage renal disease, osteoporosis, Paget's disease, alcohol or drug abuse
- Widespread neurological deficits
- Pain is non-mechanical
- Thoracic pain
- Spinal deformity
- History of significant trauma / injury
- Fails to improve with treatment



## Metastatic Spinal Cord Compression



Mets

## Patient Presentation

- Pain – 95% presenting feature
  - Expansion of cortex of vertebral body
  - Not relieved by rest
  - Intensifies night – venous engorgement
  - Pathological fracture / Spinal instability
  - Breast / prostate– twelve month history
- Neurological compression – 5%
  - Nerve roots or spinal cord
  - Weakness symmetrical in 60-85%
  - Bladder / bowel loss is a late feature
- Incidental finding whilst Ix primary tumour

### First Symptoms

|              |     |
|--------------|-----|
| Pain         | 95% |
| Weakness     | 5%  |
| Ataxia       | 1%  |
| Sensory loss | 1%  |

### Duration of symptoms before diagnosis

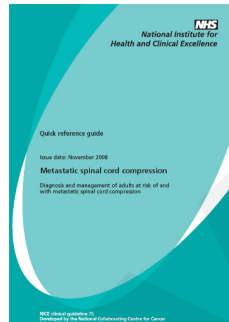
2-5 months median

Mets



## NICE MSCC Guidelines

- Suspected MSCC with neurological signs and symptoms = urgent MRI of whole spine **within 24 hours**
- Suspected Spinal Mets (normal neurology) = MRI whole spine within a week of suspected diagnosis



Mets

## Indications for Surgery

- Progressive / impending neurological deficit
- Spinal instability / collapse / deformity
- Paralysed <24hours
- Intractable pain (including paralysed >24 hours)
- Histological confirmation
- Growing tumour resistant to non-operative measures
- Relapse after / deterioration during radiotherapy
  - Spinal cord radiotherapy tolerance

Mets

## Surgical Candidate

- Indication present
- Patient willing to have surgery
- Prognosis > 3-4 months
- Patient is fit enough to have surgery
- Surgery is technically possible (ask the surgeon!)

Mets

## Steroids

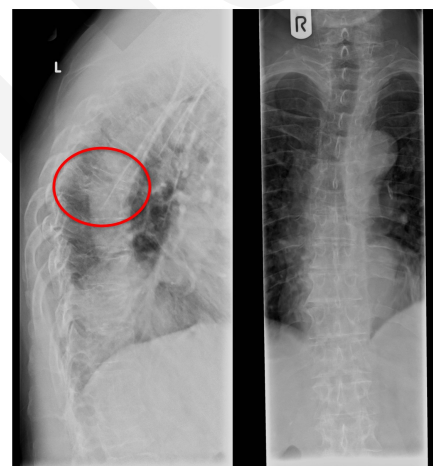
- Works by reducing oedema (cf trauma don't give them)
- 16mg Dexamethasone daily
- Load then 8mg bd
- Reduce dose over 5-7/7 post intervention
  - Neurology deteriorates – increase dose temporarily
- Monitor blood glucose
- Proton pump inhibitor (gastric cover)

Mets

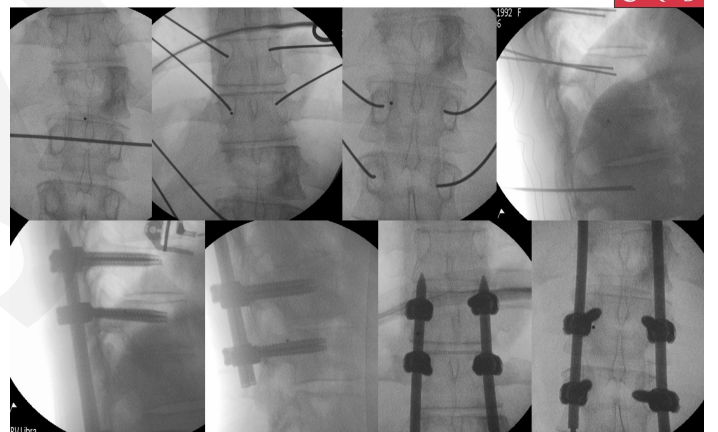
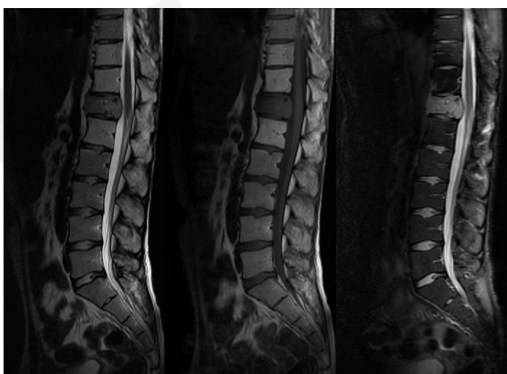
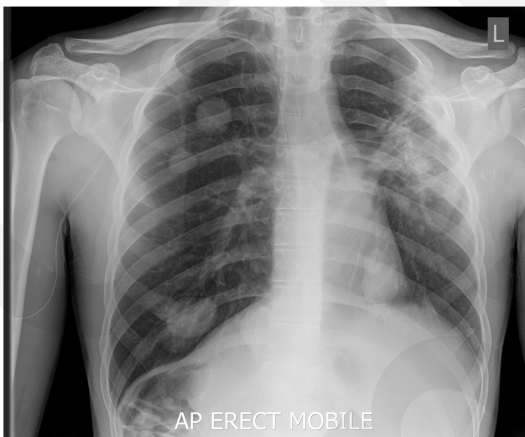
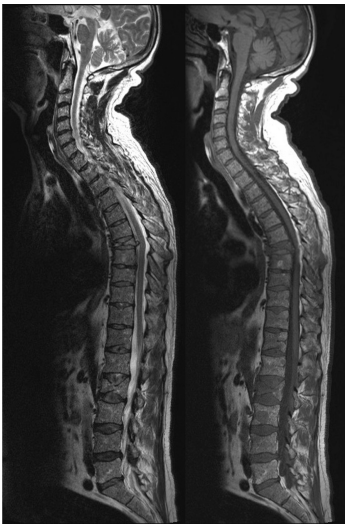
## Prognosis

- Median survival MSCC – 6 months
- Ambulatory patients with radiosensitive tumours
  - Best prognosis
  - Likely to remain mobile
- It is better to keep somebody walking than to try and make them walk again (i.e. do something before they become paralysed)

Mets



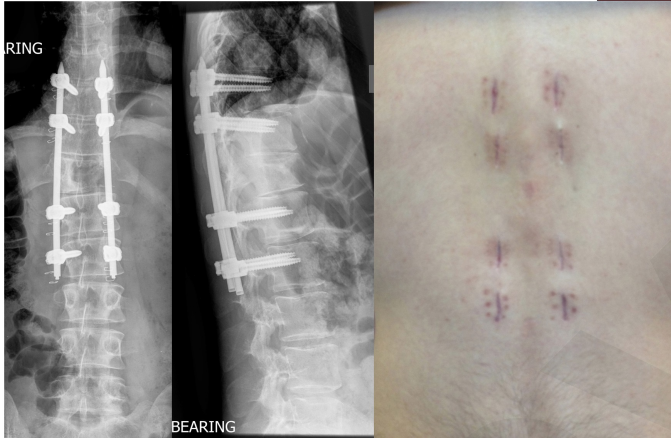
Thoracic pain  
Raised Ca<sup>++</sup>



Diagnosis?

Ideas...





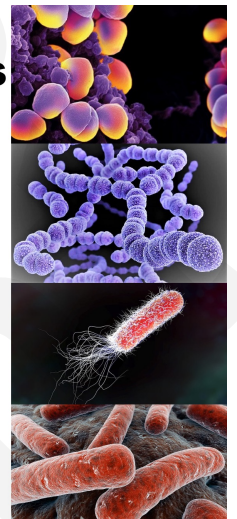
## Spinal Infection

- Acute fever and pain
- More commonly:
  - Vague symptoms, chronic illness, low grade fever and back pain
  - 50% delayed  $\Delta > 3/12$
- Back pain  $> 90\%$ 
  - C 15% Th 35% L 50%
- Fever 50%
- Neurology 15%



## Discitis / Osteomyelitis

- Spread:
  - Haematogenous
  - Contiguous
  - Direct Implantation
- Disc Involvement:
  - Pyogenic infection nearly always
  - Granulomatous do not typically involve the disc



## Spinal Infection - Patient

- Diabetic / Drug abuse
- Immuno / Immigrant
- Steroids / Spinal Surg
- Genitourinary issues
- Renal F / Rheumatoid
- Adolescents
- Cardiac issues
- Elderly



## Rule of 50%

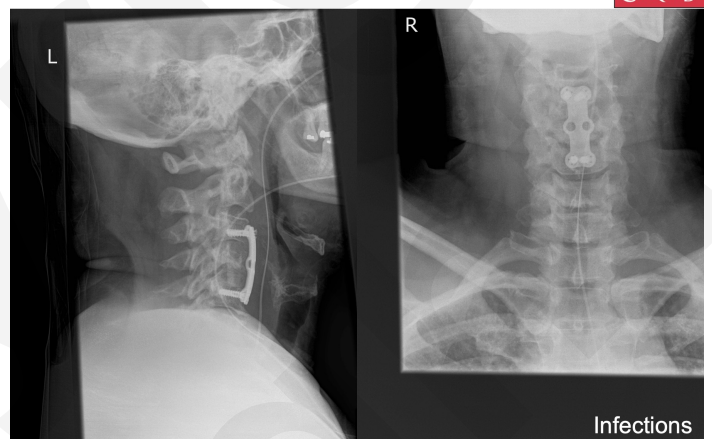
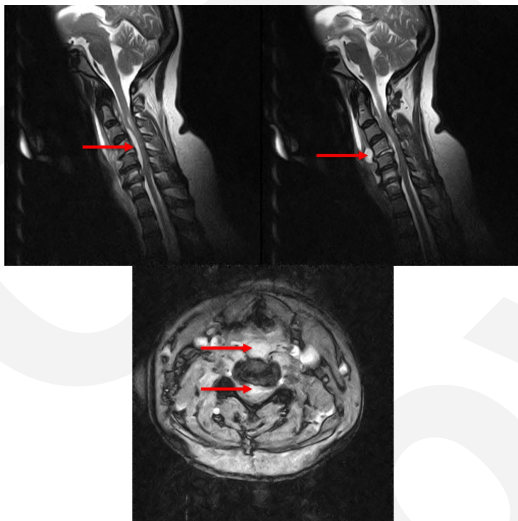
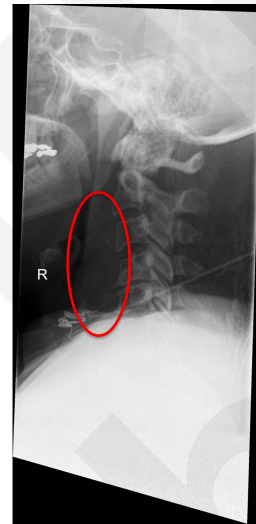
- 50%  $> 50$  yrs old
- 50% have fever
- WCC normal in 50%
- Genitourinary tract source in 50%
- Staph aureus in  $> 50\%$
- Lumbar spine in 50%
- No primary site found in 50%
- Symptoms  $> 3/12$  in 50%

## The Treatment

- Non-specialist in the majority of cases
- Rest / Brace
- Blood Cultures
- Massive and prolonged antibiotics
  - Talk to the bug doctors
  - Pref 2 agents with good bone penetration
- Watch for bone stock loss
  - Don't wait for the deformity to get worse
  - Get erect XRs during course of treatment
- "Complicated" cases – involve the spinal team



Pain  
Fever  
Neurology



## Surgical Site Infections (SSI)

CDC Jan 2014

- Spinal SSI 0.7 – 12+%
- Increased morbidity, mortality and health care costs
- SSIs = 1/3 of Hospital Acquired Infections
- CDC Jan 2014 SSI:
  - 30 days after surgery without instrumentation
  - 1 year with instrumentation
    - Other classifications:
      - Acute (<3 weeks)
      - Subacute (3 weeks to 3 months)
      - Chronic (>3 months)

- All SSIs:
  - Staph aureus 30%
  - Coag neg staph 13.7%
  - Enterococcus 11.2%
  - E.coli 9.6%
  - Pseudomonas 5.6%

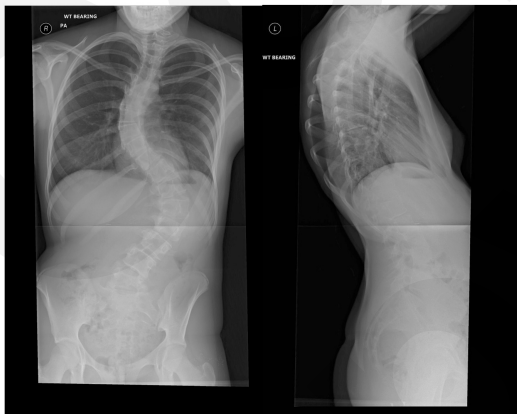
1. Direct inoculation at surgery
2. Contamination early post op
3. Contamination haematogenous seeding

## SSIs - Some Ps

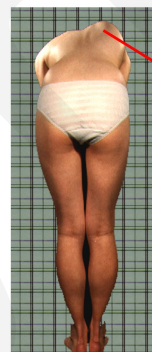
- Patient
- Pathology (incl micro factors)
- Procedure
- Preoperative
- Perioperative
- Postoperative
- Proper
- Planning Preparation
- Prevents
- Piss
- Poor
- Performance



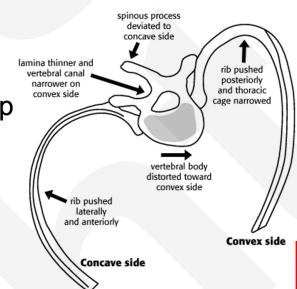
## Scoliosis



## Adams Test



Rib Hump



### BOX 3-1 Etiologic Classification of Scoliosis

|                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Idiopathic</b><br>Early-onset<br>Late-onset<br>Adult                                                                                                                                                                                                                                                                                   | <b>Neuromuscular—cont'd</b><br>Spinocerebellar degeneration<br>Cerebral palsy<br>Lower motor neuron<br>Poliomyelitis<br>Myopathic<br>Congenital hypotonia<br>Duchenne muscular dystrophy |
| <b>Congenital</b><br>Osteogenic (vertebral anomaly)<br>Anomalous formation<br>Wedge vertebra<br>Hemivertebra<br>Anomalous segmentation<br>Unilateral bar<br>Fused ribs<br>Fused vertebra<br>Neuropathic (spinal dysraphism)<br>Tethered cord<br>Chiari malformations<br>Syringomyelia<br>Diastematomyelia<br>Meningocele/myelomeningocele | <b>Developmental Syndromes</b><br>Skeletal dysostosis (e.g., neurofibromatosis)<br>Skeletal dysplasias (e.g., osteogenesis imperfecta)                                                   |
| <b>Neuromuscular</b><br>Neuropathic<br>Upper motor neuron                                                                                                                                                                                                                                                                                 | <b>Tumor Associated</b><br>Vertebral<br>Osteoblastoma<br>Osteoid osteoma<br>Intraspinal<br>Intramedullary (e.g., astrocytoma)<br>Extramedullary (e.g., neurofibroma)                     |

## Congenital Scoliosis

- Failure Formation / Segmentation / Both

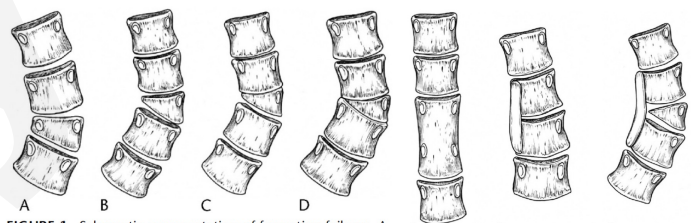


FIGURE 1. Schematic representation of formation failures. A, Wedge vertebra. B, Fully segmented hemivertebra. C, Partially segmented hemivertebra. D, Unsegmented hemivertebra. Reproduced with permission from Hedequist and Emans.<sup>14</sup>

FIGURE 2. Schematic representations of failures of segmentation. A, Block vertebra. B, Bar. C, Bar with contralateral hemivertebra. Reproduced with permission from Hedequist and Emans.<sup>14</sup>



## Ass Congenital Anomalies

- V - Vertebral
- A - Anorectal
- C - Cardiac
- T - Tracheo
- E - Esophageal
- R - Renal
- L - Limbs

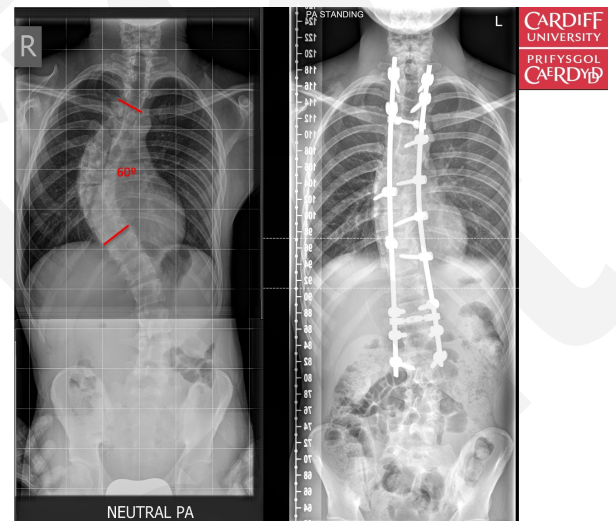


## Scoliosis

- Refer
- Non-surgical: possible bracing
- Indications for surgery:
  - Curve  $> 40^\circ$  skeletally immature
  - Curve  $> 50^\circ$  skeletally mature
  - Relentless curve progression
  - Cardiopulmonary complications
  - Function
  - Prevent neurological deterioration

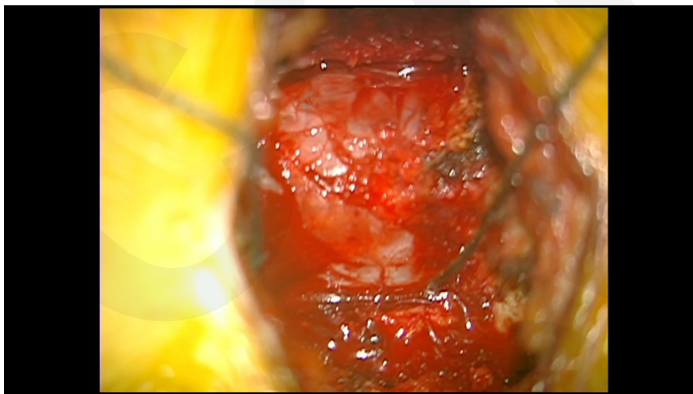
## Objectives of Treatment

- Prevent curve progression
- Permit longitudinal growth
- Avoid cardio-pulmonary complications
  - Alveoli develop up to 9yrs age
  - Spinal (chest) deformity limits lung formation
- Facilitate sitting and handling (large curves)
  - Level shoulders and pelvis
  - Centre of Gravity over sacrum
- Cosmesis



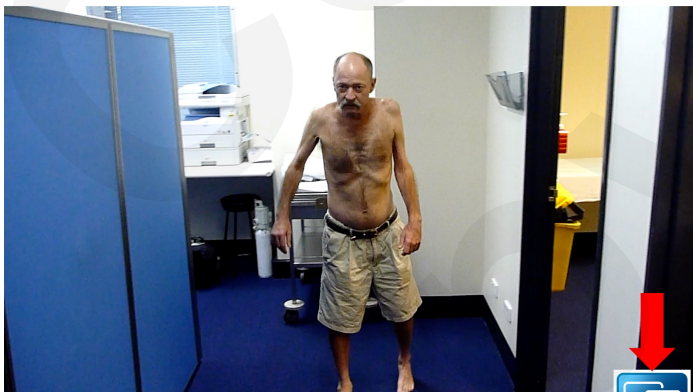
## Cauda Equina Syndrome

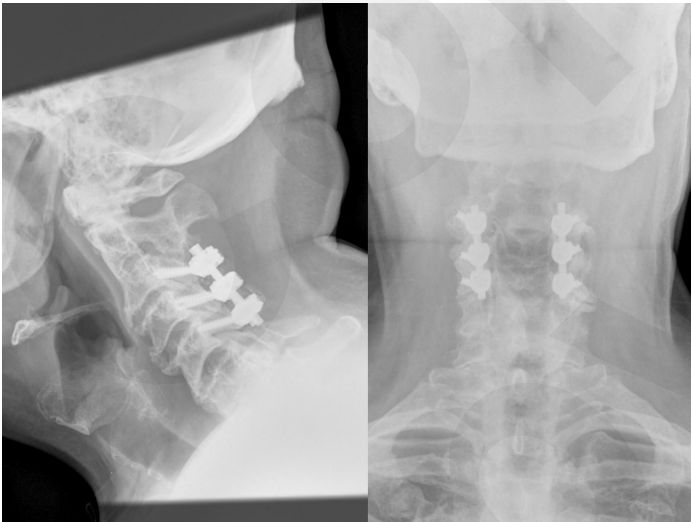
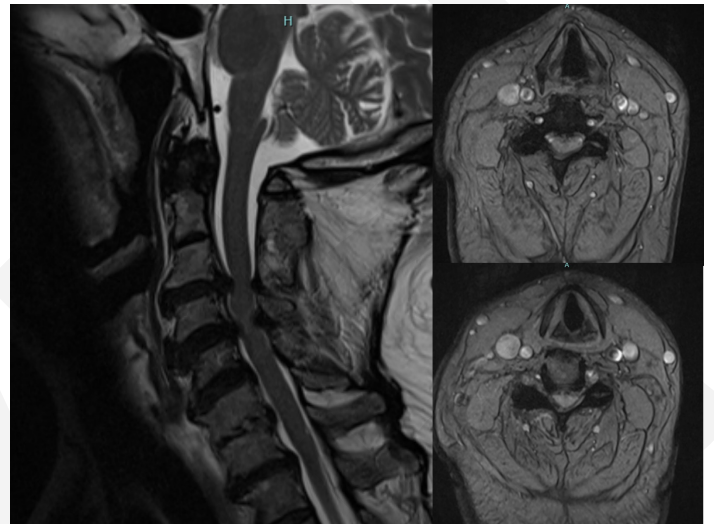
- A spectrum of low back pain, uni / bilateral radiculopathy, saddle anaesthesia and motor weakness in the lower extremities with variable rectal and urinary symptoms
  - Usually due to a canal filling disc compressing the entire cauda equina
  - Others - Tumour Infection Trauma
- 1 / 100,000
- Disproportionately high medicolegal profile
  - Missed diagnosis >>£500,000



## Cauda Equina Syndrome

- SPHINCTERIC DISTURBANCE
- **DO A RECTAL EXAM**
  - “Patient has no anus or surgeon has no fingers”
  - “If you don’t put your finger in it you put your foot in it”
- **BLADDER SCAN (>200ml)**
- **GET AN MRI SCAN**
- ONLY MODIFIABLE FACTOR IS TIME TO DIAGNOSIS AND SURGERY





## Myelopathy Radiculopathy



|                    | Myelopathy = CORD           | Radiculopathy = ROOT                         |
|--------------------|-----------------------------|----------------------------------------------|
| Levels affected    | >1                          | Usually 1                                    |
| Bilateral Symptoms | Common                      | Rare                                         |
| Sensation          | Variable                    | Decreased in Dermatome                       |
| Motor              | Weakness                    | Weakness in Myotome                          |
| Tone               | Spastic                     | Flaccid                                      |
| Reflexes           | Hyperreflexic               | Hyporeflexic                                 |
| Gait               | Broad based<br>Poor balance | Depends on level<br>(e.g. foot drop with L4) |
| Findings           | Babinski<br>Clonus          | Pain<br>Dysaesthesia                         |

UMN

LMN

## Symptoms - Myelopathy



- Subtle / varied presentation
- Pins & needles / numbness in hands
- Stiff hands and reduced dexterity
- Balance problems / recurrent falls
- Stiff legs that tire easily
- Shooting sensations through body
- Spontaneous twitching / jerking limbs
- Bowel or bladder disturbance (uncommon)
- Pain is not a common symptom

## Signs - Myelopathy



- Unsteady wide based gait
- Romberg / Walking Romberg
- Unable heel toe gait
- Triangle step test
- L'Hermittes sign
- Hoffman's sign
- Hyperreflexia
  - Ankle Clonus / Inverted Radial Reflex
- Extensor Plantar Response (Babinski)
- Increased Tone
- Grip release test
- Finger escape sign

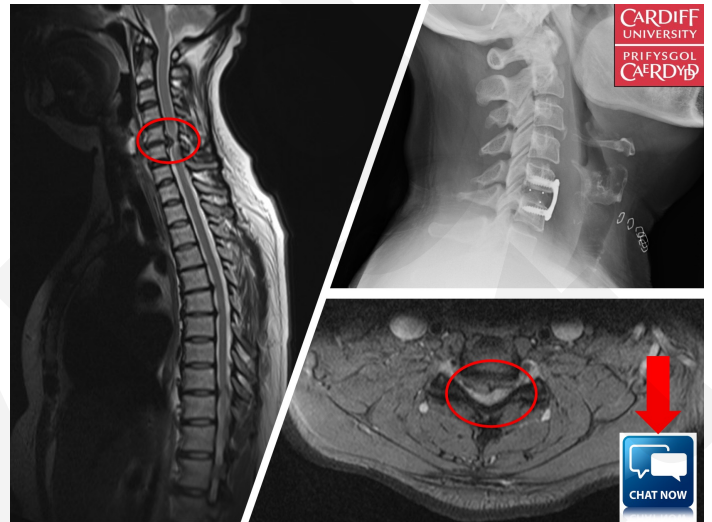
**Coordination requires**

**2 of  
Visual  
Vestibular  
Cerebellar**



## Myelopathy = Surgery (most of the time)

- "Operation prevents progression"
- "Surgical treatment is better than no treatment"
- Irreversible vascular insult / change to cord may explain why some patients fail to improve post operatively
- Despite presenting with mild symptoms it is not possible to predict which patients will deteriorate
- **Surgical intervention is the most predictable way to prevent neurological deterioration**

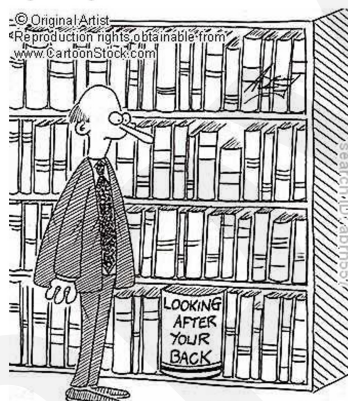


## LBP Sciatica

- LBP Statistics
  - During 1 year up to 50% population will have LBP
  - 80% adults experience LBP during their life
  - 85% LBP no clear pathology identified
  - 90% acute LBP recover within 6/52
  - 7% develop chronic LBP
  - Most common cause disability in adults <45yrs
- Sciatica Statistics
  - 1.6% lifetime prevalence of radicular leg pain lasting >2 weeks
  - 60% settle in 6/52
  - 90% settle in 3/12
  - Remaining 10% - half settle by 1 year

## Where does the pain come from?

- Nerves / Cord
- Muscles
- Ligaments
- Disc
- Bones / Joints

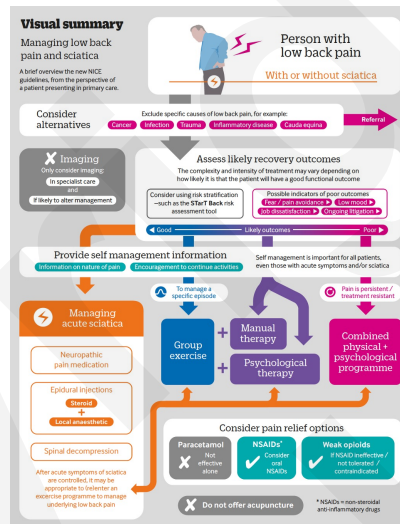
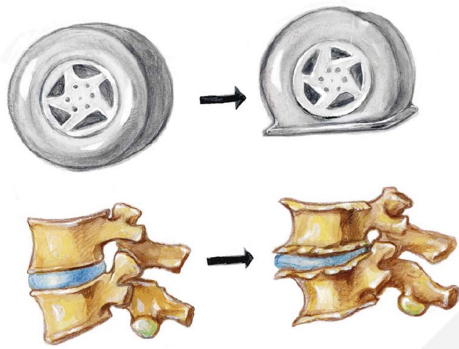


## Main Causes of LBP

- Non-specific LBP / Mechanical / Muscular
- Degenerative Disc Disease / Discogenic
- Facet Joint Arthrosis
- Spondylolisthesis / Spondylolysis
- Degenerative Scoliosis / Kyphosis
- Inflammatory Conditions
- Sacroiliac Joint Pain
- **ATIT**



## The Pathology



Low back pain and sciatica in over 16s: assessment and management

NICE guideline  
Published: 30 November 2016  
[nice.org.uk/guidance/ng59](https://www.nice.org.uk/guidance/ng59)

## Don't be ATIT

### • Exclude the serious:-

- **Abdominal** / Retroperitoneal Causes
  - AAA, Pancreatitis, Malignancy
- Spinal **Trauma**
- Spinal **Infection**
- Spinal **Tumour** - Primary / Mets

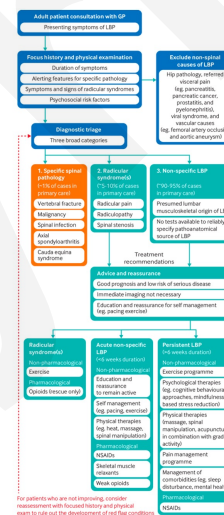
## How do you “Identify” cause?

### • VERY DIFFICULT – SKILL / ART / EXPERIENCE

- Muscular - commonest
- Disc – worse forward bend and sitting
- Facet – worse extension and sit to stand
- SIJ – not above, provocative tests
- Radicular pain due to:
  - Disc – worse forward bend (root gets stretched over disc)
  - Stenosis – worse extension (canal gets narrower)

## How do you “Identify” cause?

- You often don't have to – most acute LBP / sciatica settles down especially if early intervention
- History, examination, red flags
- BUT, a % don't settle
- A % do develop chronic LBP



**Do not routinely offer imaging for uncomplicated low back pain**

Amanda M Hall, Kris Aubrey-Bassler, Bradley Thome, Chris G Maher

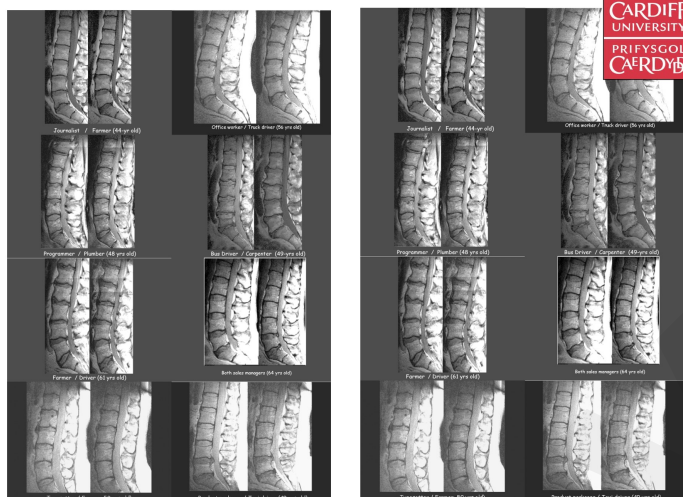
**What you need to know**

- Less than 5% of all low back pain is due to a specific underlying spinal pathology
- The remaining 95% has no indication of a serious cause and should be managed with conservative treatments such as advice and reassurance, exercise, physical therapy, therapeutic care, cognitive-behavioural therapy, or pain management
- Diagnostic stage based on clinical history and examination can help distinguish between non-specific or more serious low back pain
- Imaging may do more harm than good when serious conditions are not suspected and is likely to prolong recovery in patients with non-specific low back pain
- Patients' primary concerns of whether their pain is caused by something serious and what they should do to aid recovery can be addressed by sound education and reassurance, without the need for imaging

**Box 1: “Choosing Wisely” statements from different countries related to avoiding the use of routine imaging for low back pain**

- “Don't routinely image patients with low back pain regardless of the duration of symptoms unless (a) there are clinical reasons to suspect serious underlying pathology (i.e., red flags), or (b) imaging is necessary for the planning and/or execution of a particular evidence-based therapeutic intervention on a specific spinal condition.” – Canadian Spine Society, Choosing Wisely Canada
- “Do not undertake imaging for low back pain in patients without indications of a serious underlying condition.” – Australian Rheumatology Association, Choosing Wisely Australia
- “Do not routinely offer imaging in a non-specialist setting for people with low back pain with or without sciatica. Consider imaging in specialist settings of care (for example, a musculoskeletal interface clinic or hospital) for people with low back pain with or without sciatica only if the result is likely to change management.” – Royal College of Physicians, Choosing Wisely UK

**The clinical problem**



**Table 2: Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients<sup>a</sup>**

| Imaging Finding    | Age (yr) |     |     |     |     |     |     |
|--------------------|----------|-----|-----|-----|-----|-----|-----|
|                    | 20       | 30  | 40  | 50  | 60  | 70  | 80  |
| Disk degeneration  | 37%      | 52% | 68% | 80% | 88% | 93% | 96% |
| Disk signal loss   | 17%      | 33% | 54% | 73% | 86% | 94% | 97% |
| Disk height loss   | 24%      | 34% | 45% | 56% | 67% | 76% | 84% |
| Disk bulge         | 30%      | 40% | 50% | 60% | 69% | 77% | 84% |
| Disk protrusion    | 29%      | 31% | 33% | 36% | 38% | 40% | 43% |
| Annular fissure    | 19%      | 20% | 22% | 23% | 25% | 27% | 29% |
| Facet degeneration | 4%       | 9%  | 18% | 32% | 50% | 69% | 83% |
| Spondylolisthesis  | 3%       | 5%  | 8%  | 14% | 23% | 35% | 50% |

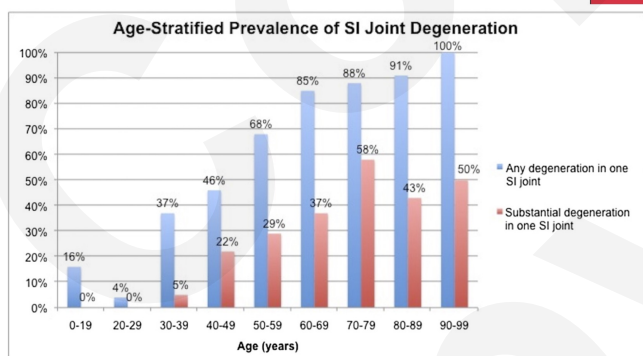


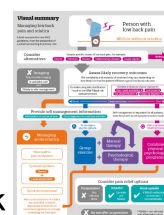
Fig. 6  
Prevalence of sacroiliac (SI) joint degeneration per decade of life.

| Alerting features                                                                                                                                                                                                                                                                                    | Diagnosis and prevalence           | Image type             | Timing                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------|--------------------------------------------------------------------------|
| Older age (>65 years for men, >75 years for women)                                                                                                                                                                                                                                                   | Vertebral fracture 0.7% - 4.5%     | X ray possible CT scan | Major risk: immediate<br>Minor risk: 1 month "watch and wait"            |
| Prolonged corticosteroid use                                                                                                                                                                                                                                                                         |                                    |                        |                                                                          |
| Severe trauma                                                                                                                                                                                                                                                                                        |                                    |                        |                                                                          |
| Presence of contusion or abrasion                                                                                                                                                                                                                                                                    |                                    |                        |                                                                          |
| History of malignancy                                                                                                                                                                                                                                                                                | Malignancy 0.2%                    | X ray and MRI          | Major risk: immediate<br>Minor risk: delay                               |
| Strong clinical suspicion                                                                                                                                                                                                                                                                            |                                    |                        |                                                                          |
| Unexplained weight loss, >50 years                                                                                                                                                                                                                                                                   |                                    |                        |                                                                          |
| Fever or chills                                                                                                                                                                                                                                                                                      | Spinal infection 0.01%             | X ray and MRI          | Immediate                                                                |
| Immune compromised patient                                                                                                                                                                                                                                                                           |                                    |                        |                                                                          |
| Pain at rest or at night                                                                                                                                                                                                                                                                             |                                    |                        |                                                                          |
| Intravenous drug user                                                                                                                                                                                                                                                                                |                                    |                        |                                                                          |
| Recent injury, dental or spine procedure                                                                                                                                                                                                                                                             |                                    |                        |                                                                          |
| New bowel or bladder dysfunction                                                                                                                                                                                                                                                                     | Cauda equina syndrome 0.04%        | MRI                    | Immediate                                                                |
| Perineal numbness or saddle anaesthesia                                                                                                                                                                                                                                                              |                                    |                        |                                                                          |
| Persistent or progressive lower motor neuron changes                                                                                                                                                                                                                                                 |                                    |                        |                                                                          |
| Progressive lower limb motor weakness                                                                                                                                                                                                                                                                | Severe neurologic deficits         | MRI                    | Immediate                                                                |
| Motor deficits at multiple levels                                                                                                                                                                                                                                                                    |                                    |                        |                                                                          |
| Chronic back pain (>3 months' duration), with back pain onset before 45 years of age and one or more of the following:<br>- Age of onset 40 years or younger<br>- Insidious onset<br>- Improvement with exercise<br>- No improvement with rest<br>- Pain at night - with improvement when getting up | Axial spondylarthritis 0.1% - 1.4% |                        | Refer to rheumatologist<br>If strong suspicion of axial spondylarthritis |
| Inflammatory back pain with at least 4 of:<br>- Age of onset 40 years or younger<br>- Insidious onset<br>- Improvement with exercise<br>- No improvement with rest<br>- Pain at night - with improvement when getting up                                                                             |                                    |                        |                                                                          |
| Peripheral manifestations (in particular arthritis, enthesitis, or dactylitis)                                                                                                                                                                                                                       |                                    |                        |                                                                          |
| Extra-articular manifestation (psoriasis, inflammatory bowel disease, or uveitis)                                                                                                                                                                                                                    |                                    |                        |                                                                          |
| Positive family history of spondylarthritis                                                                                                                                                                                                                                                          |                                    |                        |                                                                          |
| Good response to NSAIDs                                                                                                                                                                                                                                                                              |                                    |                        |                                                                          |

## LBP Management

| Alerting features                                                                                                                               | Diagnosis and prevalence        | Image type                                              | Timing                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------|-----------------------------------------------------------|
| Back pain with leg pain in an L4, L5, or S1 nerve root distribution<br>Positive result on straight leg raise or crossed straight leg raise test | Radicular pain or radiculopathy | Consider MRI in patients who are candidates for surgery | Defer work up until a trial of therapy has been completed |
| Bilateral buttock, thigh, or leg pain<br>Older age<br>Pseudotumefaction                                                                         | Spinal canal stenosis           | Consider MRI in patients who are candidates for surgery | Defer work up until a trial of therapy has been completed |

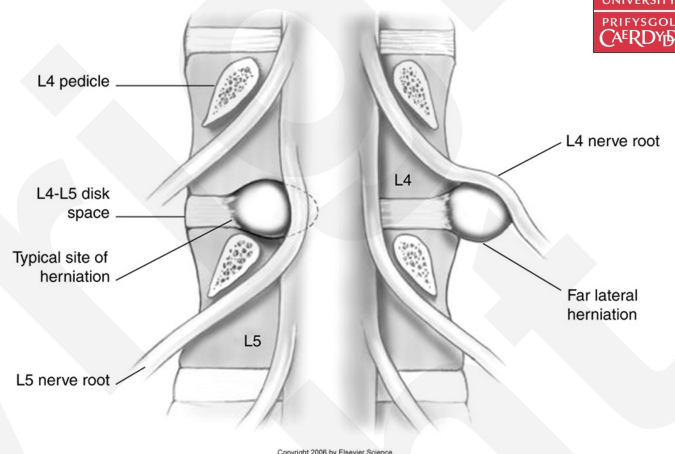
- Red flags - refer
- In the absence of an identifiable pain source the mainstay of treatment for low back pain is conservative
- In short spinal surgery is high risk and surgery for low back pain is unpredictable





## "Sciatica"

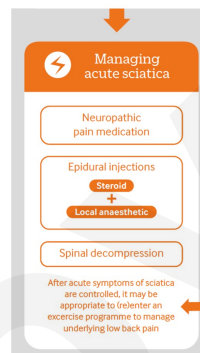
- Disc Herniation
- Radicular leg pain
  - Often far worse pain than a LBP episode
- Symptoms in distribution of nerve root
  - Most occur at L4/5 and L5/S1
  - Sensory changes
  - Motor changes
  - Rarely CES



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## Sciatica Management

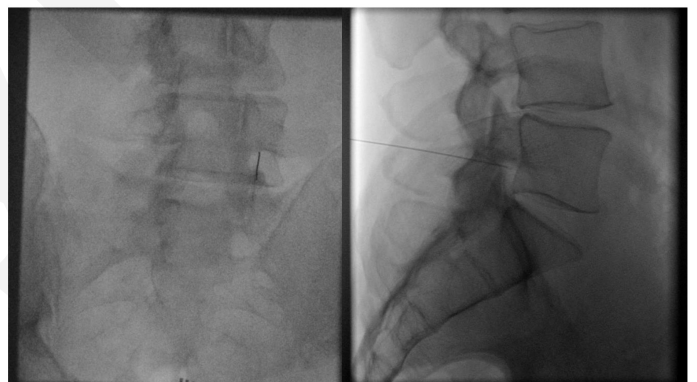
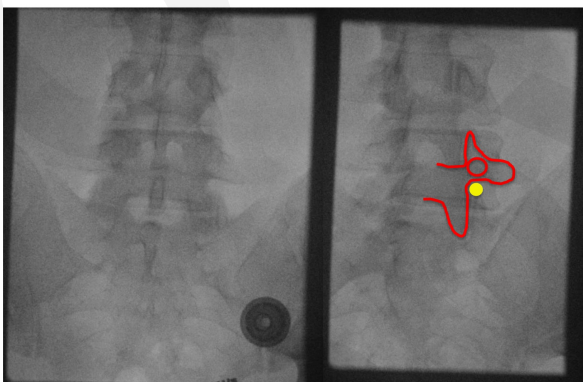
- Red flags - refer
- Doesn't settle down – refer
- Spinal surgical interventions for leg pain are generally successful

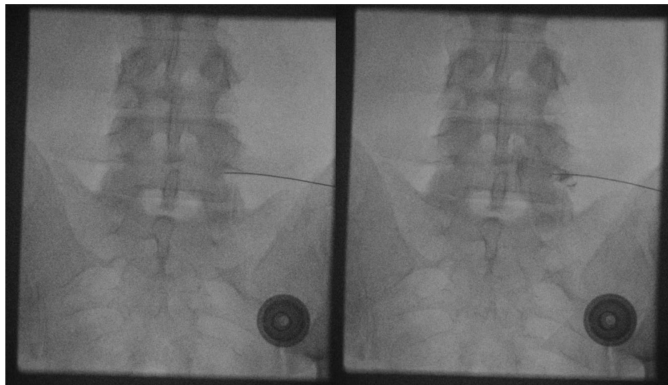


## Pharmacological Options

- **NSAIDs** / COX2 (and **Paracetamol** / Nefopam)
- **Opioids**
  - Oxycodone, tramadol, fentanyl, morphine etc
- Antidepressants
  - TCAs – **amitriptyline**, nortriptyline etc.
  - SNRIs – duloxetine, venlafaxine etc.
- Anticonvulsants
  - Gabapentin, pregabalin, carbamazepine, valproate, lamotrigine, topiramate etc.
- Topical Agents
  - Lignocaine patch, capsaicin
- **Epidural**
  - Steroid, antiTNF $\alpha$ , clonidine, ketamine
- Intrathecal
  - Ziconotide, opioids

## Foraminal Epidural / Root Block

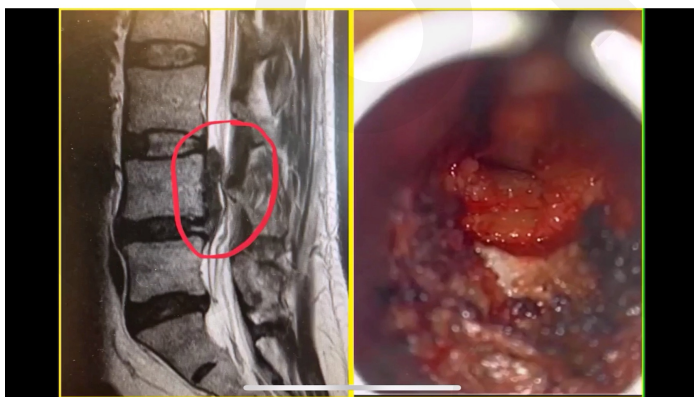




## Indications for Surgery

1. Cauda equina syndrome
2. Neurological deterioration
3. Persistent pain + signs

NB - STABLE radicular weakness (>3/5 power) resolves equally as well with conservative management



## Lumbar Disc Prolapse Outcome

- Most improve spontaneously - leg pain settles
  - The disc prolapse resorbs – mechanical compression and chemical inflammation settles
- Those with persistent leg pain:
  - Operation better outcome than non operation:-
  - For all outcome measures at 4 to 8 years
  - Overall 85% satisfaction vs 65% (SPORT Trial)
  - But, 15% reoperation rate (85% for recurrent disc) and 3% dural tear rate (risks of surgery)



## Definitions

- Stenosis:
  - “Narrowing of the spinal canal, nerve root canals or tunnels of the intervertebral foramina producing symptoms of claudication or radiculopathy” Arnoldi 1976
  - Central, lateral recess and foraminal types
    - Describes the area where the narrowing occurs

## Definitions

- Spondylolisthesis:
  - “Spine slipping” - forward backward or lateral of one vertebra relative to an adjacent vertebra
  - Various types and classifications
    - Commonest in young is lytic L5/1
    - Commonest in elderly is degenerative L4/5
- Claudication:
  - Limping
  - A condition in which cramping pain in the leg is induced by exercise

## Spinal Claudication

- Standing
  - Lumbar lordosis increases - ↑ canal narrowing
  - Slippage may increase - ↑ canal narrowing
- Subarachnoid obstruction
- Increased endoneurial pressure
  - Compartment Syndrome in the nerve roots
  - Conduction disturbances
- **Pain, numbness, weakness**
- **Unsteadiness**
- **Rarely CES type symptoms**

## Stenosis - Symptoms

- Often asymptomatic at rest
- LBP with walking
- Early leg pain, paresthesia and numbness
- Increases with distance
- Sitting / crouching / leaning forwards decreases pain

- **Spinal Claudication**
  - Ppt stand and walk
  - Relief lean and sit
  - Prox to distal
  - Worse down hill
  - Better up hill
  - Unlimited cycling
  - Weakness on exertion
  - Shopping trolley +
  - May have poor pulses
- **Vascular Claudication**
  - Ppt walk
  - Relief stand
  - Distal to proximal
  - Worse up hill
  - Better down hill
  - Cycling - pain
  - Not normally weak
  - Trophic skin changes
  - Poor pulses...

Have your finger on the Pulse!



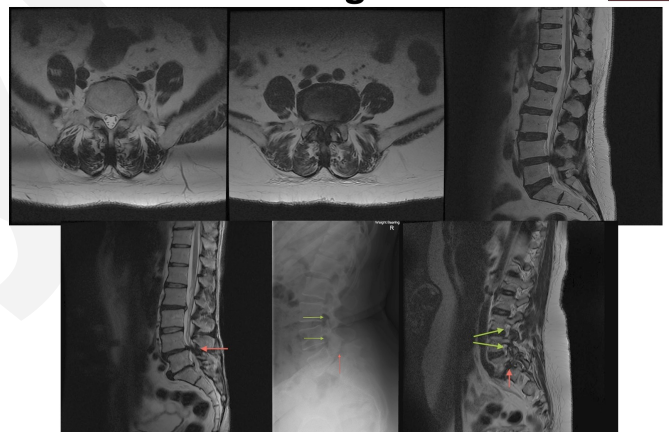
## Stenosis - Investigations



- MRI – look at nerves
- Erect XR – look at slip
- +/- CT – bony anatomy
- +/- CT Myelogram
- +/- Duplex Ultrasound
- +/- NCS EMG

But remember - treat the man not the scan!

## Investigations





## Spondylolisthesis

- Asymptomatic – stenotic symptoms
- LBP, buttock, thigh, groin pain
- +/- radicular pain
- +/- numbness weakness L5-S1
- +/- urinary / bowel
- O/E – nil, restricted motion, hyperlordosis, palpable step, kyphosis above, trunk short, rib on crests, tight hamstrings, L5-S1 neuro findings

## Spondylolisthesis

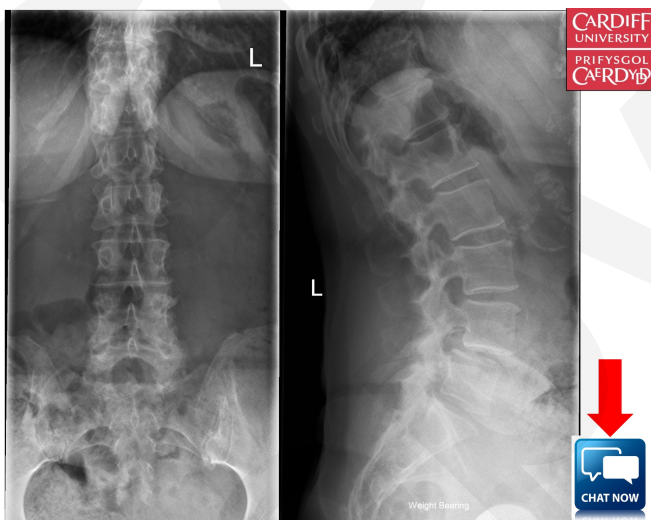
- Refer to a specialist
- Indications for surgery:
  - Failed conservative management
  - High grade slip immature patient (will progress)
  - Neurological compromise

## Spondylolisthesis



## Operations

- Indications:
  - Failed conservative treatment
  - Intractable leg pain > other leg symptoms
  - Progressive neurological deterioration
  - NOT LBP unless associated neurological signs
  - Proven stenosis on imaging
- Type of Operation:
  - Varies depending on pathology





## Real Purpose of Surgery?

