Back pain - assessment and management skills workshop

A/Prof Michael Yelland
Griffith University
Arana Hills Medical Centre
Australian Association of Musculoskeletal Medicine
What will we cover?

- Really useful anatomy
- Symptoms and their meaning
- Revise back examination and understand what it means
- Clinical reasoning with illustrative cases
- Management strategies
THE a WORD
Myotome

- The group of muscles that a single spinal nerve root innervates.
- The part of the somite that develops into muscles
- The key to understanding somatic referred pain
  - pain referred from somatic/spondylogenic structures, i.e. joints/ligaments/muscles/fascia/disc
The March of the Myotomes

Lyrics- Dr Geoff Harding and A/Prof Michael Yelland (inspired by Prof Nik Bogduk)
The March of the Myotomes

I’d like to show you how
To learn your myotomes
To music undisturbed
So turn off your mobile phones
Lumbar 2 & 3

They help me lift my knee

Iliopsoas
L2 & 3 & 4

Allow me to kick the door

Quadriceps
Lumbar 4 & 5

My foot points to the sky

Tibialis anterior
L5 and S1
For ankle ‘invershun’

Tibialis posterior
S1, S2, L5

Extension of my thigh

Gluteus maximus & hamstrings
Externally rotate

External rotators
And kick me in the date

Hamstrings
S1 and S2
I stand up on my shoes

Gastrocs
Soleus
Long toe flexors
If L5 joins the fray
My foot turns out this way

Fibularis
longus &
brevis
Thigh adductors

L2 and 3 and 4
Modesty closes the door

Thigh adductors
L4, L5, S1
Cock leg and now we’re done

Gluteus medius & minimus

Tensor fascia lata
Now you can march on home
To do this all on your own
We hope you’ll find it simple
To remember your myotomes
Referred pain from deep somatic structures – Kellgren 1939, Weinstein 1954
What is a Dermatome?

Dermatomes

- The area of skin that a single spinal nerve root predominantly innervates.
- Important for understanding radiculopathies and shingles
  
  - actual dermatomes overlap to a large and variable extent
  
  - Maps show the dominant areas for each spinal nerve root.

Common/Simplified Dermatome Map
Clinically Important Dermatomes

L1
Inguinal ligament

L3
Medial knee

L5
L4-5 or L5-S1 disc prolapse

S1
L4-5 or L5-S1 disc prolapse
Peripheral nerve entrapment

Lateral cutaneous nerve of the thigh
Compression of lateral cutaneous nerve of the thigh

‘Myralgia paraesthetica’
Lumbar disc anatomy

The L4 Disc

Figure # 9

#1 Nucleus Pulposus

#2 Anulus Fibrosus

Grey Ranus Communicans

IVF Zone

Lamina

L4 Spinal Nerve DRG

S1 S2 S3 S4 S5

Pars

Drawing by: D. Gillard
Types of Disc Herniation

- **Bulge or Protrusion**
  - Contained
    - Mostly Back Pain
  - Noncontained
    - Mostly Leg Pain

- **Extrusion**
  - Back and Leg Pain

- **Prolapse or Rupture**
  - Contained
    - Back and Leg Pain
  - Noncontained
    - Mostly Leg Pain

- **Sequestered or Free Fragment**
Nerve root compression and position of disc prolapse

• If the protrusion is only moderately posterolateral, it will impinge on the nerve exiting near the disc below (ie L5 for the L4/5 disc) and if it is paracentral it could impinge on the nerve below that (ie S1). This is due to the position of the nerves shown here at the level of the L4/5 disc.

L4/5 disc herniation

Figure. #3
Low back bony landmarks
Low back muscle landmarks
Physical examination of the back and legs videos
My approach to back pain

- Is it mechanical, non-mechanical or non-spinal?
- What level of the back is affected/dysfunctional?
- Referred pain - is it somatic referred pain, radicular pain or actually local pain?
- Are there any neurological features?
- Can I make a pathoanatomical diagnosis?
- Is there any evidence of central or peripheral sensitisation?
- What is the type and degree of disability associated with the pain?
- Are there any other occupational, social or psychological issues affecting pain, suffering and disability?
CLASSIFICATION & PROBABILITIES FOR ACUTE LOW BACK PAIN IN PRIMARY CARE

LOW BACK PAIN

MECHANICAL
- Spondylogenic: 90-95%
- Radicular: 1-5%

NONMECHANICAL
- Infective: 0.01%
- Inflammatory: 0.3%
- Malignant: 0.7%

NONSPINAL
- Viscerogenic
- Psychosocial: Unknown
- Rare

Symptoms:
- Pain related to movement or posture
- Predominantly back pain
- Predominantly leg pain
- Sharp/shooting
- Neurological features
- Fever
- Progressive
- Prolonged stiffness
- PHx malignancy
- Unexplained weight loss
- Abdominal/pelvic/urinary symptoms
- Heightened suffering and disability

Notes:
- Predominantly back pain
- Sharp/shooting
- Neurological features
- Fever
- Progressive
- Prolonged stiffness
- PHx malignancy
- Unexplained weight loss
- Abdominal/pelvic/urinary symptoms
- Heightened suffering and disability
Diagnostic frameworks for mechanical back pain

**Dysfunction**
- Intervertebral/segmental/somatic
- Focus on the **function** of intervertebral segments, not individual structures
- Recognises the limitations of history, examination and investigations to label a particular **structure** as the source of pain

**Pathoanatomical**
- Attributes pain to anatomical or pathological structures, eg discs, facet joints, nerve roots and entheses
- Limited by high frequency of abnormal findings in painfree controls
Case 1

History

- 35 year old woman
- 30/40 pregnant
- Stabbing pains right low back pain with standing and walking for 2 weeks
- No leg symptoms
- 4 years ago had severe right low back pain and leg pain for 8 months –rehab, SIJ belt No red flags
Examination

- Full lumbar movements without pain
- FABER & POSH tests negative
- Tender L4-5 spines and over right L4-5 facet
- Tight right lower lumbar muscles

Working diagnosis

- Right L4-5 intervertebral dysfunction
- Contributing factors
- Pregnancy
- ?Past back pain
- ?Anxiety

Detailed examination helps to find a level and exclude other causes
Management

• Reassurance
• Trial of mobilisation
• Thoracolumbar rotational exercises
• Imaging not necessary or desirable
• Follow-up
Identifying an affected level in mechanical back pain

Intervertebral dysfunction (or segmental dysfunction)
• Disturbance in function of a spinal segment manifest by
  – Restriction +/- pain with global spinal movements
  – Restriction, tightness and tenderness of musculoskeletal structures at a segmental level
  – Pain, when present, should be in an area consistent with the segmental signs
  • Local back pain should be at, or 1-2 segments below the dysfunctional segment
  • Referred pain usually in a myotome supplied by the dysfunctional segment
Case 2

- 52 year old female teacher
- Hurt low back 10 weeks ago lifting & twisting – pain into both groins. Settled with physio x 2
- Now has deep gluteal & posterior thigh pain
- No leg weakness or paraesthesia
Physical examination

- Full painless range of lumbar movements
- Negative SIJ stress tests
- Tender right L5-S1
- Ropy, non-tender right glut maximus

- PDx – referred pain from right L5-S1
- Treatment
  - trial of steroid/lignocaine over right L5/S1 facet and rotational exercises
  - continue meloxicam
Review in 5 days

- Partial temporary relief
- Ropy right glut max injected with lignocaine – no response
- Slump test positive but SLR 70 degrees bilaterally and no neurological signs

- PDx – right L5 or S1 nerve irritation
- Plan
  - continue meloxicam
  - MRI if it worsens
Review in 2 weeks

- Was better till some gardening
- Examination unchanged
- Modify activity

...2 weeks later

- Right buttock pain constant with sharp shooting pain right down leg
- MRI lumbar spine
Small bilateral foraminal disc protrusions of L5/S1 disc effacing both L5 & S1 nerve roots, but right S1 nerve root is displaced.
Management

- Pain worsening
- Fatigable right ankle jerk and tender right calf
- Right S1 nerve sleeve block a week later gave 1-2 days relief.

- Then commenced on prednisone and pregabalin
  Good relief to prednisone stopped and pregabalin gave side effects
  Referred for spinal surgical opinion
  - Right L5/S1 microdiscectomy giving immediate relief
Case 3

History

- 71 year old female
- 3 months of right sided mid and lower lumbar pain, right groin ache and right anterior thigh paraesthesia present following the insertion of a coronary artery stent 3 months ago
Further details

- No occupational/psychosocial issues
- Xray right hip – minimal degenerative changes
- Steroid/LA injection right hip – minimal effect

Examination

- Minimal pain with spinal movements
- Tender right L3/4
- Right femoral nerve stretch test gives anterior thigh pain
- No neurological signs
• MRI shows large right sided disc extrusion at L2/3 compressing both the L2 and L3 nerve roots.
Right L2-3 disc extrusion compressing L2 & L3 nerve roots

Normal spinal canal below level of extrusion
• Management simply sleeping with pillow between legs to stop rotation
• Symptoms resolved

• Large extrusions can resolve faster than protrusions
• Other strategies
  – Oral steroids
  – Transforaminal steroids/LA at right L2/3 intervertebral foramen
Case 4

- 37 year old male engineer
- Keen golfer
- 10 year history of intermittent burning right upper buttock pain
- Began after multiple falls on first skiing trip
- Worse with sitting & driving
- Better with standing
- Diagnosed as right L4/5 bulging/torn disc
- Little benefit from steroid injection
Examination

• Back pain at end flexion and with POSH test
• Tender right SIJ, lumbosacral junction and iliopsoas
• Injection of right SIJ ligaments with 2% lignocaine reduced pain to almost nil

Working diagnosis

• Right sacroiliac joint sprain/dysfunction secondary to repeated trauma

Learning Point

• Consider this diagnosis with history of fall onto bottom
Treatment
• 6 sessions of hypertonic glucose/lignocaine (prolotherapy) injections.
• Showed progressive improvement and returned to golf.

Other options
• Physiotherapy
• Trial of SIJ belt
Case 5
History

- 58 Year old female accountant
- 6 weeks of pain in left low back, buttock and posterior thigh +/- calf
- Worsens with sitting becoming intense at end of workday
- No leg weakness/paraesthesia
Past history

- Episodic left low back and buttock pain for a few years
- Getting partial relief from lignocaine injections at left L4/5 and gluteal trigger points
- Left L4/5 discectomy when 21 for left sciatica
- Fell on bottom 20 years ago – intermittent LBP and left buttock pain since.

Examination

- Lumbar movements OK
- SLR 75 left, 85 right
- Left FABER and POSH tests positive.
- Tender lower pole of left SIJ - injected with steroid/LA with no response
Review
• Tenderness extends from left SIJ, through sacrotuberous ligament to lateral side of ischium

Investigations
• MRI lumbar spine
  – Grade I spondylolisthesis L5/S1
  – Advanced degeneration L4/5 disc with some compression of left L5 nerve root
• USS of left hamstring
  – enthesopathy of conjoint tendon of hamstring (the most likely cause)
Hamstring tendinopathy

- Due to compression & degeneration of hamstring origin

- Management
  - referred for physio
  - avoid stretching hamstrings
  - use egg carton foam on seat
  - minimise sitting
Gluteus medius and minimus tendinopathy

• A better explanation for lateral hip pain than trochanteric bursitis
• Also a compression tendinopathy
• Contributing factors
  – Crossing leg
  – Standing on one leg
  – Sitting with hips more flexed
  – Sleeping posture
• Treatment
  – Address above factors
  – Physio to unload tendon and then strengthen musculotendinous unit
Case 6

History

- 68 year old retired female nurse
- Several years of bilateral low back pain (R>L), anterolateral thigh ache and quadriceps tightness
- Worse with walking, standing & climbing stairs
- Better with sitting & bringing knees to chest
- No leg weakness or paraesthesia
Past history

• Steroid injections into trochanteric bursae in 2014 gave brief relief

• Significant back injury at work in 2007 requiring 12 months off. Different to this problem.
Examination

- Stands forward flexed with mild scoliosis convex to left
- Hip joint range full, but lateral pain with adduction
- SIJ tests normal
- No neurological signs
- Positive femoral nerve stretch tests bilaterally
- Tender L2-5 centrally with palpable step at L4-5
- Tender bilaterally at L3-4 & L5-S1
- Tender glut medii and trochanters bilaterally
MRI

- Grade 1 spondylolisthesis of L3 on 4 and L4 on 5 secondary to advanced facet arthropathy
- Impingement of L4 nerve roots bilaterally worse on right

MRI of degenerative L4/5 spondylolisthesis with moderate stenosis
Initial management

- Frequent sitting breaks when walking or standing
- Thoracolumbar rotational exercises
- Flexion in sitting and lying
- Trial of gluteal trigger point injections

Subsequent management

- Trial of gluteal trigger point injections not helpful
- Discussion re medications
- Trial caudal epidural
- Consider surgical review
SPINAL STENOSIS

• Narrowing of spinal canal caused by
  – Congenitally narrow spinal canal
  – Disc bulging
  – Facet joint hypertrophy
  – Hypertrophy of ligamentum flavum
Spinal stenosis
CASE 7

History

- 47 year old female supermarket shelf-filler
- sharp pain left upper back today while reaching up and twisting to fill a high shelf.
- worse with deep breathing
- frequently radiates to under her left breast.
- very concerned about the possibility of a heart attack

PAIN DIAGRAM

NAME: ______________________  DATE: ________

1. Please mark on the body diagram below all of the areas where you feel pain or abnormal sensations
Use the symbols below, where possible. Put a large X where the centre of your pain is.

<table>
<thead>
<tr>
<th>PAIN</th>
<th>CONSTANT ACHE</th>
<th>XXXXX</th>
<th>BURNING FEELING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbness</td>
<td>PINS &amp; NEEDLES</td>
<td>OOOOO</td>
<td>OTHER SSSSS</td>
</tr>
</tbody>
</table>

LEFT  RIGHT  RIGHT  LEFT
Examination
• Looks worried but well
• Vital signs normal
• Normal cardiorespiratory examination
• Upper back pain with end range thoracic rotation and left sidebending
• Tender T5-6 spines and paraspinals to left
• Tender left lower costochondral junctions anteriorly

Investigations
• ECG and CXR normal

Working diagnosis
  – Left T5-6 dysfunction and left 6th rib dysfunction
Management

- Explanation
- Reassurance
- Physical therapy
  - counterstrain
  - mobilisation
  - manipulation
- Analgesia
- Liaison with workplace & Workcover
Thoracic spinal examination

• Movement testing
  – rotation important for problems at and below T5
  – neck movements important for problems at T4 and above
• Palpation
  – landmarks
  – C7/T1 spinous processes
  – T3 at top of scapula
  – T7 at bottom of scapula
• Turn thumb sideways to palpate facets & costo-transverse joints together
• Carefully palpate chest wall
What can you do to manage back +/- buttock/thigh/leg pain? (Watson P; Bogduk N et al)

• Address
  – “I hurt”
  – “I can’t move”
  – “I can’t work”
  – “I’m scared”
“I Hurt”

- Explain cause in convincing fashion
- Express optimism about recovery
- Discuss (lack of) need for imaging
- Heat/massage/physio
- Analgesics
- Anti-inflammatories
- Anti-neuropathic
“I can’t move”

- Explain cycle of pain, inactivity and stiffness
- Simple stretching exercises
- May need relative rest initially but….
  - encourage graded activities over time. Set activity goals.
- Rehab program
“I can’t work”

• Check beliefs and address concerns
• Explain danger of sick leave
• Facilitate return to work
“I’m scared”

- Avoid firecracker terms and negative body language
- Explore anxieties and discuss them
- Suggest strategies for coping
- Suggest measures for acute exacerbations of pain, eg stretching, heat, massage and analgesics
Assessment of back pain without buttock/thigh/leg pain (part 1)

Back pain without buttock/thigh/leg pain – consider red flag clinical features

- No red flags; pain +/- restriction with movement; tenderness
  - dysfunction/spondylogenic pain

  Trial of treatment with review of response – consider other causes if not resolving

- History of cancer – investigate with blood tests & imaging

- History of infection/fever; +/- pain on movement and local tenderness – investigate for infection with blood tests & imaging

  Tests negative – treat as dysfunction/spondylogenic pain
  Tests positive for spinal malignancy – appropriate referral for further management

  Tests negative – treat as dysfunction/spondylogenic pain

Tests positive for spinal infection – appropriate referral for further management
Assessment of back pain without buttock/thigh/leg pain (part 2)

Back pain without buttock/thigh/leg pain – consider red flag clinical features

History of trauma; pain +/- restriction with movement; local tenderness – exclude fracture with imaging

Tests negative – treat as dysfunction/spondylogenic pain
Tests positive for fracture – appropriate referral for further management

Prolonged stiffness; Pain +/- restriction with movement; tenderness – investigate for spondylitis with blood tests and imaging

Tests positive for spondylitis – refer rheumatologist. Tests negative - consider trial of NSAIDs

No pain or restriction with movement; no tenderness - pursue non-spinal cause

Systems review and psychosocial assessment. Investigate as indicated by findings
Assessment of back pain by clinical features
- *after red flag screen* (part 1)

1. Back pain with buttock/leg pain – consider red flags clinical features
   - Red flag features present – refer to algorithm for back pain
   - Redflag features absent – consider nature of pain, neural tension and neurological signs and musculoskeletal signs

2. Sharp/shooting pain – neural tension signs?
   - Neural tension + neurological signs - radiculopathy
   - Neural tension only – radicular pain
   - Neurological signs without neural tension – peripheral neuropathy or peripheral nerve compression
Assessment of back pain by clinical features
- after red flag screen (part 2)

Back pain with buttock/leg pain – consider red flags clinical features

Red flag features present – refer to algorithm for back pain

Red flag features absent – consider nature of pain, neural tension and neurological signs and musculoskeletal signs

Diffuse/aching pain – examine local joints/muscles/tendons

Muscle trigger points – somatic/spondylogenic referred pain

Local joint/tendon signs – arthritis/tendinopathy
Assessment of back pain by site

- after red flag screen (part 1)

1. **Back pain**
   - **Mid- or low thoracic spine**
     - Pain on rotation/sidebending + local tenderness - dysfunction/spondylogenic pain
   - **Iliac crest**
     - Pain on rotation/sidebending + local tenderness + history of trauma – consider fracture
   - **Upper lumbar**
     - Referred from thoracolumbar junction dysfunction
     - Pain on movements + local tenderness - upper lumbar dysfunction
     - No pain on movements or local tenderness – consider renal or pancreatic disease
Assessment of back pain by site
- after red flag screen (part 2)

- **Back pain**
  - **Lower lumbar**
    - Pain on movements + local tenderness - lumbar dysfunction/spondylogenic pain
  - **Sacral**
    - No movement pain or tenderness – consider pelvic or abdominal sources
    - Pain on sitting
      - Positive SIJ stress tests
      - Local tenderness – SIJ dysfunction
  - **Coccygeal**
    - Pain on sitting
      - Negative SIJ stress tests
      - Local tenderness - coccygodynia
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Red flag features</th>
<th>History</th>
<th>Examination</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervertebral dysfunction/spondylolisthesis</td>
<td>Nil</td>
<td>Pain with sitting and/or bending</td>
<td>Pain with spinal movements</td>
<td>Local increase in tone</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spinal/paraspinal tenderness</td>
<td>Normal or degenerative changes</td>
</tr>
<tr>
<td>Sacroiliac joint dysfunction/strain</td>
<td>Nil</td>
<td>Pain with standing and/or walking</td>
<td>Other findings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal malignancy</td>
<td>History of cancer or unexplained weight loss</td>
<td>Pain with spinal movements</td>
<td>Spinal/paraspinal tenderness</td>
<td>Positive SIJ stress tests</td>
</tr>
<tr>
<td></td>
<td>Maybe</td>
<td></td>
<td>Other findings</td>
<td>Normal or age-related degenerative changes</td>
</tr>
<tr>
<td>Spinal infection</td>
<td>Fever/IV drug use</td>
<td>Pain with sitting and/or bending</td>
<td>Pain with spinal movements</td>
<td>Related to primary if spinal metastases</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td>Spinal/paraspinal tenderness</td>
<td>Lytic or sclerotic lesions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other findings</td>
<td>Raised ESR/CRP</td>
</tr>
<tr>
<td>Spondylitis</td>
<td>Prolonged morning stiffness</td>
<td>Pain with sitting and/or bending</td>
<td>Pain with spinal movements</td>
<td>Related to primary source of infection</td>
</tr>
<tr>
<td></td>
<td>Maybe</td>
<td></td>
<td>Spinal/paraspinal tenderness</td>
<td>Lytic lesions</td>
</tr>
<tr>
<td></td>
<td>May improve pain</td>
<td></td>
<td>Other findings</td>
<td>Epidural abscess</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Discitis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SIJ erosions and/or sclerosis</td>
</tr>
<tr>
<td>Fracture</td>
<td>Significant trauma or a fall in the elderly</td>
<td>Pain with sitting and/or bending</td>
<td>Pain with spinal movements</td>
<td>Bruising/signs of other trauma</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td>Other findings</td>
<td>Fracture and associated oedema</td>
</tr>
</tbody>
</table>
# Key Features of Patients Presenting with Low Back +/- Buttock/Thigh/Leg Pain

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>History</th>
<th>Examination Findings</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervertebral dysfunction/spondylogenic pain/strain</td>
<td>Buttock/thigh/leg pain</td>
<td>Pain with sitting and/or bending Pain with standing and/or walking</td>
<td>Pain with spinal movements Spinal/pars pinal tenderness</td>
</tr>
<tr>
<td>Somatic or spondylogenic referred pain</td>
<td>Diffuse/aching Less than back pain</td>
<td>Maybe</td>
<td>Maybe</td>
</tr>
<tr>
<td>Radicular pain</td>
<td>Sharp/shooting Worse than back pain</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Radiculopathy</td>
<td>Sharp/shooting Worse than back pain</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Spinal stenosis</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sacroiliac joint dysfunction/strain</td>
<td>Sometimes</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Peripheral nerve compression</td>
<td>Burning/tingling</td>
<td>Maybe</td>
<td>Maybe</td>
</tr>
</tbody>
</table>
Finding expertise in musculoskeletal management

- Musculoskeletal physiotherapists
  - use search facility on Australian Physiotherapist Association website

- Musculoskeletal medicine practitioners
  - use Doctors Directory at Australian Association of Musculoskeletal Medicine

- Sports medicine professionals