CLINICAL DIAGNOSIS OF LUMBAR DISCOGENIC PAIN

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The normal disc is innervated

Degenerate discs also
Disc tearing and disruption

Internal Disc Disruption
- Distinct from and a separate condition to age related degenerative changes

Internal Disc Disruption (IDD)
- Repeated submaximal loading under compression starts with small fracture of superior vertebral endplate
- Rapidly initiates degradation of nucleus, lowered pH and/or some as yet unknown immune reaction
- Radial fissures provide means by which inflammatory mediators access the sensitive outer annulus (chemical stimulation)
- Disrupted annular lamellae and chaotic loading provides means of mechanical stimulation of essentially normal outer annulus
- Vertebral endplate disrupted and sensitive: both chemical and mechanical effects are likely pain stimuli
Internal Disc Disruption

- Normal stress distribution across disc replaced by chaotic pattern

Imaging of IDD

CT Post Discogram through L5/S1

T2 weighted MRI
Disc herniation

Clinical Assessment
- Pain drawing is essential for the spinal pain patient

Pain Drawings
Pain Drawings

Tissue origin of pain
- Only a midline structure causes midline pain

<table>
<thead>
<tr>
<th>%</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>same pain</td>
<td>significant pain</td>
</tr>
<tr>
<td>Vertebral end plate</td>
<td>61</td>
</tr>
<tr>
<td>Nucleus pulposus</td>
<td>0</td>
</tr>
<tr>
<td>Central annulus</td>
<td>74</td>
</tr>
<tr>
<td>Central lateral annulus</td>
<td>71</td>
</tr>
<tr>
<td>Posterior dura mater</td>
<td>23</td>
</tr>
<tr>
<td>Anterior dura</td>
<td>23</td>
</tr>
<tr>
<td>Normal nerve root</td>
<td>11</td>
</tr>
<tr>
<td>Compressed nerve root</td>
<td>99</td>
</tr>
</tbody>
</table>

Reference: Kuslich S et al in pre-webinar reading
### Pain location and tissue of origin

- Only midline structures cause midline pain
  - Interspinous, supraspinous, longitudinal ligs
  - Annulus but not nucleus
- Buttock and lower extremity
  - Nerve root
  - Dorsal root ganglion
  - Dura mater
- Z joints cause mostly paracentral LBP but not midline (but so can the disc and SIJ)
- SIJ can cause referred LE symptoms but not midline

Reference: Kuslich S et al in pre-webinar reading

### Clinically relevant disc biomechanics

- The disc is a sealed unit
  - Endplate above and below
  - The outer annulus is the disc ‘capsule’
  - The internal contents move counter to vertebral body direction

<table>
<thead>
<tr>
<th>Seated flexion</th>
<th>Prone extension</th>
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Do internal disc mechanics matter?
- Patients often describe changes in pain intensity and distribution contingent on movement and posture
- Is there a relationship between pain behaviour and disc mechanics?
  - Williams MM et al 1990
  - 210 consecutive LBP patients
  - Lordotic vs kyphotic postures
  - 24-48 hours
  - LP $\Rightarrow$ less back and leg pain
  - KP $\Rightarrow$ no change LB or leg pain

Repeated movements
- Donelson R et al 1991
  - Exclusions: Deformities, leg weakness, surgery, injections
  - 145 LBP patients
  - 46% reported ‘directional preference’ to extension
  - 11% reported ‘directional preference’ to flexion
  - Unreported 11% reported ‘directional preference’ to asymmetrical extension
Centralisation (CP)
- During repeated movements or static postural loading:
  - Most peripherally referred pain progressively diminishes
  - More midline/axial pain may increase temporarily
    - i.e. over time the pain appears to move progressively nearer the spinal midline
  - This may take several days or large number of movements and/or prolonged sustained positioning to identify

Directional Preference (DP)
- Pain reduces or centralizes in response to repeated movement or static loading in one direction
- Pain increases or peripheralizes in response to repeated movement or static loading in the opposite direction
- The changes occur rapidly
- The pattern is repeatable

References: Donelson and Werneke in pre-webinar reading

Connection between CP/DP and discogenic pain
- Laslett et al 2005
Relationship between CP/DP and painful pathology

- Only patients with proven discogenic pain centralize
- No cases of Zjoint (facet joint pain) centralized
- No cases of intra-articular SIJ pain centralized
- CP is a discogenic phenomenon but…
- Not all painful discs centralise

'Mechanical' discogenic pain

Cecil M

- Male, age 39, Horse groomer. non-smoker.
- 9yrs pain worsening. Fell 2 metres.
- SIJ all –ve except sacral thrust. Spring +ve L5,4,3
- neuro normal, (R)SLR 50º LBP, (L) SLR 60º painless. bilateral –ve FNT
- Repeated movements: centralisation, DP to shift correction and extension. Pain almost abolished 4/100
Mechanical disc pain
peripheralization

Beverly M

- Female, age 42, greenhouse worker, non-smoker, 2 children
- Dominant pain: midline & left LBP. Onset: across low back
- 2yrs pain unchanging. MVA restrained. 'stiff' next day, severe pain in LBP 2 days
- R SLR –ve 50, L +ve 60 (L LBP), absent L TA reflex. Normal muscle tests
- Repeated movements: peripheralisation
Disc pain
non-mechanical IDD

George L
- Male, age 52, farmer, non-smoker.
- 5yrs pain worsening. Lifting lawnmower.
- Dominant pain: right LBP, can be L > R LBP.
  Onset: midline and right LB, buttock, thigh and calf. Right leg pain stopped after a few days
- Roland 17, Zung 32, MSPQ 10, DRAM 'at risk'. VAS: Now 67, best 69, worst 92
- PT (2/12) worse, epidural 2/7 relief, facet injections/RF no benefit. No surgery
George L

- worst prone, best supine.
- pain / obstruction rising from sitting & bending
- +ve Helibigs, -ve Revels,
- SIJ all –ve. Spring +ve L4 only, vibration -ve
- neuro normal, 70º SLR bilateral –ve FNT –ve
- no centralisation, peripheralisation, DP
Non-mechanical Disc pain
Infection

Lumbar discitis 2007
Lumbar discitis

Vertebral endplate pathology
- So-called 'Modic' changes
- Only identifiable with MRI images
- Type I – evidence of endplate oedema
- Type II – evidence of fatty infiltration
- Type III – residual evidence of previous damage

What are 'Modic' Changes?

What are ‘Modic’ Changes?

Type III

HIZ: High Intensity Zone

- Seen only on MRI T2 weighted images
- A small focal area of high intensity indicating fluid (?blood or serous material) in the posterior annulus
- Highly specific to positive provocation discography (Aprill and Bogduk 1989)
- Present in 30% of severe acute back pain cases (Hyodo et al)


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Summary

- Dominant midline pain or pain that includes the midline above the sacrum is probably discogenic
- Pain that centralises is definitely discogenic (50% of LBP)
- Pain that shows reversible / repeatable DP is discogenic
- Acute deformities (lateral shift, kyphosis) are usually discogenic (see reference Laslett M 2009)
- If central or symmetrical back pain does not centralize or behave with directional preference, non-mechanical discogenic pain is likely
  - Internal disc disruption
  - Discitis (virulent infection)
  - Endplate Modic changes (non-virulent infection)
  - Other anterior column pathology (Schmorl's nodes / fractures / metastases etc)

- Unilateral pain may be:
  - Discogenic
  - Facetogenic
  - of SIJ origin
  - Pain that includes the midline is not necessarily discogenic, but dominant or isolated midline pain is almost certainly discogenic
  - Centralisation and Directional Preference = discogenic pain in most cases
  - Radicular pain is neurogenic, but caused by disc herniation usually
  - The single most potent clinical assessment tool for identifying discogenic pain is the McKenzie MDT assessment.

REFERENCES

See pre-seminar reading list and terminology document
If you need access to the journal articles, contact me directly