Musculoskeletal Imaging and Clinical Reasoning: Collaborative Effort Between Musculoskeletal Radiologist and Physical Therapists

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Brooks Rehabilitation

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Current View

- Most low back pain (LBP) is “non-specific” in nature
  - Many MR imaging findings have a high prevalence in subjects without LBP
  - Jarvik et al (2001): prevalence of MRI findings in subjects without LBP (currently or ever)
    - 83% had moderate to severe desiccation of one or more discs
    - 64% had 1 or more bulging discs
    - 56% had loss of disc height
    - 32% had at least 1 disc protrusion
    - 6% had one or more disc extrusion.

Current View

- Berg et al (2013), cross-sectional study on candidates for lumbar disc prosthesis
  - Purpose: are combined MRI findings related to the degree of disability and LBP reported?
    - MRI score calculated by taking into account Modic changes, high intensity zones in the disc, dark nucleus pulposus signal and disc height changes
    - Oswestry Disability Index and LBP intensity scores

Current View

- Berg et al (2013) continued:
  - The relationship of the MRI score to the ODI and LBP intensity scores where analyzed
  - Results:
    - The MRI score was not related to ODI or LBP intensity scores.
    - Results remained unchanged after adding facet arthropathy to the MRI total score and adjusting for physical workload and physical leisure-time activity
Biomedical Model

• Basing intervention choice off of imaging findings
  – Surgery, prescriptions (narcotics/non-narcotics), injections, therapy etc.
• Reports of MRI findings leading to fear avoidance and pain catastrophizing behaviors

International Classification of Function Model (ICF)

Current View

• Have physical therapists taken the “current view” too far?
• Are there opportunities to utilize imaging more in the management of patients.
• Can skilled PT’s through a clinical exam, identify the causes of LBP as compared to the gold standard of imaging combined with diagnostic injections?
  – Discussion for another day!
40 y.o. male with a chief complaint of left sided low back and leg pain that travels down to his lateral calf. The pain started 2 weeks ago for no apparent reason. The patient reports his pain is worse in the a.m. and with prolonged sitting.

If you were thinking of the following diagnosis... And then the following info became available... 

<table>
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<tr>
<th>Diagnosis</th>
<th>Description</th>
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<tbody>
<tr>
<td>Radiculopathy</td>
<td>Pain centralizes with extension</td>
</tr>
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-2 -1 0 +1 +2

Significantly Less likely Neither more or less likely Significantly more likely

-2                  -1                  0                +1                +2

...this diagnosis would become...

-2           -1          0           +1       +2

Significantly           Neither more             Significantly
Less  likely             or less likely                more likely

-2           -1          0           +1       +2

Radiculopathy MRI findings of severe dessication of one or more discs

-2           -1          0           +1       +2

Radiculopathy Negative MRI findings

-2           -1          0           +1       +2

In this scenario, the imaging findings do not add much to the clinical picture.

Likely to find imaging findings that suggest HNP/radiculopathy in patients without LBP or in patients with LBP of a different origin

However, there are clinical scenarios in which imaging findings could and should help guide clinical decision making algorithms.

Script Concordance^3

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Bony Changes

Transitional Lumbosacral Abnormalities

Lumbosacral Transitional Vertebrae
Facet Shape

Variability in Facet Orientation

- All degrees are from the sagittal plane

Facets oriented close to sagittal plane
- Primarily limits rotation
- Little resistance to flex/ext

Facets oriented further from sagittal plane
- Primarily limit forward displacement
- Little resistance to rotation
Presence of Bone Spurs

- Radiographic image

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-2 = Significantly less likely
-1 = Neither more nor less likely
0 = More likely
+1 = Neither more nor less likely
+2 = Significantly more likely
28 y.o. female with central/right sided low back pain. This is her 5th episode in 10 years. She reports minimal pain in the a.m. however pain worsens as the day goes on. Worst with static sitting or static standing, and bending to pick up items from the ground. Feels best after exercise on the treadmill.

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<td>Lumbar Instability</td>
<td>Fatty infiltration and atrophy of her lumbar multifidus on the right</td>
<td>-2 -1 0 +1 +2</td>
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55 y.o. female reports right sided mid-thoracic pain that is worst when she turns her trunk right or takes a deep breath.

<table>
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<th>And then the following information became available...</th>
<th>You would consider the treatment...</th>
</tr>
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<td>Mid-thoracic thrust</td>
<td>Poor bone mineralization and quality via an imaging report</td>
<td>-2 -1 0 +1 +2</td>
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Tissue Quality

- Fatty infiltration and/or atrophy of soft tissue  
  - Multifidus and Supraspinatus

- Calcification of ligaments  
  - Ligamentum flavum

- Demineralization and Bone quality
Fatty Infiltration/Atrophy\textsuperscript{10}

- **Multifidus**
  - Multifidus and paraspinal muscle groups are significantly smaller in patients with chronic LBP vs. healthy controls
  - They are also smaller on the symptomatic vs asymptomatic sides in patients with unilateral chronic LBP

- Systematic Review conclusion
  - "the role of paraspinal muscle morphology on the etiology, prognosis, and treatment of patients with LBP must be further investigated"
Multifidus

T2 and T1 MRI: Multifidus Signal Abnormality/Atrophy

T2 and T1 Axial MRI: Normal Multifidus
Fatty Infiltration/Atrophy

- Rotator Cuff
  - Increased fatty infiltration and atrophy are associated with increased re-tear rates as well as poorer functional outcomes following rotator cuff repair
  - Infraspinatus fatty infiltration predicts a poorer prognosis and functional outcome following rotator cuff repair

Fatty Infiltration/Atrophy

- Adds additional information to your cluster of examination findings
- Affects prognosis
- Directs exercise dosing
- Patient Education

Calcification/Ossification of Ligaments

10/10/2014
Calcification of Ligaments

- Adds additional information to your cluster of examination findings
  - Physical Therapy Diagnosis and Prognosis
- May help to influence your expectations with manual and/or exercise interventions
- Patient Education

Bone Quality

- May influence PT diagnosis
  - Raise/lower suspicion of a fracture for example
- May affect intervention choices
  - Manual therapy/thrust for example
- May affect exercise choices
  - Emphasis on weight bearing exercises

Additional Diagnoses

- Could include, but not limited to...
  - Forestier’s disease, aka Diffuse idiopathic skeletal hyperostosis (DISH)
  - Bastrup’s Sign, aka kissing disease
  - Klippel-Feil syndrome
Diffuse Idiopathic Skeletal Hyperostosis

Baastrup’s Sign
Ankylosing Spondylitis Syndesmophytes Sagittal Reformatted CT Scan

What Steps Can You Take?

• Establish communication with Radiologists
  – Shadow / Have conversations
  – Bring case examples

• Communicate with the referral processes to get the imaging reports

What is next?

• Plan to attempt to publish in Radiology journal
Special thanks to Paul Wasserman, Bob Rowe, PT, DPT, DMT, FAAOMPT, Jason Beneciuk, PT, PhD, FAAOMPT.

Questions/Comments

References

References


References

8. Adams & Bogduk 2002