Wording wisely: Including prevalence data and evidence based clinical outcomes of spinal and musculoskeletal degeneration in radiology reports

Arockia Doss

Image Guided Therapy Clinic, Perth, Western Australia, Australia

Summary

Diseases due to spinal and musculoskeletal degeneration are a common cause of disability worldwide. In the past few years, there has been widespread increase in the use of imaging in these conditions. However, the years lived with a disability has not declined. There is a growing body of evidence that imaging in spinal and musculoskeletal conditions due to degeneration and ageing is unnecessary and contributes to increasing costs. More worrying is the evidence that imaging may also cause harm due to prevalent use of cortisone injections and surgical procedures that are justified on the basis of a radiology report. Prevalence studies and randomized controlled trials in the past decade have provided a better understanding of these diseases beyond the morphological findings described in a radiology report. A radiology report supplemented with information on normal age related appearances, natural progression, available evidence on treatment and subsequent health outcome may help the referrer and patient understand the relevance of imaging findings in a patient specific context. This may reduce unwanted procedures, unnecessary costs and patient harm. This article attempts to provide such information for the most common degenerative diseases of the spine and musculoskeletal system.

Key words: degeneration; imaging; musculoskeletal; radiology report.

Introduction

The 2013 Global Disease Burden study showed rates of years lived with disability are declining much more slowly than mortality rates. One of the leading causes of years lived with disability are non-fatal conditions such as low back pain and musculoskeletal diseases in an ageing population. Fatal diseases receive preferential attention in health systems in comparison to non-fatal diseases. Despite the non-preferential attention, non-fatal conditions such as spinal and musculoskeletal degenerative disorders are important contributors to the burden of disease and an increasing component of health expenditure. The slow decline in years lived with disability from non-fatal dimensions of disease and injury, despite increasing health expenditure will require efforts that are different and beyond those we currently focus within our health systems.

Diagnostic imaging in degenerative disorders

In the past few decades there has been a rapid increase in access to cross-sectional imaging across many diseases. In a retrospective Canadian study, a staggering 100% of computerized tomography (CT) scans and 60% of magnetic resonance imaging (MRI) scans in degenerative spinal disorders were deemed unnecessary. Similarly, despite a suggestion that rotator cuff tears may not always be the source of pain and that asymptomatic tears are twice as common as symptomatic tears, there has been a dramatic increase in arthroscopic shoulder surgery.

Improvements in our ability to define morphological findings on cross-sectional diagnostic imaging has led to decisions to perform injections or surgery. Well designed randomized controlled trials lag behind widespread application of imaging and advances in surgical technology.
This appears to result in more than necessary interventions, higher costs and some patient harm.

The radiology report has an important influence on clinical decisions and ultimately patient outcomes. Whilst most reports in an acute clinical situation correlate well within the clinical context, the situation with spinal and musculoskeletal degenerative disorders is likely to be different. The lack of an association between advances in imaging technology and health outcomes may be due to the technology itself being less advanced or poor application of advanced technology. For example, in contradistinction to PET CT utilization in oncology, advanced cartilage MRI imaging has not progressed to a stage of routine clinical application to influence prognosis in joint disorders. Another reason may be the lack of understanding amongst radiologists, referrers and patients of the real meaning of imaging findings in these conditions. This article aims to address the latter.

Methodology

This is a narrative review of the most common spinal and musculoskeletal degenerative disorders. Following a literature search, the prevalence of these conditions in asymptomatic individuals and current evidence on the popular treatment options of these conditions is presented.

Meniscus tears in osteoarthritis: Is this meniscus tear age related, incidental, a pain generator or a sign of osteoarthritis?

A study of MRI knees in degenerative osteoarthritic knees showed that in 67% of asymptomatic men above 45 years and women above 50 years, a meniscal tear was not clinically relevant nor did the meniscus tear worsen pain in those who were symptomatic. In the asymptomatic knee of those above 50 years, meniscus degeneration and tearing must be expected as an incidental finding and the potential danger of using MRI alone in the determination of surgical intervention must be realized so that unjustified arthroscopic surgeries may be avoided. A systematic review and meta-analysis of nine randomized controlled trials showed that a small inconsequential benefit of knee arthroscopy surgery for the degenerative knee, was limited in time and associated with harms. Arthroscopy meniscectomy increased the risks of knee osteoarthritis and a 3-fold increased risk of total knee replacement, especially in young patients.

The radiology report should distinguish the presence of a traumatic meniscus tear in a young patient in an otherwise completely normal knee, versus a meniscus tear above 40–50 years of age with coexisting early or established joint degeneration and outline the consequences of meniscectomy that worsens osteoarthritis.

Acetabular Labral Tears: Is this labral tear an incidental finding, a pain generator or is it a sign of hip joint arthritis?

Labral tears are commonly incidental and asymptomatic, with one study quoting that up to 69% of asymptomatic volunteers (age 15–66 years) harboured labral tears. The same study showed that asymptomatic participants older than 35 years were 13.7 times more likely to have a chondral defect and 16.7 times (95% CI 1.8–158 times) more likely to have a subchondral cyst compared with participants 35 or younger. Hip arthroscopy for labral tears in hip osteoarthritis is associated with a poor outcome. In a prospective 7 year follow up study of 50 consecutive patients who underwent arthroscopic labral debridement, all dissatisfied patients had coexistent arthritis, and only 19% of patients with coexistent arthritis had improved hip function scores. An ongoing randomized double blind trial is currently recruiting patients comparing hip arthroscopic lavage versus arthroscopic osteochondroplasty.

Spinal degeneration: Is this an age related incidental finding or a pain generator?

Morphological changes of the discs and facets joints (as defined by imaging findings of disc degeneration, disc desiccation, disc height loss, disc bulge, disc protrusion, annular fissures, facet arthritis and spondylolisthesis) are seen in normal asymptomatic subjects. They are of no diagnostic value in patients with back pain and are common with increasing age. Coexisting age related changes and pain generating degenerative disease make it impossible to decide treatment locations. The chance of incorrectly assigning an arthritic appearing facet joint as a pain generator on the basis of a radiology report increases with age.

A systematic review of studies on pain free and asymptomatic individuals with no history of low back pain described 33 studies with 3110 individuals (all apart from one study on CT, described MRI imaging findings). The prevalence of disc degeneration in asymptomatic individuals increased from 37% in 20 years old to 96% in 80 year olds, prevalence of disc bulge increased from 30% in 20 year olds to 84% in 80 year olds, disc protrusion prevalence increased from 29% in 20 year olds to 43% in 80 year olds, annulus fissure prevalence increased from 19% in 20 year olds to 29% in 80 year olds. In individuals over 60 years of age, disc degeneration and signal loss were present in nearly 90% of asymptomatic individuals. While some studies suggest that disc herniations may be associated with low back pain, MRI imaging scores that included disc endplate signal changes (Modic changes), disc degeneration, posterior annulus high intensity zones/annulus fissures, disc height reduction are not correlated with disability or intensity of low back pain severity.
The Weber study and the Maine Lumbar Spine Study showed benefits from spinal de-compressive surgery for lumbar disc herniation in the first year, although at 10 years, the predominant symptom, work and disability outcomes were similar regardless of treatment received.\textsuperscript{17,18} NICE guidelines recommend consideration of surgical spinal decompression for sciatica when radiological findings are consistent with sciatic symptoms and only after non-surgical treatment has not improved pain or function.

Imaging alone is inadequate to diagnose the cause of pain in spinal stenosis. Anteroposterior axial spinal canal diameter reduction to 11.5 mm causing canal stenosis can be seen in 23% asymptomatic individuals.\textsuperscript{19} The Spine Patient Outcome Research Trial (SPORT) in neurogenic claudication with radiographic canal stenosis suggested that the benefits of decompressive laminectomy when radiological findings are consistent with sciatica symptoms and only after non-surgical treatment has not improved pain or function.

Until such time, imaging technology does not differentiate symptomatic spinal degenerative disease versus asymptomatic age related spinal changes. There is a need to establish diagnostic criteria that differentiate pathologic pain generators versus asymptomatic age related changes. Until such time, imaging findings must be interpreted with caution in the context of the patients’ clinical presentation.

**Discussion**

The Clinical Radiology Written Report Guidelines, Version 6.0 by the Royal Australian and New Zealand College of Radiologists (RANZCR) that outlines the requisites of the radiologist’s report,\textsuperscript{30} do not require radiologists to provide additional information as outlined in this paper. A response to the RANZCR reporting guidelines from the Royal Australian College of General Practitioners (RACGP) points out that incidental age related findings in spinal and musculoskeletal degenerative disorders should be explicitly mentioned in the radiology report to ensure referring general practitioners are given a better chance to avoid erroneous attribution of incidental age related changes to pathology.\textsuperscript{31} Table 1 in this paper aims to provide such information.

A systematic review of patient expectations from 35 studies (27,323 patients) showed that patients over-estimated expectations and underestimated harm from treatment.\textsuperscript{32} A systematic review of 13,011 clinicians showed that clinicians also demonstrated inaccurate perceptions of treatment benefits and harms.\textsuperscript{33} Therefore there is a need to ensure that patient and clinician expectations are realistic and both parties understand the limitations of what medicine is able to achieve within the boundaries of costs, benefits and harm. Given that there is evidence of a high chance that patients and clinicians may harbour inaccurate perceptions of treatments, benefits and harms, the radiology report has to contain information not only of diagnoses, but also include information on normal ageing and harms from any possible treatment options that may be commonly practised as a result of a radiological diagnosis. Alternatively, referrers and patients should be preview to such information (Table 1) following imaging.

There is increasing interest in the identification and appropriate use of high value, low risk health care interventions and avoidance of low value, high risk health care interventions. Medical professional bodies, private
### Table 1. Summary of imaging diagnoses, prevalence in normal individuals, evidence on common treatment options

<table>
<thead>
<tr>
<th>Imaging diagnosis</th>
<th>Prevalence in asymptomatic individuals</th>
<th>Popular treatment options: summary of available evidence</th>
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<tr>
<td>Meniscus Tear</td>
<td>67% of asymptomatic men above 45 years and women above 50 years, harbour a meniscus tear that is not clinically relevant. In 91% of symptomatic patients with osteoarthritis and a meniscus tear, the presence of a meniscus tear does not worsen knee pain.</td>
<td>Arthroscopic meniscectomy: Meta-analysis of nine randomized controlled trials has shown no benefit of meniscectomy versus placebo or conservative management. There is increased risk of osteoarthritis after meniscectomy. There is increased likelihood of early total knee replacement especially if meniscectomy is performed at a younger age with increased risks of revision knee replacement.</td>
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<td>Hip Labrum Tear</td>
<td>Incidental finding in 38.6% of young asymptomatic persons (mean age of 26 years), of whom 15.7% have additional cartilage degeneration in non-painful hips. Incidental finding in 75% of high level athletes.</td>
<td>Hip arthroscopic labral debridement surgery: No data from randomized controlled trials is available as of April 2017. There is an ongoing RCT.</td>
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<td>Subacromial Bursitis/Impingement</td>
<td>Subacromial bursitis is an incidental finding in 75% of normal asymptomatic individuals.</td>
<td>Subacromial bursal corticosteroid injection in rotator cuff tendinosis: A meta-analysis showed corticosteroid injections give small and transient pain relief and are overused.</td>
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<tr>
<td>Rotator Cuff Tear</td>
<td>Incidental full thickness tears occur between 7 to 50% of asymptomatic individuals and are common with increasing age typically above 50 years. 22% of partial bursal side supraspinatus tears are asymptomatic. Asymptomatic tears (65.3%) are twice as common as symptomatic tears (34.7%).</td>
<td>Arthroscopic tendon reconstruction and subacromial decompression: A RCT showed no difference between physiotherapy and surgery at 2-year follow-up in above 55 year olds. Another RCT showed no difference between surgery and physiotherapy at 1-year follow-up.</td>
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<td>Rotator Cuff Tendinosis</td>
<td>Incidental finding in 39% of supraspinatus tendons and 25% of subscapularis tendons.</td>
<td>Subacromial injection of corticosteroid or platelet rich plasma: These are no more effective than placebo.</td>
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<td>Lumbar Spinal Disc Bulge, Protrusion or Disc Annulus Fissure</td>
<td>In asymptomatic individuals, incidental finding of disc bulge increases from 30% in 20 year old to 84% in 80 year olds. In asymptomatic individuals, incidental disc protrusion prevalence increases from 29% in 20 year olds to 43% in 80 year olds. Incidental annulus fissure prevalence increases from 19% in 20 year olds to 29% in 80 year olds. Incidental disc extrusion is rare.</td>
<td>Lumbar Nerve Root Sleeve Injection: There is limited evidence for this procedure.</td>
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<td>Lumbar Spine Disc Degeneration</td>
<td>The prevalence of degenerate discs of the entire spine exceeds 70% in asymptomatic participants less than 50 years of age and is greater than 90% in participants older than 50 years of age. Incidental finding in 90% of above 60 year old asymptomatic individuals.</td>
<td>Epidural Injections: Consider epidural injections of local anaesthetic and steroid in acute and severe sciatica. There is insufficient/lack of evidence for effectiveness to support epidural injections using anti-Tumour necrosis factor.</td>
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<tr>
<td>Lumbar Spine Facet Arthritis/Degeneration</td>
<td>Incidental finding in 60% of adults over 30 years of age. Facet joint related pain may only be seen in 18 - 40% of those with back pain. The chance of falsely allocating a lumbar facet arthritic joint as the pain generator is 65% in 61 -70 year olds.</td>
<td>Non-Operative Management in Lumbar Disc Protrusion: More than 80% of patients with disc herniation and sciatica do not require surgical decompression as more than 50% spontaneous volume regression is seen over a 6 month period. Paradoxically, the larger the herniation, the better the spontaneous regression.</td>
</tr>
<tr>
<td>Lumbar Disc Replacement</td>
<td>NICE guidelines do not recommend disc replacement for low back pain.</td>
<td>Lumbar Disc Replacement: NICE guidelines do not recommend disc replacement for low back pain unless as part of a RCT.</td>
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<tr>
<td>Lumbar Fusion Surgery</td>
<td>Not recommended.</td>
<td>Lumbar Fusion Surgery: Not recommended for low back pain</td>
</tr>
<tr>
<td>Lumbar Facet Median Branch Block (MBB) with Corticosteroid</td>
<td>Recommended as a test prior to Median Branch Nerve RF ablation.</td>
<td>Lumbar Facet Median Branch Nerve RF Ablation: Recommended if MBB is successful.</td>
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</table>
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organisations and governments have focussed on the education of referrers who request diagnostic imaging or the patient e.g.: Choosing Wisely program in Australia. However, such efforts have not reduced over use of imaging. There is the need to reduce the knee jerk response to prescribe invasive and expensive treatments solely on the basis of an imaging report that largely describes age related changes. There is an ongoing pragmatic randomized controlled study testing the hypothesis that insertion of epidemiological benchmarks such as prevalence data of asymptomatic individuals into lumbar spine imaging reports may reduce subsequent tests and treatment. Similar trials in a host of degenerative musculoskeletal conditions are urgently needed, for example in meniscus tears, rotator cuff tears, bursitis, labral tears to name a few.

Conclusion

Contrary to popular belief, imaging findings in degenerative musculoskeletal and spinal conditions are predominantly seen in asymptomatic individuals and do not generally identify the cause of affliction. Even more worrying is that imaging findings result in widespread use of cortisone injections and surgeries that have been shown to be of no benefit in many of these conditions. Supplementing the radiology report of a patient with prevalence and evidence based outcome data ensures relevant information is available at the point of patient care. Ultimately this may alter referrer behaviour patterns, temper unrealistic expectations of referrers and patients, reduce health care costs, medical risks and improve patient outcomes.

References


10. Kemp JL, MacDonald D, Collins NJ, Hatton AL, Crossley KM. Hip arthroscopy in the setting of hip osteoarthritis:

Table 1. (continued)

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<td>Degenerative Lumbar Spinal Stenosis (LSS)</td>
<td>The prevalence of relative LSS defined as 10-12 mm anteroposterior canal diameter and absolute LSS of less than 10 mm in an axial image at intervertebral disc level in asymptomatic individuals, a) in those less than 40 years is 20% and 4%, respectively, b) between 60-69 years, is 47.2% and 19.4%, respectively. 6% of asymptomatic individuals harbour severe canal narrowing of less or equal to 10 mm axial diameter. 18.9% of low back pain sufferers have LSS of &lt;10 mm. Whilst there is a three fold risk of having LBP in the presence of an AP canal diameter of less than 10mm, imaging alone should not be used to confirm symptomatic canal stenosis.</td>
<td>Epidural injections: NICE guidelines do not recommend epidural injections for neurogenic claudication in people who have central spinal canal stenosis. Decompressive Laminectomy: Patients with symptomatic spinal stenosis without spondylolisthesis show diminishing benefits of decompressive laminectomy surgery between 6 and 8 years while outcomes in the conservative group remain stable. Conservative Management or Surgery: A Cochrane Review of 2016 was unable to provide guidance on surgery or conservative care due to lack of high quality evidence.</td>
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</table>

LSS, lumbar spinal stenosis; NICE, National Institute for Health and Care Excellence; RCT, randomized controlled trial; RF, radiofrequency.


