



QUESTION | Guidelines suggest routine imaging for low back pain is not recommended. Are there any situations where imaging is useful?

ANSWER | Overview

A 2009 systematic review and meta-analysis of the use of imaging (radiograph, CT or MRI) in non-specific low back pain found no significant differences in pain or function either short term (<3 months) or long term (6-12 months) (Chou, 2009). This finding should not be used however, to conclude imaging has no role in the management of back pain. This review excluded patients with suspected infection or malignancy, both accepted indications for obtaining imaging in those with back pain. Further, studies often fail to account for whether diagnostic information from imaging is associated with subsequent appropriate evidence-based management. If ineffectual treatment modalities are utilised in the setting of an accurate diagnosis, then it follows that outcomes will not necessarily be enhanced.

Radiographs

Radiographs have limited utility in the investigation of non-specific low back pain. They may be a reasonable option in patients when concerned for infection or malignancy, but clinical suspicion is not high (Jarvik 2002). When plain radiographs of the lumbar spine are indicated, AP and lateral views are usually adequate. Oblique radiographs, once popular for identifying pars stress fractures, substantially increase radiation exposure with little benefit, and should not routinely be performed. Dynamic flexion-extension views are often helpful in the assessment of instability, such as can occur with bilateral pars defects leading to spondylolisthesis.

Lumbo-sacral nerve root irritation often refers pain to the hip and groin. Consequently, hip radiographs can be useful in distinguishing between lumbo-sacral and hip joint pathology. Weight bearing views should be obtained including a false profile view to assess the posterior aspect of the joint. If consideration is being given to sacro-iliac joint instability, a flamingo view x-ray performed in single leg stance can identify any resulting movement at the pubic symphysis.

MRI

Spinal MRI is more informative than radiographs and CT because it can also identify other pathologies, including inflammatory, malignant, and vascular disorders. In addition, MRI is not associated with ionising radiation. One justified criticism of MRI is that findings are often misinterpreted. Incidental findings are often seen on imaging which are then incorrectly attributed as a cause of pain. Disc herniations are seen on MRI in 22 to 67 percent of asymptomatic adults (Jensen M. C. 1994, Boden 1990, Weishaupt D 1998). Given the high prevalence of these findings, the discovery by MRI of bulges or protrusions in people with low back pain may be coincidental, and drawing attention to them may contribute to fear avoidance behaviours contributing to central sensitisation. Often overlooked in these studies however, is that severity of herniations does appear to correlate with symptoms, with disc extrusions rarely seen in asymptomatic populations (Jensen 1994). Consequently, it is reasonable to conclude there is a high probability that a disc extrusion is contributing to pain if present and should not be discounted.

One limitation of MRI is that most scans are taken with the patient supine, with the spine unloaded. Loading and movement of spinal structures can often lead to dynamic changes correlating with postural symptoms. There are now MRI scanners available which can assess dynamic change in the upright position with flexion and extension. In carefully selected patients, such as those with significant postural variation in symptoms and equivocal findings on standard MRI, upright MRI can be very useful. The magnet strength of the upright MRI scanners however is not comparable to supine scanners, resulting in reduced image quality and limiting usefulness as a first line investigation. Many patients with claustrophobia also tolerate the upright scanner well. MRI enhancement with gadolinium allows the distinction of scar from disc in patients with prior back surgery.

There are a variety of possible MRI sequences impacting contrast, resolution and speed of scan acquisition. Not every possible sequence is performed with every scan, the decision of which sequences to perform usually the decision of the supervising radiologist. This can lead to some variation in the scans obtained between different imaging companies. Radiographers with expertise in musculoskeletal MRI often provide more informative reports which assists in the clinical interpretation of findings. Providing a clear clinical history outlining relevant examination findings when ordering an MRI will assist the radiologist in selecting the most appropriate sequences and improve the accuracy reporting.

Historically, CT scans have been used to diagnose pars interarticularis stress fractures in the lumbar spine. Recent research has demonstrated that 3 Tesla MRI scan using a thin slice VIBE sequence is 100% accurate in diagnosing complete pars fractures, comparing very favourably to CT. Additionally, MRI is able to detect bone marrow oedema and does not employ ionising radiation. MRI should now be the first line investigation for suspected pars stress fractures (Ang 2016), although this sequence is not yet routinely performed by every imaging company.

CT

CT scans can assess osseous structures better than either plain radiography or MRI and is therefore helpful in assessing for bony disease. While CT scans can identify disc prolapses with similar sensitivity to MRI, they are unable to visualise nerve roots limiting utility in radicular presentations. MRI is thus the preferred modality. In some circumstances, CT, especially fine cut CT, can be useful to look for specific bony issues difficult to visualise on an MRI. This may include suspicion of non-union following a surgical fusion, or cases where susceptibility artefact from implants impacts MRI quality.

CT guided local anaesthetic and corticosteroid injections

Not all pain originating from nerve root compression presents in a classical dermatomal distribution. Irritation of the small nerve fibres innervating the dura around the nerve root itself leads to somatic referred pain, typically experienced as an intense ache. Recognising the common somatic referral patterns from L5 (postero-lateral hip) and S1 (buttock region) can assist the interpretation of MRIs, however there may still be some doubt. CT guided local anaesthetic injections are very useful to confirm nerve root irritation as a source of symptoms. These injections are usually directed at nerve roots through the intervertebral foramen (perineural) or more centrally between the lamina into the spinal canal (epidural) based on examination and imaging findings. Significant improvement in symptoms while the local anaesthetic is active is diagnostically useful.

Facet joints are another common target of CT guided injection. Isolated facet joint pathology as a cause of symptoms is uncommon however, and a strong clinical suspicion should exist before injections are performed (see SPECT/CT below). Hypertrophic facet joints often lead to descending nerve root irritation, or even posterior annulus irritation, and a positive response to injection does not guarantee a facet joint as a source of pain, though it is certainly suggestive.

The type and level of any spinal injection should be carefully determined to ensure the highest chance of success. Clinician experience and skill can significantly impact the utility of CT guided injections, and the use of experienced radiographers is recommended. Cortico-steroid is usually injected concurrently, although benefit can be variable.

SPECT/CT

This is a combined test in which the nuclear medicine test Single Photon Emission Computed Tomography is combined with a CT. This is a very useful test to identify symptomatic facet joints. Follow-up with a diagnostic injection using local anaesthetic can assist in the diagnosis. The concurrent injection of cortico-steroid into facet joints with anaesthetic occasionally leads to sustained benefit.

If a facet joint is confirmed as a source of symptoms and does not respond to cortico-steroid injection, ablation of the innervating medial branch nerves has been shown to reliably provide sustained relief and can also be performed under image guidance.

Electrophysiology

Occasionally despite a strong index of suspicion of nerve related pathology, examination and imaging findings remain equivocal. The combination of nerve conduction studies (NCS) and electromyography (EMG) studies can provide further insight. These tests are most useful in patients in whom imaging findings are inconsistent with the clinical symptoms of radiculopathy, especially weakness. In cases of radiculopathy, NCS and EMG can localise the specific spinal nerve root involved, though this is more reliable at lower levels (L5 and S1). Electrophysiology testing also can identify conditions that mimic radiculopathy.

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