
Abnormal Magnetic-Resonance Scans of the Lumbar Spine in Asymptomatic Subjects. A Prospective Investigation

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60.4 Abstract

Background: In the 1980s and 1990s Magnetic Resonance Imaging (MRI) was gaining popularity as the diagnostic imaging technique of choice for the investigation of disorders affecting the lumbar spine. The sensitivity of MRI to detect previously undetectable pathologies (e.g. tears in the annulus fibrosus) was well recognised but led the authors of this paper to question if MRI was sufficiently specific.

Method: Sixty-seven individuals who had never had low-back pain, sciatica, or neurogenic claudication underwent MRI scans of their lumbar spine. The scans were reviewed by three neuro-radiologists who were blinded to the reports of the other radiologists and to the presence or absence of clinical symptoms in the subjects.

Results: Approximately one-third of the subjects were found to have an abnormality on their MRI scan. In the group

under the age of 60, 20 % were found to have herniated discs and one had spinal stenosis. In subjects >60 years old, 57 % had ‘abnormal’ scans. The abnormalities that were detected included herniated discs in 36 % of subjects, and 21 % had spinal stenosis. Minor abnormalities such as degeneration or bulging of a disc were found in 35 % of the subjects aged between 20 and 39 years, and in all but one of the over 60 age group.

Conclusion: The authors conclude that the high incidence of bulging and degenerate discs seen on MRI scans in asymptomatic subjects indicates that they should be viewed as normal or as part of the aging process. They recommend that before operative treatment is contemplated abnormalities on magnetic resonance images must be strictly correlated with age and any clinical signs and symptoms.

60.5 Summary

The authors tell us that previous studies had reported a high incidence (24–37 %) of abnormalities on Myelography and CT imaging of asymptomatic subjects. In this study the results of the (then) novel diagnostic modality of Magnetic Resonance Imaging were investigated to determine its specificity when used in the diagnosis of lumbar spinal pathology.

One hundred MRI scans were assessed by neuroradiologists. A 1.5 T MRI scanner was used. Thirty-three scans from subjects with symptoms and signs that correlated with unequivocal pathology on an MRI scan (as assessed by a radiologist not part of this study) were identified. Asymptomatic subjects were sought by advertising in local newspapers and excluded from the study if they had ever had back pain, sciatica or symptoms of spinal stenosis. There were 30 men and 37 women ranging in age from 20 to 80 years. The 33 scans from symptomatic subjects were randomly mixed with the 67 scans from asymptomatic individuals and then independently reviewed by three neuroradiologists. The radiologists were unaware of the

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results of each other's reports, nor to the presence or absence of symptoms. The radiologists were instructed to provide a report for each level of the spine at each of the five lumbar discs on all scans. If an abnormality was detected they were asked to classify it as definite, probable or possible. If the reporting radiologist had classified the level as having a definite or probable abnormality the level was classified as either abnormal or normal.

A high level of agreement between the radiologists was identified. All three agreed in 99 % of cases concerning the presence or absence of abnormality at each of the 500 levels assessed. In all but one (32 of the 33 symptomatic subjects) their MRI diagnosis agreed with the surgical diagnosis at the time of surgery.

Subjects with a history of sciatica, back pain or sensory disturbance whilst walking were excluded from the symptom free group. Despite this, significant numbers of asymptomatic subjects were found to have abnormalities on their MRI scans. Of those aged 60 or over 57 % of scans were abnormal (36 % had a herniated nucleus pulposus and 21 % spinal stenosis). Of those under the age of 60, 20 % were diagnosed as having a herniated nucleus pulposus. The prevalence of abnormalities was the same in men and women but increased with age.

60.6 Citation Count

962

60.7 Related References

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60.8 Key Message

As with other diagnostic imaging modalities, MRI was shown to detect a high frequency of abnormalities in asymptomatic individuals. In this prospective, blinded study, 22 % of the asymptomatic subjects younger than 60 years of age and 57 % of those older than 60 years had significant abnormalities detected on lumbar MRI

scans. In addition, the prevalence of disc degeneration on the T2 weighted images was found to approach 98 % in subjects older than age 60.

60.9 Why It's Important

A large number of the asymptomatic population have abnormalities on their MRI. Thus a diagnosis based on magnetic resonance imaging alone without correlation with clinical examination may not truly identify the cause of a patient's symptoms.

This paper serves as an important reminder to clinicians to treat patients rather than scans and offers reassurance to patients with unexplained pain that the abnormalities seen on a scan report are not necessarily the cause of their symptoms.

60.10 Strengths

This was a well-designed study. The reporting radiologists were blinded to the presence or absence of symptoms and to each other's reports. There was a high level of inter-observer agreement indicating the objectiveness and validity of MRI as an investigative tool. The high frequency with which abnormalities were reported highlights the potential false positive rate.

60.11 Weaknesses

Although this was the first and therefore the largest study, this was still a relatively small study with only 100 scans reported and only 67 asymptomatic subjects recruited through newspaper adverts in Washington, USA. The subjects were between the ages of 20 and 80. The conclusions of this study are applied more widely having an important message for the population as a whole. How generalizable this small group of patients is, is unknown. Additionally MRI technology continues to advance rapidly. MRI scanning machines with larger magnetic fields and significantly improved resolution are now available. How improvements of this nature are likely to affect the specificity of the result is not known.

60.12 Relevance

The almost ubiquitous nature of back pain is well known and Magnetic Resonance scanning has rapidly become the diagnostic modality of choice in investigating treatable spinal

pathology. It is frequently the only diagnostic imaging required to confirm the presence of a prolapsed intervertebral disc or spinal canal stenosis. When correlated to clinical findings it has been shown to be highly sensitive and specific [1]. The diagnostic utility of MRI is well known, so much so that patients themselves frequently request MRI scans. However, it is also well known that an individual patient's response to a particular pathology can vary considerably. Even for well established treatments such as hip and knee replacements, the radiological changes of osteoarthritis do not always lead to symptoms [2, 3] and imaging changes may well occur in the asymptomatic population. This particularly seems to be the case with diagnostic MRI imaging of the lumbar spine.

In a significant number of cases of lumbar back pain the cause of a patient's symptoms is not identifiable. The problem of mixed messages and atypical symptoms can lead to considerable difficulty. An MRI report that details multiple abnormalities can become a cause of anxiety for those being investigated and make reassurance difficult.

The findings of this study have been replicated by others [3–5]. Another highly cited and similar study by Jensen et al. [3] found that only 36 % of 98 asymptomatic individuals (mean age 42.3 years) had normal lumbar MRI scans. Using clearly defined terminology they found 52 % of asymptomatic individuals had a disc bulge at one level or more, 27 % had a protrusion and 1 % an extrusion.

Weishaupt et al. [4] attempted to identify the lumbar spine MRI abnormalities that have a low prevalence in asymptomatic patients and might therefore be predictive of low back pain in symptomatic patients. They found that in younger patients (<50 years) disk extrusion, sequestration, nerve root compression, end plate abnormalities and osteoarthritis of the facet joints were rare. The authors obtained MRI scans on 60 asymptomatic individuals aged 20–50 years. Similar to Boden and Jensen they identified disk protrusion in 67 % of asymptomatic subjects.

The presence of an abnormality on an MRI scan does not appear to predict future low back pain. Borenstein et al. [6] reported on the 7 year follow up of the 67 asymptomatic individuals reported by Borden et al. in this paper. A total of 50 individuals completed a follow-up questionnaire regarding the development of back pain. The presence of an abnormality on the original scan was not predictive of the subsequent development of back pain. Furthermore, no correlation was found between individuals that suffered the longest duration of low back pain and those individuals that had the greatest degree of anatomic abnormality on their previous scans. The authors conclude that positive MRI findings were not predictive of the development or duration of low back pain.

One hypothesis explaining why MRI findings do not always agree with clinical findings is that patients are often most symptomatic when standing or walking and that their pain settles when they are recumbent. Magnetic resonance imaging is most frequently performed with the patient recumbent. A recent study by Danielson and Willén [7] attempted to investigate this by applying axial load across the lumbar spine by applying an MRI compatible harness. This was investigated in 43 asymptomatic individuals who underwent axially loaded MRI of the lumbar spine. Dural sac cross sectional area was measured in both the 'psoas relaxed' and 'axial compression in extension' (ACE) positions. The results were then compared to the results of previously published studies in symptomatic individuals. The authors conclude that the dural sac cross sectional area (DSCA) decreases less between the two positions in asymptomatic individuals (56 %) than symptomatic individuals (76–80 %). They recommended MRI examination of the lumbar spine be performed in both the psoas-relaxed position and in the axial compression in extension position for patients with clinically suspected lumbar spinal canal encroachment.

Overall this paper serves as a useful reminder to surgeons and clinicians of the importance of correlating clinical features with the results of imaging studies. It is only in combination that an accurate diagnosis can be made and high rates of successful intervention ensured. The results of this study can also be used to reassure patients and reduce patient anxiety.

References

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