Findings of magnetic resonance imaging of lumbosacral spine in chronic lower back pain

Jabir Hasan Obaid Al.Shami[1]
[1]F.I.B.M.S (Rad.), Al.Diwaniya Teaching Hospital
Amjaad Majeed Hameed[2] .(F.I.B.M.S) Radiology
[2]Collage of medicine , AL-Qadisiah university

(Received 8 / 7 /2014 , Accepted 30 / 9 / 2014)

الخلاصة :

خلفية الدراسة:

يعتبر الرنين المغناطيسي من الفحوصات المهمة والدفيفة لتشخيص أسباب الآم الظهر وذلك لإظهاره التفاصيل المتعلقة بالفقرات والغضاريف والعضلات المتعذرة حصولها في الأشعة السينية او المفراس الحلزوني إضافة انه امين وغير مؤذ ولا يعتمد على الأشعة ولكن باستخدام المجال المغناطيسي والموجات الرادوية

هدف الدراسة: لمعرفة أسباب آلام الظهر المزمن عند المرضى المحالين من استشاريات المفاصل والكسور والجملة العصبية والجراحة

المرضى والطرق: تضمنت الدراسة اخذ عينة 50 مريض من مختلف الاستشاريات احيلو الى وحدة الرنين المغناطيسي في م. الديوانية التعليمي اعتبارا من شباط الى كانون الاول 2011يعانون من الم الظهر ومعدل عمر 15-70 سنة ،31 من الرجال 19 من النساء وصنفوا المرضى حسب العمر والجنس والمهنة والحوادث ومختلف الأمراض ا لأخرى.

النتائج : اظهرت الدراسة ان 26 مريض (52%) شخصوا انزلاق غضروفي قطني بين الفقرات القطنية الرابعة والخامسة والعجزية الاولى ،10 من المرضى(20%) شخصوا من تغيرات انحطاطية في الغضروف والفقرات ، 5 من المرضى (10%) شخصوا تشنج عضلي ،2 من المرضى (4%) شخصوا انتشار ثانوي من اورام اولية ، 3 من المرضى (6%) التهاب فقري، 4 (8%) كانت نتائج الرنين طبعيه.

الاستنتاجات : .نسبه عاليه من المرضى اللذين لديهم آلام الظهر المزمن لديهم ايجادات ايجابيه في فحص الرنين .

Findings of magnetic resonance imaging of lumbosacral spine in chronic lower back pain

Abstract:

***Background :**Magnetic resonance imaging (MRI) of the lumbar spine is a safe and painless scan that uses a magnetic field and radio waves to produce detailed pictures of the lumbar spine (the bones, disks, and other structures in the lower back), MRI of the lumbar spine can be useful in evaluating symptoms such as lower back pain, leg pain, numbness, tingling or weakness or problems with bladder and bowel control. It can also help to diagnose tumors, bleeding, swelling, developmental or structural abnormalities and infections or inflammatory conditions in the vertebrae or surrounding tissues.

Aim of study : To detect the cause of chronic lower back pain in patients referring from different departments in our hospital like Orthopaedics, Rheumatology , Surgery & neurology.

***Patients & method :** About 50 patients selected from February 2011 to December 2011 all of them are complaining from chronic lower back pain referring from different departments. Average age from 23 to 70 year, 31 were male &19 were female, the patients were classified according to their age, sex, occupation, past history of trauma, medical disease & previous surgery.

***Results** Twenty sex of patients (52%) were diagnosed as a PIVD (prolapsed intervertebral discs) at the level of L4-5 & L5-S1, ten(20%) of them diagnosed as degenerative disease of the discs, five patients (10%) diagnosed as Straitening of Spine (Muscular Spasm), 2 (4%) of them diagnosed as secondary metastases in L1& 2 vertebral bodies, 3 (6%) of them diagnosed as infected disk with gibbus deformity in lower dorsal spines & 4 (8%) had normal lumbos*acral spine* .

***Conclusion*:**
1.High incidence of abnormal MRI study in patients with chronic low back pain .
2.Highest percent of patients with chronic back pain had disc herniation follow by other pathology .
Key words: chronic backache , MRI lumbosacral spine .

Introduction:
Low back pain is one of the most common cause of physician visits in the world & frequently reported symptoms in the industrialized countries (1). In most cases the symptom is due to a benign non emergent condition involving some degree of spinal degeneration (2). Pain that continues for more than 7–12 weeks despite conservative management is described as chronic (3). The estimated prevalence of nonspecific chronic low back pain in adults is 15% but increases with increasing age to 44% at the age of 70 years (4,5).
With conservative management if chronic low back pain does not improve, the cause must be identified before the most appropriate therapy can be determined. The sheer number of spinal structures that are potential sources of low back pain results in a broad differential diagnosis and represents a major challenge to identifying the cause of pain (6). A precise medical history and thorough physical examination, along with tailored laboratory testing and noninvasive imaging are important steps toward establishing a working diagnosis (7). These measures should suffice to identify or to rule out underlying disease processes (fracture, malignancy, visceral or metabolic abnormality, deformity, inflammation and infection) neurologic disorders requiring surgical intervention (cauda equina syndrome, myelopathy), and social or psychological distress that may amplify or prolong pain (8).
However in most cases the initial clinical and imaging findings are nonspecific or insufficient for diagnosis (6). Chronic low back pain is described as nonspecific when the clinical and imaging findings have insufficient predictive values for the identification of symptomatic spinal structures (9–20). Among patients with chronic low back pain and without a demonstrated neurologic deficit or a disk herniation visible at imaging, a spinal cause was identifiable in only 15% (21).
MRI of the lumbar spine considered by many to be the best imaging technique for the investigation of lower back pain displacing myelography and CT in recent years(22).
Plain and contrast-enhanced MRI has the ability to demonstrate inflammatory, neoplastic, and most traumatic lesions as well as to show anatomic detail not available even in
isotope studies (23)

Aim of Study:
To detect abnormality in the lumbosacral spine MRI which are the causes of chronic backache .

Material & methods:
About 50 patients selected in our unit of MRI in Al-Diwaniya teaching hospital in Iraq referring from different departments in our hospital like Orthopedics, Rheumatology ,Surgery & neurology units as an out patients or as admitted patients, all of them complaining from lower back pain that not responding to usual treatment, some of them had lumbosacral X-Ray, some need contrast media, the machine was MRI GE of 1.5 Tesla .Sagital , axial T1(TR 590.0, TE 11.0),T2(TR 3540.0, TE 85.0) & Myelogram(TR 8000 0, TE 1200 0) were done for each patient. The study started from February 2011 to September 2011 & the patients classified according to the age, sex, occupations, past history of trauma , medical diseases & past surgery. Patients with history of spinal surgery, back trauma & systemic disease like diabetes mellitus & peripheral neurophathy were excluded from study .

Results :

The total number of patients involved in this study was 50, among them 31 was male(62%) & 19 was female (38%) as shown in figure 1.

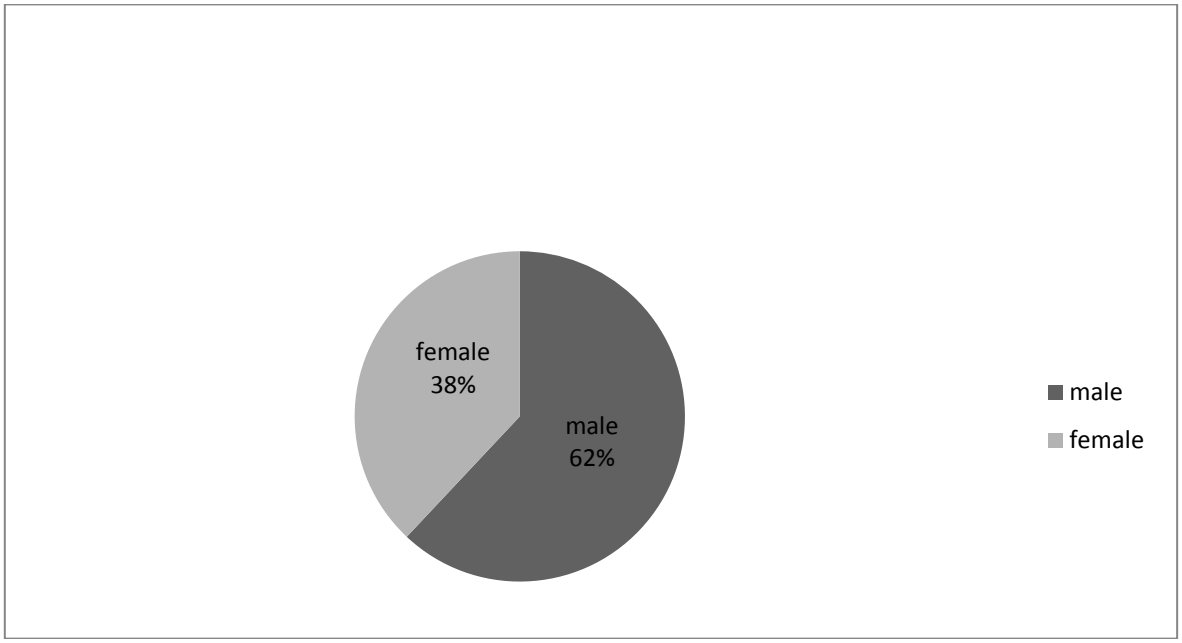

Figure 1 distribution of study sample according to sex .

Four (8%) patients present with chronic backache had normal MRI & 46(92%) patients had positive MRI findings

Table 1 distribution of the study sample according to the MRI findings .

MRI findings	Patients no.%
Normal MRI	4(8%)
Abnormal MRI	46(92%)
Total	50(100%)

As shown in table 2, in twenty sex patients (52%) the MRI finding was PIVD and 17 male (34%),9 female (18%). In 10 patients (20%) the MRI findings where degenerative disc disease modic type 1 degenerative changes at the vertebral end plates, six(12%) of them were female & 4 was male. Five patients (10%) had MRI findings as straitening of spines 4(8%) was male and one patient was female (2%) & most of them had history of lifting heavy weight. secondary metastases in the vertebral bodies (significant collapse enhancing vertebrae with loss of normal signal intensity found in 2(4%) patients one was male with history of renal cell carcinoma & metastases to the L1&2,other female had history of breast carcinoma & metastases to the L3 vertebral body.

Sign of spine infection found in three patients (6%) with suspicion of Tubercuolus spondyloses (anterior wedging &gibbus deformity of lower dorsal & upper lumber spines) all of them where male & had history of pulmonary tubercalosis . Normal lumbosacral spine MRI found in 4(8%) patients.

Table 2 causes of backache according to the MRI findings .

Causes of backache according to MRI findings	Male	Female	Total number & %
Posterior disk prolapsed	17(34%)	9(18%)	26(52%)
Degenerative changes	4(8%)	6(12%)	10(20%)
Straining of the spine	4(8%)	1(2%)	5(10%)
Metastasis	1(2%)	1(2%)	2(4%)
Spine infection	3(6%)	0(0%	3(6%)
Normal MRI of the spine	2(4%)	2(4%)	4(8%)
Total	31(62%)	19(38%)	50(100%)

As shown in table 3, in twenty sex patients the MRI finding was PIVD, the level of prolapsed was L4-5& L5-S1, Ten of them (38.6%) was posterolateral herniation more at left side, 11 of them (42.3%) was posterolateral prolapse more at right side, central posterior disk herniation found in 3 patients (11.5 %) the remaining 2 patients (7.6%) had circumfrancial posterior disc bulge .

Table 3 site of posterior disk prolapsed

Posterior circumfrancial disk bulge	2(7.6%)
Central disk herniation	3(11.5%)
Lt. postero-lateral disk herniation	10(38.6%
Rt. Posterolateral disk herniation	11(42.3%)
Total	26(100%)

As shown in table 4 the commonest site of prolapsed was at L4-L5 (53.8%) & at L5-S1 (42.4%), followed by other lumber levels.

Table 4 The no. & percent of the patient correlate with the level of the prolapsed.

Level of prolapse	**Patient No.%**
L1-L2	**0(0%)**
L2-L3	**1(3.8%)**
L3-L4	**0(0%)**
L4-L5	**14(53.8%)**
L5-S1	**11(42.4%)**
Total	**26(100%)**

pain presents problems. This is because symptoms arising from different spinal tissues can feel very similar and is difficult to differentiate .(25)

A systamatic review of the available literatures involving spinal MRI found MRI to be highly sensitive(89%-100%) imaging

Discussion :

Back pain is pain felt in the back that usually originate from the structures in the spine, chronic backache is define as pain that lasting longer than three to six month . (24)
There are several potential sources and causes of back pain, however the diagnosis of specific tissues of the spine as the cause of

reinforced by the posterior or anterior longitudinal ligament(32).

Vertebral end plates play a key role in providing the nutrients to the intervertebral disk. As a result, it conceivable that changes in the end plates occur at the same time or even before disk degeneration(modic 34), in our study the MRI finding was degenerative changes modic type 1 at the vertebral end plates in 10(20%) patients our finding goes with the Kuisma et al(35) who reported significant association between Modic 1 changes and the frequency & intensity of lower backache but it not go with Mitra et al (36)who were not able to detect any statistically significant association between modic type 1 degenerative changes & patients symptoms.

In five patients (10%) the MRI finding was straitening of spine with loss of normal lordoses most of them where male range of age 20-30 years old had previous history of lifting heavy weight, also there is many research support the possibility that low back pain can trigger spasm of paraspinal muscles such spasm thought to act as protective mechanism to spine injury(37,38&39) As MRI is the best approach for evaluation of spine metastases because its high soft tissue contrast results in excellent sensitivity, the sensitivity of MRI varies from 83%-100% and the estimated specify is 92%(40) , in 4 (8%)patients the MRI finding were 2ndary deposits in vertebral bodies due to primary tumor in male was malignant renal tumor metastases & in female was breast carcinoma .

MRI is the method of choice for evaluation of spinal infection with sensitivity of 96% & specificity of 92%(41). In our study 3 (6%) patients the MRI findings were spondylitis representing as loss of normal signal intensity of vertebrae &discs with significant enhancement after contrast all of them were male & two of them had history of pulmonary T.B

In this study we found high incidence of spine pathology(92%) in patients with chronic backaches & in four patients (8%) modalities for lumber spinal conditions & the quality of these images allows the diagnosis to make more details & accurate. (26)

Many studies suggested that two conditions to which chronic backache is often attributed lumber disk herniation & degenerate end plates changes , degeneration of the intervertebral

discs is common among patients with chronic back pain(27), our study inconsistence with those studies, in 52% the causes of chronic backache was disc prolapsed follow by 20% was degenerative changes at the end plates, also our findings go with De Palma et al(28) they confirm the disc prolapse (42%) as the most common etiology of chronic low back pain & go with findings of Jeroen et al , they confirm that more than half of patients with lower back pain undergo disc prolapse. (29)

The commonest levels of prolapsed were L4-L5and L5-S1 which is go with Nada R. (30)who mention that the prevalence of bulge & protrusion was highest at L4-L5& L5-S1 also this finding go with Moore et al who found that majority of spinal herniation occur in lumber region (95%) in L4-L5or L5-S1(31), this findings can be explain by the fact that nearly 75% of the lumbar flexion–extension and of total spinal movement occurs at the lumbosacral junction, 20% of lumbar flexion–extension occurs at the L4/5 level and the remaining 5% is at the upper lumbar levels. Consequently, it is not surprising that 90% of lumbar disc prolepses occur at the lower two lumbar levels; the most frequently affected disc is at the L5/S1 & L4-L5 levels.(32)

We found that common site of disk prolapsed was at posterolateral (Rt. posterolatral 42.3%, Lt. posterolateral 38.6%), which is inconsistence with Gerald et al (33)who found that disk tear are almost always postrerolateral in nature owing to the presence of the posterior longitudinal ligament in the spinal canal also go with Moore etal (31) who mention that herniations usually occur posterolaterally, where the annulus fibrosis is relatively thin and is not

the MRI finding was quite normal inspited of back pain , this findings is in agreement with Bao-Gau who confirm that despite of inheret challenge in elucidating the specific etiology of chronic back pain diagnostic procedure can reveal its sources in 90% patients (42)

Conclusion:

1.High incidence of abnormal MRI study in patients with chronic low back pain .

2.Highest percent of patients with chronic back pain had disc herniation follow by other pathology .

Recommendation :

Because of high incidence of abnormal spine in patient with chronic back pain & because of different pain causes, MRI is indicated to know the cause & to plane management .

Beside disk prolapsed as cause of chronic backache other causes like infection & secondaries in spine should be excluded .

Further study is suggested to follow up these patient by MRI after surgical or medical treatment correlate this findings with the patient pain.

References :

1.LuoX, Pietrobon R, Sun SX, Liu GG, Hey L. Estimates and patterns of direct health care expenditures among individuals with back pain in the United States. Spine2004; 29: 79–86.

2.Van Den HoogenHJ, Koes BW, Deville W, Van Eijk JT, Bouter LM. The prognosis of low back pain in general practice. Spine1997; 22: 1515–1521.

3.AnderssonGB. Epidemiological features of chronic low-back pain. Lancet1999; 354: 581–585.

4.Manchikanti L, Singh V, Pampati V, Beyer CD, Damron KS. Evaluation of the prevalence of facet-joint pain in chronic thoracic pain. Pain Physician2002; 5: 354–359.

5.Jacobs JM, Hammerman-Rozenberg R, Cohen A, Stessman J. Chronic back pain among the elderly: prevalence, associations, and predictors. Spine2006; 31: E203–E207.

6.JarvikJG, Deyo RA. Diagnostic evaluation of low back pain with emphasis on imaging. Ann Intern Med2002; 137: 586–597.

7.Brant-ZawadzkiMN, Dennis SC, Gade GF, Weinstein MP. Low back pain. Radiology2000; 217: 321–330.

8.DeyoRA, Rainville J, Kent DL. What can the history and physical examination tell us about low back pain? JAMA1992; 268: 760–765.

9.Van Den HoogenHM, Koes BW, Van Eijk JT, Bouter LM. On the accuracy of history, physical examination, and erythrocyte sedimentation rate in diagnosing low back pain in general practice: a criteria-based review of the literature. Spine1995; 20: 318–327

10.DreyfussP, Michaelsen M, Pauza K, McLarty J, Bogduk N. The value of medical history and physical examination in diagnosing sacroiliac joint pain. Spine1996; 21: 2594–2602.

11.SchwarzerAC, Aprill CN, Derby R, Fortin J, Kine G, Bogduk N. Clinical features of patients with pain stemming from the lumbar zygapophysial joints: is the lumbar facet syndrome a clinical entity? Spine1994; 19: 1132–1137.

12.WolffAP, Groen GJ, Crul BJ. Diagnostic lumbosacral segmental nerve blocks with local anesthetics: a prospective double-blind study on the variability and interpretation of segmental effects. Reg Anesth Pain Med2001; 26: 147–155

13.O'NeillCW, Kurgansky ME, Derby R, Ryan DP. Disc stimulation and patterns of referred pain. Spine2002; 27: 2776–2781.

14.BoosN, Rieder R, Schade V, Spratt KF, Semmer N, Aebi M. The diagnostic accuracy of magnetic resonance imaging, work perception, and psychosocial factors in identifying symptomatic disc herniations. Spine1995; 20: 2613–2625.

15.ModicMT, Obuchowski NA, Ross JS, et al. Acute low back pain and radiculopathy: MR imaging findings and their prognostic role and effect on outcome. Radiology2005; 237: 597–604.

16.SchwarzerAC, Wang SC, O'Driscoll D, Harrington T, Bogduk N, Laurent R. The ability of computed tomography to identify a painful zygapophysial joint in patients with chronic low back pain. Spine1995; 20: 907–912

17.SlipmanCW, Sterenfeld EB, Chou LH, Herzog R, Vresilovic E. The value of radionuclide imaging in the diagnosis of sacroiliac joint syndrome. Spine1996; 21: 2251–2254.

18.StadnikTW, Lee RR, Coen HL, Neirynck EC, Buisseret TS, Osteaux MJ. Annular tears and disk herniation: prevalence and contrast enhancement on MR images in the absence of low back pain or sciatica. Radiology1998; 206: 49–55.

19.Vogler JB , Brown WH, Helms CA, Genant HK. The normal sacroiliac joint: a CT study of asymptomatic patients. Radiology1984; 151: 433–437.

20.WeishauptD, Zanetti M, Hodler J, et al. Painful lumbar disk derangement: relevance of endplate abnormalities at MR imaging. Radiology2001; 218: 420–42.

21.Frymoyer JW. Back pain and sciatica , N Engl J Med 1988;318:291-30.

22. Fardon DF, Milette PC. Nomenclature and classification of lumbar disc pathology. Recommendations of the Combined task Forces of the North American Spine Society, American Society of

33. Gerald L. Burke. "Backache: From Occiput to Coccyx". MacDonald Publishing. 2013;66-80.
34. Modic MT, Steinberg PM, Ross JS, et al. Degenerative disk disease: assessment of changes in vertebral body marrow with MR imaging. Radiology 1988; 166:193–199
35. Kuisma M, Karppinen J, Niinimaki J, et al. Modic changes in endplates of lumbarvertebral bodies: prevalence and association with low back and sciatic pain among middle-aged male workers. Spine 2007; 32:1116 –1122
36. Mitra A, Harlin S. Treatment of massive thoracolumbar wounds and vertebral osteomyelitis following scoliosis surgery. Plast Reconstr Surg 2004; 113:206 –213
37. Fryer G., Morris T., Gibbons P. Paraspinal muscles and intervertebral dysfunction: part one. J Manipulative Physiol Ther. 2004;27:267–274.
38. Fryer G., Morris T., Gibbons P. Paraspinal muscles and intervertebral dysfunction: part two. J Manipulative Physiol Ther. 2004;27:348–357.
39. Ahern D., Hannon D., Goreczny A., Follick M., Parziale J. Correlation of chronic lowback pain behavior and muscle function examination of the flexion-relaxation response. Spine. 1990;15:92–95.
40. Kosuda S, Kaji T, Yokoyama H, et al. Does bone SPECT actually have lower sensitivity for detecting vertebral metastasis than MRI? J Nucl Med 1996; 37:975 –978 39.
41.Tins BJ, Cassar-Pullicino VN, Lalam RK. Magnetic resonance imaging of spinal infection. Top Magn Reson Imaging 2007; 18:213 –222.
42. Bao-Gau Peng . pathophysilogy , diagnosis , and treatment of discogenic low back pain . Word Journal of orthopedics . 2013April ;18. 4(2):42-52
Spine Radiology, and American Society of Neuroradiology. Spine 2001;26(5):93-113.
23. Jarvik JG. Imaging of adults with low back pain in the primary care meeting .Neuroimaging Clin N Am 2003; 13(2):293-305.
24.Caring for Patients with Chronic Pain: Journal of the American Osteopathic Association 2013; **113** (8): 620–627.
25. Bogduk N . Clinical anatomy of the lumbar spine and sacrum (4th ed.). Edinburgh: Churchill Livingstone.2005;4th ed:20-27.
26. Jarvik JG, Deyo RA. Diagnostic evaluation of low back pain with emphasis on imaging. Ann Intern Med 2002;137:586–97.
27. Koeller W, Muehlhaus S, Meier W. Biomechanical properties of human intervertebral discs subjected to axial dynamic compression – influence of age and degeneration.
J. Biomech 1986; 19:807–816.
28. De Palma Mj,Ketchum JM,Saullo T.What is the source of chronic low back pain and dose age pale a role ?Pain Med. 2011;12:224-233
29. Jeroen C .Nana K,Johannes B, Charles B, Frans J,Wilco C,Patrick M,Gerard J.Obervation variation in MRI evaluation of patients suspected of lumber disk hernation .AJR.2005;299.
30.Nada R.Alharis.Magnetic Resonance Imaging of lumber spine in people without back pain Kufa medical journal 2010;vol.13.No.2:141-145.
31. Keith L.Moore, Anne M.R. Agur ; in collaboration with and with content provided by Arthur F. Dalley II ; with the expertise of medical illustrator Valerie Oxorn and the developmental assistance of Marion E. (2007);3rd edition .p500.
32. Bogduk N (2004) Management of chronic low back pain. *Medical Journal of Australia* 180 (2), 79–84.