Original Article

Magnetic Resonance Imaging of Lumbosacral Spine to determine the cause of Sciatica

1. Kiran Fatima Farooq 2. Farkhanda Akhtar Abbasi

1. Sr. Registrar Dept. of Radiology, Foundation University Medical College, Islamabad 2. Sr. Registrar, Dept. of Radiology, Benazir Bhutto Hospital, Rawalpindi

ABSTRACT

Objective: To analyze the lumbosacral spine using MRI to determine the most common pathology responsible for sciatica.

Study Design: Descriptive cross sectional study

Place and Duration of Study: This study was conducted at the Department of Radiology, Military Hospital Rawalpindi from October 2005 to April 2006.

Materials and Methods: One hundred patients presenting with unilateral or bilateral sciatica were studied. MRI lumbo-sacral spine was the modality used to determine the anatomical factors responsible for sciatica. These factors included disc prolapse, osteophytes formation, and thickening of ligamentum flavum.

Results: It was seen that prolapsed disc was the most common cause of sciatica (found in 71% of the patients). Out of these cases, disc bulge was found in 50% of the patients, protrusion / herniation in 37%, and an extruded disc fragment in 7%. Osteophytes and hypertrophied facet joints were seen in 7% of the cases, while ligamenta flava were thickened in 22%. 38% of the patients were in the 4th decade of life.

Conclusion: Disc bulge is the most common pathology of lumbosacral spine in patients presenting with sciatica.

Key Words: sciatica, intervertebral disc

INTRODUCTION

Sciatic nerve is the longest nerve in the body. The term "sciatica" refers to the pain that radiates along the path of this nerve, from lower back into the buttocks and legs. The discomfort can range from mild to moderate incapacitation. It can be accompanied by muscle weakness, numbness or tingling sensation. Rather than a disease by itself, sciatica is the symptom of pathology, such as a herniated disc that puts pressure on the nerve. [1]

The first clinical clue to neurologic impairment usually is a history of sciatica: sharp pain radiating down the posterior or lateral aspect of the leg, often associated with numbness or paresthesia. Pain radiating below the knee as opposed to pain limited to the buttocks or thigh is more likely to represent true radiculopathy. Pain is sometimes aggravated by coughing, sneezing or the Valsalva maneuver. [2]

The most common cause of sciatica is a herniated intervertebral disc, which occurs most commonly between the ages of 30 and 55 years. Imaging identifies herniated discs in many persons with low back pain [3-6]; thus only minorities of these discs are therapeutically important. [7, 8]

More than 95% of clinically important lumbar disc herniations occur at the two lowest discs and involve the L5 or S1 nerve roots. Thus the most common neurological syndromes are weakness of the ankle and great toe, sensory loss along the medial foot (L5) or diminished planter reflex and sensory loss along lateral aspect of foot (S1). [9, 10]

Spinal stenosis may be caused by bone (e.g. facet hypertrophy), soft tissue (e.g. bulging disc or thickened ligamentum flavum) or both. Like other degenerative conditions, it is more common in older adults. As many as 20% of asymptomatic adults 60 years or older have imaging evidence of spinal stenosis [3], but the prevalence of symptomatic stenosis is unknown.

The spinal canal is bound anteriorly by vertebral bodies and intervertebral discs, backed by the posterior longitudinal ligaments. Posterolaterally it is limited by pedicles and laminae lined by ligamenta flava. The spinal cord descends from the medulla oblongata, commencing at about the level of foramen magnum, and terminates at the conus medullaris, which lies between the lower border of 12th dorsal and upper border of 3rd lumbar vertebra. The nerve roots pass laterally from the anterolateral and posterolateral margins of the cord at each segment. [11] The nucleus pulposus of an intervertebral disc represents the remains of the notochord. The annulus fibrosis of the intervertebral disc is derived from the mesenchyme between adjacent vertebral bodies. [12]

On MRI scans, the annulus fibrosis, spinal ligaments, dura matter and cortical bone of vertebrae give low signals. The epidural and para spinal fat provide high signal intensity on most commonly used sequences. The gel of nucleus pulposus of the normal intervertebral disc gives high signal intensity on T2 weighted sequences. In this way the gross anatomy is well shown. [11]

MRI provides clinician with a non-invasive mechanism for viewing lumbar anatomy in great detail. [13] Only limitation of MRI is patients with metallic implants. It

is also not recommended in first trimester of pregnancy [14]

Anatomy is best studied with T1-weighted images. T2-weighted acquisitions yield physiologic information about the disc and opacify the thecal space and its contents. [15]

MATERIALS AND METHODS

This descriptive study was carried out at Radiology Department, Military Hospital Rawalpindi. It was of 6 months duration from October 2005 to April 2006.

The sampling technique was non-probability purposive. Hundred voluntarily participating patients were selected, irrespective of gender.

Presenting complaints were unilateral or bilateral sciatica. Patients suffering from trauma, chronic debilitating disease, and bed ridden patients were excluded.

Non-contrast MRI scan of the lumbosacral spine was performed to diagnose sciatica by observing different components of the lumbosacral spine. Quantum gradient 1.5 Tesla Magnetom Symphony MRI scanner was used. MRI protocol included T1 and T2 weighted images in both axial and sagittal sections. Plain MR myelography images were also taken. Slice thickness was 04mm and distance factor was 10%.

Disc morphology and position of disc prolapse were studied. Presence of osteophytes, facet joint hypertrophy and thickness of ligamenta flava was noted. Patients' age and gender were recorded.

For classifying disc prolapse into bulge, protrusion and extrusion, classification introduced by Jenson et al was used [16]

Bulging was defined as circumferential extension of the disc beyond the endplates.

Protrusion was referred to as focal or asymmetric protrusion of the disc beyond the endplates but in connection with the parent disc and with the base of protrusion broader than any other dimension.

Extrusion was defined as focal protrusion of the disc beyond the end plates without connection with the parent disc.

RESULTS

Patients were between 20-70 years of age. 67 of them were males while 33 were females. There was no previous history of spinal surgery or spinal tumor. None of the subjects dropped out or were lost in any part of the study.

38% of the patients presented with right sided sciatica. Left sided sciatica was the presenting complaint in 54% patients while 8% had bilateral sciatica.

04 patients showed no abnormal findings on MRI of lumbosacral spine. In patients with abnormal findings, prolapsed disc was the most common cause (71%). Out of these cases, disc bulge was found in 50% of the patients, protrusion / herniation in 37%, and an extruded disc fragment in 7%. Disc prolapse was posterolateral in 38%, central posterior in 37% and para central in 21% of the patients.

7% of the patients showed osteophytes formation as well as hypertrophied facet joints. Ligamenta flava was found to be thickened in 22% of the cases.

Patients were divided into age brackets, with each bracket representing a decade. 38% of the patients presented in the 4th decade of life i.e. between 31-40 years. Mean age of presentation was 41.45 years with standard deviation of 9.48.

DISCUSSION

Sciatica is a major public health problem because of its high prevalence. Lifetime prevalence in developed countries is estimated up to 84% in the general population. [17]

Out of the 100 patients in this study, 67 were males and 33 were females. In an international study, it was seen that sciatica is most common among blue collar workers and motor vehicle drivers. [18]

In another international study, it was noted that males are more commonly affected than females in cases of lumbar disc herniations by a ratio of 3:2. Prolonged exposure to a bent forward working posture is correlated with increased incidence of herniated intervertebral discs. [19] In our society, majority of the drivers as well as office workers are males. This explains the high prevalence of the disease in male patients.

Disc bulge was the most commonly encountered variety of disc prolapse with 50% of the patients showing a bulging disc on MRI. This finding follows the result of a national study, [20] which states that disc bulge is the most pattern of disc disease. However, in another national study conducted in the Radiology Department of Aga Khan University Hospital Karachi, it was seen that disc herniation was the most frequent finding. Disc extrusion was seen in 18% of patients. [14] In quite a similar international study in which abnormal MRI findings and their prevalence and associations with low back pain were studied in 40 year old patients, the results showed that about 25-50% of patients showed disc bulge. [21]

Other findings seen in patients presenting with bilateral sciatica were facet joint hypertrophy and osteophytosis. 7% of the patients showed osteophytes formation and hypertrophied fact joints. Out of this, majority of the patients gave history of bilateral sciatica. It showed that patients with bilateral sciatica had more degenerative changes.

Maximum number of patients (38%) were in their 4th decade of life i.e. 31-40 years of age. 31% belonged to the 41-50 years age bracket. Only one patient presented in the 7th decade of life. In one of the international studies, it was stated that peak age for occurrence of disc prolapse is between 20-45 years. [19] In a national

study, it was seen that disc disease is most common in the 30-39 year age group. [20] The results of my study have also verified these findings.

In a study connected in the Department of Neurosurgery, Lahore General Hospital Lahore, it was observed that the largest number of patients (35%) presented in fourth decade of life. 90.6% patients had prolapsed intervertebral disc at a single level and 9.4% at multiple levels. Most of the patients (92.4%) had a prolapsed disc at L4-5 and L5-S1 levels. [22]

CONCLUSION

It is concluded that prolapsed disc is the most common cause of sciatica. Out of the three categories of prolapsed disc i.e. bulge, protrusion and extrusion, disc bulge accounts for the commonest pathology.

REFERENCES

1. Pain management centre: sciatica [on line] 2004 [cited2006 Feb 22]. Available from: URL:htp:// www.mayoclinic.com/invoke.cfm.html
2. Jeffrey GJ, Richard AD. Diagnostic evaluation of low back pain with emphasis on imaging. Annals of Internal Medicine 2002;137 (7):586-597.
3. Boden SD, Davis DO, Dina TS, Patronas NJ, Wiesel SW. Abnormal magnetic –resonance scans of the lumbar spine in asymptomatic subjects. A perspective investigation. J Bone Joint Surg Am 1990;72:403-8.
4. Jensen MC, Brant-Zawadzki MN, Obuchowski N, Modic MT, Malkasian D, Ross JS. magnetic resonance imaging of the lumbar spine in people without back pain. N Engl J Med 1994;331:69-73.
5. Boos N, Rieder R, Schade V, Spratt KF, Semmer N, Aebi M. 1995 Volvo Award in clinical sciences. The diagnostic accuracy of magnetic resonance imaging, work perception, and psychosocial factors in identifying symptomatic disc herniations Spine. 1995; 20:2613-25
6. Jarvik JJ, Hollingworth W, Heagerty P, Haynor DR, Deyo RA. The Longitudinal Assessment of Imaging and Disability of the Back (LAID Back) Study: baseline data Spine 2001;26:1158-66.
7. Deyo RA, Tsui-Wu YJ. Descriptive epidemiology of low-back pain and its related medical care in the United States spine 1987;12:264-8.
8. Currey HL, Greenwood RM, Lioyd GG, Murray RS. A prospective study of low back pain. Hematology Rehabilitation 1979; 18:94-104.
9. Deyo RA, Rainville J, Kent DL. What can the history and physical examination tell us about low back pain? JAMA 1992;268:760-5
10. Van Den, Hoogen HM, Koes BW, Van Ejik 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 spine. 1995; 20: 318-27
11. John M. Stevens, Brain E. Kendall. Neuroradiology of the spine. In: Sutton D, editor. text book of radiology and imaging. 7th ed. Churchill Livingstone; 2003.p.1649-50.
12. McMinn RMH, Hutchings RTA Colour atlas of human anatomy. 3rd ed. England: Wolfe Publications Ltd;1993.p.93.
13. Beattie PF, Meyers SP, Stratford P, Millard RW, Hollenberg GM. Associations between patient report of symptoms and anatomic impairment visible on lumbar magnetic resonance imaging. Spine 2000; 25: 819-399.
14. Siddique AH, Rafique MZ, Ahmad MN, Usman MU. Role of magnetic resonance imaging in lumbar spondylosis. J Coll Physicians Surg Pak 2005; 15:396-399.
15. Louis W, Stanley MP. Magnetic resonance imaging of cdegenerative diseseses of the spine. In Richard EL MR CT imaging of the head, neck and spine. 2nd ed. Mosby-Year book ;1991.p. 1147-1156.
16. Brant-Zawadzki MN, Jensen MC, Obuchowski N, Ross JS, Modic MT. Interobserver and intraobserver variability in interpretation of lumbar disc abnormalities. A comparison of two nomenclatures. Spine 1995;20:1257-63.
17. Walker BF. The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. J Spinal Disord 2000; 13:205–17.
18. Heliovaara M. occupation and risk of herniated lumbar intervertebral disc or sciatica leading to hospitalization. J Chronics Dis 1987;40 (3):259-64.
19. Jeffrey PL. Herniated Disc. Health A to Z [on line] last updated March 2006 cited [29 March 2006]. Available from: URL : http://www.healthatoz.com/
20. Iftikhar AB, Noman M, Javed M, Faisal N, Humanyun P. Magnetic resonance patterns of lumbar disc disease. J Rawal Med Coll Dec 2004; 8(2):53-56.
21. Kjaer P. Leboeuf-Yde C. Korsholm L. Sorchsen JS. Bendix T. Magnetic resonance imaging and low back pain in adults: a diagnostic imaging study of 40-year-old men and women. Spine 2005;30(10): 1173-80.
22. Manzoor A. Nazir A. Iftikhar AR. Lumbar intervertebral disc herniation : Age distribution and patterns of Herniation. Ann King Edward Med Coll March 1999;5(1):85-7.

Address for Corresponding Author:
Dr Kiran Fatima Farooq,
House No. 9, Golf Road, Rawalpindi
Tel: 0321-5070969
Email: kiraniftikhar@ymail.com