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Plain Radiograph and MRI Correlation of Low Back Ache in Young Adults

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Original Research Article

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Abstract: To evaluate the role of plain radiograph in young adults with low back ache and its correlation with MRI. A descriptive study involving 150 patients with low backache, referred to the Radiology department in Sree Balaji Medical College and Hospital, for plain radiographic and MR imaging evaluation over a period between March 2016 and April 2017. All patients referred for radiological evaluation of low backache in the age group of 20 – 40 years and of both sexes were included in the study. After getting detailed history of the patient, Plain radiography of lumbosacral spine in antero-posterior and lateral projection was taken followed by MR imaging of spine done by using the following sequences. Plain radiography is an excellent modality in evaluating the causes for lumbar pain as a primary or a screening tool. Various pathologies evaluated using plain radiography like osteophytes, spondylolisthesis, spondylolysis, and facetal joint arthrosis were either equal to or more sensitive in diagnosing than magnetic resonance imaging. Except disc changes which were evaluated using plain radiography are less sensitive and specific than Magnetic resonance imaging. Various pathologies like disc changes, thecal sac indentation, annular tear and others found in this study could not be evaluated by plain radiograph and leaves a large vacuum in diagnosing the etiologies of low back ache.
Keywords: Backache, plain radiographic, osteophytes, spondylolisthesis, spondylolysis.

INTRODUCTION

Low back ache is one of the most common reasons for patients to visit a physician and 80% to 90% of the population will experience this problem at some time in their life [1]. Low back ache can be acute or chronic. A complicated acute low backache is one when the pain or weakness lasts longer than six weeks. The indications of a complicated status include recent trauma in age group >50 years, unexplained weight loss or fever, immunosuppression, history of malignancy, IV drug abuse; prolonged corticosteroid use, osteoporosis, age>70 years, focal neurological deficit with progressive or disabling symptoms [2].

These patients require radiological evaluation in their work up for low back pain. Without these indications in the history or physical examination, conservative care with patient education is the first step in pain management [1]. About 70% of acute low back ache is attributed to spinal muscle strain or ligament injury (sprain) [3, 4]. Most of the patients with uncomplicated acute lumbago, abenign self-limited condition, return back to their usual activities in about a month [5, 6]. The challenge for the clinicians to distinguish that small percentage of patients from the larger population, for further evaluation to rule out any severe cause. Low back ache may be related to certain activities, poor posture, physical or psychological stress. Most acute back pain is mechanical in nature, as a result of either trauma to the lower back or a disorder such as arthritis. The purpose of diagnostic imaging is to provide accurate anatomical information and perhaps most importantly, to influence the therapeutic decision-making process. The role of diagnostic imaging in patients with low back pain is an important one in today's health care environment [7].

Plain radiography, computed tomography (CT) and magnetic resonance imaging (MRI) is the mainstay in radiographic evaluation of the lumbosacral spine. Initial evaluation with plain radiograph is recommended when any of the indications of a complicated acute low backache represent. Further evaluation with CT or MRI imaging may be justified to rule out suspected infection or tumor in patients with indicators of a complicated acute low backache. With its high contrast and spatial resolution and lack of ionizing radiation, MRI is the best imaging technique for non-invasive imaging of the spine [8, 9].

AIM AND OBJECTIVES

To evaluate the role of plain radiograph in young adults with low back ache and its correlation with MRI

MATERIALS AND METHODS

A descriptive study involving 150 patients with low backache, referred to the Radiology department in Sree Balaji Medical College and Hospital, for plain radiographic and MR imaging evaluation over a period between March 2016 and April 2017.

Patient selection

All patients referred for radiological evaluation of low backache in the age group of 20 – 40 years and of both sexeswere included in the study. Patients with contraindications to MR imaging and history of trauma were not included in the study

Procedure

After getting detailed history of the patient, Plain radiography of lumbosacral spine in antero-posterior and lateral projection was taken followed by MR imaging of spine done by using the following sequences.

Table-1: MRI plane and sequences for imaging the spine

Plane	Sequence	Repetition time (TR)	Echo Time (TE)	Slice thickness	FoV (in mm)
Sagittal	T1	528	14	4	350
Sagittal	T2	3330	120	4	350
Sagittal	STIR	3600	20	5	350
Axial	T2	4540	100	4	270
Coronal	STIR	6600	20	5	350

Scanning was performed extending from lower thoracic (T10) to lumbosacral region.

Plain radiography and MRI were reviewed by two radiologists separately without one influencing the findings of other. Results were then recorded and compared.

RESULTS

MRI showed osteophytes in 58 patients but on Plain radiography 64 patients had steophytes in their lumbar vertebrae. The pvalue of the comparison is >.05 thus showing no significant sensitivity of MRI over plain radiography. Spondylolisthesis was noted in 10 males by MRI and in 9 males by plain radiography, and in 18 females both by plain radiography and MRI. Spondylolysis was noted in 4 males and 5 females both by plain radiography and MRI. Most commonly affected was L5-S1 level (Fig.1). Facetal joint arthrosis was noted in 24 males by plain radiography and in 27 males by MRI, and in 20 females by plain radiography and in 23 females by MRI (Fig. 2).

Fig-1: Plain radiograph AP (a) and Lateral (b) showing spondylolisthesis of L5 over S1 vertebra and spondylolysis of L5 vertebra, the same can be seen on T2 sagittal MRI (c) image.

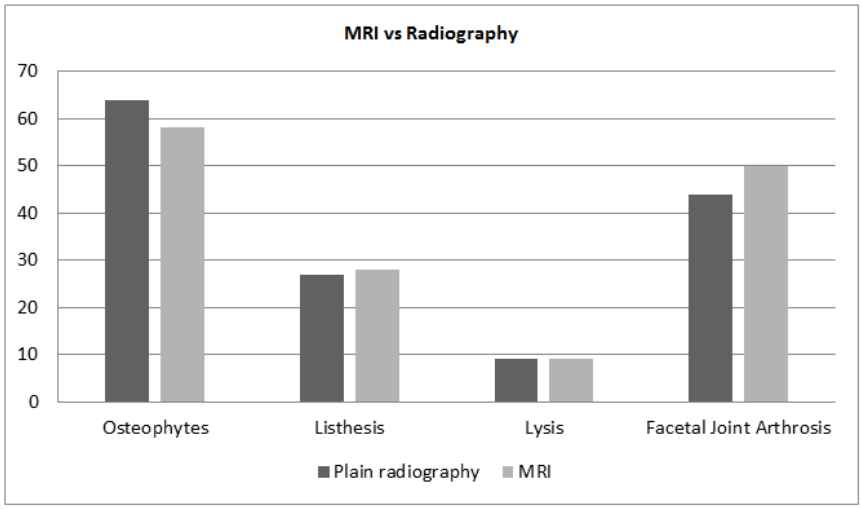

Fig-2: MRI vs Radiography

Disc height reduction was noted in 14 patients by plain radiography and in 16 patients by MRI at L1-L2 level, in 25 patients both by Plain radiography and MRI at L2-L3 level, in 44 patients by plain radiography and in 51 patients by MRI at L3-L4 level, in 50 patients by plain radiography and in 68 patients by MRI at L4-L5 level, and in 37 patients by plain radiography and in 48 patients by MRI at L5-S1 level (Table2) (Fig. 3).

Table-2: Disc Changes – Radiography vs MRI

Disc	L1-L2		L2-L3		L3-L4		L4-L5		L5-S1	
	Rad.	MRI	Rad.	MRI	Rad.	MRI	Rad.	MRI	Rad.	MRI
Number	25	27	50	50	94	106	110	143	86	103

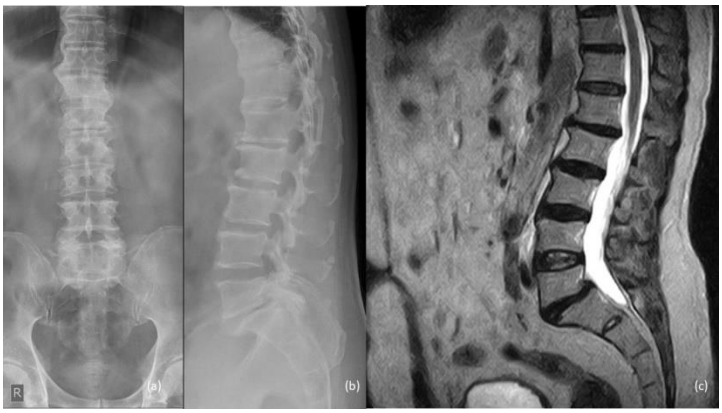

Fig-3: Plain radiograph AP (a) and Lateral (b) showing L5-S1 intervertebral disc space reduced, the same can be seen on T2 sagittal MRI (c) image but added information about cord indentation can be made out

DISCUSSIONS

A meta-analysis of 6 randomized trials comprising 1804 patients with primarily acute or sub-acute low back pain and no clinical or historical features suggestive of a specific underlying condition, found no differences between routine lumbar imaging (radiography, MRI or CT) and usual care without routine imaging in terms of pain, function, quality of life, or overall patient rated improvement[10]. The conclusions of the meta-analysis did not seem to be affected by whether radiography or advanced imaging (MRI or CT) was evaluated. On the basis of the systematic review, routine imaging can be considered a low-value health care intervention; because it is more costly than usual care without routine imaging and offers no clear clinical advantages, it cannot be cost-effective [10].

In our study we found that plain radiography was limited in evaluating the etiologies for low back ache as it couldn't assess the endplate changes, ligamentum flavum status, thecal sac indentation, annular tear of disc which could be clearly evaluated by MR imaging.

Osteophytes

In our study osteophytes was the most common finding (37% of the cases) for low back ache and same was seen by de Schepper *et al*. (28% of the

cases) [11]. In the study done by De schepper *et al*. osteophytes were more common among males than females but in our study we found it was more common among females (43%) than males (41%), though the difference is not significant but it is marginally higher. Osteophytes were most commonly seen at L4-L5 among both males (44%) and females (51%) but in a study by de Schepper *et al.* L4-L5 level was the most commonly involved among the total study population, and most common at L2-L3 levels among females (25%) and L3-L4 level among males (35%) [11].

Disc changes

On plain radiography only disc height could be assessed whereas on MRI disc degeneration, disc bulge and disc herniation could also be assessed. Murata *et al*. [12] showed that disc height reduction on plain radiography appears more easily in high grade (>grade 3) degeneration whereas it more subtle in low grade (1 and 2), in our study we found that disc height reduction was noted only 170 discs by plain radiography, whereas 208 discs by MRI showing statistical significance (p value = 0.037) that MRI is better at depicting disc degenerative changes compared to radiographic disc height reduction.

Facetal Joint Arthrosis

Abbas J *et al.* [13] in their study on prevalence of facet joint arthrosis in general and stenosis populations and to establish its relationship to age and sex, concluded that facet joint arthrosis is an age-dependent (increases with age) and BMI and sex independent phenomenon and its prevalence increased cepahlo-caudally with its highest frequency at L5-S1 level. In the stenotic group, the highest frequency was observed at L4-L5 and L5-S1 levels. In our study we also found that the L4-L5 level was the most affected by facetal joint arthrosis – 31 patients with multilevel facets involved and 8 patients having arthrosis only at this level, followed by L5-S1 – 24 patients with multilevel facets involved and 7 patients having arthrosis only at this level.

Spondylolysis and Spondylolisthesis

Yamaguchi *et al*. [14] found in their study that MRI is less sensitive in diagnosing spondylolysis as it missed ~ 64% cases of spondylolysis whereas plain radiography missed only 50% of the cases with CT as the gold standard. Other studies done by saifuddin *et al.* [15], ulmer *et al.* [16], and campbell *et al*. [17] also showed that plain radiography is more sensitive than MRI in diagnosing lumbar spondylolysis. In our study we found that spondylolysis was diagnosed equally by both plain radiography and MRI. In a study done by Niggemann *et al*. [18] 5.6% were unilateral and 94.4% were bilateral and most commonly affected was L5-S1 level, whereas in our study 67% were bilateral and 33% were unilateral with most common being L5-S1 level as well. Niggemann *et al.* [18] found in their study that 83% of the patients with spondylolysis had spondylolisthesis. In our study we found that 28 patients had spondylolisthesis with 19 cases having anterolistheis while the rest having retrolisthesis and all the patients having spondylolysis had spondylolisthesis, but not all patients having spondylolisthesis had spondylolysis.

Synovial Cysts

Doyle AJ *et al.* [19] in their review of patients with degenerative facet disease found that synovial cysts occurred at anterior or intraspinal location in 2.3% of cases and posterior or extra-spinal location in 7.3%. In our study we found that no patients presented with synovial cysts in facetal joint arthrosis patients. Plain radiography plays no role in diagnosing synovial cysts. In our study we found that plain radiography was limited in evaluating the etiologies for low back ache as it couldn't assess the endplate changes, synovial cysts, ligamentum flavum status, thecal sac indentation (Fig. 4), annular tear of disc which could be clearly evaluated by MR imaging.

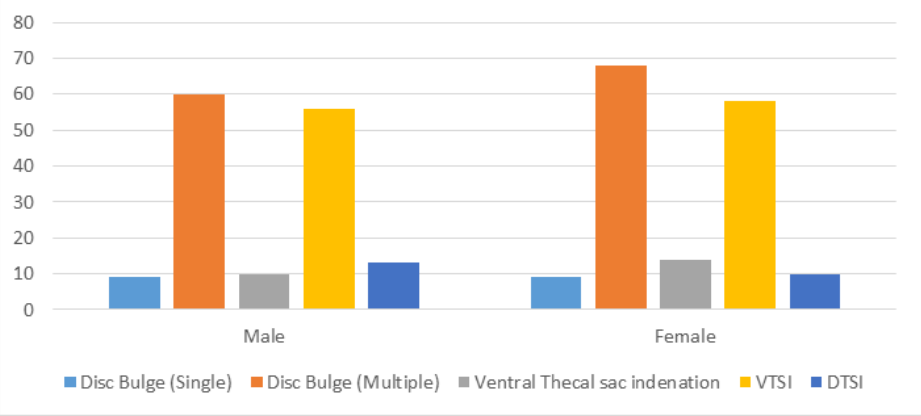

Fig-4: Pathologies noted on MRI

CONCLUSION

Plain radiography is an excellent modality in evaluating the causes for lumbar pain as a primary or a screening tool. Various pathologies evaluated using plain radiography like osteophytes; spondylolisthesis, spondylolysis, and facetal joint arthrosis were either

equal to or more sensitive in diagnosing than magnetic resonance imaging. Except disc changes which were evaluated using plain radiography are less sensitive and specific than Magnetic resonance imaging. Various pathologies like disc changes, thecal sac indentation, annular tear and others found in this study could not be evaluated by plain radiograph and leaves a large vacuum in diagnosing the etiologies of low back ache.

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