Original Article

A Clinico-Radiological correlation of patients with Lumbar spinal instability

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Abstract

Background: According to the American Academy of Orthopaedic Surgeons, instability was defined as an abnormal response to applied loads, characterized by movement in the motion segment beyond normal constraints in 1989. **Material and methods:** This was an observation study in which patients of age group 30-70 of which 11 male and 19 females with history suggestive of lumbar spinal instability with other condition were evaluated clinically and radiologically from December 2006 to September 2008 with clinical tests and with static and dynamic X-rays. Chi-square test was used. **Results:** In our study we have found that the majority of the patients were in the age group of 51-60 yrs. i.e. 36.7% followed by 41-50 yrs. i.e. 33.3%. The majority of the patients were Female i.e. 63.3% followed by Male 36.7%. Neurodeficit was present in 73.3% persons and absent 29.7% . The most common level of instability was at L5-S1 i.e. 70.00% followed by 10.0% at L4-L5 and at L4-L5&L5-S1 in 10.0% respectively. Increase lordosis was present in 66.6% followed by Decrease lordosis in 20.0% and Scoliosis was present in 13.3% PLE (passive Lumbar Extension Test) was positive in 83.3 % and was absent in 16.7% patients. Sagittal translation instability was present in 66.7 % patients Angular instability was present in 10.00% patients, Rotational Instability was present in 16.7% of the patients, Coronal translation instability found in 3.3% Patients, clinical instability was present in 93.3% of the Patients Radiological instability was present in 76.7% of the patients. No any significant difference seen in Clinico- Radiological instability (χ^2=0.652, P>0.05-Not significant). **Conclusion:** Degenerative spinal instability was more common in females and more common in age group of 50-60 yrs. most common type of instability is sagittal translational instability and statically there was no difference in Radiological and clinical diagnosis so there was good correlation.

Key words: Spinal instability, PLE (passive Lumbar Extension Test, Radiological instability

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Received Date: 16/03/2017 Revised Date: 27/04/2017 Accepted Date: 20/05/2017

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 26 May 2017

INTRODUCTION

According to the American Academy of Orthopaedic Surgeons, instability was defined as an abnormal response to applied loads, characterized by movement in the motion segment beyond normal constraints in 1989. Segmental instability has been defined as occurring in patients with low back problems and whose clinical status is unstable, with symptoms fluctuating between mild and severe symptoms in response to even minor provocations. The validity of these clinical definitions has not been demonstrated. Frymoyer *et al* defined segmental instability as "a condition where there is loss of spinal stiffness, such that normally tolerated external loads will result in pain"[1,2]. Clinical criteria for lumbar spine instability have not yet been clearly defined [3]. Recurrent, acute episodes of low back pain produced by mechanical stresses have been considered to be indicative of instability. If a full return from the bent position fails because of a sudden attack of low back pain (i.e., instability catch), if a patient is unable to get a raised, straightened leg to move down and suddenly drops the leg due to a sharp pain in the low back(ie, painful catch), and

How to site this article: Ajay Gour, Atul Patil. A Clinico-Radiological correlation of patients with Lumbar spinal instability. *MedPulse – International Medical Journal.* May 2017; 4(5): 701-705. http://www.medpulse.in (accessed 28 May 2017).

if a patient feels anxiety resulting from a sensation of collapse of the low back because of a sudden attack of back pain during movement (ie, apprehension), the patient fulfills the three criteria for instability described by Kotilainen and Valtonen. A loss of tone in the legs or in the low back and pelvic region (ie, giving away phenomenon) has also been observed in some patients with lumbar instability. However, these clinical criteria have not been rigorously evaluated. Iguchi *et al* [4] measured sagittal segmental instability at L4/ L5 disc using three lateral radiographs at neutral, extension, and flexion position, was assessed by three variables: L4 anterior slip on L5 in neutral position (SN), sagittal translation (ST), and segmental angulation (SA) using the method basically described by White and Panjabi, which has only three landmarks for the measurement: the anterior edge and the posterior edge of upper endplate of L5, and the inferior posterior edge of L4. 447 patients, 268 men and 179 women, were included in this study and their age range varied from 10 to 86 years (mean ± SD: 53.0 ± 19.8) In all patients were performed MRI study to evaluate the disc height and grade of degeneration. The disc height showed an intimate relationship with age and instability, and furthermore the principal part of the instability factors changed across age decades: ≥ 10° angulation, ≥ 3 mm translation, and finally ≥ 3 mm slip. Combination of the ≥ 3 mm slip and the ≥ 3 mm translation were closely related to severe symptoms and considered to be critical for surgical indication [5,6]. Maigne *et al* studied 42 patients with low back pain occurring immediately on sitting down and relieved on standing up. Comparing clinical, radiographic, and magnetic resonance data they found an important association between symptom and imaging signs of instability (100% specificity, 31% sensitivity) or severe anterior loss of disk space in flexion (87% specificity, 55% sensitivity) [7]. MR imaging is generally considered to be the most valuable method to diagnose degenerative abnormalities of the spine, except for the vacuum phenomenon, and it is often considered the most useful modality for evaluation of myelopathy, radiculopathy, and low back pain requiring advanced imaging. Identification of patients with an increased chance of instability on MR images can be clinically relevant and can influence indications for flexion-extension radiography [6]. The superior contrast resolution of MRI depicts the soft tissue anatomy of the spine better than plain films and CT. The spinal cord, nerve roots, cerebral spine fluid (CSF), vertebrae, discs, and ligaments can be exquisitely resolved and distinctly visualized[8].

MATERIAL AND METHODS

This was an observation study in which patients of age group 30-70 of which 11 male and 19 females with history suggestive of lumbar spinal instability with other condition were evaluated clinically and radiologically from December 2006 to September 2008 with clinical tests and with static and dynamic X-rays. Patients with age group of 30-70**,** With low back pain, Patients with degenerative spine disease**,** Patients with low back pain were included into the study and traumatic instability, instability due to infection, Instability due to tumors, Latrogenic instability were excluded from the study. Chi-square test was used for statistical analysis.

RESULTS

Table 1: Age wise distribution of study participants

Age	Frequency	Percent
30-40 yrs	5	16.7
41-50 yrs	10	33.3
51-60 yrs	11	36.7
61-70 yrs	4	13.3
Total	**30**	**100.0**

The majority of the patients were in the age group of 51-60 yrs. i.e. 36.7% followed by 41-50 yrs. i.e. 33.3%.

Table 2: Sex wise distribution of study participants

Sex	Frequency	Percent
Female	19	63.3
Male	11	36.7
Total	**30**	**100.0**

The majority of the patients were Female i.e. 63.3% followed by Male 36.7%

Table 3: Neurodeficit

	Frequency	Percent
Negative	8	29.7
Positive	22	73.3
Total	**30**	**100.0**

Neurodeficit was present in 73.3 % persons and absent 29.7%

Table 4: Level of instability

Spinal level	Frequency	Percent
L1 to L5	1	3.3.
L2 to L5	1	3.3
L3-L4	1	3.3
L4-L5	3	10.0
L4-L5andL5-S1	3	10.0
L5-S1	21	70.0
Total	**30**	**100.0**

The most common level of instability was at L5-S1 i.e. 70.00% followed by 10.0% at L4-L5 and at L4-L5andL5-S1 in 10.0% respectively.

Table 5: Deformity

	Frequency	Percent
Increase lordosis	20	66.6
Decrease lordosis	6	20.0
Scoliosis	4	13.3
Total	**30**	**100.0**

Increase lordosis was present in 66.6% followed by Decrease lordosis in 20.0% and Scoliosis was present in 13.3%

Table 6: PLE (passive Lumbar Extension Test)

	Frequency	Percent
Negative	5	16.7
Positive	25	83.3
Total	**30**	**100.0**

PLE (passive Lumbar Extension Test) was positive in 83.3% and was absent in 16.7% patients.

Table 7: Sagittal translation instability

	Frequency	Percent
Negative	10	33.3
Positive	20	66.7
Total	**30**	**100.0**

Sagittal translation instability was present in 66.7% patients

Table 8: Angular instability

	Frequency	Percent
Negative	27	90.0
Positive	3	10.0
Total	**30**	**100.0**

Angular instability was present in 10.00% patients

Table 9: Rotational Instability

	Frequency	Percent
Negative	25	83.3
Positive	5	16.7
Total	**30**	**100.0**

Rotational Instability was present in 16.7% of the patients.

Table 10: Coronal translation instability

	Frequency	Percent
Negative	29	96.7
Positive	1	3.3
Total	**30**	**100.0**

Coronal translation instability found in 3.3% Patients

Table 11: Clinical instability

	Frequency	Percent
Negative	2	6.7
Positive	28	93.3
Total	**30**	**100.0**

Clinical instability was present in 93.3 % of the Patients

Table 12: Radiological instability

	Frequency	Percent
Negative	7	23.3
Positive	23	76.7
Total	**30**	**100.0**

Radiological instability was present in 76.7% of the patients.

Table 13: Clinico-Radiological Correlation

Radiological Instability	Clinical instability	
	Negative	Positive
Negative	0	7
Positive	2	21
Total	**2**	**28**

(χ^2=0.652, P>0.05-Not significant)

No any significant difference seen in Clinico-Radiological instability (χ^2=0.652, P>0.05, Not significant)

DISCUSSION

The presence of structural defect in the inter articularies is an oblivious source of the weakness in the lumbar spine. The vertebral body of affected segment Is potentially unstable and had a natural tendency to slip forward. This is prevented only by its soft tissue attachment to adjoining vertebra. Some time the strain is too great and the slipping occurs from stretching or disruption of soft tissue. Degenerative changes in the intervertebral disc and in the facet joint or damage to intervertebral ligaments could cause a similar decrease in mechanical study tissue structures which are therefore subjected to greater strain, there is no radiological evidence of instability, however unless a slip occur as in degenerative spondylolisthesis. Although khutsson (1944) believed that parallel displacement and abnormal tilting movement between vertebrae could often be seen in flexion extension radiography before other manifestation of could often degeneration occurred. This may be earliest sign of potential instability. Spondylolisheis represents the other extreme and is the ultimate manifestation of instability. The precise origin of pain is matter of speculation. Stimulation of the annulus fibrosus of the disc during discography (Hirsh-1948) or at operation (wiberg 1949) smyth and writh (1958) will reproduce this patients pain. Injection that the increased strain thrown upon these structure in on stable back is responsible. As the strain is then taken almost entirely by ligaments. Pain is more marked at rest as the strain is almost entirely by ligament. There is little or no activity in lumbar vertebral muscle in the “stand easy” posture (joseph and mccoll 1961) movement however bringes the muscle into play and painful ligament are relived patient some of the strain. Extension of lumbar spine which support or by muscular action will have similar effect. At full flexion muscular contraction cease (Floyd and silver 1951) the ligament once more taken the strain with return of pain. Hence we suggest that not simply decompression but spinal fusion should perform for the patient with positive clinical instability but no evidence of radiological instability on functional radiography. We cannot conclude the above said in our study results because most of the patients

come to ours OPD were referred from other clinical for requested surgical treatment for lumbar spinal instability. At the initial visit they already had frank radiological instability or may present to use after frank radiological instablility developed. If study conducted with general patients with lumbar degenerative disease it is though that we can detect the instability earlier clinical before development of radiological instability. Therefore to assess the exact validity of clinical criteria for instability we suggest that a study need to be conducted with general patients with lumbar degenerative disease in the future and we should also have to include the post operative follow up of patients with spinal fusion either instrumented or non instrument in whom we are considering the clinical instability without radiological instability. Studies from the radiology literature report that MRI has a sensitivity of up to 86 %, a specificity of 82 %, a positive predictive value of 18 %, and a negative predictive value of 99 % in the diagnosis of spondylolysis. However, recent studies show that 64% of spondylolysis in symptomatic patients referred for pediatric orthopaedic surgeon if MRI was performed alone [9]. Spondylolisthesis is a debilitating chronic pathology, which generally begins with degeneration of the intervertebral discs and the facet joints, causing a narrowing of the vertebral canal and the neural foramen. A fundamental contribution to the study of this problem is provided by CT and MRI; in particular the latter enables a high degree of spatial and contrast resolution, and shows a precise evaluation of intervertebral discs, vertebrae, ligaments, spinal canal and intervertebral foramima. Despite the unquestionable diagnostic accuracy of these methods for morphological evaluation of these anatomical structures, when diagnosing foraminal stenosis, the number of false negatives is considerable, as shown in literature. Various studies conducted with CT and MRI on cadaveric experimental models underline the importance of the weight loading when examining the foramen. By subjecting in vitro cadaveric lumbar segments to movements of axial rotation, extension, bending and lateral curvature, a compression of the spinal nerve was observed, not detected by examinations without application of the weight[10-15] In our study we have found that The majority of the patients were in the age group of 51-60 yrs. i.e. 36.7% followed by 41-50 yrs. i.e. 33.3%. The majority of the patients were Female i.e. 63.3% followed by Male 36.7%. Neurodeficit was present in 73.3 % persons and absent 29.7%. The most common level of instability was at L5-S1 i.e. 70.00% followed by 10.0% at L4-L5 and at L4-L5andL5-S1 in 10.0% respectively. Increase lordosis was present in 66.6% followed by Decrease lordosis in 20.0% and Scoliosis was present in 13.3%PLE (passive Lumbar Extension Test) was positive in 83.3 % and was absent in 16.7% patients. Sagittal translation instability was present in 66.7 % patients Angular instability was present in 10.00% patients, Rotational Instability was present in 16.7% of the patients, Coronal translation instability found in 3.3% Patients, clinical instability was present in 93.3 % of the Patients Radiological instability was present in 76.7% of the patients. No any significant difference seen in Clinico- Radiological instability (χ^2 =0.652, P>0.05-Not significant)

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Source of Support: None Declared
Conflict of Interest: None Declared