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A Clinico–radiological Correlation of Patients with Lumbar Spinal Instability

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Background: A larger than normal range of motion in the spinal segment defines lumbar segmental instability, which is a sort of aberrant motion to physiologic stressors. Clinical complaints and signs such as low back ache or radiculopathy, as well as Kotilainen and Valtonen's three criteria for instability (painful catch, instability catch, and apprehension) will be correlated with an MRI investigation to determine lumbar spinal instability. Disc degeneration and facet degeneration along with soft tissues supporting spinal motion segment are important provocative factors for lumbar spine instability. The existence of lumbar instability must be identified since it can alter the treatment approach and patient prognosis.
Objective: To evaluate clinical signs and symptoms in patients with Lumbar spinal instability, as well as to investigate radiological signs using X-rays and an MRI scan.
Methods and Materials: In this study in which patients with history suggestive of Lumbar spinal instability will be evaluated clinically and radiologically. Patients of age group of 25-75 years will be included in this study. Clinical tests, static and dynamic Xrays and MRI scan will be studied.

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Expected Outcomes: By this study we can expect clinico–radiological co relation in patient with low back ache in lumbar spinal instability. Outcome data will be assessed on Clinico-radiological Criteria of Lumbar Instability and clinic-radiological correlation will be done.

Keywords: Lumbar Spinal Instability; Intervertebral Disc; Facet Joint; abnormal translation; radiological instability; disc degeneration; facet degeneration; lumbar motion segment .

1. INTRODUCTION

Clinical instability is a significant cause of low back discomfort. Lower back ache is a frequent medical problem. Low back pain affects almost half to seventy percent of people at some point in their lives. The majority of the problem is mechanical in nature, and it frequently indicates clinical spinal instability. The aberrant motion to physiologic stresses known as lumbar segmental instability is characterized by a wider range of motion than typical. Senile changes of the disc and facet joints has been linked to spinal instability in numerous studies [1,2,3]. Low back pain or radiculopathy are examples of clinical signs which might be produced by mechanical instability produced by senile alterations in these structures [4,5]. As these clinical symptoms worsens, surgical procedures such as segmental fusion, which is used when there is apparent segmental instability, can be considered. Many authors, notably Herkowitz et al., have maintained that when lumbar spinal instability exists, fusion operations should be performed, and have demonstrated that spine fusion surgery produces superior lumbar stability than decompression alone [6,6]. As a result, determining that lumbar instability is present is critical since it can alter the management protocol, outcome and the patient's prognosis. The gold standard for lumbar instability diagnosis has been standing lateral flexion-extension radiographs [7,8]. However, in recent years, MRI has become nearly universally utilized to assess lumbar illness in aged people [9].

According to M Punjabi, spine stabilizing system has three subsystems: the spinal column (providing intrinsic stability), parapinal muscles (providing dynamic stability) and control unit of the brain. Normally, Three subsystems collaborate to produce the necessary mechanical stability. Discs, ligaments, and facets are all parts of the spinal column. At least two metrics, according to Punjabi, should be used: range of motion (ROM) and neutral zone. The neutral zone is a portion of the range of motion where intervertebral motion encounters the least amount of resistance.

There have been a few studies that have looked into the use of MRI to diagnose lumbar instability with stenosis. Different imaging approaches, such as dynamic or weight bearing MRI, have been proposed. An MRI was used to determine the disc height and degree of degeneration. The disc height was found to be linked to age and instability: >10 degrees Tilt, more than 3 mm shift, and lastly more than 3 mm slip. The combination of a more than 3mm slip and more than 3mm shift was linked to significant symptoms and was regarded important for surgical indication [10,11]. Though there are no criteria clearly defined for lumbar spine instability [12], recurring acute episodes of low back pain secondary to mechanical stress are suggestive of instability. There is instability catch if the patient is unable to recover from the bending posture owing to a sudden onset of low back pain, There is a painful catch if a patient abruptly lowers the leg during a straight leg raising test owing to severe lower back discomfort and Apprehension occurs when a patient experiences a sense of lower back collapse as a result of a sudden episode of back pain while moving, the patient meets all three of Kotilainen and Valtonen's criteria for instability. In some patients a giving away phenomenon is seen in which lumbar instability with tone loss in the legs, lower back, and pelvic region occurs . On the contrary none of these clinical criteria have been completely identified.

1.1 Objectives

1. To assess clinical signs and symptoms in patients with Lumbar spinal instability.
2. To study radiological signs on MRI scan in the same group of patients.
3. The goal of this study was to see if there was a link between clinical observations and radiological markers in individuals with lumbar spinal instability.

1.2 Inclusion Criteria

1. All adult patients of low back pain with instability in degenerative spine.

1.3 Exclusion Criteria

1. Patients with Traumatic instability, instability due to infection, instability due to tumors and Iatrogenic instability

2. METHODS AND MATERIALS

2.1 Study Design

Observational Study.

Observational study in which patients with history of low backache with signs and symptoms suggestive of Lumbar spinal instability will be evaluated clinically and radiologically. Patients in the age group of 25-75 years will be included in this study. Clinical tests and MRI scan will be studied. Duration of the study is from April 2019 to November 2020.

2.2 Participants

Patients of Lumbar spinal instability in AVBRH, Sawangi (Meghe), Wardha.

2.3 Variables

Data sources/ measurement: Appropriate statistical test would be applied to analyze data.
Study size: 40 patients of Lumbar Spinal Instability

2.3.1 Quantitative variables

Radiological Criteria based on MRI:

1. >10 degrees tilt,
2. >3 mm shift and finally > 3mm slip.
3. > 3mm slip and >3 mm translation both

2.4 Statistical Methods

Appropriate statistical test would be applied to analyze data.

3. EXPECTED OUTCOMES/RESULTS

40 Patients of Lumbar Instability will be enrolled. By this study we can expect clinico–radiological correlation in patient with low back ache in lumbar spinal instability. Outcome data will be assessed on Clinico-radiological Criteria of Lumbar Instability and clinic-radiological correlation will be done

3.1 Descriptive Data

Patients of Lumbar Instability in AVBRH Sawangi (Meghe).

3.2 Outcome Data

Outcome data will be assessed on Clinico-radiological Criteria of Lumbar Instability and clinic-radiological correlation will be done.

3.3 Main Results

will be assessed on the basis of clinic radiological findings and there correlation results would be assessed on basis of clinical evaluation, functional evaluation and radiological evaluation and statistical analysis would be done to conclude the findings . Demographic pattern of 40 patients with lumbar spinal instability in AVBRH Sawangi, Meghe will be evaluated.

Other analyses: None

4. DISCUSSION AND CONCLUSION

Low back pain is frequently caused by clinical instability. Despite considerable disagreement regarding its definition, it exists.

The lack of a normal pattern of spinal motion is expected to be the cause of pain and/or neurologic impairment [5]. The spine's stabilizing mechanism may be broken down into three parts: the spinal column, spinal muscles, and the neural control unit. A Clinical spinal instability is a contentious and poorly understood condition [4]. Clinical spine instability, according to White and Panjabi, is defined as the loss of the capacity of the spine to maintain its displacement patterns under physiologic stresses with no initial or further neurologic impairment, significant deformity, or incapacitating pain. It's important to distinguish between mechanical and clinical instability. The former refers to the spine's incapacity to sustain spinal stresses, whilst the latter refers to the clinical effects of neurological deficiency and/or discomfort [9]. The involvement of the components of the spinal column (disks, ligaments, and facets) in ensuring spinal stability is critical. Panjabi defined the spinal stabilizing system has of three subsystems: the spinal column (providing intrinsic stability), parapinal muscles (providing dynamic stability) and control unit of the brain (which evaluates and determines the requirements for stability and coordinates the

muscle response). The muscles help to keep the spinal column stable mechanically.

Barr was the first to propose the idea of lumbar spine instability in 1951. It was thought that lowering disc height would loosen the grip of passive stabilizers, enabling spinal segments to move more freely. There was less space between the lumbar facet joints and the surrounding vertebral bodies when the disc height was reduced. In 1982, the International Society for the Study of the Lumbar Spine held a symposium on lumbar instability, which was attended by a number of medical and physical therapy professionals [13]. Kirkaldy-Willis described his notion of the degenerative cascade of the spine in his keynote talk. It was assumed that by reducing stiffness in each spinal section, more mobility would be possible. From the standpoint of a manual physical therapist, Paris used flexion and extension radiographs to locate and quantify more end-range motion in the lumbar spine, providing a subjective estimate of instability postulated a difference between lumbar instability and hypermobility, which he characterized as too much joint movement for one's age and level of activity. Panjabi released two books in the early 1990s that detailed his concept of spinal stability. According to this article, the structural (passive) system, muscle (active) system, and brain control system all work together to keep many joints in the body stable [8].

The American Academy of Orthopaedic Surgeons (AAOS) defines Instability is defined as an abnormal response to applied stress in which the motion segment moves beyond its typical boundaries. The structural deficiency of the interarticularis is a well-known cause of lumbar spine weakness. The spinal body of the affected segment is exceedingly unstable and has a natural tendency to slide forward. Only the soft tissue connections to neighboring vertebrae keep this from happening Despite the lack of a radiological sign of instability, senile alterations in the disc and facet joints, as well as damage to the intervertebral ligaments, can cause lumbar spinal instability, placing them under additional pressure. According to Khutsson (1944), parallel displacement and aberrant tilting movement between vertebrae were usually detected in flexion extension before any other radiological discovery. Spondylolisthesis is the most severe kind of instability. The discomfort is more obvious during rest since the strain is almost completely produced by ligaments [12]. Clinical instability can be detected before it leads to radiological instability. As a result, the exact validity of clinical criteria for instability must be determined. Spondylolisthesis is a chronic disabling illness that begins with disc degeneration and progresses to a narrowing of the spinal canal and neural foramen The intervertebral discs, vertebrae, ligaments, spinal canal, and intervertebral foramen may all be precisely assessed with MRI, which has remarkable spatial and contrast resolution. "A condition in which spinal stiffness has worsened to the point where ordinarily tolerated external stresses generate discomfort," according to Frymoyer et al. For lumbar spine instability, there are no defined clinical criteria. Mechanically induced acute bouts of low back ache have long been thought to be a sign of instability [4]. There is instability catch if the patient is unable to recover from the bending posture owing to a sudden onset of low back pain, There is a painful catch if a patient abruptly lowers the leg during a straight leg raising test owing to severe lower back discomfort and Apprehension occurs when a patient experiences a sense of lower back collapse as a result of a sudden episode of back pain while moving , the patient meets all three of Kotilainen and Valtonen's criteria for instability [14]. Few of the related studies were reviewed [15-19]. In some patients a giving away phenomenon is seen in which lumbar instability with a loss of tone in the legs, lower back, and pelvic region occurs .

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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