

A Prospective Study to Find Out the Association Between Supine Lying Low Back Pain and Retrolisthesis

Bharat R. Dave¹, Shivanand C. Mayi¹, Ajay Krishnan¹, Ramneesh Kohli¹,
Devanand Degulmadi¹, Ravi Ranjan Rai¹, Mirant B. Dave¹

Abstract

Objectives: The objectives of this study was to test the primary hypothesis that “retrolisthesis causes supine lying low back pain (LBP).”

Methods: Patients with history of chronic back pain (>12 weeks) who presented to the hospital outpatient department were evaluated. Patients with history of supine lying exaggeration of symptoms were specifically asked for duration, for which they can comfortably lie in supine position. Retrolisthesis in this study was measured on MRI mid sagittal image by measuring the slip percent. Slip percent of more than 8% was labeled as retrolisthesis. Statistical analysis was done using SPSS software.

Results: Average age of the study population was 41.46 ± 10.82 years. All the study participants had the history of supine lying LBP for 50 ± 54.51 weeks. About 94.78% (n = 115) of the study subjects had retrolisthesis on MRI. About 46.08% (n = 115) were house wives. L5-S1 was the most commonly involved level, three patients had no instability, and three patients had anterolisthesis. Duration of time up to which the patients can lie down in supine position was not statistically significant when analyzed with the VAS values for supine lying LBP and the slip percent.

Conclusion: The presence of supine lying LBP in an individual should be strongly considered for the underlying subtle instability at the lumbar intervertebral segments and diagnostic evaluation should be performed to rule out retrolisthesis.

Keywords: Retrolisthesis, Low back pain, Supine lying, Lumbar instability, Vertebral slippage, Lateral stenosis, Dynamic radiograph.

Introduction

Retrolisthesis is defined as posterior slippage of one vertebra on the adjacent caudal vertebra. It is seen in degenerative conditions, post-traumatic, and adjacent to fused level [1, 2, 3]. Retrolisthesis can occur as a compensatory mechanism to maintain the sagittal balance in an individual [4]. It can be observed at any level, but a higher incidence is seen in the lower lumbar spine [5]. The reported incidence at L5-S1 level is about 23.2% [6]. Retrolisthesis is predominately seen in males as compared to females [7].

Posterior displacement is generally limited to 2–3 mm and results in foraminal stenosis and rarely central stenosis [8].

Two mechanisms which lead to backward slippage of vertebrae are the degenerative retrolisthesis associated with the lower lumbar lordosis and sacral slope and the other mechanisms are secondary to anterolisthesis, which have high pelvic incidence and sacral slope [5, 7, 9]. Retrolisthesis causes back pain and leads to impaired function [10, 11, 12, 13]. Relationship of retrolisthesis to low back pain (LBP) has been noted by electromyographic study findings [14]. Retrolisthesis is associated with the higher likelihood of LBP in females [15]. The literature also shows reported case of LBP in supine position which is associated with retrolisthesis [16].

Many studies have come up with various radiological parameters, but none focused on clinical features of retrolisthesis. Some patients with chronic LBP have a symptom that initiated this study. Lying down in supine position increases LBP and makes the patient to frequently change position to lateral. Such patients often have disturbed sleep and avoid sleeping in supine position. The aim of this study was to find the association between supine lying LBP and retrolisthesis.

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¹Department of Spine Surgery, Stavva Spine Hospital & Research Institute, Mithakali, Ahmedabad, Gujarat, India.

Address of correspondence :

Dr. Shivanand C. Mayi,
Consultant Spine Surgeon, Stavva Spine Hospital & Research Institute, Mithakali, Ahmedabad, Gujarat, India.
E-mail: drshivanandmayi@gmail.com

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Methods

This prospective cross-sectional study was conducted at a single center from 2017 to 2019. Enrolment of patients was started after the Institutional Ethical Committee clearance and registration of the study with CTRI. Patients with history of chronic back pain (> 2 weeks) who presented to the hospital outpatient department were evaluated. Patients with history of supine lying exaggeration of symptoms were specifically asked for duration, for which they can comfortably lie in supine position before LBP starts. Informed consent was taken from all participants before enrolling them in to the study.

Inclusion criteria were to enroll patients with supine lying back pain on direct questioning, who were willing to sign the consent form and participate in the study. Exclusion criteria were patients with pregnancy, history of trauma, history of spine surgery in past, local infection, history of tumors, history of rheumatic disorders, patients with degenerative scoliosis, magnetic resonance imaging (MRI) demonstrable acute disc prolapse or stenosis, and patients with lumbar spine instability. After enrollment participants were instructed to rate the pain severity in the range of 0–10, on visual analog score (VAS). They were asked to rate the severity of their supine lying LBP on VAS. They were also asked about duration, for which they can lie down comfortably before changing the supine position. The supine lying comfort time was categorized into three categories, that is, <5 min, 5–10 min, and more than 10 min. Demographic data of the enrolled patients were also collected. After completion of initial questionnaire, patients were evaluated radiologically. Anteroposterior view and lateral view radiographs of lumbar spine were taken in standing. Lateral view radiographs were taken in maximum flexion and extension. Then, all patients underwent MRI of lumbar spine. Lateral view radiographs were examined for the presence of the

sagittal instability. Retrolisthesis was measured on MRI mid sagittal image by the position of superior vertebral body in relation to inferior vertebral body as radiographs can give wrong values unless taken in true lateral position.

Several methods of calculation of slip amount in lumbar spine instability have been described in the literature [17]. We calculated the slip percent of the upper vertebra in relation to the caudal one. The slip percentage was calculated with the formula, $\text{Retrolisthesis} = B/A \times 100$, where B represents the posterior slip of the upper vertebra in millimeters (mm) and A represents the anteroposterior distance of the superior end plate of lower vertebra in mm (Fig. 1). Mid sagittal T1 image was selected by presence of the lumbar spinous processes in the selected slice for calculation of the slip percent [15]. The distance between the two points placed at posterior most and anterior most part of the superior end plate of the inferior vertebra was taken as the denominator (A). Numerator was the distance between the points (a and b) on the posterior most part of the adjacent end plates of the vertebrae (B) at the retrolisthesis level [18]. Measurements were done electronically with Surgimap software after calibration of the image and slip percentage was calculated. Calibration of the image was done (e), as shown in Fig. 1. Intersection of line a and d is taken as the most inferior and posterior corner of proximal vertebra from where a vertical line is drawn upward (b). Point of intersection of line A and c was taken as most superior-posterior part of the caudal vertebra. Measurements were performed by two surgeons independently and the average of the two values was considered for the statistical analysis. In patient with multilevel involvement, the level with the higher slip was considered for analysis.

Statistical Analysis: Data were entered tabulated and analysis done using SPSS software version 20.0. Kruskal–Wallis test was applied as the data were not normally distributed.

Results

A total of 115 patients were included in this study for analysis. About 94.78% (n = 115) of study subjects had retrolisthesis on MRI. About 53.91 % of the study subjects were females. Among female study subjects, about 85% (n = 62) were housewives by occupation. Average age of the study population was 41.46 ± 10.82 years. On average, all the study participants had the history of supine lying LBP for 50 ± 54.51 weeks. Majority of them (46.08%, n = 115) were house wives (Table 1). About 73.04 % of the study subjects were able to lie down comfortably for more than 10 min (Table 2).

Multilevel involvement was seen in nine patients. VAS values for supine lying LBP were significant when compared between patients with and without retrolisthesis. Duration of time up to which the patients can lie down in supine position, when

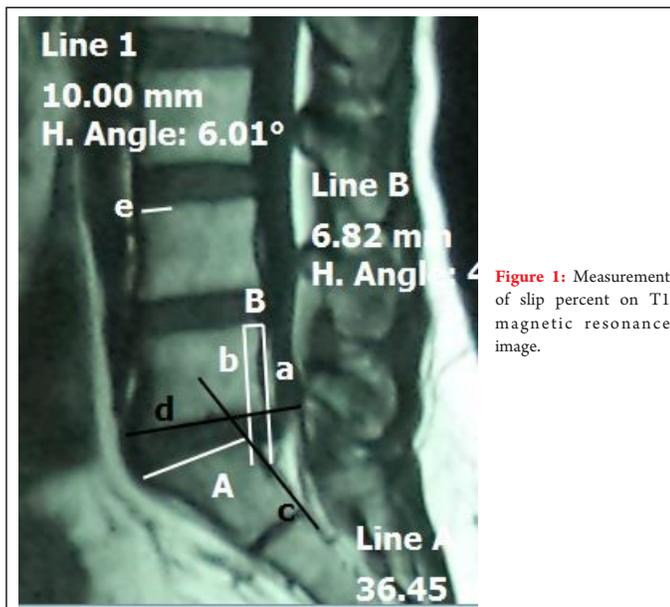


Figure 1: Measurement of slip percent on T1 magnetic resonance image.

Table 1: Demographic data of the study sample	
Patients	Number/Percent (n=115)
Female	62 (53.91 %)
Male	53 (46.08 %)
Mean age	41.46 ± 10.82 Years
Mean duration of supine lying back pain	50.13 ± 54.51 weeks
Occupation	
Housewife	53 (46.08 %)
Office job	29 (25.21 %)
Weight lifting job	11 (9.56 %)
Others	22 (19.13 %)

Table 2: Supine lying back pain in retrolisthesis	
Patients	Number/Percent (n=115)
Supine Lying comfort time	
< 5 minutes	14 (12.17 %)
5 to 10 minutes	17 (14.78 %)
>10 minutes	84 (73.04 %)
Retrolisthesis	
Present	109 (94.78 %)
Absent	6 (5.21 %)
Retrolisthesis level	
L3-4	1 (0.86 %)
L4-5	23 (20.0 %)
L5-S1	76 (66.08 %)
Multilevel	09 (7.82 %)
No instability	3 (2.60 %)
Anterolisthesis	3 (2.60 %)
Mean slip percent (n=109)	14.02 ± 3.60 %

Table 3: Supine lying comfort time and VAS supine lying LBP			
Supine lying comfort time	Number of Study participants (n- 115)	Mean VAS with SD	P value*
< 5 minutes	14	6.64 ± 2.28	0.059
5- 10 minutes	17	6.52 ± 2.30	
>10 minutes	84	5.11 ± 2.33	

Table 4 Supine lying comfort time and vertebral bode slip percentage			
Supine lying comfort time	Number of Study participants (n- 109)	Mean slip % with SD	P value*
< 5 minutes	11	15.04 ± 3.64	0.728
5- 10 minutes	15	13.55 ± 3.58	
>10 minutes	83	13.97 ± 3.61	

* p value significant if less than .05

analyzed with the VAS values for supine lying LBP was not statistically significant (Table 3). The slip percent in patients with retrolisthesis did not have any significant relationship with the duration of comfort lying in supine position (Table 4).

Discussion

Retrolisthesis occurring without any change in bony structure implies that it might be a consequence of a spinal ailment disorder and many times does not have radiological factor-related cause [7]. Different conditions such as reduced disc height, sagittal alignment of spine, endplate inclination, and traction of erector spine muscles have been considered as related to retrolisthesis [1, 5]. It is thought segmental instability to be a major cause of LBP and sciatica [19]. Our finding of LBP during the supine position was as a result of the high level of discomfort and morbidity expressed by the patients in outpatient department. The majority of the participants were household females in this study. The level of retrolisthesis is varied among different studies. In study by Berlemann et al., retrolisthesis had a high incidence at the lower lumbar levels which are in contrast to study by Iguchi et al., where most common level was L2-L3 [5, 7]. In our study, 66.08% of study participants had retrolisthesis at L5-S1. There is reported correlation between the retrolisthesis in the lower lumbar segments and reduction of lumbar lordosis, end plate inclination, and segmental height [5]. Extension movement of spine has been reported to be causing posterior slippage of the vertebra and exaggerated instability in patients having retrolisthesis [16]. When the patient is in supine position, body weight and gravity compress the unstable vertebra perpendicularly, leading to distraction instability, which becomes obvious on studies taken in this position [16]. Standard radiography has been considered as an inaccurate and unsuitable method for evaluation of segmental instability by some authors [20, 21, 22]. It has been found that MRI in supine position is shown to reveal the retrolisthesis in patients with history of LBP in supine position [16]. It is reported that the diagnosis of lumbar instability on the basis of radiographs often could lead to errors in measurement and classification and MRI in supine position is shown to reveal the retrolisthesis in patients with history of LBP [16, 23]. MRI performed in supine position that was used to calculate the slip percentage in our study subjects. Moreover, the time needed to procure the image probably relaxes the muscles and unmasks retrolisthesis. Retrolisthesis has shown to be associated with discomfort and back pain in supine position which was relieved by fixation of the unstable segment [16]. It has been reported that the supine position could diminish the effect of musculature on the spinal instability, there by revealing the true amount of posterior instability [16]. In this study, the slip percent at the unstable level did not have significant correlation with the supine lying

comfort time in participants. The previous authors have also found that the severity of LBP symptoms did not have significant correlation the degree of maximal displacement of the vertebra [22]. The distraction instability in supine position probably leads to stretching of ligaments and facet joint capsule leading to LBP [16]. The pain in legs could be due to the lateral canal stenosis associated with the supine position in retrolisthesis. The typical symptoms of the patient experiencing the discomfort or LBP in supine position need to be looked in detail and diagnostic evaluation to be done to rule out the underlying lumbar retrolisthesis.

The limitations of this study are that we did not have the control group. Whole spine radiograph would have helped us in obtaining objective measurement of sagittal balance. Further studies with control group, considering other associated instability and disc degeneration, are required to confirm the findings of this study.

To the best of our knowledge, this first study of its kind in the literature to give insight into the peculiar finding of association of supine lying LBP with retrolisthesis. The strengths of this study are that it is a prospective study with a big sample size and

we have focused on clinical symptomatology that allowed us to come to a probable mechanism of one of the most common but neglected clinical entity of supine lying LBP. Furthermore, evaluating the presence of clinical symptoms in all patients of retrolisthesis noted in cases of MRI done for other reasons except back complaints would also help. Whether this subtle instability is important and will need any intervention needs to be evaluated in vertical studies.

Conclusion

The presence of supine lying LBP in an individual should be strongly considered for the underlying instability at the lumbar intervertebral segments and diagnostic evaluation should be performed to rule out retrolisthesis.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL
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