Assessment of Instability in Degenerative Lumbar Spondylolisthesis using the Standing and Supine Lateral Radiographs.

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ABSTRACT

Objective: To compare the percentage of slip difference using the standing and supine lateral radiographs in symptomatic degenerative lumbar Spondylolisthesis.

Methods: This descriptive study was conducted in department of Spine surgery unit Hayat Abad Medical Complex Peshawar from 2nd January 2019 to 2nd December 2020.All adults patients of both gender with low backache due to degenerative Spondylolesthesis meeting the inclusion criteria were enrolled in this study. All patients underwent standing and supine lateral radiographs. Slip of Spondylolesthesis was calculated according to Dupuis technique. Percentage of slip on standing radiographs were compared with supine and *p* value calculated using student t test. *P* value <0.05 was considered significant.

Results: The total number of patients were 30. The mean age was 44.60±6.62 years. Male patients were 5 (16.7%) and female 25 (83.3%). Spondylolesthesis was noted at L4-L5 level in 17 (56.66%) patients while 13 (43.33%) patients had L5-S1 level involved. The mean slip percentage on standing x ray was 34.60± 20.03 and on supine 11.97±8.65 showing a significant slip reduction on supine radiographs.(p=0.01)

Conclusion: Supine lateral radiographs showed significant slip reduction in degenerative Spondylolesthesis. We therefore recommend routine use of supine lateral radiographs for the assessment of degenerative Spondylolesthesis.

Keywords: Low Back Pain,Lumbar, Radiographs, , Spondylolesthesis

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INTRODUCTION

Spondylolesthesis is the anterior translation of superior vertebral body over the vertebral body below in the absence of pars interarticularis defect.[1,2] The condition may be idiopathic acquired or congenital. It may have isthmic, degenerative, dysplastic or traumatic nature and the degree of vertebral slippage determines the severity.[3] Clinically the patients may be asymptomatic or having occasional pain or chronic low back pain, radicular symptoms, with or without neurologic deficit and intermittent neurogenic claudication.[1-5] It has been reported that 10% women and 5% of men have spondylolesthesis at the lumbar region without any pars defect.[5] The Spondylolesthesis at L4 L5 is usually asyptomatic.[6] The incidence of degenerative Spondylolesthesis increases with advancing age.[4] High grade Spondylolesthesis is occasionally of the degenerative variety.[7] Due to chronic nature of the pathology the clinical symptoms may improved spontaneously because of concomitant stabilization.[8] Critical to the management is the evaluation of instability in degenerative lumbar Spondylolesthesis. Routinely done standing lateral radiographs in flexion and extension are believed to exaggerate forward and backward motion of the involved segment.[8-12] Standing digital radiographs however have a better predictive value of assessing different parameters in degenerative Spondylolesthesis like lumbar lordosis, percentage of slip, disc height, inclination of sacrum and slip angle.[8] MRI and CT scan in the supine

position have shown reduction of the anterolisthesed segment.[8,9] But they are costly and radiation hazards can not be ignored.

This study was aimed to compare the percentage of slip difference using standing and supine lateral radiographs in symptomatic degenerative lumbar Spondylolesthesis.

METHODS

We conducted this descriptive study in department of Spine surgery unit Hayat Abad Medical Complex Peshawar from 2nd January 2019 to 2nd December 2020. All adults patients of both gender with low backache due to degenerative Spondylolesthesis presented to our OPD were included in this study. Patients with thoracolumbar spine surgery, lumbar spine trauma, tumor, ankylosing spondylitis, spondylolesthesis involving multiple levels, and patients with incomplete radiographic work up were excluded. The study was approved by the Ethical Committee of our hospital. Informed consent was obtained from all participants. In the included subjects complete history, clinical examination and standing and supine lateral radiographs of the lumbar spine were taken. Uniform radiography protocol was adopted for all patients. Measurement on radiographs was done according to Dupuis technique[13] by two consultants who were not part of this study. In this technique the translation distance from the posterior wall of the inferior vertebra to the posterior wall of the superior vertebra is measured and divided by the width of the superior segment. Percentage of slip on standing radiographs were compared with supine and *p* value calculated using student t test. *P* value <0.05 was considered significant.

We analysed our data with SPSS version 27. Frequency and percentage was calculated for qualitative variables while mean and standard deviation for qunatitative variables. Data was presented in table where necessary.

RESULTS

We included 30 patients in this study. The mean age was 44.60±6.62 years. Male patients were 5 (16.7%) and female 25 (83.3%). The mean duration of symptoms was 11±6 months. Spondylolesthesis was noted at L4-L5 level in 17 (56.66%) patients while 13 (43.33%) patients had L5-S1 level involved.(Table I). The mean slip percentage on standing x ray was 34.60± 20.03 and on supine 11.97±8.65 showing a significant slip reduction on supine radiographs.(p=0.01)

DISCUSSION

The incidence of degenerative Spondylolesthesis is twice in women than men.[14] The possible anatomical differences responsible for this increased frequency of Spondylolesthesis in women are increased pelvic incidence, L4 vertebral inclination and more sagittally oriented facets in women.[15] Segmental instability in spondylolesthesis is measured with dynamic radiological studies and is defined as the anterior or posterior translational displacement of a vertebral body against another, and/or an angular variation in the inter-somatic space. This can be theoretically explained by alterations in the passive stability system which is affected in the first stages of the degenerative spine process. These simple radiographic techniques can evaluate spine instability and its determination could have diagnostic and therapeutic implications.[13,16] The choice of vertebral landmarks used to measure the degree of slippage is debatable and varies among studies. Conventional standing lateral radiographs are often used to identify Spondylolesthesis whereas standing flexion-extension radiographs are commonly used to quantify the degree of intervertebral instability.[17,18] The current study was aimed to assess the instability with standing and supine lateral radiographs in terms of slip angle difference. In a study by Dhakal[8] the mean slip percentage on standing lateral radiographs was 36.85±12.78 which was reduced to 27.39±11.14 on supine lateral radiograph while in our study the standing mean slip percentage was 34.60± 20.03 which was reduced to 11.97±8.65 on supine radiographs. Also the level of Spondylolisthesis in Dhakal study was L4-L5 in 10 patients out of 23, L5-S1 level in 12 patients while one patient had both level involvement. In our study Spondylolesthesis was noted at L4-L5 level in 17 (56.66%) patients while 13 (43.33%) patients had L5-S1 level involved. Tarpada[9] compared upright flexion, neutral, extension, and supine lateral radiographs in terms of slip percentage. He showed significant slip reduction in supine lateral radiographs from upright flexion, neutral, extension lateral radiographs, 20.32±6.45%, 17.51±7.11%, 16.27±6.85% to 13.67±6.04%. This also supports the findings in our study. The predominant level involved was L4-L5 46/59 (78.0%), L5-S1 level in 11 patients and 3 patients had both level involvement supporting our findings. Gender wise female were the predominant victims of spondylolesthesis in his study as it was in our study. Foster and colleague[19] assessed 27 patients of Spondylolisthesis with radiographs and documented that the mean mobility with flexion extension

radiographs were 5.25%% while flexion supine radiograph revealed a mobility of 9.3% ($p<0.0001$). This difference was independent of age of patient and BMI. Giancarlo[20] recommended a new method called the" prone-supine" lateral radiograph for assessment of instability in low grade Spondylolisthesis. He diagnosed 19 cases with this new technique while no difference was noted in 56 cases when compared for supine x rays and prone supine x rays.

The sample size of our study was small. We recommend further comparative studies with larger sample size to confirm our results.

Table I: Demographic and radiographic details of our patients.

Serial No	Age (Years)	Gender	Spondylolesthesis Lesthesis level	Slip percentage on standing x ray	Slip percentage on supine x ray
1	45	F	L4-L5	25	15
2	52	F	L5-S1	50	30
3	40	F	L4-L5	54	41
4	30	F	L5-S1	31	18
5	56	F	L4-L5	34	26
6	45	F	L5-S1	25	15
7	50	F	L5-S1	35	20
8	37	F	L4-L5	36	22
9	30	F	L5-S1	22	9
10	38	F	L4-L5	45	20
11	40	F	L5-S1	32	20
12	48	F	L5-S1	30	13
13	58	F	L4-L5	20	12
14	50	F	L4-L5	27	18
15	38	F	L4-L5	20	10
16	42	F	L4-L5	33	19
17	43	F	L4-L5	38	23
18	40	F	L5-S1	40	16
19	46	F	L4-L5	29	16
20	55	F	L4-L5	60	40
21	48	M	L5-S1	54	29
22	39	M	L4-L5	36	22
23	40	F	L5-S1	42	19
24	52	F	L5-S1	60	40
25	49	M	L4-L5	24	16
26	42	M	L5-S1	19	11
27	46	M	L4-L5	16	8
28	40	F	L4-L5	40	20
29	41	F	L5-S1	31	18
30	40	F	L4-L5	30	15

CONCLUSION

Supine lateral radiographs showed significant slip reduction in degenerative Spondylolesthesis. Supine lateral radiograph is technically easy to performed and is less expensive than MRI or CT scan. We therefore recommend routine use of supine lateral radiographs for the assessment of degenerative Spondylolesthesis.

Conflict of Interest: None
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