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Original Research Article

IS FACET TROPISM A PREDICTOR FOR SURGERY IN CASE OF SYMPTOMATIC LUMBAR DISC HERNIATION: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Facet tropism is defined as asymmetry between the left and the right vertebral facet angles. This asymmetry of the facet joints results in alteration of biomechanics in the spine. Facet tropism has been correlated with pathogenesis of lumbar disc herniation. In this study, we aim to determine the role of facet tropism in treatment of symptomatic lumbar disc herniation.

Materials and Methods: In this retrospective cohort study, the preoperative magnetic resonance images of 35 post-operative patients were analysed. The facet angles were determined. Facet tropism was defined as an absolute difference of >7o between the right and the left facet angles. Facet tropism and its association with pre-operative and post-operative Oswestry disability index (ODI) of the patients were analysed.

Results: The mean right facet angle was 46.49o± 10.32o and the mean left facet angle was
46.69o ± 9.10o. 21 patients (60%) out of 35 had facet tropism and 14 patients (40%) out of 35 did not have facet tropism. The mean value of facet tropism was 9.97o ± 6.10o. 14 out of 35 patients with lumbar disc herniation had facet tropism at L4-L5 level followed by 6 out of 35 patients at L5-S1 level and 1 out of 35 patients at L3-L4 level. Among those 21 patients with facet tropism, the pre-operative ODI was found to be significantly higher as compared to those without facet tropism (P value < 0.05). No significant association was found between facet tropism and post-operative ODI.

Conclusion: 60% patients with symptomatic lumbar disc herniation requiring surgery were found to have facet tropism. The presence of facet tropism increased the severity of the symptoms and disablitity which significantly resulted in the patient undergoing microdiscectomy due to lumbar disc herniation.

Keywords: Facet tropism, lumbar disc herniation, microdiscectomy, Oswestry disability index (ODI.

INTRODUCTION

The facet joint is the only synovial joint comprising the articular capsule, synovial membrane, and the hyaline cartilage that covers the subchondral bone. Brailsford defined facet tropism in 1928 as asymmetry between the left and the right vertebral facet joint angles with one joint having a more sagittal orientation than the other.[1] The incidence of facet tropism in the lumbar motion segments varies from 10 to 70 %.[2] Asymmetry of facets (tropism) of the lumbar spinal unit, especially if it is marked, can alter the biomechanics of lumbar spinal movements and precipitate early degenerative changes either in the joint or adjacent intervertebral discs contributing to back pain.[3] Farfan and Sullivan first suggested the correlation between facet tropism and development of lumbar disc herniation. They suggested that asymmetry of the facet joints is correlated with the development of disc herniation, because the coronally facing facet joint offers little resistance to intervertebral shear

force, so the rotation occurs towards the side of the more coronally facing facet joint, and this possibly leads to additional torsional stress on the annulus fibrosus.[4] Lumbar disc herniation is a common cause of back pain and sciatica. Symptomatic lumbar disc herniation is treated either conservatively or surgically. Surgery has been indicated in cases with neurological deficit causing motor weakness, cauda equina syndrome, progressive neurological deficit inspite of conservative treatment, persistent pain refractory to conservative care and pain that adversely affects the quality of life. Although many studies suggest a correlation between facet tropism and pathogenesis of lumbar disc herniation, there are no studies that suggest if the presence of facet tropism in symptomatic lumbar disc herniation affects the treatment modality. This study aims to determine the role of facet tropism and its effect among patients who have undergone microdiscectomy for symptomatic lumbar disc herniation.

MATERIALS AND METHODS

This study is a retrospective cohort study including all patients with symptomatic lumbar disc herniation who have undergone microdiscectomy.

Inclusion criteria

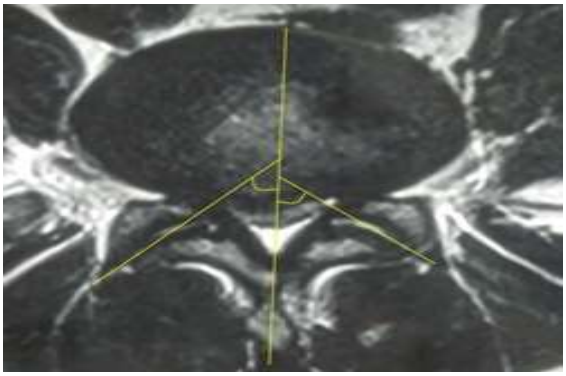
i. Patients who underwent microdiscectomy for PIVD from May 2023-May 2025
ii. MRI confirmed disc herniation.
iii. Single level virgin lumbar disc herniation.

Exclusion criteria

i. Vertebral fracture, unstable spine or other spinal deformities such as scoliotic deformity, metabolic bone disease, spinal infection, malignancy.
ii. Central spinal canal stenosis
iii. Pregnancy
iv. Spondylolytic or degenerative spondylolisthesis.
v. Multiple level disc herniation.

[Figure1]: Facet angle measurement method according to Noren et al. Both right and left facet angles at L4-L5 was measured as the angle between the reference line that passes through the disc center as well as the base of the spinous process and the facet line connecting the anteromedial and posterolateral margins of the superior articular facet.

Pre-operative magnetic resonance images of 35 patients who have undergone microdiscectomy were analysed retrospectively. Facet joint angles were measured according to Noren et al. method.[5] Axial sections of T2 weighted MRI that equally bisected the intervertebral disc space were used to measure each facet angle. The facet angle corresponds to the angle between the reference line that passes through the center of the disc and the base of the spinous process and the facet line that connects the anteromedial and posterolateral margins of the superior articular facet. The facet tropism was determined by calculating the differences between the left and right facet joint angles. The pre-operative and post-operative Oswestry disability index (ODI) was used to assess the level of disability due to symptomatic prolapsed intervertebral disc. Post-operative ODI was assessed at 6th week, 12th week and 24th week after surgery. The data obtained was analysed using IBM SPSS version 22. Descriptive statistical parameters like percentage, mean, standard deviation were measured and analytical statistics like Chi- square tests were done and p-value< 0.05 were considered to be significant.



RESULTS

The mean age of the 35 patients who have undergone microdiscectomy for symptomatic lumbar disc herniation was 36.86±14.00 years of age.

Table 1: Age distribution of facet tropism in various age groups (p value < 0.05 is significant)

Age	Facet tropism			
	Yes (%)	No (%)	Total	P-value
15-30 years	8 (53.3%)	7 (46.7%)	15	0.770
30-45 years	8 (72.7%)	3 (27.3%)	11	
45-60 years	4 (57.1%)	3 (42.9%)	7	
>60 years	1 (50%)	1 (50%)	2	

The maximum age was 70 years while the minimum age was 18 years. 24 patients (68.5%) were male and 11 patients (31.4%) were females.

Table 2: Incidence of facet tropism and association with sex (p-value < 0.05 is significant)

Sex	Facet tropism			
	Yes (%)	No (%)	Total	P-value
Male	16 (66.7%)	8 (33.3%)	24	0.234
Female	5 (45.5%)	6 (54.5%)	11	

24 patients (68.6%) had prolapsed disc herniation at L4-5, 9 patients (25.7%) had prolapsed disc herniation at L5-S1 and 2 patients (5.7%) had involvement at L3-L4 level.

14 out of 35 patients with lumbar disc herniation had facet tropism at L4-L5 level followed by 6 out of 35 patients at L5-S1 level and 1 out of 35 patients at L3-L4 level.

Table 3: Level of disc herniation and its association with facet tropism (p-value< 0.05 is significant)

Level	Facet tropism			
	Yes (%)	No (%)	Total	P-value
L3-L4	1 (50%)	1 (50%)	2	0.870
L4-L5	14 (58.3%)	10 (41.7%)	24	
L5-S1	6 (66.7%)	3 (33.3%)	9	

Table 4: Pre-operative ODI and its association with facet tropism (p-value< 0.05 is significant)

ODI (Preoperative)	Facet tropism			
	Yes (%)	No (%)	Total	P-value
Grade 1 (0-20%)	0	0	0	0.000
Grade 2(21-40%)	0	0	0	
Grade 3 (41-60%)	6 (30%)	14 (70%)	20	
Grade 4 (61-80%)	15 (100%)	0 (00.0%)	15	
Grade 5 (81-100%)	0	0	0	

20 patients (57.1%) had severe disability and their pre-operative ODI was grade 3(41-60%). 15 patients (43.9%) were crippled and their pre-operative ODI was grade 4 (61-80%). The mean right facet angle was 46.49o± 10.32o and the mean left facet angle was 46.69o ± 9. 10o.The mean value of facet tropism was 9.97o ± 6.10o. 21 patients (60%) had facet tropism and 14 patients (40%) did not have facet tropism. Facet tropism was found to be more common among males (16out of 35 i.e. 66.7%). There was no significant association between facet tropism and sex, age and level of disc involved. However, among those 21 patients with facet tropism, the pre-operative ODI was found to be significantly higher than those without facet tropism. 15 patients had pre-operative ODI of 61-80% i.e. grade 4 and 6 patients had ODI of 41-60%. Post-operative ODI was assessed at 6th week, 12th week and 24th week. The post-operative ODI was improved after microdiscectomy. Only 2 out of 35patients had grade 4 ODI i.e. 61-80% at the end of 24 weeks follow up and both these patients had facet tropism. However, on statistical analysis with Chi square test the p-value was found to be > 0.05 i.e. the association of facet tropism and post-operative ODI is not statistically insignificant.

Table 5: Post-operative ODI at 6th week, 12th week and 24th week and its association with facet tropism (p-value< 0.05 is significant)

6th week ODI (Post-operative)	Facet tropism			
	Yes (%)	No (%)	Total	P-value
Grade 1 (0-20%)	10(55.6%)	8(44.4%)	18	0.581
Grade 2(21-40%)	11(64.7%)	6(35.3%)	17	
Grade 3 (41-60%)	0	0	0	
Grade 4 (61-80%)	0	0	0	
Grade 5 (81-100%)	0	0	0	
12th week ODI (Post-operative)	Facet tropism			
	Yes (%)	No (%)	Total	P-value
Grade 1 (0-20%)	14(51.9%)	13(48.1%)	27	0.328
Grade 2(21-40%)	5(83.3%)	1(16.7%)	6	
Grade 3 (41-60%)	1(100%)	0	1	
Grade 4 (61-80%)	0	0	0	
Grade 5 (81-100%)	0	0	0	
24th week ODI (Post-operative)	Facet tropism			
	Yes (%)	No (%)	Total	P-value
Grade 1 (0-20%)	18(56.3%)	14(43.8%)	32	0.335
Grade 2(21-40%)	1(100%)	0	1	
Grade 3 (41-60%)	0	0	0	
Grade 4 (61-80%)	0	0	0	
Grade 5 (81-100%)	2(100%)	0	2	

DISCUSSION

Numerous studies have shown the association of facet tropism with lumbar disc herniation. Farfan and Sullivan were the first to suggest the correlation between facet tropism and development of lumbar disc herniation.[4] In 1980, Cyron and Hutton had postulated that tropism could lead to instability with the facet joints rotating toward the side of the most oblique facet.[6] Van Schaik et al. used CT scans to measure facet asymmetry in 100 patients with backache or sciatica or both and concluded that with greater degrees of asymmetry, there was a greater incidence of unilateral disc protrusion towards the side of the more coronally oriented joint.[7] In 2004, Karacan et al. in their study had concluded that patient with lumbar disc herniations had the asymmetry of facet joints and that these alterations were more evident in taller patients.[8] Facet tropism is defined as an absolute difference of more than 7° between the right and left facet angles.[9] In this study, we found the mean value of facet tropism was 9.97o ± 6.10o. Do et al,[10] reported a mild facet tropism prevalence of 28% at L3–4 level, 28% at L4–5, and 24% at L5–S1, and a severe facet tropism prevalence of 14% at L3–4 level, 15% at L4–5, and 17% at L5–S1, showing no significant difference by the severity of facet tropism. In our study, 68.6% facet tropism was seen at L4-5 level, 25.7% at L5-S1 and 5.7% at L3-4 level. It has been well established that asymmetry of facet joints can lead to instability. Liu et al,[11] and Fujiwara et al,[12] have suggested that facet tropism is associated with degenerative osteoarthritis of the facet joint and may play a role in LBP i.e. the degenerative changes of the facet joint that may worsen LBP during the flexion and extension of the back, which involves movement of the facet joint. In the present study, we found that in presence of facet tropism the severity of symptoms and disability is greater and the association between pre-operative ODI with facet tropism are highly significant. 21 out of 35 patients who underwent microdiscectomy for symptomatic lumbar disc herniation had facet tropism. Post operatively, the ODI improved in patients without facet tropism but in 2 patients with facet tropism, grade 4 ODI persisted at the end of 24 weeks post-operative follow up. However, no significant association was found between post-operative outcome and facet tropism.

CONCLUSION

In the present study, majority of patients (60%) with symptomatic lumbar disc herniation requiring surgery were found to have facet tropism. The presence of facet tropism increased
the severity of the symptoms and disablitity in the pre-operative period which significantly resulted in the patient undergoing microdiscectomy due to lumbar disc herniation.
Limitations of the study include a small sample size and lack of comparison with conservative treatment for symptomatic lumbar disc herniation. Further studies to compare the association of facet tropism with various other treatment modalities may help establish the significance of facet tropism as a predictive factor in the treatment of symptomatic lumbar disc herniation.

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