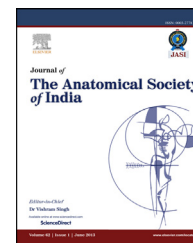


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Original Article

Prevalence of facet joint arthrosis in lumbago patients—CT scan evaluation

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ABSTRACT

Introduction: There are multiple causes of low back pain (LBP), the leading ones being degeneration of intervertebral disc, lumbar spinal stenosis (LSS) and facet joint arthrosis (FJA). There are number of studies done earlier on disc degeneration and LSS, however the studies on facet joint arthrosis are limited and incomplete. Hence the present study was undertaken to assess the prevalence of FJA of lumbar spine in lumbago patients of Delhi NCR region of India.

Method: The present study was conducted in the Departments of Radiodiagnosis of Santosh Medical College, Ghaziabad and Safdarjung Hospitals, New Delhi. Thirty eight patients were selected for CT scan imaging after pre-defined questionnaire and informed consent. The images were assessed on Philips Dicom viewer for facet joint arthritic changes.

Results: A high prevalence of 52.6% was seen in cases of LBP. FJA was seen in 80% of female cases and the highest prevalence of arthrosis was seen at lumbar spinal level of L4–L5.

Discussion: Facet joint arthrosis plays an important role in low back pain. The prevalence of FJA increases caudally from L1 to L5, with the highest incidence being at the L4–L5 spinal level. The prevalence of FJA is seen more in females than males.

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1. Introduction

The degenerative changes of lumbar spine are one of the leading causes of lumbago/low back pain (LBP). These changes occur in the intervertebral discs (IVDs), bony lumbar canal and facet joints (FJs). The IVD and FJ together act as three-joint complex, to resist the force generated by the transmission of body weight acting on each motion segment of the spine.¹ The force acting on this complex divides into – the compression

component occurring maximally in plane perpendicular to the disc and the shear or rotational component occurring in the horizontal plane of the disc at the level of facet joints. Derangement of either of these articulations, causes impairment of force transmission, termed as the “tripod effect”.^{2,3}

The facet joints play an important role in load transmission, by stabilizing the motion segment in flexion and extension and limiting the axial rotation.⁴ The facet joints are the typical synovial articulations with hyaline articular cartilage, synovial membrane, joint space and joint capsule (Fig. 1).

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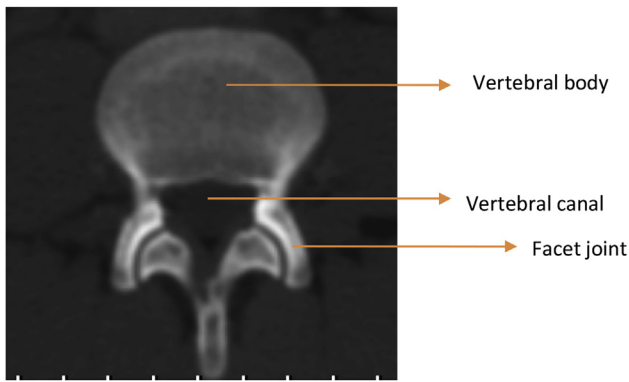


Fig. 1 – Normal facet joint on CT imaging.

They undergo degenerative changes identical to that of osteoarthritis seen in other synovial joints.⁵ Osteoarthritis of the FJs may be related to repeated stress or trauma and spinal deformity with secondary overload.^{6,7} The term commonly used to describe degeneration and arthritis of the facet joints is *Spondylosis*. The first indication that the FJ can be a source of low back pain was described by Joel Goldthwait in 1911.⁸ It has been estimated that FJ pathology is a contributory factor in 15%–52% of patients with chronic LBP.^{9–11} However, it has also been reported that the prevalence of isolated facet joint pain may be as low as 4%.¹² The fact that pain can originate from the FJs is widely accepted in the radiologic and orthopedic literature.^{13,14} This is supported by investigations employing successful intra-articular or periarticular nerve blocks and the prevalence of facet joint arthrosis (FJA) has been reported to range from 7.7% to 75%.¹⁵ Still the cardinal role of facet joint abnormalities in patients with LBP is debated.

The degenerative changes (of the IVDs, or lumbar canal) of the lumbar spine involving are most common cause for lumbar surgery and with advancement of science and technology, surgery rates have increased markedly over the past decade and gaining acceptance too.^{16,17} Since degeneration sets in not

Table 1 – Prevalence of FJA in population with sex predilection.

| FJA | Total (n = 38) | Male (n = 14) | Female (n = 24) |
|---------|----------------|---------------|-----------------|
| Present | 20 | 4 | 16 |
| Absent | 18 | 10 | 8 |

only at the IVDs but also in associated facet joints, it is imperative to study the frequency of concurrent occurrence of degenerative changes at the three joint complex at different levels of lumbar spine. The ongoing debate on choosing criteria for conservative and surgical treatment depends not only on the extent of IVD degeneration but also on the degenerative changes in the FJs.

There have been considerable work on degenerative disc disorders (DDD) and lumbar spinal stenosis (LSS) in the past, but there is hardly any work on facet joints particularly in living subjects and especially in Indian sub-continent. Hence the present study was undertaken to define prevalence of FJA of lumbar spine in lumbago patients of Delhi NCR region of India.

2. Materials and method

The present study was conducted in the Departments of Radiodiagnosis of Santosh Medical College, Ghaziabad and Safdarjung Hospitals, New Delhi. The individuals of low back pain were selected by a pre-defined modified questionnaire, prepared on the basis of Oswestry and Quebec LBP questionnaire.¹⁸ Thirty eight patients, 14 men and 24 women of mean age 44.7yrs, with complaints of LBP were included in the study. The selected patients were subjected for CT scan evaluation after obtaining informed consent and Institutional ethical clearance. The images obtained were studied on Philips dicom viewer and the facet joints were classified as Joint-1 between L1 & L2 vertebrae, Joint-2 between L2 & L3 vertebrae, Joint-3 between L3 & L4 vertebrae, Joint-4 between L4 & L5 vertebrae, Joint-5 between L5-S1 and arthritic changes in each joint was observed. The changes at the facet joints were noted

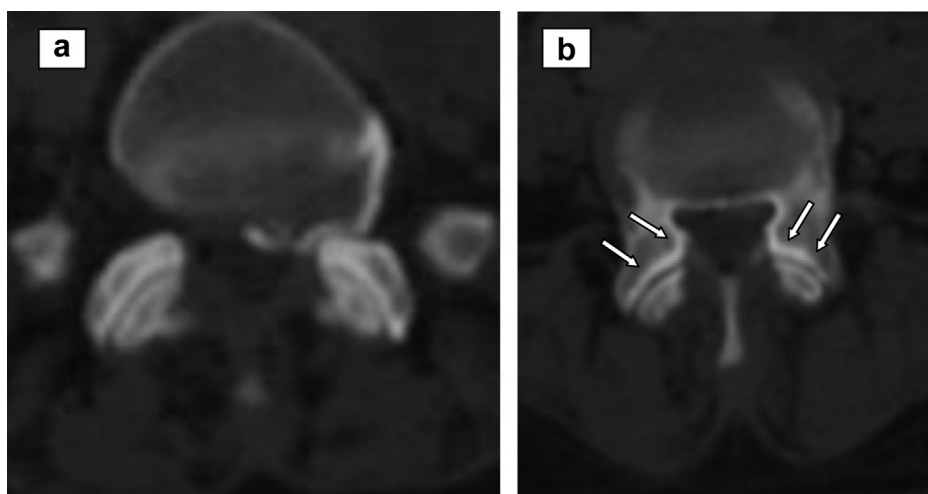


Fig. 2 – FJA (a) decreased joint space (b) hypersclerotic joint margins.

for joint space (<2 mm taken as decreased space), sclerosis of joint margins and presence of osteophytes to define severity of facet joint arthrosis⁵ (Fig. 2)

3. Results

The evaluation of observations revealed arthrosis in 52.6% of LBP patients of the population group (Table 1). It was more prevalent in females as compared to males (Graph 1).

The results were further analyzed to assess the arthritic changes at each joint and also to determine the side predilection of FJA. The highest prevalence of FJA was seen at Joint 4 i.e. vertebral level L4-L5 and irrespective of the joint level the arthrosis was either seen bilaterally or unilaterally on right side only (Table 2).

The prevalence percentage for side predilection of arthrosis of facet joints at different vertebral levels is shown in Graph 2.

4. Discussion

The facet joints are the true synovial joints in the spine. Because of their high level of mobility they are affected by large forces, especially in lumbar region. As a result they can develop significant degenerative changes and be a potential cause of pain and disability.

FJA and disc degeneration: Under normal conditions, between 3% and 25% of segmental load is transmitted over facet joint and this percentage increases upto 47% in degenerative facets.¹⁹ Many studies point that initially spinal degeneration begins in IVDs which involve the FJs secondarily.²⁰ The loss of disc height and segmental instability due to ruptured annulus fibrosis (manifested as disc herniation) increase the load on FJ leading to their subsequent degeneration and arthrosis. Vernon-Roberts and Piere²¹ were the first to suggest that FJA is a secondary event caused as a result of DDD (primary event). However lumbar FJ may undergo substantial loads even without disc degeneration. Swanepoel and coworkers, in a histological study, found only weak correlation between FJ damage and IVD degeneration.²²

FJA and age: There are very few published studies regarding the prevalence of FJA with respect to age. Eubanks et al. in a recent

Table 2 – Prevalence of FJA at different vertebral levels.

| Vertebral level | FJA | Right FJA | Left FJA | Bilateral FJA |
|-----------------|-----|-----------|----------|---------------|
| Joint1(L1–L2) | 14 | 4 | nil | 10 |
| Joint2(L2–L3) | 16 | 6 | nil | 10 |
| Joint3(L3–L4) | 12 | 4 | nil | 8 |
| Joint 4(L4–L5) | 20 | 2 | nil | 18 |
| Joint 5(L5–S1) | 4 | nil | nil | 4 |

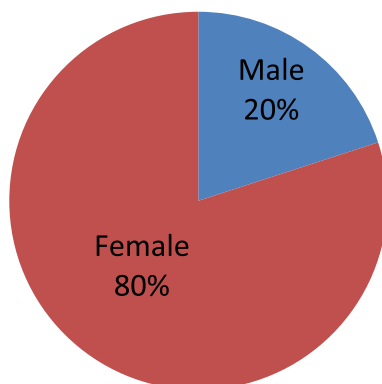
study of 647 cadaveric lumbar spines found that FJA is a universal finding. Characteristic features of arthrosis begin to appear early, with more than one half of adults younger than 30 years demonstrating arthritic changes in the facets.²³ In the present study the mean age group of patients was 44.6 years (min age 20 yrs, range 20–60 yrs) suggesting high prevalence in younger age groups in our study also.

FJA and spinal level: According to earlier researchers, the most common arthritic level appears to be L4–L5.^{20,24} A similar result was seen in the present study where Joint 4 was most commonly involved in arthrosis. Fujiwara et al found that the medium grade of FJA at L4–5 was significantly higher than that at other lumbar spinal levels.²⁰ It has been well-established that degenerative spondylolisthesis is associated with FJA and occurs most commonly at the L4–L5 level.²⁴ The possible reasons for the high prevalence and severity of FJA at the L4–L5 spinal level as compared to L5-S1 segment are: (1) relatively greater stability of the L5-S1 spinal segment compared to L4–L5 (2) more coronal orientation of the L5-S1 joints as opposed to the more sagittal orientation of the L4–L5 facet joints (3) an increased pedicle-facet angle at the L5-S1 level and (4) additional anatomic stability provided to the fifth lumbar vertebra by large transverse processes supported by strong iliolumbar ligaments.^{25–27}

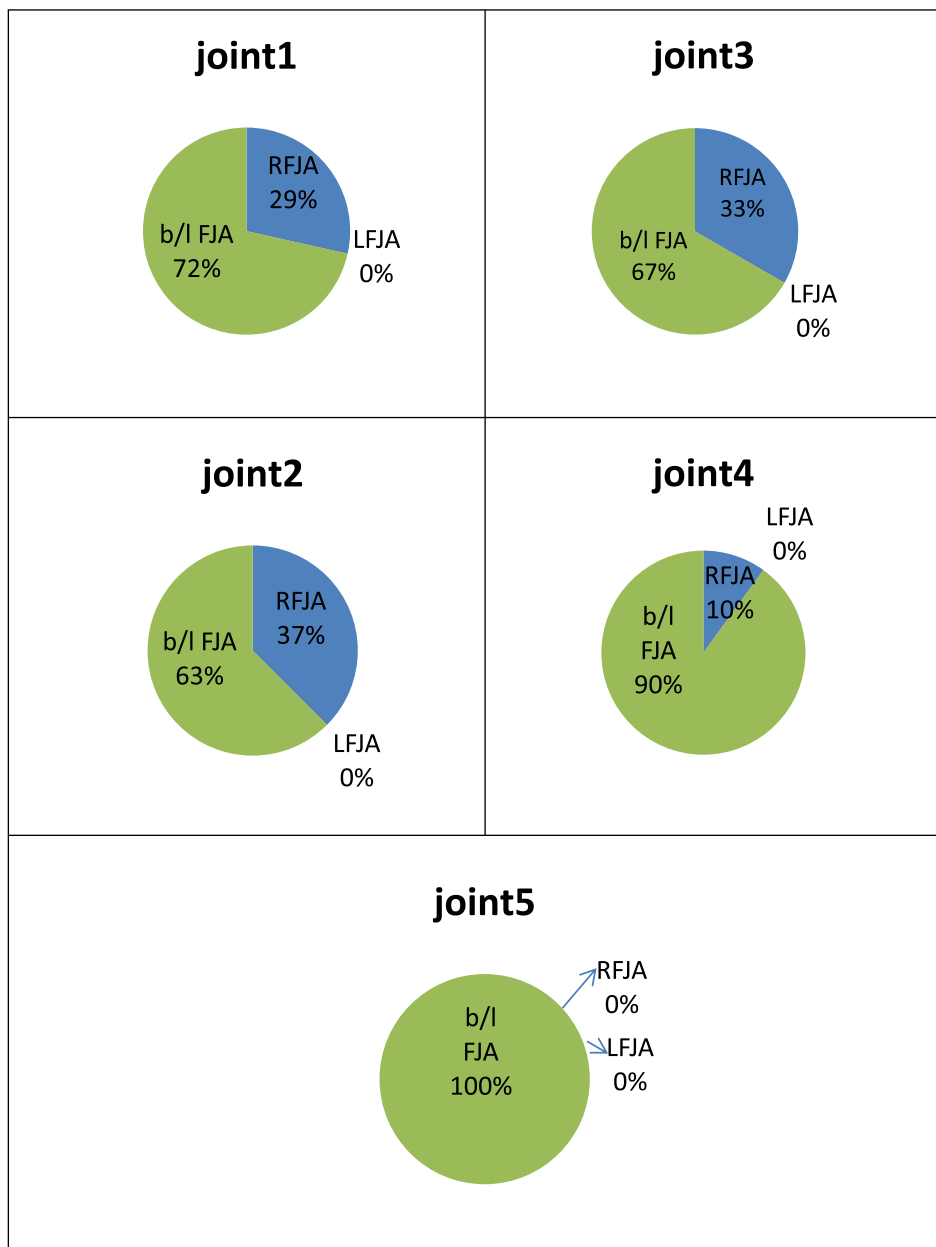
FJA and sex: In the present study marked high prevalence was seen in females as compared to males. One potential explanation for sex differences in FJA is that the cartilage is sex-hormone sensitive tissue.²⁸ Ha and co-workers in an immuno histochemical study demonstrated estrogen receptors in the facet joint cartilage. Different estrogen receptors in both sexes contribute to different prevalence rates in men and women.²⁹ Though significant further research in this field is needed.

Within the last century, surgical treatment for LBP (due to disc herniation) has been performed by discectomies or decompressions. However relief could not be attained in most of the cases and this generated the concept of Dynamic stabilization of spine for chronic recurrent cases of LBP.³⁰ In this process posterior stabilization of spine is achieved by way of restoration of facet joints along simultaneous total disc replacement (TDR). Presently facet replacement systems have developed and are gaining acceptance, to restore the functionality of facet joints and it may be used either alone or with TDR. This suggests that the role of facet joints and degenerative changes occurring at these joints provide a significantly important factor for good prognosis of the spinal surgery.

The facet joint arthrosis is one of the leading cause of LBP hence for the management and good prognosis of LBP patients, facet joint assessment for osteoarthritic changes along with disc degeneration is also imperative.



Graph 1 – Sex predilection of FJA.



Graph 2 – Pie charts of prevalence percentage of FJA at different vertebral levels. RFJA-right facet joint arthrosis, LFJA-left facet joint arthrosis, b/l FJA-bilateral arthrosis.

5. Conclusions

The present study shows that there is a high prevalence of FJA in low back pain patients. The prevalence of FJA increases caudally from L1 to L5, with the highest incidence being at the L4–L5 spinal level. Further, the women are more prone to develop lumbar FJA than men.

Conflicts of interest

All authors have none to declare.

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