Histopathological Evaluation Of Vertebral And Intervertebral Disc Lesions Causing Neural Compression

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Abstract

Background: Compressive symptoms of spinal nerves is common presentation in general population. Intervertebral disc degeneration (IVD) is the commonest pathology that leads to low back pain. Damage to intervertebral disc-vertebra interface associates with back pain and various lesions. This study is aimed at histopathological evaluation of excised specimen of cases presenting with neural compression at single or multiple sites.

Material methods: The prospective study was performed on surgically excised tissues from 75 (n) patients. Demographic data and brief clinical history were recorded. Tissue sections were prepared by using a paraffin block and stained with haematoxylin and eosin (H & E). Detailed microscopic evaluation was performed, and the diagnosis was recorded. The statistical evaluation was done using R Studio V 1.2.5001 software. The Chi-square test of association was used to find the association between histopathological findings of different lesions and age, and gender.

Results: Out of 75 cases 48 males and 27 females. The mean age of subject is 51 years ranging from 24 to 72 years. The study included histopathological findings of vertebral and intervertebral disc lesions. Intervertebral disc lesions showed presence of degenerated and inflammatory lesions. Vertebral lesions were classified as benign and metastatic lesions. The degenerated intervertebral disc material was in 35 cases, inflammatory lesions included intervertebral discitis (n=21) and Pott's spine (n=10). The benign lesions are aneurysmal bone cyst (n=2), fibrous dysplasia (n=1), giant cell tumor (n=2), meningioma (n=2), plexiform neurofibroma (n=1). One case of metastatic deposit of adenocarcinoma from lung (1) were diagnosed. No primary malignancy cases were found in our study.

Conclusion: Majority of histopathological findings of excised samples showed intervertebral discitis and Pott’s spine. The present study provided valuable information regarding histopathology of lesions and their correlation to preoperative diagnosis.

Keywords: Low back pain, Intervertebral disc lesions, inflammatory lesions, Benign lesions, Metastatic lesions.
INTRODUCTION
The compressive lesions of the vertebral column are common in community. In elderly population intervertebral disc (IVD) lesions is a typical condition described by the degeneration of at least one disc plate that separates bones of the vertebrae resulting in pain at the associated area.\[1\] The lower back pain (LBP) is a common reason for disability worldwide, its aetiology is unclear however, in 40% of cases it is associated with IVD lesions.\[2-5\] The disk degeneration is a complex and multifactorial condition. Various clinical studies in the literature have shown that age, gender, abnormal physical loading, trauma, overweight and obesity, etc. are risk factors related to IVD degeneration.\[6\] In humans, spinal anatomy and biochemical properties are different among males and females. Females have a greater lordotic angle and lordotic wedging of lumbar vertebrae, and also a sex difference in spinopelvic alignment. In females compare to male biomechanically spines have greater flexibility and range of motion. Furthermore, IVD degeneration causes a change in biomechanical property in males, which suggests sex-specific IVD degeneration.\[7\]
The histology of IVDs is utilized for stratification of the samples or as the outcome variable.\[8\] In spite of the fact that histopathological evaluation of framework for IVD degeneration are commonly used in research, they are not integrated into the daily care routine pathology of surgical samples. Therefore, limited data is available on histopathology of an excised sample of IVD and its correlation to clinical parameters and demography such as age, gender and patterns of occurrence. Many infective and neoplastic lesions presenting as subtle compressive features needs follow up management unless otherwise their will be failure in outcomes. Therefore, the study aimed to evaluate histopathology of IVD lesions and to study the pattern of occurrence of different lesions in relation to age and gender.

Methodology
The ethical clearance was obtained for the retrospective analysis of data collected by studying case sheets, operative notes and corresponding histopathological report review in 75 patients. The study was performed for a duration of 2 years (January 2018 to December 2019) in the tertiary care centre at Kolhapur. Patients with radiologically diagnosed IVD lesions were recruited into the study. Detailed clinical data and relevant information was recorded. The excised specimen were treated with 10% formalin overnight whereas, bony material were treated with 10% buffered formalin followed by decalcified with nitric acid. Tissue sections were prepared by using a paraffin block and stained with H& E. Detailed microscopic evaluation was performed, and the diagnosis was recorded.

Statistical analysis
The data were evaluated using R Studio V 1.2.5001 software. Categorical and continuous variables were expressed in frequency and mean±SD respectively. A chi-square test was performed to assess the association between the variables. P<0.05 was considered statistically significant.

Results
The mean age of the patients was 51.47±12.05 years (figure 1) including 64% (n=48) males. Histopathology of majority excised samples were divided into degenerated disc materials, inflammatory lesions, benign lesions, and metastatic lesions. Degenerated disc material (57.33%, n=43), Inflammatory lesions showed intervertebral discitis (18%, n=14), Potts spine (13.33%, n=10) detailed histopathological findings and patient sample data are displayed in table no. 1. However, no significant association of histopathological findings with gender (P=0.18) and age (P=0.97) was found.
Discussion
The LBP is a multifactorial condition and IVD degeneration is considered a strong etiological factor.[6] IVD degeneration mainly occurs in lower lumbar segments and it generally affects almost every individual in their sixties and seventies and also it is sex-specific.[7, 9-10] The histological aspect of IVD degeneration also been widely studied, the correlation with clinical aspects is unclear.[11] The objective of the study is to evaluate histopathological findings in excised IVD and its correlation with age and gender.

In this study majority of evaluated samples were obtained from male patients (64%). The mean age of the patients was 51.47±12.05 years ranged from 24-72 years. Similar findings were observed in the study of Weiler et al.[12] The histopathological findings showed the presence of degenerated disc material due to prolapse in lumbar vertebra, aneurysmal bone cyst in the pedicle of lumbar vertebra, Fibrous dysplasia, Giant cell tumor, Intervertebral discitis, Meningioma, Metastatic deposit of adenocarcinoma from lungs, Plexiform neurofibroma, and Potts spine. However, no similar study was found to support these findings which may be due to utilization of various histological criteria for the distribution between composition of disc material.[12, 13-17]

Boos et al. conducted an investigation on fragments of the lumbar spinal column in cadavers and analysed the histopathological changes in lumbar discs corresponding to age ranging from a foetus to 88 years. They generated a scale which categorises the histological degeneration of lumbar discs,[18] Similarly, Weiler et al. improved the Boos scale and approved it in a series of patients, using disc herniation treated surgically. They found no significant association of histopathological findings with age and gender.[12] Moreover, the development or severity of IVD degeneration is not linearly based on age as degenerative changes can be noted in young children and not yet be manifested in other adults.[9, 19] Munnariz et al. assessed the relationship between histological degeneration and, radiological and clinical parameters in the patients who had lumbar disc herniation surgery. They found no correlation between histopathological findings and patients age.[11] In the present evaluation histopathological findings were not graded however, no significant association of histology findings with age and gender was observed. Many articles from GBD study reflected on related aspects of this study.[20-23] Related studies were also reported by Gupta et al[24] and Gugulothu et al.[25]

The present study was aimed to assess histopathological findings in excised intervertebral disk lesion and its correlation with age and gender.[26] The results showed Intervertebral discitis and Potts spine as common histological findings with no association with gender and age. Limitations of the study were the limited sample size and the histopathological findings were not graded according to available scales. A study with a large sample size with appropriate grading would be better for correlation is the further recommendation of the study.[27]

CONCLUSION
No significant association of histopathological findings with age and gender was observed. A study with a large sample size is required to further confirmation of the present findings.

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Table 1: Patients sample data and histopathological findings

<table>
<thead>
<tr>
<th>Sample data</th>
<th>64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (%)</td>
<td></td>
</tr>
<tr>
<td>Female (%)</td>
<td>36</td>
</tr>
<tr>
<td>Age range/mean±SD (years)</td>
<td>24-72/51.47±12.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Histopathological findings</th>
<th>Cervical, Lumbar,</th>
<th>Number of patients (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degenerated disc material</td>
<td></td>
<td>43</td>
</tr>
</tbody>
</table>

**Inflammatory lesions**

<p>| Intervertebral discitis       | Lumbar | 14 |</p>
<table>
<thead>
<tr>
<th>Lesion Type</th>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benign lesions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aneurysmal bone cyst</td>
<td>Lumbar</td>
<td>10</td>
</tr>
<tr>
<td>Fibrous dysplasia</td>
<td>Lumbar</td>
<td>2</td>
</tr>
<tr>
<td>Giant cell tumor</td>
<td>Lumbar</td>
<td>1</td>
</tr>
<tr>
<td>Plexiform neurofibroma</td>
<td>Lumbar</td>
<td>2</td>
</tr>
<tr>
<td>Psammomatous Meningioma</td>
<td>Thoracic</td>
<td>1</td>
</tr>
<tr>
<td>Meningothelial meningioma</td>
<td>Lumbar</td>
<td>1</td>
</tr>
<tr>
<td><strong>Metastatic lesions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metastatic deposit of adenocarcinoma from lung</td>
<td>Lumbar</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 1: Age distribution of the patients**