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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: Outof 75 cases48 males and 27 females. The mean age of subject is51 yearsranging 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 35cases, inflammatory lesions included intervertebral discitis (n=21) and Potts spine in (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 corelation 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, andalso 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 sexspecific 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 clinicaldata 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, benignlesions, 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 ofvarious 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]Munnarriz 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.

REFERENCE

1. Intervertebral disc disease. Available from https://ghr.nlm.nih.gov/condition/intervertebral-disc-disease Accessed on: 28/02/2020
2. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, Abraham J. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study. The lancet. 2012;380(9859):2163-96.
3. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, Williams G, Smith E, Vos T, Barendregt J, Murray C. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Annals of the rheumatic diseases. 2014;73(6):968-74.

4. Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Bogduk N. The prevalence and clinical features of internal disc disruption in patients with chronic low back pain. Spine. 1995;20(17):1878-83.
5. Marcus, M. and Tomasi, D. "Emotional and Cognitive Responses to Academic Performance and Grade Anxiety. *Journal of Medical Research and Health Sciences*. 3, 4 (Apr. 2020), 919-925. DOI:https://doi.org/10.15520/jmrhs.v3i4.172.
6. Molinos M, Almeida CR, Caldeira J, Cunha C, Gonçalves RM, Barbosa MA. Inflammation in intervertebral disc degeneration and regeneration. Journal of the Royal Society Interface. 2015;12(104):20141191.
7. Chan WC, Sze KL, Samartzis D, Leung VY, Chan D. Structure and biology of the intervertebral disk in health and disease. Orthopedic Clinics. 2011;42(4):447-64.
8. Mosley GE, Hoy RC, Nasser P, Kaseta T, Lai A, Evashwick-Rogler TW, Lee M, Iatridis JC. Sex differences in rat intervertebral disc structure and function following annular puncture injury. Spine. 2019;44(18):1257-69.
9. Tripathy, D.T., Tripathy, A., Dwivedi, D.R., Gautam,, D.M., Prusty, D.U. And Nayak, D.C. 2020. Prelacteal Feeding Of Neonants&DiscardationOf First Breast Milk Among Recently Delivered Women Of Uttar Pradesh, India. *Journal Of Medical Research And Health Sciences*. 3, 5 (May 2020). DOI:Https://Doi.Org/10.15520/Jmrhs.V3i5.184.
10. Rutges JP, Duit RA, Kummer JA, Bekkers JE, Oner FC, Castelein RM, Dhert WJ, Creemers LB. A validated new histological classification for intervertebral disc degeneration. Osteoarthritis and cartilage. 2013;21(12):2039-47.
11. Cheung KM, Karppinen J, Chan D, et al. Prevalence and pattern of lumbar magnetic resonance imaging changes in a population study of one thousand forty-three individuals. Spine 2009;34:934–40.
12. Battie MC, Videman T, Parent E. Lumbar disc degeneration: epidemiology and genetic influences. Spine 2004;29:2679–90.
13. Munarriz PM, Paredes I, Alén JF, Castaño-Leon AM, Cepeda S, Hernandez-Lain A, Lagares A. Assessment of the correlation between histological degeneration and radiological and clinical parameters in a series of patients who underwent lumbar disc herniation surgery. Neurocirugía (English Edition). 2018;29(2):79-85.
14. Weiler C, Lopez-Ramos M, Mayer HM, Korge A, Siepe CJ, Wuertz K, et al. Histological analysis of surgical lumbar intervertebral disc tissue provides evidence for an association between disc degeneration and increased body mass index. BMC Res Notes. 2011;4:497.
15. Eckert C, decker A. Pathological studies of intervertebral discs. JBJS. 1947 Apr 1;29(2):447-54.
16. Willburger RE, Ehiosun UK, Kuhnen C, Krämer J, Schmid G. Clinical symptoms in lumbar disc herniations and their correlation to the histological composition of the extruded disc material. Spine. 2004 Aug 1;29(15):1655-61.
17. Yasuma TS, Makino EI, Saito S, Inui MI. Histological development of intervertebral disc herniation. JBJS. 1986 Sep 1;68(7):1066-72.
18. Yasuma TS, Koh S, Okamura T, Yamauchi Y. Histological changes in aging lumbar intervertebral discs. Their role in protrusions and prolapses. The Journal of bone and joint surgery. American volume. 1990 Feb;72(2):220-9.
19. Osti OL, Vernon-Roberts B, Moore R, Fraser RD. Annular tears and disc degeneration in the lumbar spine. A post-mortem study of 135 discs. The Journal of bone and joint surgery. British volume. 1992 Sep;74(5):678-82.
20. Boos N, Weissbach S, Rohrbach H, Weiler C, Spratt KF, Nerlich AG. Classification of age-related changes in lumbar intervertebral discs: 2002 Volvo Award in basic science. Spine (Phila Pa 1976). 2002;27:2631–44.
21. Samartzis D, Karppinen J, Chan D, et al. The association of disc degeneration based on magnetic resonance imaging and the presence of low back pain. Presented at: World Forum for Spine Research: Intervertebral Disc. Montreal (Canada), July 5–8, 2010.

22. Eman A Shakir, ZainabNazar (2017) Obesity increase the risk of carpal tunnel syndrome, International Journal Of Scientific Research And Education.05,04 (April-17) 6309-12
23. AbidillahMursyid, Waryana, LastmiWayansari, WiworoHaryani (2017) Canteen Manager And Elementary Student Empowerment About Local Food To Combat AnemiaInternational Journal Of Scientific Research And Education.05,07 (July-17) 6726-33
24. Murray, Christopher J L, Cristiana Abbafati, Kaja M Abbas, Mohammad Abbasi, Mohsen Abbasi-Kangevari, FoadAbd-Allah, Mohammad Abdollahi, et al. "Five Insights from the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1135–59. https://doi.org/10.1016/S0140-6736(20)31404-5.
25. Murray, Christopher J L, Aleksandr Y Aravkin, PengZheng, Cristiana Abbafati, Kaja M Abbas, Mohsen Abbasi-Kangevari, FoadAbd-Allah, et al. "Global Burden of 87 Risk Factors in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1223–49. https://doi.org/10.1016/S0140-6736(20)30752-2.
26. Vos, Theo, Stephen S Lim, Cristiana Abbafati, Kaja M Abbas, Mohammad Abbasi, MitraAbbasifard, Mohsen Abbasi-Kangevari, et al. "Global Burden of 369 Diseases and Injuries in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1204–22. https://doi.org/10.1016/S0140-6736(20)30925-9.
27. Wang, Haidong, Kaja M Abbas, MitraAbbasifard, Mohsen Abbasi-Kangevari, HedayatAbbastabar, FoadAbd-Allah, Ahmed Abdelalim, et al. "Global Age-Sex-Specific Fertility, Mortality, Healthy Life Expectancy (HALE), and Population Estimates in 204 Countries and Territories, 1950–2019: A Comprehensive Demographic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1160–1203. https://doi.org/10.1016/S0140-6736(20)30977-6.
28. Ritchy, R. L., Olivier, R. S. R., Mikhaël, M. R., Solofonirina, R., &Nirina, R. (2019). Aspects épidémiocliniques des blocsauriculo-ventriculairesvus aux services de Cardiologie et USIC du CHU Befelatananad'Antananarivo. Journal of Current Medical Research and Opinion, 2(10), 252–255. https://doi.org/10.15520/jcmro.v2i10.208
29. Gupta, S., A. Mohabey, V. Gawande, and K. Saoji. "To Evaluate Significance of Anatomic and Morphometric Parameters of Intervertebral Disc Using Magnetic Resonance Imaging in Patients with Low Back Pain." *International Journal of Current Research and Review* 12, no. 14 Special Issue (2020): 141–47. https://doi.org/10.31782/IJCRR.2020.141147.
30. Gugulothu, S.S., R.S. Choudhary, and S. Telrandhe. "CMOS Amplifiers Design for Neural Recording System." *Journal of Advanced Research in Dynamical and Control Systems* 11, no. 8 Special Issue (2019): 3071–76.

Table 1: Patients sample data and histopathological findings

Sample data		
Male (%)		64
Female (%)		36
Age range/mean±SD (years)		24-72/51.47±12.05
Histopathological findings	**Vertebra**	**Number of patients (n)**
Degenerated disc material	**Cervical, Lumbar,**	43
Inflammatory lesions		
Intervertebral discitis	Lumbar	14

Potts spine	Lumbar	10
Vertebral lesions		
Benign lesions		
Aneurysmal bone cyst	Lumbar	
Fibrous dysplasia	,Lumbar	2
Giant cell tumor	Lumbar	1
Plexiform neurofibroma	Lumbar	2
Psammomatous Meningioma	Thoracic	1
Meningothelial meningioma	Lumbar	1
		1
Metastatic lesions		
Metastatic deposit of adenocarcinoma from lung	Lumbar	1
		9

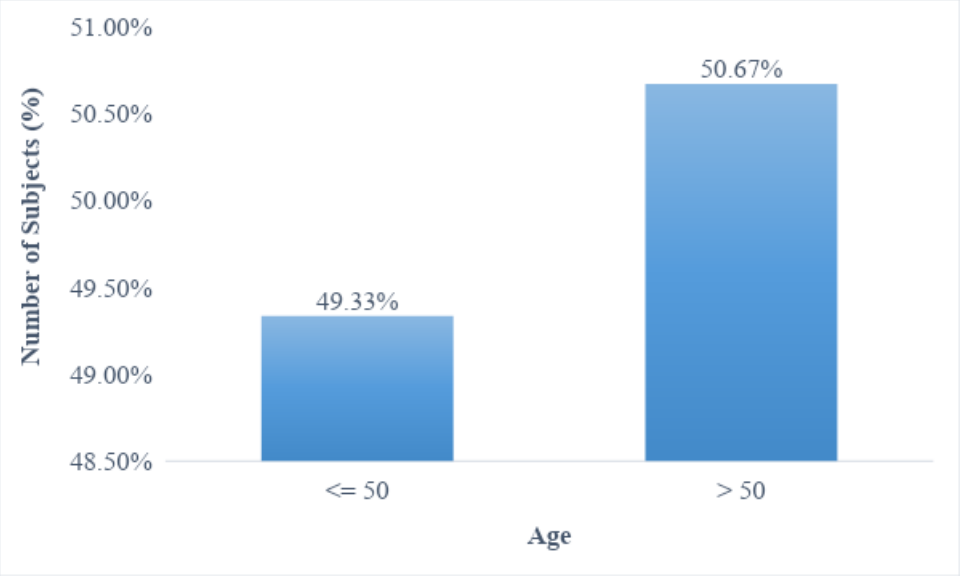

Figure 1: Age distribution of the patients