ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

MRI Study Of Prevalence Of Schmorl's Node In Thoraco-Lumbar Spine

Munsif T, Tewari V, Pasricha N,Haider S S,Siddiqui M S, Khandury S
Era's Lucknow Medical College & Hospital,Lucknow.

Manuscript Info

Manuscript History:

Received: 15 April 2014
Final Accepted: 22 May 2014
Published Online: June 2014

Key words:
Schmorl's nodes, Herniated tissue, Thoracolumbar junction, Intervertebral disc

Corresponding Author

Munsif T

Abstract

Objective: Although Schmorl's nodes are common in normal adult population, their prevalence is controversial & etiology is still debatable. Objective of this study is to find out the prevalence of Schmorl's node in normal asymptomatic population.

Material & Method :This is a retrospective study done in Era's Lucknow Medical College & Hospital, Lucknow in collaboration with Dept of Radiology. M R I scans of thoraco-lumbar region of 100 patients were assessed for various anatomical parameters.

Results: Out of 100 cases 18(18%) were found to have Schmorl's nodes. No independent association of Schmorl's node with back pain was identified.

Conclusion: Schmorl's node is common in elderly population with frequency similar to that in young population. Presence of Schmorls node's is not always associated with pain

INTRODUCTION

Schmorl's nodes (SNs) classically known as intervertebral disc herniation were first described by Schmorl in 1927.[1]. It represents a herniation of intervertebral disc nuclear material (nucleus pulposus) through vertebral end plate, with displacement of this material into adjacent vertebral body.[2]. Herniated tissue may form defect in upper or lower surfaces of involved vertebrae. SNs can appear on any spinal vertebrae but tend to concentrate more on thoraco lumbar junction [3,4]. This is usually attributed to load on the vertebrae, which increases as we descend along the spine [4,16,17]. Lesion tend to occur at central or posterior axis of vertebrae, near thoracolumbar junction. Trauma or stress transmitted through weakened endplate is the proposed pathogenesis of schmorl's node formation. This could be due to intrinsic factors in the endplate (indentations, vascular channels, ossification gaps) or acquired factors (infection, hyperparathyroidism, Paget's disease, osteoporosis [4]. However such weakening of end plate is not a necessary precondition for extrusion & is thought to be present as an underlying cause only in small percentage of Schmorl's node cases [4,5]. SNs are considered to be asymptomatic incidental finding [5]. These are common incidental finding on plain radiographs, computed tomography, and magnetic resonance imaging. SNs were recorded as present when the integrity of the vertebral body surface was disrupted, having cup shaped depression with sclerotic margins [6]. Schmorl's cartilaginous nodes can accompany any disease process that weakens thecartilaginous endplate or subchondral bone of the vertebral body and allows intraosseous disc displacement. A partial list of such processes includes trauma, neoplasm, metabolic disorders (hyperparathyroidism, osteoporosis, Paget's disease), infection, intervertebral osteochondrosis, and articular disorders

(rheumatoidarthritis). Interestingly while seronegative spondyloarthropathies or frank ankylosing spondylitis are the major differential diagnosis in inflammatory spinal disorders, this condition is "the overlooked"item in literature [7].

Epidemiology

Schmorl's nodes have been noted in 10-38% of all spine studies, with a slightly higher incidence in males. Some researchers proposed a positive association with increasing age, while others argue that age could not be a significant factor. Heredity may play an important role[8]. Hilton et al. found an incidence of 75%, with a higher frequency in the thoracolumbar region than in the mid and lower lumbar spines[9]. This regional difference has been noted by others. Studies have been restricted to the thoracic and lumbar spine and reports seldom indicates to Schmorl's nodes in the cervical spine. These nodes have been identified with increased frequency in athletic adolescents. With regard to the prevalence of SNs, cadaver studies vary in their estimates, ranging from 38% to as high as 79**%** [8].

AIMS & OBJECTIVE

To investigate the prevalence of Schmorl's node in thoraco-lumbar spine.
To reveal the preferred vertebra & its body surface.
.To gain better understanding of factors associated with SNs manifestation.

MATERIAL & METHODS

Present study was carried out in the department of Anatomy in collaboration with department of Radiology in Era's Lucknow Medical college & hospital. Sample size – 100. All **c**ases who came for MRI of thoraco-lumbar spine in Dept. of Radiology in the age group of 20-70yrs were included. Cases with H/O surgery, trauma, neoplasm, cyst, were not included in this study. MRI machine of 1.5 tesla of Hitherto Japan is used in ELMCH. For each subject 4mm thick T2 weighted saggital images centered on T1 – L5 was acquired in supine position.

OBSERVATIONS & RESULTS

Out of 100 cases, 66 were males & 34 were females. SNs occur primarily in the upper part of the lumbar spine, and usually there are multiple lesions in the same individual. We could not establish any significant correlation between SNs with gender and age. The overall prevalence was 18%. We did not find any significant correlations between SNs and overall degeneration of the lumbar spine.

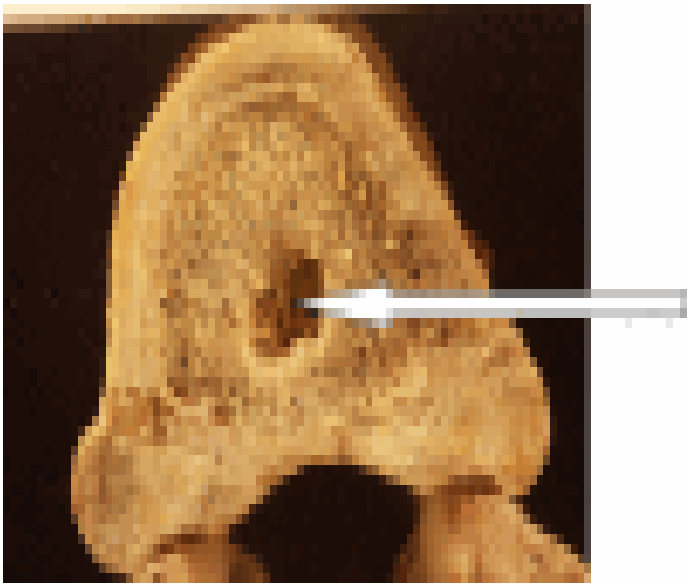

Fig1- showing typical depression of Schmorl's node on vertebrae

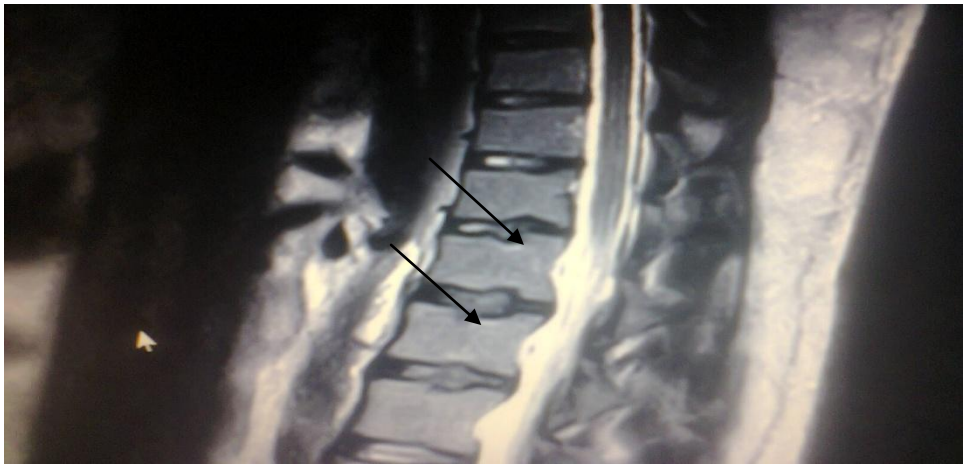

Fig2- Sagittal view T2- weighted MRI scan of thoraco lumbar spine showing schmorl's node arrow.

No of cases studied		No of cases with SN's		No of cases without SN's	
100		18		82	
Male	Female	Male	Female	Male	Female
66	34	14	4	52	30

DISCUSSION

"Schmorl's nodes" (SN) are lytic lesions at endplates which are believed to be due to the herniation of the nucleus pulposus through the cartilaginous endplate into the body of vertebral endplates. Classic description of Schmorl's nodes are of two basic components, (1) disruption of the cartilaginous endplate (2) herniation of gelatinous material of nucleus pulposus into the vertebral body. It may suggest osteonecrosis beneath the cartilaginous endplate as the basic event. Secondary herniation of nucleus pulposus may or may not ensue. Non acute schmorl's

nodes are common spinal abnormalities & reported to occur in 38% to 75% of population. In present study schmorl's nodes were present in 18 [18%] cases The association between gender & age with the schmorl's node location was examined using Chi- square test. There was no statistical significance in male-female ratio.Present data indicate that SN's nodes mostly appeared on superior surface of vertebrae & lower thoracic or upper lumbar region.

Prevalence of SNs depends on several factor: Prevalence depends on several factors: classification of SNs (i.e minimal size of the concavity to be considered as a node); definition of "individuals with SNs" (one or multiple cases of SNs); different methods applied for locating SNs Magnetic resonance imaging (MRI), Computed tomography (CT) scans, roentgenograms, autopsies and skeletal material. Demographics (sex ratio, ethnic origin, etc) & socioeconomic charecteristics (mainly daily activities) of examined population [7]. Most consider schmorl's nodes to be asymptomatic, since they are a frequent finding in persons without back pain. It is therefore not surprising that the reported frequency of SNs in the literature varies (5–70%) [18]. In our study, 18 individuals manifested one or more SNs along the spine (18%). This prevalence is lower than reported by Pfirrmann and Resnick [10] who studied 100 cadavers (58%). Schmorl's node may well be demonstrated at plain radiography ,computed tomography(CT), and was recently demonstrated by bone scintigraphy.[11] However,MRI is the modality of choice for diagnosis of schmorl's nodes as plain radiograph and CT. Detection of Schmorl's nodes on conventional radiograph depends on the size of nodes as well as reactive reactive prcosses, such as fibrosis and sclerosis, in the adjacent trabecular bone. Coventry et al.[12] first reported in 1945 that only 3.6% of 55 pathologically confirmed schmorl's nodes were visible on conventional X-ray.This prevelance is lower than present study. Yasuma et al in 1988 reported that 5.6% of 54 nodes identified histologically SN's were visible with convetional radiograph [13]. Therefore plain radiograph have limited value in assessing SNs. Moke et al in 2010[1] reported that in a crossectional population based MRI study of 2,499 individual's ,majority of SNs were located in upper lumbar levels with highest prevalence in L2-L3.This is in consistent with present study. Dar et al showed in skeletal study that SNs appear more frequently in T7- L1 region. This finding was consistent with previous report by Pfirrman & Resnick [11]. Relationship between a Schmorl's node and pain in the back is not clear. In our study, almost 2/3 rd of schmorl's node were located on the superior surface of vertebral end plates. This finding do not agree with Resnick et al, William's et al [14]. Takahashi et al [6] analysed MRI findings in patients with symptomatic and asymptomatic Schmorl's nodes. In symptomatic patients, the vertebral body, marrow surrounding the Schmorl's node gave a low signal intensity on T1-weighted and a high signal intensity on T2-weighted images. This indicated the presence of inflammation and oedema in the vertebral bone marrow. These MRI findings were not present in asymptomatic individuals which suggested that Schmorl's nodes became asymptomatic when inflammation subsides Our study showed that SNs appear more frequently in the T7–L1 region than in the higher thoracic vertebrae (T4–T6) or the lower lumbar vertebrae (L2–L5). This frequency distribution agrees with Pfirrmann and Resnick's [11]. Hilton et al. [9] proposed a strictly developmental pathogenesis for SNs.. In their study of postmortem thoracolumbar spines, they found no relationship between age and SNs. They, therefore, rejected a degenerative disease model and proposed a developmental/embryogenic model, arguing that SNs are already present during skeletal maturation; hence, the lack of a difference between specimens from their subject pool over and under the age of 50 years. To explain why SNs are not equally distributed in the spine, Hilton and colleagues [9] proposed that the thoraco-lumbar spine is under greater stress of the vertebral column, than other regions and, therefore, is predisposed to SN formation caused by

these developmental insults .Present study agrees with this study Dar et al [14] proposed an axial load model in which they argued that because of their erect posture and bipedal locomotion, humans must accommodate increased axial forces in addition to balancing the need for spinal mobility and stability. Given that the thoracolumbar spine bears great axial stress and is relatively mobile, it may accumulate micro-traumas that can lead to the formation of SNs in the general population [14]. They concluded that the combination of increased range of rotational movement, anteriorly located instantaneous axis of rotation, and low-disc thickness relative to vertebral body height in the thoracic spine makes this region more vulnerable to develop SNs. This predominance of SNs in the lower thoracic region has been verified by other studies [15].

CONCLUSION

The prevalence of SNs in the present study is 18%. The distribution and location of SNs along the thoraco-lumbar spine do not tend to support the traumatic or disease explanation of the phenomenon. Occurrence are probably associated with the vertebral development process during early life. MRI is the best modality to diagnose schmorl's node

REFRENCES

1 Mok FP, Samartzis D, Karppinen J, Luk KD, Fong DY, Cheung KM. ISSLS prize winner: prevalence, determinants, and association of Schmorl nodes of the lumbar spine with disc degeneration: a population-based study of 2449 individuals. Spine (Phila Pa 1976) 2010; 35:1944–1952.

2 Pilet B, Salgado R, Van Havenbergh T, Parizel PM. Development of acute schmorl nodes after discography. J Comput Assist Tomogr. 2009; 33:597–600.

3 Williams FM, Manek NJ, Sambrook PN, Spector TD, Macgregor AJ. Schmorl's nodes: common, highly heritable, and related to lumbar disc disease. Arthritis Rheum. 2007;57:855–860.

4. Wu HT, Morrison WB, Schweitzer ME. Edematous Schmorl's nodes on thoracolumbar MR imaging: characteristic patterns and changes over time. Skeletal Radiol. 2006;35:212–219.

5. Jang JS, Kwon HK, Lee JJ, Hwang SM, Lim SY. Rami communicans nerve block for the treatment of symptomatic Schmorl's nodes: a case report. Korean J Pain. 2010;23:262–265

6. Takahashi K, Miyazaki T, Ohnari H, Takino T, Tomita K. Schmorl'snodes and low-back pain: analysis of magnetic resonance imagingfindingsin symptomatic and asymptomatic individuals. Eur Spine J1995;4:56-9.

7. Song KS, Yang JJ (2011) Acutely progressing paraplegia caused by traumaticdisc herniation through posterior Schmorl's node opening into the spinal canalin lumbar Scheuermann's disease. Spine (Phila Pa 1976) 36: E1588-E1591.

8. Kyere KA, Than KD, Wang AC, Rahman SU, Valdivia-Valdivia JM, et al. (2012) Schmorl's nodes. Eur Spine J 21: 2115-2121.

9. Hilton RC, Ball J, Benn RT (1976) Vertebral end-plate lesions (Schmorl'snodes) in the dorsolumbar spine. Ann Rheum Dis 35: 127-132.

10. European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research society .22:8 2013 Aug pg 1907-12.

11.Pfirrmann CW, Resnick D. Schmorl nodes of the thoracic and lumbar spine: radiographic-pathologic study of prevalence, characterization, and correlation with degenerative changes of 1, 650 spinal levels in 100 cadavers. Radiology. 2001;219:368–374.

12 Coventry MB, Ghormley RK, Kernohan JW. The intervertebral disc: its microscopic anatomy and pathology. III. Pathological changes in the intervertebral disc. J Bone Joint Surg 1945; **27**:460-474.

13 Silberstein M, Opeskin K, Fahey V. Spinal Schmorl's nodes: sagittal sectional imaging and pathological examination. Australas Radiol. 1999;43:27–30.

14. Dar G, Masharawi Y, Peleg S, Steinberg N, May H, Medlej B, Peled N, Hershkovitz I. Schmorl's nodes distribution in the human spine and its possible etiology. Eur Spine J. 2010;19:670–675.

15. Williams FM, Manek NJ, Sambrook PN, Spector TD, Macgregor AJ. Schmorl's nodes: common, highly heritable, and related to lumbar disc disease. Arthritis Rheum. 2007;57:855–860.

16. Saluja G, Fitzpatrick K, Bruce M, Cross J. Schmorl's nodes (intervertebral herniations of intervertebral disc tissue) in two historic British populations. J Anat. 1986;145:87–96.

17. Faccia KJ, Williams RC. Schmorl's nodes: clinical significance and implications for the bioarcheological record. Int J Osteoarchaeol. 2008;18:28–44.

18. Hamanishi C, Kawabata T, Yosii T, Tanaka S. Schmorl's nodes on magnetic resonance imaging.Their incidence and clinical relevance. Spine. 1994;19:450–453.