

Schmorl's Nodes, Back Pain, and MRI -- Clinically Significant or Insignificant?

Schmorl's nodes are considered to be vertical disc herniations through the cartilaginous vertebral body endplates. They can sometimes be seen radiographically, however they are more often seen on MRI, even when not visible on plain film x-ray. They may or may not be symptomatic, and their etiological significance for back pain is controversial.

In a recent study in *Spine* by Hamanishi, et al.,¹ Schmorl's nodes were observed on MRI in 19% of 400 patients with back pain, and in only 9% of an asymptomatic control group. Plain film x-rays only revealed about 33% of the nodes identified on MRI. They also found a high incidence of nodes in the teenager group who had complaints of lower back pain and an increased level of participation in contact sports. The authors concluded that Schmorl's nodes are areas of "vertical disc herniation" through areas of weakness in the endplate.

In younger patients, it seems to be more common because the annulus is strong and intact, and thus nuclear material herniates through the weaker endplate. As the annulus degenerates with time and age, transverse or posterolateral herniations are more common.

In a more recent study published in the *European Spine Journal* by Takahashi, et al.,² an analysis and correlation was made in symptomatic and asymptomatic patients with MRI evidence of Schmorl's nodes. There were five patients with pain and Schmorl's nodes, and 11 asymptomatic controls. Symptomatic Schmorl's nodes were classified by physical exam, radiographs, MRI, and lab tests. All other possible etiologies were reportedly ruled out. Patients with symptomatic Schmorl's nodes had pain on percussion, and manual compression of the vertebra was involved. Back pain was exacerbated by axial loading and extreme lumbar ROM. They found no differences in the two groups on plain film x-ray evaluation. However, on MRI, in symptomatic cases, the vertebral body bone marrow surrounding the node was seen as low-intensity on T1-weighted images, and high signal intensity on T2-weighted images. These changes were local to the area of the Schmorl's node. The signal changes on MRI are reflective of bone marrow edema and inflammation often seen in cases of fracture. The MRI findings in Takahashi's study were confirmed upon histological section in two cases where surgery was performed.

Conservative care was delivered for three patients with symptomatic Schmorl's nodes. All three patients were asymptomatic after 3-4 months of conservative care. Symptomatic Schmorl's nodes represent a fresh fracture of the vertebral endplate, which allows vertical disc herniation and nuclear migration. This may cause diffuse lower back pain without associated radicular findings often seen in transverse type herniations. It must be emphasized that for a Schmorl's node to be considered symptomatic or active subsequent to trauma, an MRI should demonstrate the T1 and T2 signal changes described above.

Figure I: The patient injured her cervical spine subsequent to trauma, with MRI evidence of C7 vertebral body deformity, and Schmorl's node at the superior vertebral endplate of the C7 body.

Figure I represents a patient who injured her cervical spine subsequent to trauma, with MRI

evidence of C7 vertebral body deformity, with a Schmorl's node at the superior vertebral endplate of the C7 body. The MRI was obtained three months after trauma. The initial hospital x-rays were read as normal, and the patient was discharged despite having severe neck pain and limited ROM with myospasm.

Although Schmorl's nodes in the past have been considered clinically insignificant, clearly they may be an active symptomatic process and etiology of pain in some patients. Yochum³ states that Schmorl's nodes may be caused by numerous factors: trauma; hyperparathyroidism; osteoporosis; Schuermann's disease; osteomalacia; infections; and neoplasm. Yochum, et al., and Walters, et al.,⁴ state that trauma in adolescent athletes may be responsible for symptomatic Schmorl's nodes. Yochum, et al. also describe a unique large Schmorl's node that can cause a "squared off" vertebral body. They represent vertical disc herniation through a pain-sensitive endplate.

Recent studies have demonstrated that nucleus pulposus activates the release of inflammatory hormones and enzymes, such as leukotrenes, cytokines, PLA2, substance P, etc., and as such may be responsible for C-nociception or diffuse vertebrogenic pain seen in these types of cases.

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