

Case Report

The use of kyphoplasty balloon-assisted vertebroplasty in treating chronic symptomatic schmorl node in a young adult patient: a case report

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ABSTRACT

ABSTRAK

Schmorl node is commonly presented as an accidental finding, but it can also be the source of a chronic back pain. In some cases, persistent back pain due to Schmorl node may need surgical treatment. In this report, we present a patient with persistent back pain refractory to conservative measures caused by Schmorl node following a vertebral compression fracture, which was surgically treated with a minimally-invasive procedure in the form of kyphoplasty balloon-assisted vertebroplasty.

Schmorl node seringkali ditemui sebagai penemuan insidental, tetapi dapat juga menjadi sumber nyeri punggung kronik. Pada beberapa kasus, nyeri punggung yang menetap akibat Schmorl node dapat memerlukan tatalaksana pembedahan. Pada laporan kasus ini, kami mempresentasikan seorang pasien dengan nyeri punggung yang tidak membaik dengan tatalaksana konservatif yang disebabkan karena Schmorl node yang didahului dengan fraktur kompresi vertebra, dimana pasien ini ditatalaksana dengan prosedur minimal invasif dalam bentuk vertebroplasti yang dibantu dengan balon kifoplasti.

Keywords: Chronic back pain, kyphoplasty balloon, Schmorl node, spine vertebroplasty
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INTRODUCTION

A Schmorl node (SN) is the migration of intervertebral disc material into the spongy portion of the vertebral body through a break in the endplate.¹ Although classically presented as an accidental finding on otherwise asymptomatic individual,^{2,3} computed tomography and magnetic resonance imaging (MRI) recent evidence has suggested that painful SNs are not rarely found.^{2,4,5} Determining SN as the primary source of back pain, however, is challenging due to its close association with history of trauma,⁶ disc degeneration, endplate signal changes,⁷ and neoplastic or infectious process². The data on the prevalence of SN as identified by magnetic resonance imaging itself is unpersuasive since it shows a considerably wide range.⁸

Although SN is most commonly associated with back pain due to the disc material herniating into the spongy part of the vertebral body, it could also lead to radiculopathy when a tunnel forms posteriorly towards the spinal canal.⁹ Beside the strong relationship between SN and disc problems, integrity of the cartilaginous endplate also plays a role in the development of these nodes.¹⁰

Most cases of painful SNs will resolve with bed rest and analgesics, but some continue to persist, in which surgical procedures may be necessary.¹¹ One of the frequently proposed less invasive surgical treatment for painful SNs is injection of polymethylmethacrylate (PMMA) bone cement into the vertebrae, a procedure commonly known as vertebroplasty. Even though the classic procedure of vertebroplasty does not involve using a balloon commonly used during a kyphoplasty procedure, we report a case in which we utilized the kyphoplasty balloon to identify the SN and its tunnel through the cartilaginous endplate, assisting the vertebroplasty procedure.

Case Report

A 32-year-old obese but otherwise healthy Asian man presented in our clinic with a chronic low back pain. The patient had a history of trauma 18 months prior to admission, where the patient's spine was objected to trauma with an axial loading mechanism. The patient had gone through 3 months of external bracing use and the back pain was, initially, gradually recovered. However, in the last 3 months before the outpatient visit the back pain recurred, this time appearing also during daily activities, and this time analgesics and physical therapy did not

resolve the pain. Sensory and motor examination findings were normal despite pain on percussion on the level of L2 and limitation in back motion, especially during forward bending due to pain ranging from VAS 6-7. All routine laboratory tests were found to be normal. Plain radiography of the lumbar spine showed decreased anterior vertebral body of the second lumbar vertebrae with no other abnormality.

Due to the pain persisting after months of pain medication and physical therapy, a non-contrast computed tomography (CT) scan was performed. The sagittal slice showed a relatively straight lumbar spine, and L2 upper end-plate depression with a relatively widened interspinous distance compared to the levels above and below (Figure 1).



Figure 1. Sagittal slice of the thoracolumbar CT



Figure 2. Axial slice of the L2 vertebral body

On the axial slice, there was a left-sided bony cyst on the upper third of L2 vertebrae (Figure 2). Pre-operative anterior vertebral body height ratio was 83.3%, with the calculation as described by Yang *et al.*¹²

The patient underwent a general anesthesia procedure and was positioned prone on a radiolucent table. Under guidance of C-arm fluoroscopy, a small incision was made and a probe was inserted until it penetrated the area just before the node. Then, a modified vertebroplasty procedure using the unipedicular approach via the left pedicle, was performed, where we utilized a contrast-filled balloon commonly used in a kyphoplasty procedure to identify the SN's connection to the intervertebral disc space (Figure 3).

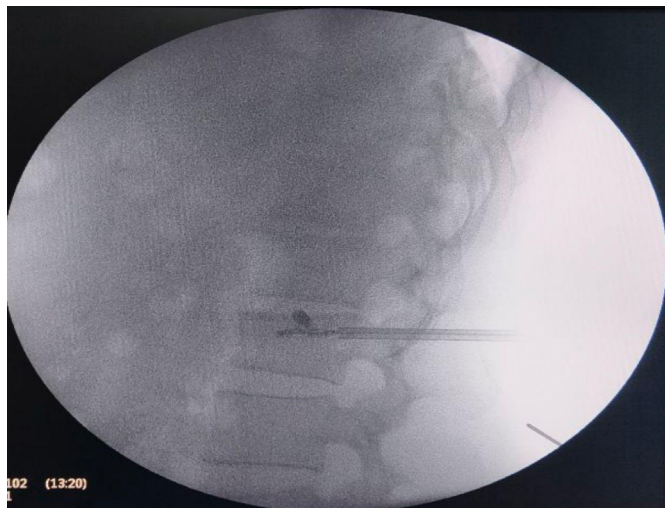


Figure 3. Intraoperative x-ray image showing the contrast-filled kyphoplasty balloon filling the defect and showing the tunnel through the superior endplate.

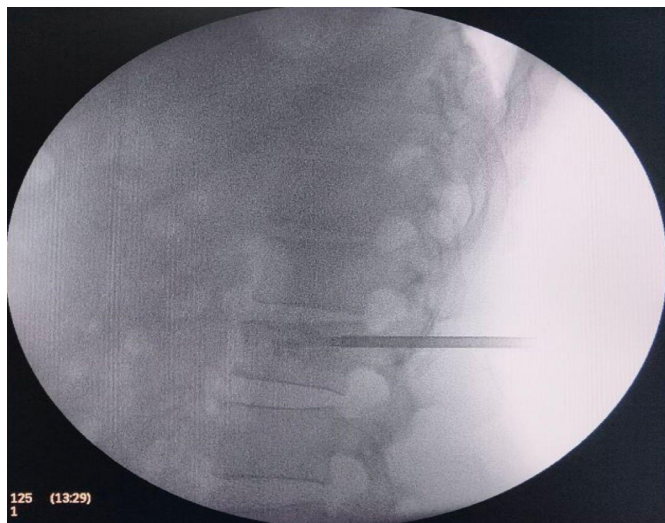


Figure 4. Intraoperative x-ray image showing the polymethylmethacrylate cement occupying the defect.

The balloon was inflated until the pressure reached 280 psi. Polymethylmethacrylate bone cement was introduced slowly by means of rod-pushing, under control using fluoroscopy in both anteroposterior and lateral planes in order to be certain that the cement does not migrate through the defect into the intervertebral disc space (Figure 4).

After the bone cement was hardened, the cement introducer was pulled out. Final anteroposterior and lateral views with C-arm fluoroscopy revealed satisfactory position of the cement without any migration to the intervertebral disc space (Figure 5).

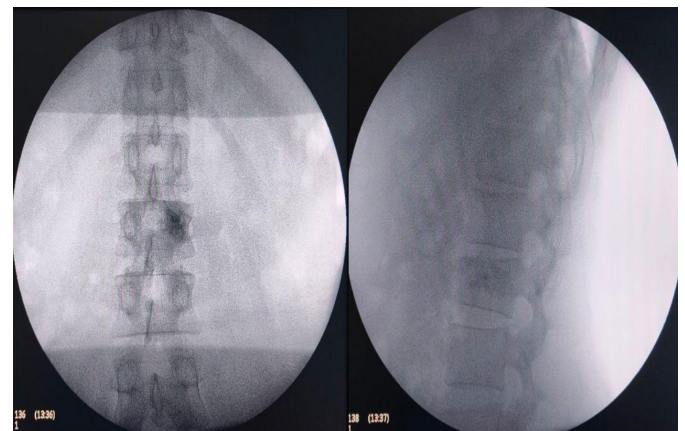


Figure 5. Final anteroposterior and lateral x-ray images showing the position of the polymethylmethacrylate cement.

Post-operatively, there was no change to the anterior vertebral body height ratio. The patient was discharged the next day, and on one-month follow up the patient was pain-free and was able to do normal activities of daily living.

DISCUSSION

Schmorl node remains a common incidental finding in the spine during a routine radiological examination or autopsy.¹³ This herniation of the disc material through vertebral endplate and into the spongy part of the vertebral body that was supposed to be painless, however, has been proposed as a possible source of back pain.^{5,13,14} As for the possible source of pain in Schmorl node, Brown *et al.*¹⁵ suggested that pain, either localized on the back or radicular pain, may be the result of malnourished or even death of the cells of the intervertebral disc.

Our patient had a history of a vertebral compression fracture, which may explain why the SN developed in the

first place, as disruption of the cartilaginous endplate has been shown to more strongly associated with SN compared to changes in the disc.¹⁶

The chronic type of pain in our patient might be explained by the innervation of endplates and the surrounding structures. Animal and human studies have shown that immunoreactive nerve cells reside on vertebral endplate, even more specifically in the lumbar region.^{15,17} A plausible explanation of the pathogenesis of pain was described by Brown *et al*,¹⁵ who proposed that traumatic and inflammatory process precedes the pain by synthesizing factors capable of stimulating nociceptors that are usually unresponsive to mechanical changes. Motion in the spine will produce changes to the pressure within the disc, which will stimulate these previously passive nociceptors into producing pain signals.

We hope that by inflating the kyphoplasty balloon, it will push the herniated disc material upwards and back into the intervertebral disc space, since it has been suggested that another possible source of pain is the inflammatory reaction caused by the interaction with disc material.¹⁸ With the disc material that might stimulate local chemokines out of the way, this balloon inflation will, in turn, provide space within the spongy part of the vertebral body for the polymethylmethacrylate cement to occupy. A retrospective study on 32 patients favored kyphoplasty over vertebroplasty in treating symptomatic SN cases because kyphoplasty has lower risk of cement extravasation, which may cause serious problems.^{19,20}

After the cement is hardened inside the space, at the same time it will provide a relative stability to the functional spine unit affected and this will resist further mechanical changes that might be one source of chronic pain generators. It had been proposed that by introducing bone cement into the node, the micromotion caused by the intraosseous fracture will be stabilized, therefore providing pain relief.¹⁹ In addition, the heat produced by the bone cement may also reduce the pain, because this will numb the intraosseous nociceptors through the process of thermal necrosis and chemotoxicity.^{20,21}

In our case, the aforementioned pain-relieving mechanism was proven to be beneficial to the patient, as the pain was significantly reduced from VAS 6-7 to complete pain relief (VAS 0) during daily activities.

CONCLUSION

We propose that symptomatic case of SN with chronic back pain can be managed less invasively with the use of kyphoplasty balloon-assisted vertebroplasty.

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