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Kyphoplasty for the treatment of an atypical osteoporotic vertebral compression fracture of the lumbar spine: A case report

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Abstract

Vertebral augmentation is a minimally invasive but sometimes technically challenging intervention typically reserved for the treatment of older patients with painful vertebral compression fractures due to osteoporosis or neoplasms. We report the successful treatment of osteoporotic vertebral compression fractures of the first lumbar vertebral body (L1) using kyphoplasty in a paraplegic young patient with multiple comorbidities. Despite the unusual and complicated clinical scenario, kyphoplasty was nonetheless performed with immediate and lasting pain relief.

Keywords

Anesthesia/pain, kyphoplasty, myasthenia gravis, osteoporosis, paraplegic, steroids, vertebral compression fracture

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Introduction

Osteoporotic vertebral compression fractures (VCF) are the most common type of osteoporotic fractures. It occurs mostly in the elderly population or after chronic steroid usage[1] and can occur with trivial trauma to the spine. The mid thoracic (T7, T8) and thoracolumbar (T12, L1) regions of the spine are more commonly involved. They could be asymptomatic if the fracture slowly occurs and progresses over time but often it is a painful condition that can significantly limit functionality and activities of daily living (ADL). It can lead to vertebral height loss, wedge deformity, subsequent VCF, kyphosis and other spinal deformities. Conservative management could be trialed initially after the acute injury but if severe or worsening pain continues then vertebral augmentation with either kyphoplasty or vertebroplasty is indicated.[2] American Academy of Orthopaedic Surgeons (AAOS) guidelines[3] on the treatment of osteoporotic spinal compression fractures from 2010 states that kyphoplasty is an option for "neurologically intact" patients with painful osteoporotic VCF.

Case study

The patient is a wheelchair-bound, paraplegic 26-year-old female with a complex medical history including spina bifida and myelomeningocele, autoimmune hepatitis (on chronic steroids), myasthenia gravis, sacral pressure ulcers and pulmonary embolism (on anticoagulation). Even with the disability, she lived independently in an assisted living facility and was enrolled in classes to complete her college education. She was traveling in a transport van that hit a speed bump, lifted the patient from her seat and caused immediate mid-to-low back pain upon landing. The patient endured 1 month of persistent excruciating pain that interfered with her ability to perform even basic ADL, sleep, and transfer to and from her wheelchair. She could not attend school and had to move in with her mother to get help. When x-rays and magnetic resonance imaging (MRI) of thoracolumbar spine revealed diffuse osteoporosis along with an acute anterior compression deformity in the anterior superior endplate of L1 with about 20% loss of vertebral body height (Figure 1), the patient was referred to pain management. Although vertebroplasty could have

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Figure 1. T2 MRI of the patient's spine (sagittal view) showing L1 vertebral compression fracture, and spina bifida with myelomeningocele.

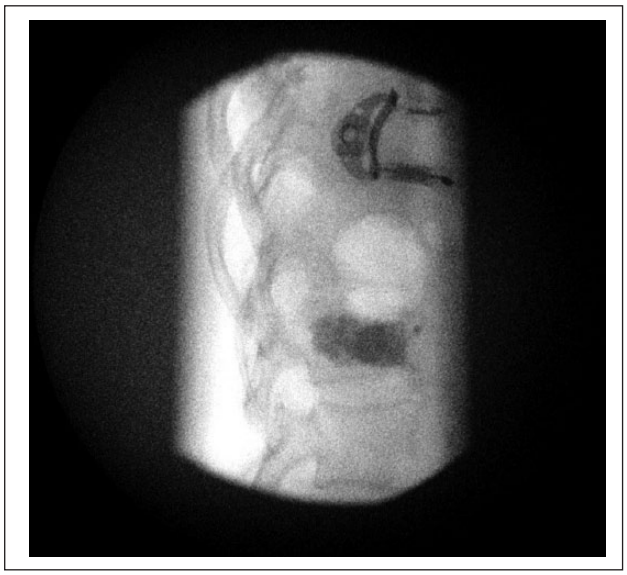

Figure 2. Lateral fluoroscopic view of successful L1 kyphoplasty.

also been done but due to the risk of cement extravasation in an osteoporotic vertebral body, kyphoplasty was planned with the intention of restoring height of L1 vertebral body and decreasing her pain in a hope to make her "independent" again. Preoperatively, the patient received clearance from hematology to hold her anticoagulation. A plan for general anesthesia was chosen that considered her myasthenia gravis, neurological deficits and autoimmune status: high-dose propofol for induction, no muscle relaxants and stress-dose steroids. Intraoperatively, the L1 vertebral body and pedicles were identified with fluoroscopy in multiple anteroposterior (AP), oblique and lateral views. A unilateral left-sided transpedicular entry approach was used to enter L1 vertebral body, and a complete radiological height restoration was achieved after inflation of the balloon tamp. The cavity created by the bone tamp was closely approximated in the center of the L1 vertebral body and under the central part of the T12-L1 disc. Subsequently, 7 mL of polymethylmethacrylate cement was slowly injected in the cavity created by the balloon tamp (Figure 2) with close monitoring of AP and lateral views of the L1 vertebra to ensure that the cement stays within the cavity. Postoperatively, the patient underwent tapering of her chronic steroids with guidance from both gastroenterology and neurology and the daily dose was significantly reduced. Additionally, the patient's primary physician initiated bisphosphonate therapy to mitigate the long-term osteoporotic effects of chronic steroid usage. The patient experienced immediate pain relief following her kyphoplasty, with her pre-procedural pain score of 8/10 decreasing to a post-procedural pain score of 2/10. When the patient was seen in clinic for follow-up 2 weeks later, she was pain free and had returned to her baseline function prior to the injury. At 8-month follow-up, the patient reported increased pain scores but was still able to transfer and had been living on her own for the last 7.5 months and was back to attending her classes.

Discussion

The efficacy of kyphoplasty to treat patients with VCF due to osteopenia arising from primary or secondary osteoporosis, multiple myeloma or osteolytic metastatic tumors is well established,[4] and newer techniques such as the craniocaudal expandable implant may further improve the efficacy of vertebral augmentation.[5] Reviewing the current guidelines published by the Centers for Medicare & Medicaid Services,[6] there are no qualifiers such as age or cause of osteoporosis that contraindicate kyphoplasty for the treatment of osteoporotic VCF. As such, insurers will reimburse for this intervention so long as the rationale is sound and the medical necessity is documented. Although AAOS guidelines recommend kyphoplasty for "neurologically intact" patients, our patient certainly did not meet this criteria. Our experience reveals the versatility of kyphoplasty when adapted for an atypical presentation.

Conclusion

It is important to emphasize that our patient was living independently prior to her injury and was able to complete nearly all her ADLs with minimal assistance. Following her injury, the patient's mobility was significantly limited secondary to pain necessitating her to move in with her mother for one-on-one care. Even though our patient suffered from diffuse osteoporosis of her entire spine, the main goal of our intervention was to

restore the patient's independence by reinstating her ability to self-transfer. By use of a multidisciplinary approach to safely plan the kyphoplasty, we optimized both the medical and surgical management of a unique constellation of comorbidities that predisposed our patient to osteoporotic VCF and successfully restored her ability to transfer thereby restoring her independence. However, given the patient's reported increased pain scores at 8-month follow-up as well her need to remain on chronic low-dose steroid therapy, it remains to be seen if the sequelae of the initial injury at L1 is leading to degenerative disc disease at the adjacent levels causing her increased pain after being pain free for almost 8 months.

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Ethical approval

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Informed consent

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