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Case Report

Redo Kyphoplasty with Vertebroplasty Technique: A Case Report and Review of the Literature

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Osteoporosis is a metabolic disorder which may result in devastating medical problems if not treated appropriately. However, even in the best treated patients fractures may occur.

The most devastating fractures are spine and hip. Traditionally, treating fractures of the spine consisted of bed rest, opioid analgesic medications, and bracing. This resulted in increased risk of side-effects from medication, myocardial infarction, pulmonary embolism, pneumonia, admissions to nursing homes, and death.

Vertebroplasty and kyphoplasty techniques were developed to decrease the detrimental effects of "conservative care" by decreasing or eliminating the pain and stabilizing the fracture. The safety and efficacy of vertebroplasty and kyphoplasty are similar with several biased opinions in the literature which denotes conflict. Choosing one technique over the other is a physician and/or facility performed preference.

There are a small percentage of patients that either vertebroplasty or kyphoplasty does not help. Possibilities could be that not enough cement was used, an adjacent level fracture has occurred, or worsening fracture around the previously treated fracture is causing the pain. For the latter, a repeat vertebral augmentation could be medically necessary. Due to technical constraints, placing an additional kyphoplasty after one has already been accomplished may be technically dangerous and a simpler less costly vertebroplasty technique may be beneficial.

This is a case report and review of the literature on the treatment of repeat vertebral augmentation after a previously treated vertebral fracture with kyphoplasty technique. To this date, this is the first article published regarding the use of vertebroplasty technique over a kyphoplasty treated patient.

In this case report, a redo vertebroplasty was performed over a previously treated kyphoplasty or vertebroplasty. This procedure can give a patient significant pain relief when they are suffering with pain after a previously treated fracture.

Key words: Vertebroplasty, kyphoplasty, vertebral fractures, redo-vertebroplasty/kyphoplasty, spine fracture, hip fracture

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Osteoporosis, the most common metabolic bone disorder affecting 25 million people in the United States, is the leading cause of vertebral compression fractures (1). Percutaneous vertebroplasty (PV) was first performed for a vertebral hemangioma by Deramond in 1984 (2). In the last 10 years it has become more widely performed for the treatment of osteoporotic compression fractures as well as metastatic tumors (3-10). Reviewing the literature, the efficacy varies from 80 to 100% cure for early

osteoporotic compression fractures (10-12). Kyphoplasty is also a very well-recognized procedure for the treatment of compression fractures (13,14). The technique of both procedures involves a unilateral or bilateral transpedicular injection of polymethylmethacrylate (PMMA) into the fractured vertebral body via an introducer needle. The objective of vertebral augmentation is to stabilize the spine, increase mobility, and decrease pain. Indications include subacute or chronic pain refractory to conservative measures, disabling pain caused by an acute vertebral fracture, and significant vertebral body height loss impairing pulmonary function. Severe pain after a vertebroplasty or kyphoplasty could be the result of an adjacent level fracture or infection. There are a small percentage of patients whose pain continues to persist after either procedure. Some causes of continued pain after vertebral augmentation are inadequate cement injected into the vertebral body, worsening fracture at the same site, or inadequate diagnosis of the cause of the pain. If there is worsening around the previously treated vertebral body, then perhaps re-cementing these patients may be of benefit. This appears to be the first case report describing the performance of a vertebroplasty over a previously treated kyphoplasty patient.

Fig. 1. *Fat suppression (STIR) image demonstrating extensive edema at the superior end-plate of L2 vertebral body.*

Case Report

An 82-year-old man fell and presented with severe pain to a neurosurgeon. The MRI demonstrated an acute compression fracture at L1 and L2. After a discussion with the patient, a kyphoplasty procedure was performed on the patient. The patient stated that 50% of his pain had improved but got progressively worse. Since then, he was suffering with pain during his hospital stay and was transferred to a skilled nursing facility. One month later, still with continued and worsening pain, the patient presented to the author's office. He was still having severe pain in the thoracolumbar junction and was taking 40 mg of Percocet per day to control his pain. His visual analog (VAS) score was 100 mm on a 100 mm scale. Muscle strength reflexes, and upper motor neuron signs were normal. A possibility of an adjacent level fracture was deemed possible so a stat MRI was ordered. The new MRI demonstrated persistent edema in the superior end-plate of the L2 vertebral body with some mild retropulsion of the posterior cortex on the L1 vertebral body (Fig. 1). After a lengthy discussion with the patient, it was determined that a re-do kyphoplasty using a vertebroplasty technique needed to be performed. The patient was instructed that there was a possibility that this might not alleviate his pain.

Since the patient was on warfarin, we awaited 3 days and retested his international normalized ration (INR) to an acceptable level (under 2.0). The patient was given preoperative antibiotic one hour prior to the procedure. The patient was prepped and draped in a sterile fashion. Versed and fentanyl were given preoperatively and intraoperatively for sedation and pain control. A total of 2 mg of versed and 150 mcg of fentanyl were used during the entire procedure. The skin, subcutaneous tissue, and the pedicle of the L2 vertebral body was anesthetized using 1% lidocaine without epinephrine. Using an 18-gauge needle, a small opening in the skin was made. A 13-gauge needle was then inserted through the punctured skin and placed on the L2 pedicle. The same procedure was repeated on the opposite side. Using AP, lateral, and oblique views, the needle was placed on the superior aspect of the vertebral body with some difficulty (Fig. 2A and B). After mixing the cement and while under lateral imaging, 2 mLs of PMMA were injected through each trochar. The spread of the bone cement was monitored using live fluoroscopy to avoid posterior, anterior, or lateral migration (Figs. 3A and B). Some cement did migrate into the L1-L2 disc space but

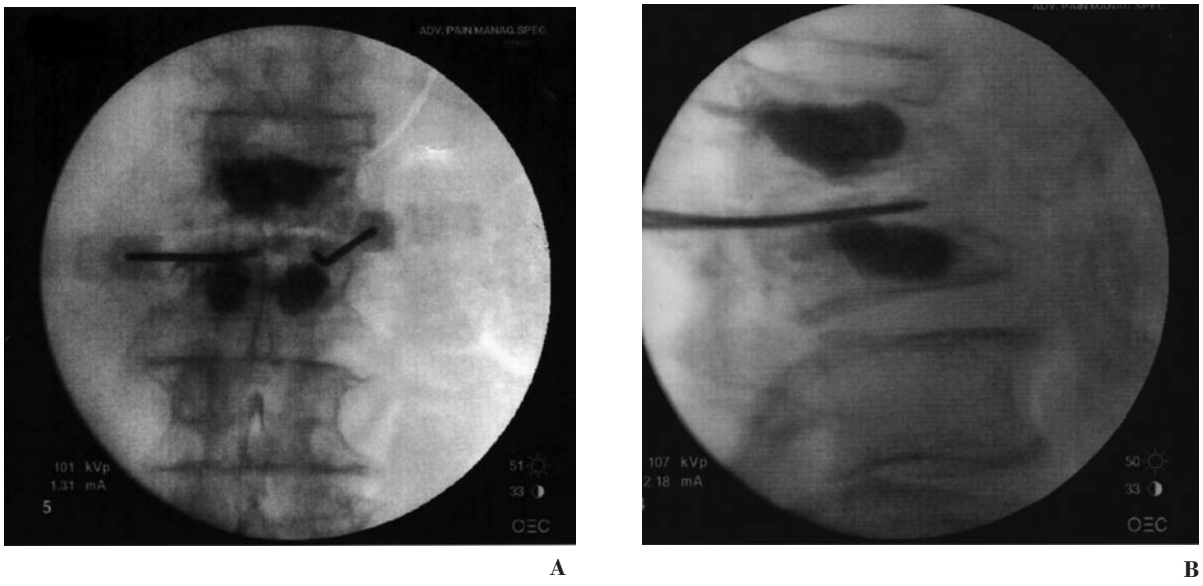

Fig. 2. *AP (A) and lateral view (B) with placement of a 13-gauge trochar above a previously treated kyphoplasty using vertebroplasty technique.*

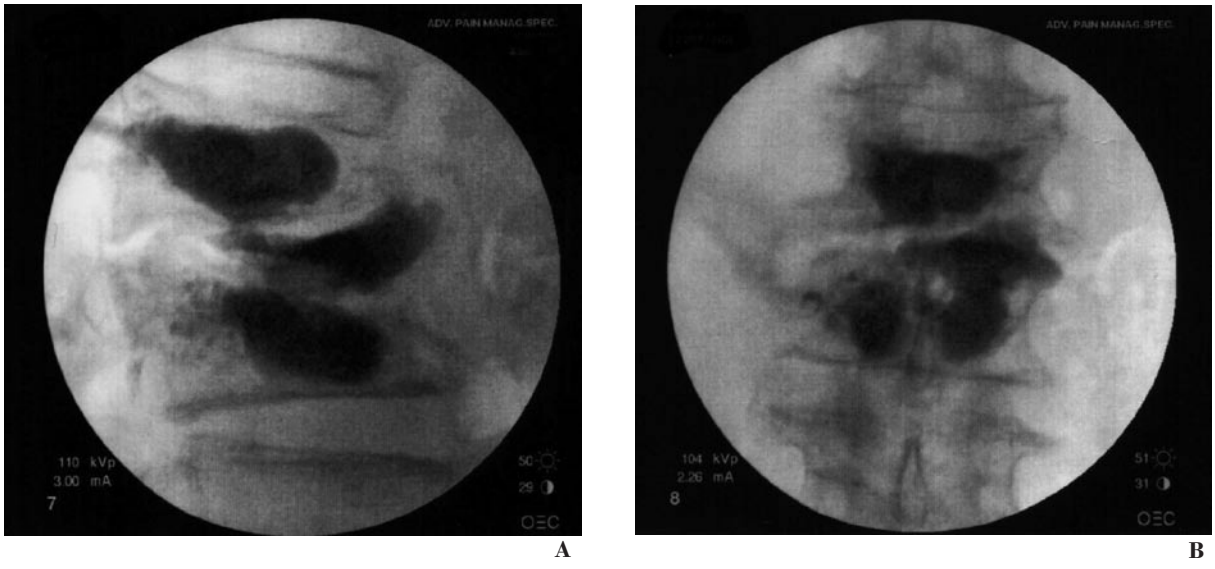

Fig. 3. *AP (A) and lateral (B) views with postoperative cement placement in the vertebral body.*

it was felt that since the L1 vertebral body was already treated, there was little concern of any problems associated with this. Once it was felt that ample cement was placed, the needles were gently withdrawn. The patient was allowed to get up off the operating table after 15 minutes to determine pain level. The patient was able to get off the table with more ease and without supervision. It took 3 people to get him comfortably on the table preoperatively. His pain level 30 minutes after the procedure changed from a VAS of a 100 mm to a VAS of a 46 mm. Forty-eight hours later he was taking 50% less of his medications and was mov-

ing around with an assisted device instead of using a wheelchair. One month after the procedure he had no more thoracolumbar pain and was ambulating more efficiently. Three months later he was still pain-free in the thoracolumbar area.

Discussion

There is little written about redo vertebroplasty or kyphoplasty procedures. Using a MEDLINE literature search for the last 5 years, only one article was found. Gaughen et al (15) looked at the therapeutic effect on repeat vertebroplasty at previously treated levels. In this study they conducted a retrospective review of consecutive vertebroplasty procedures over an 8-year period. Among the 250 patients treated, 6 patients underwent a repeat vertebroplasty for recurrent pain at a previously treated level. These patients were assessed through quantitative measurements, pre and postoperative levels, and mobility. The initial procedure performed in these patients all produced dramatic improvements. Patients developed recurrent pain between 8 to 167 days after the initial vertebroplasty. After the repeat vertebroplasty, 5 of the 6 patients reported a mean pain reduction of 6.5 on an 11 point scale. Four of the 6 patients reported immobility before the procedure, and all 4 had improvement in mobility after the procedure. Preoperative mobility was a 1.5, and was reduced to 0.25 (5-point scale) postoperatively. The authors do note that a prospective randomized controlled trial is necessary to fully determine the therapeutic benefit.

In conclusion both vertebroplasty and kyphoplasty are clinically efficacious procedures for the treatment of both osteoporotic and pathologic compression fractures. Failure of benefit from either type of vertebral augmentation could be the result of incorrect diagnosis, refracture around the cement augmentation, technique of the physician, infection, or too little cement in the vertebral body. In this subset of patients when there are no adjacent level fractures, a repeat procedure may be necessary to give the patients more pain improvement. In patients who had a previous kyphoplasty procedure, placing an additional balloon may be technically difficult and a vertebroplasty procedure may be beneficial in these patients. Another possibility is performing an extrapedicular technique with the vertebral augmentation of your choice. However it should be noted that performing a redo vertebral augmentation is difficult since there is already visual obstruction during the procedure from the previously treated vertebral body. This additional constraint would not be without additional complications and should be performed with caution. Until a randomized prospective controlled trial is done, no direct conclusions can be made. To this date, this is the first article published utilizing a vertebroplasty technique after a patient was treated with kyphoplasty.

Conclusion

Vertebroplasty and kyphoplasty are Medicare approved procedures for painful compression fractures. The success rate of pain relief from these procedures for acute fractures ranges from 80 to 100 percent. However, there is a small parentage of patients that may not experience dramatic pain relief from vertebral augmentation. Lack of pain relief could be from improper diagnosis, improper technique, not enough cement, or even worsening fracture around the previously treated vertebral body. If after repeat imaging and no adjacent level fracture is found, a repeat vertebroplasty may alleviate the patient's pain. Kyphoplasty could be technically more difficult to perform after a vertebroplasty or kyphoplasty was already performed due to difficult visualization of the balloon. In these cases, a redo vertebroplasty could be performed over a previously treated kyphoplasty or vertebroplasty. Though technically challenging this procedure can be beneficial in this subset of patients. It should be noted that this procedure should only be performed with a doctor with a vast experience of vertebral augmentation. When performed, this procedure can give patients significant pain relief when they are suffering with pain after a previously treated fracture.

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