

Retrospective Evaluation

## Interventional Techniques in Managing Persistent Pain After Vertebral Augmentation Procedures: A Retrospective Evaluation

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**Background:** Based on systematic reviews, it appears that at least 10% of patients may continue to suffer with residual or persistent pain after successful vertebral or sacral augmentation procedures.

**Objective:** To report and evaluate the incidence and prevalence of different spinal injections in patients who received vertebroplasty, kyphoplasty, and sacroplasty procedures for both benign and malignant compression fractures.

**Design:** A retrospective case review.

**Methods:** Retrospective review of all cases of vertebroplasty, sacroplasty, and kyphoplasty performed in a 12-month period in a single outpatient setting of interventional radiology was conducted.

**Results:** In a 12-month period starting from October 2005 to September 2006, 144 patients underwent cement augmentation procedures. Of the 144, 34 patients required a spinal injection procedure for residual or persistent pain within a 1-year period after the augmentation procedure.

Twenty-four patients required epidural steroid injections, 6 patients required intercostal nerve blocks, 5 patients required trigger point injections, 5 patients required sacroiliac joint injections, and 1 patient required facet joint injections. Nine patients who required lumbar epidural steroid injections and all patients who required intercostal nerve blocks and had underwent a thoracic cement augmentation procedure.

**Conclusion:** A small proportion of patients undergoing percutaneous cement augmentation for vertebral compression fractures or sacral insufficiency fractures potentially require spinal injections to treat residual pain after the procedure.

**Key words:** Kyphoplasty, vertebroplasty, sacroplasty, residual pain, vertebral compression fractures, epidural steroid injections, facet joint pain, sacroiliac joint injections, facet joint injections.

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**V**ertebral compression fractures and sacral insufficiency fractures constitute a major healthcare problem in the United States, not only because of a high incidence of these lesions but also due to their direct and indirect negative

consequences for patient health-related quality of life and the costs to the healthcare system (1-7). Vertebral fractures may result in pain at, above, or below the fracture site due to loss of height caused by vertebral collapse, spinal instability, cement leakage, facet

arthropathy, nerve root entrapment, and in many cases, surgical kyphotic deformity. Vertebroplasty and balloon kyphoplasty are 2 minimally invasive surgery approaches developed for the management of symptoms of vertebral compression fractures (1-3). More recently sacroplasty also has been used for treatment of sacral insufficiency fractures.

In vertebroplasty, polymethylmethacrylate (PMMA) is injected directly into a vertebral body under direct radiologic guidance. When performing kyphoplasty, a balloon tamp is usually placed inside the compressed vertebral body aiming for height restoration and formation of a cavity by compressing the cancellus bone before the PMMA injection. In sacroplasty, PMMA is injected into the sacral ala under fluoroscopic or CT guidance to stabilize stress fractures.

A number of reviews of the literature and commentaries have been performed evaluating vertebroplasty and kyphoplasty in patients with symptomatic vertebral compression fractures from osteoporotic or neoplastic etiology (1-3). Recent systematic reviews (2,3) and evidence-based guidelines (1) concluded that there is level 3 or moderate evidence in management of patients with symptomatic osteoporotic vertebral compression fractures refractory to conventional medical therapy. The systematic reviews have noted that a large proportion of patients had some pain relief. However, one study (3) reported improvement was 49% to 90% of subjects with ambulation. Thus, potentially a small but significant proportion of patients may continue to be in pain after vertebroplasty, kyphoplasty, and sacroplasty. In patients with spinal pain, multiple structures may be responsible for the causation of pain, specifically in the elderly with vertebral fractures. Other structures responsible for pain include intervertebral discs, facet joints, ligaments, fascia, muscles, and nerve roots. Facet joint pain, discogenic pain, and sacroiliac joint pain have been proven to be common causes of pain with proven diagnostic techniques (1).

Burton et al (8) presented a review of the literature regarding outcomes after both vertebroplasty and kyphoplasty. They reported that certain patients, even after reasonable pain relief from the fracture site, require interventional procedures to treat either residual pain or a new type of pain that manifests after the augmentation procedure. Kim et al (9) prospectively studied 500 patients with vertebroplasty performed in both benign and malignant lesions. To confirm the most painful level among the multiple

fracture sites and to get the clinical success to relieve pain they utilized facet joint blocks as prognostic indicators and performed physical examinations after the facet joint blocks at the level of the fracture as well as the adjacent levels. This retrospective evaluation was sought to evaluate the residual persistent pain after successful vertebroplasty, kyphoplasty, and sacroplasty procedures and the necessity for interventional procedures.

## **METHODS**

No institutional review board approval was required since all the data was collected retrospectively from outpatient charts. Appropriate care was taken to preserve patient privacy and identity.

Data was collected for the region of the procedure performed (thoracic, lumbar, or sacral), type of procedure performed (vertebroplasty, kyphoplasty, or sacroplasty), and spinal interventional procedure(s) required to treat residual pain. During the follow-up visit, within 1 month of treatment, patients were evaluated in various parameters including pain relief, complications, patient satisfaction, and finally, residual persistent pain. Those patients with significant residual persistent pain were treated with interventional techniques.

For this evaluation, 144 patients undergoing procedures at 200 levels with single or multi-level vertebroplasty, kyphoplasty, or sacroplasty for benign or malignant compression fractures or sacral insufficiency fractures were evaluated. The procedures were performed from October 2005 to September 2006.

## **RESULTS**

The data was available for all of the 144 patients who underwent cement augmentation procedures from October 2005 to September 2006; and 34 patients (23.61%) complained of residual pain. This patient group consisted of 13 men and 20 women with an average age of 81.5 years.

Table 1 provides patient demographic characteristics and the interventional procedures performed. Based on the symptomatology, 26 patients were treated with epidural steroids. Of the 26 patients receiving epidural steroid injections, 8 patients underwent thoracic and lumbar vertebroplasty or kyphoplasty, 6 patients underwent lumbar vertebroplasty or kyphoplasty, 9 patients underwent thoracic vertebroplasty or kyphoplasty, and 3 patients underwent sacroplasty. All 6 patients requiring intercostal nerve blocks un-

derwent thoracic vertebroplasty or kyphoplasty and developed radicular pain at the level of the vertebral augmentation. Five patients were treated with trigger point injections for a paraspinal focal pain with tenderness after thoracic or lumbar procedures. Five patients had sacroiliac joint injections that showed symptomatology indicating sacroiliac joint pain. Two of the 5 patients receiving sacroiliac joint injections had lumbar vertebroplasty or kyphoplasty, one had a thoracic vertebroplasty, one had sacroplasty, and finally, one patient underwent thoracic and lumbar vertebroplasty. Only one patient requiring a facet joint injection underwent sacroplasty and multilevel lumbar vertebroplasty and kyphoplasty in the same setting.

Of the 34 patients undergoing interventional techniques, 6 underwent multiple procedures.

## DISCUSSION

This retrospective evaluation of 144 patients undergoing cement augmentation procedures showed 34 patients or 23.61% with residual pain. The patient group consisted of 13 men and 20 women with an average age of 81.5 years. Of these, based on the reported symptomatology and physical examination findings, 26 patients were treated with epidural steroid injections, 6 patients were treated with intercostal nerve blocks, 5 patients were treated with trigger point injections, 5 patients were treated with sacroiliac joint injections, and only 1 patient underwent facet joint injection. Six patients were treated with multiple procedures. There was no significant difference between the patients undergoing vertebroplasty or kyphoplasty or procedures performed in the thoracic, lumbar, or sacral regions.

Table 1. Patient and procedural characteristics

Gender	Age	Procedure	Region	Intervention Technique(s)
Male	88	Kypho	T & L	ESI
Male	83	Vert	L	ESI
Female	85	Kypho	T	ESI & IC
Female	91	Vert	T & L	ESI
Female	69	Kypho	L	SI & TPI
Female	76	Kypho	T	ESI
Male	77	Kypho	L	ESI
Female	89	Sacroplasty Vert & Kypho Kypho	S L T	ESI, SI & lumbar face Lumbar facett ESI
Male	68	Kypho	T	ESI
Female	85	Kypho	T	ESI & TPI
Female	93	Kypho & Vert	T	ESI & ICN
Female	84	Kypho Kypho	L L	ESI ESI
Female	78	Kypho	L	TPI
Male	83	Kypho	T	ESI
Male	82	Vert	T	ESI
Female	81	Kypho	L	TPI
Female	84	Kypho	T	ESI
Female	72	Vert & Kypho	L	ESI
Male	88	Kypho Kypho	T & L T	ICN & TPI TPI

Gender	Age	Procedure	Region	Intervention Technique(s)
Female	85	Kypho	T	SI
Male	89	Sacroplasty	S	ESI
Female	85	Kypho	L	ESI
Female	81	Kypho	T S	ICN
Female	81	Kypho Kypho	L L & T	SI SI
Female	61	Kypho	L	SI
Female	71	Kypho & Vert	T	ESI
Female	73	Kypho	T	ESI
Female	85	Kypho	T	ICN
Female	83	Sacroplasty	S	ESI
Male	79	Vert	L	ESI
Male	89	Kypho	L	ESI
Male	88	Kypho	T	ICN
Male	82	Kypho	L & T	ESI
Male	83	Kypho	L & T	ESI

T=thoracic; L=lumbar; S=sacral; ESI=epidural steroid injection; ICN=intercostal nerve block; SI=sacroiliac joint injection; TPI=trigger point injection

Chronic spinal pain is a multifactorial disorder with many possible etiologies. In the lumbar spine, Kuslich et al (10) identified intervertebral discs, facet joints, ligaments, fascia, muscles, and nerve root dura as tissues capable of transmitting pain in the low back. Facet joint pain, discogenic pain, and sacroiliac joint pain have been proven to be common causes of pain with proven diagnostic techniques (1). Thus, in patients presenting with pain in the spine with evidence of vertebral fractures, other structures may be involved including intervertebral discs, facet joints, ligaments, fascia, muscles, and nerve roots. This study showed most of the pain to be originating from discs, nerves, muscles, and sacroiliac joints based on the treatment provided and the response. The common belief that in fractures of the vertebral body, facet joints will be the sources of residual pain was not proven in this retrospective evaluation.

Even though many publications have reported significant short- and long-term pain relief following vertebral and sacral augmentation procedures, there are no reports in the literature of interventional techniques applied to manage residual pain after vertebral augmentation. In this retrospective review, 23.61% of the patients continued to suffer with residual pain.

In this practice, epidural steroid injections were performed most commonly, with 9 of 26 patients receiving thoracic epidural injections. Six patients were treated with intercostal nerve blocks.

This evaluation is limited by its retrospective nature and a small number of patients. Further, no systematic evaluation was performed to identify the pain generators responsible for the residual pain to appropriately arrive at proper diagnosis. Precision diagnostic

techniques utilizing controlled diagnostic blocks must be applied. In spite of all the limitations, it is well known that observational studies are the mainstay of the literature for initial reports and for complications in general. Considering that there have not been any studies in this era, this retrospective evaluation should provide appropriate information for future controlled prospective studies. In addition, due to the retrospective nature of the study we have not utilized outcome measures with functional psychological status. Further, in a prospective setting, the role of conservative treatment in persistent residual pain may also be evaluated.

## CONCLUSION

A small proportion of patients undergoing percutaneous cement augmentation for vertebral compression fractures or sacral insufficiency fractures reported residual pain and required interventional procedures including epidural injections, intercostal nerve blocks, facet joint injections, sacroiliac joint injections, and trigger point injections. Of all the injections, epidural injections were most commonly performed in the total population, whereas intercostal nerve blocks were the most common procedures in the thoracic spine.

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