

## INTRODUCTION

Vertebral body compression fractures are a major source of chronic and intractable back pain representing a cost of over \$1 billion to the United States healthcare system(1). These fractures can be treated with conservative therapy, percutaneous vertebral body augmentation (kyphoplasty (KP) or vertebroplasty (VP)), or spinal fusion. The number of clinical situations for which percutaneous augmentation is indicated has recently increased leading to more augmentations being performed. This expansion is further encouraged by recent meta-analysis showing a survival benefit for vertebral augmentation compared to conservative management(2). The majority of KP and VP are performed in patients with osteoporosis; although, recently more pathologic fractures are also being treated.

Compression of the vertebral body with more than 70% height loss, so called vertebra plana, has been previously thought to be a relative contraindication to percutaneous augmentation due to the vertebral body endplates being compromised (3). Recent literature has found that osteoporotic vertebra plana fractures can be safely treated with VP and KP with decreased pain compared to conservative treatment (4). In this work, we retrospectively explore our institutional experience with the treatment of pathologic vertebra plana fractures using a combination of radiofrequency ablation (RF) and VP.

## METHODS

The electronic health record was reviewed to identify patients who received a thoracic or lumbar KP or VP along with concomitant radiofrequency ablation indicating possible pathologic fracture who had follow-up imaging. A total of 53 patients with a total of 68 unique encounters were treated from 2019-2022 at our institution. Of these, 7 patients had pathologic vertebra plana. Average age 64.3 years (range 51-76) and 100% female. There were 2 patients each who had breast cancer, multiple myeloma, or non-small cell lung cancer as their primary disease. One patient had angiosarcoma. All patients had a biopsy at the time of augmentation and 4/7 were positive for malignancy. One patient received vertebroplasty while the remainder underwent kyphoplasty. All patients had bipedicular access and cavity creation, if performed, using an osteotome. RF-modulated cement (Merit, Utah) was infused using a hydraulic pump infusion assist device. Clinical notes were reviewed to determine symptom duration, prior radiation, and relief following treatment. Most recent follow-up imaging was reviewed (average follow-up time of 236 days, range 8-448 days) to determine presence of an adjacent level fracture, technical success, cement extravasation and post-intervention height change.

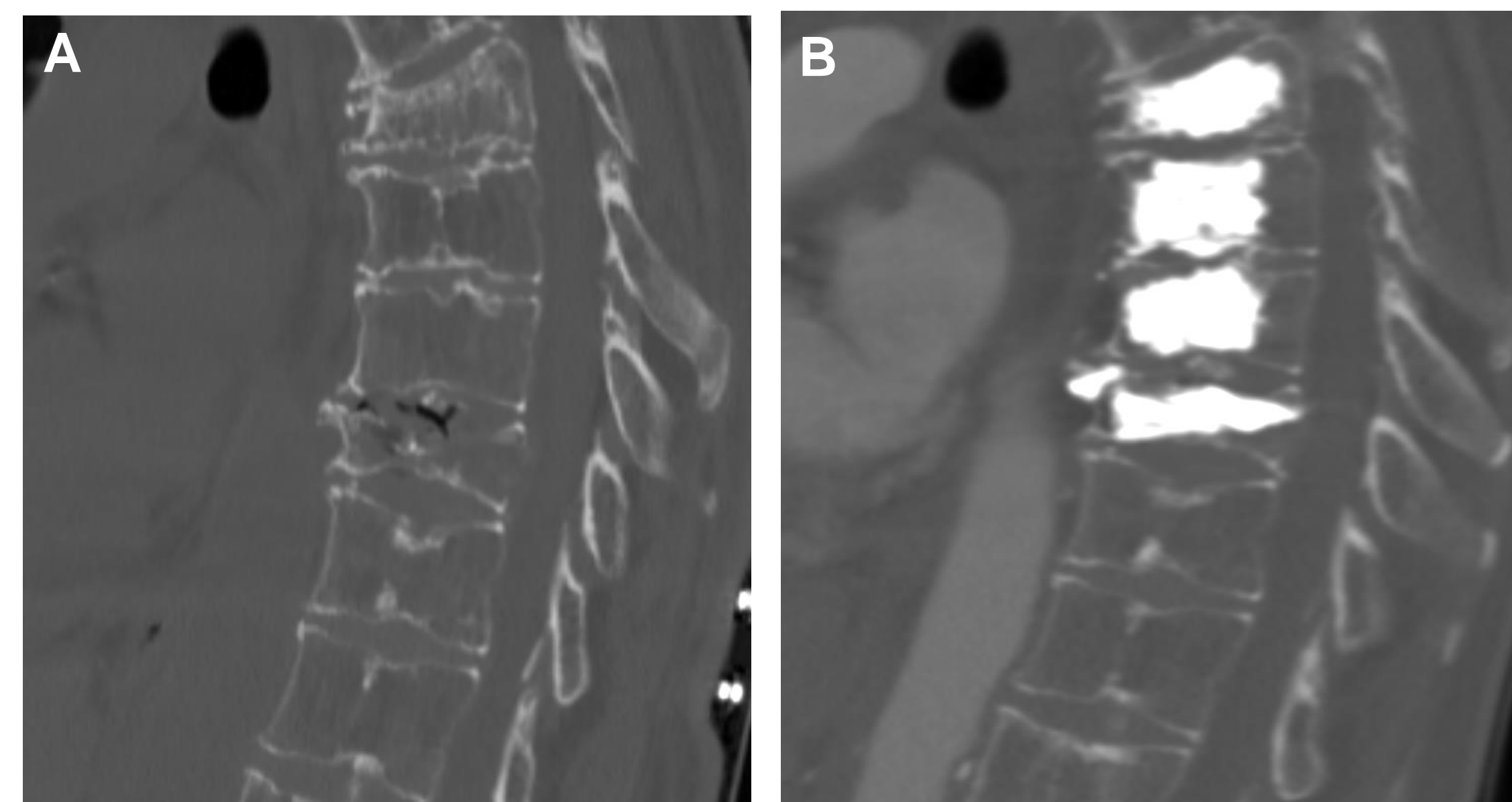
## RESULTS

**TABLE 1: Patient follow-up following augmentation for vertebra plana. Average follow-up time was 236 days (8-448 days).**

	Number of patients (n=7)
Osteoporosis	3
Multiple levels treated	2
Thoracolumbar Junction (T11-L2)	2
Same-level external beam radiation	3
Malignancy on biopsy (biopsy on all cases)	4
Multiple Myeloma	2
Average Cement Volume (available for 4 cases)	3.8 mL ± 2.3 mL (St Dev) (n=4)
Clinical Relief	6
Extravasation into the disc space	2
Height change (%)	5.4% (-6% - 22%)

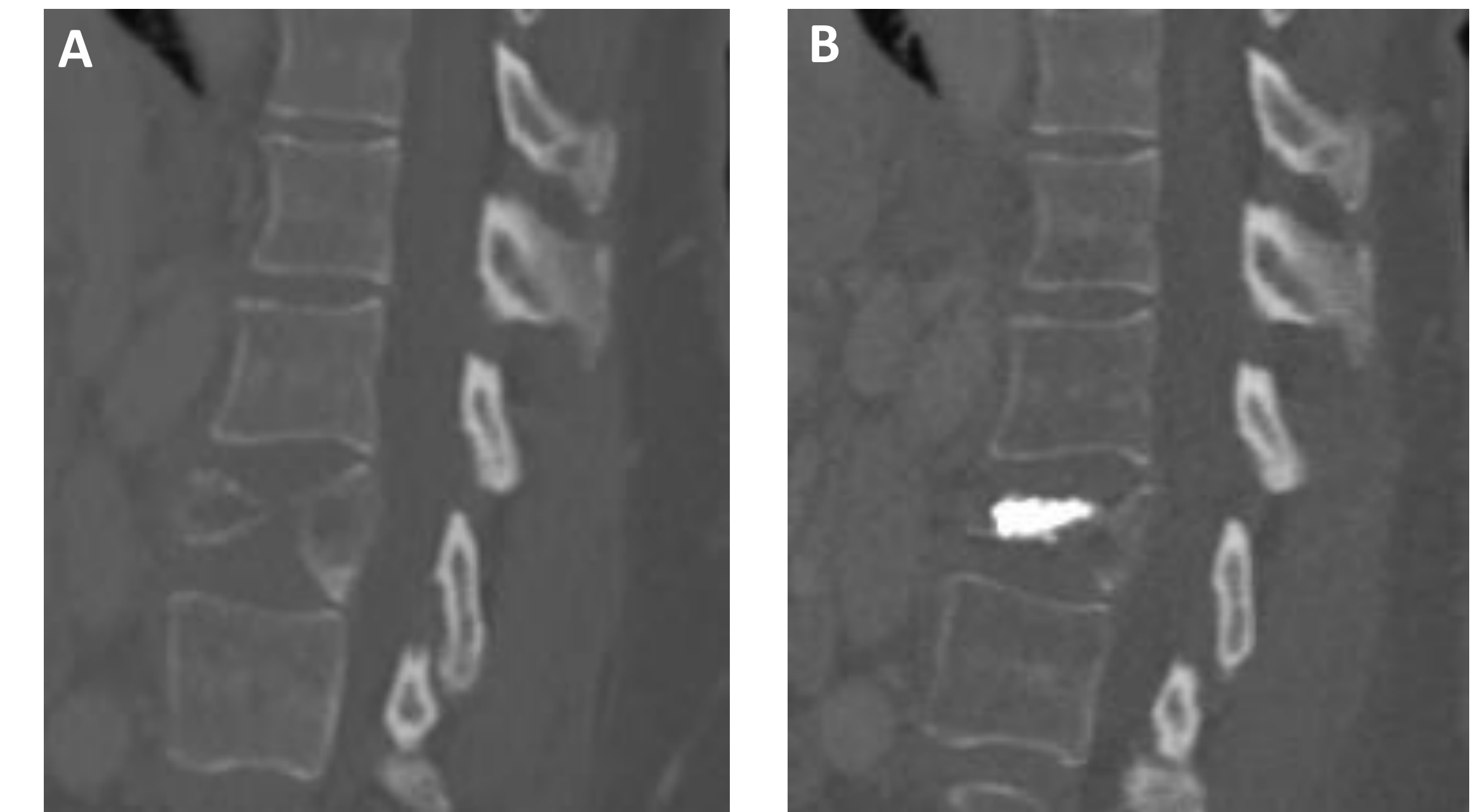
Review of all patients who received KP and VP in the setting of known malignancy at Duke revealed 7 patients who had pathologic vertebra plana. These patients all underwent contemporary radiofrequency ablation and cement augmentation. 6 of the 7 patients underwent KP while 1 underwent VP (no cavity creation). Six patients had clinical relief at the time of their next clinical follow-up visit. One patient had persistent pain despite steroid injections following kyphoplasty (Table 1). There were 2 patients who had multiple levels with augmentation with one level that had vertebra plana prior to augmentation (Figure 1). There were no patients who developed adjacent levels fractures during following; however, 1 patient did develop at fracture 2 levels away from the augmented vertebra plana.

A major concern for augmentation of vertebra plana is the loss of vertebral body endplate integrity. There was extravasation of contrast into the adjacent disc space in 2 patients (Figure 1), and in 2 patients there was contrast in the anterior venous plexus. One patient had contrast into the anterior para-spinal soft tissues (Figure 1). Overall extravasation rate was 5/7. No patients had posterior extravasation or any evidence of spinal cord or nerve root compression. No patients required additional intervention due to extravasation. There was no correlation between cement extravasation and clinical symptoms in this small group.



**FIGURE 1: 68 year old female with known history of non-small cell lung cancer who underwent T7-T10 kyphoplasty. A) preprocedure CT. B) postprocedure CT, note there is anterior soft tissue cement.**

## RESULTS



**FIGURE 2: Kyphoplasty in a 58 year old female with known angiosarcoma. A) Pre-procedure CT. B) 2 month follow-up CT.**

## DISCUSSION/CONCLUSIONS

Our experience with vertebra plana shows that kyphoplasty or vertebroplasty are safe for the treatment of pathologic vertebra plana. Furthermore, our approach of using contemporary radiofrequency ablation allows for some local disease control. We were able to provide symptomatic relief for 86% of the treated patients. This is a lower rate of clinical relief than has been reported for osteoporotic fractures (5). This could be related to the presence of known malignancy in our patient population. Our rate of cement extravasation is similar to what has been previously report in osteoporotic vertebra plana (5).

This study is limited by its observational and retrospective nature, small patient numbers, and widely variable follow-up time. Further prospective studies are required to better elucidate the factors that increased adjacent fracture risk in the malignant spinal compression fracture population.

## REFERENCES

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