

CASE REPORT

“Sternum-Into-Abdomen” Deformity With Abdominal Compression Following Osteoporotic Vertebral Compression Fractures Managed By 2-Level Vertebral Column Resection and Reconstruction

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Study Design. A unique case report.

Objective. To report a case of severe thoracolumbar kyphosis with abdominal compression causing gastric disturbance after treatment of an osteoporotic vertebral compression fracture and its ultimate management by vertebral column resection (VCR). We propose a new terminology “sternum-into-abdomen deformity” to describe this condition.

Summary of Background Data. Management of osteoporotic vertebral compression fractures mainly aims at pain control and deformity reduction. VCR for decreasing abdominal compression due to the development of severe kyphosis after treatment of osteoporotic compression fractures has never been reported in the literature to our knowledge.

Methods. This is a case report on a single patient. The hospital and office charts were reviewed. Reports of prior treatment of his compression fracture were analyzed.

Results. This 73-year-old cachectic patient underwent vertebroplasty for a midthoracic compression fracture with progressive, severe kyphosis. His condition worsened and spinal reconstruction with a 2-level VCR restored more normal sagittal alignment and

decreased his gastric compression. His back pain decreased and his ability to tolerate oral intake returned.

Conclusion. We propose the term “sternum-into-abdomen deformity” to describe this type of severe kyphosis with abdominal compression. Treatment with a VCR and fusion for realignment of focal kyphosis can improve the quality of life for patients with this condition.

Key words: gastric compression, compression fracture, vertebroplasty, vertebral column resection, severe progressive kyphosis.

Level of Evidence: 5

Spine 2015;40:E1035–E1039

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Acknowledgment date: December 12, 2014. Revision date: March 27, 2015. Acceptance date: May 20, 2015.

The manuscript submitted does not contain information about medical device(s)/drug(s).

No funds were received in support of this work.

Relevant financial activities outside the submitted work: board membership, consultancy, grants, payment for lectures, patents, royalties, travel/accommodations/meeting expenses, other (fellowship grant, philanthropic research funding).

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DOI: 10.1097/BRS.0000000000001004

Spine

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www.spinejournal.com

E1035

as 66 in. and 153 lb (body mass index: 24.7) and had lost 25 lb of weight during a 9-month period. A workup was performed by his medical doctor to exclude malignancy and was negative.

On examination, his height *via* arm span was 66 in. and weight was 127 lb (body mass index: 20.5) (because of his extremely stooped posture, arm span was the best way to obtain his actual height). He had severe kyphosis with a prominent skin crease in the anterior midabdominal wall. His sternum with lower rib cage was pushing into his abdomen, hence, the term “sternum-into-abdomen deformity” (Figure 1). He was neurologically intact without complaints of any lower extremity pain or paresthesias and no bowel/bladder dysfunction. Standing anteroposterior/lateral radiographs showed T9–T10 collapse, with cement seen in the collapsed T10 vertebra (Figures 2 and 3). He had a thoracolumbar



Figure 1 . Standing clinical photograph of the patient showing severe thoracolumbar kyphosis, with his sternum pushing into his abdomen (arrow), resulting in a “sternum-into-abdomen” deformity.

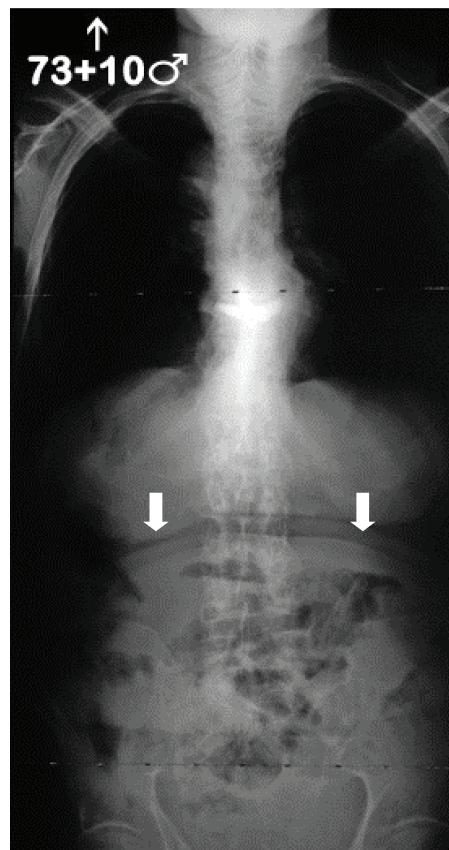


Figure 2 . Standing preoperative coronal radiograph showing the cement from the vertebroplasty and the abdominal crease from his kyphosis (arrows).

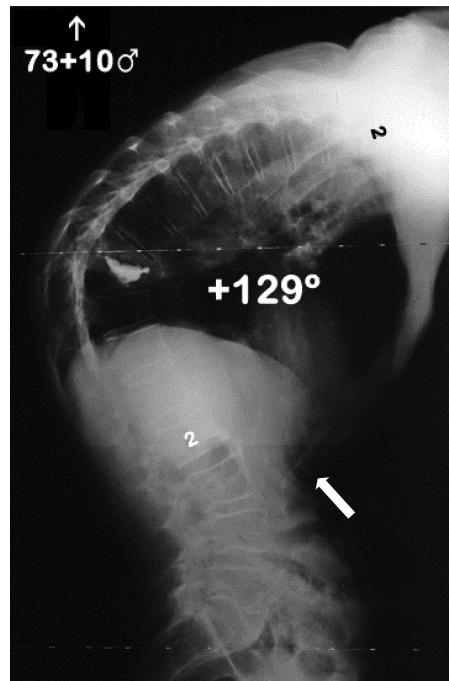


Figure 3 . Standing lateral radiograph showing thoracolumbar kyphosis of 129° due to collapse of the T9 and T10 vertebrae and the cement from the vertebroplasty. Arrow points to the tip of his sternum protruding into his abdomen in close proximity to his anterior vertebral column.

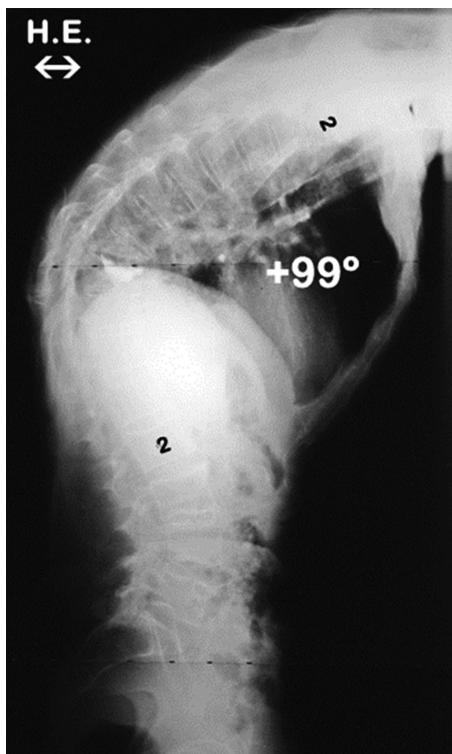


Figure 4. Supine lateral radiograph showing improvement of kyphosis to 99°.

kyphosis of +129° and his sternum was seen very close to the anterior surface of the vertebral bodies. The supine lateral radiograph showed postural correction of the kyphosis to only +99° (Figure 4). He was offered surgical realignment of his spinal deformity through an all posterior approach and opted to proceed. Of note, the patient was being treated with Actonel for osteoporosis.

The patient underwent a T2-L4 instrumented posterior spinal fusion with T9-T10 VCRs for kyphosis correction. Blood loss was 3000 mL and the patient awoke neurologically intact. Postoperatively, the patient developed a left pleural effusion managed by chest tube insertion/drainage for 2 days. This was most likely due to the magnitude of surgery and hematoma/seroma communication into the pleural space *via* small pleural rents. He also had a superficial wound dehiscence that healed completely with dressing changes.

The patient recovered well during the follow-up period. The immediate postoperative supine lateral radiograph showed kyphosis correction to +62°. His breathing returned to normal and his pulmonary function improved from 60% predicted forced vital capacity preoperatively to almost 100% predicted at 2 years postoperatively (Table 1). He was able to tolerate food and his weight/body mass index increased to 142 lb/22.9.

Five-year follow-up radiographs showed that his thoracic kyphosis correction was stable at +67° with positive sagittal balance. The patient was very pleased with his overall postural improvement (Figures 5-7) and declined surgical intervention to improve his sagittal imbalance. His radiographs showed degeneration at L4-S1 as expected but the patient was asymptomatic.

DISCUSSION

Osteoporotic compression fractures in elderly people cause pain, diminished mobility, depression, decreased quality of life, and difficulties with activities of daily living.¹⁻⁵ Multiple fractures cause progressive kyphosis, resulting in pulmonary and gastrointestinal dysfunction due to reduced volume of the thoracic/abdominal cavities.^{1,2} Gastrointestinal dysfunctions include gastroesophageal reflux, hiatal hernia, and dysphagia.⁶⁻⁸ This patient had severe thoracolumbar kyphosis causing compression of his stomach by his sternum with lower rib cage, resulting in reduced gastric volume and leading to early satiety in spite of a good appetite. The patient became cachectic because of inadequate food intake and lost 25 lb of body weight. We would like to propose new terminology of “sternum-into-abdomen deformity” in patients with osteoporotic vertebral compression fractures causing this condition. That term is descriptive of the resultant severe kyphosis with prominent abdominal wall crease from sternal/lower rib cage pressure on the abdomen, causing gastrointestinal dysfunction severe enough to cause weight loss.

Managing pain after compression fractures is the priority for patients and physicians. Although procedures such as percutaneous vertebroplasty and kyphoplasty aim at pain reduction, careful assessment of a patient’s nutritional status and digestive dysfunction must be considered. In addition, patients should be evaluated by their medical doctor for possible causes of their osteoporosis and be treated accordingly. VCR for improving sagittal alignment and reducing the gastrointestinal compression in severe osteoporotic kyphotic

TABLE 1. Pulmonary Function Values

	FVC		FEV-1		TLC	Absolute Value
	% Predicted Value	Absolute Value	% Predicted Value	Absolute Value	% Predicted Value	
Preoperative	60	1.67	74	1.61	103	6.02
Two years post-operative	98	2.56	125	2.54	107	6.14

FVC indicates forced vital capacity; FEV-1, forced expiratory volume in 1 second; TLC, total lung capacity.

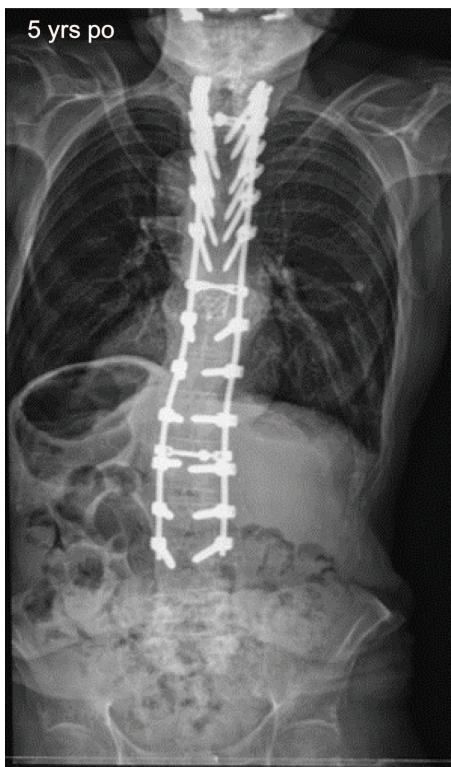


Figure 5. Five-year postoperative coronal radiograph after a 2-level posterior vertebral column resection and T2–L4 posterior spinal fusion.

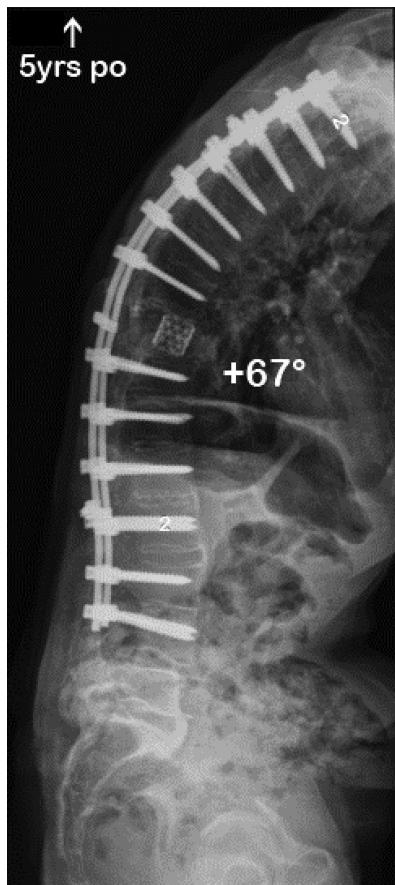


Figure 6. Five-year postoperative standing lateral radiograph showing kyphosis of 67°.



Figure 7. Five-year postoperative clinical photograph showing improved posture without a “sternum-into-abdomen” deformity.

deformities is a viable option in these cases, especially when performed through an all posterior approach.⁹

Patients with pain and a sternum-into-abdomen deformity with respiratory and digestive dysfunction may be better candidates for corrective surgical treatment instead of vertebroplasty or kyphoplasty if they can tolerate posterior spinal reconstruction. Contraindications for spinal reconstruction include those patients with severe malnutrition or respiratory compromise, making surgery too risky until those conditions improve, or those with such severe osteoporosis whose vertebral bodies will not tolerate pedicle screw fixation. Surgical procedures, which reconstruct the anterior column and correct the deformity, could improve the volumes of the thoracic and abdominal cavities, leading to better quality of life for patients.

➤ Key Points

- This case report illustrates the treatment of a patient with severe progressive kyphosis involving abdominal compression.
- One must be mindful of gastric disturbances when treating patients with osteoporotic compression fractures.
- We propose the term "sternum-into-abdomen deformity" to describe this type of severe kyphosis with gastric compression.
- The patient underwent a 2-level vertebrectomy, which improved his sagittal alignment and decreased his gastric problems.

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