Aortic Pseudoaneurysm due to Simple Vertebral Compression Fracture Treated with Conservative Management

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Blunt aortic injuries are rarely associated with minimal trauma. We present a 78-year-old man with an aortic pseudoaneurysm resulting from a simple vertebral compression fracture, which was conservatively managed. He was diagnosed with a compression fracture from a minor fall 10 days previously, and fortuitously he visited the hospital after which follow-up computed tomography (CT) for previous multiple aortic surgeries was performed. The enhanced CT revealed a pseudoaneurysm on the abdominal aorta, which was bleeding from a pinhole perforation. He was conservatively treated and follow-up CT 9 months later revealed that the pseudoaneurysm had disappeared.

Keywords: aortic pseudoaneurysm, compression fracture, conservative management

Introduction

Blunt aortic injuries (BAIs) are generally associated with high-energy trauma, such as traffic collisions or falls from great heights, and are rarely associated with minimal trauma.1) BAIs may be associated with thoracolumbar spine fractures resulting from seat belt injury (Chance fracture) or similar mechanical force.2) It is extremely rare that a fractured vertebral osteophyte is directly pierced in the aorta.3) We present a rare case of aortic pseudoaneurysm due to vertebral compression fracture after a minor fall, which was treated by conservative management.

Case Report

A 78-year-old male patient had been diagnosed with a vertebral compression fracture after he fell down flat on his back with a pole 10 days previously. He complained of a minimal back pain. His medical history was significant for ascending aorta replacement for type A acute aortic dissection 14 years ago, aortic root replacement with a mechanical valve 13 years ago, redo ascending aorta replacement 10 years ago, and total arch replacement and coronary artery bypass grafting 3 months ago, and no degenerative disease was observed. He visited our hospital fortuitously for postoperative follow-up computed tomography (CT). The CT scan revealed a pseudoaneurysm on the dorsal side of the abdominal aorta at the level of the superior mesenteric artery (SMA), which measured 2.0 cm. Enhanced CT of the pseudoaneurysm revealed blood flow from a pinhole perforation lateral to a small area of calcification; its level was coincided with an osteophyte on the fractured first lumbar vertebra with no relation to the lumbar artery (Figs. 1A, 1B, 2C, and 2D). His physical examination revealed a body temperature of 36.2°C, blood pressure of 144/82 mmHg, and normal pulse rate of 77 beats/min; laboratory tests were unremarkable and without any evidence of infection (C-reactive protein, 0.8 mg/dL; white blood cell, 3900/µL), and there was no progression of anemia (hematocrit, 33.4%; hemoglobin, 11.0 g/dL) compared with 1 month previous report.

He was emergently hospitalized and conservatively treated with antihypertensive medication and bed rest. While in hospital, no new symptoms developed, and there was no progression of anemia and no changes to the pseudoaneurysm on follow-up CT. He was discharged from the hospital 3 weeks later, and it was elected to take a wait-and-see approach. Follow-up CT 3 months later revealed that the pseudoaneurysm had decreased in size, and 9 months later, the follow-up CT revealed that the pseudoaneurysm had disappeared (Fig. 2E and 2F).

Discussion

BAI mostly occurs after a serious trauma, such as a traffic collision, significant fall, or crush injury.1) The most common location of BAIs is the thorax (particularly near the isthmus); blunt abdominal aortic injury (BAAI)
when forces, such as stretching, shearing, torsion, the “water-hammer” effect, and the “osseous pinch” effect, act on the aorta; many BAIIs involve a combination of these forces. In BAIs associated with thoracolumbar spine fracture, the mechanism of action is direct and/or indirect forces such as the one above, which mainly result in a transosseous or transligamental lesion produced by

comprises only 5% of BAIIs. In addition, Shalhub et al. have reported that BAAI to the SMA at the aortic hiatus of the diaphragm comprises 17.9% of BAAIs. BAIIs occur in conjunction with spine fractures approximately 50% of the time, and BAAIs in conjunction with spine fractures occur approximately 26% of the time; however, spine fractures rarely cause aortic injury. BAIIs occur

Fig. 1 CT scan. (A) Sagittal imaging showing the relationship between a pseudoaneurysm (P) and a fractured osteophyte of the first lumbar vertebra. (B) Three-dimensional imaging showing the pseudoaneurysm (P). CT: computed tomography

Fig. 2 Progress of CT scan. (A and B) Axial and sagittal imaging from 2 months before the injury showing a small calcified area of the abdominal aorta at the level of the SMA. Gray arrowhead is a hypothetical external direct force. L1: the first lumbar vertebra. (C and D) Axial and sagittal imaging at admission showing blood flow from a pinhole perforation (arrowhead) in the pseudoaneurysm (P). (E and F) Axial and sagittal imaging at 9 months showing the disappearance of a pseudoaneurysm. CT: computed tomography; SMA: superior mesenteric artery
flexion-distraction and shear forces.\textsuperscript{2,6} Vernon et al.\textsuperscript{3} described a case similar to ours. In their case, a BAAI resulted from an impaling osteophyte due to a vertebral fracture-dislocation injury after a traffic crush injury; the only possible explanation was direct force by the adjacent osteophyte. There have also been a few reports on non-traumatic aortic injury associated with the thoraco-lumbar spine after a surgical procedure (iatrogenic injury)\textsuperscript{7} and a needle-like osteophyte.\textsuperscript{8}

The present case is extremely rare wherein an aortic pseudoaneurysm occurred after a simple vertebral compression fracture by minimal trauma. In the present case, although the CT scan revealed that the aorta is displaced forward by a pseudoaneurysm and does not contact the osteophyte directly, after considering the anatomical relationship between a pinhole site and the pointed osteophyte, we readily understood that the pointed top of the fractured vertebral body pierced aorta. In addition, we hypothesized that an aorta fixed by the visceral arteries and calcified is more subjected to injury by an external direct force (Fig. 2A and 2B).

Grade 3 aortic injuries (based on the classification of traumatic aortic injury by Starnes et al.\textsuperscript{9}) are usually treated using open surgery and/or endograft therapy. In the present case, conservative management was chosen because the patient was not eligible for endograft therapy without the debranching method; thoracoabdominal approach surgery was considered to be too invasive, and the patient had been stable for a number of days after onset. If the patient had been unstable, we would most certainly have elected for surgical management.

**Conclusion**

A case of aortic pseudoaneurysm due to simple vertebral compression fracture is rare; however, for stable patients with a small pseudoaneurysm with pinhole perforation of aorta, conservative management is a reasonable option.

**Disclosure Statement**

The authors have no conflicts of interest to declare.

**Author Contributions**

Study conception: HI and KN
Data collection: HI
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Writing: HI
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Critical review and revision: all authors
Final approval of the article: all authors
Accountability for all aspects of the work: all authors

**References**

1) Neschis DG, Scalea TM, Flinn WR, et al. Blunt aortic injury. N Engl J Med 2008; 359: 1708-16.
2) Domenicucci M, Ramieri A, Landi A, et al. Blunt abdomino-aortic injury (BAAD) in shear fracture of the adult thoraco-lumbar spine: case report and literature review. Eur Spine J 2011; 20: S314-9.
3) Vernon SA, Murphy WR, Murphy TW, et al. Abdominal aortic rupture from an impaling osteophyte following blunt trauma. J Vasc Surg 2014; 59: 1112-5.
4) Shalhub S, Starnes BW, Tran NT, et al. Blunt abdominal aortic injury. J Vasc Surg 2012; 55: 1277-85.
5) de Mestral C, Dueck AD, Gomez D, et al. Associated injuries, management, and outcomes of blunt abdominal aortic injury. J Vasc Surg 2012; 56: 656-60.
6) Inaba K, Kirkpatrick AW, Finkelstein J, et al. Blunt abdominal aortic trauma in association with thoracolumbar spine fractures. Injury 2001; 32: 201-7.
7) Sandhu HK, Charlton-Ouw KM, Azizzadeh A, et al. Spinal screw penetration of the aorta. J Vasc Surg 2013; 57: 1668-70.
8) Dregelid E, Jenssen G, Jonung T, et al. Pseudoaneurysm of the abdominal aorta due to a needle-like osteophyte on the first lumbar vertebra. J Vasc Surg 2007; 45: 1059-61.
9) Starnes BW, Lundgren RS, Gunn M, et al. A new classification scheme for treating blunt aortic injury. J Vasc Surg 2012; 55: 47-54.