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# Unstable thoracic spine fracture with aortic encroachment: A potentially fatal association and a suggested treatment

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ABSTRACT

*BACKGROUND:* The coexistence of an unstable spinal fracture with a pending aortic lesion is potentially catastrophic and a therapeutic challenge as to timing of treatment, assigning priorities and selecting the best approach.
*CASE REPORT:* A 41 year-old healthy male victim of bike accident. Imaging revealed a fracture of 6th and 7th thoracic vertebrae with a bone fragment in close proximity to the descending thoracic aorta. After consultation with spine/vascular surgeons and interventional radiologists it was decided to secure the potential aortic injury with an endovascular stent-graft followed by posterior vertebral instrumentation for fracture's reduction.
*DISCUSSION/CONCLUSION:* A multi-specialists teamwork approach is mandatory. Vascular lesion is priority, followed by vertebral surgery. As to the treatment options, we suggest a "best but still safest" philosophy: endovascular repair and posterior spinal instrumentation should be considered first in the acute stage.


## 1. Introduction

Traumatic aortic rupture (TAR) is often fatal (up to 85% prehospital mortality) with the thoracic descending segment most frequently affected [1–3]. In hospitalized patients one can observe an association between spinal fractures and aortic lesions [4,5]. In such cases direct trauma to the aorta may be the result of fracture "per se" or it may secondarily complicate surgery for fracture's reduction [6].

While several papers describe the occurrence and treatment of aortic lesions secondary to spinal surgery [7–11] there are few reports focusing on the management of unstable vertebral column fractures with a concomitant or potential aortic injury [3,6,12–14]. Such cases pose a real therapeutic dilemma as to the optimal timing for treatment, the priorities to be assigned and the most adequate procedures to be adopted. The decision-making process requires a close multidisciplinary cooperation between spine/vascular surgeons and interventional radiologists with proper consideration given to individual cases [6,7,9,10]. The actual or potential vascular lesion takes absolute precedence [3,6,7,12,14]. Open, direct surgical repair (via thoracotomy) and endovascular treatment are alternative options followed by surgical reduction of the fracture. There are no clear guidelines as to the best therapeutic choice [6,10,13] although endovascular treatment has gained widespread use in recent years [1,2,3,8,10]. The decision should be made balancing the risks of each procedure versus the clinical condition of the patient to be treated. We report a case of traumatic dorsal column fracture with a fragment encroaching on the descending thoracic aorta. The adopted treatment is discussed with an effort to derive suggestions as to the best management of analogue cases.

This work has been reported in line with the SCARE criteria [11].

## 2. Case description

A 41 year-old healthy male referred to our hospital after bike accident. No neuro-deficits detected. After intubation, a total-body CT scan and CT-angiography revealed a compression/distraction fracture of 6th and 7th dorsal vertebrae with a fracture fragment in close proximity to the descending thoracic aorta, although without signs of wall's disruption (Fig. 1). Other injuries included: atlas and multiple ribs fractures, bilateral pleural effusion, left pneumothorax and mediastinal hematoma. After multi-specialists

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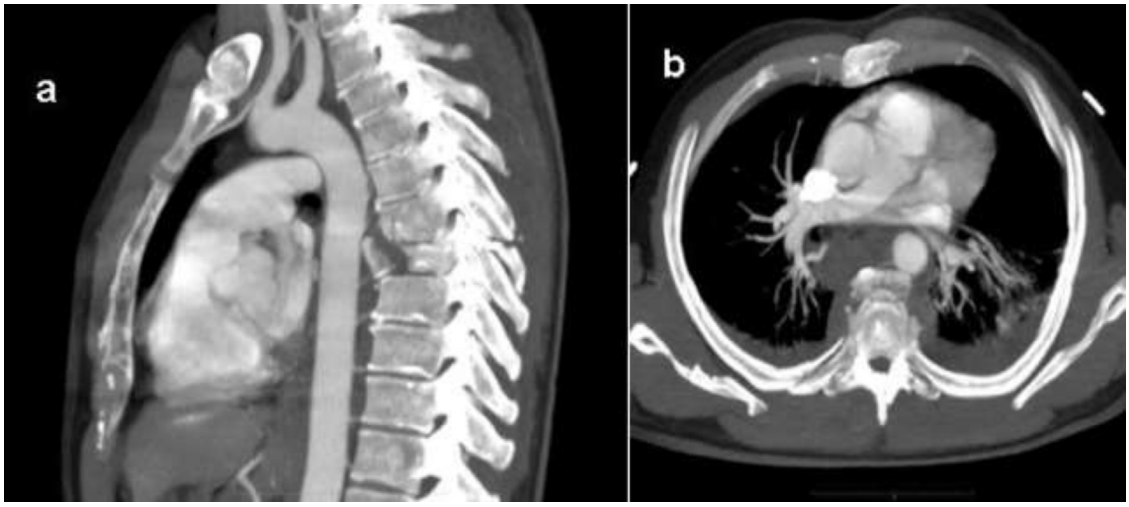


**Fig. 1.** Sagittal (a) and axial (b) CT-angiography: compression/distraction fracture of 6th and 7th dorsal vertebrae. A bone fragment is encroaching on the descending thoracic aorta although without signs of wall disruption (i.e. absent peri-vascular contrast leakage). A 3-D volume rendering reconstruction (c) confirms integrity of the aortic walls.

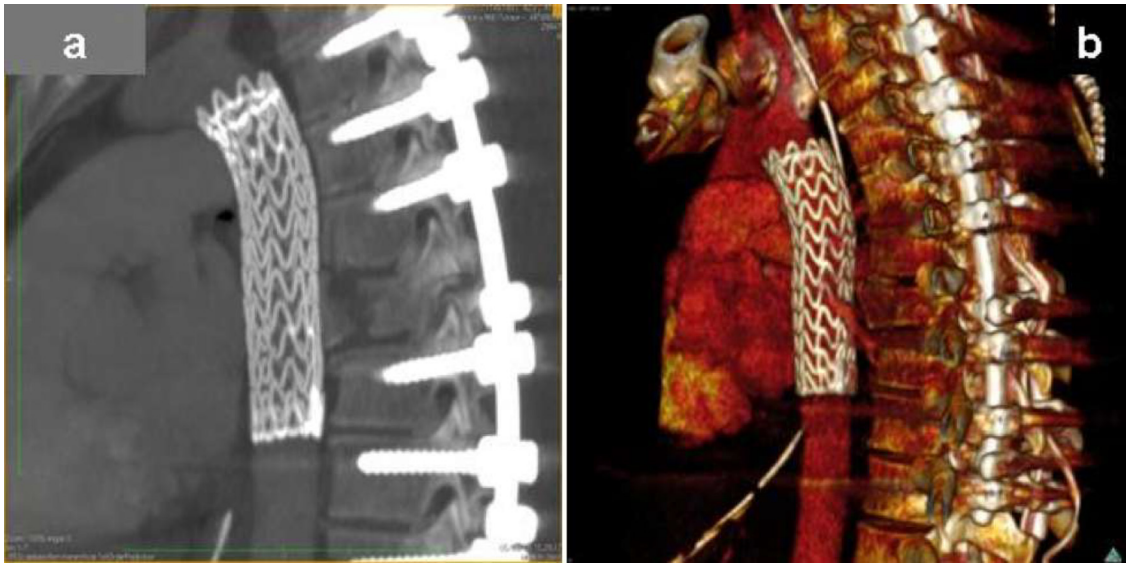


**Fig. 2.** Post-treatment CT-angiography: sagittal (a) and 3-D reconstruction views (b): aortic stent-graft in place with posterior instrumentation of the spine.

consultation it was decided to "secure" the thoracic aorta first and to carry on surgery of the spine successively. Preference was given to endovascular treatment: trauma team vascular surgeon performed an arterial trans-femoral access (GORE TAG, 26-26-100) and deployed a stent-graft into the Th4-8 segment of the thoracic aorta. Aortography confirmed adequate positioning and fitting of the stent graft with patent vascular branches. Trauma team neurosurgeon then stabilized dorsal spine with posterior instrumentation (Th3-Th10 fixation). The patient made a good recovery with uneventful postoperative courses and was discharged with short-term anti-platelet therapy. Follow-up imaging (at 1, 3 and 6 months) shows no further dislodgment of fracture with satisfactory bony healing as well as absence of stent complications (Figs. 2 and 3).

## 3. Discussion

TAR is a leading cause of death with up to 85% pre-hospital mortality [1–3]. Among hospitalized patients one can observe an association between aortic lesions and unstable spinal fractures requiring surgery. In such cases direct trauma to the aorta may be the result of the fracture "per se" or it may secondarily complicate surgery for fracture's reduction [6], making them a true challenge-to-treat in terms of priority, timing, choice of approach. While several authors describe iatrogenic aortic injuries following spinal surgery [6–10,12] only a few focus on the management of unstable vertebral column fractures with concomitant or potential aortic lesions [3,6,13–15]. Although reports are anecdotal one can attempt to get some statements. The depicted 5, 5% incidence of TAR with Th1-8 segment fractures [4] is probably underestimated [6]. Of notice, aortic lesions may manifest acutely but also evolve with pseudoaneurysm formation and delayed bleeding. In the setting of severe trauma patients, aortic injuries must therefore be always ruled out with appropriate imaging (CT +/− conventional angiography, MRI) [2,5,6,9]. If actual or potential aortic lesions and unstable spinal fractures coexist, the former takes absolute priority in the treatment schedule and should be addressed "as soon as possible" relatively to patient's condition [1,3,7,13,15]. At this time, a multidisciplinary evaluation involving spine/vascular surgeons, interventional radiologists and ICU specialists becomes mandatory [6,7]. Direct, open surgical repair (via thoracotomy) has been gold standard for years but it's burdened with a fairly high rate