

Unusual Management of Thoracic Aortic Injury After Spinal Instrumentation: Just Glue It!

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Abstract

We report the cases of two patients who presented with screw misplacement following spinal surgery. Both benefited from unusual vascular surgical management with removal of the material and injection of biological glue facing the injury, with uneventful postoperative courses.

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Key Words

Aortic injury • Spinal surgery • Biological glue

Introduction

Placing spinal instrumentation in contact with major vessels is a well-known risk for vascular damage in spinal surgery. This iatrogenic pathology has been described in the literature but is rare. Its treatment is challenging, and surgical techniques including endovascular and open surgery have been described.

We report two patients who underwent spinal instrumentation for spinal pathology. Postoperative imagery revealed screw misplacement in the column extending into the thoracic aorta. The patients benefited from unusual vascular surgical management, with removal of the orthopedic material and injection of biological glue facing the injury. The postoperative courses were uneventful in both cases. The 6-month follow-up computed tomography (CT) scans showed normal anatomy of the spine and thoracic aorta secured by the biological glue.

Case Presentation

Patient 1

The first patient was a 24-year-old female who presented with a traumatic D3-D4-D5 vertebral fracture after a traffic accident. Urgent repair through a posterior approach was performed in another hospital, with osteosynthesis of D1 to D7.

A radiologic control with CT and angio-magnetic resonance imaging (Figure 1A and B) was performed and demonstrated perforation of two screws through the posterior wall at D6-D7 in contact with the aortic arch. There was no sign of leakage, bleeding, or pseudoaneurysm. The patient was totally asymptomatic. On account of the contact of two screws with the esophagus on MRI, the patient underwent a gastroscopy that revealed two mucosal protrusions in the esophagus with the erosion of the top of one of the protrusions.

After multidisciplinary discussion, we felt it was indicated to remove the prosthetic materials, given the digestive preperforation, to avoid mediastinitis. During surgery, percutaneous access to the femoral artery was prepared using a 6-French introducer to prepare for implantation of a covered thoracic aorta endograft in the event of acute bleeding of the aorta after screw removal. No bleeding occurred when the screws were removed. We decided to secure the aortic wall by injecting BioGlue (CryoLife, Inc., Kennesaw, GA, USA)



into the spinal holes in contact with the aortic wall to prevent late bleeding. No new instrumentation was placed because of good spinal stabilization.

The patient had an uneventful postoperative course. CT performed 6 months postoperatively showed the persistence of lacunar images in the aortic arch without any complications (Figure 2).

Patient 2

The second patient was a 64-year-old female who underwent surgical treatment for streptococcal spondylodiscitis of D5-D6 with spinal cord compression. The postoperative course was characterized by a neurologic deterioration with right-sided motor deficit requiring a radiologic examination. MRI confirmed spinal cord compression with a slip of the posterior wall of D5. A new surgical approach with an osteosynthesis and arthrodesis in D3 to D7 was performed, and evolution was satisfactory.

The control CT in the postoperative setting

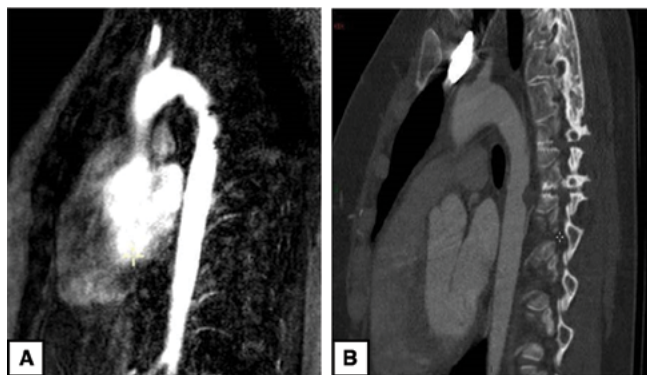


Figure 1. Patient 1 - Preoperative angio-magnetic resonance imaging (Panel A) and computed tomography (Panel B).

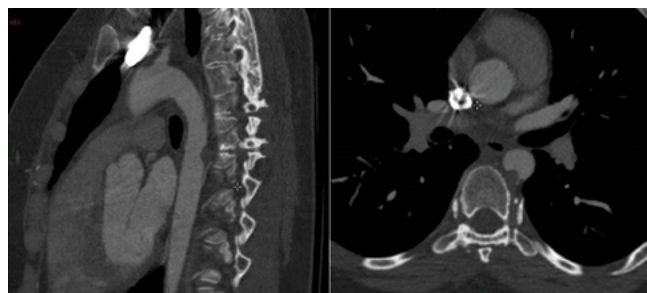


Figure 2. Patient 1 - Computed tomography control without signs of leakage.

indicated misplacement of one screw in the left D4. Contact with the descending thoracic aorta was confirmed by CT scan, without any sign of leakage, hemorrhage, or pseudoaneurysm (Figure 3A).

We felt that there was indication for revision and material removal to minimize the risk of erosion, pseudoaneurysm, or bleeding. This procedure was performed 10 months later because of pulmonary emboli and anticoagulation treatment. We used a similar surgical approach to that in the first case, with percutaneous access established in case endovascular control of aortic bleeding was required. The transpedicular screw at the D4 level was removed, and BioGlue was injected into the holes in contact with the aortic wall. No new instrumentation was placed because of good spinal stabilization. Despite anticoagulation, no intraoperative vascular complication occurred, and the patient had an uneventful postoperative course and follow-up.

A postoperative CT scan was performed the day after the procedure and showed "compression" of the aortic wall at the level of the removed screw. This simply reflected excess glue containing some air bubbles, and this disappeared on the 6-month follow-up CT (Figure 3B).

Discussion

Thoracic aortic injury is an uncommon but recognized complication after posterior spinal surgery related to the misplacement of fixation hardware in the column. Different treatment approaches have been reported in the literature. If the injury is discovered in the acute setting, the aorta is repaired by means of an endovascular stent graft or open repair where the misaligned

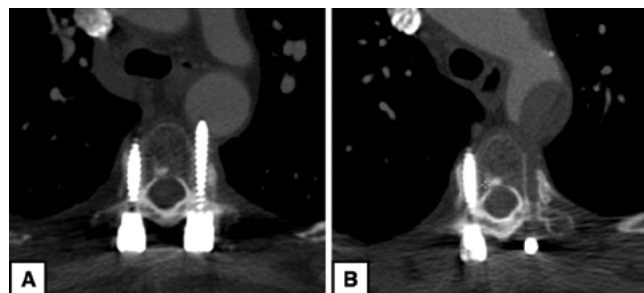


Figure 3. Patient 2 - Panel A. Preoperative computed tomography (CT). Panel B. Postoperative CT without signs of leakage.

hardware is removed and replaced [4, 5]. For asymptomatic patients, a multidisciplinary approach with revision of spinal fixation and aorta repair has been reported, as has primary repair of the vascular injury [1].

Traumatic aortic rupture is a life-threatening injury associated with high operative mortality of 32% and a paraplegia rate of 36.4% in open surgery [2]. However, the mortality rate associated with endovascular repair is significantly lower (16.6%), with a paraplegia rate of 2.7% [3]. Since first described by Parodi [4] and Volodos [5] in 1991, endografting aortic lesions has clearly transformed the outcomes for these critical patients.

The midterm results of thoracic aorta endografting for aortic rupture published by Astarci [6] were excellent at 48 months follow-up. For this reason, we prepared our two patients to receive an endograft if aortic rupture occurred during screw retrieval. The patients remained stable, without any acute bleeding, and did not require an endograft. However to avoid late bleeding of the aorta, we decided to use biological glue to secure the assumed aortic wall injury due to the screws.

A more aggressive approach is possible by preemptively inserting the endograft prior to screw removal. This is a very secure method; however, it may be unnecessary to cover at least 10 cm of thoracic aorta, with the inherent risk of covering the spinal arterial supply and inducing paraplegia by spinal cord ischemia.

In the first published case of aortic endografting simultaneous with screw retrieval by Minor [7], the author rejected the option of initial screw removal due to the associated risk of massive bleeding. The author also rejected graft deployment followed by screw removal because of the risk of graft perforation by the tip of the screw. He finally decided to deploy the graft simultaneously with screw retrieval.

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Acute bleeding at the time of screw removal is almost impossible unless there is a huge pseudoaneurysm of the thoracic aorta at the level of the screw or aortic bleeding into the pleura as reported by Kokotsakis [8]. We describe herein the feasibility of a safe gluing technique that can offer a less aggressive alternative in selected patients, without placement of a preventive thoracic endograft.

Conclusion

There is a rare but potentially morbid complication of spinal instrumentation surgery at the thoracic level. The endovascular approach allows minimally invasive treatment of the injured thoracic aorta avoiding thoracotomy and cross-clamping. However, preventive endograft deployment seems to be excessive, and as in our cases, screw removal can take place without acute bleeding.

To our knowledge, the use of BioGlue through screw holes to secure the aortic wall after spinal screw removal has never been described. Based on the outcomes of these two patients, we proposed that this treatment is a good alternative to endograft deployment in selected cases.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

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