We describe the case of a 49-year old male patient who suffered a gunshot wound in the chest which transfixed the medial mediastinum. He was hemodynamically stable, but had tachycardia and tachypnea. He was submitted to integrated work-up with chest radiogram, transthoracic echocardiography, computerized chest tomography, and arteriography of the aortic arch. A traumatic fistula was evidenced between the brachiocephalic trunk and the brachiocephalic vein. Surgical repair was performed using extracorporeal circulation and deep hypothermia with total circulatory arrest. The patient progressed well and was discharged on the fifth day postoperatively.

**Discussion**

Traumatic aortic injury accounts for a small number of firearm wounds (5.3%); however the mortality rate is high, and 73% of the patients arrive to the emergency room with detectable arterial pressure; 78% of them require urgent thoracotomy.

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In the English language literature we researched, there is only one case described of fistula between the aorta and the brachiocephalic vein secondary to a wound caused by a firearm projectile diagnosed soon after the trauma\(^1\).

Beall et al.\(^4\), in 1962, was the first to describe the acute presentation of fistula between the aorta and the brachiocephalic vein, with diagnosis reached by the progressive enlargement of the mediastinum in serial chest

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**Figure 1** - Chest X-ray showing mediastinal widening and a bullet in the left hemithorax (arrow).

**Figure 2** - Aortogram demonstrating contrast material in the brachiocephalic vein. The arrow indicates the site of the fistula.
radiograms, associated with fremitus and murmur in the anterior chest region, as well as venous distension. The initial procedure for these cases is controversial. After Brickell’s prospective study about patients with penetrating trauma of the chest, where higher mortality and longer hospital stay were described when patients underwent immediate volume replacement as compared with late volume replacement in the operation theater, it was suggested that mild hypotension might have a protective effect in this type of patients.

The population of patients with penetrating trauma of the aorta differs a little from the population with blunt trauma of the aorta. In the first group the patients are younger, without comorbid diseases, whereas in the second group patients are generally older and sometimes have comorbidities. The incidence of penetrating injuries of the aorta has been increasing by virtue of the high rates of urban violence. Surgical treatment by open route is still considered the standard treatment. We point out the importance of an accurate diagnosis and the location of the arterial injury preoperatively which allows the development of a targeted surgical strategy, thus reducing surgery time and increasing the possibilities of satisfactory outcomes. We highlight that complete circulation arrest is necessary in the repair of this type of injury. Without the circulatory arrest, surgical repair would have been more difficult, and more blood products would have been used because of the large volume of blood loss and the higher risk of ischemic and embolic injuries during surgical repair.

Some observations are valid as regards the procedure adopted, especially since no endovascular procedure was used. Firstly, even in reference centers, prostheses of the appropriate size as regards caliber are not easily found because the aortas are healthy and young and have the normal caliber. The durability of these prostheses in the long term is still unknown in view of the potential secondary procedures in late follow-up.

Secondly, the site of the fistula was unfavorable and it was proven intraoperatively that injuries in the brachiocephalic vein are generally older and sometimes have comorbidities. The incidence of penetrating injuries of the aorta has been increasing by virtue of the high rates of urban violence. Surgical treatment by open route is still considered the standard treatment. We point out the importance of an accurate diagnosis and the location of the arterial injury preoperatively which allows the development of a targeted surgical strategy, thus reducing surgery time and increasing the possibilities of satisfactory outcomes. We highlight that complete circulation arrest is necessary in the repair of this type of injury. Without the circulatory arrest, surgical repair would have been more difficult, and more blood products would have been used because of the large volume of blood loss and the higher risk of ischemic and embolic injuries during surgical repair.

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References
7. Demmers et al., in a series from 1993 to 2000, with an average follow-up of 55 ± 29 months of patients with ulcer of the aorta submitted to endovascular treatment, showed that in a 6-year follow-up period only 51% of the patients were free from reoperation. These authors suggest that the procedure is safe in the short term; however, the long term follow-up doesn’t provide reliable data regarding the durability of the prostheses. Although these authors reported on ulcer of the aorta, follow-up is related with complications of self-expandable stents. Therefore, these results suggest that these patients with a low life expectancy or high risk for surgery should be submitted to endovascular treatment of aortic penetrating injuries, whereas young patients with no other concurrent injuries should be submitted to conventional surgery.

Patients who survive penetrating trauma of the aorta and concurrently of the brachiocephalic vein are still uncommon and constitute a challenge for surgeons in all phases of the care, from pre-hospital care to surgical procedures. However, with the evolution of diagnostic and therapeutic methods, associated with improved systematization of pre-hospital care, the success rates of the treatment of these occurrences that have a mortality rate above 80% are expected to improve.

It is worth noting that the patient’s injury was accurately diagnosed preoperatively and that other associated injuries have been ruled out, which allowed a targeted intervention with the purpose of providing safe and efficient repair.

Potential Conflict of Interest
No potential conflict of interest relevant to this manuscript was reported.

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Study Association
This study is not associated with any graduation program.