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Traumatic Brain Injury Associated with Blunt Thoracic Aorta in A 2-Year-Old Child

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Abstract

Traumatic aortic injury is rare in pediatric patients and it is still rare when associated with injury in different organs. Then, it is fundamental to evaluate diagnosis, prior to therapy, so as to get appropriate outcomes. We present a case of a 2-year-old boy with both concomitant traumatic head and thoracic aortic injuries that was evaluated by computed tomography scan (CT-scan) and transesophageal echocardiography. The child underwent emergency surgery of decompressive craniectomy. After recovering head injury, he has undergone successful surgical treatment of thoracic aorta injury.

Keywords: *Pediatric, Trauma, Head injury, Surgery, Blunt thoracic aorta, Open surgery, Bovine pericardium patch, Clamp and seal.*

Introduction

Blunt thoracic aortic injury in children with special reference to diagnosis and therapeutic strategy is extremely rare in literature. Heckman et al., using National Trauma Database, found that among 26.940 children with the blunt mechanism of injury, 34 (0,1%) presented thoracic aortic injuries and 14 (41%) of whom died. These injuries have been associated with children sustained as occupants in a motor vehicle crash or severe injury [1].

Children often hurt as a consequence of fall down stairways. Mark and al., reported a total of 363 patients who were admitted to the pediatric emergency department. The majority of the children presented superficial or bone extremities injuries. Head and neck injuries occurred in 73% of, in a group of children at age less than four years old [2].

The pediatrician, when handing traumas of central nervous system and concomitant thoracic aortic injuries, aims to do correct diagnosis and take an appropriate decision making of what injury must be treated first [3].

This case report aims at describing our experience with successful surgical treatment of brain trauma injury associated with descending thoracic aortic dissection. After complete resolutions of the central nervous system, a successful surgical treatment of the traumatic thoracic aorta dissections was performed.

Fig1. *Preoperative Chest X-Ray showed mediastinal enlargement.*

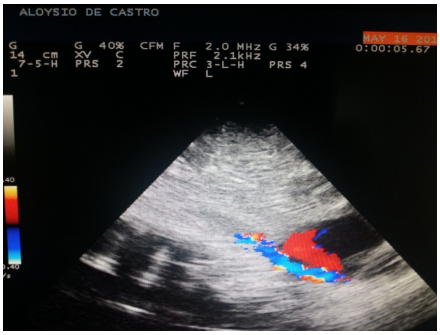

Fig2. *Preoperative Transesophageal echocardiography presented descending thoracic aorta with a false lumen(in red flow).*

Case Report

A two-year-old boy, 26,45 pounds, previously healthy, was taken to the emergency unit with parietal lobe brain trauma, after rolling down about ten steps at his home. After physical examinations, he was unconscious, but with hemodynamic stability. Cranial computed tomography showed a parietal depressed fracture. Chest X-Ray presented mediastinum enlargement

(Figure1). Chest computed tomography there was a hypodense image of 47x41x35mm, in the descending thoracic aorta, from the fourth to seventh thoracic vertebrae. The image suggested stable aortic dissection. A month ago, after undergoing successfully surgical neurologic treatment he was transferred to the department of cardiovascular surgery of our hospital, the State Institute of Cardiology, RJ. Transesophageal echocardiography confirmed diagnosis of thoracic descending aortic dissection (Figure 2).

During the preoperative evaluation, the child was asymptomatic, afebrile, without venous line or medication and his vital signs were stable. There were neither neurologic disorders nor sequelae resulting from brain trauma. In doing so, surgical treatment was scheduled forwards, to treat the descending thoracic aortic injury.

Surgery

After the child was positioned in the operating room, cardiothoracic monitoring pediatric routine was proceeded: arterial pulse oximeter, placement of electrode for cardiac monitoring, rubber blanket and Foley probe in the bladder, including: invasive blood pressure of both right radial and femoral arteries for proximal and distal systemic blood pressure control; right subclavian venous puncture and pediatric catheter introduced in it and esophagus temperature control. Endotracheal intubation followed by general anesthesia was also performed. A posterolateral thoracotomy was performed in the fourth left intercostal space. There was a pseudoaneurysm (Figure 3) of two-thirds extending the middle of thoracic descending thoracic aorta, near the isthmus (40mmx25mm), thin wall and red color, suggesting intraluminal hematoma. We proceeded thoracic aortic dissection, since left subclavian artery origin to 20mm up diaphragm and isolation of visible intercostal arteries. Intravenous systemic heparinization of 2mg/Kg was performed, followed by temporary superior and inferior cross-clamping aortic occlusions and closed of isolated intercostal arteries. A longitudinal incision was performed so as to rectify the lesion of aortic edges. There were friable extensive aorta lacerations between D-5 and D- 6 vertebras. After thrombi and blood aspirations, a proper resectioning of the pseudoaneurysm using a bovine patch pericardium interposition was used to restore the anatomic diameter of the aorta, using a continuous suture with 6-0 propylene (Figure 4). The aortic flow was restored after 27min of aortic occlusions, using clamping technique without cardiopulmonary bypass. Complete review of hemostasis, pleural tubular through water-seal drainage, and anatomic reconstruction of the thoracic wall were performed. On the first postoperative day, the patient was successfully extubated and released to the Pediatric Cardiology Ward. Transesophageal echocardiography in fourth postoperative day showed normal blood flow figure (Figure 5), hospital discharged at 10th postoperative day completely asymptomatic.

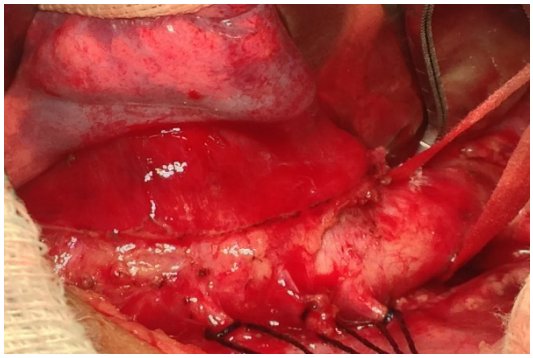

Fig3. *Pseudoaneurysm around two-thirds of descending thoracic aorta.*

Fig4. *Sutured descending thoracic aorta, using polymerized bovine pericardium patch and released intercostal arteries.*

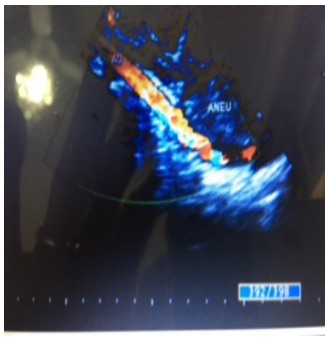

Fig5. *Pos operative Trans esophageal echocardiography of descending thoracic aorta with free blood flow.*

Discussion

The relative immobility of descending thoracic aorta as a result of peculiar anatomic characteristics when compared to the mobile aortic arch, the trauma impact of greater force drives to the aortic isthmus adjacent to ligamentum arteriosum. Trachiots et. al., reported that aortic ruptures were complete transections at the ligamentum arteriosum in 5 of 6 (83%). However, these anatomic and physical characteristics do not explain why traumatic aortic ruptures are very rare in pediatric traumas, only explained by high compliance of the chest wall in children, and lack of atherosclerosis [3].

A CT scan according to polytrauma scheme cranial-cervical-thoracic-abdomen-pelvis-legs has been used in the diagnosis of traumatic lesions as a replacement of invasive technique.

Blunt traumatic aortic injuries were suspected on basis of the mechanism of injury on children and chest abnormal roentgenogram by the presence of mediastinal enlargement, confirmed by chest computed tomography and Transesophageal echocardiography [4].

After neurologic surgical treatment, the child has been undergone thoracotomy to treat aortic lesions. The surgical modality of treatment of primary suture was done using clamp and sew technique with cross-clamp aortic time of 27 minutes, as compared to 34 minutes, (range 16 to 45 minutes [3-5].

Our decision making so as not using endovascular treatment was performed because the inadequate patient aortic diameter of a two- year-old child.

Conclusion

A child with severe blunt trauma, the immediate selective head and chest computed thomography plus Transesophageal echo cardiography were effective in diagnosis and management of simultaneous injuries. According to the correct management of these injuries in different organs, the traumatic blunt (pseudo aneurysm) of the descending thoracic aorta was treated, thirty-days after surgical neurologic resolutions, with pericardium bovine patch suture, using clamp and seal technique without cardiopulmonary bypass.

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