CASE REPORT

COMPLEX CHEST WALL DEFORMITY CAUSING CARDIAC ARREST: A PECULIAR PEDIATRIC CASE

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Abstract

Introduction: *Congenital chest wall deformities are common in children, causing self and parental concern mainly due to cosmesis. These defects rarely cause severe symptoms in patients.*

Case report: *11-year-old girl with a complex chest wall deformity and severe scoliosis causing progressive neurological loss of function. When mobilized to prone position for orthopedic surgery, she suffered sudden hypotension immediately followed by a cardiac arrest, that reverted after moving the child back to supine position. The cardiac arrest was interpreted as a result of a decrease in venous blood return secondary to heart and great vessels compression. She was then proposed and submitted to a modified Ravitch procedure with retrosternal metal bar placement in order to allow ventral positioning. This was successfully achieved, and the patient underwent scoliosis correction 3 months later. After more than a year of follow up, she reduced the need for non-invasive ventilation and tolerates prone positioning.*

Conclusion: *This case report alerts medical community that beyond cosmesis concerns, severe chest wall deformities can cause life-threatening events if not correctly managed.*

INTRODUCTION

Chest wall deformities are common, affecting nearly 1% of the population. Most of them just cause cosmetic concerns and it is rare to cause any cardiac or respiratory symptoms.[1] Cardiac arrest is a very rare complication of any surgical procedure for correction of a chest wall deformity.[2] However, cardiac arrest secondary to external compression of a chest wall deformity was never described before. Herein we describe the first case of a child with a complex chest wall deformity that suffered a sudden cardiac arrest just by chest wall compression while in prone position.

CASE PRESENTATION

A 11-year-old girl with neurofibromatosis and a severe dorsal scoliosis was admitted for orthopedic scoliosis correction due to gradual loss of motor function on her lower limbs and urinary incontinence. She also showed a severe chest wall deformity, mainly with pectus carinatum component (figure 1) and was dependent on non-invasive ventilation. She showed no cardiac anomaly on echocardiography nor arrhythmias on electrocardiography. In the operating room, when positioned in prone position for the posterior approach, she suffered cardiac arrest that was immediately reverted when mobilized back to dorsal decubitus. It was rather obvious that this condition was due to a positional component of her chest wall deformity. A chest computed tomography (CT) scan showed a severe sternal deformation: the manubrium-sternum articulation showed a 90-degree angle, with apparent compression of the left ventricle and probable cardiac/great vessels kicking when in ventral decubitus (figure 2A and B).

After a multidisciplinary discussion with Orthopedics, Anesthesiology, Pediatric Cardiology and Pediatric

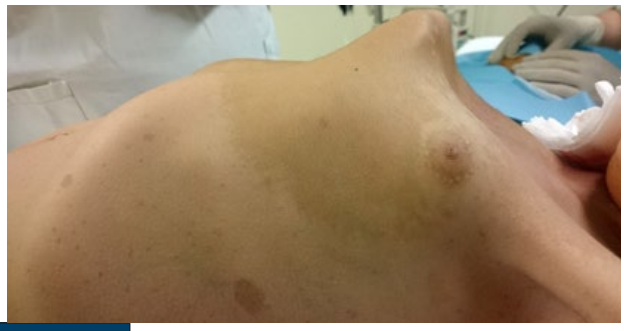

Figure 1 *Profile patient view of pectus carinatum component.*

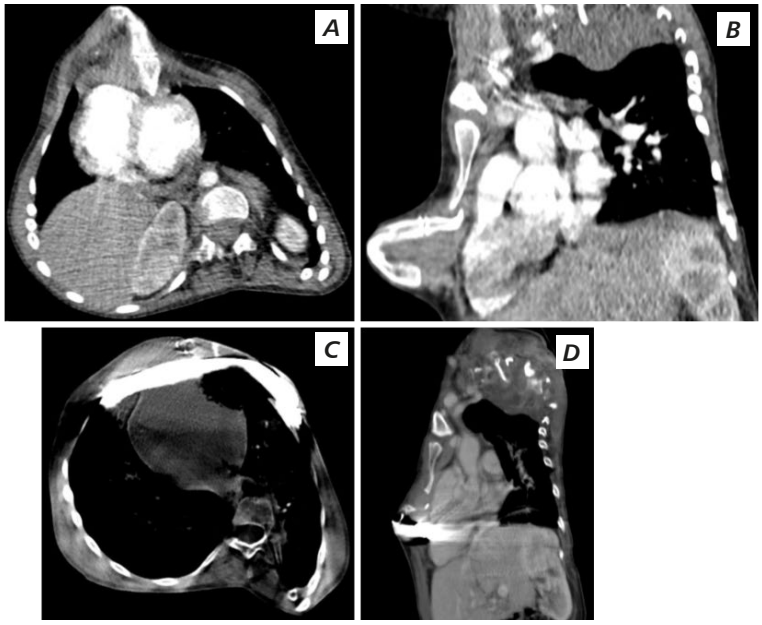

Figure 2 *CT scan imaging. A and B- preoperative heart compression by sternal deformity. C and D- postoperative image showing retrosternal bar.*

Surgery, it was concluded that: scoliosis correction was necessary in order to prevent further neurologic impairment; the prone position was mandatory for the orthopedic correction; heart and great vessels compression happened directly caused by the sternal deformity; there was no structural cardiac abnormality responsible for the cardiac arrest. On this wise, the girl was proposed for chest wall correction first, in order to tolerate the prone position necessary for the orthopedic surgery afterwards.

She was submitted to a modified Ravitch intervention, with partial sternal and rib cartilage resection and insertion of a retrosternal metal bar to enhance chest wall stability (figure 2C and D). The postoperative course was uneventful.

Scoliosis correction was done nearly 3 months after thoracic surgery, and the patient tolerated the prone position without any complication, namely cardiac dysfunction. Transesophageal echocardiogram was performed during the entire procedure and no sign of diminished blood return was noted.

After a year of follow up, the patient showed an improvement in lung function (non-invasive ventilation only during the night), stable cardiac function and can moderately tolerate ventral decubitus.

DISCUSSION

Chest wall deformities are common among otherwise healthy children. The majority of the cases are classified as pectus excavatum or pectus carinatum, and a combination of both is seen in nearly 6% of all patients.[3]

The majority of patients refer aesthetic intolerance, but some may complain of minor symptoms, such as chest pain, shortness of breath or intolerance to exercise. However, there are some reports of life-threatening events, most of them as a consequence of chronic heart compression that may lead to various types of arrhythmias.[4] Surgical correction of these deformities may also lead to serious complications, such as heart contusion and/or perforation.[2] Zou *et al* reported a case of cardiac arrest during a Nuss procedure without physical cardiac injury during the intervention and suggested it may have happened due to slight rotation of the heart.[5]

To our knowledge, this is the first described case of a pediatric patient that suffered cardiac arrest due to external compression of the heart by a complex chest wall deformity. The carinatum and excavatum components of this case make it unique and should raise awareness to the medical community: life-threatening events can occur in patients with chest wall deformities merely by their positioning.

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