CASE REPORTS

CARDIAC PERFORATION CAUSED BY PECTUS EXCAVATUM METAL BAR STABILIZER: A CASE REPORT

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Abstract

This paper reports the case of a female patient who underwent minimally invasive repair of pectus excavatum (MIRPE) in another service that evolved with bar rotation and cardiac perforation caused by the left stabilizer. The unique and frightening aspect of the case is that despite having the stabilizer inside the ventricle, the patient was oligosymptomatic: occasional chest pain and respiratory discomfort. Preoperative imaging showed rotation of the bar with stabilizers within the thoracic cavity. During surgery, intense ossification was observed around the prosthesis and it was noted that the left stabilizer had perforated the patient's left ventricle. Cardiac repair required a Clamshell incision and cardiopulmonary bypass. This case reinforces the validity of late radiological follow-up after MIRPE in an attempt to avoid this type of event, and the need to reevaluate the use of stabilizers perpendicular to the bar since they are not safe to prevent rotation of these implants.

Keywords: *Funnel chest; Minimally invasive surgical procedures; Postoperative complications; Prosthesis and implants; Nuss procedure.*

INTRODUCTION

The most feared complications of MIRPE are dislodgment of metal bars and heart injuries. Although it is known that complications are often underreported, the literature shows at least 24 cardiac injuries but most occurred during dissection of the retrosternal tunnel, a crucial time in performing MIRPE[1]. Here we describe a case of cardiac injury after bar rotation where the stabilizer injured the patient's ventricle. Some aspects that make this case more worrying are that MIRPE was performed by another team with large experience in this type of procedure, and she was discharged without complications. In addition, when the patient returned to remove the bar, despite the severity of the cardiac injury, she was oligo symptomatic.

METHODS

A 26-year-old female patient with a pre-operative Haller Index of 7.2 had undergone MIRPE under thoracoscopic visualization 6 years before in another Service, where the correction was performed with a 13-inch bar and two stabilizers (Zimmer Biomet Holdings, USA) placed under the lateral edge of pectoralis major muscles without stitches around the ribs. In 2022, she was admitted to have the metal bar removed and she reported that she had not come sooner because she was travelling outside the country. Upon admission, the patient only complained of occasional chest pain on the left hemithorax and tiredness with medium exertion.

The patient was in good general condition and showed no important signs on physical exam. On computed tomography (CT) scan, it was noted that the bar had rotated superiorly and that the proximal ends of the stabilizers were within the thoracic cavities and cardiac perforation was suspected (Fig. 1).

RESULTS

During surgery, it was observed that the bar was surrounded by extensive new bone formation, requiring the removal of the 5th rib to access the hemithorax, when it was found that the stabilizer was inside the left ventricle, which caused massive bleeding (Fig. 2). While the surgeon kept his finger on the injured ventricle to stop the bleeding, the incision was converted to Clamshell and a cardiopulmonary bypass was initiated through the femoral vessels. It was necessary to section the bar with orthopedic pliers and the right stabilizer was removed from the lung parenchyma of the middle lobe to be possible to remove the left stabilizer from inside the ventricle and perform cardiac repair (Fig. 3). Cardiac repair was done under cardioplegia and a non-beating heart with Teflon-buttressed sutures. The patient remained on cardiopulmonary

bypass for 194 minutes, developed blood dyscrasia and was maintained on mechanical ventilation for six days, having been discharged from hospital on the 14th postoperative day.

DISCUSSSION

There are only three records of cardiac injuries that occurred during the removal of metal bars, two of which occurred because the pericardium was adhered to the metal bar[2,3]. Sakakibara et al.[4] report the only case in the literature with cardiac perforation by the stabilizer. The fact that these authors removed the bar after 2 years shows that this type of injury can occur even before the 3-year period for removing the bars. On the other hand, the literature shows that the delay in removing the bar, as occurred in the present case, does not compromisse overall outcomes[5].

The exact mechanism of injury in the present case cannot be specified. The absence of acute clinical events and the fact that there is cardiac muscle surrounding the stabilizer suggest two temporally distinct events: the displacement of the bar; and subsequent cardiac perforation, in a long-lasting process in which the heartbeat must have caused the cardiac muscle to encompass the end of the stabilizer.

A central point in this event is that traditional stabilizers, perpendicular to the metal bar, only have any stability if positioned close to the midline of the chest. In order to avoid this type of complication, our group developed different stabilizers, including oblique stabilizers that can stay perpendicular to the ribs even if they are more lateralized[6] (Fig. 4).

Although the patient should have maintained semi-annual outpatient follow-up after the first three months, which she did not do, the disturbing aspect of the present case is that it was a silent event: the patient did not present relevant symptoms during this process. This suggests that if bar rotation had been detected early, perhaps this serious complication would have been avoided.

In order to reduce the chance of cardiac injuries during MIRPE, our group described a technique of the retrosternal tunnel dissection from the left side[7]. Therefore, in our opinion, it is not necessary for regular MIRPE to be carried out only in hospitals that have cardiac surgery services. However, in cases of suspected heart injury as in the present case, or in post-Ravitch MIRPE, for instance, these cases should have cardiac surgery support.

The take away messages from this case are that every patient undergoing MIRPE should have a late X-ray, for example, at 3 months, to exclude bar rotation. And, in our view it is necessary to reevaluate whether this type of bar with traditional stabilizers should remain in use given that bar rotation can lead to catastrophic complications.

After almost two years after bar removal the patient is doing well even after the troubleshooting post operative period and she gave informed consent for this publication

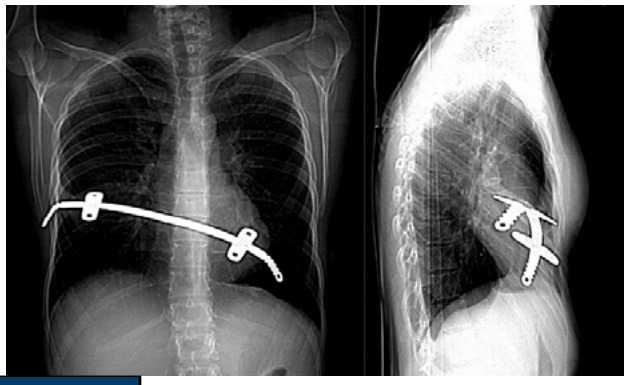

Figure 1 *Scout of the CT scan before bar removal showing rotation of the metal bar and left stabilizer over the cardiac area.*

Figure 2 *Left stabilizer merged into the left ventricular myocardium.*

Figure 3 *Metal bar was sectioned in order to be removed.*

Figure 4 *The longer, asymmetric and standard options of oblique and perpendicular stabilizers developed by our group.*

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