



A Novel Method of Minimally Invasive Repair of Pectus Excavatum (MIRPE) in Patients with Bilateral Breast Prostheses: a Report of Two Patients

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Abstract

The literature on minimally invasive repair of pectus excavatum in patients with breast prostheses is very scarce, with only one report to date. We present two cases treated in our center in which this technique was performed without prior removal of the breast prostheses. In one of the patients, a sternal zenithal traction system was additionally used to facilitate retrosternal dissection. In this work, we present the technical details of the procedure. One of the patients presented with postoperative Dressler's syndrome which resolved with conservative measures. We found no correlation between this complication and the presence of breast prostheses. After 4 and 2 years respectively, both patients are asymptomatic, with an adequate correction of the defect, and being followed up. Minimally invasive repair of pectus excavatum technique is safe and feasible in patients with bilateral breast prostheses. The placement of breast prostheses prior to the correction of rib cage deformities leads to an unpredictable aesthetic result in certain aspects, such as the exact positioning of the nipple areola complex. The approach to this pathology by a pediatric surgeon, who considers not only the aesthetic aspect but also the rib cage involvement and the potential presence of additional malformations (for example, a Poland sequence), is, in the authors' opinion, beneficial to the overall outcome of these patients.

Keywords Pectus excavatum · MIRPE · Bilateral breast implants · Video-assisted PE repair · Poland syndrome · Sternal traction · Nipple-areola complex

Background

Pectus excavatum (PE) is a thoracic deformity characterized by a median depression of the sternum, with an estimated incidence between 0.1 and 0.8% [1]. Minimally invasive repair of pectus excavatum (MIRPE) is increasingly being used in the last two decades, with excellent medium- and long-term results [2]. The improvement of sternal elevation

techniques, which provide a greater margin of safety when performing retrosternal dissection, has contributed to this.

Women, especially in pubertal age, constitute an additional challenge for the MIRPE technique. Multiple factors such as breast asymmetry, maintaining potential for growth of breasts, and in some cases presence of bilateral breast prostheses need to be considered. It is not uncommon for women with PE to be offered breast prostheses to correct the defect. This practice is prevalent in plastic surgery practice, where aesthetic considerations override the importance of intrathoracic volume changes and resulting spinal deformities [3]. We found one report [4] of a minimally invasive repair of pectus excavatum (MIRPE) in a patient with breast prostheses. The procedure was successful and there were no associated complications. It is noteworthy that the authors did not mention about using any sternal traction during surgery.

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Patients and Methods

Our center's electronic medical records were reviewed for patients with bilateral breast prostheses who underwent surgery for PE through the MIRPE technique, and two cases were identified. Sociodemographic, clinical, and radiological data of the patients were extracted. All data were anonymized in accordance with current legislation. The ethical principles of the Declaration of Helsinki were followed.

Sternal Traction System

The sternal elevation system that we use in our center [5] consists of the application of steel sternal stitches and the use of a crane system to lift the sternum effortlessly. This system significantly increases the retrosternal space, allowing a safer passage at this level (Fig. 1).

Case 1

We evaluated a 31-year-old woman in outpatient clinic for PE requesting correction on an aesthetic basis. The patient had bilateral breast prostheses implanted following subcutaneous mastectomy for fibrocystic mastopathy 5 years earlier.

Examination revealed the presence of a severe, moderately asymmetrical PE and moderate scoliosis. Cardiological and pneumological studies were performed, showing no remarkable alterations. A thoracic computed tomography (CT) scan showed a Haller index of 6.06 (Fig. 2). She was advised surgical correction using the MIRPE technique. A single-port thoracoscopy in the right 7th intercostal space in the posterior axillary line with a 5-mm trocar and a 5-mm and 30° optic was performed. The introducer was passed under direct vision and a 30.5-cm medical steel bar was placed, with clockwise rotation. No sternal traction system was used. Subsequently, bilateral stabilizers were placed. An intravenous patient-controlled analgesia (PCA) and an epidural catheter were placed. Postoperative recovery was uneventful with 3 days of patient-controlled analgesia. On the 7th postoperative day, she was discharged from the hospital in good general condition and pain free. Two years later, the patient was admitted on a scheduled basis for removal of the bar. Under general anesthesia, the previous incisions were reopened and the bar was removed without incident. The patient was discharged 24 h postoperatively without incident. The patient is currently asymptomatic, with no recurrence, with 4 years of follow-up and with a good aesthetic result (Fig. 2).

Fig. 1 Sternal elevation system used in our center. **a** System assembled and in operation, with visible sternal elevation. **b, c** Intraoperative images of the retrosternal bar passage and subsequent rotation, with sternal elevation applied (note the increase in retrosternal space)

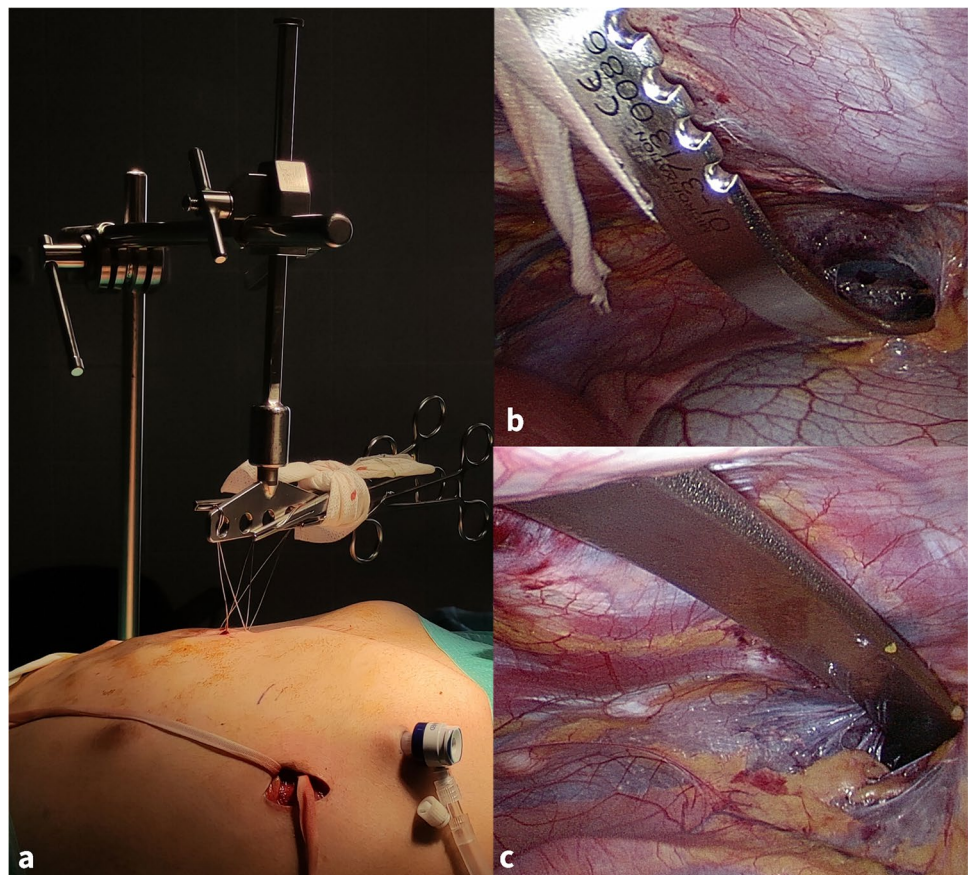
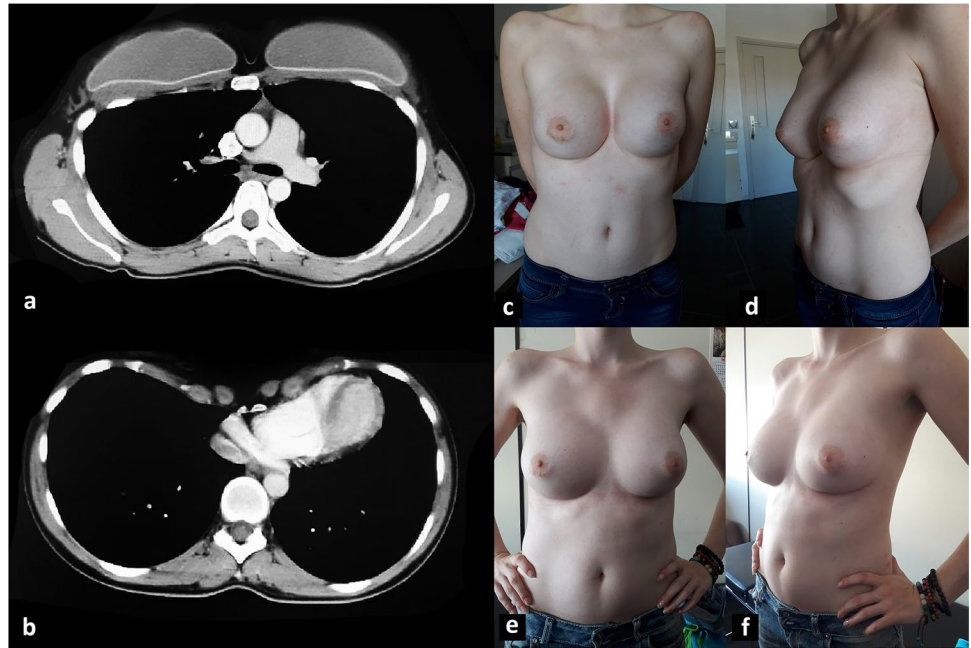


Fig. 2 Case 1. **a, b** Preoperative thoracic CT, axial sections. Note the presence of suprapectoral bilateral breast prostheses (a) **c, d** Preoperative images. **e, f** Postoperative images

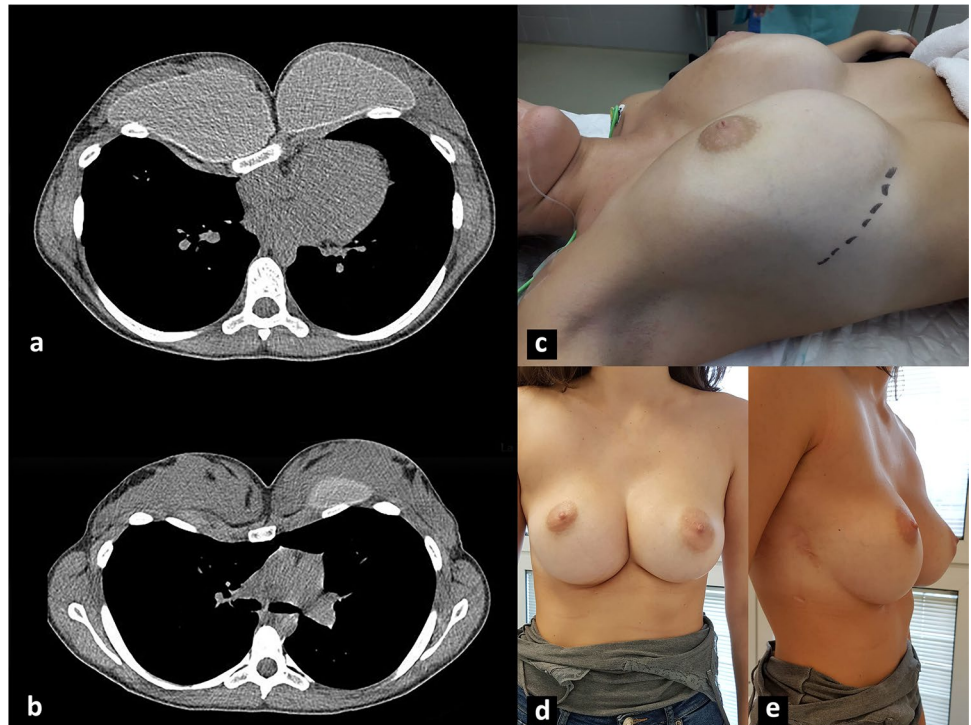


Case 2

We evaluated a 21-year-old woman who had been previously diagnosed with PE. She had been treated with a vacuum bell without achieving an adequate correction of the defect. The patient had bilateral breast prostheses that had been placed with aesthetic criteria. Physical examination revealed the presence of a moderate-severe PE, asymmetric, as well a

moderate right breast hypoplasia with a smaller size of the nipple areola complex. Cardiological and pneumological studies showed no alterations. A thoracic computed tomography (CT) scan showed a Haller index of 4.6 (Fig. 3). She was advised surgical correction using the MIRPE technique. A single-port thoracoscopy in the right 7th intercostal space in the posterior axillary line with a 5-mm trocar and a 5-mm and 30° optic was performed. The introducer was passed

Fig. 3 Case 2. **a, b** Preoperative thoracic CT, axial sections. Note the presence of suprapectoral bilateral breast prostheses (a) **c** Preoperative image, showing the limit of the right breast to avoid damaging it during trocar placement and during the introduction of the bar. **d, e** Postoperative images. Note the difference in size between the two nipple-areola complexes, already observed since the initial evaluation of the patient



under direct vision and a 30.5-cm medical steel bar was placed, with clockwise rotation. Subsequently, lateral stabilizers were placed. In this case, we decided to use our sternal zenithal traction system [5] to facilitate the retrosternal dissection maneuver. For this, we manually displaced the right breast prosthesis, exposing the sternal body, and passed the steel stitches longitudinally, with tactile and visual control to avoid inadvertently perforating the prosthesis. The introducer was passed under direct vision and a 33.5-cm medical steel bar was placed, with counterclockwise rotation. Subsequently, double bilateral stabilizers were placed. An intravenous PCA and an epidural catheter were placed. The patient evolved favorably, remaining admitted to the intensive care unit for 3 days for pain control. On the 7th postoperative day, she was discharged from the hospital in good general condition and pain free.

One month after the operation, she presented with an acute episode of bilateral chest pain. An X-ray was performed showing a bilateral pleural effusion. Diagnostic thoracentesis was performed. The biochemical analysis was compatible with an uncomplicated exudative effusion, and the patient was discharged.

Forty-eight hours later, persistent pain and the onset of fever prompted a new visit to the emergency department where an echocardiogram was performed. It showed moderate pleural and pericardial effusion. The diagnostic orientation was pleuropericardial syndrome and, after excluding cardiological involvement, admission and treatment with colchicine and ibuprofen was indicated. The patient improved and 2 weeks later was discharged.

The patient was reviewed on an outpatient basis 1 month later, reporting persistent moderate chest pain. Due to this, a new chest X-ray was performed, showing a displacement of the bar and stabilizers which had not been documented in the previous X-rays taken during the episode described above. The patient was re-intervened and the bar and stabilizers were repositioned. The subsequent evolution was favorable. Two years later, the patient was admitted on a scheduled basis for removal of the bar. Under general anesthesia, the previous incisions were reopened and the bar was removed without incident. She was discharged 24 h postoperatively without incident. She is currently asymptomatic, with no recurrence and with 2 years of evolutionary follow-up (Fig. 3).

Discussion

In this paper, we present two patients diagnosed of PE with had bilateral breast prosthesis. We performed MIRPE successfully in both patients without removing the breast implants. In the event that it was decided to remove the prostheses before MIRPE, it would have meant two additional

surgical interventions to those already considered (one for the prosthesis removal and one for their repositioning, once the bar has been removed).

In case 2, we chose to use the sternal elevation system, while in case 1 we chose not to associate sternal elevation. In relation to case 2, despite the limited intermammary space available, the high mobility of the prostheses and their lack of fixation to deep planes made it possible to lateralize one of them to apply the traction points to the sternum.

Regarding postoperative evolution, the first patient evolved excellently. The second patient, on the other hand, presented a pleuropericardial syndrome, which is one of the complications known to occur in any thoracic surgical access. We believe that the complication was not related to the breast prostheses, since the presternal and suprapectoral spaces were not manipulated during the procedure. The breast prostheses maintained their integrity and there was no periprosthetic fat involvement at any time. We attribute the displacement of the bar and stabilizers in this patient to pleuropericardial syndrome per se: the locoregional inflammation characteristic of this condition and its occurrence in the early postoperative period justify a displacement of the bar and the stabilizers. In our experience, in the last 10 years, we have had only two cases of accidental displacement of the bar: the one mentioned here and the one associated with a sudden rotational movement in a competition exercise. The fact that the patient required two thoracenteses in relation to this syndrome had an important influence on the global aesthetic result of the patient. However, MIRPE incisions, different from those of the thoracenteses performed (Fig. 3e), had an excellent cosmetic result. In this patient, the right nipple-areola complex was asymmetrical with respect to the left side before surgical correction of the PE. This finding, together with the right breast hypoplasia documented on physical examination, could be related to an incomplete Poland sequence, which is known to occur concomitantly in patients with PE [6, 7]. However, this asymmetry increased slightly after the intervention. The definitive correction of the rib cage anatomy positioned the breast and its suspensory ligaments in the position in which they should natively be, which justifies this change. This is why the placement of breast prostheses prior to the correction of rib cage deformities leads to an unpredictable aesthetic result in certain aspects, such as the exact positioning of the nipple-areola complex. As other authors have stated [4], these patients, even if they do not have a Poland-type malformation sequence, almost invariably have some underlying breast asymmetry due to the PE-associated sternal rotation. This, classically defined as pseudohypoplasia, can be corrected by means of breast prostheses, but it is not considered the best therapeutic option since the correction of the PE itself improves this asymmetry at the expense of correcting the sternal rotation. In this sense and in our opinion, the

approach to this pathology by a pediatric surgeon, who considers not only the aesthetic aspect but the whole potential malformative complex, is better overall for the outcome of these patients.

These facts should be explained in detail to patients with PE who want surgical correction, stressing the fact that the correct sequence is first to correct PE and then, if the asymmetry persists and if they wish, to place breast prostheses, but never the opposite. This can avoid the placement of unnecessary prostheses. It is relevant to note that other authors propose that prosthesis placement concurrently with PE surgery is a valid option with good results [8].

In conclusion, MIRPE in patients with bilateral breast prostheses is feasible, even using sternal traction elements [5]. Potential postsurgical asymmetry in the nipple-areola complex should be considered in the final aesthetic result.

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Declarations

Informed Consent Prior to the submission of this article, verbal and written informed consent was obtained from the patients included in this publication. The patients' medical records were accessed in accordance with the specific hospital regulations applicable to this type of case.

Conflict of Interest The authors declare no competing interests.

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