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Upper Partial Sternotomy Combined With Left Anterior Thoracotomy for Acute Type A Aortic Dissection With Severe Pectus Excavatum: A Case Report

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Abstract

We report a case of acute type A aortic dissection (ATAAD) complicated by severe pectus excavatum in a 55-year-old woman. Preoperative computed tomography demonstrated severe leftward displacement of the heart, suggesting that standard median sternotomy would not provide adequate exposure. Therefore, an upper partial sternotomy combined with left anterior thoracotomy was selected. This approach permitted ascending aortic replacement with adequate surgical exposure. The patient was discharged home, ambulatory, on postoperative day 35. This case suggests the feasibility of this surgical approach for overcoming anatomical constraints in emergency cases involving severe pectus excavatum.

Categories: Cardiac/Thoracic/Vascular Surgery
Keywords: acute aortic dissection, ascending aortic replacement, left anterior thoracotomy, partial sternotomy, pectus excavatum

Introduction

Acute type A aortic dissection (ATAAD) is a potentially life-threatening condition with high mortality that necessitates prompt and accurate diagnosis and rapid surgical repair [1]. Pectus excavatum is a congenital depression of the sternum and anterior chest wall. Its severity is graded on computed tomography by the Haller index, the ratio of the maximum transverse to the minimum anteroposterior chest diameter; an index greater than 3.25 has traditionally been used to define severe deformity [2]. In patients with severe pectus excavatum, sternal depression narrows the retrosternal space and can displace the heart and great vessels into the left thoracic cavity. Consequently, standard median sternotomy may fail to provide adequate surgical exposure. No standardized surgical strategy has been established for such anatomically challenging cases. In this report, we describe a case of ATAAD complicated by severe pectus excavatum (Haller index 10) in which upper partial sternotomy combined with left anterior thoracotomy provided adequate surgical exposure and enabled aortic repair.

Case Presentation

A 55-year-old woman (height 161 cm, weight 56 kg, and body mass index 21.6 kg/m^2) with a history of hypertension presented with sudden-onset chest and back pain. On arrival, her blood pressure was 110/50 mmHg and her heart rate was 86 beats/min. Laboratory examination revealed a hemoglobin level of 14.5 g/dL, a platelet count of 143 × 10^3/μL, and a creatinine level of 0.96 mg/dL. Transthoracic echocardiography showed pericardial effusion, a preserved left ventricular ejection fraction, and no aortic regurgitation. Contrast-enhanced computed tomography (CECT) demonstrated DeBakey type I ATAAD and severe pectus excavatum with a Haller index of 10.7. The heart was almost completely displaced into the left thoracic cavity (Figures *1A*-*1B*).

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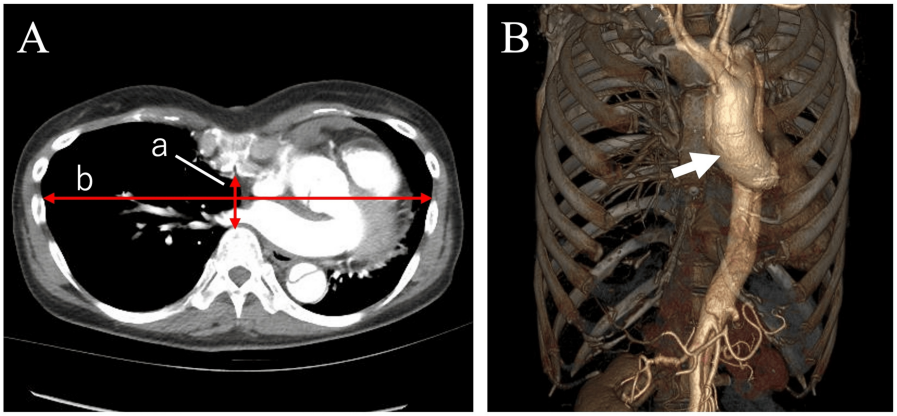


FIGURE 1: Preoperative computed tomography images

(A) Axial view showing severe pectus excavatum and marked leftward displacement of the heart into the left thoracic cavity. Arrow a indicates the minimum anteroposterior diameter of the chest (24 mm), and arrow b indicates the maximum transverse diameter (256 mm). The Haller index (b/a) is 10.7.

(B) Three-dimensional reconstruction depicting both the severe sternal depression and the DeBakey type I ATAAD. The arrow indicates the displaced ascending aorta.

ATAAD: acute type A aortic dissection

Emergency surgery was performed. As the intimal tear was located in the ascending aorta, ascending aortic replacement was planned for entry resection. To ensure adequate surgical exposure of the markedly displaced heart, we selected upper partial sternotomy combined with left anterior thoracotomy, rather than standard median sternotomy.

With the patient under general anesthesia in the supine position, a skin incision was made starting at the suprasternal notch, extending down the midline to the level of the fourth intercostal space, and then turning transversely into the left anterior chest. Partial median sternotomy was performed from the upper border of the manubrium to the fourth intercostal space. The sternum was then transected in a gentle curvilinear fashion toward the left at this level, and the left fourth intercostal space was opened (Figure *2A*). Because of the anatomical displacement associated with pectus excavatum, the right lung was injured when the chest was opened, and the injury was repaired. The left internal thoracic artery was ligated and divided. A retractor provided adequate exposure of the leftward-displaced ascending aorta and the cardiac base (Figure *2B*).

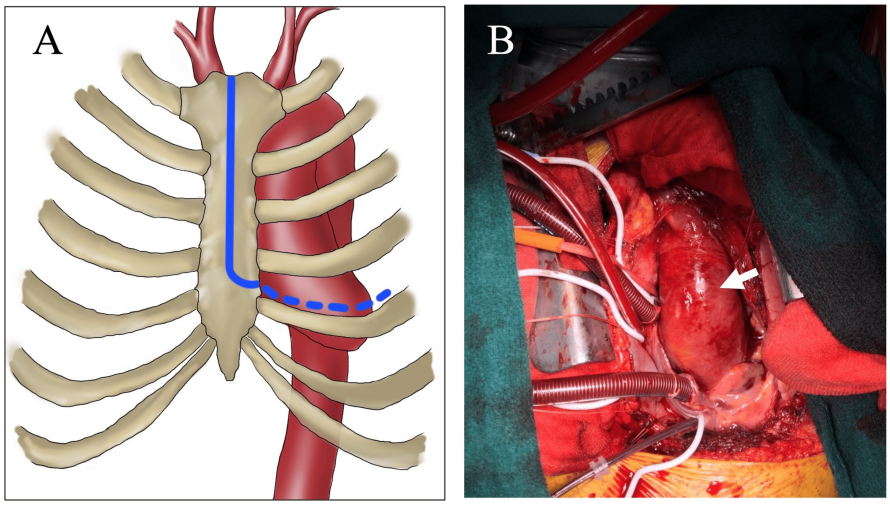


FIGURE 2: Surgical approach

(A) Schematic illustration of the upper partial sternotomy and left anterior thoracotomy through the fourth intercostal space. The solid blue line indicates the sternal transection, and the dotted blue line indicates the intercostal thoracotomy. The diagram shows the anatomical relationship between the sternum, ribs, and the displaced ascending aorta.

(B) Intraoperative photograph showing the surgical field. The arrow indicates the ascending aorta. Adequate exposure of the ascending aorta is achieved through upper partial sternotomy combined with a left anterior thoracotomy.

Figure 2A is an original author-created schematic using Procreate (Savage Interactive Pty Ltd, Hobart, Tasmania, Australia).

Cardiopulmonary bypass (CPB) was established via right femoral artery perfusion and direct bicaval venous drainage. Cardiac arrest was achieved with retrograde cold blood cardioplegia. Despite the deep surgical field caused by the chest wall deformity, this approach facilitated easy access to the ascending aorta, allowing the ascending aortic replacement itself to be performed safely without technical difficulty. The procedure was performed using a single-branched Dacron graft (J Graft; Japan Lifeline, Tokyo, Japan) under circulatory arrest with retrograde cerebral perfusion. The patient was smoothly weaned from CPB. The sternum was closed with five wires, the most caudal of which was placed across the transverse sternal transection to reapproximate the cranial and caudal sternal segments. The CPB, aortic cross-clamp, circulatory arrest, and total operative times were 154, 69, 25, and 331 min, respectively. Histopathological examination revealed no findings suggestive of a connective tissue disorder such as Marfan syndrome. The postoperative course was complicated by a right pneumothorax that was difficult to control and was presumably related to the intraoperative lung injury. Nevertheless, the patient was discharged home, ambulatory, on postoperative day 35.

Discussion

The management of ATAAD in patients with severe pectus excavatum remains a significant surgical challenge. The optimal surgical approach has yet to be established; the posterior displacement of the sternum combined with the leftward displacement of the heart, which places the ascending aorta off-axis from a midline incision, severely restricts surgical exposure. In view of this profound leftward displacement of the heart and great vessels, standard median sternotomy was considered unsuitable because it was unlikely to provide a safe or adequate surgical field for aortic repair.

An approach combining upper partial sternotomy with left anterior thoracotomy has been reported as effective for patients with pectus excavatum [3]. Nisanoglu et al. [3] employed this approach for aortic root and ascending aortic replacement in a patient with Marfan syndrome. Notably, they described initially attempting the thoracotomy at the third intercostal space but switching to the fourth to obtain adequate exposure. Their experience highlights that the level of the intercostal incision should be carefully selected based on the individual anatomy and intended procedure. In our case, the upper partial sternotomy combined with left anterior thoracotomy via the fourth intercostal space provided an adequate view for ascending aortic replacement.

In contrast, Fujimoto et al. performed partial arch replacement in a patient with pectus excavatum and no reported Marfan syndrome, using a full median sternotomy combined with thoracotomy [4]. Although our

upper partial sternotomy preserves the continuity of the lower sternum and thus may offer better lower thoracic stability than their full sternotomy approach, the latter provides wider exposure suitable for extensive repair. Therefore, if the surgical field via the partial sternotomy proves inadequate, extension to a full median sternotomy remains a valid option.

Another critical consideration is whether to correct the pectus excavatum concurrently. One-stage repair of the chest wall deformity together with the cardiac procedure has been reported both in patients with Marfan syndrome undergoing repair of ATAAD [5,6] and in patients without reported Marfan syndrome undergoing other cardiac operations [7,8]. The rationale is to secure exposure and to avoid the cardiopulmonary effects of a residual deformity, namely arrhythmia, hemodynamic compromise, and respiratory dysfunction, whose manifestations overlap with those of the cardiac disease and may complicate recovery after cardiac surgery. However, concurrent chest wall correction prolongs the operation and recovery and increases blood loss, adding to the risk of postoperative bleeding and wound infection [7,8]. Shioi et al. attempted a simultaneous sternal turnover during emergency repair of ATAAD in a patient with Marfan syndrome but had to remove the reconstructed sternocostal complex on postoperative day 2 because of mediastinal bleeding, and concluded that a two-stage strategy is preferable in this emergency setting [5]. Schwill et al., whose patient was clinically stable, likewise emphasized that in unstable emergency cases lifesaving surgery must take precedence over cosmetic repair [6]. Accordingly, in an emergency such as ATAAD, we prioritized aortic repair alone and regard staged chest wall correction, if later indicated, as the more appropriate strategy.

This report has a limitation inherent to a single case. The advantages of the present approach over other surgical exposures are inferred rather than demonstrated, because no direct comparison was performed and the few previously reported cases are too heterogeneous to allow a meaningful comparison of outcomes. Our findings should therefore be regarded as hypothesis-generating.

Conclusions

In patients with severe pectus excavatum and ATAAD, prioritizing reliable aortic repair without concurrent chest wall correction appears appropriate in the emergency setting. Upper partial sternotomy combined with left anterior thoracotomy may be a feasible option for overcoming severe anatomical displacement of the heart while preserving the continuity of the lower sternum. However, as this is a single case, our findings are hypothesis-generating and cannot be generalized without further accumulation of cases.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Yuta Watanabe

Acquisition, analysis, or interpretation of data: Yuta Watanabe, Tohru Ishimine, Naoki Taniguchi, Toshiho Tengan, Natsuki Suzuki

Drafting of the manuscript: Yuta Watanabe

Critical review of the manuscript for important intellectual content: Tohru Ishimine, Naoki Taniguchi, Toshiho Tengan, Natsuki Suzuki

Supervision: Tohru Ishimine

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Acharya M, Mariscalco G: Diagnosis and acute management of type A aortic dissection . Br J Cardiol. 2023, 30:12. 10.5837/bjc.2023.012
2. Haller J, Kramer S, Lietman S: Use of CT scans in selection of patients for pectusexcavatum surgery: a preliminary report. J Pediatr Surg. 1987, 22:904-6. 10.1016/S0022-3468(87)80585-7

3. Nisanoglu V, Battaloglu B, Erdil N, Ozgur B, Kuzucu A: Surgical approach for Stanford type A aortic dissection in a patient with Marfan syndrome and pectus excavatum. Tex Heart Inst J. 2007, 34:240-3.
4. Fujimoto N, Doi Y, Hashino A, Umesue M: Aortic arch replacement via the L-incision approach for Stanford type A aortic dissection with pectus excavatum. Jpn J Cardiovasc Surg. 2023, 52:123-7. 10.4326/jjcvs.52.123
5. Shioi K, Nagata Y, Sugimoto I, Mase T, Katoh S, Tsuchioka H: Acute aortic dissection in a patient with Marfan's syndrome and severe pectus excavatum--emergency surgical repairs of ascending aortic dissection and aortic regurgitation complicated by pectus excavatum in Marfan's syndrome. Nihon Kyobu Geka Gakkai Zasshi. 1992, 40:1902-6.
6. Schwill S, Kallenbach K, Beller CJ, Karck M: An alternative surgical approach for the combined treatment of pectus excavatum and acute aortic dissection type-A in Marfan syndrome. Interact Cardiovasc Thorac Surg. 2011, 12:526-8. 10.1510/icvts.2010.256123
7. Mihara A, Mizuno T, Arai H: Simultaneous surgical repair of severe pectus excavatum associated with mitral regurgitation, angina pectoris and left atrial tumor for an old non-Marfan patient. Jpn J Cardiovasc Surg. 2014, 43:200-4. 10.4326/jjcvs.43.200
8. Watanabe N, Hapak A, Nasirov T: Simultaneous repair of pectus excavatum with congenital heart surgery for a 72-year-old patient: case report. SAGE Open Med Case Rep. 2025, 13:7213. 10.1177/2050313X251377213