



CASE REPORT

Pectus excavatum corrected by locally adapted Nuss procedure: A case report

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INTRODUCTION

Pectus excavatum, sometimes referred to as sunken or funnel chest, is a congenital deformity of the chest wall when many ribs and the sternum develop improperly, resulting in a concave or caved-in look of the front part of the chest wall and sternum. Pectus excavatum is a condition that affects approximately 1 in every 300-500 births, with a higher incidence in males with a ratio of 3:1.¹ Although there is no specific genetic marker, pectus deformity is observed in 35% of cases where it runs in families.² This case report examines our first experience of the operating approach called minimally invasive repair of pectus excavatum (MIRPE), commonly known as the Nuss technique or pectus bar treatment, which Donald Nuss initially introduced.³ The Nuss treatment has gained significant popularity due to its early and impressive outcomes, as well as its less invasive approach compared to the open Ravitch technique.^{4,5,6}

CASE DESCRIPTION AND MANAGEMENT

This case has been reported in line with the SCARE Criteria. A 22-year-old MBBS student reported difficulty with physical activity, breathlessness, and chest discomfort for five years, with a significant exacerbation in the past six months. Examination revealed a pectus excavatum-sunk sternum. Preoperative computed tomography and echocardiography confirmed the diagnosis and cardiopulmonary compression assessment, providing a Haller's index 3.84. No family member had this chest malformation. There is no history of significant birth deformities, neurological

LEARNING POINTS

1. The Nuss treatment, which is minimally invasive, has become the standard technique for correcting pectus excavatum, which is a congenital malformation of the chest wall.
2. Nuss procedure can be done with some local adaptation and modification of instrumentation.
3. This case report showcases substantial progress in the feasibility and safety of the Nuss method used in Bangladesh.

delays, or cardiac conditions. The patient was admitted for a 'Nuss procedure' in January 2021 at Al-Helal Specialised Hospital, Mirpur, Dhaka. The patient and his family were informed about the short- and long-term results, morbidity, and mortality of the Nuss surgery, which had never been performed in Bangladesh. The Nuss treatment, is less invasive but can cause severe postoperative pain and discomfort due to the bending of the forceful sternum and cartilage. The discussion also included bar displacement and re-operative surgery. An informed written consent for surgery and anaesthesia was taken from the patient and his relatives.

In the operating room, the patient was placed supine and a permanent ink pen was used to mark the deepest part of the pectus, the intercostal spaces on the right and left sides where the bar was to be inserted, and the points on the pectus ridge that corresponded to the horizontal plane from the incisions of the deepest point to the lateral chest wall. The bar length was 11 inches on the midaxillary line distance.

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A 5-mm 30° angled laparoscope was used instead of a thoracoscope to direct the position of a specially curved stainless steel bar beneath the sternum. The bar was then flipped to raise the sternum and secured to the ribs on the sides using no-4 steel wire. The procedure lasted approximately 130 minutes and was performed under endotracheal general anaesthesia with invasive hemodynamic monitoring.

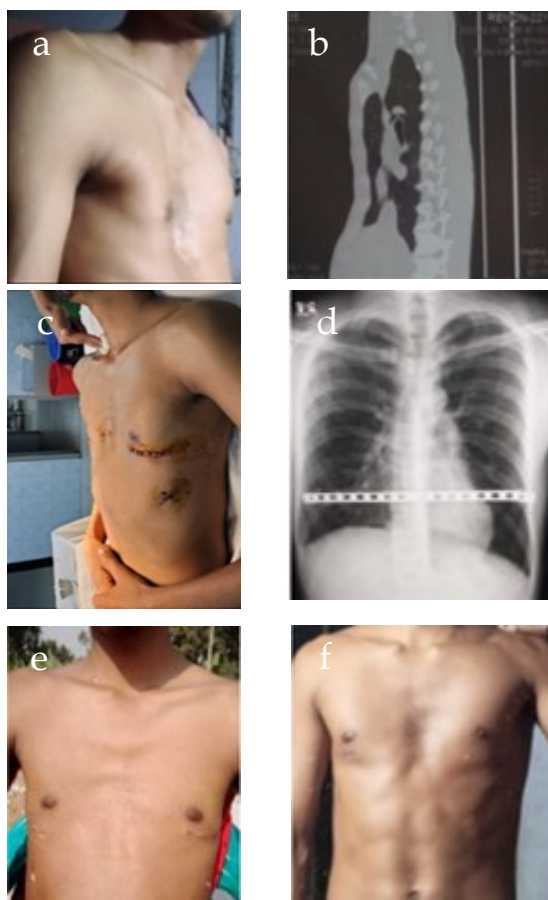


FIGURE 1 Chest appearances: (a) Before operation, (b) Preoperative computed tomography scan of the chest, (c) 5th POD, (d) Postoperative chest X-ray, (e) One month after operation, (f) Two years after operation.

The Nuss procedure requires specialised equipment, which is expensive and not readily available. Moreover, the COVID-19 pandemic has created difficulties in importing these tools during the period of procedure. Certain instruments were locally manufactured and sterilised effectively before the operation to perform this complex, minimally invasive surgery at a reduced expense. Some instruments were modified from those used in other surgical procedures.

The patient was encouraged to walk on the first postoperative day. Postoperative analgesia was maintained with a continuous infusion of 0.25% bupivacaine through a thoracic epidural catheter along with on-demand narcotics. Serial postoperative imaging showed the correct positioning of the bar and resolution of the sternal depression. After oral pain management, the patient was discharged on the ninth postoperative day and was instructed to maintain excellent posture, avoid bending and slouching, avoid heavy lifting for one month, and skip contact sports for six months.

DISCUSSION

The Nuss procedure, introduced by Dr. Donald Nuss in 1987, is a minimally invasive technique for correcting pectus excavatum and has gained significant acceptance. It has been claimed that this procedure delivers substantial cosmetic and physiological improvements. Long-term follow-up studies have indicated high patient satisfaction with aesthetic outcomes and quality of life after surgery.² Additionally, functional benefits have been documented, reporting improved lung function and exercise capacity after the procedure.⁸ Our patient, at six, twelve, and twenty-four months of follow-up, reported considerable improvement in symptoms, including improved tolerance to exercise and resolution of chest discomfort, with excellent cosmetic results and no problems. One year postoperatively, chest tomography showed a normal Haller's index of 2.8.

However, the Nuss procedure is associated with the risk of bar displacement, infection, and pneumothorax. Kelly *et al.* (2018) noted that these complications are generally manageable but sometimes require additional surgical interventions.⁹ Effective pain management is crucial due to significant postoperative pain. The incidence of complications is influenced by the surgeon's experience and the patient's age, with younger patients experiencing better outcomes and fewer complications due to their more flexible chest walls.¹⁰

Implementing the Nuss procedure in Bangladesh in 2021 highlights the nation's progress in medical expertise and its dedication to delivering sophisticated

healthcare in resource-constrained environments. This achievement requires multidisciplinary collaboration, including skilled surgeons, anaesthesiologists, and nursing staff.

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Author contributions

Manuscript drafting and revising it critically: HS, SKS. *Approval of the final version of the manuscript:* HS, SKS, MAU, MNP. *Guarantor of accuracy and integrity of the work:* HS, SKS, MAU, MNP.

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Conflict of interest

We do not have any conflict of interest.

Ethical approval

Ethical approval was not sought because this is a case report. However, informed written consent was obtained from the patient for preparation of this manuscript.

Data availability statement

We confirm that the data supporting the findings of the study will be shared upon reasonable request.

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