Simultaneous mitral valve and pectus excavatum repair with a Nuss bar

Georgios Dimitrakakis*, Ulrich Otto von Oppell, Catherine Miller and Małgorzata Kornaszewska

Department of Cardiothoracic Surgery, University Hospital of Wales, Heath Park, Cardiff, UK

* Corresponding author. Department of Cardiothoracic Surgery, University Hospital of Wales, Heath Park, Cardiff CF14 4XW, UK. Tel: +44-29-20745160; fax: +44-29-20745301; e-mail: gdmimtrakakis@yahoo.com (G. Dimitrakakis).

Received 29 January 2012; received in revised form 27 May 2012; accepted 31 May 2012

Abstract

We present the successful management of an interesting case of a single-stage combined mitral valve repair plus repair of the pectus excavatum with a Nuss bar.

Keywords: Mitral valve repair • Pectus excavatum • Nuss procedure

INTRODUCTION

Pectus excavatum is the most common congenital chest wall deformity (1 in 400 to 1 in 1000 live births), characterized by depression of the sternum, and is commonly associated with mitral valve prolapse and arrhythmias, as well as connective tissue disorders (Marfan’s and Ehlers–Danlos syndromes) [1].

Simultaneous pectus excavatum and intracardiac repair of congenital heart defects has been performed sporadically usually using modified Ravitch techniques [2].

We present a case of severe pectus excavatum and mitral valve prolapse that was surgically treated in one stage using the Nuss bar.

CASE REPORT

A 54-year-old male was referred for the assessment of severe mitral valve regurgitation (history of pulmonary oedema and NYHA 3 dyspnoea) as well as severe pectus excavatum (Haller index = 5.1) (Fig. 1A and B).

Through a median sternotomy, a successful mitral valve repair of anterior leaflet prolapse (A2–A3) using chordae expanded polytetrafluoroethylene (ePTFE)-suture (22 mm × 3 and 12 mm × 2 chordae loops) and commissural leaflet plication, plus an annuloplasty using a 38-mm Colvin-Galloway Future Band was performed.

At the end of the cardiac procedure, the pericardium was partially closed and inferiorly an ePTFE-membrane (Preclude pericardial membrane) was inserted to protect the myocardium and for uncomplicated removal of the Nuss bar in the future. The ePTFE-membrane was fixed by four tacking sutures to native pericardium to prevent dislocation. The excess lower sternum was resected with an oscillating saw and stainless steel wires used to re-approximate the sternum. Thereafter, a Nuss bar was inserted under vision while the sternum was open, the sternum was re-approximated and only then the bar was turned (Fig. 2A–B).

The patient made an uneventful recovery and was discharged on the 10th postoperative day (Fig. 2C).

Two years postoperatively the patient is doing well, has good aesthetic appearance and will be reviewed when he is 3 years postoperative for the consideration of Nuss bar removal.

DISCUSSION

Pectus excavatum is a common congenital chest wall deformity characterized by depression of the lower sternum, and depending on its severity, there may be compression of the right atrium and ventricle, as well as impairment of pulmonary function [1].

Surgical treatment for pectus excavatum is indicated for symptomatic pectus excavatum fulfilling two or more of the following criteria: (i) computed tomography (CT)-index (or Haller-index) greater than 3.25, (ii) evidence of cardiac or pulmonary compression on CT or echocardiogram, (iii) mitral valve prolapse, (iv) arrhythmias or (v) restrictive pulmonary function [1].

There is a high incidence of concomitant mitral valve prolapse (18–45%) in pectus excavatum patients [1]. For this reason, a careful assessment of the mitral valve by an experienced team, taking into consideration the age and other co-morbidities of the patient, is of paramount importance.

In cases with severe mitral valve regurgitation, the surgical correction of pectus excavatum and the mitral valve might be performed concomitantly at one stage.

The choice of the method for the repair of the sternum deformity depends on the characteristics of the patient, cardiac pathology, co-morbidities and experience of the surgeon.

A recent meta-analysis of the Ravitch and Nuss techniques identified no differences in the overall complications, length of hospital stay, time to ambulation after surgery or patient satisfaction [3]. In this meta-analysis, Nasr et al. [3] found that the Nuss
procedure had a higher rate of reoperation, postoperative haemothorax and pneumothorax compared with the Ravitch procedure.

However, the minimally invasive Nuss procedure is safe and a recent review (1949 children with a mean age of 10.6 years) showed no mortality and morbidity incidence in 15.4% (bar-related events, pneumothorax, pleuropulmonary complications) [4].

There are anecdotal reports of the simultaneous correction of pectus excavatum and associated heart defects by various techniques with no additional morbidity [2, 5].

However, although the long-term results of pectus deformity repair through a vertical midline approach are excellent, the outcome with a temporary sternal bar is superior to the technique without a bar [2].

The simultaneous treatment of pectus excavatum and cardiac pathologies can significantly reduce the risk of cardiac compartment syndrome due to compression from the sternum deformity [5]. Moreover, myocardial ischaemia and oedema due to the pathophysiology of cardiopulmonary bypass can further decompensate the cardiac function and can create a vicious cycle in the presence of the sternum deformity [5].

Another advantage of the simultaneous approach with the minimally invasive Nuss procedure is the preservation of the blood supply of the thoracic wall (intact internal thoracic and intercostal arteries) and, as a result, the risk of impaired wound healing or sternotomy infection is reduced. From the respiratory point of view, a repaired sternum deformity is of paramount importance for the improvement of pulmonary function and the proper postoperative administration of the respiratory care.

Disadvantages of a simultaneous approach stem from the additional operative risk of the cardiac procedure, the prolonged duration of the operation and hospital stay, diathesis for bleeding and blood transfusion requirements due to cardiopulmonary bypass and/or use of heparin and pain control, bar-related complications, wound healing problems and infection.

In our case, we felt that the severity of the pectus deformity necessitated a sternal bar support. An ePTFE-membrane was interposed to reduce the risk of bar-related events, to protect the myocardium during late bar removal and to prevent any interference with temporary epicardial pacing wires. We did not believe that the bar would interfere with rapid reopening for tamponade if required, as it could be displaced inferiorly or removed.
A combined simultaneous approach to dealing with concomitant congenital or acquired heart conditions should be assessed on an individual basis and performed safely by an experienced team.

Conflict of interest: none declared.

REFERENCES