Late coronary artery and tricuspid valve injury post pectus excavatum surgery

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Abstract

We report the surgical case of a 25-year old man admitted because of progressive dyspnoea and stabbing chest pain, who had undergone a pectus excavatum correction using a retrosternal strut 8 years previously. The computerized tomography scan showed that the right tip of the pectus bar had migrated across his right ventricle and tricuspid valve into the right atrium. Intraoperatively, it was confirmed that in its path, the right coronary artery and the posterior leaflet of the tricuspid valve had been damaged. After removing the bar and repairing the tricuspid valve, the patient made a full recovery.

Keywords: Pectus excavatum • Tricuspid valve • Coronary artery

INTRODUCTION

During open and minimally invasive surgical correction of pectus excavatum, metal struts or wires are widely used to stabilize the sternum, with good results and minor complications. However, there are reported cases of delayed heart perforation by dislodgment of these metallic supports [1–5]. As far as we are aware, this is the first documented case of a pectus excavatum correction bar that migrated through the right atrium, the atroventricular groove and the right ventricle, damaging in its path the right coronary artery and the tricuspid valve.

CASE REPORT

A 25-year old man was admitted because of a 2-week history of NYHA class III dyspnoea and stabbing chest pain. At the age of 17, he had undergone an open pectus excavatum correction with the placement of a metallic strut retrosternally. Four months later, he was admitted because of a pericardial effusion with signs of cardiac tamponade, and 1000cc of haemoserous fluid was drained by pericardiocentesis.

On the current admission, a new systolic murmur and a new right bundle block were noted. The transthoracic echocardiogram showed biventricular impaired function, a severely enlarged right atrium, and a dilated right ventricle cavity associated with severe tricuspid regurgitation and significant pulmonary hypertension. On the posteroanterior chest radiograph, the right tip of the bar seemed slightly dislodged upwards (Fig. 1a). The computerized tomography (CT) scan requested to exclude pulmonary embolism revealed that the strut had penetrated the right ventricle and extended through the tricuspid into the right atrium (Fig. 1b–d). Surgical procedure was therefore recommended.

The intracardiac position of the bar was confirmed by intraoperative transoesophageal echocardiogram (TOE) (Fig. 2a). The right femoral artery and vein were cannulated. Cardiopulmonary bypass (CPB) was instituted and sternotomy was performed. During the pericardial dissection, it became evident that the bar was protruding through the apex of the right ventricle and was stuck to the left chest wall. The point where the bar eroded into the right ventricle was the end of a scar that ran along the marginal border of the right ventricle, crossed the atroventricular groove and started in the right atrium (Fig. 2b and c). The superior vena cava was cannulated, and both cavae were snared. After aortic cross-clamping, the right atrointomy was performed, and the tip of the bar was found in the atrium crossing the tricuspid (Fig. 2b and c). A careful dissection of the adhesions above the apex was carried out to free the strut from the chest wall, until it was possible to remove it by pulling from its atrial side. The defect at the apex was then repaired. The examination of the tricuspid showed that part of its posterior leaflet was destroyed and fixed in the scar tissue mentioned above. A ‘windsock’ of pannus/clot encasing part of the ventricular tip of the bar was found. The valve was repaired suturing part of the anterior to the septal leaflet, followed by a ring insertion (30-mm Carpentier-Edwards Physio Annuloplasty Ring). The patient was weaned off CPB uneventfully (CPB time 172 min, cross-clamp time 125 min) and intraoperative TOE showed a residual mild-moderate tricuspid regurgitation. The patient had an uneventful postoperative course and was discharge on the 8th postoperative day.
Figure 1: (A) Posteroanterior chest radiograph. (B) CT scan: sagittal projection. (C) CT scan: axial projection. No completely corrected pectus excavatum is shown. (D) CT scan: coronal projection.

Figure 2: (A) Intraoperative transoesophageal echocardiogram: the bar (arrow) crossing the tricuspid valve. (B) The bar (arrow), still attached to the left chest wall, is hold through the atriotomy. The scar that crosses part of the right atrium, the atrioventricular groove and right ventricle (RV) is shown (asterisk). (C) After removing the bar, the RV perforation (arrow) is exposed with the above-mentioned scar (asterisk).
COMMENT

Pectus excavatum is the most common anterior chest deformity. Both the open and the minimally invasive techniques have shown good results for pectus excavatum surgical repair with minor complications after a learning curve.

Cardiac injury induced by the struts or wires used to stabilize the sternum is a very uncommon and challenging complication that can be diagnosed even several years after the pectus excavatum correction and does not have to be related to a thoracic trauma [1–5]. It can be discovered because of haemopericardium with signs of cardiac tamponade [2–4], embolic events [5] or progressive dyspnoea with chest pain [1], depending on the damaged structures. Reviewing the literature, injury of the right cavities [1, 4, 5], left ventricle [5], aorta [2, 3] or even the left upper left bronchus [1] secondary to the migration of these supports has been reported. However, this is the first documented case of right heart perforation associated with the atrioventricular groove, right coronary artery and tricuspid valve damage.

We hypothesize that the bar dislodgement started very early, provoking the pericardial effusion, and there was no further follow-up, as it was considered an inflammatory response to the surgery due to its haemoserous nature. According to the anatomical position of the scar, it is very plausible that, in its path, the bar damaged the right coronary artery. This could explain partly the impaired function of both ventricles and the severe dilatation of the right one. For that reason, we think that it would have been advisable to perform a coronary CT. However, it was considered unnecessary because the patient had not presented any sign of ischaemia previously.

In the previous surgery, a 15 cm-long bar was fixed retrosternally at both ends by suturing. According to our own experience and the literature reviewed, we could not find any relation between the design or length of the strut and its migration [1–5].

Femoral cannulation was preferred because the fact that the bar was stuck to the chest wall increased, theoretically, the risk of ventricular tearing as the sternal retractor is spread apart or because of encountering difficulty during the sternotomy.

CONCLUSION

We believe that this case illustrates how the intracardiac migration of metal struts used for pectus excavatum correction could be associated with unspecific symptoms and provides the reason why coronary CT should be performed in haemodynamically stable patients, if coronary damage is suspected because of the result of a previous test or even because of the theoretical path of the bar.

We recommend the institution of CPB prior to the sternotomy in this type of surgery.

This case is a reminder that following a correction of pectus excavatum it is important to remove pectus bars early.

Conflict of interest: none declared.

REFERENCES