How-to-do-it

The use of pedicled pleural flaps for the repair of pericardial defects, resulting after intrapericardial pneumonectomy

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Abstract

We report our technique for the repair of large pericardial defects resulting after intrapericardial pneumonectomy for locally advanced non-small cell lung carcinoma, using pedicled pleural flaps. Creation of a pedicled pleural flap, large enough to cover the pericardial defect, performing blunt dissection of parietal pleura from the inferior edge of the thoracotomy incision and suturing it in the defect margins, is an easy, safe and effective technique for the prevention of cardiac herniation. Pedicled pleural flaps are an excellent material, not very popular nowadays, for the repair of pericardial defects resulting after intrapericardial pneumonectomy, when it is possible to create a pleural flap.

Keywords: Surgical treatment; Non-small cell lung carcinoma; Intrapericardial pneumonectomy; Pericardial defect; Pericardial gap; Pleural flap

1. Introduction

Large pericardial defect results after intrapericardial pneumonectomy for the surgical treatment of locally advanced non-small cell lung carcinoma (NSCLC) with invasion of the pericardium, the vessels of the pulmonary hilum and the left atrium (LA) [1–5]. Large pericardial defects should be repaired, because of the hazard of cardiac herniation, which is usually a fatal complication [1–7]. Repair using synthetic material or bovine pericardium patch is the preferred standard technique today for the closure of pericardial defects [2–5]. Parietal pleura as a pericardial substitute is referred, in the current and past literature [4–6]. We report here our technique for the repair of large pericardial defects using pedicled pleural flaps.

2. Technique and results

Following intrapericardial pneumonectomy, a pedicled parietal pleural flap, having large enough dimensions to cover the pericardial defect, can be created with blunt dissection from the inferior edge of the thoracotomy incision and with progression to the diaphragm. The pleural flap is then reflected, reformed with scissors, adapted and sutured at the pericardial margins, with interrupted silk (3-0) sutures. The mesothelial surface of the flap faces the epicardial surface of the heart. Attention should be given not to penetrate the flap during dissection. Partial closure of the defect should be made, leaving a small gap in the superior segment, for the prevention of cardiac tamponade. Fenestration of the flap is avoided, in order to secure the strength of the flap (Fig. 1). Underwater seal drainage of the postpneumonectomy space, allowing the equilibration of pressures, is always performed. The chest tube is kept appropriately clamped, except to monitor or readjust pleural pressures. Attention should be paid to avoid excess negative pressure into the postpneumonectomy space. The tube should be removed within 48 h from the operation, if the postoperative course is normal. The standard monitoring during intensive care unit (ICU) stay of patients (24–48 h) include arterial blood pressure, central venous pressure and rhythm monitoring, pulse oximetry and daily portable chest radiograph.

We used the technique in seven cases of intrapericardial pneumonectomy (five on the left side and two on the right side), performed for NSCLC with invasion of the pericardium, during the period June 1997–June 1999 with the resulting pericardial defects being more than 5 × 5 cm². No clinical or radiologic signs of cardiac tamponade, herniation and important mediastinal deviation were noted in the seven patients, during the postoperative period. None of the patients had restriction of the heart or pericardial...
effusion at echocardiography, performed routinely in all patients 1 and 6 months after the procedure, for the estimation of pulmonary artery systolic pressure.

3. Comments

A large pericardial defect after intrapericardial pneumonectomy, on either the left or right side, should be repaired [3]. A patch or large strips of synthetic mesh or bovine pericardium, pedicled diaphragmatic and pleural flaps and fascia are the available materials for the defect closure [1–7]. Another technique is to suture the pericardial defect margins to the adjacent atrial and ventricular myocardium; however, the risk of damage to the coronary vessels and/or to produce atrial tear, discourage its use [5,6].

Most authors prefer heavy synthetic materials or strong autologous grafts, such as the pedicled diaphragmatic flaps (mainly on the right side and only when the hemidiaphragm is denervated by phrenic transection), for the closure of pericardial defects [2–5]. However, if postpneumonectomy empyema develops, any synthetic material should be removed for the eradication of the infection [7]. The re-operation for the removal of the mesh is difficult to perform and due to the difficulty in the removal of the mesh in two previous cases of our patients with postpneumonectomy empyema, we re-established the closure of pericardial defects, using the infection-resistant autologous pleural flap. If the resected tumor is associated with inflammatory conditions (obstructive pneumonitis, abscess), the use of autologous pedicled grafts (pleural, diaphragmatic) is more justified. In our opinion and experience, regarding the absence of clinical and radiologic evidence of cardiac herniation in the seven patients, the elastic pleural flap is strong enough to prevent displacement of the heart into the operated hemithorax. Unfortunately, pleural flap has no bulk and cannot produce abnormalities at radiography or computed tomography (CT) scan, while echocardiography cannot visualize it [8]. In addition, the elastic pleural flap, do not restrict cardiac function and provides an inner surface similar to that of the pericardium, avoiding epicardial irritation. The thin texture of the pleural flap, which makes its use as a pericardial substitute doubtful, and the wide availability of synthetic meshes, which are ready to suture in the defect margins without any additional operative maneuver, have limited the use of pleural flaps [7]. Histologically, the pleura consist of a single layer of mesothelial cells, resting on an elastic basal membrane. Costal pleura, despite its thin nature, is elastic and have enough force against tear, to follow the normal movements of the chest wall. Its function as a pericardial substitute is based on these properties. Indeed, it is not always possible to create such a pleural flap. Excessive pleural adhesions, excessive asbestos pleural plaques, inelastic parietal pleura because of previous infections and destruction of the flap during dissection are the main causes of failure in creating a pedicled pleural flap.

Fig. 1. Repair of pericardial defect using a pedicle pleural flap.

References