How-to-do-it

Pericardial flap for bronchial stump coverage after extrapleural pneumonectomy; is it feasible?

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Abstract

Bronchial stump reinforcement with viable tissue after pneumonectomy is an important prophylactic measure against the development of bronchopleural fistula. We present our technique of utilizing the pericardium on the posterior wall of the left atrium as a flap to cover the bronchial stump after extrapleural pneumonectomy. From January 1999 to March 2008, we used this technique in 50 patients (29 on the right side and 21 on the left side) with no incidence of bronchopleural fistula or empyema. This technique is proved to be feasible, safe and effective; also it does not increase operative time or surgical trauma.

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1. Introduction

Extrapleural pneumonectomy (EPP) with a potentially curative intent is increasingly performed as a part of trimodality therapy for management of mesothelioma. This major procedure is burdened by a high rate of perioperative complications; of great importance is the development of bronchopleural fistula (BPF), which has an incidence ranging from 2.4 to 9.5% [1,2]. Certain risk factors for BPF are inherited with this operation: some sort of inevitable devascularization of the bronchial stump is produced in order to achieve radical resection together with mediastinal nodal dissection. Also, these patients usually receive preoperative chemotherapy and/or postoperative radiotherapy and these have been shown to be risk factors for postpneumonectomy BPF in patients with lung cancer [3]. In addition the resultant raw area with postoperative bleeding and the use of drainage thoracostomy tubes all are predisposing factors to postoperative empyema and/or bronchopleural fistula [1].

In this report we describe a technique of bronchial stump reinforcement with a pericardial flap after EPP.

1.1. Technique

After en bloc removal of the pleura, lung, part of the pericardium and hemidiaphragm, we start by mobilization of the esophagus (and the descending aorta on the left side) away from the posterior pericardium with blunt dissection. The pericardial reflections between the inferior pulmonary vein and the inferior vena cava (on the right side) and along the upper border of the superior pulmonary vein are usually freed during intrapericardial mobilization of the pulmonary veins (Fig. 1); further dissection of pericardial reflection on the posterior aspect of the superior pulmonary vein and the adjacent part of the left atrial wall is carefully performed with sharp dissection to gain free mobility of the flap. The pericardium is then divided transversely in a medial direction opposite the lower border of the inferior pulmonary vein, and then vertically upward until we get enough length to reach the bronchial stump without tension. We are aware of the need to keep the base of the flap as wide as possible. The pericardial flap is then tacked to the bronchial stump with multiple 4/0 Vicryl interrupted sutures. After this, with posterior retraction of the esophagus, the Gore-Tex (W.L. Gore & Associates Inc.) patch used to close the pericardial defect can be sutured to the posterior pericardial border without difficulty (Fig. 2).

2. Results

From January 1999 to March 2008 we used this technique on 50 patients (39 males and 11 females) who underwent EPP for malignant mesothelioma. EPP was performed within a protocol of trimodality therapy consisting of induction chemotherapy followed by EPP and then postoperative radiotherapy in 43 (86%) patients, while in the early period of this study only 7 (14%) patients underwent EPP followed by postoperative radiotherapy. The distribution by side was 29
cases on the right side and 21 (42%) on the left side. There were 2 (1%) hospital mortalities due to cardiac complications. None of the remaining 48 patients developed BPF or empyema in the early postoperative period or during follow-up. Also, we did not encounter any case of postoperative cardiac tamponade or cardiac luxation.

2.1. Comment

It is a common practice in thoracic surgery to cover the bronchial stump in high-risk patients with viable tissue in an attempt to minimize the incidence of BPF. Some authors found difficulty in applying this concept in patients undergoing EPP due to paucity of viable intrathoracic flaps as the pleura and ipsilateral pericardium are removed as a part of en bloc resection and the intercostal muscle is unsuitable due to associated cachexia [2]. Others used to perform transposition of extrathoracic muscle e.g. latissimus dorsi or serratus anterior [4,5] or the greater omentum [6]; however, this will increase the operative time and surgical trauma of an already major and long surgery; also transposition of the omentum entails additional laparotomy with its potential complications.

Our experience in lung transplantation with intrapericardial mobilization of the pulmonary veins and preparation of the left atrial cuff direct our attention to the possibility of utilizing the pericardium on the posterior wall of the left atrium as a covering flap to the bronchial stump. This method has the advantages of utilizing intrathoracic material without the need for additional incisions or prolongation of operative time. We also adapted this method in cases of ordinary pulmonary resection and in such cases the integrity of the anterior pericardium is maintained without adhesions. This will not compromise re-entrance into the pericardium if the patient undergoes subsequent cardiac surgery.

The main concern about this method is that removal of excess pericardium complicates the process of patch closure of the pericardium with the possibility of making the patch too tight with subsequent tamponade. However, with good mobilization of the esophagus away from the pericardium the patch can be sutured easily leaving roomy areas around the entrance of both cava veins.

3. Conclusion

We consider that pericardial flap coverage of bronchial stump after EPP is feasible, safe, and effective; also it can be performed without increasing the operative time or the surgical trauma.

References


Fig. 1. (A) Diagram illustrating the anatomy of the pericardial reflections and the relation of the posterior pericardium to the esophagus and descending aorta. (B) Postero-anterior view illustrating the proposed site of pericardial flap on both sides.

Fig. 2. Intra-operative view showing the pericardial flap covering the bronchial stump (arrow) and pericardial reconstruction with Gore-Tex patch. (A) Stump of pulmonary artery; (B) esophagus; (C) azygos vein.