Late complication of bovine pericardium patches used for lung volume reduction surgery

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Abstract

Lung volume reduction surgery has recently become an option for the management of patients with severe emphysema. The procedure consist of resecting non-functional lung in order to improve respiratory mechanics. Because postoperative prolonged air leakage is a serious complication of the operation, most surgeons now use staplers reinforced with bovine pericardial strips to seal the lung. We report a patient where the migration of an intact pericardium patch caused an obstructive pneumonia and recurrent hemoptysis over several years.

Keywords: Metalloptysis; Reduction surgery; Pericardial staples

1. Introduction

Lung-volume-reduction-surgery (LVRS) has recently become a treatment option for patients suffering from end-stage diffuse emphysema not responding to maximal medical management [1–5]. Short- and medium-term results have shown that quality of life, exercise tolerance and lung function will improve in selected patients. The surgical technique involves the resection of 30–35% of one or both lungs by video assisted thoracic surgery (VATS) or through a median sternotomy. One of the commonest and most feared complication related to the procedure is persistent air leakage thought to be due to the tearing of the lung by staples. In order to solve the problem, most surgeons are now using buttressing materials applied along the staple line, either collagen or bovine pericardium, as it was shown to decrease the duration of postoperative tube drainage as well as the length of postoperative stay [6]. Although the use of bovine pericardium strips is generally considered safe, three studies have reported incidents where patients have expectorated surgical staples sometimes with pieces of bovine pericardium months after the operation [7–9]. This syndrome is called ‘metalloptysis’. We present one case where the migration of whole bovine pericardial strips into the bronchial lumen caused an obstructive pneumonia and repeated episodes of hemoptysis over several years.

2. Case-report

A 51-year-old man, a former 30-pack-year smoker, was assessed in September 1995 for progressive shortness of breath related to severe chronic obstructive pulmonary disease. Thorax computed tomographic (CT) scan showed heterogeneous disease predominant in both upper lobes. In January 1996, he underwent median sternotomy with bilateral upper-lobe LVRS. Parenchymal closure was achieved with the GIA stapler and all staple lines were buttressed with dry bovine pericardial strips. Approximately 10–12 staple applications were used in each lung. The postoperative course was uneventful and all parameters of pulmonary function, including quality of life, were improved at 1 year follow-up.

Starting at 13 months postoperatively, however, the patient began to experience daily episodes of mild hemoptysis. The cause of the bleeding as well as its source were never documented despite a total of seven diagnostic flexible bronchoscopies all reported as being normal.

The patient was seen in June 2002 with a history of cough, increased shortness of breath, fever, and persistent
hemoptysis. CT scan showed an infiltrate in the upper left lobe (Fig. 1A) and bronchoscopy revealed what initially appeared to be mucus plugs obstructing the lingula and the apical segment of the right upper lobe. With the use of a biopsy forceps, these ‘mucus plugs’ were easily pulled out from the involved bronchi and to everyone’s surprise, they turned out to be intact bovine pericardium strips (Fig. 1B). Microscopic examination showed devitalized collagen with portions of bronchial wall, both infiltrated with polymorphonuclear cells. Following these extractions and systemic antibiotherapy, the patient’s condition rapidly improved with no recurrent hemoptysis.

3. Discussion

Most surgeons who perform LVRS use reinforced staples with bovine pericardium in the hope of reducing the incidence of prolonged air leaks. To some extent, these bovine pericardial strips prevent the tearing of the overdistended and friable lung when one is applying the staples.

Fortunately, the use of bovine pericardial strips has never been shown to be associated with early postoperative complications. There has been, however, a few isolated reports on long-term complications (Table 1). In 1999, Iwasaki et al. described two patients who apparently developed interstitial pneumonia related to bovine pericardium 3 months postoperatively [10]. Four other cases of post-LVRS asymptomatic metalloptysis due to bovine pericardium reinforced staple suture lines have been reported [7,8]. These patients had metalloptysis 6–20 months after operation without other symptoms except for one patient who expectorated a mass containing peristrips with staples [8]. In this last case, CT scan had shown an inflammatory mass at the site of the staple line [8], as did a fifth patient reported by Shamji et al., 4 years after bilateral apical bullectomy [9].

Our case is unusual because the patient had complications secondary to patch migration without prior bronchoscopic staple visualization or prior metalloptysis. In fact, he had almost daily hemoptysis for several years and this symptom subsided after endoscopic removal of the bovine pericardium. This is also the first reported case where migration of an intact patch caused a complete obstruction of a bronchial lumen with secondary obstructive pneumonia.

Despite the large number of LVRS done since the 1995 publication by Cooper et al. [11] and widespread use of bovine pericardium patches to reinforce staple lines, very few complications directly related to these patches have been reported. Possible explanations are that metalloptysis is underdiagnosed or simply that patients do not live

![Fig. 1. Thoracic CT scan showing the upper left lobe infiltrate (A). Intact bovine pericardium strips with staples obstructing the lingula (B).](image-url)
long enough to develop the complication. In our opinion, metalloptysis or whole patch migration probably occurs more often that what is reported as evidenced in the series of Oey et al., where the authors identified three cases of metalloptysis out of a total of 48 LVRS (6%) [8].

The exact mechanism of bovine pericardium migration is still speculative. Some authors think that because the suture line crosses relatively large bronchi, portions of bovine pericardium may eventually erode into these bronchi. Local inflammation and/or infection may facilitate this phenomenon. Other authors have suggested that bovine pericardium may elicit an inflammatory reaction, which may in turn be responsible for erosion and migration.

Because persistent air leak is a major issue after LVRS, bovine pericardium-reinforced staples are useful and will continue to be used in the hope of reducing the incidence of this problem. Thoracic surgeons should, however, be aware that late complications related to this technique are a reality and are probably more common than previously thought. Metalloptysis and whole patch migration may present with uncommon and varied symptom combinations and they may occur several years after the operation.

References


