

Implantation of Polypropylene Mesh for Lung Herniation after Minimally Invasive Mitral Valve Plasty

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Case Report

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ABSTRACT

During two decades minimally invasive mitral valve surgical approaches have been developed to achieve similar results to conventional sternotomy approach with the aim to reduce postoperative complications, improve cosmesis and shorten hospital stay. Lung herniation is a rare source of acute chest pain following mitral valve repair. In this case short series we describe the clinical presentation, diagnostic process, and surgical treatment of two cases of patients who developed symptomatic lung herniation after mitral valve repair through the anterior mini-thoracotomy. Preoperative evaluation included both conventional chest X-ray and thoracic computed tomography (CT) scan. Both patients underwent a surgical repair using a Polypropylene mesh. At 12-month follow-up patients were asymptomatic and without recurrence of hernia.

INTRODUCTION

Minimally invasive mitral valve surgery has revolutionized surgical management of mitral valve diseases with reduced perioperative morbidities and quicker recovery compared to conventional sternotomy^[1]. Pulmonary hernia is a rare complication after minimally invasive surgery with only few cases reported in the literature^[2]. The rising number of minimally invasive cardiothoracic procedures may increase the incidence of different complications such as lung hernia and generates challenges regarding to the optimal management. In this study we describe the clinical presentation, diagnosis and surgical treatment of lung herniation in two patients previously submitted to limited access mitral valve surgery, through anterior mini-thoracotomy.

CASE DESCRIPTION

Case 1

A 50 years old man was admitted to our Institution with a chief complaint of chest pain and dyspnea. His medical history included chronic gastritis and generalized anxiety disorder. Three months before, he underwent minimally invasive mitral valve repair with an incision at the level of the third intercostal space in midclavicular line. He was 180 cm tall and weighed 89 Kg (body mass index 27.47 Kg/m²).

Patient had an uneventful postoperative course. Two weeks after surgery he complained about asthenia and dyspnea and went to the emergency room. Chest computed tomography (CT) revealed protrusion of a small part of right upper lobe through the third intercostal space consistent with herniation of the lung parenchyma immediately under the pectoralis major muscle associated with massive right pleural effusion and atelectasis of the lung (**Figure 1**).

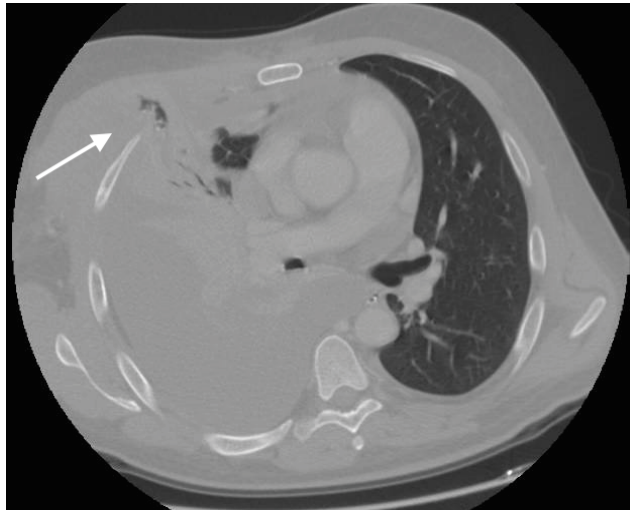


Figure 1. Chest-computed tomography showing a lung parenchyma protruding into the thoracic wall (white arrow).

A chest drain was positioned in the sixth intercostal space with evidence of massive haemothorax, obtaining the drainage of 2500 ml of dark blood.

The patient was discharged on postoperative day five and followed-up in outpatient clinic. He then complained with persistent pain chest associated with a slight bulge on the anterior wall of the right chest. CT confirmed lung protrusion with pleural effusion resolution. Three months later, the patient underwent surgical repair of lung herniation. After a surgical incision on the third right intercostal space, the thorax wall breach was identified on the anterior part of the third intercostal space. The herniated lung parenchyma appeared adhering to the parietal pleura and to the external chest strap. The affected portion of the lung was healthy and there was no need for lung resection. No air leaks were detected. The lung was freed from adhesions and pulled into the pleural cavity. The third intercostal space was closed tightly with interrupted sutures and thoracic wall was reinforced using a Polypropylene mesh, fastened with Prolene 0 sutures, to prevent a recurrence. The post-operative course was uneventful and follow-up CT at 12 months after surgery showed no recurrence of hernia.

Case 2

A 61 years old man was referred to our institution for chest pain. One year before, he underwent minimally invasive cardiac surgery for mitral valve plasty for mitral regurgitation. During the operation a mini-thoracotomy was used at the level of the third intercostal space. The hospitalization was normal with no postoperative complications. He was 175 cm tall and weighed 77 Kg (body mass index 25.14 Kg/m²). His past history was unremarkable. One year after surgery he experienced a slight bump on the anterior wall of the right chest, exacerbated by cough and Valsalva maneuver. The patient himself was not in respiratory distress and was cardiovascularly stable.

Chest computed tomography (CT) revealed a pulmonary herniation through the third intercostal space and defined the extension (**Figure 2**).



Figure 2. Chest-computed tomography showing herniation of lung parenchyma (white arrow) adjacent to the median lobe scarring.

Operative repair of the hernia was performed with the patient positioned in supine position, the previous incision was opened and the defect in the chest wall was easily identified and debrided. Part of the median lobe of the right lung was prolapsed

across a 3 cm breach through the third intercostal space. The lung was freed from adhesions and then pulled into the thorax cavity; the intercostal space was closed with interrupted pericostal sutures. The repair of the thorax wall was performed using a Polypropylene mesh, fastened with Prolene 0 sutures, to prevent a recurrence. The postoperative recovery was uneventful, without complications. At six months' follow-up patient was asymptomatic and without recurrence.

DISCUSSION

Lung herniation is a rare condition with less than 300 cases reported in literature^[3]. The anterior thorax lacks the muscular support of the posterior part, making it the weakest part of the thoracic cage; for this reason, it is the site of predilection of intercostal hernias. According to the etiology, it can be classified as congenital, acquired-traumatic, acquired-pathologic, and spontaneous or postsurgical^[4].

Postoperative intercostal hernia can develop following the disjoining of the intercostal space on the area of thoracotomy, video thoracoscopy or limited access mitral valve surgery. The possible mechanism of pulmonary hernia is intercostal muscle weakness in combination with situations that increase intrathoracic pressure such as coughing and weight lifting. Predisposing factors are related both to patients' comorbidities and operative trauma, chronic obstructive pulmonary disease (COPD), inflammatory or neoplastic processes, increased chronic steroid use and BiPAP or pleural effusion^[5,6]. Furthermore, during minimally invasive surgery, the intercostal incision is usually longer than the skin incision and an accurate pericostal closure is sometimes more difficult than in routine thoracotomy closure^[2].

In our series both patients suffered lung herniation following minimally invasive mitral valve surgery without pericostal closure. Furthermore, our Case 1 presented with massive pleural effusion, confirming the relation between increased intrathoracic pressure and the risk to develop intercostal hernia. Patients presented in our report referred the most common symptoms such as pain, a bulge enlarging with coughing, and intercostal retraction during inspiration on the site of the previous surgery.

Complications can be serious; the incarcerated lung can twist, causing intense pain, necrosis, and hematoma or the persisting intercostal hernia can cause atelectatic degeneration of the lung. Chest CT scans have been reported to be the gold standard for diagnosis; it defines the location and size of the tear and excludes underlying pulmonary complications^[7]. Treatment of lung herniation should be considered according to factors such as symptoms, size, incarceration of tissue, and respiratory condition.

Symptomatic lung herniation rarely shows spontaneous healing; therefore, it is generally advocated that symptomatic cases should be treated with surgical repair^[8]. In cases with slight herniation and no symptoms, follow-up without surgery may be acceptable. In the last two decades, minimally invasive mitral valve surgery (MIMVS) has gained consensus among surgeons offering the same quality and safety of the standard mitral valve surgery approach with the advantages of less pain, better aesthetic results and perioperative outcome^[9]. In the majority of cases, MIMVS has been performed through either a right anterior minithoracotomy or a hemisternotomy. Lung herniation is a rare postoperative complication after minimally invasive mitral valve surgery with few cases reported in the literature^[2]. The rarity of lung herniation resulted in few studies reporting different methods repairing the defect. Different options are available for repairing lung herniation including direct closure or the use of patches such as polypropylene mesh, polytetrafluoroethylene or absorbable mesh. In cases with weak or fragile tissues surrounding the herniation or with a large hernia gate, the use of patches is preferred. Polypropylene mesh has frequently been used, but sometimes causes seroma or adhesion to other organs^[10]. Polytetrafluoroethylene (PTFE) reportedly causes less inflammation while offering greater durability and good outcomes after long-term follow-up for reconstruction of the chest wall^[11]. In our experience, approximation of ribs and restoration of costal margin continuity followed by implantation of extrothoracic polypropylene mesh can achieve good results.

CONCLUSION

Lung herniation is rare but should be taken into account in case of chest pain after minimally invasive mitral valve surgery. Surgery with the use of patches is recommended in symptomatic patients with good results as we showed in this case short series.

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