Arteriobronchial Fistula Complicating Right Upper Lobectomy

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Bronchial stump fistula (BSF) is a known complication after lobectomy, although its incidence after lobe resection for non-small cell lung cancer usually does not exceed 2%. We present the case of a patient in whom a late BSF developed that led to a fatal pulmonary hemorrhage 4 weeks after right upper lobectomy and 4 hours after emergency readmission. Such a pulmonary hemorrhage could have been prevented by pulmonary artery embolization and intrapericardial pneumonectomy. The decision to perform pneumonectomy as a preventative procedure without overt clinical symptoms was a difficult decision to reach, particularly given the likelihood of being unnecessarily aggressive.

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We present the case of a patient in whom a late bronchial stump fistula (BSF) developed, which led to a fatal pulmonary hemorrhage 4 weeks after right upper lobectomy for non-small cell lung cancer (NSCLC) and 4 hours after emergency readmission.

A 61-year-old man underwent right upper lobectomy by video-assisted thoracic surgery (VATS) for preoperatively confirmed NSCLC. Two incisions were placed in the seventh intercostal space in addition to a 5-cm-long utility incision that was placed in the fourth intercostal space in the anterior axillary line. Branches of the pulmonary artery were closed with ligatures and hemolock vascular clips, and the vein was stapled with a linear vascular stapler, after which the right upper lobe bronchus was easily divided. The bronchus was then stapled and cut with a green load of an Endo GIA 30-mm stapler, which was introduced anteriorly through the utility incision. Upon inspection, the bronchus had a usual diameter of 8 mm. Systemic lymph node sampling was subsequently performed. The intraoperative blood loss of the 180-minute procedure was 100 mL. This procedure was performed by a sufficiently experienced surgeon in the third year of a VATS lobectomy program.

The patient’s postoperative course was uneventful. Specifically, an air leak ceased on the day of operation, and the patient was discharged home on the fourth postoperative day, at which time a chest roentgenogram was unremarkable. However, 4 weeks after operation, the patient was readmitted with a 4-day history of body temperatures 37.5°C and one incident of hemoptysis (20 mL of light red blood). On admission, the patient otherwise presented in good clinical condition, and apart from fetor ex ore there were no remarkable symptoms on physical examination. The only subjective impression of the on-call thoracic surgeon was the patient’s slight anxiety. Computed tomographic angiography revealed a cavity in the pulmonary parenchyma around a dehisced bronchial stump (Fig 1). Pulmonary embolism was ruled out, with no signs of active bleeding. Furthermore, laboratory tests revealed leukocytosis (14,960/μL; reference range, 4,500 to 11,000/μL) and elevated C-reactive protein (76.8 mg/mL; reference range, 0.0 to 5.0 mL), without any additional aberrations. With these findings the diagnosis of BSF was made. Subsequently the patient declined bronchoscopy, and after 4 hours of conventional medical treatment, massive pulmonary bleeding led to immediate asphyxia and cardiac arrest. Resuscitation was not successful.

Examination during autopsy revealed an abscess surrounding a BSF, through which a trunk of the right pulmonary artery crossed. The ligatures and vascular clips did appear tightly adjacent to their stumps. De novo pulmonary artery fistula communicating through the abscess and bronchial stump fistula to the bronchial tree was the exact cause of asphyxia, exsanguination, and death (Fig 2). Finally, bacteriologic analysis of the sputum isolated Enterobacter cloacae as the predominant organism.

Comment

Bronchial stump fistula complicates up to 2% of lobectomies. After planned resections for thoracic malignancies,
the incidence of this complication is even rarer. Regardless, VATS procedures do not reportedly increase the risk of postoperative complications, including BSF [1]. Along these lines, the risk factors for BSF are previous ipsilateral thoracotomy, previous chemo/radiotherapy, male sex, smoking habit, diabetes, and an occurrence of postoperative respiratory complications [2, 3]. Apart from smoking, none of these risk factors occurred in our patient, though we could not define whether the patient experienced a late BSF or a slowly developing early fistula.

Technical failure should be considered as a possible cause of this rare complication. Manual stump closure increases the risk for BSF if performed by an inexperienced surgeon. By contrast, stapling reduces the differences in outcomes between surgeons, and it provides stump closure comparable with that of manual suturing. However, certain facets of the stapled approach do improve the success of the technique. For instance, the stapler should typically be closed with the jaw parallel to the membranous wall of the bronchus. Furthermore, introduction of the endoscopic linear stapler during right upper VATS lobectomy is usually advocated through the lower ports [4, 5]. Our routine clinical practice proves that choosing this approach allows proper attitude of the linear stapler jaw to the membranous wall of the bronchus, resulting in ease of its application. A utility incision linear stapler jaw to the membranous wall of the bronchus. Furthermore, choosing this approach allows proper attitude of the bronchus, which may be achieved by torsion of the lobe. In our patient, the stapler was introduced through the utility incision. Though we cannot exactly conclude that this maneuver contributed to the formation of the BSF, this scenario should be considered but is doubtful.

Acute lung abscess associated with a BSF leading to pulmonary artery erosion is an exceptional reason for emergency readmission after lobectomy. Furthermore, lung abscess with hemothypnosis is an emergency, often requiring urgent diagnosis and surgical treatment to prevent massive pulmonary hemorrhage, of which cavitation involving the pulmonary artery is reported as a possible cause. An appropriate way to diagnose and treat this life-threatening emergency is computed tomographic angiography followed by embolization of the pulmonary artery. Pulmonary artery embolization is not widely accepted and is not assumed to be a routine procedure in many centers, including ours. Ex-post we suppose that pulmonary artery angiography could have been helpful in diagnosis, especially considering that the patient declined bronchoscopy. If endovascular treatment is insufficient, it probably needs to be completed by residual pneumonectomy because of the large diameter of the pulmonary artery at the level of the fistula. If bleeding ceases after endovascular treatment, it could be defined as a final treatment of pulmonary artery fistula, but not in case of coexisting BSF. In some instances, the decision to perform thoracotomy is delayed by at least a few days, given the fear of performing a potentially unnecessary, extensive pulmonary resection, but these days could have been gained if embolization had been performed earlier. In cases of minor hemothypnosis, such a fear may delay a thoracic surgeon’s decision-making process. Indeed, in the case described here, the surgeon’s intuition failed in light of an exceptionally rare complication after an otherwise uneventful procedure. Unfortunately, the extremely sudden, massive, and fatal pulmonary hemorrhage could have been prevented by a right intrapericardial pneumonectomy. Yet, the decision to perform a pneumonectomy as a preventative procedure without overt clinical symptoms and no signs of bleeding on angiography was difficult to reach. Nonetheless, this patient could have been saved if this decision had been undertaken instantly after readmission. In this case the surgeon’s intuition failed, resulting in fatal consequences.

References