Case Report

Right carinal pneumonectomy for a delayed diagnosis

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Abstract
The authors present the case of a male patient misdiagnosed with right upper lobe tuberculosis and repeatedly treated for this in the last two years, without response. In our institution, the source of the hemoptysis proved to be a pulmonary carcinoma, which in its evolution involved the carina and the last tracheal ring. Right carinal pneumonectomy with two tracheal ring resection is performed, with reconstruction of the airway by anastomosing the main left bronchus to trachea. The resection involved also the azygos vein and the lateral wall of the superior vena cava (angioplastic resection), the vagus nerve and the pericardium, the last are being reconstructed with synthetic mesh. Histopathologic diagnosis is squamous cell carcinoma moderately differentiated. The right tracheal sleeve pneumonectomy was the therapeutically choice for a middle-aged patient with recurrent hemoptysis and retrostenotic lung destruction.

Keywords: tracheal sleeve pneumonectomy, carinal pneumonectomy, central bronchial carcinoma, T4 lung cancer.

Introduction
The tracheal sleeve pneumonectomy is an infrequent, relatively difficult and challenging procedure; it is usually performed for a central bronchial carcinoma extending in the pulmonary hilum and involving the orifice of the main-stem bronchus or the lateral aspect of the lower trachea. It is more frequent performed on the right side due to the short length of the right main-stem bronchus. Squamous cell carcinoma is the most frequent favorable histological type [1].

Patient and Methods
The 52-year-old man, moderate smoker, presented for recurrent hemoptysis, cough, progressive dyspnea and fatigability. He was diagnosed two years ago (in another institution) with right pulmonary tuberculosis on radiological and clinical bases, without bacteriological confirmation; he was under anti-tuberculous therapy repeatedly, with no improve. He is admitted under suspicion of lung cancer.

The chest film shows the atelectasia of the right lung, with important mediastinal shift. The CT-scan confirms a central tumor of the right lung, involving the lumen of the main bronchus, surrounding the pulmonary hilum and invading the mediastinum (Figure 1); no distant metastases are described in the thorax, abdomen or cerebrum.

The endobronchial aspect consist of mucosal infiltration of the last tracheal ring, the tumor at the origin of the right main bronchus with its obstruction, proliferative, highly vascularised and covered by necrotic tissue; the carina is normal and also is the left main bronchus.

The respiratory function is restricted with 75% of the vital capacity, with a FEV1 of 1.17 L. The cardiac function is evaluated and the known stable angina 1st–2nd CCS class is confirmed, being well controlled under specific medication.

The nutritional and immunological status is normal, the patient presenting an inflammatory biological response. The patient’s history includes epilepsy, well controlled with neurological medication, without episodes in the past two years; the patient is also psychological evaluated and counseled and he ceased smoking.

Preoperatory blood autotransfusion is performed. The preoperatory diagnosis is right lung cancer involving the carina and distal trachea, with atelectasia and suppuration of the lung, stage cT4N0Mx – IIIA – and the surgical resection is performed.

Results
Through a right posterolateral thoracotomy the destroyed lung is released from pleural adhesions and the 8 cm tumor is evaluated. The pneumonectomy is performed by intrapericardial approach of the vessels, the tumoral invasion of pulmonary vessels imposing the mechanical suture of the pulmonary artery in its most central – in the retrocaval space. There are also resected the invaded pericardium, the vagus nerve, the azygos vein, the lateral wall of the superior vena cava (an angioplastic resection).
During dissection the subcarenal (number 7 lymphatic station) and right tracheo-bronchial (number 4R lymphatic station) adenopathy are found and excised; extensive mediastinal lymphadenectomy is not indicated, in order to preserve the vasculatisation at the level of anastomosis and to prevent the postpneumonectomy pulmonary edema [2]. Limited pretracheal blunt dissection is performed as a tension-reducing maneuver in the anastomosis. The last two tracheal rings and the carina are excised together with the tumor and the destroyed lung (Figure 2).

The anastomosis is performed between the left main bronchus and distal trachea and is covered with pleural, pericardial and thymic flap. The pericardium is reconstructed with polypropylene mesh to avoid heart herniation.

Repeated postoperative bronchoscopy with aspiration of the secretions is performed. Neck flexion is maintained for eight days after the operation in order to reduce the tension in the tracheo-bronchial anastomosis during the healing; in this period, the oral intake is restricted and the nutrition is parenteral.

The immediate postoperative course is normal and the recovery is very good. After nine days the temperature rises at 38–39°C and right empyema is diagnosed (Figure 3), requiring pleural drainage and lavage; the cultures were repeatedly negative. Under repeated controls, no anastomotic dehiscence or fistula is diagnosed (Figure 4).

The histological diagnosis is squamous cell carcinoma with keratinisation, moderately differentiated. There were islands and sheets of round or polygonal epithelial cells with eosinophilic cytoplasm and hyperchromatic nuclei with prominent nucleoli and keratinization in isolated cells or keratin pearls (Figures 5 and 6).

The major bronchia had areas of in situ carcinoma. Tumoral necrosis with central comedotype pattern was present and visceral pleura was involved (Figure 7).

The subcarenal and tracheo-bronchial (inferior paratracheal) lymph nodes had large metastases of squamous cell carcinoma (Figure 8).

The postoperative tumoral stage is pT4N2Mx – stage IIIB.

The last documented postoperative control is at 16 months from surgery, when the general status was very good, the CT-scan described the persistence of the right empyema with no local recurrence and no distant metastases and no clinical sign of anastomotic complication.

After 22 months, we had no more information from him.
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Discussion

Tracheal sleeve pneumonectomy is indicated for a bronchial non-small cell lung carcinoma (NSCLC) centrally located at the hilus of the lung with extension to the main-stem bronchus or the lateral aspect of the lower trachea [1, 3].

Usually the carcinoma arises from the upper right lobe bronchus and extends to carina, being classified as T4, as the case presented. The key evaluation is the tracheo-bronchoscopic exam and some authors advise the biopsy of the tracheal mucosa proximal to the tumor in order to establish the limit of tracheal resection [4].

The CT-scan evaluates the local situation and searches for distant metastases and it is mandatory. The cervical mediastinoscopy is indicated for the histological evaluation of the N2 lymph nodes [5–7]; for this purpose the advantage of PET–CT upon the

Figure 3 – Postoperative CT-scan, prior to pleural drainage: the collection from the postpneumonectomy space is inhomogeneous, with fluid, parafluid and aeric densities; the mechanical suture of the right pulmonary artery is visible in the retrocaval space.

Figure 4 – Postoperative tracheo-bronchoscopic exam: the line of the anastomosis between trachea and the left main bronchus.

Figure 5 – Endobronchial tumoral mass of squamous cell carcinoma (HE stain, ob. 2.5×).

Figure 6 – Moderately differentiated squamous cell carcinoma (HE stain, ob. 10×).

Figure 7 – Squamous cell carcinoma involving visceral pleura (HE stain, ob. 10×).

Figure 8 – Lymph node metastasis of squamous cell carcinoma (HE stain, ob. 10×).
mediastinoscopy are yet unclear, the two being considered complementary at this moment. In the presence of the N2 the resection should be performed after neo-adjuvant chemotherapy [4], although there are some authors who advise the resection even in the presence of intracapsular N2 [8]. The N3 contra-indicates the resection.

A complete cardio-pulmonary function evaluation should be performed in order to assure the postoperatory reserve. In our patient, the right pneumonectomy was functionally “done” by the tumoral obstruction andatelectasis and the resection reduced the pulmonary functional shunt in the non-ventilated but perfused lung.

The lateral invasion of the superior vena cava is not a contra-indication to resection – we performed a lateral resection (angioplasty) [1].

For the right upper lobe carcinoma invading the carina, there is also the surgical possibility of resecting the upper lobe or the upper and the middle lobes along with carina and reimplanting the remaining right bronchus in the left main bronchus anastomosed to the trachea. In the presented case, the destruction of the entire right lung imposed its resection.

For releasing the tension in the anastomosis there are some maneuvers such as intrapericardial hilar mobilization, dissection around the main left bronchus, limited pretracheal dissection, neck flexion [9].

“A second layer of tissue is routinely placed over all intrathoracic anastomoses, not only to assist in sealing the anastomosis but also to interpose tissue between the suture line and major vessels, which often lie adjacent to the anastomosis” (Grillo HC) [9]. In our case, the cover with pleural, pericardial and thymic flap and the promptitude of the pleural empyema drainage protected the anastomosis and no dehiscence occurred.

The most important complication of the right carinal pneumonectomy is the fistula/dehiscence of anastomosis and the post-pneumonectomy pulmonary edema – ARDS [4].

The prognosis depends mainly on lymph node involvement [4], but also on the histological type [10]. The 5-year survival rate described in different studies is between 13% and 43% and the operative mortality rate should be under 10% [1].

The mediastinal metastatic adenopathy diagnose was unnecessary in this case, the presence of the N2 (diagnosed at mediastinoscopy or PET-CT) could not impose the oncologic treatment first because of the recurrent hemoptysis which represents in this case the absolute indication for resection.

Conclusions

The right carinal pneumonectomy was the resection of choice in this case of a carcinoma originating from the right upper lobe, obstructing the main bronchus with parenchymal destruction, invading the carina and the distal trachea. Although it is not the first carinal pneumonectomy in our clinic, we presented the case because of the late carcinoma diagnosis, the imperious indication for resection and the very good postoperatory evolution of the anastomosis in spite of the developed empyema. The importance of the histopathological diagnosis of a pulmonary mass is to be emphasized again in any patient at risk for lung cancer, as the patient presented: male, over 45-year-old, smoker.

References