How to do it

Both atrial resection and superior vena cava replacement in sleeve pneumonectomy for advanced lung cancer

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Abstract

Extended sleeve pneumonectomy including removal of the superior vena cava, right atrium and parts of left atrium on cardiopulmonary bypass was successfully performed in a 40-year-old man. The tumour was histologically proven a T4 N1 stage with margins free from tumour. Adjuvant radiochemotherapy was administered postoperatively on an outpatient base. The patient did well for 7 months then he died from myocardial infarction due to metastatic infiltration of the right coronary artery. Other metastatic deposits were not found at autopsy. More data from extended pulmonary resections are required to demonstrate a benefit. © 1999 Elsevier Science B.V. All rights reserved.

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1. Results

A 40-year-old man complained of cough and hemoptysis of 2 months duration. He smoked two packs of cigarettes per day for 25 years. Chest X-ray films showed a mass in the right upper lobe invading the mediastinum. Computed tomography of the thorax (CT) revealed tumour invasion of the carina and superior vena cava (SVC) (Fig. 1). Enlarged lymph nodes were not found. Biopsy taken bronchoscopically from the right main bronchus showed a squamous cell carcinoma. Metastases were ruled out by abdominal CT and bone scintigraphy. The patient was deemed to be in an excellent clinical condition for primary resection. Operative access was achieved by right posterolateral thoracotomy. Invasion of the mediastinum was found more advanced than preoperatively expected: the tumour extended into the right heart by continuity. As there was no evidence of malignant pleural effusion nor for pleural carcinosis we decided to put the patient on cardiopulmonary bypass by cannulating superior and inferior vena cava, as well as the ascending aorta. Blood cardioplegia was employed and the right atrium entered anteriorly.

Fig. 1. Chest CT showing tumour invasion of the carina and superior vena cava.

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The interatrial septum and the confluence of the superior and inferior pulmonal veins were invaded as well. Resection comprised three quarters of the right atrium, a 5-cm long segment of the SVC and a quarter of the left atrium. The right main pulmonary artery was dissected and centrally stapled by a TA 30 vascular stapling device and divided. The resection was accomplished by division of the distal trachea one ring above the carina and the left main bronchus one ring below. Fig. 2 shows the intraoperative situs when resection was completed. The specimen showed the real extension of the tumour; frozen section of the resection margins were free of tumour. Reconstruction began with the end-to-end anastomosis of the trachea and left main bronchus with interrupted monofilamentous sutures PDS 3-0. The anastomosis was secured by a pedunculated intercostal muscle flap which was wrapped around the sutures and fixed by fibrin glue. A gelatine coated 18 mm dacron prosthesis was interposed in the caval and right atrial defect (Fig. 3). The left atrial defect was closed by continuous suture. A temporary pacemaker (Fig. 3) was administered and the pericardial defect closed by a Goretex patch. The patient could then be easily weaned from cardiopulmonary bypass. One chest tube was inserted on the right side and removed 2 days later. The postoperative course was complicated by a pneumonia. However, the patient recovered well under antibiotic therapy and was discharged on the 25th day after operation. Histologically the margins were free from tumour and lymph node metastasis found in the first level representing a T4 N1 M0 stage.

The patency of the SVC-graft was documented by cavography before discharge. According to the advanced tumour stage combined radiochemotherapy was administered on an outpatient base consisting of Mitomycin C and a total radiation dosage of 50 Gy. The patient did well for 7 months then he was admitted with multiple pulmonary infiltrations and left sided thoracic pain. Within 1 week the patient died from myocardial infarction. Autopsy revealed myocardial metastasis which obstructed the right coronary artery. The margins of the Goretex patch were free of tumour and no other

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**Fig. 2.** Intraoperative situs after completion of resection. (a) Diaphragm (b) inferior vena cava (IVC) (c) cannulas for outflow (d) cannula for inflow (e) aorta (f) superior vena cava (SVC).

**Fig. 3.** Reconstruction by a gelatine coated dacron prosthesis, bronchial anastomosis (arrows below).
metastatic deposits were found. The SVC graft was patent and the bronchial anastomosis epithilized.

2. Discussion

Since Nissen [1] and Woods [2] introduced cardiopulmonary bypass in order to allow extended pulmonary resection, several attempts were made to achieve resectability in locally advanced tumours invading the bifurcation, the great central vessels or the atrium. Shuman [3] demonstrated the feasibility and surgical technique for performing pneumonectomy and left atrial resection on cardiopulmonary bypass via a median sternotomy approach. Shirakusa [4] operated on a series of four patients with right pneumonectomy and left atrial resection. Two of his patients were alive and well with no recurrence after 54 and 12 months. Since most patients with mediastinal tumour involvement due to direct invasion do poorly with primary surgical treatment and long-term survivors are reported anecdotally [5], the use of cardiopulmonary bypass is discussed controversially. The operative technique for any extended resection is available, but more data are necessary to clearly demonstrate the benefit for the patients. Grunenwald and Le Chevalier proposed a new staging system for better differentiation of the subset of stage III cases into three categories A, B and C, where direct infiltration of the heart (except left atrium) would be considered stage III C and inoperable [6]. We realized, late, the infiltration of the right atrium when we opened the left atrium on bypass. As a consequence heart infiltration should be ruled out preoperatively by transesophageal cardiosonography.

References