Superior Sulcus Lung Cancer Invading the Ribs and Brachial Plexus Successfully Resected by Modified Trap-door Thoracotomy after Induction Chemoradiotherapy

We report on a 49-year-old male patient presented with right superior sulcus lung adenocarcinoma, which had invaded the first and second ribs and brachial plexus. He underwent concurrent chemoradiotherapy, which resulted in a partial response. The tumor was resected along with the first and second ribs without difficulty via a modified trap-door thoracotomy. The brachial plexus was preserved, and the surgical margin was microscopically negative for cancer due to the effect of the neoadjuvant chemoradiotherapy which degenerated most of the tumor into scar tissue. We conclude that modified trap-door thoracotomy is a good approach for resection of superior sulcus lung cancer invasive to the first and second ribs and brachial plexus. Neoadjuvant chemoradiotherapy is also necessary to achieve a negative surgical margin. (Jpn J Thorac Cardiovasc Surg 2004; 52: 181–184)

Key words: trap-door thoracotomy, lung cancer, superior sulcus tumor, neoadjuvant chemoradiotherapy

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Surgery for superior sulcus tumors is often complicated by difficulties with the exposure of vessels or the brachial plexus. Several surgical approaches for resection of superior sulcus tumors have been reported.1–7 Recently, multimodal therapy has improved the resectability of locally advanced non-small cell lung cancer and overall patient survival.8

Here we report a case of superior sulcus lung adenocarcinoma invading the first and second ribs and brachial plexus that was resected successfully via a modified trap-door thoracotomy after induction chemoradiotherapy.

Case

A 49-year-old male was admitted to our hospital presented with severe pain in the right back and ulnar side of the right arm. A chest roentgenogram demonstrated an undefined opacity in the upper right lung (Fig. 1A). Chest computed tomography (CT) showed a tumor located in the right apical area and invading the posterior thoracic wall (Fig. 1B) and we did not detect swollen lymph nodes in mediastinum. Magnetic resonance imaging (MRI) showed the tumor invading the first and second ribs. Invasion to brachial plexus was also suspected (Fig. 2). Fluoro-deoxyglucose-positron emission tomography (FDG-PET) revealed accumulation at the tumor site and mediastinal lymph node (Fig. 3). The serum level of carcinoembryonic antigen (CEA) was 108.9 ng/ml (normal range: <5 ng/ml). Because bronchoscopic biopsy was not informative enough for diagnosis of the tumor, we conducted video-assisted thoracoscopic biopsy to get specimen and observe thoracic cavity, and a diagnosis of poorly differentiated adenocarcinoma was obtained. Two courses of chemotherapy consisting of docetaxel (60 mg/m² on day 1) and carboplatin (300 mg/m² on day 1), with concurrent radiation therapy (2 Gy given 20 times, five fractions per week) were administered before surgery. CT showed a partial response (PR) of the tumor after
A: Chest roentgenogram showed a tumor in the right apical area.
B: Chest CT showing a tumor in the right apical area invading posterior thoracic wall.

Fig. 1.

Fig. 2. Magnetic resonance imaging showed a tumor invading the ribs. Invading to brachial plexus was also suspected.

Fig. 3. FDG-PET showed accumulation at tumor in the right apical area and mediastinal lymph node.

neoadjuvant chemoradiotherapy (Fig. 4), and the accumulation of FDG-PET in the tumor and mediastinal lymph node decreased. The patient's complaints were reduced and the serum level of CEA decreased to 6.2 ng/ml. We judged that the invasion to the brachial plexus decreased and this patient would be operable. On June 27, 2002, an operation was performed via a trap-door thoracotomy (Fig. 5). The patient was placed in the supine position with the neck hyperextended. An upper median sternotomy communicating with an incision in the third intercostal space as well as a transverse cervical incision on the right side was made. The sternocleidomastoid, sternohyoid, and sternothyroid muscles were divided. The anterior chest wall flap was retracted, and the pleural cavity was opened. The tumor was found to have invaded the posterior part of the first rib, second rib, and brachial plexus. The anterior sides of the first and second ribs were cut from inside the thorax, which enabled the anterior chest wall to be fully retracted posteriorly, resulting in a well expanded operative field. The pulmonary vessels and lobar bronchus of the right upper lobe were dissected first, leaving the area that had been invaded by the tumor. The tumor was dissected from the brachial plexus, and the involved posterior parts of the first and second ribs were cut from inside the thorax, resulting in complete en-bloc resection of the tumor (Fig. 6). Although there was severe adhesion of the tumor around brachial plexus, we could dissect the tumor, which was scar in