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CASE REPORT

Extended resection for unexpected invasion of the left sided lung cancer into the liver: combined lung, diaphragm, and liver resection

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Abstract

Complete anatomic lung resection remains the best curative option in patients with early-stage lung cancer. In some cases, extended lung resections are required to achieve R0 resection. Although diaphragmatic invasion and resection is a well-known condition in lung cancer, direct invasion of the diaphragm and liver in lung cancer is rare. We report a 66-year-old man with left-sided lung cancer. Preoperative evaluation revealed the risk of diaphragm invasion, but the liver invasion was detected intraoperatively. In addition to left pneumonectomy, left-sided partial liver and diaphragm resection was performed. At 24 months from the operation, the patient is alive without any disease progression. We believe that combined resection including lung, diaphragm, and liver may have survival benefits in selected cases.

Keywords Diaphragm resection · Extended lung resection · Liver resection · Locally advanced lung cancer

Introduction

Direct invasion of the diaphragm and liver in non-small cell lung cancer (NSCLC) is a very rare occurrence and associated with poor prognosis [1]. Although there are reported cases of combined resection of lung and liver in locally advanced lung cancer, the recommended approach is non-surgical treatment in cases with detected liver invasion preoperatively [2–6]. There are a few similar cases in the literature, of lung cancer that cause transdiaphragmatic liver invasion. However, in all of these cases, the tumor was located in the right lung and there was a suspicion of liver invasion, according to the preoperative evaluation.

Here, we aim to present our surgical approach in this interesting case which had locally advanced NSCLC.

Case report

A 66-year-old man presented with chronic cough and dyspnea on effort. He was known to have type 2 diabetes and a 50-pack year history of cigarette smoking. Chest computed tomography (CT) demonstrated a heterogeneous mass, approximately 4 × 3.5 cm in diameter, in the left lower lobe, close to the diaphragm (Fig. 1). A bronchoscopy was performed, and no endobronchial lesion was observed. On transthoracic fine-needle aspiration biopsy, the lesion was classified as squamous cell carcinoma. Positron emission tomography/CT (PET/CT) scan and endobronchial ultrasound (EBUS) was performed and as a result of preoperative evaluation, the patient was clinically staged as T3–4N0M0. The patient's respiratory parameters and performance status were good; therefore, surgical resection was planned (FEV1:2.16 Lt-%84).

A left-sided posterolateral thoracotomy was performed through the 6th intercostal space. It was seen that the tumor invaded the interlobar fissure and diaphragm. The diaphragm was then incised, and interestingly it was observed that the tumor was invading the edge of the left lobe of the liver and triangular ligament (Fig. 2). The diaphragm was resected circularly, leaving approximately 2 cm of the macroscopic clean area. The left triangular ligament was dissected, and the left lobe of the liver was mobilized. A clean resection margin was established, and liver parenchyma was transected using cautery. After the partial diaphragm and liver resection was completed, mediastinal lymph node stations 5, 6, 7, 8, and 9 were dissected. Because of the interlobar fissure invasion, left pneumonectomy had to be performed. The diaphragm was repaired with a horizontal mattress suture of 0-silk (Fig. 3).

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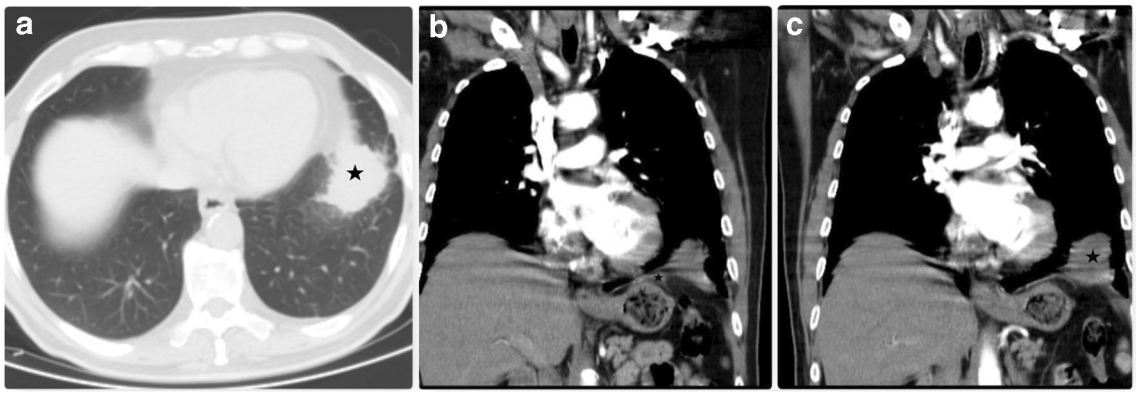


Fig. 1 **a** Left-sided tumor is seen in thorax CT (asterisk). **b** Retrospectively checked, the left-sided edge (asterisk) of the liver was observed near the tumoral lesion. **c** Tumoral lesion (asterisk) in the left lower lobe invading the diaphragm

Postoperative follow-up was uneventful. The chest tube was removed on postoperative day (POD) 3, and the patient was discharged on POD 4.

Pathological examination revealed diaphragm and liver invasion with negative resection margins. There was also no lymph, vascular, or visceral pleural invasion; therefore, the patient was staged as T4N0M0. After the recovery period, postoperative chemotherapy was planned for the patient.

The patient is on routine follow-up, and after 24 months following surgery, there was not any evidence of recurrent or residual disease.

Discussion

It was known that surgical resection in the presence of diaphragm invasion is associated with poor prognosis, especially in patients with N2 disease [7]. Combined resection of the lung, diaphragm, and liver is rare and only presented in a few case reports [2–6]. Therefore, the survival benefits of this kind of extended resections are unknown. Smith et al. reported 18 months of survival without any evidence of recurrence after combined lung and liver resection and suggested extensive resection for this group of patients [5]. Sakamoto et al. reported a combined resection, including lung, diaphragm, chest wall, and liver. Their patient died within 4 months due to diffuse lung metastases [4]. Matsumoto et al. reported the longest survival in the literature of 5 years [3]. Our patient is on the 24th month of follow-up, and there is not any evidence of recurrence.

Unlike for superior sulcus tumors, the necessity of neoadjuvant therapy in T4 tumors is controversial. Our patient was a clinical N0, with adequate respiratory performance; therefore, we preferred surgical resection instead of neoadjuvant therapy [8].

Magnetic resonance imaging (MRI) has been demonstrated to be the most accurate technique in providing the morphological features and revealing the relationships of the diaphragm with surrounding structures; therefore, it may be preferred to detect diaphragmatic invasion in suspected cases [9].

The interesting feature that distinguishes our case from its counterparts in the literature is that liver invasion is formed by left-sided lung cancer. According to the thorax CT findings, the liver invasion was unexpected in this case, and we prepared for the operation with the expectation of isolated diaphragmatic invasion. Therefore, even if the diaphragmatic invasion is

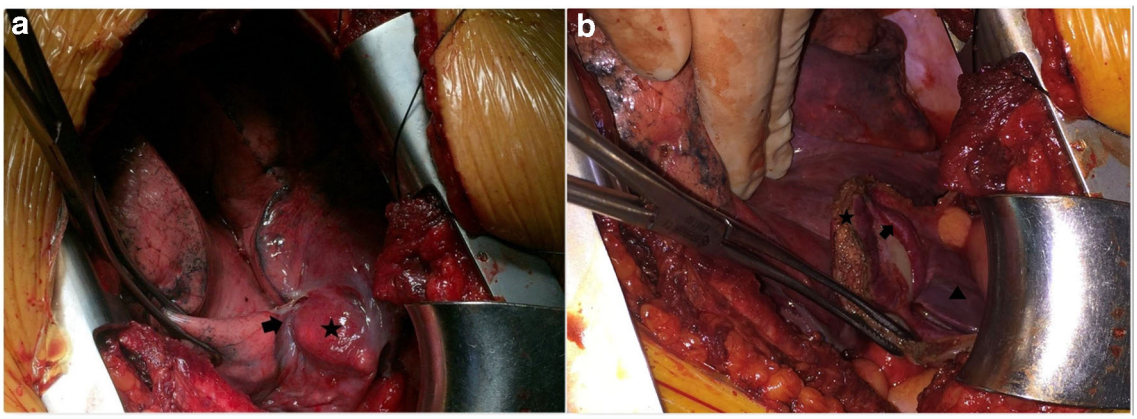


Fig. 2 **a** Tumoral (asterisk) invasion of the interlobar fissure as seen intraoperatively (arrow). **b** Diaphragm and liver invasion (asterisk indicates diaphragm, arrow indicates triangular ligament, and triangle indicates liver)

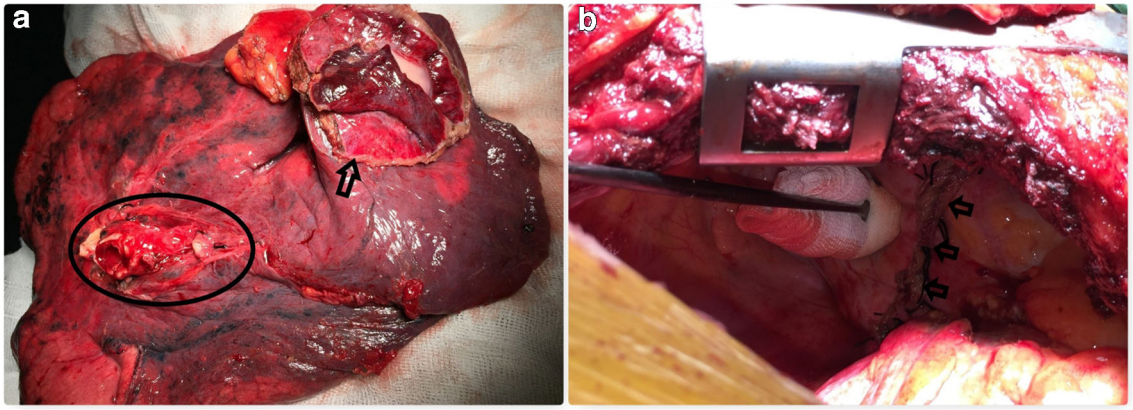


Fig. 3 **a** Resection material (area in the circle indicates left hilum of the lung, arrow indicates diaphragm). **b** Diaphragm repaired with a horizontal mattress suture of 0-silk (arrows)

left-sided, advanced imaging techniques should be applied in terms of liver invasion.

Conclusions

In summary, intraoperative exploration findings may necessitate combined resections. Although the data is limited, combined resection of the lung, diaphragm, and liver may have a survival benefit in locally advanced NSCLC.

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Data availability Not applicable.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Code availability Not applicable.

Informed consent Obtained.

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