Case report - Thoracic oncologic
Surgical resection of solitary cardiophrenic lymph node metastasis by video-assisted thoracic surgery after complete resection of hepatocellular carcinoma

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Abstract
This report presents the case of a patient that developed a postoperative metastatic tumor in the cardiophrenic lymph node as a rare pattern of distant lymph node metastases of hepatocellular carcinoma (HCC) after a complete resection. This is the case of surgically and pathologically proved cardiophrenic lymph node metastasis of HCC using video-assisted thoracic surgery. General thoracic surgeons should therefore be aware of the possibility of this rare form of extrahepatic recurrence when a growing nodule is found in the pericardial fat pad during the follow-up of a malignancy in the liver.

Keywords: Cardiophrenic lymph node metastasis; Hepatocellular carcinoma; Rare form of extrahepatic recurrences; Video-assisted thoracic surgery

1. Introduction
Hepatocellular carcinoma (HCC) is one of the most common malignancies; however, the long-term prognosis after a hepatic resection of HCC still remains unsatisfactory due to the high incidence of postoperative recurrence [1]. Although the most common recurrent pattern of HCC is intrahepatic metastases, extrahepatic metastases of HCC particularly affect the long-term survival of HCC patients. The lymph nodes are one of the most common sites of extrahepatic recurrence of HCC [2]. However, metastatic distant lymph nodes including mediastinal, cardiophrenic, mesenteric, internal mammary, perirectal, retrocrural, iliac and paraspinal areas are relatively rare. Moreover, cases of pathologically proven distant lymph node metastases of HCC are extremely rare.

This report presents a pathologically proven case of a patient with a solitary cardiophrenic lymph node metastasis after a hepatic resection of HCC.

2. Case report
A 73-year-old male presented with a growing nodule in the pericardial fat pad. The patient had undergone a partial hepatectomy (S6/7) combined with the right diaphragm for HCC two years earlier, and thereafter has been undergoing lipiodolizations (LPD) for recurrences in the liver. The laboratory data including hepatic function test and tumor markers showed no abnormalities. Chest computed tomography (CT) showed a small nodule in the right pericardial fat pad, measuring 7 mm. Five months after the first detection, this nodule increased in size, about 20 mm in diameter (Fig. 1a). The CT findings suggested cardiophrenic lymph node metastasis of HCC. Intrahepatic recurrences were well controlled by LPD and there were no other extrahepatic recurrent sites, therefore, the patient underwent a video-assisted thoracoscopic extirpation of the cardiophrenic lymph node. Two 11.5 mm ports were added at the anterior axillary line of the 4th intercostal space (ICS) and at the posterior axillary line of 6th ICS, respectively, and the thoracoscopy was inserted. An enlarged lymph node was found in the pericardial fat pad and thereafter a dissection of this lymph node was performed after making mini-thoracotomy, with an incision measuring about 5 cm in length above this lymph node and opening the right thoracic cavity through the 5th ICS. Macroscopically, the lymph node was yellow-whitish in color (Fig. 1b) and pathologically, the lymph node was definitely diagnosed to contain extrahepatic metastasis of HCC (Fig. 1c).

The patient had an uneventful postoperative recovery and was discharged from the hospital. The patient has been free from any recurrence for 6 months after the surgical resection of the extrahepatic metastasis and has also been carefully followed up.

3. Comment
Katyal et al. [2] reported the incidence, locations and relative frequency of extrahepatic metastases in HCC patients. In this radiological study, the extrahepatic metastasis...
metastases were found in 148 (37%) of 403 HCC patients. The most frequent site of metastasis was the lung (55%). Lymph node metastasis was also found in 78 (53%) patients and distant lymph nodal metastases were detected only in 18 (12%) patients. Distant metastatic lymph nodes were observed in various regions, such as the mediastinal, cardiophrenic, mesenteric, internal mammary, perirectal, retrocultural, iliac and paraspinal areas. However, there have so far been few reports of pathologically proven distant lymph node metastases of HCC and only one case of a solitary mediastinal lymph node metastasis of HCC has been reported [3]. Therefore, the present report is the first surgically resected case of a solitary cardiophrenic lymph node metastasis of HCC.

Witte et al. reported that an extremely rare case of non-small cell lung cancer that had multiple lymph nodes metastases in the pericardial fat pad [4]. This case report indicated that the lymph nodes involved the pericardial fat pad (the cardiophrenic lymph nodes) also included the part of the mediastinal lymphatic drainage.

The cardiophrenic lymph nodes also drain from multiple organs, such as the diaphragm, liver, the pleura and chest wall. Tanaka et al. showed three lymphatic drainage pathways from liver to the mediastinum [3]. The present case had HCC in the right lobe and the lymph node metastasis in the right pericardial fat pad, therefore, the pathway that runs from the right hepatic lobe through the right triangular ligament and to paratracheal lymph nodes, may be associated with the present case.

Finally, no standard treatment of extrahepatic metastases after a hepatic resection of HCC has been established. Most recurrent HCC patients have multiple extrahepatic metastases and the median survival time after the diagnosis of extrahepatic metastases is about five months [5]. A recent review noted several reports of a pulmonary metastasectomy for HCC with good results [6]. Therefore, the surgical resection of extrahepatic metastases may be indicated for a limited population of HCC patients. The present case had only a solitary lymph node metastasis of HCC in the pericardial fat pad, therefore, surgical resection of this lesion was selected. This surgical procedure can be effective and thus allow the patient to achieve a long-term survival, however, a careful follow-up is necessary.

In conclusion, this report presented the case of a solitary cardiophrenic lymph node metastasis after a hepatic resection of HCC that was resected using video-assisted thoracic surgery. General thoracic surgeons should be aware of the possibility of this rare form of extrahepatic recurrence when a growing nodule is found in the pericardial fat pad during the follow-up of malignancies of the liver.

References