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Case Report

Role of Vats in Management of Malignant Pleural Effusion with Suspected Diaphragmatic Fenestrations

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Abstract

We present a case of 65 years old woman with history of metastatic breast cancer and recurrent right sided pleural effusion. During video assisted Thoracoscopic surgery inspection two diaphragmatic fenestrations were noted with fluid flowing from abdomen to chest. The fenestrations were endoscopically repaired and talc pleurodesis performed. The presence of diaphragmatic fenestrations should be suspected when there is evidence of fluid collection on either side of the diaphragm. Active inspection for diaphragmatic fenestrations is advocated during the VATS procedure otherwise pleurodesis might fail. Simple stitching and talc pleurodesis control such effusions and prevent exacerbation of trans-coelomic spread of malignancy.

Keywords: VATS; Malignant pleural effusion; Diaphragmatic fenestrations; Pleurodesis; Transcaelomic spread

Case Presentation

A 65 years old woman was admitted to our unit for consideration of diagnostic drainage and pleurodesis of recurrent right pleural effusion. An intercostal drain was inserted in the medical ward with average drainage of 300-400mls of straw coloured fluid on daily basis. She had a background of metastatic right breast cancer in 2003 surgically treated by lumpectomy and nodal clearance. The tumour was ER positive, HER-2 negative on histology. Therefore, she received chemo/radiotherapy and hormonal manipulation treatment post-operatively. Her main presenting symptom was incapacitating shortness of breath and she was limited to walking 50-100 yards on the flat. Ascites and abdominal pain were investigated by computed tomography (CT) of the chest, abdomen and pelvis. CT revealed peritoneal metastatic deposits, small volume of ascitic fluid with no focal liver lesion and significant right-sided pleural effusion. Other findings included; subcutaneous lesions within the anterior abdominal wall suggestive of secondaries as well as body of T10 vertebral metastasis. Right VATS pleural biopsy and talc pleurodesis was discussed as a palliative procedure. If the lung would not expand fully intra-operatively then insertion of a permanent tunneled intrapleural catheter would have been contemplated.

At operation three-port video assisted thoracoscopic surgery (VATS) was fashioned. 3½ litres of pleural effusion were obtained for microbiology and cytology. The parietal pleura was studded with nodular lesions reminiscent of pleural malignant deposits. Full thickness pleural biopsies were taken for histology. Closer inspection of the diaphragm revealed clear ascitic fluid flowing into the chest through two fenestrations in the diaphragm (Figure 1). Endoscopic repair of the diaphragmatic fenestrations was performed by purse string stitching using Vicryl 2-0 (Figure 2). 6 gm of sterile Talc was evenly sprinkled under direct vision for chemical pleurodesis. The patient had an uncomplicated post-operative hospital stay and was asymptomatic at the time of discharge. At 6 months follow up there was no recurrence of effusion. Cytology from the pleural fluid and peritoneal tap confirmed the presence of malignant metastatic breast cancer. The histology of pleural biopsy also confirmed metastatic adenocarcinoma in keeping with breast origin.

Discussion

The current medical and surgical management for pleural and peritoneal malignant dissemination remains palliative. Untreated pleural effusions could lead to complications such as lung collapse and empyema. Repeated therapeutic pleural aspirations provide transient relief of symptoms and avoid hospitalisation for terminally ill patients with limited survival expectancy and poor performance status. VATS has grown in popularity as a safe diagnostic and therapeutic tool for malignant effusions. Talc pleurodesis via VATS is more effective than talc slurry introduced via an intercostal drain in the ward (mean success rate ≥ 90%) [1]. The VATS procedure also facilitates the breaking up of septations, loculations and release of adhesions that prevent full lung expansion.

Medical and surgical pleurodesis are doomed to fail in high-output effusion, the reason being continued dilution of the talc and distraction of lung from the chest wall. Diaphragmatic fenestrations

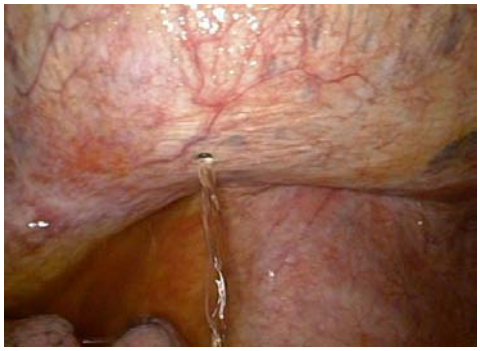

Figure 1: Ascitic fluid flowing into the right thoracic cavity through a 2mm diaphragmatic fenestration.

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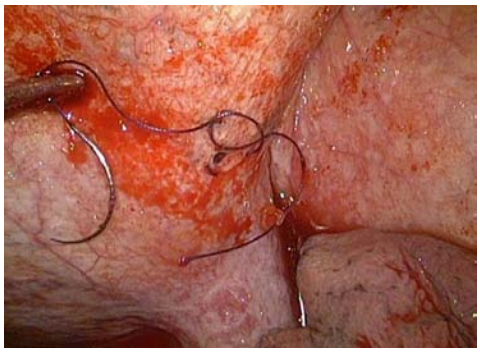

Figure 2: Endoscopic repair of diaphragmatic fenestration using a single purse string suture.

could be a reason for high-output pleural effusion. Kirschner integrated the synonyms of a diaphragmatic defect such as a hole, perforation, fenestration into porous diaphragm syndrome (PDS) in 1998 [2]. Huang and associates in 2005 reported a classification of these openings. According to their report type 1 is described as no openings, type II represents small "blebs" on the diaphragm, type 3 represents multiple small fenestrations and type 4 multiple large gaps [3]. Whether fenestrations are one end of the spectrum of pleuroperitoneal defects that ultimately manifest as diaphragmatic hernias such as Bochdalek or Morgagni is unknown [4]. There is a theory that they are iatrogenic from liquifactive degeneration of endometriotic foci in association of catamanial pneumothorax [5].

The pressure gradients across the diaphragm indicate that the direction of flow favours peritoneal fluid flowing into the pleural space through congenital or acquired fenestrations [6]. Positive intra abdominal pressure coupled with negative intra-thoracic pressure causes a direct flow of fluid from abdominal cavity into the pleura [7]. However, with massive pleural effusion it is quite possible that the pressure across the diaphragm leads to bidirectional traffic of malignant fluid through these diaphragmatic fenestrations. In the upright position fluid can shift to the abdominal cavity as a result of gravity and at times of high positive thoracic pressure as experienced during straining and coughing. In the supine position fluid could re-enter the chest. This might be the case in our patient who developed malignant ascites without liver cirrhosis. Presence of fluid in both cavities across the diaphragm should always raise suspicion of the presence of diaphragmatic fenestrations.

One of the dreaded complications of transcoelomic dissemination is the involvement of a second virgin space with malignancy. Commonly this is encountered when fashioning a pericardial window for malignant effusion into the right or left pleural spaces. Diaphragmatic fenestrations lead to similar complications. Peritoneal deposits can ultimately lead to adhesive intestinal obstruction and the need for surgical exploration.

The presence of diaphragmatic fenestrations should be suspected when there is evidence of fluid collection on either side of the diaphragm and VATS should be the first-choice tool of investigation.

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