Iatrogenic perforation of the left heart during placement of a chest drain

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CHEST IMAGING

CASE REPORT

ABSTRACT

Chest drain insertion is a widely used invasive therapy for treating pneumothorax and pleural effusions. The complication rate is low, especially if image guidance is used. Reported complications include infection, vascular lesion with bleeding, and injury to the lung, liver, diaphragm, stomach and spleen. We report on the very rare complication of left heart perforation after chest drain placement.

Case report

An 88-year-old male patient suffering from chronic heart failure was admitted to another hospital following acute cardiac decompensation. Because of dyspnea with voluminous bilateral effusions, an attempt was made to drain the left pleural cavity. Malposition of the chest drain was suspected because blood was initially draining from the catheter. Computed tomography of the chest revealed the location of the intercostal drain. The drain had perforated the left ventricle, run through the mitral valve and exited the left atrium via a pulmonary vein, ending in the contralateral lung (segment 4, middle lobe). The patient was brought to the surgical theater, where cardiac surgeons performed a left anterolateral thoracotomy and extracted the drain successfully. Three days later, the patient was discharged from our hospital in a good general condition.

Key words: • heart • chest tube • complication
The patient was brought to the surgical theater where cardiac surgeons performed a left anterolateral thora
cotomy under general anesthesia (Fig. 2). The drain was carefully extracted and both the myocardium of the left ventricle and the pericardium were sutured. During the postoperative course neither the x-ray of the chest nor an echocardiograph revealed hemothorax or pericardial tamponade. Three days later, the patient was discharged from our hospital in a good general condition.

Discussion

Chest drain placement is a standard procedure for treating pneumothorax, empyema or pleural effusion (1). The overall complication rate of chest drain placement is reported to be as high as 30%, although the major complication.
rate is low if the procedure is carried out properly. Major complications include laceration of the lung, liver, diaphragm, stomach, spleen, smaller blood vessels and nerves (2). One publication reported the laceration of the left subclavian vein after chest drain placement (1). A heart perforation during chest drain placement is a very rare complication that, to our knowledge, has been described in only seven publications to date. The first incidence was reported in 1986; during chest drain placement, the right ventricle was perforated due to adhesion of the pericardium to the chest wall, and the patient died shortly after insertion (3). Meisel et al. (4) reported a fatal laceration of the right atrium in a kyphoscoliotic patient. One patient survived the perforation of an enlarged right atrium (5). A perforation of the right ventricle occurred during chest drain placement in a trauma patient who did not survive (6). Another fatal perforation, in this case of the right ventricle adherent to the chest wall, was reported in a post-pneumectomy patient (7). In another case, a lethal perforation of the left ventricle was observed after chest drain placement for pneumothorax (8). The last report about a heart perforation during chest drain insertion was in 2007; due to mitral valve regurgitation, there was an accidental perforation of the massively dilated left atrium during chest drain placement for pleural effusion from the right side. That patient survived (2). Our case report describes the very rare complication of heart perforation during chest drain placement due to a dilated left ventricle that was adherent to the left-side chest wall. This is the first report of a patient in which a chest drain perforated the left ventricle and passed the mitral valve and the left atrium, with the tip ending in the pulmonary vein of the middle lobe. Only two of the seven already-published heart perforations resulted in survival of the patient as in our case.

This report emphasizes the fact that the site of drain insertion must be confirmed prior to the procedure. If anatomic orientation is hampered because of massive pleural effusion, as in this case, it is vital to aspirate air (in the case of pneumothorax) or fluid (in the case of pleural effusion) at the time of anesthesia. If this aspiration fails, the procedure should not be continued unless more complex imaging than a chest X-ray has been performed, as outlined in current guidelines for chest drain placement (9). We feel that the safest way to place a small-sized chest drain correctly is by using image guidance by ultrasound or computed tomography; however, the latter is too expensive and limited for everyday use, especially in intensive care patients. As most intensive care units currently provide ultrasound, this technique should be used for guidance as a standard. The reported complication could have potentially been avoided if imaging had been used during or prior to the procedure described. An already published study reported no procedure-related major complications when using ultrasound or computed tomography for chest drain placement (10). When placing smaller chest drains (<14F) some authors recommend Seldinger’s technique or image guidance to minimize the risk of fatal complications whenever possible (1). For medium (16–24F) or large (>24F) chest drains, blunt preparation and digital palpation of the pleural space with a finger is mandatory (2). If unusual resistance is discovered during drain insertion no substantial force should be applied. The most common site of chest drain insertion is the so-called “safe triangle” which is bordered by a horizontal line through the nipples and a horizontal line through the apex below the axilla, the anterior border of the musculus latissimus dorsi and the lateral margin of the musculus pectoralis major (9).

If, despite all precautions, the heart is perforated, the drain must be clamped and computed tomography of the chest should be performed immediately as long as the patient is in a stable hemodynamic condition. A (mini-) thoracotomy is the treatment of choice in this type of complication.

In conclusion, chest drain placement is a safe and efficient procedure for treatment of pneumothorax, empyema and pleural effusions if image guidance is used. If the anatomic orientation is difficult and neither air nor fluids can be initially aspirated, more complex imaging than a chest X-ray is indicated to avoid major complications.

References