Case report

Wedge resection on recurrent pneumothorax, failed lung expansion after needle aspiration: A case report

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ABSTRACT

Background: Pneumothorax has several classifications, including based on etiology, location, extent, and degree of collapse as well as by mechanism and type.

Case presentation: A 61-years-old man with the main complaint of sudden shortness of breath after lifting a birdcage. The complaint worsened, and it was accompanied by nausea, sweating, and decreased vital signs. The patient was in a life-threatening condition with a tension pneumothorax and treated with needle aspiration (NA).

On the second day of treatment, a clinical evaluation showed recurrent dyspnea. Lung physical examination and chest X-ray evaluation showed recurrent pneumothorax with subcutaneous emphysema. Installation of chest tube drainages (CTD) with active continuous suction of −20 cmH₂O. High-resolution CT (HRCT) showed right pneumothorax with multiple blebs, bullae, and bronchopleural fistula. Video-assisted thoracic surgery (VATS) was carried out to repair bronchopleural fistula (BPF). However, pre-surgery found multiple bullae and multiple fistulas accompanied by adhesion to the chest wall, thus the procedure could not be conducted. As an alternative, thoracotomy was performed, followed by wedge resection and fistula reparation.

Discussion: Diagnosis of pneumothorax is based on clinical manifestations. Conservative management by providing oxygen or NA/CTD insertion. Needle aspiration is a simple and alternative treatment and performed for an outpatient indication, whereas CTD requiring hospitalization and is performed by experts. Management aims to restore clinical symptoms, restore lung expansion and prevent a recurrence.

Conclusion: The choice of thoracoscopy/VATS or thoracotomy needs to be considered according to the indications so that complications do not occur and have a good prognosis.

1. Introduction

Pneumothorax is a medical emergency that requires early recognition and management of the air in the pleural space between the parietal and visceral pleura, which can occur spontaneously or can be caused by trauma [1,2]. The incidence is higher in men than women, with a ratio of 4.7:1, while smoking is a risk factor of 12% [3,4]. Pneumothorax is common in obstructive pulmonary disease (COPD or asthma) due to high intrathoracic pressure [5]. Needle decompression or needle aspiration (NA) is a simple and easy alternative and is recommended by the British Thoracic Society (BTS) as the first-line management of spontaneous pneumothorax [6]. In our case, at the time of NA, the patient experienced improvement over time, but we found multiple bullae. Based on the description above, we are interested in reporting a unique case of recurrent pneumothorax after NA reported using the surgery case report (SCARE) 2020 criteria [7].

2. Case presentation

A 61-years-old man with the main complaint of sudden shortness of breath after lifting birdcage. The complaint worsened 3 h before arriving at the emergency room. Complaints included nausea, sweating, and decreased vital signs. The patient was in a life-threatening condition with a tension pneumothorax and treated with NA. The patient had a history of tuberculosis and had been taking the complete antituberculosis drug for 6–9 months. The patient had no history of allergies. Following NA, physical examination improved with consciousness GCS E4-V5-M6, BP 100/60 mmHg, HR 112 × min⁻¹, RR 26-28 × min⁻¹, and SpO₂ 98% (nasal oxygen cannula 3 l/min).

The physical examination of the lungs showed an asymmetrical chest, delayed movement of the right chest wall, decreased palpation of fremitus in the right hemithorax. The percussion was hypersonic in the right hemithorax. Vesicular breath auscultation was decreased in the
right hemithorax. Laboratory data on blood gas analysis showed mild hypoxemia with normal acid-base (pH 7.41, pCO₂ 44 mmHg, pO₂ 128 mmHg, HCO₃ 24.2, BE 2.0, SpO₂ 98%, P/F ratio 400 mmHg, aADO₂ 45.2). The patient also underwent radiological chest X-rays (Fig. 1).

Needle aspiration was maintained because the lung parenchyma expanded more than 80%, and the patient was treated with chest physiotherapy with active range of motion (AROM) mobilization, active breathing exercises, effective cough exercises, and relaxation exercises. On the second day of treatment, a clinical evaluation showed recurrent dyspnea. Lung physical examination and chest X-ray evaluation showed recurrent pneumothorax with subcutaneous emphysema (Fig. 2). Chest tube drainage (CTD) was installed immediately, and continuous suction starting from −20 cmH₂O. In addition, a high-resolution computerized tomography (HRCT) examination showed right pneumothorax with multiple blebs, bullae, and bronchopleural fistula. Collapses of the corpus at the level of the IV thoracic vertebra with subcutaneous emphysema (Fig. 3).

Surgery was performed with video-assisted thoracic surgery (VATS) to repair the bronchopleural fistula. However, surgery found multiple bullae in the right lung superior lobe and multiple fistulas accompanied by adhesion on half of the right lung superior lobe to the chest wall. Thus, VATS could not be conducted. Thoracotomy was performed by releasing adhesions to the chest wall, followed by wedge resection of the right superior lung lobe and repairing the fistula in the right superior lung lobe. After evaluation of bleeding, mechanical pleurodesis was performed with CTD insertion. Chest tube drainage was maintained until the lungs expanded and active continuous suction starting from minus 20 cmH₂O. Evaluation of the chest X-ray after surgery showed the lung parenchyma starting to expand, and after three days of expansion, CTD was removed. After discharge from the hospital, two weeks later, spirometry examination showed moderate obstruction with mild restriction (Table 1). Surgery was performed by a specialist in cardiovascular and thoracic surgeons in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

3. Discussion

The diagnosis of pneumothorax is based on clinical and emergency management with radiological confirmation [8]. Management decompression with NA at intercostal II mid-clavicle line on the side of the thorax will change into a simple pneumothorax and can be followed by CTD thoracotomy [4,9]. In recent years, management strategy changes using a conservative approach. Needle aspiration and conservatives are performed for an outpatient indication, whereas CTD requires hospitalization and performs by experts [9]. Management aims to restore clinical symptoms, restore lung expansion and prevent recurrence [3].

The recommendations guideline management of pneumothorax from the BTS and the American College of Chest Physicians (ACCP), Observation and oxygen therapy within days to weeks with serial chest X-ray 12–24 h for 2 days with or without hospitalization. Hospitalization is recommended to provide oxygen. Small, unilateral, and stable, asymptomatic pneumothorax can be observed and evaluated for symptoms 2–3 days without hospitalization. Needle aspiration and CTD thoracotomy are performed for pneumothorax with an area of >15%. Decompression NA with a large needle of 16G-14G in the pleural space, positive air pressure comes out through the needle and makes a connection with the outside air through the contra vent and connecting the tube. The other side of the tube is inserted into a bottle filled with water and air bubbles in the bottle [16,11].

The BTS guidelines recommend NA as the first intervention, if necessary, for all pneumothoraces in an attempt to avoid the disadvantages of CTD [12]. In cases where there is respiratory distress, CTD insertion is avoided, because it is painful for the patient and the risk of complications. Moreover, it avoids unnecessary immobilization [9]. Although alternative NA is simple and recommended as initial management, the success rate is 60.65% [13].

The BTS guidelines recommend that if NA failure occurs, CTD should be attempted for at least 3 days and indirect surgery perhaps for 3–5 days. CTD failure is high in case of NA failure, so surgery is recommended due to prolonged air leak (PAL) or failure of lung re-expansion. The ideal time for thoracic surgery in cases of PAL is up to 5 days. Should it fail with PAL/NA, thoracotomy and tare poudrage can be performed. The PAL management with VATS can replace open thoracotomy to identify and seal areas of air leakage, and for resection of blebs or bullae in the visceral pleura, and pleurodesis. Pleurodesis in bleb/bullectomy to achieve low recurrence rates [14].

This is similar to this case, HRCT obtained BPF and considered VATS and fistula repair. However, during the operative Durante exploration, there were multiple bullae of the right lung superior lobe and multiple fistulas with the adhesion of the superior lobe to the chest wall, so that VATS was not possible. Relief of adhesive to the chest wall was performed in cases where wedge resection and fistula repair were subsequently performed. After evaluation of bleeding, mechanical pleurodesis with CTD insertion was performed. Patients with spontaneous pneumothorax may experience recurrence, after improvement with observation and after NA/CTD insertion. However, recurrence is rare in patients undergoing open thoracotomy. Patients with good management did not develop complications [15].

4. Conclusion

A 61-years-old man with the main complaint of sudden shortness of breath after lifting birdcage. Diagnosis is based on clinical manifestations ranging from asymptomatic to hemodynamic disturbances. Physical examination and support are important for diagnosis, investigation with chest X-ray, and CT scan as a gold standard for pneumothorax. CT
scans can show blebs or bullae and the surface area of the pneumothorax. Conservative management includes observation by providing oxygen and NA/CTD insertion. Needle aspiration is a simple alternative with a 60.65% success rate. CTD failure is high after NA failure, due to PAL. Management of PAL uses VATS to identify and seal the area of air leakage and for bleb/bullae resection and pleurodesis. The choice of thoracoscopy/VATS or thoracotomy needs to be considered according to the indications so that complications do not occur and have a good prognosis.

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Ethical approval
We have conducted an ethical approval base on the Declaration of Helsinki at Ethical Committee in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Consent
Written informed consent was obtained from the patient for publication of this case report.

Guarantor
Arief Bakhtiar is the person in charge of the publication of our manuscript.

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Declaration of competing interest
Anita Nur Charisma and Arief Bakhtiar declare that they have no conflict of interest.

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Table 1
Result of spirometry examination.

| Test            | Subject | Prediction | % Normal |
|-----------------|---------|------------|----------|
| VC (liter)      | 2540    | 4080       | 62       |
| FVC (liter)     | 2580    | 4080       | 63       |
| FEV1            | 1700    | 3260       | 52       |
| FEV1/FVC        |         |            | 65.9     |

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Fig. 2. A) Chest X-ray evaluation, avascular area impression, recurrent right lung parenchyma collapsed, and subcutaneous emphysema. B) After chest tube insertion, it appears that the lung parenchyma has not expanded.

Fig. 3. HRCT imaging shows a right pneumothorax with multiple blebs, bullae, bronchopleural fistula, and subcutaneous emphysema.
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