CASE REPORT

Outpatient Treatment of Spontaneous Pneumothorax Using an Improved Pocket Sized Heimlich Valve

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Summary

We report two patients, who have used PneumostatTM to replace the conventional underwater seal drainage system for recurrent pneumothorax. Both patients had required repeated chest tube insertion for recurrent pneumothorax and needed a longer hospital stay. Both patients were able to be discharged with the Pneumostat™ device and were reviewed in outpatient clinic. Both patients had optimal clinical improvement and chest X-ray showed no residual pneumothorax.

Key Words: Pneumothorax, Outpatient, Pneumostat, Heimlich valve

Introduction

Pneumothorax is a common problem encountered in medical practice. The conventional underwater seal drainage system is technically cumbersome to manage, and restricts patient ambulation. The Heimlich valve, first introduced in 1968, has gained widespread acceptance. It was originally designed to allow emergency treatment of pneumothorax on the battle front lines so that servicemen would survive to receive definitive care at the field hospital. The earlier devices had deficiencies. The connectors on each end are similar in the Heimlich flutter valve. Hence, it is dangerous if connected by an inexperienced person in the reverse manner. The Pneumostat™ (Atrium Medical Corporation, USA) is an improved device with more safety features and a small chamber to collect pleural fluid (Fig. 1). It has a closed drainage system with an air leak detector added. It can be attached to any size chest drain and be clipped to the patient's garment. The collected fluid in the chamber can be removed from the Leur port. We report the first two patients in Malaysia who used this device at home successfully in October 2002.

Case Report

Case 1

A sixty-year-old man with chronic obstructive airway disease was admitted with an acute shortness of breath for one day. There was no recent fever, trauma or chest pain. He had a similar episode two years previously and a chest drain was inserted for left sided pnuemothorax. Since then, he had stopped smoking. There was no family history of asthma. Clinically, the patient was tachypnoeic at rest, with reduced air entry on the left side of the chest. On 4 L/min of oxygen via

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nasal prong, arterial blood gas showed pH: 7.46; PO_2: 62mmHg; PCO_2: 35.4mmHg; O_2Sat: 92.8%; HCO_3: 26.9mmol/L. His chest X-ray showed left pneumothorax with minimal pleural effusion. A chest drain was inserted into the left pleural space and bubbling of air noted in the underwater seal drainage system. The patient was treated with regular nebuliser, chest physiotherapy, and a repeated chest x-ray showed lung expansion. After chest tube removal, the patient redeveloped shortness of breath. The chest X-ray showed recurrent pneumothorax with evidence of apical bullae. The patient was planned for video-assisted thoracoscopic bullectomy and talc pleurodesis. After adequate pre-operative optimisation, the lung function test still showed severe lung impairment with FEV1: 0.89L; FVC: 2.02L; ratio of 44% and PEFR 3.1L /sec. A decision was then made for the patient to continue on chest drainage as surgery was deemed high risk. The Pneumostat™ device was used to replace conventional underwater seal drainage. This allowed the patient to ambulate. He was discharged a few days later with the device after confirmation of lung expansion. On follow-up at second week, the lung was fully expanded (Fig. 2) and the device was removed. The patient was satisfied with the home use of the device and he was well since then.

Case 2

A 56-year-old woman, who is a known case of pulmonary lymphangiomyomatosis, was admitted with shortness of breath for one day. She was on the waiting list for lung transplantation and had developed recurrent pneumothoraces in the past, Clinically there was decreased air entry and hyperresonance on her right side of the chest. The arterial blood gas showed pH: 7.3; PO_2: 55mmHG; PCO_2: 42mmHg, O_2Sat: 86.4%; HCO_3: 21.2mmol/L. A chest X-ray confirmed a large, right sided pneumothorax. A chest tube was inserted and an underwater seal drainage was used. Following initial clinical improvement, the chest tube was removed. However, the pneumothorax recurred and this time Pneumostat™ was used. She was sent home with the device on the next day. At the outpatient clinic follow up, the chest tube was removed with chest X-ray showed no residual pneumothorax.

Discussion

The Pneumostat™ device is designed for pneumothorax with the added feature of a 30ml chamber to collect pleural fluid. The fluid can be removed repeatedly via the Leur port using a syringe without a needle. It has an internal mechanical one-way valve with a built-in vent.

Fig 1: Size and position of device in relation to patient

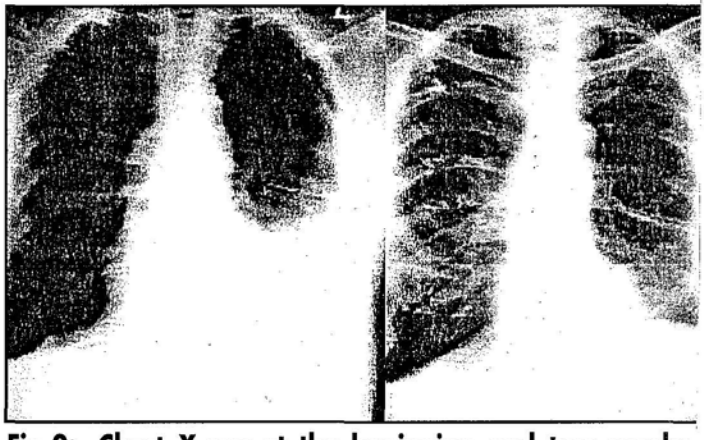

Fig 2: Chest X-ray at the beginning and two weeks with the use of device

Because air leaves the system through a vent, and not the distal end, there is only one possible way to attach the device to chest tube. The only access to the device is through the Luer port. Therefore, the patient cannot place foreign objects into the device which can compromise device function. The device is latex free and does not have to be taped to patient's chest. It has a clip that can attach itself to patient's garment. The device moves freely and remains in gravity dependent in various position adapted by the patient.

One of the main advantages of the Pneumonstat™ is allowing early ambulation which can prevent deep vein thrombosis and pulmonary embolism. Immediately after connecting to the device, both patients were able to walk around in the ward. This allows early restoration of lung function, improved patient motivation and independence. Our patients clinically and radiologically demonstrated optimum drainage of pleural air and fluid. Both patients eventually requested for an early discharge from hospital. The shorter hospital stay can reduce patient's expenses and avoid nosocomial infection.

There are safety precautions for using the device at home. The doctor needs to recheck the drain and if necessary to re-stitch the drain with strong non-absorbable suture before the patient goes home At home, regular wound inspection and redressing can be done at a nearby clinic. The patient must have easy access to the nearby hospital. In the event that symptom of shortness of breath recurs, he should to go to the hospital.

Previous reports showed the Heimlich valve use was beneficial in patients with penumocystic carinii, cystic fibrosis and metastatic pneumothorax[1-3]. Similar device was designed in the past for post transthoracic-biopsy pneumothorax. The Pneumostat™ is a convenient and effective alternative to conventional underwater seal drainage. It allows many patients to be treated successfully on an outpatient basis.

References

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