Intra-pleural Instillation of Autologous Blood – Fine-tuning Techniques for Better Success Rate: Two Case Reports

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SUMMARY

In the past, many case series have reported the effectiveness of autologous blood patch pleurodesis (ABPP) in recurrent secondary spontaneous pneumothorax (SSP), particularly in those who were unfit for surgery. We describe two cases of persistent air leak in pneumoconiosis and pulmonary fibrosis with bronchiectasis, whereby the techniques employed had improved the success rate of ABPP. The determining factors that lead to the success of ABPP were determined by the volume of autologous blood instilled, Trendelenburg position post instillation, and early chest physiotherapy with mobilisation by application of pneumostat.

INTRODUCTION

Persistent air leaks (PAL) in secondary spontaneous pneumothorax (SSP) are troublesome, especially for patients who are unfit for surgical intervention. The PAL can be further complicated if the lung is not fully expanded. Autologous blood patch pleurodesis (ABPP) is one of the methods that can use to treat the PAL to achieve symphysis between the parietal and visceral pleura and a ''patch'' effect whereby coagulated blood seals the site of the PAL. Herein, we describe two cases of PAL where ABPP had led to resolution of the PAL.

CASE REPORT

Case 1

A 42-year-old woman working as a dental technician presented to our centre in February 2015 with complaints of one-month duration of cough with haemoptysis, low-grade fever and loss of weight amounting to ten kilograms. High resolution computed tomography (HRCT) of the thorax showed consolidation with air bronchogram over bilateral upper lobes with tree-in-bud appearance in bilateral upper lobes, right middle and lower lobes. Bronchoscopy done revealed bilateral inflamed and narrow segmental bronchus. She was initiated empirically on anti-tuberculous treatment, but her symptoms did not improve. She was then subjected for a CT guided lung biopsy, which showed histiocytic proliferation with presence of refractile materials (possibly crystal or dental instrument materials) and her diagnosis was revised as dental pneumoconiosis.

Unfortunately, she was lost to follow up until October 2018 when she presented again with sudden onset of shortness of breath associated with pleuritic chest pain. She was treated with community-acquired pneumonia but had persistent dyspnoea and HRCT thorax done revealed a right-sided apical pneumothorax (Fig. 1a). A 24 Fr chest tube was inserted, but the pneumothorax did not improve over two weeks despite applying Gomco suction pressure of -5cmH2O for a period of up to 72 hours as well as redirecting the chest tube towards the apex. We eventually subjected her for ABPP with 1ml/kg of autologous blood but were unsuccessful on the first two attempts. She was then subjected to a third ABPP with 2ml/kg of autologous blood with the patient in Trendelenburg position at 30 degrees during the procedure, followed by application of pneumostat to encourage early ambulation. Two weeks later, the PAL resolved (Fig. 1b).

Case 2

In a separate case, an 84-year-old man, ex-smoker of 60 pack-years and retired woodworker, presented with complaints of reduced effort tolerance and chronic cough of seven-month duration. A contrasted CT thorax showed honeycomb appearance in the left lung with bronchiectasis, fibrosis, and ground-glass opacities over the right upper and lower lobe. Bronchoscopy done showed dilated airways and workups for tuberculosis were negative. He was diagnosed as a pulmonary fibrosis and bronchiectasis with the spirometry showed obstructive ventilator defect.

He had a pneumothorax which resolved spontaneously one earlier before referral to our centre for recurrent left pneumothorax (Fig. 1c) and had a 20 Fr chest tube inserted. Unfortunately, it did not resolve over eight days with Gomco suction pressure of -5cmH2O, and was subjected for ABPP with 1ml/kg of blood on three occasions over six days in which the third attempt was made after reinserting a 32 Fr chest tube directed to the apex with patient placed in Trendelenburg position of about 30 degrees, followed by application of pneumostat. Subsequent chest x-ray showed resolution of pneumothorax (Fig. 1d).

DISCUSSION

Primary spontaneous pneumothorax is defined as an episode of pneumothorax without preceding cause with no underlying lung disease. On the other hand, SSP is the same, but in an individual with an underlying lung disease. The majority of lung disease associated with SSP are pulmonary emphysema, interstitial lung diseases, lung malignancy and infections. Collectively, they carry a higher risk of

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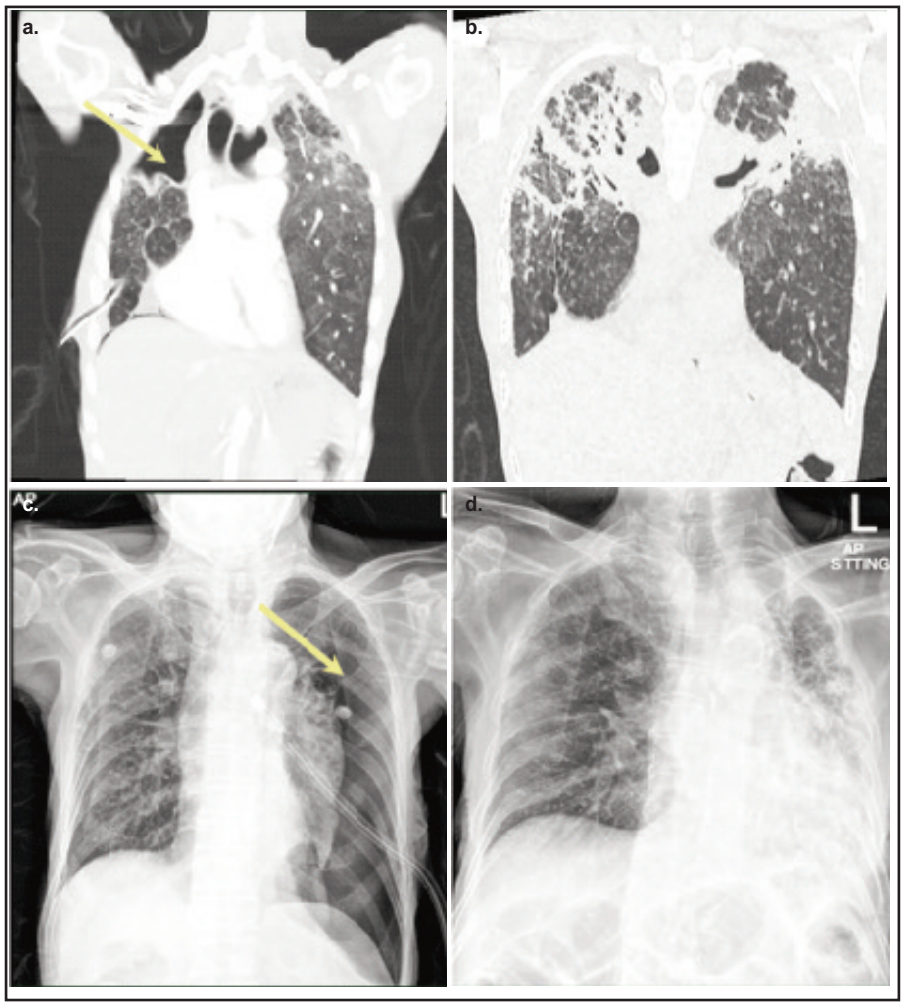

Fig. 1: X-ray showing left-sided pneumothorax (yellow arrow). Fig. 1d: Resolution of pneumothorax with pre-existing bilateral fibrotic changes more marked on the left side.

complications and mortality as well as higher rates of PAL compared to primary spontaneous pneumothorax of which frequently resolve without needing intervention.

In addition, SSP with PAL carries a much higher morbidity and mortality rate, despite advances in surgical techniques. This may be related to the dampened lung physiology and prolonged hospital stay related to those with chronic lung pathologies. Furthermore, their poor comorbid condition frequently restricts them from surgical interventions, giving rise to multiple techniques of conservative measures. Examples include prolonged chest tube drainage, chemical pleurodesis, metal coils, Watanabe spigots, endobronchial valves and many more.

Chemical pleurodesis is a method frequently employed in those unfit for surgery as it is cheap, can be administered with little supervision and obviates the need for expensive instruments which are not found commonly in district hospitals like bronchoscopes. They act through inflammation of the pleural surfaces leading to the opposition of the pleura and thus, closing offs the leak with the condition that the residual pneumothorax is small or negligible prior to the procedure. Preferably, the agent use should adhere to the lung tissue, non-allergenic or immunogenic, and freely permits lung expansion.

ABPP denotes the use of the patient's own blood instilled into the pleural cavity, a method employed since the 1980s. Its mechanism of action has been subject for debate with some claiming there is a patch effect through coagulated blood in addition to actual pleurodesis leading to better clinical outcomes. Its side effects include fever and infection. In comparison with chemical pleurodesis however, they do not cause much decline in pulmonary function tests, fewer toxicity rates, no report of pain or long term sequelae, and they can be used in partially expanded lungs.[2] Interestingly, there are no guidelines or randomised controlled trial (RCT) in relation to the procedure in non-surgical patients yet with many studies developing their own techniques including volume of blood used and position of the tube.[1-3]

Based on our institutional experience and literature review, we suggest the following step for higher success rates of the blood patch pleurodesis:

1. Withhold anti-platelet, anti-coagulation to minimize the risk of failure.[4]
2. Ensure no bacteremia or septicaemia.
3. Insert large-bore branula with a 3-way stopcock to withdraw blood.
4. Instillation of autologous blood of 1-2ml/kg.[3]
5. It is use of a large-bore chest tube (28-32 Fr) to reduce the risk of chest tube blockage post pleurodesis.[2]
6. Flush the chest tube with 10cc of normal saline after instillation of blood to prevent clot formation in-tubing.
7. After instillation of the blood, place the patient for 15 minutes in Trendelenburg position of up to 30 degrees with the chest tube directed towards the apex as the common site of bullae and PAL are at the apical lung.5
8. Loop the drainage tube over the drip stand for at least two hours after instillation.
9. If bubbling continues, repeat instillation of blood up to a maximum of three instillations.
10. If blood patch pleurodesis is unsuccessful despite three instillations, may consider resting for one week then connecting the chest tube to a pneumostat and encourage ambulation with incentive spirometry.
11. Blood patch pleurodesis might be repeated after one week of rest if the initial attempt was not successful.

CONCLUSION

ABPP offers an excellent alternative to conventional chemical pleurodesis in cases of SSP when the patient may not be fit for surgical options. Besides its simple procedure steps, it has better side effect profiles than other methods of pleurodesis while representing a cost-effective and safe way to resolve a PAL. We conclude that with the right techniques, results are maximised while complications are minimised and in future, we hope to increase our sample size or perform a randomised control trial for its use in non-surgical patients with SSP and formulate a protocol to improve the results and outcome further.

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