CASE REPORT

Successful use of blood pleurodesis to resolve an iatrogenic persistent pneumothorax in a patient with pulmonary tuberculosis

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SUMMARY

A Somali patient with previous tuberculosis presented clinically unwell with features consistent with a right-sided pleural effusion. Subsequent investigations confirmed a community-acquired pneumonia and relapse of pulmonary tuberculosis, with a drug resistant strain isolated. The patient developed a large left-sided iatrogenic pneumothorax, which recurred and failed to resolve despite the successful insertion of both Seldinger and surgical chest drains, and the patient remained clinically unstable on the intensive care unit. A blood pleurodesis was successfully used to provide resolution of this patient's previously persistent pneumothorax, which has resulted in stabilisation of the patient and no further pneumothoraces have occurred subsequently. The authors therefore highlight the use of a blood pleurodesis as a little used technique that may provide a valuable tool to other clinicians in similar cases.

BACKGROUND

Pneumothorax is a common respiratory condition, which can occur spontaneously or secondary to respiratory disease or iatrogenic causes. British Thoracic Society (BTS) guidelines exist on the management of primary and secondary pneumothoraces, with guidance on when aspiration and chest drains should be utilised.¹ Management of non-resolving pneumothorax in patients unsuitable for surgery includes medical pleurodesis with tetracycline or talc, and the lesser-used blood pleurodesis. The complications of tetracycline pleurodesis have been described,² and talc pleurodesis may be non-licensed and cause adult respiratory distress if talc with small particles is used.³ Therefore we highlight the use of blood pleurodesis to successfully resolve an iatrogenic pneumothorax, which resulted in immediate resolution and did not result in any complications for this patient.

CASE PRESENTATION

A 42-year-old Somali man, presented with a 4-day history of difficulty in breathing associated with drenching night sweats. He also reported a significant weight loss in the 3 weeks preceding presentation. He denied having a cough, haemoptysis, abdominal or urinary symptoms. His medical history included previously treated pulmonary tuberculosis (TB) (diagnosed 8 years previously and treated with on a standard TB regimen for 6 months) and schizophrenia.

The patient was febrile on arrival, and noted to be tachycardic (heart rate 160 bpm), borderline hypotensive (blood pressure 109/77 mm Hg) and tachypnoeic (respiratory rate 28) with pulse oximetry recording saturations of 88% on air. Examination revealed reduced breath sounds at both lung bases, with crepitations in the left lung audible from the base to the mid-zone. His right lung base was noted to be dull to percussion in comparison to the left base. Initial bloods demonstrated a neutrophilia with raised inflammatory markers (white cell count $10.8 \times 10^9/L$, neutrophils $10.22 \times 10^9/L$, C reactive protein 127 mg/L) and sodium 124 mg/dL with other renal function being normal. His liver function tests and coagulation were within normal parameters. The patient was started on tazocin and clarithromycin, in addition to steroids and oxygen therapy in accordance with BTS guidelines. On admission his chest radiograph demonstrated bi-basal consolidation and a moderate right-sided pleural effusion (figure 1A). A Seldinger chest drain was inserted under direct ultrasound guidance, and pleural fluid obtained was consistent with an exudate (serum total protein 28.5 vs 36 g/L serum; lactate dehydrogenase serum 875 U/L vs pleural fluid 751 U/L; pleural fluid glucose 7.5 mmol/L, pleural pH 7.3).

The patient remained febrile despite 24 h intravenous antibiotics, did not show improvement in his other vital signs and remained clinically septic. Further investigations included a CT chest that demonstrated bilateral diffuse small nodular opacities consistent with miliary TB and mediastinal lymphadenopathy (figure 1B). Additionally there was right-sided pleural effusion and bi-basal consolidation consistent with examination and chest radiograph findings (figure 1C). An ultrasound of the patient's abdomen demonstrated several mildly enlarged lymph nodes in the porta hepatis and epigastrium. It was therefore felt that this patient had miliary TB and, after bronchoscopy at which bronchoalveolar lavage fluid (BAL) was obtained, he was started on TB treatment with quadruple therapy. His inflammatory markers continued to improve and the patient showed clinical improvement, so his antimicrobial therapies were rationalised.

Despite initial clinical improvement the patient deteriorated clinically, and repeat chest radiograph showed worsening bi-basal consolidation (figure 1D). His BAL fluid grew *Klebsiella pneumoniae* on microbial culture. The patient continued to deteriorate and

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Figure 1 (A) Chest radiograph obtained on admission, demonstrating bi-basal consolidation and a moderate right-sided pleural effusion. (B) Transverse section of CT chest illustrating diffuse small nodular opacities consistent with miliary tuberculosis and mediastinal lymphadenopathy. Additionally a right-sided pleural effusion and bi-basal consolidation was detected on further sections. (C) Chest radiograph after clinical deterioration, demonstrating a worsening bi-basal consolidation.

developed a type 1 respiratory failure with blood gases results on 15 L oxygen showing pH 7.30, pCO₂ 5.8, pO₂ 10.1, lactate 1.6, bicarbonate 21.0, base excess −3.8. A diagnosis of acute respiratory distress syndrome (ARDS) was performed. The patient was intubated and admitted to the intensive care unit (ICU), where he developed a left-sided pneumothorax secondary to mechanical ventilation that necessitated a second chest drain. His TB therapy was escalated to moxifloxacin and amikacin due to the patient's deterioration and failure to respond to initial quadruple therapy. Investigations revealed that he was serologically negative for HIV, hepatitis B and C and subsequent sensitivity results in the BAL fluid revealed that he was *Mycobacterium tuberculosis* positive, with a strain highly resistant to isoniazid and rifampicin, but sensitive to ethambutol, pyrazinamide, amikacin and ofloxacin.

The patient remained clinically stable and after an 8 day ICU admission was transferred to the respiratory ward, but subsequently deteriorated again, with a recurrent type 1 respiratory failure. Imaging revealed a discernable increase in the size of the left-sided pneumothorax that now caused a complete collapse of the left lung (figure 2A). A third chest drain was inserted and the patient was readmitted to the ICU, for a further 6 days. His pneumothorax continued to persist for several weeks, despite numerous Seldinger and surgical chest drains being sited.

TREATMENT AND OUTCOME

The patient's pneumothorax was therefore managed by use of blood pleurodesis that provided definitive management in this

case. This was performed following the methodology outlined in Rinaldi *et al*.⁴ Briefly, 100 mL of the patient's own blood was taken aseptically and injected aseptically into the already sited chest drain. The drainage tube was held in an elevated position, and rotation of the patient avoided. The chest drain was shortened after 4 h, left overnight and inspected the following morning for bubbling. In this case, the drain was no longer swinging, and a chest radiograph was performed. A series of chest radiographs show the pneumothorax persisting despite the Seldinger and surgical chest drains, with resolution of his pneumothorax occurring after blood pleurodesis (figure 2A–F).

After a 6-day ICU admission the patient was transferred to the respiratory ward, the patient stabilised clinically, and his chest drains were removed. He was discharged home after a total hospital stay 59 days, including two admissions to ICU totally 14 days. His discharge plan included outpatient follow-up in the TB clinic under direct observed administration of medications performed by the TB nurse specialists. This patient has been attending outpatient clinic for 18 months and has been report with TB treatment throughout this time period. He has had no further respiratory problems and his pneumothorax has not recurred in the subsequent time since discharge home.

DISCUSSION

The use of medical pleurodesis in patients with recurrent pneumothorax has been shown to have a lower recurrence rate

Figure 2 (A) Anteroposterior (AP) chest radiograph taken on deterioration of the patient on the medical ward after his initial intensive care unit admission during which the patient was intubated. A left-sided pneumothorax is present as well as features consistent with acute respiratory distress syndrome. (B) AP chest radiograph obtained 3 days after insertion of a Seldinger chest drain, showing a persistent left-sided pneumothorax. (C) AP chest radiograph obtained 2 days after insertion of a surgical chest drain, demonstrating the left-sided pneumothorax persists. (D) AP chest radiograph taken immediately postblood pleurodesis to the left thoracic cavity, demonstrating a reduction in the size of the pneumothorax. (E) Posteroanterior (PA) chest radiograph taken 5 days following blood pleurodesis, demonstrating resolution of the left-sided pneumothorax. (F) PA chest radiograph taken in outpatients' department 18 months after the patient's discharge from his acute admission.

than chest tube drainage alone in patients unable to undergo surgery.⁵⁻⁷ Previous literature illustrates the use of blood pleurodesis to treat primary and secondary pneumothorax, however, evidence supporting its use and indications for this procedure remain unclear. While other case reports highlight the use of blood pleurodesis in primary pneumothorax,⁸⁻¹⁰ there are no randomised controlled trials comparing this technique to others.

The strongest evidence for its use exists when an air leak persists following thoracic surgery¹¹ although this study looked at its use in patients not suitable for surgical intervention. A review of the literature did not reveal any published cases highlighting the use of blood pleurodesis in a patient with active pulmonary tuberculosis. There were also no reports of its use following pneumothorax precipitated by chest drain insertion, although its

use and role in persistent air leak following thoracic surgery or intrathoracic procedures has been clearly documented. Studies investigating the efficacy of blood pleurodesis outside this specific group of patients unable to undergo surgical intervention have not been performed, and it therefore remains unclear as to if autologous blood pleurodesis has any clinical advantage in comparison to surgical techniques.

In published case reports, the complication rate of blood pleurodesis appears low, although this clearly may be affected by publication bias. Reported complications include empyema, reported to occur with an incidence of 9% in one paper, and tension pneumothorax.^{12 13} Hence a potential benefit of blood pleurodesis include the possibility of a lower complication rate in comparison to other agents, and it appears that blood pleurodesis may have a lower complication rate than the tetracycline, which is currently recommended as a first-line agent.² The use of talc to cause pleurodesis is well documented, however its use remains non-license and acute respiratory distress may occur. Furthermore, the use of the patient's own blood is an easy technique that may prove to be relatively inexpensive and cost-effective. Blood pleurodesis may also cause less pleural thickening and adhesions, and there have not been reports of pain or long-term complications associated with this technique.^{8 14 15} Additionally, case reports typically cite an almost immediate resolution of the pneumothorax where blood pleurodesis has been successfully used.^{4 16} This may represent an advantage to this technique over other medical pleurodesis methods, and it has been suggested that this is a result of the blood forming a sealing clot over the leak, termed a blood patch, rather than true pleurodesis.

In this case, we report the successful use of blood pleurodesis to resolve a persistent pneumothorax caused by mechanical ventilation of a patient in ARDS, precipitated by pulmonary TB and a community-acquired pneumonia. In this case we found that using this technique did not provoke a clinical deterioration in this clinically unstable patient, but rather that it lead to the

stabilisation of this patient and their clinical recovery. This patient has not developed any respiratory complications as a result of blood pleurodesis, and has remained stable throughout the 18 months of follow-up conducted in the outpatient clinical setting. The authors therefore highlight this apparently little used technique and advocate a randomised controlled trial may prove useful to determine its efficacy in comparison to other medical and potentially surgical techniques to resolve persistent pneumothorax.

Contributors MS wrote the manuscript, and obtained images for publication. CH, VMM and TCO edited the manuscript. CH reviewed the literature and VMM obtained patient consent.

Competing interests None.

Patient consent Obtained.

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REFERENCES

- 1 Davies HE, Davies RJ, Davies CW; British Thoracic Society Pleural Disease Guideline Group. Management of pleural infection in adults: British Thoracic Society Pleural Disease Guideline 2010. *Thorax* 2010;65(Suppl 2):ii41–53.
- 2 Henry M, Arnold T, Harvey J. BTS guidelines for the management of spontaneous pneumothorax. *Thorax* 2003;58(Suppl 2):ii39–52.
- 3 Janssen JP, Collier G, Astoul P, et al. Safety of pleurodesis with talc poudrage in malignant pleural effusion: a prospective cohort study. *Lancet* 2007;369:1535–9.
- 4 Rinaldi S, Felton T, Bentley A. Blood pleurodesis for the medical management of pneumothorax. *Thorax* 2009;64:258–60.
- 5 Ifageme I, Moreno L, Huertas C, et al. Spontaneous pneumothorax. Long-term results with tetracycline pleurodesis. *Chest* 1994;106:347–50.
- 6 Gyorik S, Erni S, Studler U, et al. Long-term follow-up of thorascopic talc pleurodesis for primary spontaneous pneumothorax. *Eur Respir J* 2007;29:757–60.
- 7 Light RW, O'Hara VS, Moritz TE, et al. Intrapleural tetracycline for the prevention of recurrent spontaneous pneumothorax. Results of a Department of Veterans Affairs cooperative study. *JAMA* 1990;264:2224–30.
- 8 Ando M, Yamamoto M, Kitagawa C, et al. Autologous blood-patch pleurodesis for secondary spontaneous pneumothorax with persistent air leak. *Respir Med* 1999;93:432–4.
- 9 Martinez-Escobar S, Ruiz-Bailen M, Lorente-Acosta MJ, et al. Pleurodesis using autologous blood: a new concept in the management of persistent air leak in acute respiratory distress syndrome. *J Crit Care* 2006;21:209–16.
- 10 Robinson CL. Autologous blood for pleurodesis in recurrent and chronic spontaneous pneumothorax. *Can J Surg* 1987;30:428–9.
- 11 Shackcloth MJ, Poullis M, Jackson M, et al. Intrapleural instillation of autologous blood in the treatment of prolonged air leak after lobectomy: a prospective randomized controlled trial. *Ann Thorac Surg* 2006;82:1052–6.
- 12 Cagirci U, Sahin B, Cakan A, et al. Autologous blood patch pleurodesis in spontaneous pneumothorax with persistent air leak. *Scand Cardiovasc J* 1998;32:75–8.
- 13 Williams P, Laing R. Tension pneumothorax complicating autologous "blood patch" pleurodesis. *Thorax* 2005;60:1066–7.
- 14 Mallen JK, Landis JN, Frankel KM. Autologous "blood patch" pleurodesis for persistent pulmonary air leak. *Chest* 1993;103:326–7.
- 15 Mitchem RE, Herndon BL, Fiorella RM, et al. Pleurodesis by autologous blood, doxycycline, and talc in a rabbit model. *Ann Thorac Surg* 1999;67:917–21.
- 16 Lang-Lazdunski L, Coonar AS. A prospective study of autologous 'blood patch' pleurodesis for persistent air leak after pulmonary resection. *Eur J Cardiothorac Surg* 2004;26:897–900.

Learning points

- Blood pleurodesis can be successfully used to provide resolution of pneumothorax.
- The authors demonstrate successful use of blood pleurodesis in a clinically unstable patient where other techniques have failed.
- This technique can provide definitive management with no further respiratory complications.

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