Intrapleural fibrinolysis in clotted haemothorax

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ABSTRACT

The immediate treatment of haemothorax is thoracostomy tube insertion. One complication of haemothorax is retained blood and if improperly managed, this can lead to complications such as empyema and fibrothorax. The ideal management of clotted haemothorax is a matter of controversy. Video-assisted thoracoscopic surgery (VATS) is believed to be the best available modality for the management of clotted haemothorax. However, VATS is not routinely available in many centres. One easily available and effective alternative to VATS is the use of intrapleural fibrinolysis. We report the successful management of a post-traumatic clotted haemaothorax in a 34-year-old man, using intrapleural instillation of streptokinase, and review the literature on the management of clotted haemothorax.

Keywords: clotted haemothorax, haemothorax, intrapleural fibrinolysis, intrapleural streptokinase, video-assisted thoracoscopic surgery

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INTRODUCTION

Haemothorax is a common emergency and is most commonly a result of trauma, either blunt or penetrating. Although tube thoracostomy is commonly adequate for the initial management of a haemothorax, in most instances, failure of tube thoracostomy and clotted haemothorax can result in 5% to 30% of cases[1]. Controversy still exists regarding the approach to management of residual clotted haemothorax after trauma. Both aggressive and conservative types of treatment of clotted haemothorax have been advocated. A second chest tube is an inadequate alternative in retained haemothorax where initial tube thoracostomy is insufficient[2].

Although thoracotomy is an effective procedure in the management of clotted haemothorax, currently, minimal invasive procedures are preferred to open thoracotomy. Video-assisted thoracoscopic surgery (VATS) is currently regarded as the best available modality for the management of clotted haemothorax[1]. However, VATS is not routinely available in many centres, and is not without complications. Another easy, widely-available and effective alternative to surgical management is intrapleural fibrinolysis using streptokinase[3]. In this article, we report the successful management of a patient with clotted haemothorax, and review the literature on the current management of clotted haemothorax.

CASE REPORT

A 34-year-old previously-healthy man presented with history of chest pain and breathlessness of one-day duration. There was a history of blunt chest trauma following a roadside accident when his car steering wheel had hit his chest. There was no history of fever, cough or haemoptysis. On physical examination in the emergency department, the patient was conscious and afebrile, with a pulse rate of 100/min, blood pressure of 120/80 mmHg with no postural fall, and respiratory rate of 28/min. Examination of the respiratory system revealed decreased breath sounds in the whole of the right hemithorax. Examination of the abdomen, cardiovascular system and nervous system was unremarkable.

Chest radiograph revealed left-sided pleural effusion with no rib fractures, which was confirmed on computed tomography (CT) of the chest (Fig. 1). Thoracocentesis revealed frank blood with haematocrit of 22% (corresponding peripheral blood hematocrit of 31%). A diagnosis of haemothorax was made, and a tube thoracostomy was performed, which drained almost 1 L of sanguineous fluid. As patient was haemodynamically stable, no blood transfusions were given. However, the patient received oral amoxiaclav 625 mg three times/day

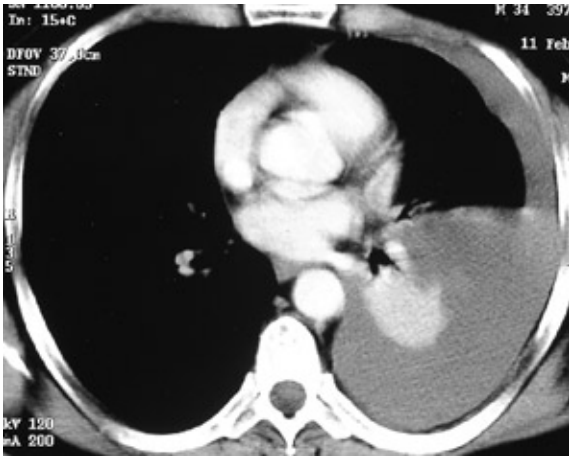

Fig. 1 Axial CT image of the chest shows a left-sided pleural effusion.

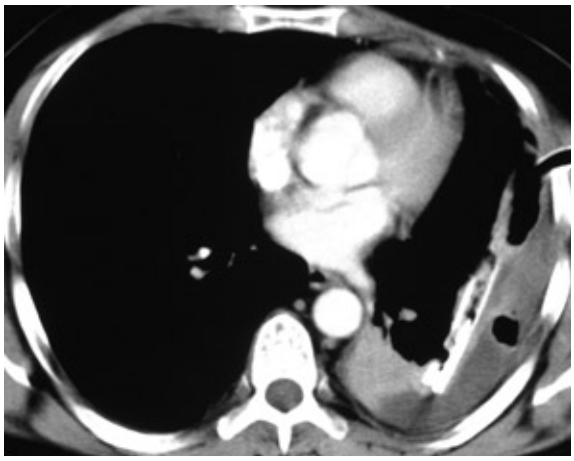

Fig. 2 Repeat axial CT image of the chest on day three shows a left-sided organised pleural collection.

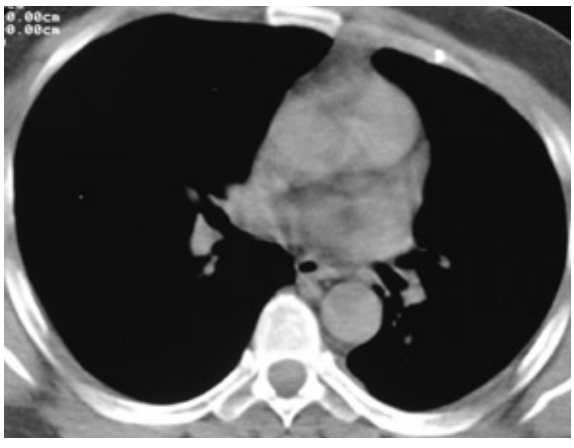

Fig. 3 Axial CT image of the chest after seven days shows clearing of the left-sided organised pleural collection.

as prophylaxis for empyema, and haematinics for anaemia. Repeat chest radiograph done on the third day showed persistence of effusion and no drainage through the intercostal tube. CT of chest was repeated which showed an organised collection in the left hemithorax (Fig. 2).

In view of the retained blood, intrapleural fibrinolysis was performed. 250,000 units of streptokinase were diluted in 100 ml of normal saline, and instilled intrapleurally once a day for five consecutive days (days three to seven) with a dwell time of four hours. There was no change in the clotting profile of the patient, as assessed by the prothrombin time and activated partial thromboplastin time. Intrapleural instillation of streptokinase was followed by significant drainage of serosanguineous fluid, and repeat CT showed complete resolution of the retained collection (Fig. 3). Patient was discharged, and was asymptomatic at one-month follow-up.

DISCUSSION

Haemothorax is defined as presence of bloody fluid in the pleural cavity, with pleural fluid hematocrit being 50% or more of the peripheral blood haematocrit[4]. The most common cause of haemothorax is trauma, either blunt or penetrating. Causes of spontaneous haemothorax are rare, and include anticoagulant therapy, pulmonary embolism, and pleural malignancy. Initial treatment of haemothorax includes treatment of the associated haemorrhagic shock, if any, and drainage of the pleural space with a tube thoracostomy.

Drainage has three distinct advantages, namely: apposition of the pleural surfaces and tamponade of the bleeding vessel, expansion of lung parenchyma and tamponade of parenchymal vessels, and drainage of partially-clotted blood. If the pleural effusion persists despite tube thoracostomy, then a diagnosis of clotted or retained haemothorax is made, which is defined radiologically as an absence of improvement despite tube thoracostomy on the second day after trauma[5]. This complication can occur in as many as 5% to 30% of patients, and up to 40% of these patients will require further surgical intervention for non-resolving, complicated intrapleural collections, empyema or fibrothorax[5].

The placement of additional chest tubes to treat a retained haemothorax is ineffective because of the presence of clotted blood and loculations[2]. VATS allows the breakdown of adhesions and drainage of any residual collection, and is increasingly used in the management of empyema[6]. In fact, other than thoracotomy, VATS is believed to be the best available modality for the management of clotted haemothorax with efficacy rates between 80% and 100%[5,7]. Also, a decision to proceed with an open thoracotomy can be made expeditiously at the time of VATS. However, VATS is not routinely available in many centres (including our centre), and physicians must resort to other measures of treatment.

One universally-available alternative is intrapleural fibrinolytic therapy (IPFT). In two studies, the use of intrapleural fibrinolytic agents (streptokinase 250,000 units or urokinase 100,000 units daily) resulted in resolution of clotted haemothorax with an overall success rate of 92%[3,8]. Moreover, it has been clearly shown that intrapleural streptokinase administered at doses of 250,000 IU retained in the pleural cavity for up to two hours to a cumulative dose of 1.5 million IU over three days, does not cause physiologically-significant systemic fibrinolysis, as seen in our patient, and is therefore unlikely to cause systemic bleeding. Thus, it is safe to administer IPFT locally to patients requiring enhanced drainage of pleural collections, including clotted haemothorax[9,10].

What are the complications of VATS versus IPFT? The reported complication rates of VATS in large series are around 10%[11]. The most common complications of VATS are transient hypoxaemia or reversible arrhythmia. Surgical complications such as chest wall bleeding or iatrogenic lung injury have also been reported. Insertion or levering on the trocars can result in intercostal neuritis. However, IPFT is also not immune to complications. Although, the use of IPFT generally causes no systemic coagulation effects[9,10], there is a report of a single case of a major haemorrhage following intrapleural streptokinase instillation, attributed to systemic absorption of the agent[12]. Other systemic side effects with intrapleural streptokinase are arthralgia, nausea, malaise, headache, fever (as high as 40°C) and pleural pain[12,13].

Anaphylaxis and acute hypoxaemic respiratory failure, although very uncommon, have also been reported[14,15]. Hypoxaemia most likely results from a direct effect of the products of fibrinolysis on the pulmonary circulation. In addition, streptokinase may be associated with allergic reactions, although these are uncommonly seen nowadays, due to the availability of purified forms of streptokinase. Fibrinolysis may also theoretically increase the risk of empyema. IPFT can also cause lysis of clots that has contributed to haemostasis, hence it should not be employed for the first 48 hours after trauma[8]. IPFT is a time-consuming procedure which takes three to seven days, as compared with VATS which requires approximately one hour.

Can IPFT replace VATS? There have not been any prospective trials to answer this question but in a retrospective analysis, VATS was found to be superior to IPFT, both in terms of decreased hospital stay and need for thoracotomy[5]. However, prospective trials are required to definitely answer this question. Recently, intrapleural streptokinase, even without pleural drainage, has been shown to increase resolution of clots in the pleural space, and decrease pleural thickening and adhesion in experimental clotted haemothorax[16]. Again, more human trials are needed to confirm this finding.

Can IPFT be complementary to VATS? An understanding of the pathological features of a clotted haemothorax makes it clear that the clotted haemothorax should be evacuated within seven to ten days of injury, otherwise by the tenth day, the clotted blood will form a thick fibrous peel which cannot be easily removed and decortication will be required[17]. Thus, with the available window period, one can first utilise IPFT and if unsuccessful, can proceed to surgical therapy. In conclusion, IPFT is a safe, widely-available and effective alternative to VATS. IPFT should be added to the algorithm for management of clotted haemothorax before proceeding to VATS, minithoracotomy or thoracotomy.

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