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Intrapleural Tranexamic Acid for Management of Iatrogenic Massive Haemothorax Following Central Venous Catheterization: A Case Report and Literature Review

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1. Abstract

Haemothorax refers to the accumulation of blood within the pleural cavity and is most frequently encountered following thoracic trauma. Less commonly, it may occur secondary to malignancy or as a complication of invasive medical procedures. Standard management includes prompt resuscitation, pleural drainage using tube thoracostomy, and definitive control of the bleeding source. Surgical exploration may be necessary in cases of ongoing haemorrhage; however, thoracotomy carries substantial procedural risk in critically ill patients. We describe a case of severe iatrogenic haemothorax that developed after central venous catheter placement in a renal transplant recipient. Because the patient was considered unsuitable for surgical intervention, intrapleural tranexamic acid was administered through the chest drain, resulting in rapid reduction of haemorrhagic output and clinical stabilization. In addition, a brief review of previously reported cases utilizing intrapleural tranexamic acid for haemothorax is presented.

2. Keywords

Haemothorax, Tranexamic Acid, Iatrogenic Complication, Thoracotomy, Pleural Bleeding

3. Key Messages

- Haemothorax is a medical emergency requiring rapid diagnosis, hemodynamic stabilization, and pleural drainage.
- Thoracotomy remains an important treatment option for persistent or life-threatening bleeding but may not be feasible

in high-risk patients.

- Intrapleural administration of tranexamic acid may represent a valuable adjunctive therapy in selected patients with ongoing haemothorax when surgical intervention is contraindicated or delayed.

4. Introduction

Haemothorax is defined by the presence of pleural fluid with a hematocrit that is at least 50% of the patient's peripheral blood hematocrit. The condition most commonly arises from chest trauma but may also result from malignancies or procedural complications. Among iatrogenic causes, central venous catheter insertion and thoracostomy tube placement are frequently implicated. Initial treatment focuses on restoration of hemodynamic stability through fluid resuscitation and blood transfusion, followed by evacuation of blood from the pleural cavity using tube thoracostomy. Persistent bleeding despite these measures may necessitate thoracic surgery. However, operative intervention is associated with considerable morbidity, particularly in critically ill individuals. In such situations, alternative therapeutic strategies may be considered. We report a case of massive iatrogenic haemothorax successfully managed with intrapleural tranexamic acid and review the available literature regarding its use in similar settings.

5. Case Presentation

A 30-year-old woman with end-stage kidney disease resulting from immunoglobulin A nephropathy underwent living-donor renal transplantation in May 2024. Her postoperative course was complicated by acute allograft rejection. Despite treatment with pulse methylprednisolone, renal function continued to deteriorate, with progressive elevation of serum creatinine and the development of uremic symptoms.

Given the need for renal replacement therapy, a hemodialysis catheter was inserted into the right internal jugular vein. Approximately three hours after the procedure, the patient developed acute breathlessness accompanied by hypoxemia. Chest radiography and bedside lung ultrasonography demonstrated a large right-sided pleural effusion (Figure 1). The absence of blood return through the catheter lumen raised concern for vascular injury with associated haemothorax.

The patient rapidly developed hemodynamic instability, necessitating transfusion of blood products and initiation of

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vasopressor support. A 24-Fr intercostal drainage tube was inserted into the right pleural cavity, immediately yielding frank blood. Approximately 2.5 liters of hemorrhagic fluid were evacuated initially, followed by an additional liter during the subsequent one to two hours. Concurrently, hemoglobin concentration declined from 8 g/dL to 4 g/dL despite ongoing resuscitation.

Progressive cardiorespiratory compromise required endotracheal intubation and mechanical ventilation. Contrast-enhanced computed tomography of the thorax demonstrated a large right pleural collection but failed to identify active contrast extravasation (Figure 2). Ongoing pleural bleeding prompted consideration of thoracotomy. However, due to the patient's recent major surgery, poor physiological reserve, and overall frailty, the thoracic surgical team deemed operative intervention excessively high risk.

Consequently, intrapleural tranexamic acid was administered through the chest tube. A total dose of 5 g diluted in 250 mL isotonic saline was instilled, and the drain was clamped for 30 minutes. Over the following 24 hours, drainage became progressively serous and the volume of pleural output decreased substantially. Hemodynamic parameters improved, enabling discontinuation of vasopressor support and extubation on the third day.

Subsequent chest tube output remained below 100 mL per day, and follow-up chest radiography demonstrated satisfactory lung re-expansion with marked reduction of the pleural collection (Figure 3). The intercostal drain was removed on day five, after which the patient was transferred out of the intensive care unit. Five months later, she remained clinically stable on maintenance hemodialysis and low-dose prednisolone therapy.

6. Discussion

Haemothorax is an uncommon but potentially fatal condition that requires immediate recognition and treatment. Mortality rates may be extremely high when diagnosis and intervention are delayed. Central venous catheterization, including insertion of hemodialysis catheters through the internal jugular vein, represents a recognized but infrequent cause of iatrogenic haemothorax.

Although ultrasound guidance has improved procedural safety, certain stages of catheter placement, including guidewire advancement and vessel dilatation, are not continuously visualized and may result in inadvertent vascular injury. Extrathoracic venous injuries are often readily recognized because they produce visible swelling or hematoma formation. In contrast, intrathoracic injuries can remain occult until significant blood loss has occurred, leading to respiratory compromise and circulatory collapse.

Clinical indicators of catheter-related vascular injury include sudden hypotension, hypoxemia, and inability to aspirate blood through the catheter ports. Prompt diagnosis is essential because management requires both evacuation of accumulated blood and control of the bleeding source.

Tube thoracostomy remains the cornerstone of treatment for haemothorax. Patients with persistent or massive bleeding may require thoracotomy or endovascular embolization. However, these interventions are not always feasible due to patient-related factors such as recent surgery, severe comorbidity, or hemodynamic instability.

Tranexamic acid is a synthetic antifibrinolytic agent widely used to control bleeding in a variety of clinical settings. In respiratory medicine, it has demonstrated efficacy in reducing procedure-related hemorrhage during bronchoscopic and pleural interventions. Intrapleural administration has also been investigated following lung decortication surgery and in malignant hemorrhagic pleural effusions, where it has been associated with reduced drainage volumes and decreased transfusion requirements.

A literature review was conducted using PubMed and Embase databases with combinations of the terms "haemothorax," "tranexamic acid," and "intrapleural tranexamic acid." Four previously reported patients were identified. All cases involved haemothorax secondary to malignant disease and demonstrated successful resolution following intrapleural administration of tranexamic acid. Reported doses generally ranged around 5 g, administered either as a single treatment or over two consecutive days.

Unlike previous reports, our patient developed haemothorax following a procedural complication rather than malignant disease. Administration of intrapleural tranexamic acid was associated with a rapid decline in pleural blood loss, stabilization of hemodynamic status, and avoidance of high-risk thoracotomy. To our knowledge, this represents one of the first documented cases demonstrating successful use of intrapleural tranexamic acid for iatrogenic haemothorax related to central venous catheterization.

7. Conclusion

Intrapleural tranexamic acid may offer an effective adjunctive treatment option for selected patients with persistent haemothorax when conventional management fails or surgical intervention is not immediately feasible. While current evidence remains limited to case reports and small case series, the favorable outcome observed in our patient suggests a potential role for this therapy in managing difficult cases of iatrogenic haemothorax. Larger studies are required to establish optimal dosing, safety, and efficacy before routine clinical adoption.

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