Tissue plasminogen activator for mediastinal tube clearance in pediatric chylothous effusion: A case report

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Chylothorax is a significant problem in pediatric cardiac surgery and is associated with longer hospital stays, greater costs, and increased morbidity.¹ It occurs from injury of the thoracic duct system, venous or lymphatic congestion, or central vein thrombosis. Complications from chylothorax include metabolic derangements, malnutrition, coagulopathy and thrombosis, increased infection risk, and restrictive lung disease. A number of treatments have been proposed without a clear standard. Drainage tubes remain a cornerstone of therapy until chylous drainage resolves. However, the tubes are at increased risk of occlusion due to high fibrin content of chyle. Without a functioning tube, patients may be at greater risk for restrictive effusions.

CLINICAL SUMMARY

A 16-month-old boy with a double outlet right ventricle and ventricular septal defect was admitted following repair with intracardiac baffle, right ventricular outflow tract muscle bundle resection, and patent foramen ovale closure. A patent ductus had been ligated via left thoracotomy 1 year earlier. A single 19-French Blake chest tube was placed in the anterior mediastinum to drain the pericardial space. On postoperative day (POD) 3, chest tube output consistency became milky white. Fluid analysis revealed a triglyceride concentration of 395 mg/dL with 29,092 cells/cumm nucleated cells (93% lymphocytes) consistent with chylous effusion. Despite implementation of a low-fat diet and drainage from the existing mediastinal tube, the pericardial effusion increased and the patient returned to the operating room for a pericardial window on POD 25, at which time the tube was replaced with a 15-French Jackson-Pratt drain. Over several days, the drain output continued to decrease despite an increase in pericardial effusion. Mechanical manipulation of the tube by stripping the drain was unsuccessful. On POD 30, 3 mg tissue plasminogen activator (tPA) was instilled

Pericardial drainage per day versus qualitative effusion size, by echocardiogram.

Central Message

Tissue plasminogen activator is a viable option for clearance of occluded mediastinal tubes in the setting of chylothous effusion.

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in the drain with a responding increase in daily output of nearly 5 times. The drain subsequently remained patent and both the drainage and effusion continued to decrease. The drain was eventually removed on POD 36 without further accumulation (see Figure 1).

DISCUSSION

Chylothorax incidence has been described at a rate of between 3% and 9% in literature reviews.^{2,3} Mery and colleagues,¹ using the Pediatric Health Information System database, showed that chylothorax incidence increased from 2% in 2004 to 3.7% in 2011, possibly related to increasing complexity of surgeries or a focus on early feeding. The high fibrinogen and prothrombin content of chyle increases chest tube clotting risk. In addition, chest tube occlusion is a common complication of any chest tube in pediatric cases given the smaller diameter of tubes used.

With the increasing incidence of chylothoraces, new interventions for chest tube clearance need to be considered. Fibrinolytic therapy with tPA and urokinase have been described for empyema in adults and children and fibrinopurulent pericarditis in adults.^{4,5} For empyema in a pediatric patient, Hawkins and colleagues⁵ employed dosing of tPA starting at 0.1 mg/kg to a maximum of 3 mg prepared in 10 to 30 mL normal saline. After infusion through a chest tube, the solution dwelled for 45 to 60 minutes and then the tube was placed to suction, repeating the

FIGURE 1. Pericardial drainage per day versus qualitative effusion size, by echocardiogram. *TPA*, Tissue plasminogen activator.

process 3 times daily for 3 to 4 days.⁵ In this review of 21 patients,⁵ the only complication was an average drop in hemoglobin of 2.5 g/dL. Therefore a relative contraindication to this type of therapy could include any moderate or uncorrectable coagulopathy. We selected 3 mg as the dose based on the prior pediatric dosing for empyema⁵ and a desired volume of 3 cc (1 mg/cc tPA concentration), which we thought was adequate to fill a tube of this size. This dosing of tPA was sufficient to clear the chest tube without significant complication (there was a decrease in hemoglobin of 1.4 g/dL).

Infusion of fibrinolytic therapy into the pericardium has been described in adults, but to the best of our knowledge there has been no prior description of it in children. As described in our patient, it is likely a viable option for clearance of mediastinal tubes in the setting of chylous effusions and may help avoid additional procedures and anesthesia. Based on adult data showing decreased rates of bleeding complications from thrombolytic therapy for stroke after 7 days from major surgery,⁶ we do not

advocate this treatment during the first postoperative week and advise administering under close hemodynamic monitoring.

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