



Treating Empyema Thoracis in children with Tissue Plasminogen activator (t-PA). A case report.

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Abstract

Introduction: Intrapleural tissue plasminogen activator (t-PA), has been used in complicated parapneumonic effusions in adults and paediatric population, who are not responding to medical management and tube drainage due to presence of loculated/thick pleural fluid.1 The mainstay is the right indication and choice of patient's population. Here, we present a 13-year-old boy admitted in paediatric ICU with fever and difficulty in breathing, a known case of cerebral palsy. He was diagnosed as left massive pleural effusion. At the outset we put in a chest tube. Tube drainage was minimal with poor drainage and no expansion of the lung until after 5 days. Thus, the option of Image guided placement of pig tail catheter and fibrinolytic therapy (t-PA) was sought to avoid further morbidity. The purpose of reporting this case is to redefine the indications of fibrinolytic therapy in paediatric cases in our set of population.

Conclusion: The fibrinolytic therapy is an effective method in children with complicated parapneumonic effusion & empyema thoracis, not responding to tube drainage. And if chosen in the right patient at the right time the results are promising.

Case Report**Introduction**

Empyema thoracis is a sequela of parapneumonic effusions in childhood Pneumonia. It has long been known and treated by tube drainage, VATS (video assisted thoracoscopic surgery) and open Thoracotomy & decortication, depending upon the stage of Empyema (Stage I to Stage III). Literature shows promising results of Ultrasound guided placement of pigtail catheter and a subsequent course of Tissue plasminogen activators (tPA) to liquify and drainage of empyema. Multiple studies have been done with increasing rates of success with this minimal invasive approach and development of safe tPA. In our part of the world the use of tPA is not considered safe so it is not being used as frequently as it is described in western literature. We used Alteplase (tPA) and achieved the promising results in a child with compromised state of general and mental health. This case report will act as an index case for the safe use of tPA in children with Parapneumonic effusion & empyema.

CASE HISTORY:

A 13 years old boy, known case of cerebral palsy and developmental delay admitted through emergency room as a case of bronchopneumonia complicated by left sided pleural effusion.

According to mother, child was in his usual status of health until 10 days ago. Then he developed moderate to high grade fever & dry cough associated with chest pain. mainly on the left side, aggravated by positioning. He had difficulty in lying down in left lateral and supine position, fever was documented up to 39 C, improved with sponging and antipyretics. There was poor oral intake and activity. The parents sought medical advice from a nearby clinic, where he was given nebulization and antibiotics and discharged. Since there was no improvement in clinical condition so he was brought to our facility after 6 days. There is past history of repeated upper respiratory tract infections for which he used to receive nebulization and oral antibiotics. On examination, child had mild respiratory distress, maintaining oxygen saturation by face mask at 5 litres of oxygen. Air entry was reduced in the left lung field. X-ray chest PA (figure 1) view showed left sided massive pleural effusion with mediastinal shift to the right side.



Figure 1

CT chest further confirmed the findings of pleural effusion with underlying lung collapse and loculated thick-walled fluid collection at middle lung zone (figure 2).

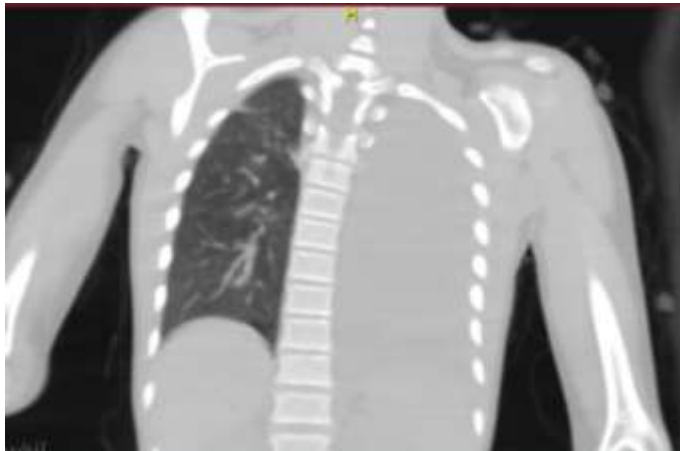


Figure 2

CBC showed leukocytosis with neutrophilia & ESR =120, Aspirated fluid was serosanguinous on tube insertion (figure 3) with RBCs=42000/mm³, WBCs=304/mm³, LDH= 520U/L, Proteins= 50 gm/L, AFB = negative & fluid culture showed no growth.



Figure 3

Patient was admitted in Paediatric ICU on Oxygen with face mask. Broad spectrum IV antibiotics started. After 5 days of admission patient became clinically better but with minimal tube drainage and lung expansion. Parents were counselled about the possible options including image guided fibrinolytic therapy, VATS and/or operative decortication, depending upon the response of initial procedure.

On 5th day of admission, a pigtail catheter size 10 was inserted (figure 4) by the interventional radiologist under ultrasound guidance with child in sedation in radiology suite, in the loculation in middle zone of left lung. The catheter was flushed with 5 ml saline once a day.



Figure 4

Thick yellowish minimal fluid drained without expansion of the lung and there was some improvement in aeration in the lower lobe. It was then followed by fibrinolytic therapy in ICU setting. 6 mg Reteplase (t-PA) diluted with 50 ml normal saline injected through chest tube and pleural catheter (25 ml each), with continuous cardiac and O₂ saturation monitoring. Both the catheters were clamped for 2 hours and then opened to drainage container and bag respectively. The procedure repeated for the next 2 days. There was significant thin pussy fluid drained in both the tubes. 20 ml and 40 ml on second day following the first injection and then 75 ml and 77 ml following second injection and 50ml and 70 ml after the 3rd administration of t-PA. Xray chest was repeated on the next day of each injection. The improved lung expansion was witnessed every day (figure 5) .



Figure 5

Post procedure CT & Ultrasound on completion of t-PA, showed significant improvement in terms of lung expansion and insignificant residual pleural fluid (figure 6) . Two days later both the chest tube and pig tail catheter were removed. The child was afebrile and there was significant improvement in oral intake and activity according to mother. He was discharged on the 17th day of admission on oral antibiotic for the next one month.



Figure 6

In the follow ups (10 days and at 1 month) child was stable and x-ray chest (figure 7) shows fully expanded left lung.



Figure 7

In the last follow up (7 months) after the intervention, patient was doing well with no residual symptoms. It was a telephonic follow up, as mother has some family problems and father works outside the city of their residence and she cant come alone to hospital for follow up.

Discussion

Pleural effusion, para pneumonic effusion, empyema thoracis are all the overlapping terminologies which are used for the progressive stages of pleural infection. The effusion fluid progresses in an otherwise closed but essentially a potential space between the visceral and parietal pleura of lung. Once the diagnosis of empyema thoracis is established, the mainstay of treatment is drainage of effusion fluid and antibiotic therapy for 4-6 weeks. Further management depends upon the drainage fluid, drainage amount and the expansion of lung (Radiological improvement of the X-Ray chest).

Our patient had complicated empyema thoracis due to partially treated pneumonia. The associated co morbid was Cerebral Palsy. Parents sought medical advice for pneumonia but due to irregular antibiotic therapy, the condition worsened and the child developed massive pleural effusion. Although chest tube placed along with broad spectrum Intravenous antibiotic at the outset, but the response was not optimal in

the first few days in terms of lung expansion. Pleural fluid culture was also turned out to be negative. According to a systematic review, pleural fluid culture was observed positive in 56% of cases.¹

Intrapleural Enzyme therapy (IET) dates back to 1949, used by Tillet & Sherry as a combination of Streptokinase and deoxyribonuclease. Since then, pleural infections were treated by such agents due to their adjunctive fibrinolytic characteristics.^{1,2} There were number of Randomized controlled trials done in adults as well as in pediatric patients. In the beginning the therapy was not generally accepted in pediatric age group, but now modified agent like tPA (Alteplase) and more randomized trials in pediatric population produced promising results, in terms of efficacy and avoidance of (VATS) and surgical decortication procedures. Therefore, this IET has become the procedure of choice in pediatric Empyema thoracis. ^{3,4,5}

Our case also showed favourable results by the use of tPA in the dose recommended as safe in children in the recent literature.⁶ The child very well tolerated Reteplase, in the dose of 6mg diluted in 50 ml of Normal saline. After 3 doses there was gradual reduction in the output of both the drains in the chest and radiological improvement was also followed thereafter.

Turkmen et al⁷, in a current article described 100% technical results of administration of fibrinolytic agents in unilateral single, unilateral double as well as bilateral catheter insertions as a treatment prerequisite, The study was conducted on 84 children and 41 out of 84 who received tPA proved to be clinicoradiologically improved completely. The minimum of 3 to maximum 6 sessions of tPA administration (depending upon the drainage of pleural fluid), were performed. All these patients improved with minimal complications in some, as compared to other fibrinolytic agents used in the same study. Total duration of catheter removal was 5 to 12 days. In our patient, clinicoradiological improvement was observed on 5th day post tPA administration (3 doses in 3 days) and catheter was removed on 7th day. No complications encountered related to catheter or tPA.

Oyetunji and his associates after a decade of doing a randomised controlled trial with fibrinolytic therapy in their institution, conducted a prospective study with level IV evidence, which demonstrated fibrinolytic agents as the most effective primary treatment option.⁷ The results of that RCT paved the way for this 5-year study and it not only proved to be effective as first line of management of empyema but also rendered VATS and major surgical intervention in most of the children. Our case was a child with already a moribund condition and had limitations for any major surgical procedure. So, we used tPA as a primary treatment option and succeeded in achieving the required results.

Conclusion

The recent literature as well as the response of tPA in our patient therefore leads us to revise a standard treatment protocol in complicated empyema. The fibrinolytic agent (tPA) as the primary treatment option in failed tube drainage is highly recommended in our set of patients. In consequence avoiding more aggressive surgical options (VATS & Decortication)

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Conflict of interest:

We have no conflicts of interest.

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