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Medical Science

THE ROLE OF VIDEO ASSISTED THORACOSCOPIC SURGERY(VATS) IN PEDIATRIC EMPYEMA

DR.R. Senthilnathan	M.S.,M.CH., Professor of Paediatric Surgery Department of Paediatric Surgery Institute of child health and hospital for children, Chennai
DR. R. Maniappan*	M.S., M.CH (RESIDENT) Department of Paediatric Surgery Institute of child health and hospital for children, Chennai. *Corresponding Author
Dr. S. Vivek	M.S.,M.CH.,Assistant Professor of Paediatric surgery Department of Paediatric Surgery Institute of child health and hospital for children, Chennai.

ABSTRACT

BACKGROUND: Empyema is a common complication in children presenting with pneumonia. Early empyema is usually treated with antibiotics and intercostal drainage. However, significant proportion of the patient progress to level of complication that requires surgical intervention. In this article we have analyzed the role of VATS in the management of pediatric empyema.

METHODS: Retrospective analysis of empyema patient managed with VATS from January 2018 to February 2019 at our institute, ICH&HC,Chennai.

RESULTS: A total of 11 patients with empyema were operated with vats over a period of 14 months. Out of 11 patients, 2 patients belong to stage I, 8 patient stage II and 1 patient of stage III. 2 patients were converted to open thoracotomy. All the children tolerated the procedure well and discharged early after surgery.

CONCLUSION : VATS is an effective minimally invasive treatment option in the management of pediatric empyema. The ability to provide effective drainage and debridement, faster recovery, shorter hospital stay and excellent cosmesis makes VATS the first line treatment option in management of empyema.

KEYWORDS : empyema thoracis, VATS,decortication

INTRODUCTION:

Empyema thoracis, is a collection of purulent fluid in pleural space with significant morbidity .[1-3]The most common cause for empyema thoracis is parapneumonic effusion (a complication of bacterial pneumonia). Infection of the pleural space occurs either from direct bacterial spread across visceral pleura or by intra-pleural rupture of peripherally located lung abscesses. Once the pleural fluid gets infected the neutrophil count of the pleural fluid increases, which in turn increases chemotactic factors and the coagulation cascade is activated which leads in raise in procoagulant factors. The increase in procoagulant activity in the pleural fluid leads to fibrin deposition within the pleural space and this is the reason for formation of septations and loculations.

Empyema clinically presents with persistent high grade fever, cough, tachypnea / dyspnea, irritability and chest deformity. Empyema is divided into 3 stages depending on progression of their pathogenesis[3].

- *Stage 1 - exudative phase:* Thin exudative fluid leaks into the pleural space.
- *Stage 2 - fibropurulent phase:* Deposition of fibrin lead to septation and loculations with an increase in white cells ,turbidity and ultimately frank pus (empyema).
- *Stage 3 - organizing phase:* increased fibroblast activity leads to formation of collagen fibers over visceral and parietal pleura, with development of a thick pleural peel that prevents lung re-expansion.

Initially patient treated with i.v.antibiotics and chest tube drainage. Thoracotomy and decortication has been used in the management of empyema previously who fail to respond with i.v.antibiotics and ICD tube insertion.[4-6] But nowadays VATS is been recommended as primary treatment as well as for failure after ICD.[7,8]

Our study is aimed to look at the outcome of empyema after VATS.

METHODS

This study was conducted in the department of pediatric surgery, Institute of Child Health and Hospital for children, Egmore, Chennai from January 2018 to February 2019. In this study total 11 patients were included who presented with respiratory symptoms and pleural effusion(Figure 1). Intercostal drainage tube was inserted for all patients as initial management to relieve the respiratory distress(Figure 2). Patients were aged between 3 months to 11 years.7 female and 4 male patients. After ICD insertion patient was started on i. v. antibiotics. The children were diagnosed with empyema thoracis based on chest X- ray , USG chest and CT chest and underwent VATS .

Pleural fluid analysis was done in all patients. The fluid obtained was subjected to total and differential cell count ,sugar and protein, gram/AFB stain and bacterial culture. Hematological investigations (hemoglobin, total leukocyte counts, differential counts and ESR), RFT, LFT, electrolytes were done in all subjects. Blood cultures were done

In an average, ICD was kept for five days and observed for improvement with serial chest Xray and ultrasound .A CECT thorax(Figure 3) was done in all the patients, to demonstrate loculated collections and to demarcate the extent of the disease. CT scans had shown loculated empyema, residual fluid after tube thoracostomy, thickened pleural , tenting of diaphragm, air containing cystic spaces and shift of mediastinum.. All patients were operated under general anesthesia. 10mm *30°* scope was used. Scope was inserted through the thoracostomy wound . 2 or 3 more trocars were inserted under visual guidance . Fibrinolytic substances were not used in any of the cases. Those who presented early ,the procedure included initial clearing the pleural cavity of collections and then removal of all adhesions between the lung and the parietal pleura. The dissection was mainly carried out initially by the scope itself till enough space was created for insertion of a second trocar. Suction irrigation cannula was also used to remove the tough as well as the fibrinous collections. A thorough irrigation followed meticulus debridement was done. In the case that presented later , the pleural membrane appeared to be extremely thick and were densely adherent to the underlying lung as well as to the thoracic wall and diaphragm(figure 4). There were loculations and lobar collapse. In one patient the adhesions were dense and the pleural was very thick. So converted to open decortication. One patient had necrotizing pneumonia of the affected lobe, so converted to thoracotomy and left lower lobectomy was done. ICD was left in situ following the completion of the procedure. A postoperative X-ray was taken to evaluate the expansion of the lung following the surgery. The ICD was removed on 5th day. One patient had recurrent pneumothorax after removal of ICD for which reinsertion of ICD tube was done. Then subsequently the patient improved. All the patients were discharged averagely on 8th day. All the patients were followed up for 2 months at 2weeks interval and monthly once up to 6months.

RESULTS

The average age of all the patients was 5years, ranging between 3

months and 11years. There were 7 females and 4 males(Table). All the patient presented with fever, cough and respiratory distress with variable duration of symptoms (table).All of the patients were initially evaluated with chest X-rays and ICD tube was placed. Patient was started on i.v.antibiotics. Observed for average of five days and CECT chest was taken if there is no reduction of pleural collection or condition of the patient worsening. Findings noted in these patients included-loculated pus collections, collapsed non expanding pulmonary lobes and thickening of the pleura .Out of eleven patient 2 patient was stage I,8 patients were stage II and 1 patient was stage III. All the patient underwent VATS.2 patients had very minimal fibrinous adhesion for which thorough wash only given. 8 patients underwent VATS decortication. One patient had necrotizing pneumonitis of left lower lobe for which open decortication with left lower lobectomy was done. One patient had dense adhesions and thick pleura which was not able to peel via VATS, so converted to open decortication. The conversion rate is 18% .The mean operating time was 90 mins(ranging between 150 mins and 70 mins).In all patients intercostal drainage tubes were kept post operatively. On an average of 5th day ICD was removed. Lung expansion in the immediate postoperative period was good in all cases except one in which the patient had persistent pneumothorax for which re insertion of ICD was done. There were no immediate post operative complications in any patients. All patients improved well and discharged on average of 8th post operative day. All the patients were followed up to 6 months. The plain chest X-ray are normal in all patients .There was no mortality in our study.

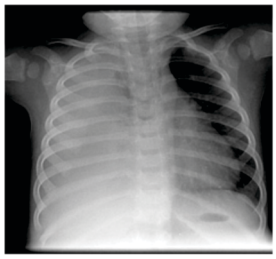

Figure 1: initial xray chest before ICD

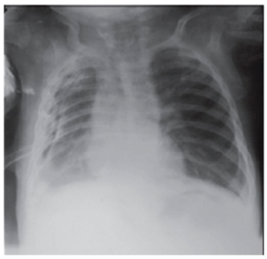

Figure 2: post ICD

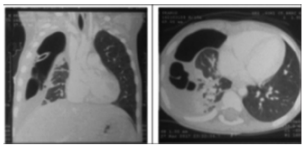

Figure 3:CECT chest – pleural collection with underlying pneumonitis.

Figure 4 : VATS : dense fibrin adhesion

TABLE : 1

S.NO	AGE	SEX	DURATION DAYS	ICD	VATS	OPEN	COMPLICATION	PROGNOSIS	STAY DAYS
1	1Y	F	5	+	+	_	_	GOOD	7
2	11Y	F	6	+	+	_	_	GOOD	9
3	11Y	F	4	+	+	_	_	GOOD	8
4	3M	F	3	+	+	_	_	GOOD	6
5	10	M	7	+	+	_	_	GOOD	7
6	5Y	M	6	+	+	_	_	GOOD	8
7	2Y	M	5	+	+	_	_	GOOD	5
8	4Y	F	4	+	+	_	_	GOOD	6
9	3.5Y	F	7	+	+	_	_	GOOD	9
10	1Y	M	3	+	+	+	Thick pyomembrane, persistent pneumothorax	GOOD	10
11	4Y	F	10	+	+	+	Necrotizing pneumonitis, left lower lobectomy	GOOD	11

DISCUSSION

In this antibiotic era, 40 to 50% of empyema are complications of bacterial pneumonia in spite of early antibiotic administration. The treatment of empyema depends on the stage of the disease. stage I is treated by tube thoracostomy inserted by the conventional closed technique or a primary endoscopic suction-irrigation and debridement would be enough for good lung expansion. The second stage of empyema is treated with tissue plasminogen activator via ICD tube or VATS decortication. Failure to do this leads to further organization of the empyema, which can then be treated only through open decortication.12It was initially thought that thorough decortication and debridement can only be accomplished by open thoracotomy and decortication in all cases of empyema in children.15,16 Unfortunately, these procedures are associated with significant morbidity and mortality and prolonged hospitalization. Kern and Rodgers have shown in a series of 9 patients that there is rapid resolution of empyema after thoracoscopic debridement in children.$_9$ Lobe and Schropp showed in a series of 19 patients that thoracoscopy eliminated the discomfort, morbidity of the thoracotomy and reduced the expense of a prolonged hospitalization and that it may be used as the first line of treatment in a majority of pediatric patients with fibropurulent empyema.10

CONCLUSION

We conclude that thoracoscopic debridement is a safe and effective treatment option for empyema in children. VATS is associated with decrease in the morbidity , duration of ICD tube, i.v.antibiotics, and hospital stay as well as good cosmesis .

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