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Original Article

Comparison of Outcomes between Video-assisted Thoracoscopic Surgery and Thoracotomy in Pediatric Patients for Empyema Thoracis

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Abstract

Introduction: A thoracotomy is a major surgical procedure that allows surgeons to access the lungs, heart, aorta, and diaphragm during surgery. The open surgical procedure, performed under general anesthesia, is performed to evaluate and treat pulmonary problems when non-invasive procedures are non-diagnostic or unlikely to be definitive. Recently, video-assisted thoracoscopic Surgery has been used to treat more patients with thoracic disorders.

Aim: The aim of this study is to analyze the usefulness of thoracoscopy in the pediatric population in the management of empyema thoracis in relation to its feasibility, safety, efficacy, and reliability.

Methods: This prospective study analyzing various procedures performed at the Department of Pediatric Surgery, Coimbatore Medical College Hospital and the outcome of the various procedures were evaluated. A total of 20 pediatric patients had undergone either diagnostic or therapeutic thoracoscopic procedures for empyema thoracis during the study.

Results: For thoracotomy cases, the Intercostal Drainage Tube (ICD) was kept in an average of 5 days, analgesia required in an average of 4.1 days, and children were ambulant in an average of 5.8 days. For thoracoscopic decortication cases, the ICD was kept in an average of 3.7 days, analgesia required in an average of 2.5 days, and children were ambulant in an average of 3.1 days. Among 8 cases of open decortication, 1 case needed a blood transfusion, and among 12 cases of thoracoscopy group, 1 case needed transfusion.

Conclusion: This study also reveals that thoracoscopic procedures can be done with conventional dual lung ventilation with pneumothorax. One-lung ventilation or double-lumen tubes are not mandatory. This study reveals that complications encountered in thoracoscopy are usually minor.

Key words: Empyema thoracis, Thoracotomy, Video-assisted thoracoscopic surgery

INTRODUCTION

Video-assisted thoracoscopic Surgery (VATS) procedures are being used in children since 1970s. With the advent of smaller endoscopic instruments and improvement in video technology, more VATS procedures are being performed.[1]

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These procedures are very safe and efficacious in pediatric patients of all age groups including newborn.[2] Initially, the usefulness of thoracoscopy was limited to only biopsies, decortication, and deroofing of pulmonary cyst. Today, more than 20 types of VATS procedure are introduced in infants and children. They mainly deal with disease of the esophagus, lungs, mediastinal tumors, diseases of the diaphragm, pleura, and pericardium.[3] VATS obviously has certain advantages such as superior cosmetic results, prevention of functional disorders of the thorax, lesser post-operative pain, and faster recovery.[4] Endosurgery has a considerable learning curve. Future of the thoracoscopy in children depends on the creation of better and new instruments. With this background, the present study is

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intended to analyze various thoracoscopic procedures performed in our institution and examine the merits and demerits of this procedure.

Aim

The aim of this study is to analyze the usefulness of thoracoscopy in pediatric population in the management of empyema thoracis in relation to its feasibility, safety, efficacy, and reliability.

MATERIALS AND METHODS

This prospective study analyzing various procedures performed at the Department of Pediatric Surgery, Coimbatore Medical College Hospital and the outcome of the various procedures were evaluated. The Institutional Ethics Committee approval and informed consent from parents were obtained. A total of 20 pediatric patients had undergone either diagnostic or therapeutic thoracoscopic procedures for empyema thoracis during the study.

All patients who were investigated and confirmed of their diagnosis were taken up for therapeutic procedures. All patients received general anesthesia, controlled ventilation. Lateral decubitus position was used with the side of the pathology remaining upward. Dual lung ventilation used. Pneumothorax created with CO_2 or atmospheric air. Number of ports varied according to the pathology and as per the need. No specialized instruments used. All patients received chest tubes following the procedure. Post-operative analgesia was given as per children's need.

RESULTS

The various observations made in this prospective study were recorded and analyzed. The following results were obtained from 20 pediatric patients. 12 male pediatric cases and 8 female pediatric cases underwent surgery.

Maximum number of cases was in 2-4 years group, followed by <2 years and <6 years age groups, respectively (Figure 1).

The etiological distribution of cases of empyema showed 19 cases were due to parapneumonic effusion and 1 case was due to tuberculosis.

Most of the patients with empyema thoracis sought medical help within 1 week of onset of symptoms. (Figure 2).

Table 1 shows the duration of illness and the type of procedure required to manage the patients. For patients' presenting with less than a week of symptoms, feasibility of thoracoscopic procedure was higher. If the duration is more than 2 weeks, most of the patients needed thoracotomy for decortication (Table 1).

Table 2 shows the patients who needed thoracotomy for decortication as the procedure of choice which also shows most of the patients have come with duration of illness more than 2 weeks. Initial thoracoscopy revealed fibrothorax, which was later converted to thoracotomy (Table 2).

For thoracotomy cases, the Intercostal Drainage Tube (ICD) was kept in an average of 5 days, analgesia required in an average of 4.1 days, and children were ambulant in an average of 5.8 days.

Most of the patients who had come earlier for the management of pyothorax needed only thoracoscopic decortication. For thoracoscopic decortication cases, the

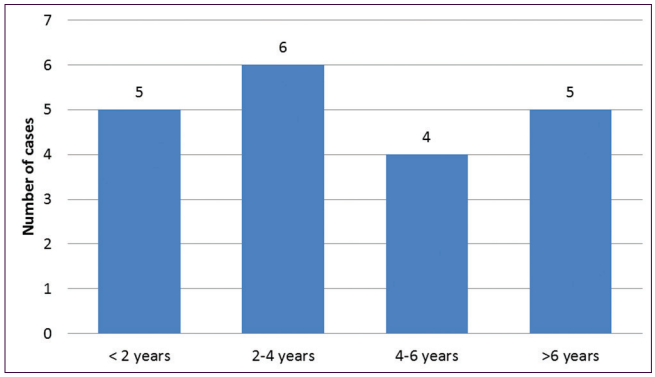

Figure 1: Age-wise distribution of the pediatric cases

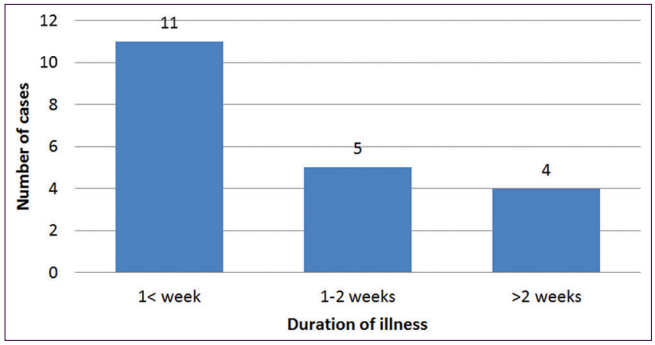

Figure 2: Distribution of duration of illness

Table 1: Distribution of procedure done

Duration of illness (weeks)	Procedure	
	Thoracoscopy alone	VATS+Thoracotomy
<1	9 (82)	2 (18)
1-2	2 (40)	3 (60)
>2	1 (25)	3 (75)

VATS: Video-assisted thoracoscopic Surgery

Table 2: Distribution of diagnostic thoracoscopy and thoracotomy (8 cases)

Duration of Illness	Number of ports	Blood transfusion	Number of days (post-operative)			Outcome
			ICD kept	Analgesia	Ambulation	
1 month	1	Yes	4	5	5	Good lung expansion
2 weeks	2	Yes	3	3	5	Good lung expansion
8 days	2	Yes	5	4	6	Good lung expansion
2 weeks	2	Yes	5	4	6	Good expansion
5 days	2	Yes	7	5	7	Bronchopleural fistula
3 weeks	2	Yes	7	3	5	Bilateral pleural effusion
5 days (conversion)	3	-	10	5	6	Mini-thoracotomy - good expansion
1 month (conversion)	3	Yes	4	4	5	Good lung expansion

ICD: Intercostal Drainage Tube

Table 3: Distribution of thoracoscopic decortication (12 cases)

Duration of illness	Number of ports	Blood transfusion	Number of days (post-operative)			Outcome
			ICD kept	Analgesia	Ambulation	
7 days	3	-	3	3	4	Good lung expansion
7 days	4	Yes	7	5	6	Good lung expansion
2 months	2	-	7	5	-	Expired
2 weeks	3	-	3	4	3	Good lung expansion
7 days	3	-	3	2	3	Good lung expansion
10 days	3	-	3	2	3	Good expansion
7 days	2	-	3	2	3	Good lung expansion
2 days	3	-	6	2	4	Good lung expansion
5 days	2	-	3	2	3	Good lung expansion
7 days	2	-	3	2	3	Good lung expansion
7 days	2	-	2	1	2	Good lung expansion
5 days	2	-	2	1	2	Good lung expansion

ICD: Intercostal Drainage Tube

ICD was kept in an average of 3.7 days, analgesia required in an average of 2.5 days, and children were ambulant in an average of 3.1 days. Among 8 cases of open decortication, 1 case needed blood transfusion, and among 12 cases of thoracoscopy group, 1 case needed transfusion (Table 3).

Table 4 shows the 4 pediatric patients who had complications in this study group, 1 case prolonged air leak, 1 case residual disease, and 2 cases in open thoracotomy group had wound infection. Even though there are two mortalities in this series which are unrelated to thoracoscopic procedures.

Table 4: Distribution of complications

Total number of cases	Anesthesia related	Insertion related	Post-operative
20	-	1	3

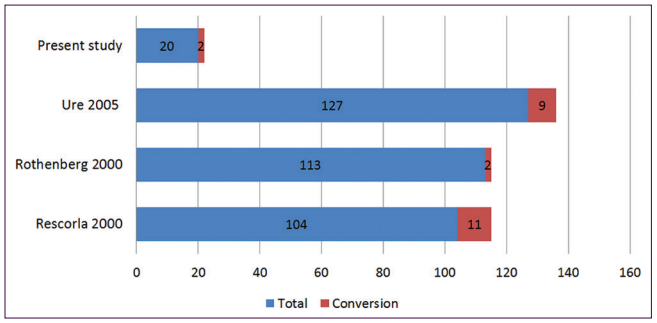

Figure 3: Comparison of the study results

DISCUSSION

The various results and observations made from this study were compared with similar studies, and the outcome is discussed here. The feasibility and safety of VATS in children have been shown in several series. Conversion rate according to the series of studies discussed was 7% to 11%, conversion rate in the present study is 10% (Figure 3).[5-7]

If the patients seek medical help earlier within 1 week, the condition was managed with thoracoscopic decortication. If the duration of symptoms was more than 1 week, most of the patients will require open thoracotomy which increases the morbidity to the patient. VATS has been used in children for debridement of the pleural space failing ICD insertion. Several authors have presented their successful experiences with thoracoscopic drainage of empyemas in children (Table 5).[8-12]

Table 5: Results of VATS in the treatment of pediatric empyema

Reference	Patients (*n*)	Pre-operative chest tube (days)	Post-operative chest tube (days)	Post-operative LOS (days)	Total LOS (days)	Recurrence, failure, or death (*n*)
Kern and Rodgers[8]	9	6.9±1.8	8.4±4	13.4±2.9	NA	1
Stovroff *et al*.[9]	12	4-6	4	6-8	NA	0
Silen and Weber[10]	3	4±1	7±1	8±1	NA	0
Davidoff *et al*.[11]	9	NA	8.5	NA	NA	2
Grewal *et al*.[12]	25	2±1.6	3.2±2.2	4.9±2.7	7.3±4	0
Present study	12	4-6	3.7	6-8	NA	1

LOS: Length of stay

CONCLUSION

Thoracoscopy is definitely superior to thoracotomy in the management of empyema thoracis in relation to pain relief, morbidity, and early recovery. VATS has an important role in the management of empyema thoracis. Lower wound infection rate and better cosmetic results were also seen. This study also reveals that thoracoscopic procedures can be done with conventional dual lung ventilation with pneumothorax in children. This study reveals that complications encountered in thoracoscopy are usually minor.

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