



A Compare Study on Early and Late Thoracotomy in Pediatric Thoracis Empyema Cases

KEYWORDS

Thoracotomy, Thoracis Empyema

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ABSTRACT

Introduction-In India, climate, socioeconomic conditions leading to poor hygiene, malnutrition, inadequate education, all favour infection and late referral, majority have intrathoracic infection, thus most common indication for thoracotomy management is empyema. Mainstay of treatment in empyema remains drainage of pus, debridement, and decortications with drain in the chest and systemic antibiotics. Recently video-assisted thoracoscopic (VATS) is good alternative to early thoracotomy and has certain advantages over conventional open surgery because there is limited trauma to the skin, muscles, nerves and other tissue, compared to open surgery, less post-operative pain adds to early and speedy recovery, because less pain promotes effective clearance of respiratory passage, by ability to cough out. Over all, in this study and also in developing country, early thoracotomy remains the standard procedure for managing pediatric thoracis empyema.

Material and methods- In a large teaching hospital that is a tertiary-center, prospective study of 40 patient done early and late thoracotomy in all the symptomatic thoracis in all the symptomatic thoracis empyema cases in pediatric age group admitted in pediatric surgery ward under in the department of surgery, Dr.B.R.A.M. Hospital and Pt.J.N.M. Medical college Raipur, Chhattisgarh, India, ethical consideration most of the patient came to us for further management from primary and secondary referrals with typical history of cough and fever and where and where given a course of various antibiotics, however the fever persisted with gradual worsening of the general condition, increased tachypnoea and respiratory distress. The treatment in all cases of thoracis empyema started as soon as diagnosis was suggested and confirmed by-relevant history, examination investigation. Data was compiled in MS-Excel and checked for its completeness and correctness. Then it was analyzed.

Result – In this study, 40 patients included between 0 to 18 years of age: youngest patient was 5month and the oldest was 14 years. Seven patients (17.5%) were between 9 to 18 years of age and one patient (2.5%) was between 8 to 9 years of age. Twenty four (60%) patients had right sided disease and only 16th patient (40%) had left sided disease, no patient was found having bilateral disease. Out of 40 patients 33(82.5%) culture are sterile and following microorganism presents staphylococcus ssp.3 (7.5%), acid fast bacilli 1(2.5%), E.colli 3(5%) and pseudomonas ssp.3 (7.5%). Out of fourty patients, 37(92%) patients with empyema, 2(5%) patient with pyoneumothorax. Chest tube removed around 9 days and hospital stay around 12 days in early thoracotomy and in late thoracotomy chest tube removed around 15days and hospital stay around 16 days.

Conclusion- In the present study we found, early thoracotomy is remains standard treatment procedure for management of empyema because there is thin to turbid pus with no/minimal thickening of pleura or thick pus with fibrin deposition on the pleura and no rib crowding is the usual picture, this can be managed well with early thoracotomy or early mini-thoracotomy, intercostals tube drain and systemic antibiotics. After early thoracotomy, general condition of the patient is improved rapidly, less postoperative pain and fever, time of surgery and blood loss is increased with physiotherapy and no significant surgical scar and long term complication like scoliosis and reduces morbidity and mortality.

Introduction

Empyema is localized or free collection of purulent material in the pleural space as a result of combination of pleural dead space, culture medium of pleural fluid, and inoculation of bacteria. It is an advanced parapneumonic effusion. The most common bacteria for post pneumonic; nontubercular empyema are staphylococcus aureus, pneumococci, E coli, pseudomonas. Klebsiella, and anaerobes.¹

In India, climate, socioeconomic conditions leading to poor hygiene, malnutrition, inadequate education, all favour infection and late referral, majority have intrathoracic infection, thus most common indication for thoracotomy management is empyema. Mainstay of treatment in empyema remains drainage of pus, debridement, and decortications with drain in the chest and systemic antibiotics²

There are many approaches for management of empyema. Treatment strategy is decided on the basis of duration of the disease, clinical examination finding and investigation

(X-ray, Ultrasonography and CT scan) reports.³ In early stage (Within 14 days) of empyema, there is thin to turbid pus with no-minimal thickening of pleura or thick pus with fibrin deposition on the pleura and no rib crowding is the usual picture, this can be managed well with early thoracotomy or early mini-thoracotomy, intercostals tube drain and systemic antibiotics. After early thoracotomy, general condition of the patients improved rapidly, less post-operative pain and fever, time of surgery and blood loss, early ambulation and oral feed, good lung expansion and is increased with physiotherapy and no significant surgical scar and long term complication like scoliosis and reduce morbidity and mortality.⁴ In later stage (after 14 days), pus is organized with thickened, though, fibrosed, thick pleural peel encasing the lung is found. Skeletal changes in form of reduced intercostals spaces restrict movement and scoliosis is present. And this type of patient include late thoracotomy, required more incision and more exposure, more tissue handling, blood duration of surgery and post-operative pain, hospital stay is more, significant surgical

scar, lung expansion present but not satisfactory, skeletal changes persist like scoliosis and increased morbidity and mortality.⁵

Recently video-assisted thoracoscopic (VATS) is good alternative to early thoracotomy and has certain advantages over conventional open surgery because there is limited trauma to the skin, muscles, nerves and other tissue, compared to open surgery, less post-operative pain adds to early and speedy recovery, because less pain promotes effective clearance of respiratory passage, by ability to cough out. These are no limitation to deep breathing leading to effective chest physiotherapy. In the long run, because of small or no postoperative fibrosis and/or scarring there are less chances of developing skeletal deformity and scoliosis which are significantly common with open procedures. But could not be done in our center due to lack of equipment and its few limitation for the treatment of later (after 14 days) staged disease due to the extensive fibrosis encountered.⁶

Over all, in this study and also in developing country, early thoracotomy remains the standard procedure for managing pediatric thoracic empyema. With the above background, the present study was conducted to see the clinic pathological along with radiological findings in pediatric thoracic empyema and outcome of early and late thoracotomy in these cases.

Material and methods

In a large teaching hospital that is a tertiary-center, prospective study of 40 patient done early and late thoracotomy in all the symptomatic thoracic in all the symptomatic thoracic empyema cases in pediatric age group admitted in pediatric surgery ward under in the department of surgery, Dr.B.R.A.M. Hospital and Pt.J.N.M. Medical college Raipur, Chhattisgarh, India, ethical consideration most of the patient came to us for further management from primary and secondary referrals with typical history of cough and fever and where and where given a course of various antibiotics, however the fever persisted with gradual worsening of the general condition, increased tachypnoea and respiratory distress.

The treatment in all cases of thoracic empyema started as soon as diagnosis was suggested and confirmed by-relevant history, examination investigation.

Exclusion Criteria-

- Greater than 18 years of age
- Neoplasia
- Trauma
- Extra pulmonary complication
- Iatrogenic pulmonary infection

Method required-

- Antibiotic with or without USG guided aspiration
- Intercostals chest tube drain
- Open thoracotomy.

Antibiotics –

Antibiotics start as soon as possible after identify the pleural infection empirically and, where possible, this should be chosen based on results of pleural fluid or blood culture and sensitivities.

Intercostals chest tube drain-

Intercostal chest tube drain was done in all patients presented with sign and symptoms of thoracic empyema with

dyspnoea and chest pain, in following manner:

After written and informed consent, titanox injection and xylocain test, penting and drapping done in supine position. Adequate infiltration of local anesthesia at safest site for insertion of a drain lies, anterior to the midaxillary line, above the level of the nipple and below and lateral to the pectoralis major muscle, ideally at the fifth intercostals space. Meticulous attention to sterility throughout. Sharp dissection only to cut the skin and blunt dissection with artery forceps down through the muscle layers; these should only be the serratus anterior and the intercostals upto the pleura and a chest tube drain inserted over the upper edge of the rib to avoid the neurovascular bundle after measuring the tube from medial end of clavicle to incision site and continue to underwater seal bag. Secure the tube by pursting suture surrounding the tube. After completion, check that the drain has achieved its objective by taking a chest radiograph and observe the patient for respiratory distress, collum movement, drain amount, colour and drain block.

If patient general condition is not improved, persistent fever and chest pain, plan for open thoracotomy according to patient general condition, blood investigation-ray, USG and CT scan.

Thoracotomy-

Thoracotomy is done to remove the pleural peel and lyse the adhesion if the patient does not responded promptly to the treatment as mentioned above. Decortications comprises removal of the organized inflammatory membrane. It comprises of two types of procedure:

- Removal of the visceral peel alone,
- Empyemectomy comprising of extra pleural dissection outside the parietal pleura and removal of the complete cavity.

After preoperative and written and informed consent, patient shift to operative room in supine position and then patient induced by general anesthesia, used a double lumen endotracheal tube and patient is positioned in post-lateral position of the affected side and penting drapping done and incision made passes 1-2 cm below the scapula, and extends posterior and superiorly between the medial border of the scapula and the spine and depend through the subcutaneous tissues to the latissimus dorsi, taking care over haemostasis, a plan of dissection is developed by hand deep to the scapula and serratus anterior. The ribs can be counted down from the highest palpable rib (usually second) and the sixth rib periosteum is scored with diathermy near its upper border, A rib spreader is inserted between the ribs and opened gently to prevent fracture. Resection of a rib is not usually required as blunt dissection done to create space between parietal pleura and parietal wall before opening the pleura this kind of dissection avoid rib resection. The anesthetist is now able to deflate the affected lung to allow a better view of the intrathoracic haemostasis and two large-caliber (24-28) intercostals drains are usually inserted at the end of the procedure, thorough the seventh or eighth of 24 hour drained output, lung expansion. A rib approximation done by manner layer by layer and akin closure is a matter of personal preference and after meticulous dressing patient shift to ward with double lumen endotracheal tube and remove accordingly to the patient process may be stated intraoperatively by infiltrating the intercostals nerves in the region of the incision with a long acting local anaesthetic

and postoperatively given 8 or 12 hourly and observe the patient in post operative ward for:

- Breathing difficulty
- Bleeding
- Blockage of chest drain
- Blood clots
- Peunonitis
- Chest pain

Data was compiled in MS-Excel and checked for its completeness and correctness. Then it was analyzed.

Result –

In this study, 40 patients included between 0 to 18 years of age: youngest patient was 5month and the oldest was 14 years. Seven patients (17.5%) were between 9 to 18 years of age and one patient (2.5%) was between 8 to 9 years of age. [Table-1]. Out of all 40 patients. In this study 23 (57.5%) were male and 17 (42.5%) patients were females. [Table-2]

Twenty four (60%) patients had right sided disease and only 16th patient (40%) had left sided disease, no patient was found having bilateral disease. [Table-3].

All the patients (100%) present with fever, this was expected in all patients with empyema and fever was high grade in 12 (30%), moderate in 21(55.5%) and low grade in one (2.5%) patient who was finally diagnosed as tuberculosis. Out of forty, all patients (100%) had cough and is most of them cough was irritating and sometimes in bouts, half of the patient had associated expectoration which was mucoid and rest has mucopurulent and patients had no hemotysis. Out of forty 28(70%) patients had dyspnoea, which was most of them had ever at rest and 36(90%) patients had chest pain more on stress or cough. [Table-4]

Out of 40 patients 33(82.5%) culture are sterile and following microorganism presents staphylococcus ssp.3 (7.5%), acid fast bacilli 1(2.5%), E.colli 3(5%) and pseudomonas ssp.3 (7.5%) [Table-5] Out of forty patients, 37(92%) patients with empyema, 2(5%) patient with pyoneumothorax. [Table-6]

All of the patients were subjected to thoracotomy. and all the patients preoperative intercostals tube draw was inserted and. Out of forty patients, 12(30%) patients had early thoracotomy done and 28(70%) and followings procedure done during thoracotomy decortications 26(65%). Debridement 7(17.5%) and 7(17.5%) both, in which 2 patient debridement done in early thoracotomy and 5 patients in late thoracotomy and 8 patients decortications done in early thoracotomy and 18 patient in late thoracotomy and in 2 patient both procedure done in early thoracotomy and 5 patients in late thoracotomy. average operative time 1 hours and average blood loss was 100 ML. Post operatively all patients who had thoracotomy were comfortable, injection thremadol was inserted after completion of the procedure and repeated after 8 to 12 hours. Postoperative fever occurs in 12 patients in early thoracotomy up to 5 days, and in late thoracotomy fever occurs in 22 patients up to 5 days and 6 patients up to 5to10days easily relieved by simple medicine. [Table-7to 13] Chest tube removed around 9 days and hospital stay around 12 days in early thoracotomy and in late thoracotomy chest tube removed around 15days and hospital stay around 16 days. [Table-14]

Discussion –

Pus culture was done in 40 (100 %) patients, in which staphylococcus species one (2-5 %), E.coli 2 (5%), pseudomonas aures 3(7.5 %) and sterile 33(82%) present. And compare with the other studies also. Ashis k. gupta et al², in total 60 patients, sterile 17(28.3%), E.coil 13(21.7%) and mix organism are 6(10%). Hoff et al⁷, in a series of children. Reported that resolution of the disease process were more prolonged in patients managed by chest tube alone (16.8 days in hospital) than resolution after thoracotomy (6.7 days. P<0.001).

J A cacarey et al⁵, in total 22(11.76%) patients was streptococcus pneumonia. R.Demirhan.et al⁸, total 111 patients. In which Sterile (50.45%), staphylococcus aureas (13.52%) streptococcus pneumonia (32.43%).

TN.Hilliard et al⁹. total 48 patients, in which 70.83% . In the current study, all 40(100%) patients were subjected to thoracotomy, out of them 12 (30%) patients to early thoracotomy and 28 (70%) patients done late thoracotomy, and among those, 7(17%) patients were treated by thoracotomy with drainage of pus, debridement and ICD placement done 26 (65%) patients was treated by thoracotomy with decorticaltion and ICD placement.

Carey et al⁵, reported a series of 22 children with empyema referred to a paediatriccardiothoracics unit. Those children who had immediate thoracotomy (18 cases) within 48 hours. Their mean hospital stay was 4 days.

Alexiouset al¹⁰, reported a series of 44 children undergoing early thoracotomy revealed very short duration of fever (mean 1 days) and an average of 3 days until chest tube remove. This series authors point out that their mean hospital stays were shorter than series of children manage with VATS.

Ashish k. gupta et al². reported a series of 60 pediatric thoracic empyema cases thoracotomy and decortication revealed a more rapid recovery with a decreased number of chest tube days and discreded length of hospital stay and success rate is 96.6%.

Karaman et al⁴, reported a series of 15 patients, primary thoracotomy done among childrens with empyema, NO, of failures –O, No, of death-O, average chest tube removed 7.5 days and length of hospital stay 9.5 days. And also reported a series of 15 patients, managed primary nonoperative, in which, no of failure-O, No, death-O, average chest removed 13.5 days and length of hospital stay 15.4 days.

Merry et al¹¹, reported a series of 19 patients, primary thoracotomy done among children with empyema, no. of failure-O, No, death-O, average chest tube removed 2-9 days and length of hospital stay 10-3 days and also reported a series of 27 patients managed primary nonoperative, in which no of failure-4, no of death-O, average chest tube removed not fix, and length of hospital stay 14.6 days.

Gupta D.K al and Sharma et al¹, in their review article mentioned that thoracoscopy closely imitates open thoracotomy and drainage. According to the authors thios approach is not suitable for late stages, when thick pleura encasing the lung needs to be removed.

Ozeelik and pothulaet al¹²: Both study reported that decortications decreases chest tube drainage and hospital stay and has low morbidity and mortality rates.

Robert et al⁶ : Reported a series of 44 retrospective studies of 1369 patients undergoing early thoracotomy or VATS had shortest length of stay (p=105). There was no statistical difference in chest tube duration statistical between methods. There was no trend correlating antibiotic use with treatment methods, length of hospital stay, duration of fevers, or length of chest tube requirement.

TN Hilliard et al⁹: Reported a series 748 patients intercostals drain followed by intrapleural fibrinolytic therapy and 24 (50%) had a thoracotomy, in which, median length of stay (interquartile range) for each initial procedure was 15 days (6-20) for intercostals drain alone, 8 days (6-12) for fibrinolytic therapy and 6.5 days (5 to 9) for thoracotomy.

In the present study we found, early thoracotomy is remains standard treatment procedure for management of empyema because there is thin to turbid pus with no/minimal thickening of pleura or thick pus with fibrin deposition on the pleura and no rib crowding is the usual picture, this can be managed well with early thoracotomy or early mini-thoracotomy, intercostals tube drain and systemic antibiotics. After early thoracotomy, general condition of the patient is improved rapidly, less postoperative pain and fever, time of surgery and blood loss is increased with physiotherapy and no significant surgical scar and long term complication like scoliosis and reduce morbidity and mortality.

In late thoracotomy pus is organized with thickened, tough, fibrosed, thick pleural peel encasing the lung is found. Skeletal changes in form of reduced intercostals spaces, restrict movement and scoliosis are also present. and this type of patient include late thoracotomy, required more incision and more exposure, more tissue handling, blood loss, duration of surgery is more and postoperative pain. Hospital stay is more, significant surgical scar, lung expansion present but not satisfactory, skeletal changes persist like scoliosis and increased morbidity and mortality.

Conclusion

In the present study we found, early thoracotomy is remains standard treatment procedure for management of empyema because there is thin to turbid pus with no/minimal thickening of pleura or thick pus with fibrin deposition on the pleura and no rib crowding is the usual picture, this can be managed well with early thoracotomy or early mini-thoracotomy, intercostals tube drain and systemic antibiotics. After early thoracotomy, general condition of the patient is improved rapidly, less postoperative pain and fever, time of surgery and blood loss is increased with physiotherapy and no significant surgical scar and long term complication like scoliosis and reduces morbidity and mortality.

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TABLE – 1. Age wise distribution of study subjects

Age in year	0-1	1-2	2-3	3-4	4-5
No of patients	2 (5%)	6 (15%)	6 (15%)	4 (10%)	3 (7.5%)
Age in year	5-6	6-7	7-8	8-9	9-18
No of patients	5 (12.5%)	4 (10%)	2 (5%)	1 (2.5%)	7 (17.5%)

TABLE – 2. Sex distribution in our study of thoracic empyema:

Sex	No of patient with empyema (percentage.) total 40 patients
Male	23 (57.5%)
female	17 (42.5%)

TABLE – 3. Involvement of site of chest in thoracic empyema:

Side of the chest	No of cases
Rt	24 (60%)
Lt	16 (40%)
B/L	Nil (0%)

TABLE -4. Clinical presentation of thoracic empyema in our study:

Clinical presentation	Fever	Cough	Dyspnoea	Chest pain
No (%)	40 (100%)	40 (100%)	28 (70%)	36 (90%)

TABLE – 5. Microorganism present in our study of thoracic empyema:

Organism	No
Streptococcus spp.	Nil (0%)
Staphylococcus aureas	1 (2.5%)
E. coli	2 (5%)
Pseudomonas aeruginosa	3 (7.5%)
Acid fast bacilli (TB)	1 (2.5%)
Others	Nil (0%)
Sterile	33 (82.5%)

TABLE – 6. Diagnosis made after investigation or intraoperative in our study:

	Empyema	Lung abscess	Pyoneumothorax	Other
No	37 (92.5%)	2 (5%)	1 (2.5%)	Nil (0%)

TABLE – 7. Diagnosis and offered procedure:

Diagnosis	Procedure offered	
	Early	Late
Empyema	11	26
Lung abscess	1	1
Pneumothorax	0	1

TABLE – 8. Operative treatment offered in thoracic empyema:

Procedure	No
ICD with thoracotomy	39 (91.5%)
ICD with re- thoracotomy	1 (2.5%)

TABLE – 9. Proportion of early and late thoracotomy

Thoracotomy	No
Early thoracotomy with ICD	12 (30%)
Late thoracotomy with ICD	28 (70%)

TABLE – 10. Operative procedure during thoracotomy:

	Debridement	Decortications	Both	Other
No	7 (17.5%)	26 (65%)	7 (17.5%)	Nil (0%)

TABLE – 11. Operative procedure done in early and late thoracotomy:

Operative procedure	Thoracotomy	
	Early	Late
Debridement	2	5
Decortications	8	18
Both	2	5

TABLE – 12. ICD removal early and late thoracotomy in days:

Operation	ICD REMOVAL AFTER SURGERY(DAYS)		
	1-10	10-20	20-60
Early thoracotomy	1 (2.5%)	1 (2.5%)	Nil (0%)
Late thoracotomy	8 (20%)	18 (45%)	4 (10%)

TABLE – 13. Postoperative fever after early and late thoracotomy in thoracis empyema cases:

S.NO.	Procedure	fever	
		0-5 days	5-10 days
1	Early thoracotomy ICD	12 (30%)	Nil (0%)
2	Late thracotomy with ICD	22 (55%)	6 (15%)

TABLE – 14. Hospital stay after early and late thoracotomy in our study of thoracis empyema:

S.NO	Operation	Hospital stay		
		1-10	10-20	20-60 days
1	Early thoracotomy	8 (20%)	4 (10%)	Nil (0%)
2	Late thoracotomy	4 (10%)	18 (45%)	6 (15%)

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