www.jmscr.igmpublication.org
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v7i4.160

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Predictors of Outcome after Surgical Intervention of Empyema Thoracis in Pediatric Age Group

Authors
Dr Shipra Sharma[1], Dr Nitin Sharma[2], Dr Aditya Kekti[3*]
[1]Professor Cum HOD, Department of Surgery, Pt. JNM Medical College Raipur (C.G.)
[2]Assistant Professor Department of Pediatric Surgery, Pt. JNM Medical College Raipur (C.G.)
[3]Post Graduate Student Department of Surgery, Pt. JNM Medical College Raipur (C.G.)
*Corresponding Author
Dr Aditya Kekti
Address: Pt. JNM Medical College, Jail road Raipur (C.G.) Pin Code- 492001, India
Email: *aditya1987kekti@gmail.com*, Mob. No. 7470303104

Abstract
Background: *Childhood empyema is important complication of bacterial pneumonia. It is observed 3.3 per 1 LAC Children affected by empyema thoracis that is 0.6% of childhood pneumonia progresses to empyema. Treatment options for empyema are antibiotics alone or in combination with chest tube drainage, Intrapleural fibrinolytics, video assisted thoracoscopic surgery (VATS) and open decortications.*
Methods: *This was a prospective observational study, conducted in the department of pediatric surgery of Dr.B.R.A.M. Hospital Raipur C.G from July2017-August 2018. All children in age group of 0 days to 17 years diagnosed with empyema during the study period were included in the study. Patient who were not giving consent for the study, malignancy, congenital lung or heart anomalies, traumatic empyema, were excluded.*
Results: *Twenty-three cases of empyema (0 to 17 years) were recorded during the study period. Youngest patient was 6 month and eldest was 13year. 15 (65.2%) were male and 8 (34.8%) patients were female. Chest involvement 15 (65%) patients had right side, 7 (31%) had left sided and 1 (4%) patient was found bilateral disease. All the patients (100%) presented with fever and cough, on investigation 7 (30.4%) patients had anaemia. In X ray chest Pleural effusion was seen in 23(100%) patient, Pyopneumothorax in 8 patients, overcrowding of rib in 15 patients and 18 patients had mediastinal shift. Scoliosis and clear lung field was not seen in any patients. In USG pleural effusion was seen in 23(100%) patients, and 7 patients presented with Pyopneumothorax. Pus culture was sterile in 18/23(78.3%) cases, Staphylococcus was found in 4/23(17.4%) and pseudomonas in 1/23(4.3%) case. Blood culture was sterile in 19/23(82.6%) cases, Coagulase negative staphylococcus aureus 3/23 (13.0%), pseudomonas and citrobacteria both were counted in 1/23 (4.2%) case. 12(52%) patients underwent open decortication, 9(39%) primary thoracostomy and 2(9%) underwent primary VATS.*
Conclusion: *In this study Association was seen between the duration of disease, age and nutritional status (BMI and Preoperative Albumin level) of empyema patient with clinical and radiological outcome of empyema thoracis and I found statically significant association between pleural thickening with BMI and preoperative albumin level in postoperative period and 2 week follow up. I recommended detailed focused study to verify and validate my observation.*
Keywords: *pediatric empyema, thoracotomy, pleural thickening, staphylococcus aureus, Pyopneumothorax*

Introduction

Empyema thoracis is a common debilitating respiratory disease, known to mankind since the day of Hippocrates. With the evaluation of society the disease has also shown periodic changes. The etiologic factors, the problems in diagnosis, and the therapy of the empyema have undergone a series of changes in the last 80 years. The introduction of newer antibiotics has produced a dramatic change in the entire clinical picture of pleural infections, including the etiologic factors, the bacteria encountered and the clinical presentation.[1] Childhood empyema is important complication of bacterial pneumonia. It is observed 3.3 per 1 LAC Children affected by empyema thoracis that is 0.6% of childhood pneumonia progresses to empyema. Treatment options for empyema are antibiotics alone or in combination with chest tube drainage, Intrapleural fibrinolytics, video assisted thoracoscopic surgery (VATS) and open decortications. Very few studies are available regarding optimal management of empyema in children.[25]

Aims and Objectives

- To know the outcome in pediatric age group undergoing surgical intervention for empyema thoracic in terms of duration of disease, age, nutritional status of patient.
- To know the predictor of outcome in children undergoing surgical intervention for empyema thoracic.
- To know the clinico-bacterial profile.

Methods

This was a prospective observational study, conducted in the department of pediatric surgery of Dr.B.R.A.M. Hospital Raipur (C.G.) from July2017- August2018. The study was approved by the Institute's ethical committee and written informed consent was obtained from all participants. All children in age group of 0 days to 17 years diagnosed with empyema during the study period were included in the study. Patient who were not giving consent for the study, patient with malignancy, congenital lung or heart anomalies, patient with traumatic empyema. The diagnostic criteria for empyema thoracis was presence of pleural effusion on clinical and radiological examination, and symptoms like fever, cough, dyspnea, tachypnea, pleuritic chest pain. All patients suspected of pleural effusion clinically were subjected to chest X-ray and, if required, ultrasonography and contrast enhanced computer tomography (CECT) of the chest. All patients were subject to pleural fluid aspiration; ultra sound guided, if required. The fluid thus obtained was subjected to gross examination, cytology (total and differential cell count), biochemistry (sugar and protein), gram/AFB stain and bacterial culture. Hematological investigations (hemoglobin, total leukocyte counts, differential counts and ESR), serum ADA level, electrolytes were done in all subjects. The outcome variables for the study were clinical improvement in terms of fever, dyspnea ,tachypnea, cough, post operative tube drainage, radiological improvement in terms of x-ray chest PA and lateral views was taken in first follow-up,if lung was not fully expanded than x- ray were taken consecutive follow-up i.e.pleural effusion, pyopneumothorax, clear lung field, mediastinal shift, overcrowding of ribs(subjective), scoliosis and USG thorax was done in first follow up-pleural thickening, pleural effusion, pyopneumothorax. Different surgical procedure was offered to empyema patients in this open decortication, primary thoracostomy and VATS. Duration of Intercostal Tube Drain (ICD) Removal was assessed after Surgical Intervention in all patients.[25]

Results

Twenty-three cases of empyema (0 to 17 years) were recorded during the study period. Youngest patient was 6 month and eldest was 13 year. Sex distribution 15 (65.2%) were male and 8 (34.8%) patients were female. Chest involvement 15 (65%) patients had right sided disease and 7 (31%) had left sided disease and 1 (4%) patient was found

bilateral disease. All the patients (100%) presented with fever and cough, Out of twenty three 18 patients had Dyspnea, which was most of them had even at rest and 19 patients had chest pain more on stress or cough. 9 patients had suffered from tachypnea and 1 patient had abdominal pain. On investigation out of twenty three patients, 7 (30.4%) patients had anemia. X-ray chest and ultrasonography was done in all 23 patients. Pleural effusion was seen in all 23(100%) patient, 8 patients presented with Pyopneumothorax, 18 patients had mediastinal shift and in 15 patients overcrowding of rib was seen. Scoliosis and clear lung field was not seen in any patients. In USG pleural effusion was seen in 23(100%) patients, and 7 patients presented with Pyopneumothorax. Pus culture was sterile in 18/23(78.3%) cases, Staphylococcus was found in 4/23(17.4%) and pseudomonas in 1/23(4.3%) case. Blood culture was sterile in 19/23(82.6%) cases, Coagulase negative staphylococcus aureus 3/23 (13.0%), pseudomonas and citrobacteria both were counted in 1/23 (4.2%) case. Serum ADA was considered positive at the value above 40 IU, Only 2 patients were raised ADA level. 19 patients had a history of prior antibiotic therapy and out of 19 patient 8 had also history of previous hospitalization. Different surgical procedure were offered to empyema patients in this 12(52%) patients underwent open decortication, 9(39%) patients underwent primary thoracostomy and 2(9%) underwent primary VATS. 12 out of 21 patients showed continue ICD drainage so they had treated with open decortications. [Table – 1 and Table - 2]

Duration of Intercostal Tube Drain (ICD) Removal was assessed after Surgical Intervention in 23 patients. In patient underwent thoracostomy, ICD was removed between 11-20 days in 6 patients, 21-30 days in 2 patients and in one case it was removed between 0-10 days. The mean duration of ICD drainage was 18 days for patient underwent thoracostomy. ICD was removed between 0-10 days in the two cases of primary VATS. The mean duration of ICD drainage was 7.5 days for patient underwent primary VATS. Out of the 12 cases of open decortications ICD was removed between 0-10 days in 8 cases, 11-20 days in 4 cases. The mean duration of ICD drainage was 9.6 days for patient underwent Thoracotomy. [Table - 3]

Duration of postoperative hospital stay- shortest duration <10 days was seen in 5, 2 and 1 cases of open decortications, primary thoracostomy and primary VATS respectively. Longest duration >20 days was seen in 3 patients with primary thoracostomy and 1 patient with open decortication. The mean duration of post operative hospital stay was 18 days for patient underwent thoracostomy, 10.5 days for patient underwent primary VATS and 11 days for patient underwent thoracotomy. Duration of total length of hospital stay- shortest duration was seen in 1 patient with thoracostomy (<14 days) and longest duration 45-60 days was seen in 2 patient with open decortication procedure. [Table - 4]

Postoperative fever of <5 days was seen in 4 patient of open decortications, 2 patients of thoracostomy and one patient of primary VATS. Postoperative fever of >8 days was present in 2 patients with primary thoracostomy. [Table - 5]

X-ray findings at Discharge- Overcrowding of ribs was seen in 12/23 cases, mediastinal shift was seen in 8 cases, and 4 patients had pleural effusion. All of them improved radiologically. In USG pleural thickening was seen in 7 patients and pleural effusion was seen in 4 patients. [Table – 6 and Table – 7]

Table 1: Age distribution

Age in Year	Number of Empyema Patient	Age in Year	Number of Empyema Patient	Age in Year	Number of Empyema Patient
0-01	3(13%)	05-06	2(8.7%)	10-11	1 (4.3%)
01-02	2 (8.7%)	06-07	3 (17.4%)	11-12	1 (4.3%)
02-03	0	07-08	3 (13.0%)	12-13	1 (4.3%)
03-04	2 (8.7%)	08-09	2 (8.7%)	13-14	1 (4.3%)
04-05	1 (4.3%)	09-10	1 (4.3%)	14-17	0
TOTAL	8	TOTAL	11	TOTAL	4

Table 2: Sex distribution

Sex	No of Patient with Empyema
Male	15(65%)
Female	8(35%)

Table 3: Duration of Intercostal Tube Drain (ICD) Removal after Surgical Intervention

Procedure Done	Duration Of ICD Removal (In Days)			(Days)
	0-10	11-20	21-30	Mean
Thoracostomy	1(4.3)	6(26.1%)	2(8.6%)	18
Primary Vats	2(8.6%)	0	0	7.5
Open Decortication	8(34.8%)	4(17.4%)	0	9.58

Table 4: Duration of post operative hospital stay

Procedure Done	Duration Of Post Operative Hospital Stay (In Days)				
	<10	11-15	16-20	>20	Mean
Thoracostomy	2(8.6%)	1(4.3%)	3(13.0%)	3(13.0%)	18.1
Primary Vats	1(4.3%)	1(4.3%)	0	0	10.5
Open decortication	5(21.7%)	6(26.1%)	0	1(4.3%)	11.08

Table 5: Duration of post operative fever (In days)

Procedure Done	Duration Of Postoperative Fever(In Days)			Days
	<5	5-8	>8	Mean
Thoracostomy	2(8.6%)	5(21.7%)	2(8.6%)	6.7
Primary Vats	1(4.3%)	1(4.3%)	0	4.5
Open Decortication	4(17.4%)	8(34.8%)	0	4.9

Table 6: X-ray findings in empyema patients

X ray Findings	preoperative	At Discharge	Follow up		
			2week	6week	12week
pleural effusion	23(100%)	04(17.4%)	0	00	0
Pyopneumothorax	8(34.7%)	0	0	0	0
clear lung field	00	9(39.1%)	18(78.3%)	20(86.9%)	22(95.6%)
mediastinal shift	18(78.3%)	8(34.7%)	5(21.7%)	4(17.4%)	2(8.7%)
overcrowding of rib	15(65.2%)	12(52.2%)	12(52.2%)	6(26.1%)	6(26.1%)
scoliosis	00	0	0	0	0

Table 7: USG findings in empyema patients

USG Findings In Empyema Patient	Preoperative	At Discharge	Follow Up		
			2week	6week	12week
pleural effusion	23 (100%)	4 (17.3%)	0	0	0
Pyopneumothorax	7 (30.4%)	0	0	0	0
pleural thickening	0	7 (30.4%)	7(30.4%)	5(21.7%)	4(17.3%)

Discussion

In the present study, children between 0 to 17 years of age were included, the youngest and oldest being 6 months and 13 years of age respectively, while the age incidence observed in Poonam Mehta series (2017) was 1 month to 14 years of age.[24]

The sex incidence between male and female in the current study is 65.2% and 34.8%, while the incidence observed in G.Cardillo series of 2009 was 58.4% and 41.5% respectively.[8]

The present study showed 65% of the patients presenting with right sided pathology, 31% presenting with left side pathology while 4% had pathology in both side; as compared to the study by R. Demirhan et al (2008), where 64% and 36% showed pathologies in right and left sided respectively.[13]

In the present study 100% of the patients presented with fever and cough, 78.25 presented with dyspnea, 82.6% with chest pain. 39.1% with tachypnea and 4.3% presented with abdominal pain. Likewise in the study by R. Demirhan et al (2008) 87% and 79% of the patients presented with fever and cough, 58% presented with dyspnea, 46% presented with chest pain.[13]

Pleural fluid analysis in this study showed sterile fluid in 78.3%, pseudomonas and staphylococcus growth in 17.4% and 4.35 respectively. In the study by Prabhaker Gupta, Mohd Aam Haseen and Mohd Haneef Beg (2015), 13.82% showed gram negative culture, Staphylococcus was isolated in 13.1%, E.coli was isolated in 7.35, Klebsiella and pseudomonas was isolated in 3.35 each.[22]

In present study duration Of Intercostal tube drain (ICD) Removal was assessed after Surgical Intervention in all. Among those who underwent thoracostomy ICD was removed between 11-20 days in 6 patients, removed in 21-30 days in 2 patients and between 0-10 days in 1 patient. Among those who underwent primary VATS procedure ICD was removed between 0-10 days in 2 patients. Among the cases of open decortications ICD was removed between 0-10 days in 8 patients while it was removed between 11-20 days in 4 patients. In comparison, in the study by Breen DP, Mallawathantri S, Fraticelli A, et al (2009), the time to chest drain removal was found to be < 4 hours, 4 to 24 hours, 24 to 48 hours and > 48 hours in 53.2%, 23.4%, 9.7% and 13.7% respectively.[7]

Duration of post operative hospital stay: In thoracostomy procedure – 2 patients- <10days, 1 patient- 11-15 days, 3 patients-16-20 days, 3 patients->30 days. In primary VATS procedure- 1 patient- <10 days, 1 patient- 11-15 days and in open decortications – 5 patients- <10 days, 6 patients- 11-15 days, 1 patient - >20 days; the mean duration of hospital stay for thoracostomy, VATS and Open decortication was found to be 18.1 days, 10.5 days and 11.08 days respectively. While in the study by Breen DP, Mallawathantri S, Fraticelli A, et al (2009), the median length of stay for all patients was one day (interquartile range, 1-4 days).[7] In the study conducted by Shah SS, DiCristina CM, Bell LM et al (2008) where ICD placement (n=71), VATS (n=50) and thoracotomy (n=197) were done the mean duration of hospital stay was 10 days (interquartile range, 7-1days.)[27]

Duration of post operative fever after surgical procedure- In thoracostomy 2 patients suffered from fever < 5 days, 5 patients- 5 to 8 days, 2 patients- >8 days. In VATS procedure 1 patient suffered from fever <5 days, 1patient- 5 to 8 days and in open decortications 4 patients- <5 days, 8 patients – 5 to 8 days. The mean duration of post

operative fever in thoracostomy, VATS and Open Decortication was 6.7 days, 4.5 days and 4.9 days respectively. Cunniffe MG, Maguire D, McAnena OJ et al (2000) reported a series of 10 consecutive patients underwent VATS debridement of fibropurulent empyema; Postoperative pyrexia settled within 4.2 +/- 2.1 days. Intercostal chest tubes were removed by 4.5 +/- 1.0 days. The mean postoperative stay was 11 +/- 8.1 days.[8] Manasa G, Swetha B, Yashoda H. T, Pramod S. (2017) Conducted a study on the outcome of VATS in children with empyema thoracis and the mean duration for removal of chest tubes were 4.53 ± 0.7 days and duration of hospital stay was 8.26 ± 1.77 days.[23]

Conclusion and Recommendation

In this study Association was seen between the duration of disease, age and nutritional status (BMI and Preoperative Albumin level) of empyema patient with clinical and radiological outcome of empyema thoracis and I found statically significant association between pleural thickening with BMI and preoperative albumin level in postoperative period and 2 week follow up. I recommended detailed focused study to verify and validate my observation.

References

1. Adams.17 (1939) The genuine works of Hippocrates.
2. Agarwal N, Taneja S, Saxena R, Verma A. Clinical profile, complications, morbidity and outcome of empyema thoracis in children in a tertiary care centre. International Journal of Contemporary Pediatrics. 2018 Apr 20;5(3):967-72.
3. Agostoni E, Zocchi L. Mechanical coupling and liquid exchanges in the pleural space. Clinics in chest medicine. 1998 Jun 1;19(2):241-60.
4. Antony VB, Mohammed KA. Pathophysiology of pleural space infections. InSeminars in respiratory infections 1999 Mar (Vol. 14, No. 1, pp. 9-17).
5. Aziz A, Healey JM, Qureshi F, Kane TD, Kurland G, Green M, Hackam DJ. Comparative analysis of chest tube thoracostomy and video-assisted thoracoscopic surgery in empyema and parapneumonic effusion associated with pneumonia in children. Surgical infections. 2008 Jun 1; 9(3):317-23.
6. Baranwal AK, Singh M, Marwaha RK, Kumar L. Empyema thoracis: a 10-year comparative review of hospitalised children from south Asia. Archives of disease in childhood. 2003 Nov 1; 88(11):1009-14.
7. Breen DP, Mallawathantri S, Fraticelli A, Greillier L, Astoul P. Feasibility of short term drainage for diagnostic thoracoscopy. Monaldi Archives for Chest Disease. 2016 Jan 22; 71(2).
8. Cardillo G, Carleo F, Carbone L, Di Martino M, Salvadori L, Petrella L, Martelli M. Chronic postpneumonic pleural empyema: comparative merits of thoracoscopic versus open decortication. European Journal of Cardio-Thoracic Surgery. 2009 Nov 1; 36(5):914-8.
9. Chaurasia B, Sharma N, Verma S.R. A Novel Approach for Isolated Left Endobronchial Intubation with Single Lumen Tube In Pediatric Patients. 2016 May: 22-24.
10. Cunniffe MG, Maguire D, McAnena OJ, Johnston S, Gilmartin JJ. Video-assisted thoracoscopic surgery in the management of loculated empyema. Surgical endoscopy. 2000 Feb 1; 14(2):175-8.
11. Dass R, Deka NM, Barman H, Duwarah SG, Khyriem AB, Saikia MK, Hoque R, Mili D. Empyema thoracis: analysis of 150 cases from a tertiary care centre in North East India. The Indian Journal of Pediatrics. 2011 Nov 1; 78(11):1371.
12. Davies AT. A note on Thomas Davies, introducer of the exploring needle. Proceedings of the Royal Society of Medicine. 1923 May;16(Sect_Hist_Med):19-22.

13. Demirhan R, Kosa A, Sancakli I, Riral H, Orki A. Management of postpneumonic empyema in children. 2005, 108.208-211.
14. Eastham KM, Freeman R, Kearns AM, Eltringham G, Clark J, Leeming J, Spencer DA. Clinical features, aetiology and outcome of empyema in children in the north east of England. Thorax. 2004 Jun 1; 59(6):522-5.
15. Eren N,Eric BK.O.gen G, Solak 11, Balci. AF, Tas S. Early decortications for postpneumonic empyema in children. Scand J Thom Cardiovase Surg 1995, 29:125-130.
16. Fatjah Esymons RG, Krishnadasan B, Wood DE. Flum DR. Management of pleural infection: a population based analysis. Thorac Cordio vssa sure 2007; 133: 346-51.
17. Ferguson AD, Prescott RJ, Selkon JB, Watson D, Swinburn CR. The clinical course and management of thoracic empyema. QJM: An International Journal of Medicine. 1996 Apr 1;89(4):285-90.
18. Finley C, Clition J,Fitzgenild JM, Yee j, Enipvema: an increasing concern in Canada.. 2005; 174:817-23.
19. Gasior AC, Knott EM, Sharp SW, Ostlie DJ, Holcomb III GW, Peter SD. Experience with an evidence-based protocol using fibrinolysis as first line treatment for empyema in children. Journal of pediatric surgery. 2013 Jun 1; 48(6):1312-5.
20. Gupta AK, Lahoti BK, Singh S, Mathur RK, Mishra H, Wadhera S. A study on comprehensive management of acute and chronic empyema thoracis In the pediatric age group and their outcome. Internet J Surg. 2008; 14:1.
21. Gupta DK, Sharma S. Management of empyema-Role of a surgeon. Journal of Indian Association of Pediatric Surgeons. 2005 Jul 1; 10(3):142.
22. Gupta P, Haseen A and Mohd H.B. Microbiological Prevalence in Empyema Thoracis in a Tertiary Care Centre, (2015) 1: 182-188.
23. Manasa G.Swetha B., Yashoda H. T., Pramod S. Conducted study on Outcome of Video-assisted Thoracoscopic surgery in children with empyema thoracis.(2017)
24. Mehta P, Kumar K, Rathod G. Clinical profile of patients with pleural effusion. 2017 Jul-Sep 3 Vol 4.
25. Narayanappa D, Rashmi N, Prasad NA, Kumar A. Clinico-bacteriological profile and outcome of empyema. Indian pediatrics. 2013 Aug 1;50(8):783-5
26. Sharma S, Sonkar S.K., Nirala S. Prospective comparative study of video assisted thoracoscopic surgery versus conventional thoracostomy drainage in emyema thoracis in paediatric age group. 2015 Oct 3: *(10):2538-2542*
27. Shah SS, DiCristina CM, Bell LM, Ten Have T, Metlay JP. Primary early thoracoscopy and reduction in length of hospital stay and additional procedures among children with complicated pneumonia: results of a multicenter retrospective cohort study. Archives of pediatrics & adolescent medicine. 2008 Jul 7; 162(7):675-81.