

# Minimally Invasive Lateral Thoracotomy (MILT) and Decortication: A Prospective Study on Chronic Organised Empyema and its Outcome

Arun Kumar Haridas<sup>1</sup>, Bharathi Shridhar Bhat<sup>2</sup>

## ABSTRACT

**Introduction:** Chronic empyema is prevalent worldwide. Technique of needle aspiration, intercostal drainage tube insertion works in early stage. Decortication and open drainage are required for late stage of empyema. Treatment and approach to the disease to be decided on the basis of stages of empyema and status of the lung. Complex advanced nature of chronic organised empyema does not permits to use Video Assisted Thoracoscopic Surgery(VATS) as first line of approach, so instead use open classical posteriolateral thoracotomy and Decortication. Study objectives were to evaluate outcome of minimally invasive lateral thoracotomy (MILT) and decortication as an alternative approach to overcome the short comings of posteriolateral thoracotomy and VATS.

**Material and methods:** We studied fifty patients, suffering from chronic empyema due to various causes. All had undergone lateral thoracotomy with minimal incision of 3 inches length and Decortication. Subsequently cases evaluated for duration of surgery, complete lung expansion, post operative complication.

**Result:** Minimally invasive lateral thoracotomy (MILT) evidently allows successful complete Decortication and full lung expansion in the majority of cases. It reduced the amount of pain with minimum acceptable complication. Helped to reduce Stay in the hospital and minimised total cost of treatment.

**Conclusion:** Minimally invasive lateral thoracotomy (MILT) approach can be used alternate to VATS instead of conventional posteriolateral thoracotomy. One can reap more or less all advantages of VATS at lesser cost with need of lesser learning curve to do Decortication.

**Key words:** Empyema, Tuberculosis, Pleural Effusion, Decortication, VATS

## INTRODUCTION

Chronic Pleural empyema is defined as collection of pus in the pleural space with lung encased by cortex or peel. it is commonest disease evaluated and treated by the chest physicians and Thoracic surgeons in India. Empyema divided in to exudative, up to 1 week (Stage I), Fibrinopurulent, 2–3 weeks (Stage II), and organized empyema, more than 3 weeks (Stage III).<sup>1</sup>

Treatment should be early, according to the stage and adapted to the given situation. Expenditure and morbidity of treatment are the higher, the longer it is delayed. Stage one, respond to appropriate antibiotics, and need aspiration and intercostal drainage. Fibrinopurulent stage requires early intercostal drainage using ICD tube or VATS deloculation. Last fibrotic stage responds only to surgical intervention and

Decortication.<sup>2</sup>

Empyema is caused by the bacterial infection and tuberculosis. Tuberculosis pandemic in developing countries. it is still one of the commonest causes of chronic empyema. Less likely cause of empyema is poorly managed chest injury with or without ICD.<sup>3</sup> Co morbid condition like diabetes and pre-existing COPD, exaggerates the sepsis, prolongs duration of stay in hospital, eventually contribute to morbidity and mortality.

Empyema needs multimodality treatment, at appropriate time to reduce morbidity and mortality.<sup>4</sup> goal of treatment is standard, curtail the infection, drain the pus and hasten early lung expansion.<sup>5,6</sup> Status of underlying lung and stage of empyema directs the type of treatment.<sup>7</sup>

Organised empyema with matured cortex or peel on visceral pleura encasing lung treated by peeling the cortex, allowing lung to expand, provided underlying lung is free from fibrosis and fibrocavitary lesions. Anti-tuberculosis drug lonely never works for tubercular organised empyema. Its diligent evaluation and opting decortication or open drainage depending on underlying lung condition.<sup>8</sup> Controversy still exists regarding timing and technique of therapy.<sup>9,10</sup>

Empyema is a debilitating disease with immense morbidity and mortality. Surgery was in front role since from beginning, to treat such cases.<sup>11</sup> Decortication established as standard procedure and done with classical posteriolateral thoracotomy and lesser invasive incision like VATS and RATS for stage II and III chronic empyema.<sup>12</sup>

Classical posteriolateral thoracotomy is an extensive incision measuring more than 10 to 12 inches. Advantages are great exposure of lung and ease to do complete Decortication. its Short false are long duration of surgery, bleeding, excruciation pain, long hospital stay and of course high cost. To overcome afore mentioned complications, Video assisted thoracoscopic surgery (VATS) and Robotic assisted thoracoscopic surgery (RATS) came in to vogue to treat

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various lung diseases including decortication. These techniques claimed less pain and short stay in hospital but expenses for such procedures are exorbitant. Moreover in advanced, organised stage of empyema, VATS or RATS does not permit complete Decortication. It's painstakingly difficult to remove adhesions and peel the cortex. Eventually associated with increased post operative complications like air leak and persistent pneumopocket.

To overcome short comings of afore mention technique, we adapted minimally invasive lateral thoracotomy (MILT), incision being not more than 3 inches. In majority cases we could accomplish complete Decortication without extending incision successfully. Study objectives were to evaluate outcome of minimally invasive lateral thoracotomy (MILT) and decortication as an alternative approach to overcome the short comings of posteriolateral thoracotomy and VATS.

## MATERIAL AND METHODS

It was a prospective study, done over period of 1 year, from January 2017 to January 2018. Fifty cases of chronic empyema chosen and operated, followed by the single surgeon. Tubercular organised empyema patients with underlying normal lung also included in the study. All underwent lateral thoracotomy of 3 inch incision and Decortication.

Chronic empyema patients with plastered lung, fibrocavitary lesions in the lung and major bronchopulmonary fistula (BPF) with signs of desaturation were excluded from our study. Preoperative, informed consent was taken in all. Study got prior approval from institute ethical committee.

### Method

All patients's, chest roentgenograms PA view and Computed Tomography chest scan (figure-1) done to evaluate extent of disease, lung status, septation and narrowing of ribs. All patients underwent routine blood investigations along with the sputum and Pus for AFB staining. Pre anaesthetic check done for fitness.

All surgeries were done general anaesthesia. Double lumen ET tube was inserted. Patient was put in lateral decubitus position.

Operating surgeon and first assistant wore surgical loupe x 4 for magnification. Operating head light used.

Thoracotomy done using three inch lateral incision (Figure 1, 2, 3 and 4) keeping angle of scapula as centre point three centimetres below it. Muscle layer divided beyond the skin incision for better visibility. Chest entered through fourth inter costal space. Fifth rib excised if intercostal space is narrowed. Pus evacuated, adherent lung separated from its all border and finally Decortication done. Bronchopulmonary fistula (BPF) and air leak if any sutured using 4-0 polypropylene.

Cavity washed with Luke warm saline and complete haemostasis maintained. Two ICD inserted. Number 28 anterior tube, towards apex and number 32 posterior towards diaphragm. Ribs approximated by interrupted suture using three, number one vicryl. Muscle layers approximated using number one vicryl. Interrupted mattress suture used to

approximate skin with number one ethilon.

All patients were extubated on the table. Pleura and pus sent for HPE and AFB staining respectively. All patients put on appropriate antibiotics for 5days. Preoperatively diagnosed, tubercular empyema patients, ATT drugs continued as per revised national TB program protocol.<sup>13</sup> Depending on lung expansion (Figure-5) and air leak, ICD removed one at a time. Patient's outcome compared under different parameters subsequently.

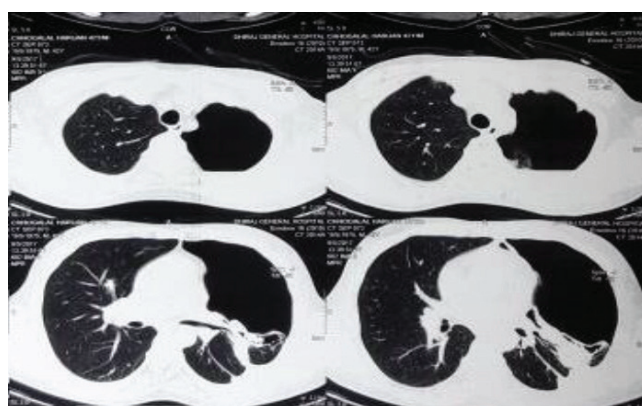
## STATISTICAL ANALYSIS

The statistical software used for statistical analysis is SPSS 20. Descriptive statistics like mean and percentages were used for analysis.

## RESULTS

Out of 50 patients, 30(78%) were male and eleven (22%) females (table-1). 33(66%) cases were under fifty years. Median age was 41.50 (SD-14.06).

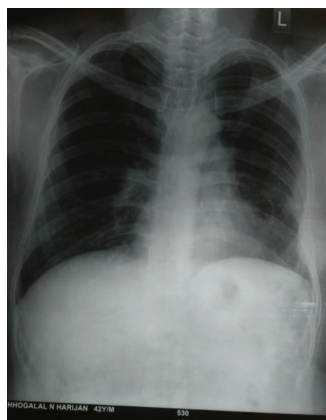
In Thirty-nine (78%) cases, empyema was due to pyogenic infection and eleven (22%) were proven tuberculosis preoperatively (Figure-6). Four (8%) empyema was followed by chest trauma. seven (14%) and ten (20%) were associated with diabetes and COPD respectively (Figure-7). Nine (18%) cases were in frank sepsis.



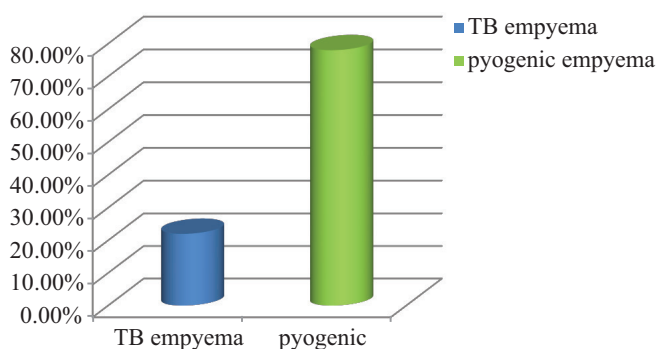
**Figure:** Empyema with collapsed lung



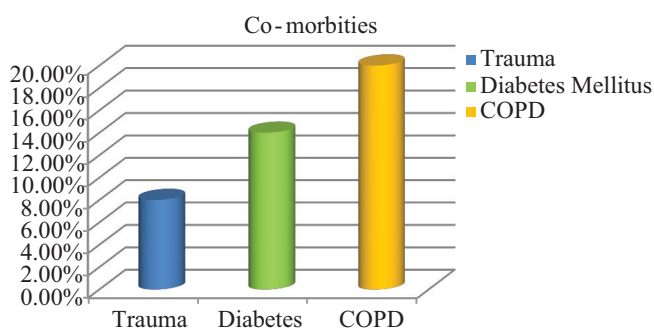
**Figure-1:** Incision; **Figure-2:** Peel; **Figure-3:** post decortication; **Figure-4:** MILT closed



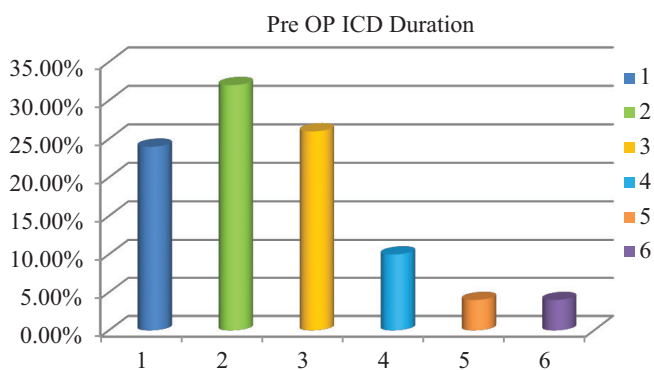
**Figure-5:** Post op chest x-ray



**Figure-6:** Causes



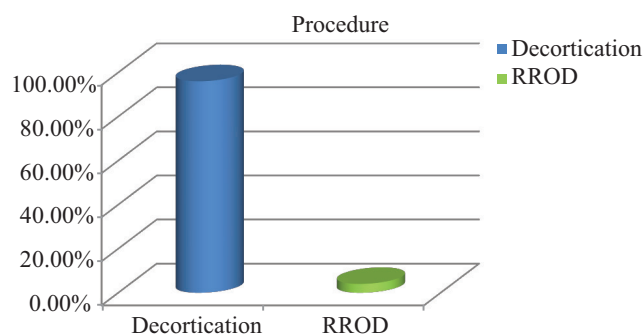
**Figure-7:** Co-morbidities



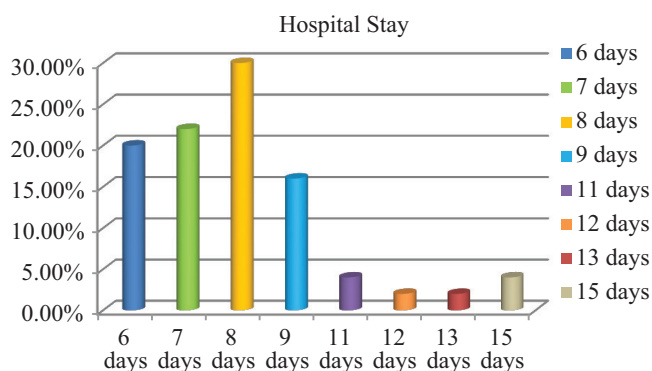
**Figure-8:** Duration of ICD insertion preoperatively

Twelve (24%) cases were chronic alcoholic and twelve (24%) chronic smokers. Preop sputum and pleural fluid tested positive for acid fast bacilli using Z-N stain in 6(12%) and 3(6%) respectively.

Patients with chronic empyema were treated initially with



**Figure-9:** Procedures



**Figure-10:** Total duration of hospital stay

Gender	N	%
Female	11	22.00%
Male	39	78.00%
Total	50	100.00%

**Table-1:** Provide legend

intercostal drainage tube (ICD) insertion. In 41 (82%) cases, ICD was present from one month to three months before referring to us for Decortication (Figure -8).

In 47(94%) cases Decortication done completely with minimally invasive lateral incision. In one (2%) case incision has to be extended by another 1 inch as lung was plastered to mediastinum. Average mean duration of surgery was 54.40 minutes (SD-12.02). Two (4%) cases decortication had to abandon due to incomplete decortication and non expansion of lung with significant broncho-pleural fistula (BPF). These two patients converted in to rib resection and open drainage procedure (Figure-9).

Post operatively patients had following complication and majority of them were self limiting. There was minimal air leak in four (8%) cases and stopped spontaneous in 24 hours, in two (4%) cases air leak prolonged for five days and than stopped. No active intervention was need in air leak patients other than delayed removal of ICD. We encountered one (2%) case, bleeding more than 200 ml post operatively probably due to tubercular adhesion and plastered cortex, treated conservatively with appropriate blood product transfusion.

In four (8%) cases persistent pneumopocket was present. In three cases ICD kept for on an average ten days with negative low suction to hasten the lung expansion. in one case patient had to be discsed with anterior ICD for one



month and ultimately lung expanded.

In 45(90%) cases anterior ICD removed in less than 4 days. 34(86%) cases posterior ICD removed in less than six days. one (2%) patient with diabetes, died due to progressive sepsis unrelated to thoracotomy. Total 36 (72%) cases discharged on eighth post operative days. (Figure-10)

## DISCUSSION

Empyema is born with human race. Diagnosis and treatment of empyema mentioned by Hippocrates and sushruta.<sup>14</sup> chronic empyema does not respond to anything lesser invasive treatment other than decortication, if tried end up prolonging morbidity and increases mortality.

In 1919, sir William Osler described first time rib resection and open drainage for management of chronic empyema.<sup>15</sup> it is in 1935 Leo eloesser described, "Eloesser Flap" drainage technique.<sup>16</sup> Panagiotis symbas, in 1971 modified Eloesser technique.<sup>17</sup> Clagett and Geraci, in 1963, did technique of wide open rib resection and open drainage, and then they filled the cavity with antibiotic solution and closed the fistula.<sup>18</sup>

Excision of an empyema sac and thickened pleura cortex from the lung has been performed for over 70 years. Delorme first to perform true Decortication in 1895. Modified during both world wars and later established as primary treatment of empyema. Basic principle of Decortication is to revive the lung function, curtail the infection and prevent thoracic deformity by Early, rapid and complete obliteration of the pleural space.<sup>19</sup>

It's the timing of intervention, which predicts the outcome of disease. Earlier the decortication better is the outcome. So shortens the duration of stay in hospital and lessen the expenses.<sup>20</sup>

Traditionally, chronic empyema has been treated by decortication using posterior lateral thoracotomy. Pulmonary complications are major cause of morbidity and mortality in the post-operative period after thoracotomy, so is the reason for popularity of VATS.<sup>21</sup> Classical thoracotomy is a major surgery associated with serious risks and potential complications. There risks of anaesthesia, surgical trauma, and longer hospital stay, postoperative discomfort with pain, complication like haemorrhage, infection, air leak and bronchoplural fistula are the greatest hazards.

VATS and RATS are best for stage II and lesser severity but not accepted universally for advanced stage.<sup>22</sup> VATS proponents claims shorter hospital stay, less pain, little scarring, minimal blood loss, no cutting of the ribs or sternum, eventually faster recovery and return to normal activities, but the cost for procurement of instrument required to do VATS or RATS are exorbitant and techniques demands steep learning curve. In countries like India and third world, it's economically not viable. More over patients present to us in very advanced stage, in which entering thoracic cavity and doing complete decortication is impossible with VATS or RATS.

Video-assisted thoracoscopic surgery (VATS) advocated by many surgeons. Its adequacy and safety still not accepted either for lung surgery in cancer or infective pathology, added to it appropriate skills and unique instruments are required

to perform VATS.<sup>23</sup> it is evidently proven the mean duration of stay in hospital shorter but cost doing it of significantly higher in majority of studies.<sup>24</sup> This option not viable in majority of our patients.<sup>25</sup> VATS and RATS have advantage of less pain and lesser complication when it's done for non infective lung diseases.<sup>26, 27</sup>

Roberts et al, approached all empyema patients with VATS in spite of surprisingly having high rate of (61.6%) conversion to thoracotomy.<sup>28</sup> which proves our claim of non suitability of VATS in advanced empyema. another similar study Claims 32% of cases were converted to thoracotomy while doing VATS either to control bleeding or to do open drainage. They had two case with massive bleeding, which is rare to see with open technique.<sup>29</sup> so ease of doing open thoracotomy under all circumstance have hindered VATS and RATS universal acceptance among thoracic surgeons.

To forbid or to reduce complications of classical posteriolateral thoracotomy and reap advantage of VATS without increasing cost of surgery, we adopted minimal invasive lateral thoracotomy (MILT) incision. it is three inch incision, appropriately located, to give best exposure, allowed to touch lung and tissue to do peeling the cortex which is truly painstaking if not. It reduced incidence of the air leak and BPF post operatively. Never had incidence of major bleeding needed exploration and avoided blood transfusion in majority. Less post operative pain, early mobilization lead to early discharge of patient. Scar cosmetically acceptable.

Identifying plane between peel and visceral pleura difficult and removing it truly painstaking. It's associated with dreaded air leaks. Using the surgical loupe and the head light make surgeon work ease, even in smallest possible incision and help to do complete Decortication.

Postoperative chest tube drainage and hospital stay was significantly longer in those with DM and sepsis.<sup>30</sup> Its proved in our studies as well. Revival of pulmonary Function is gradual but complete. immediate postoperatively reduced function of lung found in few studies it may be due to underlying diseased lung rather than technique used.<sup>31</sup>

Complete Decortication, avoiding significant air leak, post of intensive physiotherapy and if needed low negative suction is enhance complete successful lung expansion over a period.

## CONCLUSION

Minimally invasive three inch lateral thoracotomy (MILT) incision can be used safely to do decortication for chronic empyema. It's at par to VATS decortication with advantage of lesser cost, lesser learning curve and allows human touch for tissue dissection leads to complete removal of peel with lesser incidence of bleeding and air leak. Eventually allows complete lung expansion with lesser pain, faster recovery and with cosmetically appealing scar.

Minimally invasive lateral thoracotomy (MILT) and decortication, found to be well calculated surgical option with low morbidity and mortality. It allows excellent revival of lung function.

Word of caution. Decortication may not be the option in

advanced stage of chronic organised tubercular empyema particularly if lung involved with fibrosis and fibrocavitary lesion, instead in such cases we advocate rib resection and open drainage.

Usage of surgical loupe with four times magnification and adjuvant bright head light help to reduce length of incision drastically and gives the best results.

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