

## Video-Thoracoscopic Management of Empyema Thoracis in tertiary level thoracic unit

Shrestha UK, Thapa B, Baral R, Sapkota R, Sayami P.

Manmohan Cardio-thoracic Vascular and Transplant Center, Institute of Medicine, Tribhuvan University

**Corresponding author:** Bibhusal Thapa, Institute of Medicine, Maharajgunj, Kathmandu, Nepal

**Email:** thapabibhusal@yahoo.com

### Abstract:

**Introduction:** Thoracic empyema is a common problem. Use of minimal access surgery for the treatment is comparatively new. We audited our results with VATS in thoracic empyema.

**Methods:** We analyzed the retrospective data from the patients who received Video-Assisted Thoracoscopic Surgery (VATS) for empyema thoracis from April 2011 to April 2013 at Manmohan Cardio-thoracic Vascular and Transplant Center (MCVTC).

**Results:** Of the 44 patients who underwent surgery for empyema of various stages, 37 patients underwent the procedure via VATS. The average age was  $26.4 \pm 17.19$  yrs (1-64). The male to female ratio was 2:1. The duration of symptoms before VATS intervention varied very widely (7-712 days avg:  $92.7 \pm 28.8$  days). The duration was 32 days on an average among patients in whom deloculation sufficed but was 111 days among those in whom decortication was required. A complete VATS procedure with satisfactory lung expansion at the end of the procedure was possible in 34 patients (100% patients who underwent deloculation and 88% of those who underwent decortications). Inadequate lung expansion forced conversion in three and subsequent collapse necessitated re-operation in one. The operative times were: VATS converted to open decortication (150 mins), completed VATS decortication (60-180 mins, avg: 125.7 mins) and VATS deloculation (45-120 mins, avg: 69 mins). Post-operative chest tube drainage was shorter in patients in whom a successful VATS procedure was completed 4.0 Vs 40 days).

**Conclusion:** Videothoracoscopic approach is feasible in surgical management of empyema thoracis. The results seem to be better in earlier stages.

**Key words:** Deloculation, decortication, empyema, Video-assisted thoracoscopic Surgery (VATS)

### Introduction

Empyema is a common Thoracic surgical problem. They often complicate pneumonias<sup>1</sup>, tubercular effusions, infected hemothoraces etc. Three developmental stages, the acute or exudative (stage I), the fibrinopurulent stage (Stage II) and the organizing stage (Stage III) have been described.<sup>2</sup> Surgical interventions like tube thoracostomy, deloculation and decortication have been applied to halt progression or reverse effects.<sup>2</sup> More recently, Video-assisted thoracoscopic surgery (VATS) has been gaining acceptance and popularity.

The problem of empyema thoracis is all too common. The VATS approach is now considered optimum in the fibropurulent phase when medical treatment is inadequate.<sup>3</sup> However, the experience with this technique is limited in organizing phase where the lung is trapped by thick cortex.

In this study we review our initial experience with use of VATS approach in various phases of empyema thoracis. The demographic profiles, duration of empyema, success rates and complications encountered were studied.

## Methods

This study was conducted as a retrospective descriptive case series in the Department of Cardio-Thoracic Vascular Surgery of Manmohan Cardio-Thoracic Vascular and Transplant Center, Institute of Medicine (IOM), Tribhuvan University. Approval was obtained from the Institutional review board of IOM and the hospital authority for use of hospital data sources.

All consecutive patients with empyema who underwent VATS between April 2011 and April 2013 were included for analysis while all patients who underwent open (thoracotomy) decortication without a trial of VATS were excluded. The analysis also excluded patients who underwent decortication for malignant effusion.

The approach was through one camera port and one to three working 12mm ports. The cavity was first deloculated and debrided. If the lung expanded fully then the procedure was terminated after thorough irrigation and tube drainage and termed VATS deloculation. If the expansion was not adequate, we proceeded to do a formal decortication using blunt dissection with a blunt tipped suction tube (VATS decortication). The procedure was considered successful when there was satisfactory expansion of the lung and patient could be discharged without a chest tube. If at the end of the operation, the lung did not expand fully, the procedure was considered unsuccessful and was converted to open decortication.

Data regarding patient demographics, preoperative and postoperative diagnoses, comorbidities, operative time, duration of chest tube drainage, total hospital stay and postoperative complications were obtained from review of the medical records and operative notes. Unless noted otherwise, data are presented as mean  $\pm$  standard deviation.

## Results

Between April 2011 and April 2013, 44 patients underwent surgery for empyema of various stages at the Manmohan Cardio-Thoracic Vascular and Transplant Center (MCVTC). Seven patients were operated via thoracotomy prior to the availability of VATS services at the institute and were therefore excluded from analysis. Thirty-seven patients were studied. The average age was  $26.4 \pm 17.19$  yrs (1-64). The male: female ratio was 2:1. Nearly three fourths of patients came from outside Kathmandu valley. Only ten had current or past history of smoking. Twenty one patients were empirically on anti-tubercular treatment (ATT) with either non resolving or recurrent effusions at time of surgery. The empyema was thought to be due to complication in synpneumonic effusions in 12 patients. Infection in hemothorax accounted for two empyemas whereas the cause was post-operative pleural collection in three.

The duration of symptoms before VATS intervention varied very widely (7-712 days avg:  $92.7 \pm 28.8$  days). The duration was 32 days on an average among patients in whom deloculation sufficed but was 111 days among those in whom decortication was required.

A complete VATS procedure with satisfactory lung expansion at the end of the procedure was possible in 34 patients. Satisfactory lung expansion after deloculation was obtained in twelve patients whereas twenty-two required decortication. In three patients, the lung expansion was deemed inadequate and decortication was not progressing well and so they were converted to open decortication. In one patient in the VATS decortication group the lung collapsed post-operatively. He was subjected to thoracotomy and decortication as a subsequent procedure.

The operative time, duration of post-operative chest tube drainage and post operative hospital stay were as shown in table 1.

**Table 1: Comparison of operative and post-operative parameters.**

Group	No. of patients	Operative time(avg. in minutes.)	Post –operative chest tube duration (avg. in days)	Post-operative hospital stay (avg. in days)
VATS Deloculation	12	$69 \pm 21.44$	$4.4 \pm 3.02$	$5.6 \pm 3.32$
VATS Decortication	22	$124 \pm 33.47$	$4.9 \pm 4.2$	$5.8 \pm 3.06$
VATS Converted to open decortication	3	$150 \pm 11.22$	$40 \pm 22.18$	$23.4 \pm 10.88$

The three patients in whom VATS decortications failed were subjected to open decortications. However lung expansion was not complete even after open decortication. They were therefore discharged with chest tubes in situ. They underwent

staged gradual withdrawal of the tube as the thoracic cavity collapsed. One patient had significant post-operative bleeding which subsided after fresh frozen plasma. No post-operative recurrent empyema was been encountered.

## Discussion

Empyema and complex pleural effusions are common thoracic surgical problems. Surgery in the form of tube drainage, deloculation and decortication have been effective treatment modalities. However, the probability of post-operative pain and large thoracotomy scars are often deterrents to surgery especially in the fibropurulent phase. Technologic advances have now allowed for surgeons to treat these conditions with lower perioperative morbidity and mortality. Numerous groups have demonstrated the feasibility of VATS for management of empyema, with favorable results.<sup>4-6</sup> Potential advantages of the thoroscopic approach include improved visualization, less surgical trauma, and post-operative pain and improved cosmetic outcomes. To date, there is no consensus on the efficacy of the minimally invasive approach in terms of operative results and complications.

Majority of our patients (21/37) were on a trial of ATT at time of operation. This reflects the prevalence of the disease in our region but also probably points to the widespread practice of use of empirical ATT.

We were able to complete 91.89 % (34/37) of the procedures via VATS. All 12 deloculations were completed VATS. Eighty eight percentages 22/25 of decortications were completed via VATS. This is comparable to reported series. Conversion rates to open decortications ranged from 3.5% to 41% in an analysis of contemporary series in 2007.<sup>6</sup> Solani et al in this review found higher conversion rates corresponding to stage III empyema.<sup>6</sup> In a large series of thoracic decortications which compared results for 420 patients, 326 who underwent VATS decortication and 94 who had open decortications, Tong et al reported a conversion rate of 11.4%<sup>7</sup>. Tong et al reported operative time of 97 minutes for VATS decortications compared with 154 minutes for Open decortications. ( $p = 0.001$ ). In our series, the mean operative time of VATS decortication was 124 minutes. This probably reflects the effect of the learning curve we are going through. The average time for a VATS deloculation was however 69 mins.

Three patients who required a conversion had to continue with the chest tube for a prolonged period of time (30-60 days) for incomplete expansion ( $n=2$ ) and prolonged air leak ( $n=1$ ). We did not encounter re-accumulation of pleural empyema. One patient had peri-operative bleeding. We had no 30 day mortality. This compares favorably with the reported post-operative complication, recurrent empyema and

30-day postoperative mortality rates of 9%, 2.4% and 4%, respectively in the series reported by Lardinois et al in 2005.<sup>8</sup>

The present study represents an audit of patients who underwent VATS as surgical management for pleural empyemas. Although our results have been encouraging, the lack of comparison between VATS and traditional open decortication is a major limitation of this study.

## Conclusion

VATS is an acceptable technique in surgical management of both early and late stages of empyema thoracis. Although VATS deloculations in early stage empyemas are more likely to succeed, VATS decortications too can give good results.

Conflict of interest: The authors declare that there is no conflict of interest associated with the study. We have not received/ used funds from any source.

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