

Decortication and Deloculation Surgery with Uniportal Video - Assisted Thoracoscopy in the Treatment of Pleural Empyema; An Effective and Reliable Technique

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Abstract

Introduction: Therefore, empyema is of great importance in terms of morbidity, mortality and hospital costs. The main goal in treatment is increasing lung expansion and cleaning the fibrin deposits in the thoracic cavity. In this way, clinicians' aim is to provide treatment without the need for thoracotomy. In recent years, there are a number of studies in the literature reporting the consequences of the results treated with video-assisted thoracoscopic surgery. With VATS, debridement reduces the need for thoracotomy by preventing empyema from becoming chronic by ensuring proper drainage and lung expansion. VATS has an important role in the fibrinopurulent period between the early and late period.

Objective: We aimed to evaluate the results and reliability of uniportal video-assisted thoracoscopic surgery in stage II-III pleural empyema.

Materials and Methods: The results of patients treated for pleural empyema in our hospital were investigated. Patients who underwent uniportal video-assisted thoracoscopic surgery (U-VATS) between March 2015 and June 2020 were included in the study.

Results: The files of 19 patients who underwent pleural deloculation and decortication with U-VATS in our clinic were evaluated retrospectively and results were recorded. Twelve of the patients were male, and 7 were female. Admission symptoms in patients were fever, shortness of breath, night sweats and chest pain. In our patient group, the number of patients with comorbid disease was 15. Five of them had COPD and four of them had extrathoracic malignancy etiology. Diabetes mellitus and cardiac patients were seen in three patients. U-VATS surgery was generally performed on the right side (n: 12). In our study, stage II empyema was present in 13 and stage III in 6 patients. Postoperative complications were seen in 7 patients, prolonged air leakage and expansion defect were seen

Keywords: Uniportal VATS; Empyema; Decortication; Deloculation

Introduction

Today, despite contemporary diagnosis and treatment methods, pleural empyema remains a serious health problem. The most common cause of pleural empyema is parapneumonic effusions [1]. The process begins with an increase in pleural permeability and exudative fluid accumulation in the pleural space in response to bacterial contamination during pneumonia. After this stage, the fibrinopurulent stage and finally the well-organized chronic stage develops [2]. According to the stage as treatment options are antibiotic therapy, thoracentesis, decortication, chest tube placement, fibrinolytic therapy, video assisted thoracoscopic surgery (VATS) and decortication with thoracotomy [3].

Therefore, empyema is of great importance in terms of morbidity, mortality and hospital costs. The main goal in treatment is increasing lung expansion and cleaning the fibrin deposits in the thoracic cavity. In this way, clinicians' aim is to provide treatment without the

need for thoracotomy. In recent years, there are a number of studies in the literature reporting the consequences of the results treated with video-assisted thoracoscopic surgery [4,5]. With VATS, debridement reduces the need for thoracotomy by preventing empyema from becoming chronic by ensuring proper drainage and lung expansion [6]. VATS has an important role in the fibrinopurulent period between the early and late period [7]. This period can occur within a few days to 3 weeks when the disease begins, and is characterized by thickened pleura, and loculations.

Aim of the Study

We aimed to evaluate the results and reliability of uniportal video-assisted thoracoscopic surgery in stage II-III pleural empyema.

Materials and Methods

The results of patients treated for pleural empyema in our hospital were investigated. Patients who underwent uniportal video-assisted thoracoscopic surgery (U-VATS) between March 2015 and June 2020 were included in the study. The data of all patients were evaluated, age, gender, symptomatology, surgical side, comorbid conditions, microbiological cultures, operation time, drain removal time, hospital stay and follow-up details were analyzed. All patients were imaged with contrast-enhanced thorax CT in the preoperative period. The incision was decided based on the empyema localization in thorax CT. Patients considered excessive pleural adhesion was treated with multiportal VATS or thoracotomy rather than uniportal surgery.

Statistical analysis

All data on clinical results before and after surgery were collected and analyzed retrospectively. The findings from the patients were analyzed with SPSS software (SPSS Inc., Chicago, IL, USA) using a mean and standard deviation (SD) with a 95% confidence interval (CI). Frequency and percentage were calculated for gender, comorbidity, ASA physical condition class, surgical procedure, and lesion localization. Findings such as anesthesia induction time, operation time, drain removal time and hospital stay were recorded.

Results

The files of 19 patients who underwent pleural deloculation and decortication with U-VATS in our clinic were evaluated retrospectively and results were recorded. 12 (63%) of the patients were male, and seven (37%) were female. The average age was 63.2 ± 16.9 (23 - 89). Fever was present in 11 (58%), dyspnea 8 (42%), night sweats 5 (26%) and chest pain in three (16%) patients, seven patients had more than one symptom. The time from the onset of symptoms to the time of admission to the hospital was 14.9 ± 2.71 (11 - 20) days. The majority of patients were referred to us from the Department of Chest Diseases, and antibiotics were given primarily until surgery was planned. The average duration of antibiotic treatment until VATS surgery was found to be 7.15 ± 1.9 (5 - 10) days (Table 1).

		(n:19)	%
Age		63,2 ± 16,9	23 - 89
Gender	Male	12	63
	Female	7	37
Symptoms	Fever	11	58
	Dyspnoea	8	42
	Night sweats	5	26
	Chest Pain	3	16
Duration of symptoms		14,9 ± 2,71	11 - 20
Duration of antimicrobial treatment		7,15 ± 1,9	5 - 10

Table 1: Demographic information and preoperative findings of patients.

In our patient group, the number of patients with comorbid disease was 15. Five of them had COPD and four of them had extrathoracic malignancy etiology. Diabetes mellitus and cardiac patients were seen in three patients. U-VATS surgery was generally performed on the right side (n: 12, 63%), the number of patients who underwent surgery on the left hemithorax was 6, and 1 patient underwent bilateral surgery. In our study, stage II empyema was present in 13 (68%) and stage III in 6 (32%) patients. The pleural fluid culture taken during U-VATS surgery was mostly negative. Only 4 (21%) patients had positive culture results, and 15 (79%) patients did not grow any bacteria in the pleural fluid culture. We had 4 patients who underwent tube thoracostomy during antibiotic therapy and were given intrapleural fibrinolytic therapy. Tissue plasminogen activator was used in these patients, but surgery was performed because of no benefit. The information of our patients in the preoperative period is given in table 2.

		(n:19)	%
Comorbidity n: 15 (79%)	COPD	5	26
	Extrathoracic malignancy	4	21
	Diabetes mellitus	3	16
	Cardiac diseases	3	16
Lesion localisation	Right	12	63
	Left	6	32
	Bilateral	1	5
Empyema stage	II	13	68
	III	6	32
Bacterial culture of thoracocentesis fluid	Positive	4	21
	Negative	15	79
Intrapleural fibrinolytic use		4	21

Table 2: Clinical findings of patients.

When we look at the operation time of the patients; mean operation time was 64.75 ± 18.3 (45 - 100) minutes. During surgery, patients were generally intubated with a double lumen tube. However, U-VATS was applied in 4 patients with non-intubated technique. 28 and 32 french thorax drains were used as drainage. Thirty-two fr was used in 5 (26%) patients and 28 fr in 14 (74%) patients. Single drain was placed in all of our patients, and we did not use double drain. We had 1 patient who underwent thoracotomy during the operation. In this patient, the incision was expanded instead of the standard posterolateral thoracotomy, and surgery was completed with the support of VATS (Table 3).

		Values	%
Operation time		$64,75 \pm 18,3$	-
Drain size (french)	32	5	26
	28	14	74
Conversion to thoracotomy		1	5
VAS score (in postoperative first 24 hours) (2-4)		$2,7 \pm 0,92$	-
Complications (n:7, %37)	Air leak	3	16
	Cardiac arrhythmia	2	11
	Wound infection	2	11
Drain removal time (5-13)		$6,9 \pm 2,7$	-
Hospital stay (7-14)		$9,4 \pm 2,45$	-
Need for open decortication		3	16
Postoperative pathology	Chronic nonspecific pleuritis	12	63
	Tuberculosis	4	21
	Malignancy	3	16

Table 3: Perioperative and postoperative findings of patients.

Postoperative pain assessment of the patients was done with Visual Analogue Scale (VAS). The mean VAS score in the first 24 hours postoperatively was 2.7 ± 0.92 (2 - 4). Postoperative complications were seen in 7 (37%) patients, prolonged air leakage and expansion defect were seen in 3 (16%) patients, 2 (12%) patients developed cardiac arrhythmia, and 2 (12%) patients developed wound infections. The mean drain removal time was 6.9 ± 2.7 (5 - 13) and the hospitalization day was 9.4 ± 2.45 (7 - 14) days. Chronic non-specific pleuritis was reported as 12 (63%), tuberculosis 4 (21%) and malignancy 3 (16%) as postoperative pathology (Table 3). There was no patient in need of decortication during our follow-up. There was no mortality in the first postoperative month.

Discussion

The first goal in the treatment of pleural empyema is to control the infection and to prevent pleural adhesions and to provide lung expansion. Treatment varies according to the empyema stage. There are various options from conservative treatments to major surgical procedures [8,9]. Antibiotic therapy, tube thoracostomy, and intrapleural fibrinolytic agents may be preferred in early stage empyema [10]. Although it has been reported in some studies that the cost of fibrinolytic agents is increased and hospitalization is prolonged, its use continues widely since it is a less invasive technique [11]. In advanced stage empyema, decortication is required with VATS or thoracotomy, since pleural thickness increases and pleural adhesions develop [12].

With the development of video-assisted thoracoscopic surgery, it is increasingly used in the treatment of empyema. It has also been shown that good results are obtained in patients undergoing decortication with VATS [13]. The number of centers implementing both multiportal VATS and uniportal VATS is gradually increasing. We also use VATS as the first choice in empyema surgery in our clinic. Höfken, *et al.* [14] reported the results of VATS surgery in 248 patients in their study, in which they presented their 10-year experience. The treatment rate in Stage I was 97.6%, and it was 80.3% in stage II and 63.1% in stage III. In this series with a large number of patients, 30-day mortality was 4.8%, and in-hospital mortality was 8.1%. In our series, thoracotomy was performed in only one patient, and our success rate was 95%. Reasons for decortication with thoracotomy during VATS or during follow-up; tight adhesions that do not allow dissection, continued expansion despite the debridement, advanced stage disease and vascular injuries [15].

In the consensus report published by the European Cardio - Thoracic Surgery Association (EACTS), VATS has been shown to have an important place in the treatment of pleural empyema due to its safety and efficacy in both stage II and stage III [16]. With the VATS surgery being at the forefront, the series of patients reported from a single incision were also published [17]. The success rate is high in these series, which are shown to be more comfortable both in terms of cosmetics and pain control. Marra M., *et al.* [16] showed that single incision VATS is a reliable and effective technique in 61 disease series. In this study, it was reported that 98% of patients achieved complete debridement of the pleural cavity macroscopically. The average operation time was found to be 53 minutes. The average operation time in our series was 64.75 minutes. Intraoperative complications were not observed in this patient group [18].

In our patient series, the VAS scores of the patients were found to be 2.7 in terms of postoperative pain scoring. We attribute this low value to our effective pain control and uniportal surgery practice. We think that we reduced postoperative pain score with local anesthesia in the incision lines during surgery. In addition, we routinely prescribed non-steroid anti-inflammatory painkillers to our patients without complaints of pain. The drain was removed when the fluid from the thorax drains fell below 200 ml daily during clinical follow-up. As a result, the average drain time was 6.9 days, and the hospital discharge time was 9.4 days. We see that these values are compatible with the literature. In the study of Reichert, *et al.*, VATS showed that postoperative hospitalization decreased was safe, more tolerable and more effective for patients [19].

Hsiao, *et al.* [20] took uniportal video thoracoscopy a little further and shared the results of their patients who applied uniportal non-intubated VATS. In this series, 33 patients who were at high risk for general anesthesia were operated without intubation [20]. In our series, 4 patients with insufficient cardiac and respiratory functions for general anesthesia underwent surgery with non-intubated VATS. None of these patients required intubation during the operation and there was no need to undergo thoracotomy. Bongiolatti, *et al.* [21]

showed that staging and imaging with preoperative thoracic ultrasound in patients who underwent uniportal VATS increased the success rate. In this study, in-hospital mortality was zero and general morbidity was 29%. U-VATS has been shown to be associated with low blood loss, low chest tube duration, shorter hospital stay, and lower complication rate [21]. The absence of hospital mortality in our series is one of the important results of our study. Randomized controlled trials are needed to evaluate the short drain time and early discharge that we obtained in our patients statistically. Our limitations are the low number of patients and the fact that our study is not prospective.

Conclusion

Uniportal VATS surgery is a technique that can be applied safely in experienced centers in the treatment of empyema. We see that it provides an effective treatment option in patients with U-VATS. Especially in the early stages of empyema, the need for decortication with chronic and thoracotomy will decrease. Non-intubated VATS may also be preferred in patients at high risk for general anesthesia.

Consent

Informed consent has been obtained.

Funding

No funding was required for this study.

Conflict of Interest

No potential conflict of interest exist.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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