

Efficacy of Video-Assisted Thoracoscopic Surgery (VATS) in the Treatment of Primary Pleural Empyema

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ABSTRACT

Background: Video-Assisted Thoracoscopic Surgery (VATS) has recently occupied a significant place in the surgical treatment of primary pleural empyema (PPE). Patients with anamnesis shorter than 4 weeks have a good chance of being cured only by VATS. As it is not easy to define precisely the beginning of the disease, it is difficult to say strictly to which period VATS method will be successful in PPE treatment. **Objective:** The aim of this study was to determine the efficacy of the VATS method in the surgical treatment of primary pleural empyema. **Methods:** The study included 50 patients with findings appropriate for PPE over a period of three years, in whom the VATS method was applied in the surgical treatment of pleural empyema. **Results:** The established total length of treatment was 13.56 ± 7.98 days and the length of hospital treatment after surgery was 9.90 ± 3.315 . The duration of thoracic drainage was 8.06 ± 3.005 . Treatment was completed by the primary procedure without additional interventions in 94% of patients. Based on the final outcome, all patients from the clinic were discharged as cured. **Conclusion:** The best time to indicate surgical treatment by using VATS method is history of disease in duration of four weeks. Debridement or VATS decortication method is safe and efficient surgical procedure, especially in the first two stages. It is recommended to use this method as the first surgical option for patients in early stages of the disease. **Keywords:** VATS, thoracic drainage, pleural empyema, disease stage.

1. INTRODUCTION

Standard thoracic drainage is the most commonly used procedure in the treatment of pleural empyema. In recent years pleural empyema video assisted thoracoscopic surgery within surgical treatment (VATS) is increasingly applied. VATS is defined as minimal invasive surgery carried out by coordination of surgeon's hand and eye supported by video link. Literature shows that the results of this method are much better compared to standard pleural drainage techniques, especially in I and II stage of pleural empyema (1, 2). Although the literature state procedure of decortication using VATS technique, it is not entirely clear if some authors are using this method in late stages of disease (III stage). Some papers state VATS decortication procedure, but it cannot be said for sure that it is proved that stan-

dard Fowler-Delorme procedure has been carried out (3, 4). Success rate of procedures carried out by VATS technique is from 68% to 93%, and it seems that it is in close correlation with careful choice of group of patients (5). Patients whose history is shorter than 4 weeks have a good opportunity to be cured only by VATS method (6) while patients with a history of over 5 weeks (presumed stage III) usually require decortication (7). Just as it is not easy to precisely define the onset of the disease, it is difficult to say with strict precision how long the VATS method will be successful in treating pleural empyema.

2. AIM

The aim of this study was to determine the efficacy of the VATS method in the surgical treatment of primary pleural empyema.

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3. PATIENTS AND METHODS

The study included 50 patients with clinical, laboratory and radiological findings appropriate for PPE, with an orientationally determined stage of the disease according to the duration of symptoms.

4. RESULTS

In the period from January 1, 2016 to December 31, 2018 the study was performed on a sample of 50 patients with primary pleural empyema at the Clinic for Thoracic Surgery (CTS), University Clinical Center (UCC) in Sarajevo. Average age of the patients was 53.82 ± 14.14 (from 26 to 76) years. In the gender structure of patients, 82% (41/50) of patients are men and 18% (9/50) are women, with a male/female ratio of 4.55: 1. The anamnesis-established duration of symptoms in the preclinical phase of the disease, i.e. until admission to the Clinic, ranges from 3 to 43 days. The average duration of symptoms is 19.2 ± 7.77 days. Most patients were admitted with symptoms within 4 weeks (Table 1).

Duration of symptoms	PATIENTS
1 week	6% (3/50)
2 week	30% (15/50)
3 week	20% (10/50)
4 week	28% (14/50)
Over 4 weeks	16% (8/50)

Table 1. Duration of symptoms in weeks until admission to the CTS

In the first stage of the disease there were 6% (3/50) patients, in the second stage 78% (39/50) patients and the third stage, 16% (8/50), patients (Table 2).

STAGE OF DISEASE	PATIENTS
I stage	6% (3/50)
II stage	78% (39/50)
III stage, early stage	16% (8/50)
TOTAL	100% (50)

Table 2. Overview of patients according to the stage of disease on admission to the CTS

Based on microbiological analysis performed in all patients, a positive culture of pleural puncture was found in 64% (32/50) of patients. The average length of total treatment at the clinic was 13.56 ± 7.98 days, while the length of treatment after surgery was 9.90 ± 3.315 days. The duration of underwater thoracic drainage from the moment of the performed surgical procedure was 8.06 ± 3.005 days (Table 3).

TEST GROUP	AVERAGE LENGTH OF TREATMENT		
	TOTAL LENGTH OF TREATMENT	LENGTH OF THORACIC DRAINAGE	LENGTH OF TREATMENT AFTER SURGERY
	13.56 ± 7.98	8.06 ± 3.005	9.90 ± 3.315

Table 3. Overview of average length of treatment

Treatment was completed by the primary procedure without additional interventions in 94% (47/50) of patients. In 6% (3/50) patients, conversion to thoracotomy and lung decortication was performed (Table 4).

	VATS
Treatment completed by primary procedure	94% (47/50)
Conversion to thoracotomy	6% (3/50)
Conversion to VATS	0
Re-drainage (additional drainage)	0

Table 4. Comparison of VATS method efficacy and standard drainage procedure

The observed complications in the postoperative period were manifested only in the form of prolonged drainage due to prolonged secretion and loss of air to the drains. Prolonged drainage in the study group was observed in 8% (4/50) of patients. Based on the final outcome, all patients from the Clinic were discharged as cured. Mortality was not recorded in this study.

The analysis of the standard radiogram in PA and the corresponding lateral position performed during the discharge of the patient from the clinic and follow-up control a month after discharge is given in Table 5. Analysis of pulmonary radiograms was carried out according to Rx score 5% scale. The standard radiogram at discharge was neat and without radiologically verified sequelae with complete restitution and Rx score 5% = 100 in 68% (34/50) patients, and at follow-up after one month in 84% (42/50) patients. Significant post-therapeutic and postoperative changes radiologically verified as sequelae in the form of obliterated fc sinus, Rx score 5% = 50 on the control radiogram after one month were registered in 10% (5/50) of patients. Severe sequelae verified radiologically at the control examination in the form of fibrothorax Rx score 5% = 25 were recorded in only 2% (1/50) of patients (Table 5).

Lungs X-ray	Rx score (5%)	On discharge from the Clinic	Follow-up control after 30 days
Clean (complete restitution)	100	68%(34/50)	84%(42/50)
Narrowed fc sinus	75	18%(9/50)	4%(2/50)
Shadowed/Obliterary fc sinus	50	12%(6/50)	10%(5/50)
Incomplete reeksp/Fibrothorax	25	2%(1/50)	2%(1/50)

Table 5. Analysis of lungs X-ray on discharge from the CTS and follow-up control after 30 days

Mean values Rx scores of 5% are shown in Table 6. The analysis of the standard chest radiogram was performed at the discharge of the patient from the clinic and at the follow-up examination after 1 month.

Mean values Rx score 5%	
On discharge from the Clinic	88
Follow-up control after a month	95,5

Table 6. Evaluation of standard chest radiogram

	Pulmonary function	p*
Before the procedure	FEV ₁	63.5 ± 16.1
	FVC	62.3 ± 15.7
After the procedure	FEV ₁	89.8 ± 12.1
	FVC	88.2 ± 12.2

Table 7. Comparison of the values of the examined lung functions before and after the procedure

Examination of pulmonary function FEV₁ and FVC was performed immediately before surgery and at the control examination one month after surgery (Table 7)

5. DISCUSSION

A new approach in the treatment of pleural empyema is based on the need to initiate surgical treatment at an early stage of the disease. There is an almost general consensus that VATS, as a minimally invasive method, has a significant place, especially in the surgical treatment of early stages of pleural empyema (8). A key factor for the effectiveness of VATS debridement is early diagnosis and indication for surgery. The ideal time in the history of the disease in which surgical treatment with the VATS method should be indicated is still the subject of reasoned discussions (9). Several studies in the literature prove the claim that VATS is effective in the early stages of empyema (stage I and stage II) (10). However, Waller and Rengarajan (2001) prove that this method can also be effective in the advanced stages of empyema (stage III). It seems that the claim that patients with a history of less than 4 weeks have a good chance of being cured with VATS alone (11) can be defended with certainty, while the chances of patients with a history of more than 5 weeks (stage III) are lower (12, 13).

The sublimated conclusion of most papers published so far could be set in such a way that debridement or decortication by VATS method is a safe and efficient surgical procedure, especially in the first two stages, but that it also has a role in stage III (14).

After research done within this work, it can be accepted without reserve that in most cases debridement achieving complete enabling of lungs with full re-expansion is sufficient technical process with concurrent satisfying result in regard of small pleural trauma and avoiding pleural fistula, which has direct impact on post-operative recovery in terms of shorter duration of thoracic drainage and shortening the length of post-operative treatment.

As the results in this study show, the average length of total treatment at the clinic (13.56 ± 7.98) was shortened. As a significant indicator of the efficiency of the applied method, in addition to the length of total treatment, the duration of thoracic drainage after surgery was analyzed, which is also favorable for the application of the VATS method.

Applying the VATS method reduces the need for other, more aggressive surgical procedures, such as thoracotomy. The complications noted are less common and are milder in its scope. The final outcome of treatment of patients treated with VATS method shows far better results in the percentage of healing, as well as the established results based on radiological analyzes performed in the postoperative period by Rx score 5% method. Based on this research, this method can be introduced as part of a standard protocol in the treatment of primary pleural empyema whose history of disease is up to 5 weeks, and in indicated cases even after this period of disease duration. It can be considered an ideal surgical method for patients with pleural empyema whose med-

ical history does not last longer than 4 weeks.

6. CONCLUSIONS

Based on the objectives of research, conducted methodological treatment and obtained values of the research results, the following can be concluded:

- The best time to indicate the surgical treatment by VATS method is the history of disease in duration of four weeks.
- Debridement or decortication by VATS method is safe and efficient surgical procedure, especially in the first two stages, but it has its role in stage III also.
- It is not necessary to insist on the classic procedure of decortication because good results in radiological and functional terms can be achieved by debridement also.
- This method is extremely safe and efficient for patients with low rate of conversion to thoracotomy, the type and frequency of mild complications.
- It can be recommended to use this method as the first surgical option for patients in early stages of disease.

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