

Minithoracoscope versus Conventional Medical Thoracoscope in Patients with Exudative Pleural Effusion

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ABSTRACT

BACKGROUND: Thoracoscopy allows visualization of the pleural cavity including diaphragm, visceral pleura, and lungs. It provides the physician with information about the disease extent and it has the ability to get a biopsy from these lesions to differentiate between tumors and fibrotic reactions. This study aims to compare minithoracoscopy and medical thoracoscope in patients with exudative pleural effusion as regards the diagnostic yield, safety, complications, and duration of hospital stay.

PATIENTS AND METHODS: Sixty patients were diagnosed with exudative pleural effusion and were randomly divided into 2 equal groups: Group (1): included 30 patients who underwent minithoracoscopy and Group (2): included the remaining 30 cases who underwent the standard thoracoscope.

RESULTS: Pathological examination of the sample revealed that biopsy size was 2.02 and 1.25 in group 1 and group 2 was respectively with highly statistically significant between both groups ($P < .001$). Group 1 revealed TB, malignant, chronic nonspecific pleurisy, Staph aureus, Klebsiella, and Pseudomonas in 30% (9), 30% (9), 33.3% (10), 69% (9), 15% (2), and 15% (2) of cases respectively. While group 2 revealed TB, malignancy, chronic nonspecific pleurisy, Staph aureus, Klebsiella, Pseudomonas, and other causes in 40% (12), 23.3% (7), 23.3% (7), 67% (8), 8% (1), 8% (1), and 16% (2) respectively with no statistically significant differences between both groups ($P > .05$).

CONCLUSION: Minithoracoscopy is well tolerated by patients as minimal pain and early hospital discharge could be achieved by that approach.

KEYWORDS: Minithoracoscopy, conventional medical thoracoscopy, pleural effusion

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Introduction

Disruption of the normal mechanisms of formation and drainage of the pleural space fluid results in the formation of pleural effusion. Multiple diseases can lead to pleural effusion, which often carries a grave prognosis.¹

In daily medical practice, pleural effusion is commonly encountered by respiratory and non-respiratory physicians. In USA, about 1 to 1.5 million cases are diagnosed with effusion every year, whereas in UK, the new cases are estimated about 200 000 to 250 000 new cases per year.²

The differential diagnosis of pleural diseases is often a lengthy process fraught with pitfalls. If pleural effusion is diagnosed, it is recommended to use a timely and systematic evaluation as the differential diagnosis of such conditions carries multiple possibilities.³

Thoracoscopy allows visualization of the pleural cavity including the diaphragm, visceral pleura, and lungs. It provides the physician with information about the disease extent and it also has the ability to get a biopsy from these lesions to differentiate between tumors and fibrotic reactions.⁴

Performing an endoscopy via small-diameter instruments (2 mm–5 mm) is defined as minithoracoscopy. Minithoracoscopy can be considered as a complementary technique to the standard thoracoscopy as it could be used for small effusions that are inaccessible to the standard equipment.⁵

Aim of the work

This study aims to compare minithoracoscopy and medical thoracoscopy in patients with exudative pleural effusion as regards the diagnostic yield, safety, complications, and the duration of hospital stay.

Patients and methods

This study was an Interventional-Randomized study conducted in the Chest Medicine Department, Mansoura University Hospitals. It was conducted during the period between November 2017 and November 2018. The experimental protocol was approved by the Institutional Research Board of Faculty of Medicine, Mansoura University in 4-12-2017 (Code Number: MS/17.11.53).



Patients older than 18 years who were diagnosed with exudative pleural effusion after initial cytological and microbiological examination were included. We used Light's criteria to confirm the presence of exudative effusion. A pleural effusion is likely to be exudative in nature if at least one of the following exists:

1. The ratio of pleural fluid protein to serum protein is greater than 0.5.
2. The ratio of pleural fluid LDH and serum LDH is greater than 0.6.
3. Pleural fluid LDH is greater than 0.6 or $\frac{2}{3}$ times the normal upper limit for serum.⁶

On the contrary, the presence of transudative effusion, pregnancy, bleeding diathesis, hemodynamic instability, myocardial ischemia, hypoxemia not corrected with low flow oxygen, or contraindication for performing minithoracoscopy because of a lack of pleural space are due to advanced empyema that causes exclusion.

Sixty cases with exudative pleural effusion were included. They were randomly used closed envelop divided into 2 equal groups; group 1 included 30 cases who performed minithoracoscopy, while group 2 included the remaining 30 cases who underwent the standard thoracoscopy.

All patients were subjected to complete history taking through physical examination and routine laboratory investigations. Besides, dyspnea according to Medical Research Council (MRC) scale⁷ was divided into: Grade 0: I only get breathless with strenuous exercise, Grade 1: I get short of breath when hurrying on level ground or walking up a slight hill, and Grade 2: I walk slower than people of the same age on level ground because of breathlessness, or I have to stop for breath when walking at my own pace on the level. Grade 3: I stop for breath after walking about 100 yards or after a few minutes on level ground, Grade 4: I am too breathless to leave the house or I am breathless when dressing was assessed for all cases. Radiological evaluation included plain chest x-ray, computed tomography (CT), and chest ultrasonography (US).

The procedure

Group (1): subjected to thoracoscopic examination via minithoracoscopy (Richard Wolf company, Germany) see Figure 2.

Group (2): subjected to thoracoscopic examination using medical thoracoscope using 11 mm single trocar thoracoscope (Karl Storz Company, Germany) see Figure 1.

The procedure was performed in cleaned and draped endoscopy unit stocked with the necessary medications and resuscitation equipment. The patient was positioned at lateral decubitus position and ultrasound was used to choose the best area containing pleural effusion.

Anesthesia was performed using bolus propofol (30 mg-50 mg). Furthermore, lidocaine 2% solution was injected into



Figure 1. Karl Storz—Endoscope.



Figure 2. Richard Wolf GmbH Pforzheimer Strabe 32-75438 Knittlingen, Germany.

the subcutaneous tissue and periosteum of ribs above and below.

Accurate identification of the level of incision was identified based on ultrasound. An axillary point of entry was selected in all cases. The axillary triangle was used as an entry point as it has no bulky muscle that may obstruct the instruments. The point of incision was generally near the mid-axillary line within the triangle.

An incision was made with a scalpel through skin and subcutaneous tissue appropriate to the size of the trocar used. While the fixation of the intercostal space, the trocar was introduced with a forceful corkscrew motion for the release of the resistance of the internal thoracic fascia. The trocar was positioned to lie at 0.5 cm within the pleural space. Then, the trocar was removed and the telescope lens was inserted through the cannula into the pleural space.

Pleural fluid suction and pleural biopsy maneuver

Firstly, we made the suction of pleural fluid through the suction port of telescope that was connected to a suction device. Coagulation forceps were set at 60 W to 80 W to coagulate and seal the cut surface. Then, the lesion was grasped with forceps toward the trocar during applying current with a foot pedal. Three specimens were obtained during the session.

At the end of thoracoscopy, a Nelaton catheter (for minithoracoscope) or intercostal chest tube (for conventional medical thoracoscope) was inserted through trocar at the point of

entry. Both of them were connected to an underwater seal apparatus. Continuous monitoring for O₂ saturation (we consider the decrease of O₂ saturation equal or less than 95% was abnormal) and ECG throughout the procedure after intervention for 2 h were ensured.

Bleeding after each biopsy was evaluated according to Aktas et al. as follows; 0: no bleeding, 1: mild bleeding controlled by maintained suction, 2: moderate bleeding controlled by different interventional techniques as local application of cold saline and fibrin glue patch, and 3: severe bleeding needs ICU admission and blood transfusion due to hemodynamic instability.⁸ Follow up chest X-ray was done to evaluate lung expansion and the presence of surgical emphysema.

In addition, post-procedure pain was evaluated up to 3 h after termination of the procedure via a numerical rating scale.⁹ The duration of hospitalization was recorded for both groups.

Statistical analysis

Statistical analysis of the collected data was performed using IBM SPSS statistics (Statistical Package for the Social Sciences) for windows (version 25, 2017), whereas charts were created using SPSS chart builder and Microsoft Excel for Windows 2019. The normality of data was assessed via the Shapiro–Wilk test. All tests were conducted with 95% confidence interval. *P* (probability) value <.05 was considered statistically significant.

Results

In our study, we found that the mean ages of groups 1 and 2 were 42.27 and 46.37, respectively. Percentages of male gender were 73% and 60% in both groups respectively, while the remaining cases were females. According to smoking, the percentages of non-smokers, ex-smoker, and smoker were 27%, 43%, and 20% in-group 1 and were 47%, 20%, and 33% in-group 2 respectively. The percentages of DM, HTN, and IHD were (23%, 43%, and 10%) and 50%, 33%, and 3% in-group 1 and 2 respectively. As regards, dyspnea grades, 3%, 60%, and 37% of group1 cases developed dyspnea grade III, IV, and V respectively, while 37%, 57%, and 7% of group 2 cases developed dyspnea grade III, IV, and V respectively. The percentages of cough were 50% and 40% in-group 1 and 2 respectively, while the percentages of toxemic manifestations were 47% and 40% in both groups respectively. See Table 1

The mean procedure times were 19.73 and 26.07 in both groups respectively. The percentage of intra-operative events that included hypoxemia, bleeding, and arrhythmia were (60%, 36.7%, and 50%) and (20%, 10%, and 23.3%) in the 2 groups respectively. As regard thoracoscopic findings, the percentage of adhesion, nodule, plaques, and anthracotic patches were (63.3%, 50%, 16.7%, and 3.3%) and (66.7%, 26.7%, 20%, and 0%) in both groups respectively. See Table 2.

The degree of pain after 3 h were mild, moderate and severe in (60.0%, 30.0%, and 10.0% conventional thoracoscopy and (100.0%, 0.0%, and 0.0%) minithoracoscopy group with highly

Table 1. Demographic characteristics and medical history of the studied groups.

		MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	<i>P</i>
Age		42.27 ± 7.57	46.37 ± 11.32	.1
Gender	Male	73% (22)	60% (18)	.41
	Female	27% (8)	40% (12)	
Smoking	No	43% (13)	47% (14)	1
	Ex-smoker	20% (6)	20% (6)	
	Smoker	37% (11)	33% (10)	
DM		23% (7)	50% (15)	.06
HTN		43% (13)	33% (10)	.6
IHD		10% (3)	3% (1)	.61
Dyspnea	III	37% (11)	37% (11)	1
	IV	60% (18)	57% (17)	
	V	3% (1)	7% (2)	
Cough		50% (15)	40% (12)	.6
Toxemic manifestation		47% (14)	40% (12)	.8

Data are expressed as mean and standard deviation. *P* is significant when <.05.

statistically significant difference among both studied groups ($P < .001$). The degree of surgical emphysema was classified into (0, I, II, and III) and representing about (43.3%, 40.0%, 14%, and 3.5%) and (83.3%, 10.0%, 7%, and 0.0%) in the 2 groups respectively. The percentages of bleeding, persistent air leak incomplete lung expansion and tube obstruction were (6.7%, 20%, (3.3%, 6.7%), 6.7%, 30%, and 30%, 26.7%), in both groups respectively, see Table 3.

The biopsy size was 1.25 and 2.02 in both groups respectively with statistically significant difference between both 2 groups ($P < .001$). Group 1 revealed TB, malignancy, chronic nonspecific pleurisy, Staph aureus, Klebsiella, and Pseudomonas in 46.7%, 30%, 23.3%, 69%, 15%, and 15% respectively. Group 2 revealed TB, malignancy, chronic nonspecific pleurisy, Staph aureus, Klebsiella, Pseudomonas, and other causes in 36.7%,

30%, 33.3%, 67%, 8%, and 8% respectively with no significant differences between both groups ($P > .05$) See Table 4.

In our study, the duration of hospital stay was 9.47 and 6.17 in medical and mini- thoracoscope respectively with statistically significant difference between both studied groups ($P = .001$). The time of full lung inflation was 3.3 and 1.7 in medical thoracoscopy versus minithoracoscopy with a significant difference between both studied groups ($P < .001$), see Table 5.

Table 6 diagnostic yield of both procedures were 77% and 67% in minithoracoscopy and medical thoracoscopy respectively and mortality were 0% of both groups.

Discussion

Starting with the demographic data of the enrolled cases, the mean ages of the study cases were (42.27 ± 7.57) and

Table 2. Intra-operative events and findings of the studied groups.

	MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	P
Consumed time (minutes)	19.73 \pm 6.73	26.07 \pm 3.47	<.001
Hypoxemia	20% (6)	60% (18)	.003
Bleeding	10% (3)	37% (11)	.030
Arrythmia	23.3% (7)	50% (15)	.06
Adhesion	66.7% (20)	63.3% (19)	1
Nodule	26.7% (8)	50% (15)	.11
Plaques	20% (6)	16.7% (5)	1
Anthracotic patches	0% (0)	3.3% (1)	1

Data are expressed as mean and standard deviation. P is significant when $< .05$.

Table 3. Post-operative complications and events of the studied groups.

		MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	P
Pain 3 hours after the procedure	Mild	100% (30)	60% (18)	<.001
	Moderate	0% (0)	30.0% (9)	
	Severe	0% (0)	10.0% (3)	
Surgical emphysema	0	83.3% (25)	43% (13)	.002
	I	10.0% (3)	40% (12)	
	II	7% (2)	14% (4)	
	III	0.0% (0)	3.5% (1)	
Persistent air leak		3.3% (1)	6.7% (2)	.5
Bleeding		6.7% (2)	20% (6)	.25
Tube obstruction		30% (9)	8 (26.7)	.77
Incomplete lung expansion		6.7% (2)	30% (9)	.042

Data are expressed as mean and standard deviation. P is significant when $< .05$.

Table 4. Results of pathological examination of the sample of the studied groups.

	MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	P
Biopsy size	1.25 ± 0.307	2.02 ± 0.464	<.001
TB	46.7% (14)	36.7% (11)	.43
Malignant	30% (9)	30% (9)	1
Chronic nonspecific pleurisy	23.3% (7)	33.3% (10)	.38
Microbiology			
Staph aureus	69% (9)	67% (8)	.4
Klebsiella	15% (2)	8% (1)	
Pseudomonas	15% (2)	8% (1)	

Data are expressed as mean and standard deviation. *P* is significant when <.05.

Table 5. Post-operative recovery profile of the studied groups.

	MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	P
Hospital stay (days)	6 ± 1.9	9.5 ± 4.7	.001
Time to full lung inflation	1.7 ± 0.9	3.3 ± 1.4	<.001

Data are expressed as mean and standard deviation. *P* is significant when <.05.

Table 6. Diagnostic yield and mortality of both approaches.

	MINITHORACOSCOPY (N=30)	MEDICAL THORACOSCOPY (N=30)	P
Successful diagnosis	23 (77%)	20 (67%)	.39
Mortality	0%	0%	1

(46.37 ± 11.32) for group 1 and group 2 respectively. The majority of cases were males representing about 2/3 of the study cases 66.6% (40).

In agreement with our findings, Thomas et al. revealed that around 85% of the included patients were young males with an average age of 33 ± 12.1 years.¹⁰

According to smoking frequency, about 45% of our cases were nonsmokers, while 55% were smokers and ex-smokers. The incidence of co-morbidities was 36% (22) for diabetes mellitus, 38% (23) for hypertension (HTN), 6% (4) for ischemic heart disease (IHD), and 8% (5) for chronic obstructive pulmonary disease COPD patients.

In another study, El-Shabrawy and Elhawary revealed that 55% of pleural effusion patients who underwent minithoracoscopy were smokers and 80% had comorbidities; 60% was the most common for comorbidity diabetes mellitus, 4 (20%) patients had HTN, 3 (15%) patients had IHD, 3 (15%) patients had COPD, and 2 (10%) patients had liver diseases.¹¹

The current study revealed that dyspnea was the most common presenting feature, which presents in all studied cases with

variable degrees underwent either medical thoracoscopy or minithoracoscopy. Cough was reported by 50% (15) and 40% (12) of cases in both groups respectively. After that, the toxemic manifestations, which developed in 47% (14) and 40% (12) of cases, underwent medical thoracoscopy and minithoracoscopy respectively.

In accordance with the present study, El-Shabrawy and Elhawary revealed that dyspnea was the most common symptom among the studied patients, at 70% followed by chest pain, at 60%, and cough, at 45%.¹¹

This was in agreement with the findings of the studies performed by Law et al. and Prabhu and Narasimhan, who concluded that dyspnea was the main complaint of the pleural effusion patients they studied.^{12,13}

This could be explained by the diaphragmatic paradoxical movement in such cases.¹⁴

The current study revealed that there was adhesion; nodule, plaques, and anthracotic patches in both groups with no significant differences (*P* > .05).

In accordance, Ahmed et al. revealed in their study conducted by medical thoracoscope that there were nodules (62%), adhesions (2%), grayish-white membrane (2%), nodules and congested pleura (12%), nodules and adhesions (14%), nodules and congested pleura and adhesions (4%) in cases with pleural effusion.¹⁵

The current study revealed that TB was the commonest cause of exudative pleural effusion (46.7% [14] and 36.7% [11] of cases in both groups respectively) see Figures 3 and 4 followed by chronic nonspecific pleurisy (33.3% and 23% in both

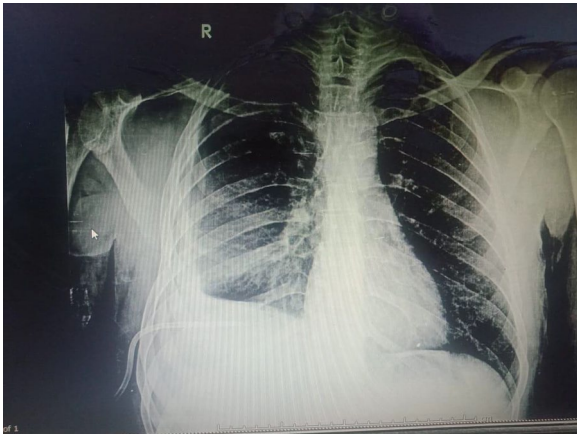


Figure 3. CXR of case no (1) shows Nelaton catheter with minor degree of surgical emphysema. The diagnosis was TB pleurisy.



Figure 6. CXR of case no (2) shows Nelaton catheter with a minor degree of surgical emphysema and the lung was fully expanded. The diagnosis as adenocarcinoma.

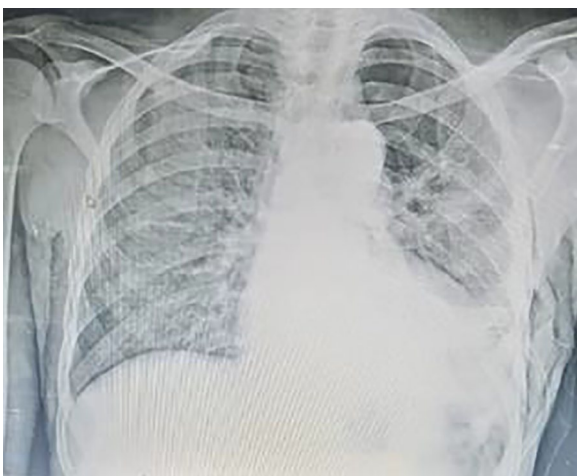


Figure 4. Chest x-ray case no (3) show right-sided intercostal chest tube and lung fully expanded. The diagnosis as TB pleurisy.



Figure 5. Chest x-ray of case no (4) shows left intercostal chest tube and lung fully expanded minimal surgical emphysema. The diagnosis as chronic nonspecific pleurisy.

groups respectively) see Figure 5 than malignant pleural effusion (30% and 30% in both groups respectively) see Figure 6.

As regard microbiology, the current study revealed that the percentages of Staph aureus, Klebsiella, and Pseudomonas were about (69% [9] and 67% [8]), (15% [2] and 8% [1]) and (15% [2] and 8% [1]) in both groups respectively.

In accordance with our results, Thomas et al. revealed that tuberculosis accounted for exudative pleural effusion in 84.5% of cases, whereas malignant pleural effusions were detected only in 5.2% of cases.¹⁰

In the same line, Kim et al. revealed that minithoracoscopy biopsy showed accurate diagnosis in 14 patients (93.3%), consisting of tuberculous pleurisy in 8 (66.7%), malignant effusions in 4 (33.3%), and parapneumonic effusions in 2 (13.3%).¹⁶

On the contrary, El-Shabrawy and Elhawary stated that pleural biopsies were as follows: 6 (30%) patients had metastatic adenocarcinoma, 7 (35%) patients had mesothelioma, 3 (15%) patients had tuberculous pleuritis, 2 (10%) patients had empyema, and the other 2 (10%) patients had nonspecific pleuritis.¹¹

Furthermore, Mohamed et al. studied pleural biopsy among the population and revealed that out of 42 patients, 9 (21.4%) patients were diagnosed with malignant pleural mesothelioma (MPM). Where 10 (23.8%) patients with metastatic adenocarcinoma primary from breast, lung, and liver, 1 (2.3%) patient with undifferentiated carcinoma, 5 (11.9%) patients with caseating tuberculous granuloma, 9 (21.4%) with non-specific pleurisy (NSP), and 8 (19.04%) with empyema. As regards, pleural fluid microbiology, gram staining positive was present in 19% (8) (Streptococci, Gram-negative cocci) of cases, and negative in 81% (34) of cases.¹⁷

As regards complications, the current study revealed that pain after 3 h and surgical emphysema were the most common complications. All cases (100%) who underwent minithoracoscopy had mild pain after 3 h, while 60.0% (18), 30.0% (9), and 10.0% (3) who underwent MT had mild, moderate, and severe pain after 3 h respectively (according to the Numeric Rating Scale) with a significant difference among both groups ($P < .001$).

As regards the Intra-operative events in the current study, the consumed time (minutes), hypoxemia, and bleeding were more in cases who underwent medical thoracoscope than those who underwent minithoracoscopy with statistically significant differences ($P = .003$) and ($P = .030$) respectively. In addition, arrhythmia was present in both groups with no statistical differences.

The majority of cases that had surgical emphysema after minithoracoscopy were grade 0 (83.3%), while the remaining (17%) cases had other degrees, while in MT group were 43.3% (13), 40.0% (12), 13.3% (4), and 3.3% (1) for grades 0, I, II, and III respectively with highly statistically significant difference among both groups ($P=.002$).

The correlation of persistent air leakage and tubal obstruction was comparable between the 2 groups ($P=1$) and representing about 5% and 28% of all studied cases respectively.

Bleeding occurred in 6.7% and 20% of group 1 and group 2 respectively with no significant differences ($P=.25$). Incomplete lung expansion was encountered in 3.3% and 6.7% of patients in both groups respectively with no significant difference between both groups ($P=.5$). In addition, there was no mortality was encountered in the present study.

The current study was in agreement to some extent with El-Shabrawy and Elhawary who revealed that post-thoracoscopic complications occurred in 4 (20%) patients, surgical emphysema in 1 (5%) patient, bleeding during the procedure in 1 (5%) patient, and failure of re-expansion in 2 (10%) patients.¹¹

In addition, Loddenkemper et al. reported that bleeding is the most dreadful complication of medical thoracoscopy, which occurs due to blood vessel injury.¹⁸ In addition, Lee and Colt reported other complications such as subcutaneous emphysema, air leak, empyema, fever, surgical site infection, hypotension, cardiac arrhythmias, along with tumor seeding into the chest wall from underlying mesothelioma.¹⁹

Furthermore, Prabhu and Narasimhan reported there is no major complications in the included 68 cases who underwent medical thoracoscopy. However, minor complications were reported in 4 cases including subcutaneous emphysema (3 cases) and air leak (1 case).¹³ Özgül et al. reported that expansion defects were detected in 3 out of 27 patients after having medical thoracoscopy. One case developed hemothorax and this case died of respiratory failure after 34 days of hospitalization.²⁰

On the contrary, Hansen et al. reported there is no mortality among the included cases who underwent thoracoscopy for pleural effusion. Neither hemoptysis nor biopsy site bleeding was encountered in that study. In addition, subcutaneous emphysema, bradycardia, and vasovagal episodes were not reported. Nonetheless, staphylococcal empyema occurred in 1 patient. Moreover, subcutaneous fistula was encountered in 1 case who had adenocarcinoma and it closed spontaneously only after 75 days. Therefore, the overall complication rate in that study was 3%.²¹

Rahman et al. revealed that medical thoracoscope is a tolerable and safe technique with a very low mortality rate. In 2010, the British Thoracic Society (BTS) Pleural Disease Guideline reported an overall mortality of 0.34%.²²

In many studies that used MT as a diagnostic procedure, the mortality rate was 0%. However, therapeutic MT with talc poudrage had a mortality rate of 0.69%; thus, this approach was safe, minimally invasive, and efficient.^{22,23}

Minithoracoscopy is not only less invasive compared to MT, but also it is more accurate in achieving the diagnosis of cases with undiagnosed exudative pleural effusion. Nevertheless, MT remains the cornerstone in the establishment of the diagnosis of exudative PE.¹⁶

Minithoracoscopy has several advantages over conventional thoracoscopic. First, the patient feels less pain. Commonly, general anesthesia is required, but minithoracoscopy can be performed by local anesthesia and recovery after surgery.^{16,18}

The current study revealed that there was a reduction of the duration of hospital stay in cases who underwent minithoracoscopy (6.17 ± 1.98) in comparison with those underwent medical thoracoscope (9.47 ± 4.69) with a significant difference between the 2 groups ($P=.001$). In addition, the time to reach full lung inflation was reduced in cases that underwent minithoracoscopy (1.7 ± 0.95) in comparison with cases that underwent medical thoracoscope (3.3 ± 1.42).

According to the duration of hospital stay in cases who underwent minithoracoscopy, the current study was in agreement with El-Shabrawy and Elhawary, who revealed that the duration of hospital stay was (6.6 ± 7).¹¹

Regarding the duration of hospital stay in cases who underwent medical thoracoscope, the current study was in agreement with Ahmed et al. who revealed that the duration of hospital stay was ranging from 7 to 39 days.¹⁵

The current study revealed the diagnostic yield of medical thoracoscope was 67%, while the minithoracoscopy was 77%. This may have improved by 6 months follow up intervention to patients diagnosed as chronic nonspecific pleurisy.

Our results did not agree with another study at which medical thoracoscopy succeeded to reach a definitive diagnosis in 38/40 cases with a diagnostic yield of 95%.²⁴ In addition, Mootha et al. stated that medical thoracoscopy had 95% to 99% diagnostic yield, which was very high.²⁵

Conclusion

Minithoracoscopy is well tolerated by patients as minimal pain and early hospital discharge could be achieved by that approach.

However, medical thoracoscopy is still of crucial value in managing cases with undiagnosed exudative pleural effusion. It remains the gold standard technique as it is characterized by being simple and safe with high diagnostic accuracy and few complications.

Author Contribution

NA Rezk conceived of the presented idea, developed the theory and carried out the intervention and manuscript writing. HOH verified the analytical methods and shared in the intervention. SAMAH supervise the finding of this work. DAA shared in the intervention and supervision. ME performed microbiological examination. AHMS performed the pathological examination.

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