RESEARCH ARTICLE

The diagnostic role of video-assisted thoracoscopic surgery in exudative pleural effusion and follow-up results in patients with nonspecific pleuritis

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Abstract

Objective: To assess the diagnostic value of video-assisted thoracoscopic surgery in exudative pleural effusions, and to evaluated the frequency of malignancy development with long-term follow-up of patients defined as nonspecific pleuritis after surgery.

Methods: The retrospective study was conducted at Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital, Istanbul, Turkey, and comprised data of patients with undiagnosed exudative pleural effusions seen between January 2008 and December 2013. Data related to clinical, radiological, thoracoscopical, histopathological and follow-up periods were obtained from the hospital records. SPSS 15 was used for data analysis.

Results: Of the 229 patients, 145(63.3%) were males and 84(36.7%) were females. The overall mean age was 54.5 ±15.1 years. Malignancy was found in 84 (36.6%) patients, and tuberculosis in 26(11.4%). The remaining 119(52%) patients had nonspecific pleuritis and their mean follow-up period was 29.2±27.1 months (range: 1-103 months). Video-assisted thoracoscopic surgery was repeated in 3(2.52%) patients in the 1st, 4th and 16th months of follow-up period due to the recurrence of pleural effusion. Tuberculosis and mesothelioma were diagnosed in 1(0.8%) and 2(1.7%) cases, respectively.

Conclusion: Video-assisted thoracoscopic surgery was found to be a valuable diagnostic procedure in patients with undiagnosed exudative pleural effusion.

Keywords: Video-assisted thoracoscopic surgery, Nonspecific pleuritis, Exudative, Pleural effusion, Follow-up. (JPMA 69: 1103; 2019)

Introduction

Pleural effusion (PE) is an important and common medical problem affecting numerous patients. Despite repeated thoracentesis and closed pleural biopsy, diagnosis remains uncertain in 20% PE patients.[1] When thoracentesis and closed pleural biopsy are inadequate for diagnosis, the next option in the diagnostic algorithm in exudative PE with a high suspicion index for malignancy is thoracoscopic approach.[2-4] Despite thoracoscopic biopsy, specific diagnosis cannot be achieved in some patients. In those patients, a follow-up period of 12-18 months is suggested to monitor for malignancy development in the future.[5]

The current study was planned to evaluate the role of video-assisted thoracoscopic surgery (VATS) in the diagnosis of patients with exudative PE when a specific diagnosis could not be reached by thoracentesis and pleural biopsy. Considering the high incidence of mesothelioma in Turkey, we also planned to identify mesothelioma development in undiagnosed patients even after VATS procedure through the long-term follow-up.

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Patients and Methods

The retrospective study was conducted at Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital, Istanbul, Turkey, and comprised data of patients with undiagnosed exudative PE seen between January 2008 and December 2013. After approval was obtained from the institutional ethics committee, records of all consecutive patients of exudative PE seen within the five-year period were reviewed retrospectively. Data reviewed related to patients aged 14-80 years with undiagnosed exudative PE despite thoracentesis, pleural biopsy or bronchoscopy who subsequently underwent VATS for diagnosis. Data of patients with exudative PE diagnosed with other diagnostic methods and those outside the age range were excluded.

Clinical and physical examination, blood analysis, biochemical, bacteriological and cytological examinations of pleural fluid, radiological and histopathological data was obtained from the patient charts as well as from the electronic database of the

hospital. Pleural biopsy and/or bronchoscopy had been performed in all patients without a definitive diagnosis. Pleural tissue sampling with VATS was performed by the Department of Thoracic Surgery.

VATS was performed by experienced thoracic surgeons in the operating room. All patients underwent one-lung ventilation with double-lumen endotracheal tube placement under general anaesthesia. Patients with narrow rib spaces, bleeding diathesis, dysrhythmia and haemodynamically unstable and unable to tolerate general anaesthesia and one-lung ventilation had been excluded.[6] Multiple biopsies were performed with minimum six suspected areas from pleura. Frozen section examination was done to control for adequate tissue sampling during VATS. Decortication or talc pleurodesis was added to the patients with malignant and unresectable conditions for either therapeutic or palliative purposes. Early and late complications were noted from the hospital records.

Biopsy specimens were examined by experienced pathologists. Patients with malignancy were subclassified according to the cell type. Periodic acid-Schiff (PAS) and Ehrlich-Ziehl-Neelsen (EZN) stains were used to determine the presence of fungal and acid-resistant bacterial infections. Patients with chronic pleuritis with findings of fibrosis, pleural thickening and benign reactive changes in the absence of malignant infiltration on the histopathological examination were described as nonspecific pleuritis. Clinical findings (symptoms, signs, physical examination), radiological (chest X-ray, thoracic ultrasonography, thoracic computed tomography (CT) follow-up data after VATS, and intra-operable and post-operable complications of VATS in patients with nonspecific pleuritis were noted. When adequate information could not be found, the current health status was asked about by contacting the patient or his/her relatives. VATS were repeated for PE recurrence during the follow-up period in this group.

SPSS 15 was used for statistical analysis. Descriptive statistics were expressed as mean, standard deviation and minimum-maximum range for numerical variables, and as frequencies and percentages for categorical variables. Comparisons of age groups ratios in diagnosis by VATS groups were made with the Chi-Square Test Calculator.

Results

Of the 685 patients seen during the study period, 456(66.5%) had been diagnosed at the first-step diagnostic procedure. The remaining 229(33.5%) patients formed the study sample. Of them, 145(63.3%) patients were male and 84(36.7%) were female. The overall mean age was 54.5±15.1 years (Table-1).

Table-1: Patient characteristics.

Patient details	n = 229
Mean Age (years)	54.5 ± 15.1
Sex	
Male	145 (63.3%)
Female	84 (36.7%)
Effusion side	
Right	139 (60.7%)
Left	90 (39.3%)
Age groups	
<40	42 (18.4%)
40-60	97 (42.3%)
>60	90 (39.3%)

Table-2: Age distribution according to the histopathological diagnosis following video-assisted thoracoscopic surgery (VATS).

Age Group	Diagnosis by VATS						
	Malignant		Tuberculosis		Nonspecific Pleuritis		
	n	%	n	%	n	%	p
<40	6	7.2	10	38.4	26	21.9	0.001
40-60	38	45.2	12	46.2	47	39.5	0.658
>60	40	47.6	4	15.4	46	38.7	0.013

Table-3: Distribution of patients subjected to a histopathological diagnosis following video-assisted thoracoscopic surgery (VATS).

Histopathological diagnoses	n	%
Malignant	84	36.6
Mesothelioma	31	13.5
Primary lung cancer	28	12.2
Metastatic tumour	16	7.0
Lymphoma	9	3.9
Tuberculosis	26	11.4
Nonspecific pleuritis	119	52.0
Total	229	100

There was a statistically significant difference in the rate of patients <40 years (p=0.001) and >60 years (p=0.013) in VATS diagnostic groups. The rate of patients <40 years of age in the malignant group and the rate of patients >60 years in the tuberculosis (TB) group was low (Table-2).

None of the patients developed intraoperative complications. In the postoperative period, 16(6.98%) patients developed complications, including wound infections in 5(2.8%), prolonged air leak in 6(2.6%), subcutaneous emphysema in 3(1.3%), and pneumonia in 2(0.08%) cases. No deaths occurred.

Of the total, 110(48%) cases had been diagnosed as

Table-4: The features of the patients with recurrent pleural effusion.

Age	Sex	Fluid appearance	Initial diagnosis	Repeated VATS	Final diagnosis
74	F	Serohaemorrhagic	Nonspecific pleuritis	Month 1	Mesothelioma
40	F	Serous	Nonspecific pleuritis	Month 4	Tuberculosis
62	M	Serous	Nonspecific pleuritis	Month 16	Mesothelioma

VATS: Video-assisted thoracoscopic surgery.

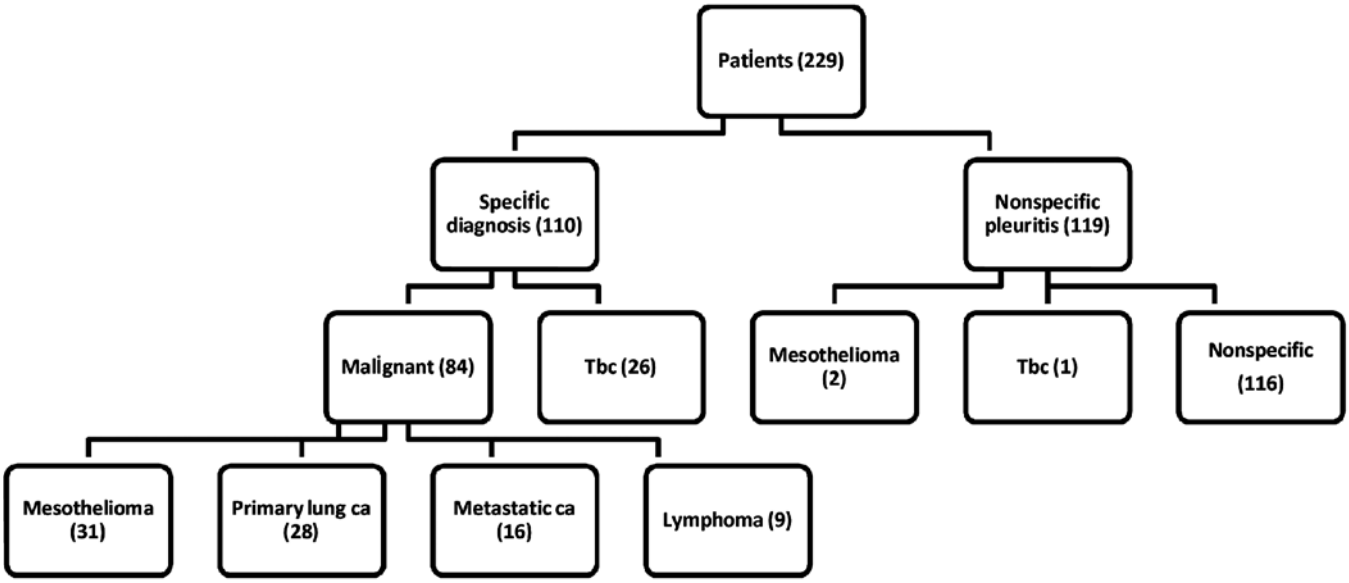

Figure-1: Final diagnoses of 229 patients.

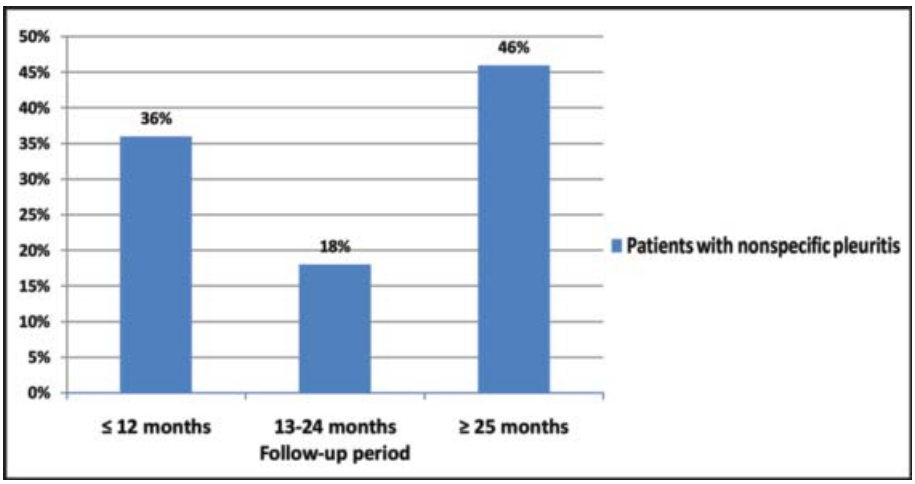

Figure-2: The distribution of the patients with nonspecific pleuritis according to follow-up period.

malignancy or TB. Histopathological examination of 84(36.6%) patients in the malignancy group revealed mesothelioma in 31(13.5%) patients, metastatic effusion due to primary lung cancer in 28(12.2%), extrapulmonary organ cancer in 16(7%) patients, and lymphoma in 9(3.9%) patients (Figure-1). There were 26(11.4%) patients diagnosed as TB cases. The remaining 119(52%) patients had nonspecific pleuritic changes (Table-3). Of these 119 patients, 85(71.4%) were males and 34(28.6%) were females. The overall mean age was 53.2±16.0 years (range: 14-80 years). The mean follow-up period of these patients was 29.2±27.1 months (range: 1-103 months) (Figure-2). During the follow-up period, VATS were repeated in 3(2.5%) patients with nonspecific pleuritis. Malignant mesothelioma and TB were diagnosed in 2(1.7%) and 1(0.8%) patients, respectively (Table-4). Both patients with malignant mesothelioma had a history of asbestos exposure. In this group, the remaining 116(97.5%) patients showed a benign course without recurrent PE during the follow-up period.

VATS was found to have sensitivity 97.3%, specificity 100%, positive predictive value (PPV) 100%, negative predictive value (NPV) 97.5%, and an accuracy rate of 98.7% in the diagnosis of exudative PE that could not be diagnosed by other methods.

Discussion

Results showed that VATS was a highly sensitive and accurate method in the diagnosis of exudative PE undiagnosed by other methods. Numerous studies reported that VATS achieved a diagnostic rate of above 95% in PE.[1,7-9] The present study supports all previous studies with 97.3% sensitivity, 100% specificity and 98.7% diagnostic accuracy. The potential of thoracoscopy to examine the entire pleural cavity and to allow multiple tissue sampling in large numbers under visual inspection are the main advantages for the diagnostic success of this procedure.[10,11] However, some patients with exudative PE are diagnosed as nonspecific pleuritis and the aetiology remains unclear even after thoracoscopic biopsy.[5,12-15] The main diagnostic value of thoracoscopy in this patient group is the exclusion of malignancy and TB.[16] Although a large number of studies demonstrated that the clinical course of patients with nonspecific pleuritis is often benign, malignancy develops in 3.7%-15.8% patients during the follow-up period.[12-14,17-19] In our study, malignancy was found in 2(1.6%) patients with nonspecific pleuritis during the follow-up period. The remaining patients had a benign course. Since there are limited data on the long-term outcomes of patients with nonspecific pleuritis, standardised follow-up criteria and duration time has not been established. We noted that there is no consensus for the optimal follow-up period. In many studies, the mean follow-up period was 21.3-62 months.[12-14,17-19] A study reported 8 of 52 patients with nonspecific pleuritis diagnosed as malignant within 12 months of the initial biopsy. The mean follow-up time was 35.5 months, maximum duration for the diagnosis of malignant mesothelioma was 10 months. That study concluded that 12 months of clinical follow-up was likely sufficient to detect the majority of malignancies.[18] Another study reported that malignancy in patients with nonspecific pleuritis would most likely be within 1 year after the first pleural biopsy but longer durations were possible.[20] In our study, mean follow up period was 29.2 months. The rate of patients with nonspecific pleuritis followed up for more than 24 months was 46% and none of them developed malignancy. When all of our patients were evaluated, malignancy had developed in only 2 cases within 1 and 16 months of the initial biopsy. We believe that the 12-month follow-up period may not be sufficient. These conflicting results need to be clarified with more standardized guidelines for the follow-up of these patients. This may be achieved with prospective studies with larger numbers of patients and longer follow-up periods. There are no studies comparing surgical with medical thoracoscopic biopsies in undiagnosed exudative PE cases. Studies indicated that malignancy developed more frequently in medical thoracoscopy (MT) than in VATS in the follow-up period of patients with nonspecific pleuritis in long-term outcome.[12,13,18] Mesothelioma is the most common malignancy in these patients.[21] In patients with pleural adhesions and/or fibrinous layer on the pleura, inadequate examination of the pleural cavity and difficulty in accessing the neoplastic tissue reduce the diagnostic success of MT, and VATS is recommended in such patients.[22] VATS is performed under general anaesthesia in a lateral decubitus position. Single-lung ventilation with collapse of the ipsilateral lung provides exploration of the thoracic cavity during the procedure and allows surgical instruments to move comfortably within the cavity. As such, adhesions can be handled easily.[23,24] Despite the high incidence of malignant mesothelioma in Turkey and referral of large number of patients from all geographical areas to our centre, mesothelioma was detected only in 1.6% patients with nonspecific pleuritis during the follow-up period. In contrast with many other MT studies,[12,13,18] sufficient visualisation and evaluation of pleural cavity with VATS may be an important factor for the development of malignancy in the small number of patients during the follow-up period.

In terms of limitations, the current study was a single-centre and its scope and its retrospective design further limited the generalizability of its findings.

Further multi-centre studies are required to clarify the follow-up duration and prognosis of these patients for standardised criteria.

Conclusion

VATS was found to be a valuable diagnostic method for exudative PE that cannot be diagnosed by other methods. Although patients with nonspecific pleuritis usually have a benign clinical course, the possibility of malignancy development should not be ignored.

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Conflict of Interest: None.

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