

■ Original Article

Single-port thoracoscopic talc pleurodesis for malignant pleural effusion

Malign plevral efüzyonlarda tek port torakoskopik plöredez

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ABSTRACT

Aim: The aim of this study was to evaluate the efficacy of single-incision thoracoscopic surgery (SITS) talc pleurodesis for malignant pleural effusion.

Material and Methods: We examined the medical records of all consecutive patients with malignant pleural effusion who underwent single port thoracoscopic pleurodesis from 2014 to 2018 at the Health Sciences University Antalya Practice and Research Center. There were 30 males (54.5%) and 25 females (45.4%), ranging in age from 35 to 88 years (mean age: 64.0 years). Pleurodesis was achieved by insufflation of 4g of sterile asbestos-free talc; the chest tube was left in place a minimum of 3 days and was removed when fluid drainage was less than 100 ml/24 h. Patients were discharged the day after chest tube removal and a return visit was scheduled on the 30th post-operative day, for clinical evaluation and for a new chest radiograph. Pleurodesis was regarded as successful if the amount of the fluid on chest radiograph on the 30th post-operative day showed a pleural effusion occupying less than one-fourth of the pleural space.

Results: The main causes of malignant pleural effusion were non-small cell lung carcinoma and breast cancer. Major symptoms were dyspnea, chest pain and radiographic findings of pleural fluid. The effusion was on the right side in 40 patients (72.7%) and on the left side in 15 (27.2%). There was no intraoperative mortality. The postoperative complication rate was 10.9% (6 patients), and included fever in 1.8% (one patient) and chest pain in 9.0% (5 patients) of the patients. Duration of postoperative pleural drainage ranged between 3 and 13 days (mean: 3.36 days). The postoperative hospital stay ranged from 3 to 15 days (mean: 5.6 days). A successful pleurodesis was achieved in 34 of 55 patients (61.8%).

Conclusion: SITS talc pleurodesis is an effective and safe treatment for the management of malignant pleural effusion.

Key Words: malignant; pleural effusion; pleurodesis

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Öz

Amaç: Malign plevral efüzyonda tek port üzerinden yapılan torakoskopik cerrahi (SITS) ile plörodezin etkinliğini değerlendirmek.

Gereç ve Yöntemler: 2014 ila 2018 yılları arasında, Sağlık bilimleri Üniversitesi Antalya Sağlık Uygulama ve Araştırma Merkezinde malign plevral efüzyon nedeniyle tek port torakoskopik plöredeze uygulanan hastaların medikal kayıtları tarandı. Hastaların 30'u (%54,5) erkek ve 25'i (%45,4) kadın olup, yaşları 35 ila 88 yaş (ort. 64 yaş) arasında değişmekteydi. Hastalara tek port üzerinden 4 gr asbestsiz steril talk insuflasyonu ile plöredeze yapıldı. En az üç gün süre ile göğüs dreni takılı kalan hastalarda günlük drenaj miktarı 100 ml altına düşmesi ile drenleri çekildi. Drenleri çekilerek taburcu edilen hastalara ameliyat sonrası otuzuncu güne klinik değerlendirme ve son akciğer grafilerini görmek amacıyla poliklinik randevusu verildi. Ameliyat sonrası 30. günde kontrole gelen hastaların çekilen göğüs radyografileri değerlendirilerek, kontrol grafisinde o taraf plevral boşluğun dörtte birini doldurmayan mayisi olan hastalarda plöredeze başarılı olarak kabul edildi.

Bulgular: Hastalarda en sık malign plevral efüzyonu nedeni olarak küçük hücreli dışı akciğer kanserleri ve meme kanseri tespit edildi. En sık gözlenen belirti ve bulgular dispne, göğüs ağrısı ve radyolojik plevral sıvı bulgularıydı. Efüzyon 40 (%72,7) hastada sağ ve 15 (%27,2) hastada sol tarafta gözlemlendi. Hiçbir hastada intraoperatif mortalite gözlenmedi. Postoperatif komplikasyon oranı %10,9 (6 hasta) olup bunlar %1,8 (bir hasta) ile ateş ve %9,0 (5 hasta) göğüs ağrısı olarak belirlendi. Postoperatif drenaj süresi 3 ila 13 gün (ort. 3,36 gün) ve hastanede kalış süresi 3 ila 15 gün (ort. 5,6 gün) arasında değişmekteydi. Toplamda 55 hastanın 34'ünde (%61,8) plöredeze başarısının sağlandığı görüldü.

Sonuç: SITS ile talk plörodezis malign plevral efüzyonların tedavisinde etkili ve güvenli bir yöntemdir.

Anahtar Kelimeler: malign; plevral efüzyon; plörodezis

Introduction

The discovery of malignant cells in pleural fluid and/or parietal pleura signifies disseminated or advanced disease and a reduced life expectancy in patients with cancer[1]. Annual incidence of malignant pleural effusion in Europe is estimated to be between 375000 and 400000 per year [2]. Lung cancer is the most common metastatic tumor to the pleura in men and breast cancer in women so that both malignancies together account for 50-65% of all malignant effusions [3].

Observation, therapeutic pleural aspiration, intercostal tube drainage and instillation of sclerosant, thoracoscopy and pleurodesis or placement of an indwelling pleural catheter are the management options for malignant pleural effusions. Current guidelines recommend pleurodesis to prevent the recurrence of effusion in patients with symptomatic malignant pleural effusions [4].

Among sclerosing agents, talc has been shown to have the highest efficacy.

Instead of classical VATS which is performed with three ports, single-incision thoracoscopic surgery (SITS) is becoming increasingly popular and is now preferred procedure in many thoracic surgery centers in the management of pleural effusions [5,6].

The aim of this study was to report the results of a consecutive series of pleurodesis for malignant pleural effusion performed by SITS in our department.

Material and Methods

Medical records of 119 patients who were referred to our Thoracic Surgery Department for suspicion of malignant pleural effusions from 2014 to 2018 at the Health Sciences University Antalya Practice and Research Center were reviewed, with 55 cases fitting for inclusion criteria. Patients were included if they initially had a diagnostic thoracentesis before SITS pleurodesis, if patients were symptomatic or if pleural effusions were recurrent or refractory to medical treatment. Effusions of patients with recent myocardial infarction or cardiac failure, clotting disorders, poor performance status (Karnofsky performance index ≤ 30) or life expectancy less than 2 months, were managed by other than SITS. Management options for these patients included therapeutic pleural aspiration, intercostal tube drainage and pleurodesis. In nine terminally ill patient therapeutic pleural aspirations provided transient relief of symptoms. Four-teen patients with central pulmonary lesion were taught to be with trapped lung were managed by insertion of a tunnelled pleural



catheter. Intercostal chest tube drainage and pleurodesis was the management option for the remaining forty-one patient. Diagnoses of malign pleural effusions were established either preoperatively by cytological examination of thoracentesis fluid (51 patients) or peroperatively by frozen-section (4 patients). There were 30 males (54.5%) and 25 females (45.4%), ranging in age from 35 to 88 years (mean age: 64.0 years). A complete blood count, clotting tests, and routine biochemical tests were performed preoperatively.

A written consent was obtained for the SITS pleural drainage, biopsy and pleurodesis procedure from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki. This study was approved by our Institutional Ethics Committee (2018-143).

SITS was performed either under general anesthesia with a double-lumen endotracheal tube for ipsilateral lung collapse or under local anesthesia, sedation and spontaneous ventilation depending on the patients' performance status. Patients were positioned and draped as for a standard posterolateral thoracotomy. The safest point for thoracentesis was planned preoperatively according to the chest radiograph, tomography or thoracic ultrasound. In most cases, intersection of the midaxillary line and the fifth or sixth intercostal space was the site of thoracentesis and eventually the site of thoracoport entry. After local anesthesia was obtained with 10 ml lidocaine injected in the planned intercostal space; a thoracentesis was performed from the pleural effusion for biochemical, microbiological, and pathological examination. A 10.5-mm single thoracoport was used to enter the thorax after single skin incision. A 10-mm thoracoscope with a 6-mm working channel was used for the procedure. First the pleural effusion was aspirated with a suction catheter. After the aspiration was accomplished, the pleura and the lung were inspected. A simple pleural biopsy with a forceps through the thoracoscope was performed in patients with the unknown primary cancer and those with pleural nodules or any case of pleural abnormality. Additional injection of lidocaine was applied at the site of pleural biopsy required for a diagnostic purpose in patients with sedation. For patients under general anesthesia, the degree of lung expansion was ascertained with sustained positive pressure ventilation. If re-expansion of the lung was not proper, partial lung decortication was performed. Care

was taken in order to aspirate all the pleural fluid in the pleural cavity. If pleural fluid aspiration was satisfactory, pleurodesis was produced by instillation of 4 g of sterile asbestos-free talc (Steritalc, Novatech, France) which was insufflated with a disposable atomizer under direct vision. At the end of the procedure a 32-F single thorax drain was placed through the thoracoport incision. The chest tube was left in place a minimum of 3 days and was removed when fluid drainage was less than 100 ml/24 h. Patients were discharged the day after chest tube removal and a return visit was scheduled on the 30th post-operative day, for clinical evaluation and a new chest radiograph. Pleurodesis was regarded as successful if the amount of the fluid on chest radiograph on the 30th post-operative day showed a pleural effusion occupying less than one-fourth of the pleural space.

Results

Fifty-five consecutive patients who underwent SITS (26 patients under general anesthesia with a double-lumen endotracheal tube and 29 patients under local anesthesia and sedation) talc pleurodesis for symptomatic or recurrent malignant pleural effusions were enrolled in this study. There were 30 males (54.5%) and 25 females (45.4%), ranging in age from 35 to 88 years (mean age: 64.0 years). Dyspnea was the main symptom in patients with malignant pleural effusions, which was observed in 46 patients (83.6%). Of the 55 patients, 34 (61.8%) patients showed successful pleurodesis, while 21 (38.1%) patients showed failed pleurodesis.

There was no intraoperative mortality. The postoperative complication rate was 10.9% (6 patients), and included fever in 1.8% (one patient) and chest pain in 9.0% (5 patients) of the patients. Duration of postoperative pleural drainage ranged between 3 and 13 days (mean: 3.36 days). The postoperative hospital stay ranged from 3 to 15 days (mean: 5.6 days).

Table 1 shows the definitive diagnoses of the patients. 24 (43.6%) patients had lung cancer (22 patients with Non-small Cell lung cancer vs. 2 patients with Small Cell lung cancer). Other cancers included: breast cancer (12 patients), prostate (3 patients), stomach (3 patients), mesothelioma (2 patients), lymphoma (2 patients), colorectal (2 patients), nasopharynx (one patient), cholangiosarcoma (one patient), thyroid (one patient), skin (one patient), pancreas (one patient), ovary (one patient) and undetermined (one patient).

Table 1 Patient demographics	
Demographic variables	Total patients n(%)
Age, mean (range)	64.0 years (35 to 88 years)
Gender	
Male	30 (54.5%)
Female	25 (45.4%)
Cancer	
Lung	24 (43.6%)
Non-small Cell	22 (40.0%)
Small Cell	2 (3.6%)
Breast	12 (21.8%)
Prostate	3 (5.4%)
Stomach	3 (5.4%)
Mesothelioma	2 (3.6%)
Lymphoma	2 (3.6%)
Colorectal	2 (3.6%)
Nasopharynx	1 (1.8%)
Cholangiosarcoma	1 (1.8%)
Thyroid	1 (1.8%)
Skin	1 (1.8%)
Pancreas	1 (1.8%)
Ovarian	1 (1.8%)
Undetermined	1 (1.8%)
Total	55 (100%)

Discussion

Median survival following diagnosis of malignant pleural effusions ranges from 3 to 15 months and is dependent on the stage and type of the underlying malignancy [1]. The most effective management of malignant pleural effusions includes complete drainage of the effusion and instillation of a sclerosant to promote pleurodesis and prevent recurrence of the effusion. Treatment options are observation, therapeutic pleural aspiration, intercostal tube drainage and instillation of sclerosant, thoracoscopy and pleurodesis or placement of an indwelling pleural catheter. Current guidelines for malignant pleural effusions recommend

VATS talc poudrage for pleurodesis in patients with good performance status [4].

Sixty-four patients managed by treatment options other than SITS were not included to our study because most of these patients were seen on emergency department or intensive care units with severe dyspnea and the main aim of these procedures were urgent relief of symptoms.

Recent reports also support VATS talc pleurodesis in the aspects of efficacy and safety [7,8]. SITS on the other hand is actually a uniportal VATS. In contrast to conventional three-

port VATS, SITS has the advantages of a single incision, which minimizes the transmission of infection to the incision line and infiltration of the tumor to the skin, subcutaneous tissues, and chest wall in cases of malignant disease such as mesothelioma [6,9]. Reducing the number of access ports allows to avoid multiple skin incisions thus could also decrease the risk of intercostal nerve damage and postoperative chest pain[10].

SITS is not always performed in a patient under general anesthesia with selective intubation but also in a patient under moderate sedation with local anesthesia and spontaneously breathing, which is also named as medical thoracoscopy. By this way SITS can also be performed in patients with poor lung function or those with a high anesthetic risk associated with an open procedure.

Pleurodesis is generally used as a palliative procedure in malignant pleural effusions to prevent recurrent fluid accumulation. Many sclerosing agents have been used to carry out an adhesion in the pleural cavity, including tetracycline hydrochloride and its derivatives (doxycycline, minocycline), bleomycin, quinacrine, sodium hydroxide, silver nitrate and *Corynebacterium parvum*. Talc was found to be the best sclerosant according to the American Thoracic Society and European Respiratory Society Task force consensus statement for the management of malignant pleural effusion [11]. Although there is an uncertainty whether the technique for administering talc affects the outcome, a meta-analysis showed that thoracoscopic insufflation of talc was more effective in achieving non-recurrence of the effusion as compared to bedside instillation of talc slurry through a chest tube [12]. Furthermore in a recent meta-analysis in which twenty trials involving 1,525 patients with malignant pleural effusion were included, the success rate of talc pleurodesis was found to be significantly higher than that of control therapies with similar adverse events. In addition, thoracoscopic talc poudrage was more effective than bedside talc slurry [13]. In our study, we used single port thoracoscopic talc insufflation of in our patients with malignant pleural effusion. Either under local or general anesthesia video thoracoscopic visualization of pleural cavity allows complete aspiration of pleural fluid and eventually dissemination of talc to all dry pleural surfaces. Pleural effusions are more common in old population with several co-morbidities that often preclude the possibility to perform surgery under general anesthesia[14]. Patients with ASA score three or higher were candidates for SITS under



local anesthesia and sedation, in our study. We performed non-intubated SITS in 52.7% (n=29) of our study patients whereas intubated SITS ratio was 47.2 % (n=26). Compared with intubated SITS, the major advantage of non-intubated SITS is its cost-effectiveness for patients with poor tolerance for general anesthesia[15].

Despite less invasive methods, which are, limited in their therapeutic effectiveness as fibrous septa and dense viscous liquid, SITS has the ability to merge pouches, aspirate fibrin debris, and, when necessary, easily perform partial decortication to ensure lung expansion. It was also reported that VATS was found to be a safe, effective, and well-tolerated surgical procedure in patients who have failed to resolve with initial treatment with fibrinolytics [16].

Successful pleurodesis rates ranging between 77-100% has been reported in studies regarding treatment outcomes for patients undergoing VATS talc pleurodesis for malignant pleural effusion [17–25]. In our study 61.8% of patients showed successful pleurodesis. This lower success rate may be related to the one-month follow up time in our study. We accepted procedure as unsuccessful in case of any effusion more than one fourth of the same hemithorax in one-month follow up.

The most common major complications associated with thorascopic talc poudrage are empyema and acute respiratory failure secondary to infection or re-expansion pulmonary edema [26–28]. In our study, we had a 10.9% postoperative complication rate which included fever in one patient (1.8%) and chest pain in 6 patients (9.0%). None of our patients experienced empyema or acute respiratory failure.

Study Limitations

Our present study was retrospective, and therefore subject to bias. It is also limited in that it was conducted in a single center with a small sample size. Data collection was limited by the completeness of the available patient records.

Conclusion

SITS talc poudrage is a safe and well-tolerated procedure and also has the ability to obtain a diagnosis, drain the effusion and perform a pleurodesis in selected patients with malignant pleural effusion.

Declaration of conflict of interest

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