A comparison of chemical pleurodesis using 8 f percutaneous catheter and 28 f chest tube thoracostomy in malignant pleural effusions

Malign plevral efüzyonlarda perkutan 8 f kateter ve 28 f göğüs tüpü ile uygulanan kimyasal plörodezin karşılaştırılması

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ÖZET

GİRİŞ ve AMAÇ: 6 yıldan fazla süren bu çalışmada, malign plevral efüzyonlarda farklı kateterler ile uygulanan kimyasal plörodezin etkinliği karşılaştırılmıştır.
YÖNTEM ve GEREÇLER: Bir gruba 28 F göğüs tüpü, diğer gruba da 8 F kateter konularak tetrasiklin ile kimyasal plörodez uygulandı. Daha sonra bu gruplar belli bir zaman içinde tedavi başarısı açısından karşılaştırıldı.
BULGULAR: Toplam 80 hasta değerlendirildi. 28 F göğüs tüpü takılan hastalarda göğüs boşluğuna ilk ve ikinci kez sklerozan ajan verilmesiyle elde edilen başarı %90 ve %100 iken aynı oranlar 8 F kateter takılan hastalarda %60 ve %100 olarak elde edildi. 8 F kateter takılan hastalarda %15 rekürrens görüldü.
TARTIŞMA ve SONUÇ: 28 F göğüs tüpü ile uygulanan plörodez, 8 F kateter ile uygulananlar ile karşılaştırıldığında daha kısa sürede uygulanma ve daha yüksek başarı oranına sahiptir. Bu başarı, plevral efüzyonun daha geniş çaplı kateter ile daha kolay ve çabuk drenajına ve plevral zarlara daha çabuk ulaşım ile daha geniş yüzeyine etki etmesine bağlanabilir.
Anahtar Kelimeler: Plevral efüzyon, Göğüs tüpü, Plevral kateter, plörodez

ABSTRACT

INTRODUCTION: In this study over a 6-year period, a comparison was made of the efficacy of chemical pleurodesis applied with different catheters to patients with malignant pleural effusion.
METHODS: Thoracostomy was applied with a 28F catheter to one group and with an 8F catheter to the other and chemical pleurodesis was performed with tetracycline. The groups were compared in respect of the duration and success of the treatment.
RESULTS: A total of 80 patients were evaluated. In the patients applied with 28F catheter, success in the first adminstration of sclerosing agent to the thoracic cavity was obtained in 90% and in 100% in the second adminstration. For the group applied with 8F catheter these rates were calculated as 60% and 100%. Recurrence was seen at the rate of 15% in the 8F catheter group.
DISCUSSION AND CONCLUSION: Pleurodesis was obtained in a shorter time and with a higher success rate with applications made with a 28F catheter compared to the 8F catheter. This success can be considered due to the provision of easier drainage with the larger diameter catheter and an earlier and wider area of contact of the pleural membranes.
Keywords: Pleural effusion, Chest tube, Pleural catheter, Pleurodesis.

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INTRODUCTION

Malignant pleural effusion (MPE) occurs as a result of the expression of pleural fluid and/or impaired absorption resulting from the spread of tumours in the lungs or pleura in malignant diseases. MPE constitutes approximately 30% -60% of all pleural fluids.[1-3] Symptomatic treatment in MPE is possible with pleurodesis and there are various catheter and drainage systems which are used for the purpose of drainage and pleurodesis.

The aim of this study was to compare the treatment duration, efficacy and frequency of recurrence of chemical pleurodesis applied with a 28F catheter and an 8F catheter to clinically similar patient groups.

METHODS

Approval for the study was granted by the Local Ethics Committee. The study included patients with a diagnosis of MPE who presented at the Thoracic Surgery Polyclinic between February 2011 and December 2013. The etiological factors that played a role in the development of MPE in the patients were determined. The age and gender of the patients, treatment methods applied and the duration of treatment were recorded. Patients were excluded from the study if their general condition was poor, they were of ASA III or above or if they had received chemical pleurodesis, VATS or thorascopy for pleural effusion or chemotherapy for >6 months.

The standard procedure in our clinic requires that thoracentesis is applied to patients in the polyclinic to determine that lung expansion can be obtained. Patients with massive and long-term (>3 months) effusion, with pleural adhesions on radiological examination and those for whom it was considered that lung expansion could not be achieved in the thoracostomy with thoracentesis to be applied in the clinic, were excluded from the study and were referred to the video-assisted thorascopy and pleural powder program. Following definitive diagnosis from the pleural cytology or pleural biopsy, the patients were randomly allocated to the two groups as 40 patients in the 28F chest tube group and 40 patients in the 8F percutaneous catheter group and thoracostomy was a applied on the day of admission to hospital. Lung expansion was monitored on direct pumonary radiographs and when full expansion of the lungs was achieved, pleurodesis was applied via the thoracostomy route.

To prevent pain associated with the intrathoracic reaction providing pleurodesis, local anaesthetic of diluted 400mg prilocaine hydrochloride was administered to the intrapleural gap via the thoracostomy route. For the purpose of pleurodesis, all patients were administered with sclerosing agent (tetracylcine HCL) diluted with 30cc isotonic, administered to the intrapleural space by the thoracostomy route. Before the application, to prevent over-sensitivity reactions which may be seen, all patients were intravenously administered 1 ampoule pheniramine maleate, 80 mg steroid and 20 mg famotidine, then the 20cc flacon of sclerosing agent diluted with 30cc isotonic was administered to the pleural space. After the procedure, the 28F catheter or the 8F catheter was clamped for 2 hours and at the end of this period, the tube or catheter was opened and drainage was monitored. No side-effect or excessive sensitivity was seen in any patient associated with the intrathoracic agent applied.

During follow-up, when the daily drainage amount fell to <100cc, the procedure was accepted as successful and the thoracostomy was terminated. In patients with continuing daily drainage of >200cc following pleurodesis, the sclerosing agent was applied again via the thoracostomy route and daily drainage was again monitored. After lung expansion was confirmed on radiological examination and daily drainage fell to <100cc, the thoracostomy was terminated.

The patients were called for follow-up examination at 1 week and 1 month after the procedure and effusion was monitored radiologically. Patients determined with recurrent effusion were admitted to the thorascopy program with the possibility of

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pleural adhesions associated with the procedure which had been applied.

Statistical Analysis

All analyses of the study data were made with IBM SPSS vn 23.0 statistics software. Categorical variables were stated as number (n) and percentage (%). Numerical variables were presented as descriptive statistics as mean ± standard deviation (SD) or median and range (minimum- maximum) values. In the comparison of 2 groups of numerical variables, 'the significance of the difference between two means test' was applied to variables showing normal distribution, and the Mann Whitney U-test was applied to variables not showing normal distribution. For the group comparisons of categorical variables, the Chi-square test (Pearson Chi-square, Yates correction Chi-square) was used. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

Intervention was made to a total of 80 patients with a diagnosis of pleural effusion. The patients comprised 40 males and 40 females with a mean age of 45.88 ± 9.78 years. No statistically significant difference was determined between the groups in respect of age or gender (Table 1).

Table 1: Distribution of patients according to age and gender

	28F catheter	**8F catheter**	
No of patients	40	40	
Age (years)	44.08±9.68	47.68±9.67	P=0.100
Gender			
Female	22	18	P=0.502
Male	18	22	

The most common symptom was shortness of breath followed by chest pain. In the first thoracentesis applied for biochemical examination of the pleural fluid, cytological examination and patient relief, ≥1000 cc fluid was aspirated from 52 (65%) patients.

When the primary malignancies causing MPE in the patients were examined, the most frequently encountered factor was primary lung cancer (48 patients, 60%), in 38 males and 10 females. This was followed by breast cancer metastasis in 18 (22.5%) patients, gastrointestinal cancer in 9 (11.25%) and mesothelioma in 5 (6.25%).

When the time from thoracostomy to full lung expansion was compared between the groups, this period was determined as mean 2 days (range, 1-4 days) in the 28 F catheter group and as mean 2 days (range, 1-6 days) in the 8F catheter group. The duration was longer in the 8F catheter group but the difference was not statistically significant (Table II). When the period from the application of pleurodesis to the termination of thoracostomy was compared between the groups, it was determined as mean 5 days (range, 3-12 days) in the 28F catheter group and as mean 7 days (range, 4-14 days) in the 8F catheter group and the difference was determined to be statistically significant.

Pleurodesis was achieved in 36 (90%) of the 40 patients in the 28F catheter group on first application and to all on the second

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application. In the 8F catheter group, pleurodesis was achieved in 24 (60%) of the patients on first application and to the remaining 16 patients on second application. In 8 (20%) patients in the 8F catheter group, a problem of obstruction in the catheter was experienced. Of these, 3 were patients with successful pleurodesis on first application and 5 required a second application of the sclerosing agent. Recurrence of effusion was seen in 6 (15%) patients in the 8F catheter group in the 1st month of follow-up.

No statistically significant difference was determined between the groups in respect of length of stay in hospital with the durations calculated as mean 8 days (range, 4-16 days) in the 28F catheter group and mean 9 days (range, 5-19 days) in the 8F catheter group (Table II).

Table II: Distribution of the patients according to the length of stay in hospital and the success of the applications

	28F catheter	8F catheter	P
Length of hospital stay (days)	8 (4-16)	9 (5-19)	0.753
Before pleurodesis (days)	2 (1-4)	2 (1-6)	0.011
After pleurodesis (days)	5 (3-12)	7 (4-14)	<0.001
Success on first application	36	24	0.005
Success on second application	4	16	

DISCUSSION

Most patients with MPE are symptomatic and life expectancy is short, with 54% lost in the first month and 84% within the first 6 months.[4,5] MPE is present in 15% of patients with a new diagnosis of lung cancer and will eventually occur in 46% (6). In addition to direct radiographs, computed tomography (CT) and ultrasonography (USG) provide significant contributions in diagnosis.[5] However, definitive MPE diagnosis is made from cytological examination of pleural fluid or pleural biopsies.[7] Taking fluid with thoracentesis is sufficient for cytological examination. The MPE diagnosis of all the patients in the currnt study was confirmed by cytological examination or needle biopsy. Open pleura biopsy was not applied as routine to the current study patients but in suspicious cases, percutaneous pleura biopsy was taken. Patients who were diagnosed with open pleura biopsy were not included in the study as interventions such as powdering for pleurodesis were applied during the procedure.

The underlying cause in 50%-75% of MPE cases is lung cancer and breast cancer.[5,7] In a study conducted in Turkey, the primary pathology pathologies causing MPE were listed as lung cancer, breast cancer and mesothelioma.[8] In the current series, the most common causes were found to be consistent with literature as breast cancer in females (18/40, 45%) and lung cancer in males (30/40, 75%).

Apart from radiotherapy and chemotherapy, thoracentesis is the least invasive of the treatment methods applied to MPE cases.[7] Thoracentesis should be applied to all MPE cases with respiratory problems. Thoracentesis is useful in reducing patient symptoms and evaluating the underlying expansion capability of the lungs and tendency for fluid to accumulate again. However, as repeated thoracentesis can lead to pleural adhesions and loculations, it is not recommended in treatment.[5] Until relief is seen with the drainage of pleural effusion, it is important that patients to whom pleurodesis is

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to be applied are patients with evident symptoms.[5,7] Thoracentesis is not accepted as a treatment method for cases except those in a poor general condition and with a short life expectancy.

Chemical pleurodesis is accepted as the first treatment option in cases with a good general condition and those where shortness of breath has been alleviated with theraputic thoracentesis.[5,7,9] The aim in pleurodesis is to provide adhesion of the parietal and visceral pleural membranes with fibrosis and remove the pleural space. Therefore, talc, some antibiotics (tetracyclines, minocycline, doxycycline), antineoplastic agents (bleomycin, 5‑fluorouracil, mitomycin, etc.), silver nitrate (SN), immunomodulating agents and biological agents are applied to the pleural gap.[10,11] The success rates of pleurodesis wth different sclerosing agents varies from 60% - 100%.[12] Of these, tetracycline is the oldeat and most widely used.[13,14] In our clinic, tetracycline is used as standard for pleurodesis.

For pleurodesis and the drainage of pleural fluid in MPE, an 8 French diameter percutaneous catheter and a standard 28 or 32 French chest tube are the most commonly used drainage tools. Shankar reported that 78% success in pleurodesis was achieved with the use of 8F-12F catheters.[15] It was also stated that as small diameter 8F catheters could be inserted under USG or tomography guidance for loculated fluid drainage, this provided an advantage over wider diameter chest tubes.[15] Many centres use chemical sclerotherapy with percutaneous catheters as the first choice treatment option in MPE.[16,17] However, there has always been the problem that obstruction of the narrow diameter occurs easily. Kiliç et al recommended the use of Cystofix catheter because of the problem of obstruction in 8F catheters.[18]

In several series in literature, a recurrence rate of 6%-38% has been reported even at the late stage in thorascopic talc pleurodesis.[19,20] In the current study, long-term results were not calculated as follow-up was not possible. However, it is most likely that the short-term recurrence rate of 15% which was determined, would increase over the long-term.

CONCLUSION

The most significant disadvantage of the practical application of drainage and pleurodesis with a 28F catheter is the requirement for hospitalisation. We believe that in patients diagnosed with MPE for whom pleurodesis is planned, drainage and pleurodesis with an 8F catheter first would be more suitable as follow-up is possible in the polyclinic. To be able to apply the treatment in the polyclinic and not require the patient to be hospitalised, allows the patient to better tolerate this time-consuming treatment, eliminates the loss of workforce of hospital personnel and reduces hospital costs. However, there must be an awareness that the success rates are low for patients planned to receive chemical pleurodesis and to avoid the risks of treatments to be made later, the chemical pleurodesis procedure should be applied with a wide diameter catheter.

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