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Research Article

Does Wide Pore Drain Still have a Role in Drainage of Free Malignant Pleural Effusion?

Moataz E Rezk[1]*, Ashraf M Elnahas[1] and Marwa E Elnaggar[2]

[1]*Cardiothoracic Surgery, Faculty of Medicine, Benha University, Egypt*

[2]*Chest, Faculty of Medicine, Benha University, Egypt*

***Corresponding Author:** Moataz E Rezk, Cardiothoracic Surgery, Faculty of Medicine, Benha University, Egypt.

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Abstract

Purpose: Purpose is to compare wide pore with small pore chest drain in management of patients with malignant pleural effusion.

Methods: This prospective study included 50 patients with malignant pleural effusion attended to cardiothoracic surgery department at Benha University Hospital from January 2017 to January 2019. Patients were divided into two groups; group A which included 25 patients who underwent insertion of wide pore chest drain and group B which included 25 patients who underwent insertion of small pore chest drain. Both groups were compared in terms of efficacy, safety and complications.

Results: The study included 24 males and 26 females. The mean age of patients at intervention was 53 ± 12 in group A and 53 ± 13 year in group B. Initial drainage in group A was 1012 ± 369 cm^3 compared with 960 ± 355 cm^3 in group B (P = 0.614). Average drainage was 496 ± 188 cm^3 in group A and 354 ± 167cm^3 in group B (P = 0.007). The rate of complications in the form loculations and wound infection was higher in group A relative to group B with significant statistical difference (P = 0.024 and 0.023, respectively).

Conclusion: Small pore chest drain was found to be more effective with fewer complications relative to large pore one in management of malignant pleural effusion.

Keywords: *Malignant Pleural Effusion; Large Pore Chest Drain; Small Pore Chest Drain*

Introduction

Malignant disease is the leading cause of exudative pleural effusions. In a series of 3077 consecutive patients with tapped pleural effusions, it accounted for 27% of the cases, followed by heart failure (21%), pneumonia (19%), and tuberculosis (9%) [1]. Mesothelioma warrants special consideration, as 95% of patients will develop a malignant pleural effusions (MPE) [2].

In some patients, the analysis of the pleural effusion is not diagnostic and an invasive procedure should be done to get the accurate diagnosis [3].

The management of malignant pleural effusion is mainly by tube thoracostomy followed by pleurodesis. A variety of chest tubes can be used for thoracostomy ranging traditionally from 28 - 32 French (Fr). In the current era of minimally invasive procedures, the use of small pore catheters such as a 14 Fr catheter have proven to be successful [4,5].

Aim of the Study

The aim of current study is to compare between large pore chest drain and small pore one in patients with free malignant pleural effusions.

Patients and Methods

This study was carried out on 50 patients with malignant pleural effusion attended to cardiothoracic surgery department after approval from ethical committee. Inclusion criteria included patients presented with malignant pleural effusion either primary or secondary. Patients were excluded if they had loculated effusion; patients with empyema and patients who previously underwent failed pleurodesis. These patients were divided into two groups: group A included 25 patients managed by insertion of large pore chest drain (intercostals tube size 28,30 or 32 Fr) and group B also included 25 patients managed by insertion of small pore chest drain (pigtail size 14 Fr). All patients were subjected to full history taking, general and local chest examinations and imaging studies in the form of chest x-ray before and after insertion of the drain and computerized tomography (CT) in selected cases. Main parameters of the study included initial drainage and average drainage of pleural fluid per day and rate of complications including loculations, pain, wound infection and the need of repositioning. Patients were followed up for a period of one month by chest x-ray. Data interpretation and statistical analysis were done using SPSS vs.25. (IBM, Armonk, New York, United states). Comparisons between two groups were done using independent t test for numerical data. Categorical data was compared using Chi-square test. P values less than 0.05 were considered significant.

Results

The study included 24 males and 26 females. The mean age of patients at intervention was 53 ± 12 in group A and 53 ± 13 years in group B. Table 1 illustrates demographic data in the form of age, sex, weight, height and smoking with no statistically significant difference between both groups.

ITEM	Group A (n = 25)	Group B (n = 25)	P value
Age, year, mean ± SD	53 ± 12	53 ± 13	0.94
Weight, kg, mean ± SD	76 ± 11	73 ± 8	0.232
Height, cm, mean ± SD	169 ± 9	167 ± 7	0.311
Smoking, no, (%)	11 (44)	10 (40)	0.744
Etiology			
1ry pleural cancer no, (%)	7 (28)	7 (28)	1
Metastatic pleural cancer no, (%)	18 (72)	18 (72)	1
Co-morbidity, no (%)	6 (24)	9 (36)	0.355
Treatment status			
Prior to systemic therapy no, (%)	6 (24)	8 (32)	0.529
Ongoing systemic therapy no (%)	19 (76)	17.0 (68)	0.631

Table 1: *General characteristics in both groups.*

In our study, initial and average drainage of group A was higher than group B. Mean initial drainage of group A was 1012 cm^3 and average drainage per day for the first few days was 496 cm^3 compared with 960 cm^3 and 167 cm^3 in group B respectively and this difference is statistically significant (P = 0.007) (Table 2).

Item, mean ± SD	Group A (n = 25)	Group B (n = 25)	P value
Initial drainage (cm^3)	1012 ± 369	960 ± 355	0.614
Average drain/day (cm^3)	496 ± 188	354 ± 167	0.007

Table 2: *Initial drainage and average drainage per day in both groups.*

Regarding complications, loculations were observed in 64% of patients at group A compared with 32% in group B. Drainage block was observed in 64% and 80%of patients in group A And group B respectively. 60% and 28% of patients of group A and B respectively suffered from wound infection at site of drain insertion while 32% and 36% of patients in both group had recurrence of effusion (Table 3). Regarding pain during tube insertion, the median of pain score in group A was 6 and group B was 0 according to VAS and this difference is highly statistically significant (P = 0.001) (Table 4). Pleurodesis was effective in 56% of patients of group A while it was effective in 68% of patients of group B and the difference was statistically insignificant (P = 0.38). Regarding the need for repositioning of drain, 56% of cases at group A needed repositioning of drain while 32% of cases at group B needed repositioning and this difference is statistically insignificant (P = 0.08). Also, our study showed that 36% of patients at group A ambulated early after drain insertion in comparison to 76% of patients at group B, a difference which was statistically significant (P = 0.004). Regarding to hospital stay the mean hospital stay of patients of group A was 10 ± 2.3 days after drain insertion versus 8 ± 2.16 days for group B with p-value of 0.012.

Item, no, %	Group A (n = 25)	Group B (n = 25)	P value
Loculations	16 (64)	8 (32)	0.024
Drain blockage	16 (64)	20 (80)	0.208
Wound infection	15 (60)	7 (28)	0.023
Recurrence of effusion	8 (32)	9 (36)	0.355

Table 3: *Rate of complications in both groups.*

	Group A (n = 25)		Group B (n = 25)		
	Median	Range	Median	Range	P value
VAS	6	(3 - 9)	0	(0 - 4)	< 0.001

Table 4: *Visual analogue scale for pain in both groups.*
VAS: Visual Analogue score.

Discussion

In our study, the mean age of patients of both groups was 53 years and percentage of male in group A was 52% vs 44% in group B and this finding matches the study of Gammie 2000 in which, the mean age was 50 years and percentage of male was 45% [6].

The cause of malignant pleural effusion in both groups was primary pleural malignancy in 28% cases and metastatic lung disease in 70% and this finding did not match most of the previous studies reported the same subject. For example, in the trial of Sterman., *et al.* 2007 they have recruited 100 patients with MPE to detect efficacy of various types of sclerotherapy at pleurodesis and showed that the etiology was 70% primary pleural malignant disease and 30% was metastatic lung disease [7]. This difference could be explained by that most of cases of primary lung malignancy referred to us were admitted mainly at chest department and managed by ultrasound guided thoracentesis and referred by pulmonologist to oncology center to continue treatment, while patients who were referred to cardiothoracic surgery department showed loculations and were excluded from our study. On the other hand, patients with metastatic lung disease were primarily referred to cardiothoracic surgery department for palliative drainage of MPE.

Regarding the initial and average drainage in our study, This finding coincides with the study of Walsh., *et al*. 1989 in which 15 consecutive patients with disseminated disease and asymptomatic malignant effusion were drained by 12F drain while and another 15 patients were drained by traditional large-pore drain. The initial and average drainage of both groups was near equal demonstrating equality of

effectiveness [8]. The results of Seaton., *et al.* trial, which was carried out on 47 patients who underwent small tube drainage and sclerotherapy and had radiographic follow up for 30 day closely matched our results; in which 81% had complete response and 14% had partial response after 30 days follow up [9].

In our study regarding loculations, repositioning or insertion of another drain, these results somehow related to what Horsley., *et al*. had found in their study on 100 patients with MPE which showed the 25% incidence of loculations in patients with small pore and 50% loculations with large pore drain. This may be attributed to that the insertion of small pore drain was done with the help of ultrasound, so the drain position was more accurate which decreased the duration of drain at pleura leading to less possibility of loculations [10].

For drain blockage, 16% of patients in group A showed drain blockage and 20% of patients in group B showed drain blockage. Drain blockage show wide range of variability in different studies; for example, in Horsley., *et al*. study, they reported that near 37% patients suffered from drain blockage. On the other hand, Davies., *et al*. reported that 9% of cases showed drain blockage in his trial which studied complications of small-pore (seldinger) intercostal chest drain. This dissimilarity stays dubious and probably is due to frequency of drain flushing in the different series [11].

During our study, we have found that 60% of patients at group A had wound infection with variable degrees and 28% of patients at group B had the same complication. This finding matches those of Parker., *et al*. which studied small-pore catheter drainage and sclerotherapy for malignant pleural effusions which revealed wound infection in 10% of cases. Another study of Seaton., *et al*. about treatment of MPE using small-pore drain showed wound infection in 9% of cases. Also, David., *et al.* reported that wound infection developed in 15% of cases with large pore drain and in 8% of patients with small pore drains [12].

Regarding pain, we used VAS (visual analogue scale) that showed nearly cases in group B had no pain with median 0 and range (0 - 4), while in group A, median VAS was 6 and range from (3 - 9) and this difference is highly significant as P value is 0.001. These findings match those of Davies., *et al*. who had merely no pain in their trial. Another study supporting this finding is Mishra., *et al*. study which also reported no pain in cases treated by indwelling pleural catheter in comparison with cases treated by traditional chest drain [13].

In the current trial, pleurodesis was effective in 56% of patients of group A and 68% of patients of group B and this difference is statistically insignificant. This result quite matches the results of Seaton., *et al.* trial which showed success of pleurodesis through small-pore in 70% of cases. In another study, pleurodesis by small percutaneous catheter was found effective in 73% of cases [14].

Regarding early ambulation, 36% of patients at group A showed early ambulation in comparison to76% of patients at group B, and this difference is statistically significant with p value = 0.004. This result coincides with the results of another study which had found that 70% of patients with small-pore ambulated early in comparison to 40% of patients with large-pore drain and this may be attributed to patients' tolerability and less pain sensation [15].

Regarding hospital stay, group A showed that mean hospital stay was 10 ± 3 and in group B, it was 8 ± 2 with a P value of 0.017. This result coincides with Alden., *et al*. results which showed mean hospital stay in patients with large-pore was 12 ± 3 and in patient with small-pore was 10 ± 2. This difference regarding hospital stay may be explained that patients who are motivated and highly educated can be discharged with small-pore drain after receiving instructions about catheter management which decreases hospital stay.

Conclusion

Regarding outcomes: small pore chest drain is effective in drainage of cases with malignant pleural effusion whether primary or secondary. The incidence of complications regarding pain and wound infection is less in small pore than large pore chest drains and this give it superiority in palliative management of malignant pleural effusion than large pore chest drains.

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