



Effectiveness of Narrow versus Wide Chest Tube Drainage in Treating Malignant Pleural Effusion

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ABSTRACT

Background: Pleural effusion, characterized by the abnormal accumulation of fluid within the pleural space, is a common manifestation of various pleural diseases. It can result from increased fluid production or impaired lymphatic drainage. Management strategies often involve therapeutic interventions such as thoracentesis, repeated drainage procedures, pleurodesis, or insertion of indwelling pleural catheters. **Objective:** To determine the effectiveness of Narrow versus Wide Chest Tube Drainage in Treating Malignant Pleural Effusion. **Methodology:** The current Randomized controlled trial was carried out at the Department of Pulmonology, HMC Peshawar from 10th march 2025 10th June 2205. A total of 60 patients were enrolled with 30 patients allocated to each group A and B. Outcome measures were duration of tube placement, recorded in days, and pain assessments was conducted at various time points using a Visual Analog Scale (VAS) to measure pain levels. Data analysis was performed using SPSS version 22. Mean \pm standard deviation was calculated for continuous variables like age, pain score, and duration of tube placement. A categorical variable such as gender and residence was analyzed using frequency distributions and percentages. **Results:** In group A, the male and female patients were 18 (60%) and 12 (40%) respectively while in group B, the male patients were 17 (56.67%) and female patients were 13 (43.33%). The mean (\pm SD) age in group A was 45 (\pm 3.44) while in group B it was 46 (\pm 2.97). The means (\pm SD) VAS (24 h) score in group A was 1.49 (\pm 3.11) while in group B, it was 4.11 (\pm 2.01) ($p=0.001$). The means (\pm SD) Tube Duration (days) in group A was 11.99 (\pm 3.22) days while in group B, it was 7.01 (\pm 2.32) days ($p=0.001$). **Conclusion:** According to our research, small-bore chest tubes considerably reduce the level of pain when compared to large-bore tubes. Small-bore tubes usually need more time to place, although overall complication rates are comparable. The results of this research suggest that small-bore chest tubes should be the first choice for treating malignant pleural effusions.

INTRODUCTION

Pleural effusion, characterized by the abnormal accumulation of fluid within the pleural space, is a common manifestation of various pleural diseases. It can result from increased fluid production or impaired lymphatic drainage [1]. With numerous underlying causes including cardiopulmonary disorders, systemic inflammatory conditions, and malignancy [2], pleural effusion poses a significant clinical challenge. In the United States alone, the annual diagnosis rate exceeds 1.5 million cases [3].

Malignant pleural effusion specifically refers to the presence of cancer cells within the pleural fluid, occurring in approximately 15% of cancer patients [4]. Management strategies often involve therapeutic interventions such as thoracentesis, repeated drainage

procedures, pleurodesis, or insertion of indwelling pleural catheters [5]. Central to these interventions are chest tubes, cylindrical devices designed for effective drainage within the pleural space, categorized broadly into large bore (≥ 20 French) and small bore (< 20 French) types [6].

Historically, large bore chest tubes have been preferred due to perceived advantages in drainage. However, ongoing debate surrounds the optimal tube size for managing malignant pleural effusion [6]. Recent studies comparing large and small bore chest tubes have shown similar rates of successful pleurodesis [7, 8]. Small bore chest drains, while associated with risks like pain and blockage, offer easier insertion and comparable efficacy to large bore

tubes in managing malignant effusion and pneumothoraces [9].

A study in Pakistan showed that small bore thoracostomy drains were more effective than large bore tubes, with shorter drain placement (3.0 ± 1.6 days vs. 7.9 ± 3.8 days) and lower pain scores (1.07 ± 0.81 vs. 5.67 ± 1.68) [10]. These findings indicate that small bore drains offer better outcomes in managing pleural disorders.

Despite these studies, local data on the use and effectiveness of small-bore chest drains in managing malignant pleural effusion are limited, particularly in our setting. This study seeks to address this gap by investigating the outcomes associated with small bore versus large bore chest tube drains in our population. By evaluating factors such as duration of drain placement, pain management, and other outcomes, this research aims to provide evidence-based recommendations to optimize clinical practice and enhance patient outcomes.

MATERIAL AND METHODS

The current Randomized controlled trial was carried out at the Department of Pulmonology, HMC Peshawar from 10th march 2025 10th June 2205. Consecutive sampling (non-probability) was used. A total of 60 patients were enrolled with 30 patients allocated to each group A and B.

Inclusion Criteria

- Age 18-70 years.
- Both male and female gender.
- Patients diagnosed with malignant pleural effusion requiring therapeutic drainage.

Exclusion Criteria

- Patients with malignant effusion who are terminally ill.
- Patients with prior chest tube insertion for pleural effusion within six months.
- Patients with widespread metastatic disease with life expectancy under three months.

Data Collection Procedure

Ethical approval was secured from the Institutional Review Board (IRB) at HMC Peshawar before starting the study. Also, synopsis approval was sought from CPSP before data collection. Once approved Participants was recruited from the in-patient department of pulmonology ward. Informed consent was obtained from all participants, who were then assigned unique participant IDs. Baseline assessments includes demographic information (name, age, gender, residence, socioeconomic status) and relevant medical history including comorbidities and prior chest interventions. Patients with malignant pleural effusion was randomly assigned to two groups using the Blocked Randomization method.

Group A: Small bore chest drains.

Group B: Large bore chest drains.

To minimize operator bias, all drains was inserted by third-year trainees. The intervention details including the type of chest tube (small bore or large

bore) and the date and time of insertion will be documented. Outcome measures were duration of tube placement, recorded in days, and pain assessments was conducted at various time points using a Visual Analog Scale (VAS) to measure pain levels.

Data was collected using a standardized proforma to ensure accurate documentation of participant information and assessment results. All collected data was securely stored to maintain confidentiality. Confidentiality of participant information was strictly maintained throughout the study.

Data Analysis Procedure

Data analysis was performed using SPSS version 22. Mean \pm standard deviation was calculated for continuous variables like age, pain score, and duration of tube placement. A categorical variable such as gender and residence was analyzed using frequency distributions and percentages. To compare the duration of tube placement and Pain scores at different time points using Visual Analog Score (VAS) between two groups an independent sample t-test was conducted. The significance level was set at p-values \leq 0.05 for all statistical analyses. In the case of two groups independent sample t-test was use and in the case of more than two groups ANOVA was used at 5% level of significance.

RESULTS

In the current study, a total of 60 patients were enrolled with 30 patients allocated to each group A and B. In group A, the male and female patients were 18 (60%) and 12 (40%) respectively while in group B, the male patients were 17 (56.67%) and female patients were 13 (43.33%). The mean (\pm SD) age in group A was 45 (± 3.44) while in group B it was 46 (± 2.97). Based on age wise distribution, 24 (80%) patients were >45 years of age and 6 (20%) were ≤ 45 years of age in group A while 7 (23.33%) patients were ≤ 45 years of age and 23 (76.67%) were > 45 years of age in group B. Based on residence, 18 (60%) patients were from rural areas and 12 (40%) patients were from urban areas in group A while in group B, 16 (53.33%) patients were from rural areas and 14 (46.67%) patients were from urban areas. (Table 1)

The means (\pm SD) VAS (24 h) score in group A was 1.49 (± 3.11) while in group B, it was 4.11 (± 2.01) ($p=0.001$). The means (\pm SD) Tube Duration (days) in group A was 11.99 (± 3.22) days while in group B, it was 7.01 (± 2.32) days ($p=0.001$). (Table 2)

The different post-operative complications were bleeding, emphysema and wound infection. In group A, bleeding was observed in 8 (26.66%) patients while group B, bleeding was observed in 11 (36.67%) patients. In group A, emphysema was observed in 4 (23.33%) patients while group B, bleeding was observed in 8 (26.66%) patients. In group A, wound infection was observed in 3 (10%) patients while group B, bleeding was observed in 6 (20%) patients. Drain blockage was observed in 6 (20%) patients in group a while it was observed in only 1 (3.33%) patient in group B. Drain dislodgement was observed in 6

(20%) patients in group A while it was observed in 3 (10%) patients in group B. (Figure 1)

Table 1

Demographic Parameters Comparison in both the Groups

Parameter	Sub category	Group A Frequency (%)	Group B Frequency (%)
Gender	Male	18 (60%)	17 (56.67%)
	Female	12 (40%)	13 (43.33%)
Age	≤45 years	6 (20%)	7 (23.33%)
	>45 years	24 (80%)	23 (76.67%)
Residence	Rural	18 (60%)	16 (53.33%)
	Urban	12 (40%)	14 (46.67%)

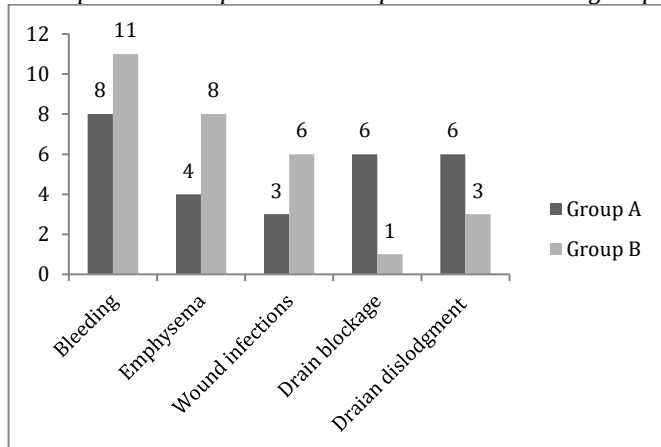
Table 2

Comparison of pain score and tube duration in both the groups

Parameter	Group A Mean (±SD)	Group B Mean (±SD)	P value
VAS (24h)	1.49 (± 3.11)	4.11 (± 2.01)	0.001
Tube Duration (days)	11.99 (± 3.22)	7.01 (± 2.32)	0.001

Figure 1

Post-operative complications comparison in both the groups



DISCUSSION

Malignant pleural effusion development is a poor prognostic factor. Severe, incapacitating symptoms and a reduced quality of life may result from recurrent pleural effusions. MPE may sometimes occur with other infections or pulmonary disorders, including mycobacterial illness, which makes patient care and results more difficult [11, 12]. Malignant pleural effusion treatment should have a low incidence of morbidity and death since it is palliative. There are a variety of treatment options available, and some researches have shown that small-bore catheters may cure malignant effusions just as well as big chest tubes [13]. The idea behind the interest in using small-bore catheters for sclerotherapy and effusion drainage is that, in comparison to typical large-bore chest tubes, they may be less intrusive and hence more accepted by patients without compromising effectiveness [14]. 60 patients with malignant pleural effusions were included in this research; they were split into two groups, Group A (30 patients) using a small-bore chest tube and Group B (30 patients) using a large-bore chest tube. In group A, the male and female patients were 18 (60%) and 12 (40%) respectively while in group B, the male patients were 17 (56.67%) and female patients were 13 (43.33%).

The mean (±SD) age in group A was 45 (±3.44) while in group B it was 46 (±2.97). Based on age wise distribution, 24 (80%) patients were >45 years of age and 6 (20%) were ≤45 years of age in group A while 7 (23.33%) patients were ≤45 years of age and 23 (76.67%) were >45 years of age in group B. Based on residence, 18 (60%) patients were from rural areas and 12 (40%) patients were from urban areas in group A while in group B, 16 (53.33%) patients were from rural areas and 14 (46.67%) patients were from urban areas. There were no appreciable age or gender disparities between the two groups, and their fundamental traits were similar. These characteristics were similar to those of the earlier study [14]. In our study, the means (±SD) VAS (24 h) score in group A was 1.49 (± 3.11) while in group B, it was 4.11 (± 2.01) (p=0.001). The means (±SD) Tube Duration (days) in group A was 11.99 (± 3.22) days while in group B, it was 7.01 (± 2.32) days (p=0.001).

The effectiveness of small-bore chest tubes was compared to that of ordinary large-bore chest tubes in several studies [15], and the findings demonstrated that the small-bore tubes were at least as successful as the conventional large-bore tubes. The technique was well tolerated, had an acceptable response with little problems, and no casualties were recorded in our research. The use of small-bore catheters in the treatment of malignant pleural effusions was supported by a research that compared them to the conventional big chest tube [16]. Hemothorax and severe hemorrhage have not been documented in our research. Previous research studies reported comparable results [17, 18]. In our study, Drain blockage was observed in 6 (20%) patients in group A while it was observed in only 1 (3.33%) patient in group B. Drain dislodgement was observed in 6 (20%) patients in group A while it was observed in 3 (10%) patients in group B.

This is similar to a research in which Group A (SBCT) only reported one (6.6%) instances of dislodgement [25]. This can be the result of the drain's loose attachment to the chest wall. The numerical pain rating scale was used to quantify pain. In comparison to Group A, it was much greater in Group B. Smaller (12F) chest tubes are linked to less discomfort than bigger (24F) tubes, according to a prior research [19]. Blockage and kinking seem to be more common with small-bore chest tubes. According to studies, the blockage rate of small-bore tubes was 8.1%, while that of large-bore tubes was 5.2% in a prospective (non-randomized) research [15], which is consistent with the results of our investigation. Although it was not a component of our strategy, routine drain cleaning might be used in the future to further minimize obstruction and enhance results with small-bore drains. This high incidence of tube blockage in our setup might be caused by the quality of the chest tube, the number of holes in it, and the intubation method.

CONCLUSION

According to our research, small-bore chest tubes considerably reduce the level of pain when compared to large-bore tubes. Small-bore tubes usually need more time to place, although overall complication rates are comparable. While longer may need more medical

resources, less discomfort may make the patient feel more at ease. In conclusion, small-bore chest tubes offer a more comfortable and safe option for treating malignant pleural

effusion tubing. The results of this research suggest that small-bore chest tubes should be the first choice for treating malignant pleural effusions.

REFERENCES

- Jany, B., & Welte, T. (2019). Pleural effusion in adults—Etiology, diagnosis, and treatment. *Deutsches Ärzteblatt international*. <https://doi.org/10.3238/arztebl.2019.0377>
- Aboudara, M., & Maldonado, F. (2019). Update in the management of pleural effusions. *Medical Clinics of North America*, 103(3), 475-485. <https://doi.org/10.1016/j.mcna.2018.12.007>
- Korczyński, P., Górska, K., Konopka, D., Al-Haj, D., Filipiak, K. J., & Krenke, R. (2020). Significance of congestive heart failure as a cause of pleural effusion: Pilot data from a large multidisciplinary teaching hospital. *Cardiology Journal*, 27(3), 254-261. <https://doi.org/10.5603/cj.a2018.0137>
- Skok, K., Hladnik, G., Grm, A., & Crnjac, A. (2019). Malignant pleural effusion and its current management: A review. *Medicina*, 55(8), 490. <https://doi.org/10.3390/medicina55080490>
- Porcel, J.M. (2018). Chest tube drainage of the pleural space: A concise review for Pulmonologists. *Tuberculosis and Respiratory Diseases*, 81(2), 106. <https://doi.org/10.4046/trd.2017.0107>
- Hallifax, R. J., Psallidas, I., & Rahman, N. M. (2017). Chest drain size: The debate continues. *Current Pulmonology Reports*, 6(1), 26-29. <https://doi.org/10.1007/s13665-017-0162-3>
- Kulandaisamy, P. C., Kulandaisamy, S., Kramer, D., & Mcgrath, C. (2021). Malignant pleural effusions—A review of current guidelines and practices. *Journal of Clinical Medicine*, 10(23), 5535. <https://doi.org/10.3390/jcm10235535>
- Thethi, I., Ramirez, S., Shen, W., Zhang, D., Mohamad, M., Kaphe, U., & Kheir, F. (2018). Effect of chest tube size on pleurodesis efficacy in malignant pleural effusion: A meta-analysis of randomized controlled trials. *Journal of Thoracic Disease*, 10(1), 355-362. <https://doi.org/10.21037/jtd.2017.11.134>
- Orlando, A., Cordero, J., Carrick, M. M., Tanner, A. H., Banton, K., Vogel, R., Lieser, M., Acuna, D., & Bar-Or, D. (2020). Comparing complications of small-bore chest tubes to large-bore chest tubes in the setting of delayed hemothorax: A retrospective multicenter cohort study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 28(1). <https://doi.org/10.1186/s13049-020-00754-5>
- Ramzan, M., Mahmud, T., Saqib, M., Khan, A. S., Saboor, Q. A., & Mirza, A. R. (2021). A comparative study between-small bore and large bore tubes for therapeutic pleural drainage. *Proceedings*, 35(2), 68-72. <https://doi.org/10.47489/pszmc784-35-2-68-72>
- Walker, C. M., Zhou, C. Y., & Pathak, V. (2021). Adenocarcinoma of the lung with concurrent mycobacterium avium complex infection. *Lung India*, 38(4), 365-367. <https://doi.org/10.4103/lungindia.lungindia.470.19>
- Walker, S., Mercer, R., Maskell, N., & Rahman, N. M. (2020). Malignant pleural effusion management: Keeping the flood gates shut. *The Lancet Respiratory Medicine*, 8(6), 609-618. [https://doi.org/10.1016/s2213-2600\(19\)30373-x](https://doi.org/10.1016/s2213-2600(19)30373-x)
- Alomar, Z., Tawfek, Z., Alomar, Y., Mahmood, I., Alomar, A., El-Menyar, A., Rizoli, S., & Al-Thani, H. (2025). Failure rate and complications of small-bore, wire-guided chest drains in adult patients presenting with traumatic and nontraumatic pleural diseases: A systematic review. *Qatar Medical Journal*, 2025(2). <https://doi.org/10.5339/qmj.2025.55>
- Mei, F., Rota, M., Bonifazi, M., Zuccatosta, L., Porcarelli, F. M., Sediari, M., Bedawi, E. O., Sundaralingam, A., Addala, D., Gasparini, S., & Rahman, N. M. (2023). Efficacy of small versus large-bore chest drain in pleural infection: A systematic review and meta-analysis. *Respiration*, 102(3), 247-256. <https://doi.org/10.1159/000529027>
- Stamenovic, D., Dittmar, E., Schiller, P., Trenchev, D., Karampinis, I., Galata, C., & Roessner, E. (2023). A randomized controlled trial: Comparison of 14 and 24 French thoracic drainage after minimally invasive lobectomy - MZ 14-24 study. *Heliyon*, 9(12), e22049. <https://doi.org/10.1016/j.heliyon.2023.e22049>
- Hallifax, R. J., McKeown, E., Sivakumar, P., Fairbairn, I., Peter, C., Leitch, A., Knight, M., Stanton, A., Ijaz, A., Marciniak, S., Cameron, J., Bhatta, A., Blyth, K. G., Reddy, R., Harris, M., Maddekar, N., Walker, S., West, A., Laskawiec-Szkonter, M., ... Rahman, N. M. (2020). Ambulatory management of primary spontaneous pneumothorax: An open-label, randomised controlled trial. *The Lancet*, 396(10243), 39-49. [https://doi.org/10.1016/s0140-6736\(20\)31043-6](https://doi.org/10.1016/s0140-6736(20)31043-6)
- Bediwy, A. S., Al-Biltagi, M., Saeed, N. K., Bediwy, H. A., & Elbeltagi, R. (2023). Pleural effusion in critically ill patients and intensive care setting. *World Journal of Clinical Cases*, 11(5), 989-999. <https://doi.org/10.12998/wjcc.v11.i5.989>
- Qiabi, M. (2021). *PLEurodesis Using hypertonic Glucose administration to treat post-operative air leaks following lung resection surgery (PLUG): Phase I trial* (Master's thesis, The University of Western Ontario (Canada)). https://ir.lib.uwo.ca/etd/7773?utm_source=ir.lib.uwo.ca%2Fetd%2F7773&utm_medium=PDF&utm_campaign=PDFCoverPages
- Aziz, H., Kwon, Y. I., Lee, K. Y., Park, A. M., Lai, A., Kwon, Y., Aswani, Y., & Pawlik, T. M. (2024). Current evidence on the diagnosis and management of spilled gallstones after laparoscopic cholecystectomy. *Journal of Gastrointestinal Surgery*, 28(12), 2125-2133. <https://doi.org/10.1016/j.gassur.2024.10.001>