Open Respir Arch. 2020;2(3):194–196

Sociedad Española de Neumología y Cirugía Torácica SEPAR

Open Respiratory Archives

www.elsevier.es/ora

Scientific letter

An Inexpensive Way to Drain Malignant Effusions With Indwelling Pleural Catheters and Its Impact on Performance Status and Pleurodesis. Experience from a Tertiary Hospital in México

Una forma económica de drenar derrames malignos usando catéteres de drenaje pleural permanentes y su impacto en el estado funcional y la pleurodesis. La experiencia de un hospital de tercer nivel en México

Erick J. Rendón-Ramírez[a], Héctor Enrique Cedillo-Huerta[a], Perla R. Colunga-Pedraza[b], Erick Willhelm Renpenning-Carrasco[a], Roberto Mercado-Longoria[a], Juan Francisco González-Guerrero[c], José M. Porcel[d,*]

[a] *Department of Pulmonary and Critical Care Medicine, "Dr. José E. González" University Hospital, Nuevo León Autonomous University, Monterrey, Mexico*
[b] *Internal Medicine Department, "Dr. José E. González" University Hospital, Nuevo León Autonomous University, Monterrey, Mexico*
[c] *University Center Against Cancer, "Dr. José E. González" University Hospital, Nuevo León Autonomous University, Monterrey, Mexico*
[d] *Pleural Medicine Unit, Department of Internal Medicine, Hospital Universitario Arnau de Villanova, IRBLleida, Lleida, Spain*

Dear Editor:

Malignant pleural effusion (MPE) is the most common cause of recurrent exudative pleural effusions (PE). Indwelling pleural catheters (IPCs) offer an alternative to bedside or thoracoscopic talc pleurodesis for controlling persistent symptomatic effusions.[1] IPC, which is a silicone tube placed in the pleural cavity and tunneled subcutaneously, allows for ambulatory management, thereby minimizing hospital stay. The external portion of the IPC is attached to vacuum bottles for drainage.[2]

A meta-analysis of 1348 patients with MPEs treated with IPCs revealed that 95.6% had symptomatic improvement and 45.6% achieved spontaneous pleurodesis (SP) after a median of 52 days.[3] Following successful IPC placement, no further ipsilateral pleural procedures were required in 92% of 279 MPE cases from another series.[4] However, IPC drainage using commercially available vacuum bottles is expensive and often financially prohibitive in developing countries. Therefore, looking for an alternative drainage strategy using the IPC, but with manageable cost, is necessary[5] as we report in the following experience.

Methods

A prospective study was performed from January 2016 to June 2018 at a tertiary University Hospital in Monterrey, México. It included patients with MPEs and chronic benign PEs refractory to medical treatment and thoracenteses. An IPC was indicated for symptomatic patients with contraindications for pleurodesis (unexpandable lung) and a predicted survival of at least 1 month, and also for those who preferred the IPC to classical pleurodesis after a discussion of the pros and cons. The presence of a non-expandable lung was evaluated on a post-therapeutic thoracentesis chest radiograph, and it was defined as <50% pleural apposition based on subjective visual estimation. The aim of IPC placement was the improvement of performance status with no need for further pleural intervention and, secondarily, the achievement of a spontaneous pleurodesis (SP) leading to IPC removal. Effusions were classified as malignant on the basis of a positive pleural fluid cytology or histology, whereas the diagnosis of benign effusions depended on well-established clinical criteria.[6]

Before IPC insertion (PleurX™, Becton Dickinson), patients were subjected to a clinical (including Eastern Oncology Cooperative Group – ECOG – and Karnofsky scales), analytical and thoracic ultrasound (TUS) evaluation. The latter determined the pleural fluid pattern (anechoic, echogenic, and complex septated or non-septated), presence of pleural thickening and optimal point of entry for IPC placement. Pleural drainage was performed either with vacuum bottles (PleurX drainage kit, 500 mL) or manually depending on the patient's economic resources. In Mexico, the approximate cost of one 500 mL vacuum bottle is 80 dollars while that of manual drainage is only 3. Manual drainage was performed using a 14G angiocatheter (without the introducer needle) which was inserted into the outer end of the IPC (valve) and connected through a three-way stopcock with a 50 mL syringe. The manually

* Corresponding author.
E-mail address: jporcelp@yahoo.es (J.M. Porcel).

https://doi.org/10.1016/j.opresp.2020.02.003

Table 1
Characteristics of the study population.

	All population (n = 100)	Manual drainage (n = 55)	Vacuum bottle drainage (n = 45)	p value
Age, median (range), years[a]	59 (27–91)	59 (27–88)	60.5 (35–91)	0.54
Etiology, n (%)[a]				0.075
Malignant				
Breast	21 (24.13)	11 (12.6)	10 (11.5)	
Lung	17 (19.54)	9 (10.3)	8 (9.19)	
Lymphoma	7 (8.04)	6 (6.89)	1 (1.14)	
Kidney	6 (6.89)	2 (2.29)	4 (4.59)	
Sarcoma	5 (5.74)	4 (4.59)	1 (1.14)	
Gastrointestinal	5 (5.74)	2 (2.29)	3 (3.44)	
Mesothelioma	2 (2.29)	1 (1.14)	1 (1.14)	
Others	13 (14.94)	7 (8.04)	6 (6.89)	
Non-malignant				
Hepatic hydrothorax	5 (5.74)	5 (5.74)	0 (0)	
Chronic kidney failure	4 (4.59)	3 (3.44)	1 (1.14)	
Heart failure	1 (1.14)	1 (1.14)	0 (0)	
Idiopathic	1 (1.14)	0 (0)	1 (1.14)	
Baseline performance status				
ECOG grade, median (range)	2 (0–4)	3 (1–4)	2 (0–4)	0.062
Karnofsky score, median % (range)	60 (20–100)	60 (20–80)	70 (20–100)	0.004
One-month performance status				
ECOG grade, median (range)	1 (0–4)	1 (0–4)	1 (0–4)	0.98/<0.001
Karnofsky score, median % (range)	80 (10–100)	80 (10–100)	80 (10–100)	0.121/<0.001
Spontaneous pleurodesis				
Yes, *n* (%)	47 (47)	26 (47.27)	21 (46.66)	0.75
No, *n* (%)	53 (53)	29 (52.72)	24 (53.33)	
Time to pleurodesis, median (range), days	54 (8–495)	60 (8–495)	45 (12–159)	0.148

[a] Calculated for 87 patients instead of the 100 IPC procedures.
Fist p value corresponds to the comparison of manual and vacuum bottle drainage, while the second p refers to the difference between baseline and 1-month performance status.

aspirated fluid was drained into a simple non-sterile plastic bottle. Both vacuum and manual drainages were performed twice weekly by a nurse or a family doctor in the outpatient setting. A monthly clinical and TUS follow-up was conducted by a pulmonologist. The IPC was removed when the amount drained was less than 50 mL for three consecutive drainages and a TUS demonstrated either the absence or a minimal quantity of fluid; a situation which was presumed to represent a spontaneous pleurodesis (SP).

Vacuum bottles and manual drainage groups were compared with the chi-square, Student's t or Mann–Whitney U tests, as appropriate. The research local committee approved the study protocol (Ref. No. NM17-00006).

Results

A total of 100 IPCs were inserted into 87 patients. Eleven (12.6%) required bilateral IPCs and one needed three IPCs. The median age population was 59 years (range 27–91); 40 patients (46%) were male and 47 (54%) female (54%). There were 76 patients (87%) with MPEs and 11 (13%) with benign conditions. The most common indications for IPC placement were breast cancer (21 patients, 24%) and lung cancer (17 patients, 19.5%). Forty-five percent of IPC drainages were performed using vacuum bottles and 55% manually (Table 1).

At the time of IPC insertion, the median ECOG performance status grade was 2 (range 0–4) and the Karnofsky score 60% (range 20–100%). One month after IPC placement, significant improvements were observed in both the ECOG stage (1, range 0–4) and Karnofsky score (80%, range 10–100%) (both $p < 0.001$). The impact of IPC on performance status at one month was independent of the drainage modality used, whether vacuum bottle or manual aspiration ($p < 0.98$) (Table 1). No further pleural procedures were necessary in 98% of the patients after a median follow-up of 95 days (range 8–540). SP occurred in 47 cases (47%) after a median time of 54 days (range 8–495), and it was not influenced by the IPC drainage modality ($p = 0.773$) (Table 1). The total drainage volume for patients who achieved SP using vacuum bottles was 5.83 L (range 0.96–29) whereas for those who were drained manually it was 6 L (range 0.4–35.7) ($p = 0.435$).

There was no relationship between the TUS pleural fluid pattern and the development of SP ($p = 0.266$). Ultrasonographic pleural thickening of >1 cm, which was identified in 56 cases, did not have an effect on SP ($p = 0.071$).

Discussion

This is the first study to demonstrate that manual drainage of IPC devices is a valid and less expensive alternative to the use of vacuum bottles in low-income countries. For important patient-related outcome measures, such as the performance status or the time that IPC needs to be in place (linked to SP),[7,8] no differences were found between classical vacuum bottle drainages and manual fluid aspirations. In other words, having few economic resources available should not be a barrier to palliative treatment with an IPC in patients with symptomatic persistent MPEs.

This study, however, should be considered preliminary due to its intrinsic limitations. It included a limited number of patients, though they were recruited prospectively and assigned to the drainage method according to their financial resources, thus reflecting a real-world scenario. In addition, it should be noted that IPC and talc pleurodesis are not mutually exclusive. It is plausible that in the future the combination of IPC insertion, talc slurry pleurodesis and daily catheter drainage will provide a highly cost-effective approach to symptomatic MPEs.[9] Therefore, the economic impact of this or other new approaches in the removal of pleural fluid will need to be reassessed.

References

1. Asciak R, Hallifax RJ, Mercer RM, Hassan M, Wigston C, Wrightson JM, et al. The hospital and patient burden of indwelling pleural catheters: a retrospective case series of 210 indwelling pleural catheter insertions. Respiration. 2019;97:70–7, http://dx.doi.org/10.1159/000491934
2. Porcel JM. Chest tube drainage of the pleural space: a concise review for pulmonologists. Tuberc Respir Dis (Seoul). 2018;81:106–15, http://dx.doi.org/10.4046/trd.2017.0107
3. Van Meter ME, McKee KY, Kohlwes RJ. Efficacy and safety of tunneled pleural catheters in adults with malignant pleural effusions: a systematic review. J Gen Intern Med. 2011;26:70–6, http://dx.doi.org/10.1007/s11606-010-1472-0
4. Porcel JM, Torres M, Pardina M, Civit C, Salud A, Bielsa S. Predictors of indwelling pleural catheter removal and infection: a single-center experience with 336 procedures. J Bronchology Interv Pulmonol. 2020;27:86–94, http://dx.doi.org/10.1097/LBR.0000000000000632
5. Olfert JA, Penz ED, Manns BJ, Mishra EK, Davies HE, Miller RF, et al. Cost-effectiveness of indwelling pleural catheter compared with talc in malignant pleural effusion. Respirology. 2017;22:764–70, http://dx.doi.org/10.1111/resp.12962
6. Porcel JM, Light RW. Pleural effusions. Dis Mon. 2013;59:29–57, http://dx.doi.org/10.1016/j.disamonth.2012.11.002
7. Davies HE, Mishra EK, Kahan BC, Wrightson JM, Stanton AE, Guhan A, et al. Effect of an indwelling pleural catheter vs chest tube and talc pleurodesis for relieving dyspnea in patients with malignant pleural effusion: the TIME2 randomized controlled trial. JAMA. 2012;307:2383–9, http://dx.doi.org/10.1001/jama.2012.5535
8. Bhatnagar R, Keenan EK, Morley AJ, Kahan BC, Stanton AE, Haris M, et al. Outpatient talc administration by indwelling pleural catheter for malignant effusion. N Engl J Med. 2018;378:1313–22, http://dx.doi.org/10.1186/s13063-015-0563-y
9. Lui MMS, Lee YCG. Twenty-five years of respirology: advances in pleural disease. Respirology. 2020;25:38–40, http://dx.doi.org/10.1111/resp.13742