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REVIEW ARTICLE

# Effectiveness and Safety of Tunneled Pleural Catheter Placement in Patients with Malignant Pleural Effusions

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## Introduction

Malignant pleural effusion (PE) is a frequent complication that worsens the quality of life and prognosis of patients with end-stage oncologic disease. Preceded only by parapneumonic PE, malignancy is one of the most common causes of pleural exudates and lung cancer accounts for as much as 37% of these cases [1,2]. In Europe, approximately 100,000 patients with lung cancer develop PE every year and these patients have an average survival of 4 to 7 months [3,4]. Dyspnea is the most frequent symptom in malignant PE occurring in over 50% of cases [5]. Patients can also experience discomfort, chest pain, cough, constitutional symptoms and underlying tumor manifestations such as hemoptysis, among others, which can significantly reduce their quality of life [6,7].

The treatment of recurrent malignant PE is usually palliative, so it is advisable to use minimally invasive measures for its management [8]. There are several techniques to treat malignant PE, including repeated thoracocentesis and thoracoscopic talc poudrage [1,9]. Systemic treatments (chemotherapy, hormone therapy or radiotherapy) may also control the PE in specific tumors like lymphoma, breast cancer or small cell lung cancer [7].

Tunneled pleural catheters (TPC) have become a new strategy in the treatment of malignant PE, since they are usually placed in an outpatient setting without significant complications, improve quality of life, and can be easily managed at home [7,10]. We aimed to review our experience with TPC use assessing the outcomes of patients who got this intervention.

## Material and Methods

We performed a retrospective chart review of 26 consecutive patients with recurrent malignant pleural effusion despite pleurodesis and patients diagnosed with trapped lung who were treated with TPC (PleurX®) between January 2016 and November 2018 in the Respiratory Department of a tertiary care university hospital in Spain.

An analysis was done regarding patients and pleural effusion characteristics, tumor origin, symptomatolgy, quality of life, complications of the techniques, prognosis, and survival. This information was obtained through review of electronic medical records.

We used the modified scale of the Medical Research Council (mMRC) to assess for degree of dyspnea, the scale of the Eastern Cooperative Oncology Group (ECOG) to measure the functional capacity of the patients and the LENT score (prognostic score for malignant PE) to evaluate the mortality risk. The descriptive analyses of the different variables are presented as means, standard deviation (SD) and interquartile range. The binary data is expressed by abso-

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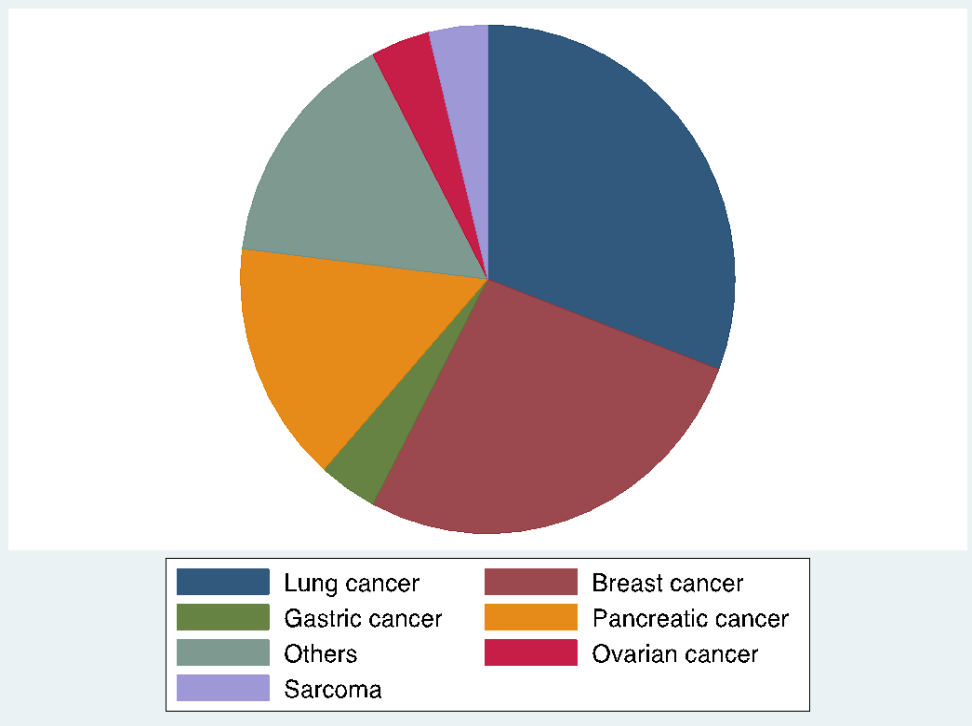


**Figure 1:** Frequency of the tumor origin of the malignant pleural effusion.

lute and relative frequencies. The assumption of normality in continuous variables was evaluated by the Shapiro-Wilk method.

We used T-student (paired sample T-test to compare the degree of dyspnea before and after the TPC) for normal distributions and Mann-Whitney for non-normal distributions of continuous data. The statistical significance is defined as $p < 0.05$. The Stata14 software (StataCorp LLC) was used for the analyses.

## Results

A total of 26 patients with malignant PE were enrolled. Out of these, 12 (46%) women and 14 (54%) men, with an average age of 66.5 ± 17.2 years. 77% of the patients were referred by the oncology department.

According to the mMRC dyspnea scale, 23 (88%; 95% confidence interval [CI], 70-98%) patients had grade 3 dyspnea, and 3 (12%) patients had grade 2 dyspnea. Sixty five percent (17/26) of the patients had an ECOG of 1 or 2, 27% (17/26) had an ECOG of 3 or 4, and only 8% (2/26) had an ECOG of 0. 77% of the patients included had a LENT score with moderate risk and 23% of high risk.

On chest radiography, 82% of patients (24/26) had > 30% volume of hemithorax occupation due to a PE. Lung carcinoma (31%) and breast cancer were the most common malignancies in this patient population (Figure 1).

The indication for implantation of the TPC in 5 patients (19%) was recurrent PE after talc pleurodesis. In the remainder of the patients (21), the indication for TPC was recurrent malignant PE in trapped lung.

TPC was placed in an outpatient setting in 20 (77%) of the 26 patients and 6 (23%) were implanted in the inpatient setting a median of 1 day (range 1-5) after hospital admission.

After TPC placement, there was a statistically significant decrease in the dyspnea scale (3.19 vs. 1.96; $p < 0.0001$) (Table 1). Immediately after TPC placement, one patient (3.8%; 95% CI, 0.1-20%) experienced a complication associated with local anesthetic, consisting of tonic-clonic seizures that responded well to specific treatment (Table 2). None of the patients died during or after the procedure.

The median time from placement of the TPC to removal was 114 days (range 14-155).

Median survival after TPC placement was 96 days (range, 33 to 243 days). 46% of patients died from causes unrelated to the TPC.

## Discussion

The placement of TPC has been an effective and safe measure for the symptomatic control of recurrent malignant PE in the 26 involved patients with end-stage oncologic disease.

These data agree with previous studies that reflect that TPC placement is associated with symptomatic and quality of life improvement in patients with malignant PE [10,11]. Lung cancer was the most frequently associated neoplasm with malignant PE, which coincides with several studies in which lung cancer is iden-

**Table 1:** Dyspnea grades before and after the insertion of the tunneled pleural catheter.

| Dyspnea grade* pre-TPC | N = 26 | Dyspnea grade* post-TPC | N = 26 |
|---|---|---|---|
| 1 | 0 | 1 | 7 (27%) |
| 2 | 3 (11%) | 2 | 14 (54%) |
| 3 | 15 (58%) | 3 | 4 (15%) |
| 4 | 8 (31%) | 4 | 1 (4%) |
| **Mean dyspnea decrease pre-TPC** | **3.19** | **Mean dyspnea decrease post-TPC** | **1.96** |
| **p-value < 0.0001** | | | |

*Dyspnea has been assessed using the mMRC (modified Medical Research Council) scale.

**Table 2:** Complications after insertion of the tunneled pleural catheter.

| Complications | Catheter number n = 26 (%) |
|---|---|
| **During the procedure** | |
| No complication | 25 (96.2%) |
| Associated with local anesthetic | 1 (3.8%) |
| **Early complications (1-7 days post-catheter)** | |
| Pneumothorax | 1 (3.8%) |
| Pain | 1 (3.8%) |
| **Late complications ( > 7 days post-catheter)** | |
| Catheter dislocation | 1 (3.8%) |
| Catheter obstruction | 3 (11.5%) |
| Metastatic implant | 1 (3.8%) |
| Empyema | 1 (3.8%) |
| **Catheter patency** | |
| Functional | 26 (100%) |

tified as the neoplasm that is associated with more than 30% of cases of malignant PE [2]. Malignant PE is also identified in more than 90% of patients with mesothelioma [12].

The implantation of a TPC was successful in 100% of the cases with adequate subsequent function. TPC has been described to be a safe technique with an incidence of pleural infection of less than 5% and an adequate response to antibiotic treatment (risk of death below 0.3%) [12,13]. Other reported complications are pneumothorax, pain or malignant seeding along the insertion tract [7]. In our study, there was only one case with a complication associated with local anesthetic after TPC placement, as well as a low incidence of postoperative complications, with catheter obstruction being the most frequent one, which strengthens the evidence on safety of the technique reported in other studies [6,7,14].

The survival median from the placement of the TPC was 96 days (range 33-243), which is higher than several studies previously conducted in Spain [15].

Finally, 46% of the patients involved in the study have died from causes unrelated to the TPC such as progression of the underlying disease.

The following limitations of the study are worth mentioning. It was a retrospective, single-center, uncontrolled study with a small sample size. These limitations could be addressed in future prospective randomized, controlled studies.

## Conclusions

TPC placement is a safe and effective approach to the treatment of malignant PE that may provide symptomatic relief and improved quality of life. TPC can be placed in an outpatient setting with infrequent complications associated to the technique. Future larger, randomized-controlled studies could help evaluating this therapy's safety and benefits compared to other frequently used methods such as pleurodesis.

## Anowledgements

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