Effectiveness of Tunneled Pleural Catheter Placement in Patients with Malignant Pleural Effusions

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ABSTRACT

Pleural effusions (PE) occur frequently among patients with various types of advanced malignancies, resulting in remarkably decreased quality of life. Treatment of malignant PE includes placement of a chest tube with subsequent placement of a tunneled pleural catheter. We reviewed our experience with tunneled pleural catheter use to assess outcomes and resource utilization of this intervention. A retrospective study of consecutive patients ($n = 163$, including 41 outpatients) who were treated between July 2001 and April 2008 with tunneled pleural catheters was performed to evaluate operative and discharge outcomes. The average age of the patients was 59.32 years (range: 24 to 89). Lung cancer, breast cancer, and ovarian cancer were common primary diseases in this patient population. The mean hospital stay after tunneled pleural catheter placement was 3.19 days (range: 0 to 56), with 41 patients treated as outpatients. Thirteen inpatient deaths were related to the patients' primary diseases, but no deaths were due to drain placement itself. Eight patients (4.91%) required reoperation to replace a nonfunctioning drain or to add an additional drain, and six patients underwent a second procedure to place a contralateral drain. One hundred twenty-six patients (77.30%) were discharged home following the procedure and hospital stay. Fifty-five people achieved spontaneous pleurodesis. Tunneled pleural catheter placement is a safe and effective approach to the treatment of PE. The advantages of tunneled pleural catheter placement include symptomatic relief and improved quality of life. This method allows patients to spend time at home with their family and avoid prolonged hospitalization.

KEYWORDS: Tunneled pleural catheter, malignant pleural effusions

Pleural effusions (PE) reflect an imbalance between fluid accumulation and elimination from the pleural space. They are often caused by various malignancies. These include ovarian, breast, and lung cancers. Malignant PEs (MPE) can lead to a significantly decreased quality of life commonly due to dyspnea and

increased pressure buildup in the chest. There are multiple ways to provide palliative care for patients with MPE. Chemical pleurodesis is a procedure in which a chemical agent is inserted into the pleural space following initial drainage. The agent causes irritation and subsequent closure of the gap between the visceral and

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Int J Angiol 2011;20:39–42. Copyright © 2011 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel: +1(212) 584-4662.

DOI: <http://dx.doi.org/10.1055/s-0031-1272548>.

ISSN 1061-1711.

parietal pleura, thus preventing further fluid accumulation.¹ Another option is mechanical pleurodesis, in which a surgeon irritates the pleural space mechanically, also leading to elimination of pleural space. A third option is insertion of a tunneled pleural catheter (Pleurx[®] pleural catheter, Cardinal Health Interventional Specialties, McGaw Park, IL) into the pleural space to allow the patient to self-drain the effusion at home.

The tunneled pleural catheter is a 66-cm, 15.5-French flexible silicone catheter that is surgically inserted into the pleural space.² Tunneled pleural catheter allows patients to be ambulatory and independent throughout catheter placement.³ In addition, the tunneled catheter helps prevent against infection and catheter dislodgement.⁴ The following study is a retrospective review of the safety and effectiveness of tunneled pleural catheter placement.

METHODS

Patient Selection

Records of 163 consecutive patients treated at the University of Kentucky between February 2001 and April 2008 with tunneled pleural catheters were reviewed retrospectively. Prior thoracentesis was performed in the majority of these patients, and all patients underwent chest X-rays and computed tomography scans to diagnose MPE.

Surgical Procedure

Local anesthesia with 1% lidocaine was used for each procedure. A needle was passed and guide wire inserted into the pleural space under fluoroscopic guidance. A small incision was made 10 cm from the wire exit site and a 1 cm incision was made at the wire exit site. The catheter was tunneled from anterior to posterior with the cuff fixed beneath the incision. The introducer and dilator were passed over the guide wire and then removed to allow the catheter to be placed directly through the peel-away sheath. The catheter was then stripped away, leaving the catheter in place. The drain was hooked to wall suction and the pleural fluid was drained. The drain was then left in position and the wound sutured closed. Correct drain placement was confirmed using fluoroscopy and subsequent chest radiograph.

Information Gathered

Patient age, diagnosis, operative procedures performed, date of drain placement, initial drainage from the drain, replacement status of drain, discharge outcome, and discharge date were all obtained through review of

Figure 1 Common causes of pleural effusions.

patient files. The length of stay was measured as the number of days spent in the hospital following the drain procedure.

RESULTS

The average age of the patients was 59.32 years (range: 24 to 89). Known lung cancer (32.72%), breast cancer (21.60%), and ovarian cancer (9.88%) were common causes of MPE in the patient population (Fig. 1).

The mean hospital stay after drain placement was 3.19 days (range: 0 to 56), with 41 patients treated as outpatients. Thirteen inpatient deaths occurred due to patients' primary disease, but no deaths were due to drain placement itself.

Eight patients (4.93%) required reoperation to replace a nonfunctioning drain, and six patients underwent a second procedure to place a contralateral drain. Removal of the drain occurred following spontaneous pleurodesis. One hundred twenty-six patients (77.30%) were discharged home following the procedure and hospital stay, including the 41 outpatients. Initial drainage information from the drain was known for 153 drains. The mean drainage from the operating room was 1201.91 mL. Among outpatients, the initial drainage was found to average 1166.25 mL.

The drain was known to be removed in 57 patients, most often due to spontaneous pleurodesis. In two patients, however, the drain was removed because it became clogged and was nonfunctional. Twenty-four patients died with the drain in place, and data were not available for the other 82 patients.

DISCUSSION

Complications

Common complications stemming from tunneled pleural catheter insertion include bleeding, pain, pneumothorax, and infection leading to empyema. Some patients have experienced pain at the drainage site, but most

often the pain was not severe enough to necessitate removal of the drain. In one patient, dissatisfaction with the drain resulted in performance of chemical pleurodesis and subsequent removal of the drain.

Less than 5% (eight patients) of the patient population required reoperation for ipsilateral drain replacement or additional drain placement, suggesting the high success of initial drain placement in controlling MPE. This value is slightly lower than previous reports of reoperations following drain placement.^{4,5} Reasons for replacement included blockage of the drainage holes by fibrin or debris and loculation of the fluid to a compartment where the drain is not positioned. Two of the eight patients had drain replacements months after initial drain removal, suggesting that previously resolved PE had recurred.

Benefit Comparison with Chemical Pleurodesis

The mean duration of stay in the hospital was 3.19 days, including 41 patients who underwent the procedure as outpatients. This result is similar but slightly greater than a few previous studies.⁶⁻⁸ The longer hospital duration in this study could be due to the fact that many of the hospital visits (42%) included performance of various procedures in addition to drain placement (74/176 total procedures). The average length of stay for patients undergoing chemical pleurodesis is ~6 days,^{6,9} more than twice as long as with tunneled pleural catheter placement.

A previous study by Putnam et al showed a short-term cost advantage and fewer hospital days with tunneled pleural catheter placement compared with doxycycline pleurodesis.⁶ Other studies have supported this conclusion.^{3,4} Putnam et al further suggested that the improvement in dyspnea and quality of life were comparable between the two treatment options.

The use of tunneled pleural catheter has also been shown to be a viable option for patients with trapped lung, a condition for which mechanical/talc pleurodesis would be an unsuccessful treatment.^{7,9,10} In addition, talc pleurodesis requires that the body be able to mount a sufficient inflammatory response to fuse the visceral and parietal pleura in a short period of time. Therefore, as many as 35% of the patients who underwent this treatment option experienced recurrent PE within 6 months.⁹ The tunneled pleural catheter procedure does not require an inflammatory response from the body and can be used in a wider set of patients.

Future Considerations

Although there are many benefits of tunneled pleural catheter placement, there are a few possible dis-

advantages to note. First, draining the pleural fluid requires the patient and/or patient's family to be physically able to attach the vacuum bottle and remove fluid. If the patient lives alone, this can be very difficult. Proper education for patients and/or caregivers is necessary to ensure that the catheter will be drained properly and that physicians will be notified when needed.¹¹ In addition, long-term usage of drains can become expensive. Sterile bottles and catheters are required for each draining, and over the long term, this option may not be feasible if insurance does not include it. Given that each box contains 10 drainage kits and costs about \$500, a month's worth of equipment will run approximately \$1500, assuming daily draining. The cost of drain placement would exceed that of chest tube placement in 3 months of continued drainage, based on calculations made by Putnam et al.³

CONCLUSIONS

The majority of the patients requiring treatment for MPE are at the terminal stage of their illnesses. For this reason, palliative care is very important. With the tunneled pleural catheter procedure, patients are discharged from the hospital soon after surgery, allowing them more quality time with their families. In addition, this procedure did not result in any treatment-related deaths or have any major complications.

ACKNOWLEDGMENTS

The University of Kentucky College of Medicine provided financial assistance as part of the summer research program.

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