Comparison of Percutaneous Management Techniques for Recurrent Malignant Ascites

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The Pleurx subcutaneous tunneled catheter is approved for repeated, long-term drainage of malignant pleural effusions; however, there is limited literature describing its use in malignant ascites. The authors compared the safety and efficacy of two percutaneous drainage methods: large volume paracentesis and Pleurx catheter placement over a 41-month period. The Pleurx catheter provided effective palliation with a complication rate similar to that for large volume paracentesis, while preventing the need for frequent trips to the hospital for repeated percutaneous drainage.

Abbreviation: LVP = large volume paracentesis

THE accumulation of large volume ascites is a common occurrence for patients with intraperitoneal spread of tumor. Fifty percent of the time malignant ascites are caused by invasion of the surface of the parietal or visceral peritoneum. In the remaining cases, 15% have ascites caused by liver invasion and portal venous compression, 15% caused by a combination of the previous two, and the rest can be attributed to chylous build-up from lymphatic invasion (1). Patients often experience symptoms of abdominal pressure, shortness of breath, nausea, early satiety, and limited mobility because of the mass effect of the fluid.

Management of symptoms is palliative and methods used include percutaneous drainage, diuretics, shunt placement, and intraperitoneal drug therapy. Lee et al have shown that paracentesis is not only the most common treatment method used by physicians, but also the most effective at relieving symptoms (2). Unfortunately, management of recurrent ascites with paracentesis requires frequent trips to the hospital. In addition, paracentesis has small, but well-defined risks such as infection, bowel perforation, and hemorrhage. Diuretics and diet modification have little effect on fluid accumulation unless the underlying cause is portal vein compression, which is relevant to only a small fraction of the patient population. Peritovenous shunt placement is associated with complications relating to disseminated intravascular coagulation and tumor seeding; additionally, shunt placement is also associated with high failure rates after initial placement of up to 36% (3,4). Management of ascites with various intraperitoneal drugs has had limited success that is often determined by tumor type or origin (5–8).

Because of these findings and the fact that life expectancy with intractable malignant ascites is 1 to 4 months (9), palliation has been most easily accomplished by frequent paracentesis, or indwelling catheter placement. To avoid frequent trips to the hospital that, in some patients, may occur several times a week, Richard et al (9) and Iyengar and Herzog (10) evaluated the use of the Pleurx catheter (Denver Biomedical, Golden, CO) for malignant ascites management and found excellent palliation with minimal complications. However, their sample size was small, and no comparison was made to other drainage techniques. The objective of this study was to compare the safety and efficacy of large volume paracentesis (LVP) versus Pleurx catheter management of malignant ascites.

MATERIALS AND METHODS

This retrospective study was performed in the interventional radiology section at a single tertiary care metropolitan medical center. We included adult patients (aged 18 years or older) who had (i) undergone at least two previous paracenteses and presented with either (ii) cytologically proved malignant ascites or (iii) clinically suspected malignant ascites caused by re-accumulation of fluid and diagnosis of cancer.

With an institutional review board approved protocol, we retrospectively searched our HI-IQ interventional radiology data base (Conexsys, Woonsocket, RI) for patients with recurrent malignant ascites from April 1999 to September 2002. General characteristics are shown in the Table. The primary outcome studied was the complication rate for LVP compared with Pleurx drains. Complications were defined similarly to those described by Richard et al (9) and included infection.
and catheter failure. Infection was defined as subcutaneous infection, bacterial peritonitis, or positive blood cultures, while catheter failure was defined as poor patency causing malfunction or inability to provide symptomatic relief.

Paracentesis was typically performed under direct ultrasound (US) guidance with a 5-F Yueh (Cook, Bloomington, IN) needle. Ascites was drained thoroughly via Vacutainer bottles (Abbott Laboratories, North Chicago, IL).

Pleurx catheters were placed under US and fluoroscopic guidance in a manner similar to that reported by Richard et al (9). The peritoneal cavity was accessed with a needle with US guidance. A guide wire was advanced through the needle with fluoroscopic guidance, with serial dilation of the tract and a sheath advanced over the wire. A tunnel was created and the catheter was advanced in a retrograde fashion through the tunnel and into the sheath. The sheath was removed and the incision was closed with absorbable suture. Periprocedural antibiotics were not used. Patients received instructions for draining the catheter with the clean technique, given a drainage demonstration video to take home for reference, and instructed to drain as often as necessary for comfort and convenience. This typically resulted in every other day drainage. Standard instructions for follow up and infection/complication surveillance were given to patients in both groups. Patients were asked to report back to the interventional radiology department with any signs of infection, difficulty draining the catheter, or other problems.

We analyzed mean complication rates for each treatment method with descriptive statistical measures, including 95% confidence interval (CI) analysis and compared the general characteristics of both groups with 95% CI for difference in proportions as indicated in the Table.

### RESULTS

Our study sample included 107 patients: 67 underwent repeated LVP and 40 had Pleurx catheters. The 67 patients that underwent repeated LVP had a total of 392 procedures. Bacterial peritonitis, defined by a positive fluid culture from ascitic fluid, occurred in three of 392 procedures (0.8%; 95% CI, 0.36%–10.0%). Of the remaining 62 LVP patients without complication, 36 died of their disease while having their symptoms treated by paracentesis and 23 were undergoing chemotherapy with temporary resolution of their fluid accumulation. They died before returning to the interventional radiology department for additional paracenteses. The final eight patients were lost to follow-up in hospice care.

In the 40 patients with Pleurx catheter placement, one device had to be removed because of infection (2.5%; 95% CI, 0.07%–13%). The Pleurx catheter was removed from one grossly obese patient because of leakage of ascitic fluid into the subcutaneous tissues (2.5%; 95% CI, 0.07%–13%). Loculations occurred in one patient who also had concomitant percutaneous gastrostomy and nephrostomy drains (2.5%; 95% CI, 0.07%–13%). Of the Pleurx patients without complications, one patient had the catheter removed when the fluid stopped accumulating, 26 died with their catheters functioning, and 11 were lost to follow-up in hospice care.

The overall complication rates were as follows: when using the procedure as the outcome measurement for LVP, 1.3% (95% CI, 0.4%–3%), when the patient is used as the outcome measurement for LVP, 7.5% (95% CI, 2.2%–15%), and for Pleurx 7.5% (95% CI, 1.6%–20%).

### DISCUSSION

Management of large volume malignant ascites by repeated paracentesis requires frequent trips to the hospital. Patients often delay their visits for as long as possible because of physical fatigue and pain associated with the procedure. Many wait until the fluid has accumulated to an intolerable level of discomfort before scheduling the next visit. Patients treated with the Pleurx catheter subjectively report satisfaction with ease of drainage, lack of procedural pain, and ability to frequently drain the ascites before bulk-related symptoms occurred. Repeated large volume paracentesis has been associated with significant reductions in serum protein levels. However, Richard et al (9) and Belfort et al (11) have reported no significant protein loss in patients when a high-protein diet is combined with frequent, small volume removal of ascites. This study looked only at adequacy of symptom relief with the two drainage techniques and their associated complication rate. Laboratory values were not repeated or measured.

The complication rate with the Pleurx catheter at our institution is similar to that of LVP. A closer look at
the complications we experienced can be attributed to the learning curve associated with any new technique. The one case of infection was in a breast cancer patient with an abscess. Drainage of fluid from the catheter had not been performed for 2 months because of a new chemotherapy regimen that temporarily resolved her ascites accumulation. Despite observing the fluid in the catheter becoming turbid over the 2 month course, she did not report to the interventional radiology department until an abscess had formed. Better patient education on reporting back to interventional radiology when fluid accumulation stops might have prevented the abscess formation. In the complication where ascites accumulated in the flank, the colon cancer patient was grossly obese. The space between the polyester cuff and the first fenestration of the Pleurx catheter was not long enough to traverse the subcutaneous tissues, despite placement of the cuff at the insertion site rather than the tunnel exit site. Adding 4 to 5 centimeters of length from the cuff to the first fenestration would help prevent extravasation of fluid into subcutaneous tissues in obese patients. The complication of loculations in the abdominal cavity may not have been entirely caused by the Pleurx catheter, because this breast cancer patient also had percutaneous nephrostomy and gastrostomy tubes. Loculations also developed in two colon cancer patients who had LVP only.

It is important to mention one ovarian cancer patient who presented challenges in ascites management. She had intractable chylous ascites that required drainage of 4–6 L twice per week. Despite changes in her chemotherapy regimen that slowed her disease progression, her ascites accumulation continued at these high volume levels. She underwent 125 LVP procedures, had an abdominal pigtail catheter placed following by hospital admission for sepsis/catheter infection, and finally had the abdominal Pleurx catheter placed. She spent the last 4 months of her life draining at home without complications before her death.

Other methods for treating malignant ascites (not tested in this study) include peritovenous shunts and non-tunneled indwelling catheters (pigtail catheters). Peritovenous shunts are associated with catheter malfunction, heart failure, disseminated intravascular coagulation, and metastasis caused by tumor seeding via the central venous infusion (12). The nontunneled indwelling catheters are also associated with a complication rate of up to 30%, including infection, sepsis, and problems with catheter patency (13). Our infection rate with long-term pigtail catheter placement was similar to that of Lee et al (13). Because of our concern with the infection rate from long-term pigtail catheter placement, we used these catheters only in patients with a life expectancy of 2 weeks or less.

There were several important limitations to our study. First, the retrospective study design yielded potential selection and information bias. However, we have no reason to believe that a specific bias would exist in a direction favoring more complications in either group. Subjects were in general similar and thought to be of no different level of risk for the procedure in either group. Second, protein levels were not studied in this retrospective design. A prospective, randomized study design would be preferred. Third, long-term follow up on patients was limited. Although the oncologists believe the patients died with their catheters functioning, it is possible that there were problems not reported to the physicians. This represents preliminary data that may be used to justify larger scale prospective studies with more complete follow-up and comparison of efficacy in addition to complications. Finally, the Pleurx catheter is not currently approved for use in the treatment of malignant ascites by the United States Food and Drug Administration. This application represents an off-label use of a device that is approved for draining malignant pleural effusions.

In conclusion, we recommend either LVP or Pleurx catheter placement for the treatment of malignant ascites. Although they each have similar complication rates, the Pleurx catheter reduces the number of separate patient encounters. A prospective study that compares the use of the Pleurx catheter versus LVP in the management of malignant ascites is warranted.

References