Original Study

Intraperitoneal Catheter Placement: The "Hammock" Technique

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Abstract

Women with advanced ovarian cancer benefit from the addition of intraperitoneal (IP) chemotherapy after optimal cytoreductive surgery. Due to catheter complications, many patients are unable to complete IP chemotherapy. This study looks at a new technique for inserting IP catheters. 38 patients charts were retrospectively reviewed, two catheter complications were identified: a "flipped" reservoir, and an infection at the port site. This technique successfully eliminated major catheter complications.

Background: Ovarian cancer is the leading cause of death from gynecologic malignancies in the United States. The NCI released a clinical announcement supporting the use of intraperitoneal chemotherapy in addition to intravenous chemotherapy. However, multiple trials have shown that IP administration is severely limited by catheter complications. **Purpose:** We present a new technique for inserting and securing IP catheters in order to prevent the previously reported complications, in particular obstruction of the catheter, bowel and vaginal cuff perforation. **Methods:** From March 2006 through February 2010, 38 patients with stage III or IV ovarian cancer underwent optimal cytoreductive surgery and had an IP catheter placed via the "Hammock" technique. **Results:** 14 patients underwent modified posterior exenteration (37%); 6 underwent splenectomy (16%); thirteen small bowel resections (34%). All 38 patients underwent pelvic and aortic lymphadenectomy. Two patients had reservoir complications; one "flipped over", and the other had an infection at the port site. Both patient's elected to discontinue the IP portion of the chemotherapy regimen. 219 cycles of chemotherapy were completed (96%) out of a possible 228 cycles. The only complications were related to the reservoir. There were no catheter-related complications. **Conclusion:** As an increasing number of IP catheters are placed at the time of cytoreductive surgery, we will continue to have catheter complications and IP chemotherapy administration difficulties. In using the "Hammock" Technique, we had no catheter complications, and a 96% chemotherapy completion rate. We recommend using the "Hammock" Technique for inserting and securing IP catheters at the time of cytoreductive surgery. .

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Introduction

Ovarian cancer is the leading cause of death from gynecologic malignancies in the United States with 21,550 new cases and 14,600 new deaths estimated in 2009 largely because the majority of patients present with advanced-stage disease at the time of diagnosis.[1] Traditionally, advanced ovarian cancer was treated with cytoreductive surgery and intravenous (IV) chemotherapy.[2] Now a paradigm shift is taking place in the management of advanced ovarian cancer. After completion of multiple large National Cancer Institute (NCI)–sponsored randomized clinical trials, all showing improved median survival associated with the use of intraperitoneal (IP) chemotherapy in optimally debulked stage III epithelial ovarian cancer, [3-7] the NCI released a clinical announcement supporting the use of intraperitoneal chemotherapy in advanced ovarian cancer patients who were optimally debulked.[8]

Armstrong et al[6] found that 119 of 205 patients (58%) did not receive six planned cycles of IP chemotherapy. Forty patients (19.5%) discontinued IP chemotherapy because of catheter-related complications. Complications associated with IP catheters remain a legitimate concern, and are a major hurdle to patients completing the

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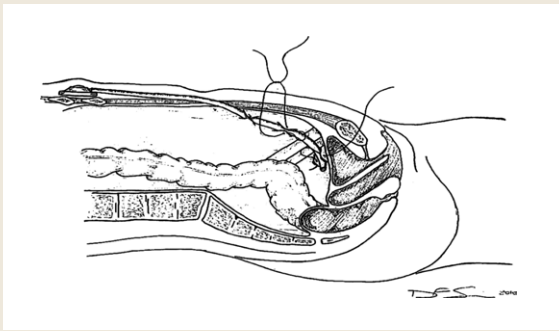
Figure 1 The "Hammock" Technique



recommended six cycles of IP chemotherapy. Reported complication rates vary from 3% to 34.6%[9-17] and include catheter infection, blockage, and leakage. To a lesser extent, abdominal pain, access problems, vaginal vault perforation, bladder erosion, and bowel perforation have also been reported.[9-17]

The purpose of this article is to present a new technique for inserting and securing IP catheters to prevent many of the previously reported complications, in particular, obstruction of the catheter, and bowel and vaginal cuff perforations.[9-17]

Technique

At the completion of optimal cytoreductive surgery, a subcutaneous pocket is created over the last two ribs on the patients' right side. In patients undergoing extensive cytoreduction requiring an incision from the xyphoid to the symphysis, this pocket can be created as a direct extension from the midline incision into the subcutaneous tissues. In those patients with a limited incision, a 3-cm incision can be made on the patients' right side overlying the last two ribs. The subcutaneous tissue is dissected and a pocket is developed at the level of the fascia. Using a tunneling device, the peritoneum and the fascia is penetrated approximately 10 cm distal to the reservoir pocket. The catheter is then attached to the tunneler, withdrawn from the peritoneal cavity through the subcutaneous tissues, and connected to the reservoir. We use a Power Port* Implantable Port with Suture Plugs with Attachable 8F Groshong Single Lumen Venous Catheter (Bard Access Systems, Inc, Salt Lake City, UT). We use the largest venous catheter system available. The reservoir is flushed with heparinized saline to test for patency. Vicryl 3-0 interrupted sutures are used to secure the reservoir to the fascia overlying the ribs. We then secure our catheter along the lateral anterior abdominal wall/sidewall using our "Hammock" technique. Using 0 vicryl or monocryl suture, the peritoneum is grasped on either side of the catheter, and an interrupted stitch is thrown. This is performed two or three times to secure the catheter to the abdominal wall well lateral to the midline incision (Figure 1). Catheter patency is tested again with heperanized saline. Care is taken to ensure the catheter is not so long as to intertwine with loops of small intestine and is trimmed if necessary. Fascial and skin incisions are then closed.

Results

From March 2006 through February 2010, 38 patients who had stage III or IV ovarian cancer after having undergone optimal cytoreductive surgery (less than 5 mm of residual disease) had an IP catheter placed as described above. During primary surgery, Seprafilm (Cambridge, MA) was placed with the intent to minimize adhesion formation. Fourteen patients underwent modified posterior exenteration (37%); 6 underwent splenectomy (16%); 13 small bowel resections (34%); and all 38 underwent aortic and pelvic lymphadenectomy. Patients were scheduled to receive six cycles of IV taxol (AUC 5 or 6) and IP cisplatin 75 mg/m^2. Two patients had reservoir complications that were identified on physical examination during prechemotherapy visits. One reservoir "flipped over" after the first cycle of chemotherapy, requiring replacement, and one patient suffered from an infection at the port site after the second cycle resulting in the removal of the reservoir. In each case the patient elected to discontinue the IP portion of their chemotherapy regimen. Two hundred nineteen (96%) cycles of chemotherapy were completed of a possible 228 cycles. The only complications were related to the reservoir, and there were no catheter-related complications.

Discussion

A paradigm shift is taking place in the management of advanced ovarian cancer as a result of multiple trials, which show that the addition of IP chemotherapy to IV chemotherapy improves survival in advanced ovarian cancer patients after optimal cytoreductive surgery.[3-7] However, the planned number of IP chemotherapy courses is not completed in a significant number of patients because of catheter complications. Walker et al[13] reported that 19.5% of patients in the IP arm of Gynecologic Oncology Group study GOG 172 did not complete the number of prescribed courses of IP chemotherapy secondary to catheter complications such as infection, blockage, leakage, and access problems. Fujiwara et al[18] documented that approximately 10% of the patients undergoing IP chemotherapy had catheter-related complications. Of perhaps more significance, Gadducci et al,[19] in a study closed because of inadequate accrual, reported that 20 patients assigned to the IP chemotherapy arm did not complete treatment. The catheter was obstructed in 3 patients, and in 3 others the IP catheter had eroded into the intestine. Others discontinued treatment secondary to abdominal pain, peritonitis, and a variety of other reasons, none of which reached the significance of the bowel perforations and catheter blockages, making it clear that every effort should be made to prevent the catheter from coming into contact with the intestine.

No trials comparing available reservoir and catheter systems have been undertaken. Alberts et al[20] suggest that the use of Port-A-Cath designed for IV injection should replace Port-A-Cath designed for IP injection because it appears to prevent fibrous sheath formation and greatly decreases the risk of small bowel obstruction and perforation. Black et al[9] and Makhija et al[10] reported lower complication rates with the BardPort titanium reservoir with a fenestrated silicone rubber catheter. Landrum et al[11] reported lower complication rates with a single lumen, venous silicone catheter. Ivy et al[21] reviewed 81 patients who had IP ports placed: 67(83%) at the time of initial cytoreductive surgery and 14(17%) placed at a secondary time. Fifty-

two (64%) patients had a fenestrated port placed, and 29 (36%) had a single lumen port placed. They found no significant difference in the number of IP treatments received, the number of catheter-related complications, or the rates of discontinuation.

Other methods of delivering IP chemotherapy have been described. Yamaguchi et al[22] used real-time transvaginal ultrasound–guided instillation of IP chemotherapy in 11 patients who had ovarian cancer. The average time of instillation was 23.9 minutes. The only complication observed was hematuria. Lan et al[23] used a peripheral venous needle with a catheter (16 ga, 1.7 × 83 mm) to deliver IP chemotherapy in 194 patients with ovarian, fallopian tube, and primary peritoneal cancer. 62.4% of patients were able to complete six or more cycles of IP chemotherapy (patients with large residual disease received more than six cycles of IP chemotherapy); 37.6% of patients did not complete six cycles of IP chemotherapy. Reasons for cessation were categorized as IP-access related, possibly IP-access related, and not IP-access related. IP-access–related reasons were noted in 1.0%, possibly IP-access–related reasons in 14.9%, and reasons not related to IP access were found in 18.1% of patients, respectively.

A potential weakness of this study is its retrospective nature. However, since implementing this technique in 2006, we have not noted any catheter blockages, vaginal cuff erosions, bowel perforations, or bladder erosions in our patient population. Furthermore, prospective studies are necessary to compare surgical techniques of IP catheter placement, differences in reservoir systems, and possibly other ways of administering IP chemotherapy to advanced ovarian cancer patients.

Clinical Practice Points

- Current literature has shown that many patients with IP catheters have complications precluding them from receiving intraperitoneal chemotherapy.
- This study demonstrates a new technique for IP catheter insertion for which we experienced no catheter blockages, no vaginal cuff erosions, bowel perforations or bladders erosions.
- If this technique is regularly used in clinical practice, it has the potential to decrease the number of catheter complications experienced by advanced ovarian cancer patients.

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