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It's not just for laparoscopy anymore: Use of insufflation under ultrasound and fluoroscopic guidance by Interventional Radiologists for percutaneous placement of intraperitoneal chemotherapy catheters

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ABSTRACT

Objectives. While intraperitoneal (IP) chemotherapy has shown significant survival benefits, the ability to successfully deliver IP chemotherapy has been limited. In GOG 172, surgically-placed IP catheters had a reported complication rate of 34%. In addition, IP catheters have to be placed surgically. We have developed a novel percutaneous placement technique for IP catheters in patients without ascites.

Methods. This study was a retrospective analysis of all patients receiving percutaneously-placed IP catheters from 12/2008 to present. Catheters were placed using a two-step technique under conscious sedation. IP access was gained using ultrasound-guided peritoneal puncture over the right lobe of the liver. A 5 Fr catheter was placed into the peritoneal cavity and the abdomen insufflated with carbon dioxide (CO_2). Access was gained in the RLQ once distention separated the bowel from the abdominal wall. A 14.5 Fr multi-side hole catheter was coiled in the pelvis, and a reservoir tunneled onto the lower anterior chest wall. For this analysis, abstracted data included patient demographics, indication for catheter placement, complications (procedural and with chemotherapy delivery), fluoroscopy time, and timing/indication of catheter removal.

Results. Eleven patients received IP catheters. The mean age was 58 years, mean body mass index was 27.1, and mean number of days from surgical debulking was 38. There were two stage 2, and eight stage 3 patients. Two patients had fallopian tube, and nine patients had ovarian cancer. All patients had an optimal debulking procedure. Seven of 11 patients also obtained central intravenous access when the IP port was placed. Follow-up data were as follows: Average fluoroscopy time was 9 min. One patient (9%) had an intra-procedural complication but the catheter was successfully placed. Zero patients had catheter-related complications in the course of receiving chemotherapy. Five of the 11 patients (45%) completed the planned IP chemotherapy treatments, with three additional patients (27%) currently receiving therapy. The remaining three patients (27%) discontinued chemotherapy for reasons unrelated to IP catheter function: two due to chemotherapy side effects, and one with sepsis from a perforated diverticulum.

Conclusions. Thus far, our experience with percutaneous placement of IP catheters is associated with a low risk of catheter-related complications and high technical success rates. CO_2 insufflation may make peritoneal puncture easier and potentially safer. This procedure offers an alternative to surgical placement, even in patients without clinically significant ascites.

Introduction

With the publication of Gynecology Oncology Group (GOG) 172 in 2006 [1], enthusiasm for the use of intraperitoneal (IP) chemotherapy for ovarian cancer in the United States has increased. GOG 172 demonstrated the longest overall survival rate in the literature in a prospective trial for patients with advanced disease. Despite its criticisms, this study, along with SWOG 8501/GOG 104 and GOG 114, all demonstrated a survival advantage for IP chemotherapy [2,3]. These findings convinced many gynecologic oncologists that IP chemotherapy should be the standard of care for women with optimally debulked ovarian cancer.

The concept of IP therapy may be extended to women with suboptimally debulked disease, due to systemic absorption of drug. GOG 252, a three arm prospective randomized study with two IP arms and one intravenous (IV) arm, was initially open to patients with optimal and suboptimal disease. Also, GOG 9924 introduced the use of IP chemotherapy in the setting of recurrent disease—an idea that is

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relatively new, but one that makes intuitive sense in the setting of platinum-sensitive disease that is confined to the peritoneal cavity.

Despite the improved outcomes for patients receiving IP chemotherapy, some physicians have not considered IP chemotherapy to be standard of care, owing to its toxicities and to potential delivery difficulties with IP catheters [4]. Catheter-related complications, including blockages and infections, were frequent in GOG 172 [4]. Furthermore, catheter insertion became an issue. Placement of the IP catheter at the time of primary surgery is obviously ideal, but not always practical for several reasons. First, the final pathology may not be consistent with ovarian cancer (for example, another primary tumor, such as colon cancer, or a tumor of low malignant potential). In this case, the IP catheter would need to be removed without being used. Alternatively, the diagnosis may not be clinically obvious at the time of first surgery and is only discovered with the final pathology report, and so a port was not placed at the time of first surgery. Second, the patient may not be a candidate for IP chemotherapy after her primary surgery, due to poor performance status, inability to travel to a specialized center able to deliver IP therapy, or patient preference. Third, in the setting of GOG 252, the patient may be randomized to the IV arm, and therefore would not utilize the IP catheter. Fourth, it may be challenging to discuss IP catheter placement pre-operatively with a patient going to the OR with an unknown primary diagnosis, especially if the patient is hopeful that her pelvic mass represents benign disease. Finally, a patient may undergo her primary surgery with a surgeon who is not familiar or comfortable with IP port placement and may later desire IP chemotherapy.

For all of the above reasons, gynecologic oncologists may choose to place the IP catheter after the primary surgery. Laparoscopic methods have been described for this purpose and are detailed in the GOG manual, but these require a second general anesthetic and trip to the operating room (OR)—this uses valuable OR time, and the cost of these second procedures has not been considered in cost analyses of IP therapy [5], although it could potentially be substantial.

For the past two and a half years at the University of Virginia, our Interventional Radiologists have been using a technique of placing IP catheters using conscious sedation in the Interventional Radiology (IR) suite. This technique was developed for use especially in patient who are recently post-operative and who do not have ascites. This technique has allowed us to improve our care for our ovarian cancer patients, while saving significant OR time and cost.

Methods

This study is a retrospective analysis of all patients receiving percutaneously-placed IP catheters from 12/2008 to present. Institutional Review Board permission was obtained for this retrospective review. Patients were collected from IR procedure records. For this analysis, abstracted data included patient demographics, indication for catheter placement, complications (procedural and with chemotherapy delivery), fluoroscopy time, and timing/indication of catheter removal.

Catheters were placed using a two-step technique under conscious sedation. IP access was gained using ultrasound-guided peritoneal puncture over the right lobe of the liver. A 5 Fr catheter was placed into the peritoneal cavity and the abdomen insufflated with CO_2. The CO_2 injection was done in 50 cm^3 aliquots until an adequate bubble could be identified under fluoroscopy; this process usually required approximately 250 cm^3 of CO_2, though the total amount varied per patient. The patient was routinely positioned in a 15° Trendelenberg position to promote CO_2 collecting in the lower abdomen. A second peritoneal access was gained in the RLQ once distention separated the bowel from the abdominal wall. Under direct fluoroscopic visualization, small amounts of contrast (Omnipaque 300, GE Healthcare, Waukesha, Wisconsin) were injected through a 21 Gauge needle, to confirm the needle was intraperiteonal but free of bowel and mesentery. A 14.3 Fr multi-side hole catheter was coiled in the pelvis, and a reservoir tunneled onto the lower anterior chest wall (Bard Access, Murray Hill, NJ).

Results

A total of eleven patients underwent this procedure. The mean age at time of port placement was 58 years. The mean body mass index was 27.1 kg/m^2. The mean days from surgical debulking until IP port placement was 38 (range 24–84). Table 1 lists demographic and medical data for these patients. All women had either fallopian tube (2) or ovarian cancer (9). Only one patient had a suboptimal debulking procedure, which was not performed by a gynecologic oncologist. Of the 10 patients who underwent optimal debulking, three individuals required radical pelvic surgery, one had a recto-sigmoid resection with reanastomosis, and 4 had peritoneal stripping and/or argon beam destruction of carcinomatosis.

Procedural data are displayed in Table 2. The average time under fluoroscopy was 9 min. Seven of 11 the patients also had IV ports placed at the time of IP catheter placement. One patient (9%) had an intra-procedural complication but the catheter was successfully placed. This patient had the initial needle inserted into right hepatic vein. Further attempts to insufflate with CO_2 were therefore abandoned; however, the patient was still able to have the IP port placed successfully on a second attempt.

Table 1
Demographics.

#	Age at port placement	Body mass index	Days from surgical debulking until IP port placed	Debulking procedure	Primary malignancy	Pathology	Stage	Initially on GOG trial
1	79	34.4	39	Optimal	Ovarian	High-grade serous carcinoma	3b	No
2	54	23.1	27	Optimal	Ovarian	High-grade serous carcinoma	3c	Yes
3	49	33.0	24	Optimal	Fallopian Tube	High-grade serous carcinoma	3b	Yes
4	62	28.6	35	Optimal	Ovarian	High-grade adenocarcinoma with serous and focal endometroid features	2c	Yes
5	60	23.3	32	Optimal	Ovarian	High-grade endometroid carcinoma with clear cell and serous features	2c	Yes
6	62	23.7	84	Optimal	Ovarian	Moderately-differentiated serous carcinoma	3c	No
7	76	28.4	44	Optimal	Fallopian Tube	High-grade serous carcinoma	3b	No
8	56	24.8	38	Optimal	Ovarian	High-grade serous carcinoma	3c	No
9	52	23.2	38	Optimal	Ovarian	Carcinosarcoma of the ovary	3a	No
10	58	21.7	42	Optimal	Ovarian	Clear cell of the ovary	2c	Yes
11	27	33.4	13	Suboptimal	Ovarian	High-grade endometrioid adenocarcinoma of the ovary	3c	Yes