Objective: Compare aortic lymph node metastasis identified above and below the inferior mesenteric artery when aortic lymphadenectomy is indicated in clinically early high-risk endometrial cancer, epithelial ovarian cancer, and fallopian tube carcinoma.
Methods: Included were 95 women with clinical stage I and II uterine, 34 with IB cervical carcinoma, and 34 with tubal/ovarian cancer with no gross metastatic lesions. One hundred sixty-three had bilateral pelvic lymphadenectomy, 82 had bilateral inframesenteric (IM) aortic lymphadenectomy, and 71 had bilateral infrarenal (IR) lymphadenectomy. All underwent LH, bilateral salpingooophorectomy, appendectomy, and peritoneal washings for cytology with or without infracolic omentectomy. Statistical analysis was performed using independent t-test and ANOVA for comparison of means and chi-square for categorical variables.
Results: The mean age was 56 years (range, 27-90 years), mean body mass index was 28.3 (range, 17.2-50). The median number of pelvic, IM, and IR nodes harvested was 24 (range, 1-32), 11 (range, 1-26), and 14 (range, 1-28), respectively. There was no difference in procedures or nodal yields between the 3 primaries, so all were considered together. Lymph node metastasis was found in 34 (21%) patients: 29/163 (18%) pelvic, 18/82 (22%) IM, and 13/71 (18%) IR. Among the 29 with positive pelvic nodes, 15 (52%) had positive aortic nodes, 13 (45%) had positive IM nodes, and 11 (38%) had positive IR nodes. Among the 134 with negative pelvic nodes, 5 (4%) had positive aortic nodes, 4 (5%) had positive IM nodes, and 2 (1.5%) had positive IR nodes. Among the 17 with positive IM nodes, 13 (76%) had positive pelvic nodes and 10 (59%) had positive IR nodes. Among the 13 with positive IR nodes, only 2 had negative IM nodes, and 2 had negative pelvic nodes. Ten of 13 with positive IR nodes had high-grade endometrial carcinoma. The rate of nodal metastasis increased significantly with the number of nodes harvested (95% CI 0.093- 0.26, $P < 0.0001$). A total of 7/34 (21%) of stage IB cervical cancer patients, 23/95 (24%) stage I or II endometrial cancer patients, and 4/34 (12%) patients with ovarian/tubal carcinoma were upstaged from lymphadenectomy alone.
Conclusions: Comprehensive laparoscopic lymphadenectomy for early pelvic carcinomas is feasible, with acceptable nodal yields. Nodal metastasis was identified up to the renal vessels in 18% of cases, most often when the pelvic and inframesenteric nodes were involved. Obtaining more nodes resulted in higher rates of upstaging and more appropriately aggressive therapy.

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Impact of obesity on surgical outcomes of laparoscopic radical pelvic lymphadenectomy for women with cervical, endometrial, or ovarian cancer

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Objective: Gynecologic oncologists performing traditional laparotomy for staging hysterectomy with radical pelvic lymphadenectomy who desire to transition to minimally invasive approaches may be deterred by the increasing rates of obesity in women today. We document the impact of obesity on surgical adequacy and complication rates from a minimally invasive approach to laparoscopic radical pelvic lymphadenectomy across the body mass index (BMI) spectrum.
Methods: Institutional review board approval was maintained at the primary hospital. Data were abstracted from medical records for all patients undergoing a laparoscopic radical pelvic lymphadenectomies for cervical, endometrial, tubal, or ovarian carcinoma from 9/1/1996 to 7/26/2012. Statistical analysis was performed using independent t-test and ANOVA for comparison of means and chi square for categorical variables.
Results: A total of 159 women underwent laparoscopic radical pelvic lymphadenectomy. The mean age was 54 years (range, 27-90 years), weight was 74 kg (range, 43-135 kg), and BMI was 28.5 (range, 17.8-50.3). At final pathology, 92 (58%) had endometrial carcinoma/sarcoma, 34 (21%) had cervical carcinoma, 30 (19%) had ovarian/tubal carcinoma, and 3 (1.9%) had endometrial and ovarian primaries. Women were stratified by obesity: 107(67%) had BMI < 29.9, 45(28%) had BMI 30-39.9, and 7(4%) had BMI > 40. Complications occurred in 13 (8%) patients; 7 were reoperative, including 1 each pelvic abscess, vaginal cuff bleed, ureteral stenosis, bowel obstruction, and cystotomy repair and 2 incisional hernias. Six complications were not reoperative, with 1 each subcutaneous hematoma, colotomy repair, and cystotomy repair, and 3 with pelvic cellulitis, not related to BMI (NS). The mean surgical duration for ideal/overweight was 202 minutes (NS). The mean blood loss was: 183 mL for ideal/overweight, 129 mL for obese, and 314 mL for morbidly obese ($P < 0.0104$), Three patients required transfusion, unrelated to BMI (NS). The mean hospital stay for all BMI categories was 1.4 days (NS). The mean pelvic node yield was 23 (NS). Pelvic nodes were positive in 22/107 (21%) of ideal/overweight, 6/45 (13%) of obese, and 0/7 (0%) of morbidly obese ($P < 0.0001$). Notably, the chance of finding positive nodes increased significantly with increasing number of pelvic nodes harvested ($P = 0.0001$).
Conclusions: Surgeons can expect to successfully perform radical pelvic lymphadenectomy across the BMI spectrum with low complication and transfusion rates. These data affirm existing data suggesting that complete lymphadenectomy more accurately reveals nodal positivity.

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Transperitoneal versus retroperitoneal approach for staging aortic lymph- adenectomy

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Objective: Assess safety and feasibility of transperitoneal and retroperitoneal aortic lymphadenectomy up to the renal veins in early endometrial, tubal, and ovarian cancer patients.
Methods: A retrospective chart review was undertaken. Statistical analysis was performed using independent t-test and ANOVA for comparison of means and chi square for categorical variables.
Results: Seventy-two patients underwent laparoscopic hysterectomy with comprehensive staging from 12/1996 to 8/2012. A total of 30 (42%) aortic lymphadenectomies were performed by initial transperitoneal approach, and 42 (58%) were performed by retroperitoneal approach. Omentectomy was performed in 36/72 patients, with no difference between groups. Two (4%) of the retroperitoneal approaches were converted to open procedures due to a transection of the renal artery in one patient and bleeding with loss of pneumoretroperitoneum in another. All transperitoneal approach dissections were successful. Nonreoperative complications included 1 ureteral kinking requiring stenting, 1 vaginal cuff bleed, and 1 pelvic cellulitis. Total surgical duration (includes total laparoscopic hysterectomy/bilateral salpingo-oophorectomy/appendectomy/pelvic lymphadenectomy) for the both groups was 227 minutes (NS). Mean estimated blood loss totals for the entire procedure (including hysterectomy on all) for the transperitoneal and retroperitoneal

approach groups was 214 mL for each (NS). Mean length of hospital stay was 1.3 days for all patients (NS). All aortic dissections were bilateral and divided in 2 segments: from the ureter up to the inferior mesenteric artery and from the inferior mesenteric artery up to the renal veins. There was no difference in nodal yields by approach (Table).

Conclusions: Aortic inframesenteric and infrarenal lymphadenectomy are both essential for patients with early endometrial, tubal, and ovarian carcinoma and were safely accomplished in 97% of cases, with 6% positive at each level. Both approaches yielded an equal number of nodes, although there was a trend for more nodes to be removed on the left by the retroperitoneal approach.

Table. Nodal Yields.

	Right	Left	Total
	Mean # nodes	Mean # nodes	Mean # nodes
	(% Positive nodes)	(% Positive nodes)	(% Positive Nodes)
Transperitoneal			
Infrarenal	5 (8%)	7 (6.5%)	12 (7%)
Inframesenteric	6 (8%)	6 (2%)	12 (5%)
Total	11 (8%)	13 (4.2%)	24 (6%)
Retroperitoneal			
Infrarenal	5 (4%)	10 (7%)	15 (5%)
Inframesenteric	6 (5%)	7 (8%)	13 (6%)
Total	11 (4.3%)	17 (7%)	28 (5.7%)

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Does IORT at the time of pelvic exenteration impact survival for patients with recurrent, previously irradiated cervical, vaginal, or vulvar cancer?

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Objective: To determine whether intraoperative electron radiation therapy (IORT) at the time of pelvic exenteration (PE) improves survival in patients with recurrent, previously irradiated cervical, vaginal, or vulvar cancer.

Methods: We conducted a single-institution retrospective chart review of all patients who had undergone pelvic exenteration. Patients with cervical, vaginal, or vulvar cancer without evidence of distant disease at the time of surgery were included. Patient characteristics, procedures performed, pathologic factors, and recurrence and survival data were collected. IORT was given using beveled cones applying 10-20 Gy delivered with 6-MeV electrons.

Results: Of the 30 patients identified, 20 (67%) had cervical cancer, 7 (23%) had vaginal cancer, and 3 (10%) had vulvar cancer. Of these, 20 (67%) received IORT with 10-20 Gy delivered with 6-MeV electrons. The mean age was 52 years (standard deviation, 11 years); patients who received IORT were slightly younger than those who did not (48 vs. 60 years, $P = 0.004$). Eight patients had a laterally extended endopelvic resection (LEER). Median progression-free survival (PFS) for those with no IORT/no LEER was 33 months vs. 8 months for IORT/no LEER and 12 months for IORT/LEER. Of patients who had IORT/no LEER, 83% had a treatment-free interval of <24 months vs. 30% of those without IORT ($P = 0.03$), 50% had close <1 mm or positive margins, 75% had lymphovascular space involvement (LVSI), and mean maximal tumor diameter was 6.3 cm for both. Of the patients who had a LEER and IORT, 12.5% had positive or close margins and 50% had a treatment interval of <24 months. Of the patients who had IORT/LEER, none recurred only locally whereas 62.5% had distant ± local recurrence. Patients with no IORT/no LEER had mainly local (40%) and a few (10%) distant recurrences compared to 33% local and 42% distant ± local recurrences for those with IORT/no LEER. For the 8 patients who had a LEER (all had IORT), close <1 mm or positive margins was the only significant factor to influence survival. Median PFS and overall survival were not reached for those with no IORT and negative margins. If IORT was given, PFS was similar for patients with positive/close versus negative margins (risk ratio 0.97, 95% CI 0.30-2.77).

Conclusions: IORT at the time of PE counteracted the negative impact of positive/close margins on survival. However, patients who had a clinical indication for IORT at the time of PE had a worse prognosis compared those who did not require IORT, possibly secondary to the (lateral) extension of the tumor. If the need for IORT is anticipated, the surgeon may consider performing a LEER if cure is the ultimate goal of this radical procedure.

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CyberKnife for single extracranial ovarian or uterine cancer metastases

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Objective: To report disease control, overall survival, and toxicity following CyberKnife for single extracranial ovarian or uterine cancer metastases.

Methods: Patients presenting with biopsy-proven single extracranial ovarian or uterine cancer metastasis, treated using the CyberKnife system, were retrospectively reviewed. A metastasis was considered single if there was no evidence of additional gross disease when CyberKnife treatment was completed. A prescribed dose of 30 to 50 Gy was delivered to the gross tumor volume (GTV) in 5 fractions. Clinical examination and imaging were performed at 3- to 6-month follow-up intervals.

Results: Twenty patients were treated over a 6-year period extending from August 2005 to August 2011: 10 with single ovarian cancer metastases (4 papillary serous carcinoma, 2 mucinous carcinoma, 2 granulosa cell tumor, 1 clear cell carcinoma, and 1 undifferentiated carcinoma) and 10 with single uterine cancer metastases (6 endometrioid adenocarcinoma, 2 carcinosarcoma, and 2 leiomyosarcoma). The metastases involved the liver (6), abdominal cavity (4), lung (4), spine (3), pelvis (2), and thigh (1). The mean GTV was 52.7 cc (range, 4.1 – 273.0 cc). The mean dose delivered to the GTV was 37 Gy (range, 30 - 50 Gy). At a median follow-up of 23 months, the 2-year Kaplan-Meier local control, disease-free survival, and overall survival estimates were 86%, 47%, and 68%, respectively. Two metastases recurred locally approximately 1 year following relatively low-dose treatment (30 Gy). Seven patients developed additional metastases. Two with second single metastases completed CyberKnife alone and 5 with multiple metastases received chemotherapy. All deaths were attributed to the development of successive metastases. No grade 3 or greater toxicities were attributed to CyberKnife in this cohort of patients.

Conclusions: CyberKnife is a well-tolerated effective local treatment option for single extracranial ovarian and uterine cancer metastases. Sixty-five percent of treated patients remained disease-free following CyberKnife treatment alone. Remission has been maintained beyond 5 years in 2 patients to date, suggesting durable local control and possibly cure. At a minimum, CyberKnife has improved quality of life by delaying chemotherapy in these patients. Whether this treatment approach is superior to metastectomy, conventional radiation therapy, or chemotherapy deserves further study.

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