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Case series

Laparoscopic ovarian transposition prior to pelvic radiation for gynecologic cancer

Brenna E. Swift[a], Eric Leung[b], Danielle Vicus[c], Allan Covens[c,*]

[a] Department of Obstetrics and Gynecology, University of Toronto, Toronto, ON, Canada
[b] Department of Radiation Oncology, Odette Cancer Centre, University of Toronto, Toronto, ON, Canada
[c] Division of Gynecologic Oncology, Odette Cancer Centre, University of Toronto, Toronto, ON, Canada

ABSTRACT

This study evaluates a novel technique of laparoscopic ovarian transposition performed by Gynecologic Oncologists prior to pelvic radiation for gynecologic cancer. A retrospective review was completed of all patients that underwent laparoscopic ovarian transposition from February 2007 to June 2017 at one tertiary care cancer. The technique involves salpingectomy, followed by retroperitoneal dissection to move the ovaries lateral to the hepatic and splenic flexures of the colon. Normal ovarian function was defined by the absence of vasomotor symptoms, FSH and menstrual history (if menstruating). The radiation dose to the ovary was calculated through dose volume histograms from three-dimensional image planning. Ten patients had laparoscopic ovarian transposition, of which, eight patients received post-operative external beam radiation to the pelvis (45–59.4 Gy). Four had additional brachytherapy (35.5–40 Gy). Median age and follow up were 29 years (18–37), and 20 months (6–103). Nine patients had cervical and one had vaginal cancer. Four patients were treated with primary radiation, three had radical trachelectomy with adjuvant radiation, and three had radical hysterectomy with one of three receiving adjuvant radiation. No patients developed vasomotor symptoms (0/8 (95% CI 0–19%)). FSH was normal in 2/2 patients. Menses continued post-radiation in 5/7 women who retained their uterus. The median radiation dose to the right and left ovary was 0.51 (0.23–1.1) Gy and 0.53 (0.23–1.1) Gy, respectively. Laparoscopic ovarian transposition with mobilization to the hepatic and splenic flexures of the colon achieves preservation of ovarian function in women prior to pelvic radiation.

1. Introduction

Ovarian transposition is a surgical technique moving ovaries out of the pelvis prior to pelvic radiation for gynecologic or non-gynecologic cancers. In young patients, ovarian preservation is important, as early menopause is associated with increased osteoporosis, cardiovascular disease, hot flushing, urogenital atrophy and sexual dysfunction (Mytton et al., 2017). Additionally, fertility preservation is possible as ovarian transposition theoretically enables women to genetically produce offspring by transabdominal ultrasound-guided oocyte retrieval and use of a gestational carrier (Willows et al., 2016).

As half of cervical cancer patients are premenopausal when diagnosed, ovarian transposition prior to radiation therapy to preserve ovarian function is beneficial. Adjuvant radiotherapy is required when there are risk factors for recurrence; including lymph node metastasis, deep stromal invasion with lymphovascular space invasion, positive margins, or parametrial involvement (Waggoner, 2003). Additionally, stages IB2 and greater are usually treated with primary chemoradiation.

A systematic review and meta-analysis of open and laparoscopic ovarian transposition demonstrated high rates of ovarian preservation at 90% (95% CI 92–99) in the surgery alone group (Gubbala et al., 2014). However, studies assessing ovarian function after surgical transposition and pelvic radiation report a much lower rate of ovarian preservation. Most studies are small ranging from 3 to 31 patients. The ovarian preservation rate after ovarian transposition and external beam pelvic radiation and/or brachytherapy is 65% (95% CI 56–74) (Gubbala et al., 2014).

Low rates of ovarian preservation after surgical transposition and radiation result from placement within the radiation field, or proximity to the radiation field (subjecting ovaries to internal scatter, or vascular compromise) (Huang et al., 2007). The patient's age at the time of surgery is important as the number of primordial oocytes decline with increasing age until menopause. As the number of oocytes decline, smaller doses of radiation are more harmful to the ovaries (Wallace et al., 2003).

This study describes our results with a laparoscopic surgical

* Corresponding author at: Division of Gynecologic Oncology, Odette Cancer Centre, University of Toronto, 2075 Bayview Ave. T2051, Toronto, ON M4N 3M5, Canada.
E-mail address: al.covens@sunnybrook.ca (A. Covens).

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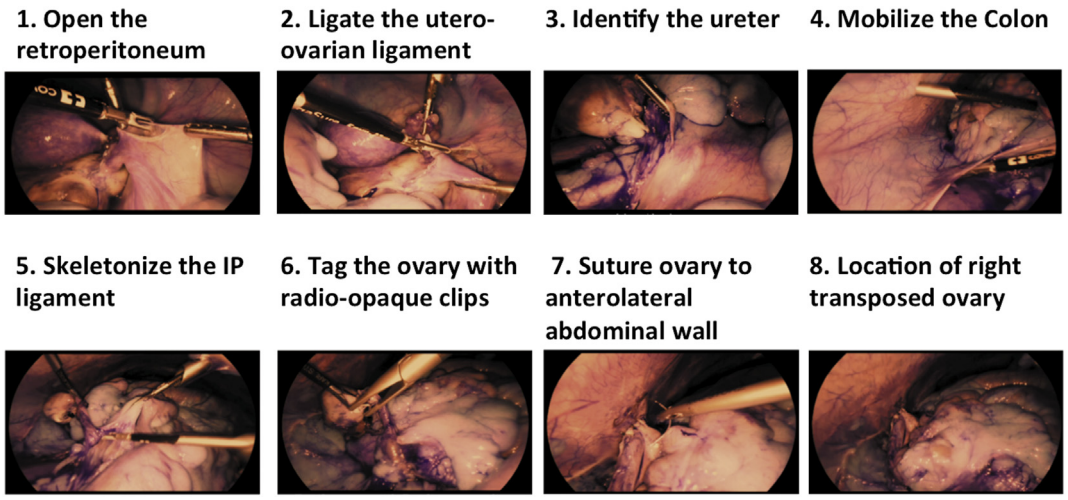

Fig. 1. Laparoscopic ovarian transposition sequential surgical steps.

technique for ovarian transposition involving retroperitoneal dissection making it possible to move ovaries higher and out of the pelvic radiation field.

2. Methods

2.1. Study population

A retrospective chart review was completed for patients aged 18–40 that underwent a laparoscopic ovarian transposition at the Odette Cancer Centre from January 1st, 2007 until June 30th, 2017. Postmenopausal or patients over the age of 40 at the time of diagnosis were excluded. The study was approved by the Research Ethics Board at Sunnybrook Health Sciences Centre.

2.2. Laparoscopic ovarian transposition surgical procedure

The peritoneum was insufflated with CO_2 gas. Four ports were placed for the procedure, a 10 mm umbilical and 10 mm suprapubic port with 5 mm right and 5 mm left mid quadrant ports. Beginning on one side, the fallopian tubes were removed. The utero-ovarian ligament was cauterized and divided. The retroperitoneum was opened and the ureter was identified. The infundibulopelvic ligament was mobilized along its entirety with a vessel sealer/divider. Incising the peritoneum overlying the paracolic gutters facilitated mobilization of the ascending and descending colon to the level of the hepatic and splenic flexures, respectively. The ovary was brought up to the costal margin with the infundibulopelvic ligament traversing the retroperitoneal space underlying the colon. Care was taken to avoid torsion of pedicle. Hemoclips were placed on the distal side of each ovary for radiologic marking. The ovary was sutured to the intraperitoneal surface of the anterior abdominal wall with a barbed suture.

2.3. Radiation dose to the ovary

All patients underwent CT simulation as part of radiation planning such that the transposed ovaries could be identified on the scan and contoured. The radiation dose (mean) received by the ovary was determined through volumetric dosimetry of the contoured ovaries. In cases where the location of the ovaries were above the superior limit of the CT scan, the max dose at the superior CT scan slice was used as a surrogate for ovary dose. In patients that received brachytherapy, dose distributions were conformal and confined centrally in the lower pelvis, and the contribution to the ovaries were negligible.

2.4. Evaluation of ovarian function

Normal ovarian function prior to the surgical procedure was defined as regular menstrual periods and the absence of vasomotor symptoms. Ovarian function was assessed by either; FSH < 25 IU/L, continued menses without exogenous hormones, or the absence of vasomotor symptoms (surrogate marker) if FSH was not measured and the patient was not menstruating.

3. Results

Ten patients with gynecologic cancers had laparoscopic ovarian transposition at the Odette Cancer Centre from February 2007 to June 2017. Sequential images describing the surgical procedure are shown in Fig. 1.

Patient characteristics are summarized in Table 1. The median age of patients undergoing ovarian transposition was 29 years (18–37 years). Nine patients had cervical cancer (six squamous cell, three adenocarcinomas, two of which were clear cell and one mucinous), and one had vaginal cancer (clear cell carcinoma). Bilateral ovarian transposition was performed in eight patients. Unilateral transposition was performed in two patients due to endometriosis presenting as an ovarian mass and adhesions. Three patients had a radical trachelectomy followed by adjuvant chemoradiation. Three patients had a radical hysterectomy, with one patient requiring adjuvant chemoradiation treatment. The other two patients treated with a radical hysterectomy did not require adjuvant radiation. Four patients received primary treatment with three of the four patients receiving primary chemoradiation, one patient declined cisplatin and was treated with primary radiation. Three patients received external beam radiation and 4 patients received external beam radiation with brachytherapy. The median follow up after surgery was 22 months (8–103 months). All patients were alive and free of disease at last follow up.

Table 2 summarizes each patient's treatment and ovarian function. All patients were pre-menopausal at the time of surgery. Four patients treated with primary chemoradiation received 45–50.4 Gy by external beam radiation therapy (EBRT) and 39.6–40 Gy by brachytherapy. Four patients treated with adjuvant EBRT received 45–59.4 Gy. The median follow up after radiation was 20 months (6–103 months). No patients developed vasomotor symptoms (0/8) (95% CI 0–19%). Two patients had their FSH measured after treatment, and both were normal. Five women continued to have regular menses post-radiation.

The location of the transposed ovaries are identified by placement of surgical clips at the time of surgery as shown by abdominal xray in Fig. 2. The distance of the transposed ovary from the radiation field and