Gynecologic Oncology 124 (2012) 276–280

Contents lists available at SciVerse ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Fertility sparing surgery for treatment of early-stage cervical cancer: Open vs. robotic radical trachelectomy

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ARTICLE INFO

Article history:
Received 8 July 2011
Accepted 24 September 2011
Available online 27 October 2011

Keywords:
Robotic surgery
Radical trachelectomy

ABSTRACT

Objective. To compare the open versus robotic surgical approaches and provide surgical outcome data on patients who have undergone radical trachelectomy (RT).

Methods. We identified patients who underwent open (ORT) or robotic radical trachelectomy (RRT) between September 2005 and June 2011. Tumor characteristics, perioperative, operative and obstetrical outcomes were analyzed.

Results. Thirty-seven patients with early stage cervical cancer that desired future fertility underwent attempted radical trachelectomy, and 32 patients (20 with 1B1, 11 with 1A2, and 5 with 1A1 with LVSI/poorly differentiated histology) had successful completion of RT. Five (1 open/4 robotic) underwent conversion to radical hysterectomy secondary to close (<5 mm) endocervical margin ($p=0.08$). The median age at diagnosis was 28.9 years (range; 21.4–37.2), 70% were nulliparous, and 9 had a visible lesion. Twenty-five patients (68%) underwent ORT and 12 (32%) underwent RRT. RRT was associated with less blood loss (62.5 mL vs. 300 mL, $p=0.0001$) and decreased length of postoperative stay (1 vs. 4 days, $p<0.001$), with no difference in operative time or histopathologic outcomes. Twenty-three patients (62%) had no residual cervical disease on final pathology. Common long-term morbidities were irregular menstrual bleeding or amenorrhea (25%), cerclage erosion (13%), or cervical stenosis (9%). Although there was a higher rate of conversion to hysterectomy in the robotic surgery cohort, rates of serious morbidities among the cohorts were comparable (robotic: 33% vs. open: 24%, $p=0.70$). Eleven (36%) patients are actively attempting pregnancy and three have achieved pregnancy. The median time of follow up is 17.0 months (range 0.30–64.9 months). There are no documented recurrences.

Conclusions. RRT results in less blood loss and decreased length of hospital stay with no compromise in histopathologic outcomes.

Introduction

Radical trachelectomy is an acceptable alternative to radical hysterectomy in a select population of early-stage cervical cancer patients who desire fertility conservation. Since Dargent introduced the clinical applicability of vaginal radical trachelectomy in 1994 [1], numerous reports have documented the successes and feasibility of the vaginal and abdominal approaches to trachelectomy [2–7]. Vaginal radical trachelectomy is a procedure that requires refined skills from an oncologic surgeon trained in advanced vaginal surgery making vaginal radical trachelectomy an option for patients at a few specialized centers. An alternative surgical approach has been the abdominal radical trachelectomy performed via laparotomy. Although making fertility sparing surgery for early-stage cervical cancer more feasible across gynecologic oncologists, the open approach has theoretical drawbacks, particularly formation of adhesions and scar tissue that may ultimately impact a woman's fertility, increased blood loss and prolonged hospital stay. Minimally invasive surgery has gained wide acceptance secondary to the implied advantages of faster return to normal activity and diet, decreased postoperative pain, reduced hospital stay and better cosmesis, as well as the potential advantage of decreased rate of adhesive disease [8,9]. For advanced gynecologic procedures, the use of laparoscopy is still limited to those with experience in high complexity procedures. Although, laparoscopic radical trachelectomy has been described in the literature, limited numbers have been performed secondary to the degree of surgical skill and expertise required [10,11]. The introduction of the robotic surgical system offers a theoretical advantage to surgeons performing more complex procedures in that it offers 3-dimensional optics and wristed motion with finer instrumentation. Direct comparisons of abdominal and robotic trachelectomy are lacking. The focus of the current work is to report on the initial experience of a cohort of patients who underwent robotic radical trachelectomy and determine if there is a difference in perioperative outcomes between patients undergoing robotic radical trachelectomy compared to open radical approach.

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doi:10.1016/j.ygyno.2011.09.035

Methods

After approval was granted by the University of Texas M. D. Anderson Cancer Center Investigational Review Board, data were collected retrospectively on all patients who had undergone open or robotic radical trachelectomy as previously described [7,10] for early stage cervical cancer from September 2005 to June 2011.

The surgical dissection of robotic radical trachelectomy mimicked that of open radical trachelectomy. Briefly, an incision is first made over the round ligament, and the peritoneum lateral to the infundibulopelvic ligaments is opened bilaterally. The paravesical and pararectal spaces are then developed and the ureters are separated from the peritoneum down towards the parametrial tissue. The ureters are then dissected and mobilized completely to the bladder after division of the anterior and posterior vesicouterine ligaments. The peritoneum over the bladder is incised and the bladder is mobilized inferiorly over the anterior vaginal wall. The uterine vessels are transected bilaterally at their origin and dissected over the ureters bilaterally. The peritoneum over the rectovaginal space is then incised and the uterosacral ligaments are divided bilaterally. A circumferential incision is made 2 cm below the vaginal stump to detach the specimen from the apical vagina. An electrosurgical device is then used to amputate the cervical stump. Regardless of the surgical modality, intraoperative evaluation of the surgical margin is carried out by perpendicular sectioning of the endocervical margin and adjacent 1.0 cm long portion of the endocervical canal with attached parametrial tissue being submitted in toto for frozen section. All frozen section evaluations are carried out by a pathologist who specializes in gynecologic pathology. If the surgical margin was grossly positive or close (<10 mm) for dysplasia or invasive cancer, the patient underwent immediate additional resection or conversion to hysterectomy if the residual cervical length was felt to be inadequate to perform a reanastomosis to the apical vagina.

The surgical approach to trachelectomy was based on surgeon training and preoperative discussion concerning the risks, benefits and alternatives of each surgical approach with patients. Vaginal radical trachelectomy is not performed at our institution and consequently the robotics approach was compared only to the open approach. Patients who underwent conversion to radical hysterectomy were excluded from the portion of the analysis pertaining to early and late morbidities. Data extracted from the medical record included patient's age, marital status, pregnancy history, preoperative imaging, and findings on preoperative pelvic examination. Operative reports were reviewed and operative times, estimated blood loss, length of hospital stay, length of follow up, and incidence of intraoperative complications were recorded. Pathologic data included tumor histologic subtype and grade, size of residual tumor, surgical margin, presence or absence of lymph vascular space invasion, nodal status and number of lymph nodes removed, and parametrial length. All postoperative morbidities were recorded and dichotomized as early (occurring less than 30 days) or late (occurring greater than 30 days but within 1 year of surgery) morbidities. Serious morbidity was defined as need for readmission, reoperation or an additional procedure excluding patients taken to the back to the operating room for dilation of a stenotic cervix, anemia necessitating blood transfusion, venous thromboembolism, ICU admission, death, or loss of fertility. Postoperative fecundity rate was also determined. Specifically, attempts to achieve pregnancy and pregnancy outcome, and a postoperative diagnosis of infertility were ascertained from the electronic medical record. Lastly, patient and disease status at the time of last follow up was recorded.

Statistical analyses were performed using XLSTAT v. 2011. Associations between categorical variables and modality of radical trachelectomy (open vs. robotic) were determined using Fisher's exact or Chi-square test. Nonparametric continuous variables were summarized and compared using the Mann Whitney rank sum test. All tests were two-sided, and a p-value <0.05 was considered statistically significant.

Results

Thirty-seven patients with early-stage cervical cancer (20 [54%] with Ib1, 11 [30%] with Ia2, and 5 [14%] with Ia1 with LVSI or poorly differentiated tumor histology) underwent attempted radical trachelectomy. The median age at diagnosis was 28.9 (range 21.4–37.2). Twenty-three women (62%) were married and 70% were nulliparous. Thirty patients (81%) underwent cold knife conization for diagnostic purposes prior to trachelectomy. On preoperative pelvic examination 9/37 (24%) had a visible cervical lesion ranging from 1 to 3 cm, and there was no difference in mean tumor size based on surgical modality (robotic: 21.5 mm vs. open: 23 mm, $p=0.67$). Preoperative magnetic resonance imaging (MRI) was obtained in 24 patients and all but two had no evidence of extracervical disease. Ten patients (27%) had suspicion of tumor in the cervix on preoperative MRI. Two patients had an enlarged pelvic lymph node on preoperative MRI; both underwent a subsequent CT scan. One patient had no suspicious abnormality on CT scan, and one was noted to have an enlarged pelvic lymph node on CT and underwent nondiagnostic FNA. Intraoperatively, this lymph node was sent to frozen section and found to be negative prior to proceeding with trachelectomy. The majority of patients had adenocarcinoma (59%) followed by squamous (32%) and adenosquamous (8%).

Twenty-five patients (68%) underwent open radical trachelectomy and 12 (32%) underwent robotic radical trachelectomy. Twelve patients (8 in the open cohort and 4 in the robotic cohort) underwent intraoperative lymphatic mapping, and all had identification of sentinel lymph nodes. Patients undergoing robotic radical trachelectomy had significantly less blood loss than patients undergoing open radical trachelectomy (median EBL 62.5 mL [range 25–450] vs. 300 mL [range 50–1100], respectively; $p=0.0001$) and spent fewer postoperative days in the hospital (median LOS 1 days [range 1–2] vs. 4 days [range 3–9], respectively, $p<0.001$) (Table 1). There was no difference in operative time (robotic: 328 min [range 207–379] vs. open: 294 min [range 203–392], $p=0.26$) and there were no intraoperative complications with either surgical modality.

Comparing histopathologic outcomes, there was no difference in median length of parametrial tissue removed based on surgical modality (robotic: right parametrial length 3.45 cm [range 2.5–4] and left parametrial length 3.55 cm [range 2.5–5] vs. open: right parametrial length 4.69 cm [range 2–8] and left parametrial length 4.58 cm [range 1.5–9.5]; $p=0.18$ and 0.16, respectively) (Table 1). The median number of lymph nodes removed was 18.5 (range 7–50), and there was no difference in nodal counts based on surgical approach (robotic: 22 [range 9–50] vs. open: 18 [range 7–33]; $p=0.57$). On final pathology, three patients had positive lymph nodes. One patient with a positive parametrial lymph node received postoperative chemoradiation and two with positive pelvic lymph nodes had both been converted to radical hysterectomy secondary to a close surgical margin and recommended to undergo postoperative adjuvant therapy. The majority of patients (23/37 or 62%) had no residual disease at the time of trachelectomy. Among patients with residual disease 5/14 (1 open case (4%) vs. 4 robotic cases (33%), $p=0.03$) were converted to radical hysterectomy secondary to a close (<10 mm) or involved surgical margin (Table 2). All but one patient converted to radical hysterectomy had stage 1B1 disease. Two of the patients converted to a hysterectomy for a close surgical margin had residual adenocarcinoma-in-situ in the hysterectomy specimen and one had residual moderately differentiated squamous cell carcinoma. Four (29%) patients had LVSI. Although a larger percentage of patients with squamous cell carcinoma had residual disease on final pathology (5/7 or 71%), there was no significant difference in the incidence of residual disease based on the different histologies ($p=0.94$).

Excluding patients that underwent conversion to radical hysterectomy, within 30 days of surgery, the most common morbidities included urinary tract infections or retention (7/32, 22%) and fever (5/32, 16%) (Table 3). The most common long-term (>30 day)