

Robotic radical trachelectomy with sentinel lymph node mapping using ICG in early cervical cancer – a brief report

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Summary

Objective: To describe the implementation of robotic radical trachelectomy with sentinel lymph node mapping utilizing indocyanine green (ICG) in patients with early cervical cancer. **Materials and Methods:** This retrospective analysis studied six cases of robotic assisted laparoscopy with the use of the da Vinci-Firefly fluorescence imaging to detect sentinel lymph nodes. **Results:** Six patients with cervical cancer clinical Stages IA2 to IB1 were included. All patients underwent fertility preserving surgery in which complete tumor resection with free pathological margins was confirmed by final pathology (including an obese patient with a BMI of > 40). There were no major surgical complications. **Conclusion:** Robotic radical trachelectomy with sentinel lymph node mapping using ICG is an effective and safe method to treat early cervical cancer.

Key Words: Fertility preservation; ICG; Radical trachelectomy; Robotic laparoscopy; Sentinel lymph node.

Introduction

Cervical cancer is the fourth most common cancer worldwide and is the second most frequent cause of cancer death in developing countries [1]. In 1994, Dargent *et al.* described the first case of radical trachelectomy (RT) [2]. This procedure offers an opportunity to avoid hysterectomy in selected patients with early stage cervical cancer that wish to preserve their fertility.

RT can be performed in several approaches: vaginal, abdominal, and laparoscopic. Minimally invasive procedure has known advantages including decreased blood loss, shorter hospital stay, reduced pain, and shorter recuperation [3]. Robotic assisted laparoscopy is a new branch of minimally invasive procedures that can be exploited by gynecologic oncologists in complex procedures. In this study the authors report their first six patients who underwent robotic assisted laparoscopic RT and the procedure outcomes.

Materials and Methods

Six cases of robotic assisted laparoscopic RT were performed in this institution between January to December 2016. Follow up was continued until January 2017. Information was gathered on all six patients including: age, gravidity, parity, background medical information, body mass index (BMI), tumor histology, presence of lymph-vascular involvement, status of lymph node (LN) involvement, intra- and postoperative complications, final pathologic results, and relapse during the follow up period.

Following general anesthesia, patients were placed in dorsal lithotomy position. Two cc of Indocyanine Green (ICG) were in-

jected into each side of the cervix to a depth of 1 cm (four syringes of 1 cc at three and nine o'clock positions). A cervical manipulator was inserted.

One obese patient had preoperative insertion of ureter catheters to mark them during the procedure due to excessive fat in the pelvic side walls. After generating pneumoperitoneum, one 8-mm metal trocar was blindly inserted 1 cm cephalically to the umbilicus for optics. Three 8-mm and one 11-mm trocars were then placed under vision. The da Vinci surgical system-model Xi was docked and the pelvic sidewalls, presacral area, and para-aortic lymph beds were scanned entirely. The sentinel lymph nodes (SLN) were identified via the da Vinci-Firefly fluorescence imaging. LNs were considered sentinel if they were green and the lymphatic channels originating in the cervix were noted to drain to the node. As part of the present authors' learning curve of ICG mapping, a complete pelvic lymphadenectomy was performed in four of the six patients. Nodes were evaluated by frozen section to rule out metastases prior to RT performance.

The surgical procedure was performed as previously described by Burnett *et al.* [4]. Vaginotomy was performed circumferentially over the plastic vaginal manipulator that delineates the extent of the vaginal margins. The uterus was rotated to a 90-degree angle to perform intra-abdominal amputation of the cervix using a harmonic scalpel device. The latter enables a sharp dissection for frozen section evaluation of the endocervical margin. The specimen was removed through the vagina and sent to pathology for frozen section evaluation to assure free surgical margins. The isthmus was re-attached to the vagina by a continuous Stratafix suture. No cerclage was placed based on previous data [5, 6] concluding that this procedure can be safely omitted. An 8-gauge foley catheter was placed inside the isthmical uterine canal for three weeks to avoid synechia and ensure patency of the remaining cervical canal. Patient ambulation was encouraged at the same day of the procedure and the urine catheter was removed one-day

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Table 1. — Patient's demographics and operation outcomes

Age (years)	BMI (kg/M ²)	Pregnancies	Deliveries	Stage	Operation length (min)	SLN	Complete lymph node dissection	HGB drop (gm/dl)	Complications
31	17.7	1	1	1A2	236	BS	Yes	2.1	Urinary retention, UTI
26	25.7	1	1	1A2	248	Right side	Yes	0.07	No
28	19	1	0	1A2	235	BS	Yes	2.1	No
39	29.7	2	2	1A2	273	BS	Yes	1.7	No
35	42.9	0	0	1B1	195	BS	No	2	Ureters spasm
28	17.8	0	0	1A2	244	BS	No	1.9	No

BMI = body mass index; SLN = sentinel lymph nodes; HGB = hemoglobin; BS = both sides; UTI = urinary tract infection

post-op with trial of spontaneous urination. All patients received low molecular weight heparin for four weeks post op.

Results

Patient demographic and operative information are shown in Table 1. The average age was 31.2 years with an average body mass index (BMI) of 25.5 kg/m². Five of the patients had squamous cell carcinoma and one had adenocarcinoma pathology. The clinical stage was IA2 to IB1. Prior to surgery, all patients were evaluated by PET-CT and a pelvic MRI that were suggestive of an early stage limited cervical lesion.

SLN were bilaterally resected following identification with ICG in all except one patient in which SLN was not identified in the left hemipelvis. All of the frozen sections and all the final pathologic reports were negative for LN metastases and all cervical surgical margins were negative.

There were no major intraoperative complications. The average hemoglobin drop was 1.6 (range 0.07-2.1) gm/dl and none of the patients required blood transfusion. Two patients had minor complications: one patient had a transient urinary retention with uncomplicated urinary tract infection which was treated with urine catheter for an additional 24 hours and parenteral antibiotics with resolution of symptoms. One patient had preventive ureter catheters inserted preoperatively and removed at the end of surgery. She developed transient ureteral spasm presented as oliguria that resolved quickly with fluids and papaverine administration. There was no relapse during a follow up period of 8.8 (range 1.1-12.4) months.

Discussion

In the past, the diagnosis of cervical cancer meant inevitable loss of fertility. The innovation of RT [2] gave women the possibility to conceive and give birth without compromising cancer treatment. Although most procedures were performed via a vaginal approach in combination with laparoscopic pelvic lymphadenectomy, satisfactory oncological outcomes can be achieved by abdominal and minimally invasive approaches [3]. Robotic procedures are a rather new method for minimally invasive surgery that can

be mastered with a short learning curve and good outcomes.

The present case series adds to the scant data published on robotic assisted laparoscopic RT [4, 7, 8]. In all of the present patients' procedures were successfully completed with fertility preservation and a complete tumor resection with free pathological margins. The present authors' short learning curve with no major intraoperative complications and only a few minor postoperative complications encouraged that robotic RT is both safe and feasible.

Bilateral identification of pelvic SLN was approved by the NCCN [9]. The da Vinci Xi model at the present institution with the Firefly fluorescence imaging was used to identify the SLN after ICG cervical injection. ICG which is an FDA approved drug for SLN mapping, has already been shown to have a higher detection rate compared to the more commonly used blue dye and technetium⁹⁹ radiocolloid [10, 11] with a high negative predictive value for LN metastases [12]. By resecting only SLN we can minimize complications caused by complete lymphadenectomy. It is noteworthy that from the present experience, omitting complete pelvic lymphadenectomy shortens the surgical time. Another advantage of the robotic procedure is the ability to perform minimal invasive surgery in morbid obese patients, such as the sixth patient who had a BMI of 42.9 kg/m². Previously, a high BMI was considered a relative exclusion criteria from the option to have a trachelectomy procedure. In those patients, abdominal surgery is challenging, and laparoscopic surgery might be technically impossible in cases the instruments are too short or too difficult to handle. The use of the robotic platform may offer those patients a chance of fertility sparing procedure.

Based on previous studies that showed similar obstetrical outcomes when RT was performed with or without a cerclage [5, 6], and from the present experience the authors decided not to place a cervical cerclage. Of note, this was done as opposed to other published data on robotic assisted laparoscopy RT [4, 7, 8].

In conclusion, robotic RT with SLN mapping using ICG in early cervical cancer shows promising results and is probably advantageous when compared to the abdominal and vaginal approaches. Although this is a preliminary small group of patients, it seems both safe and feasible. As further data from the present series and from new cases re-

garding recurrence rate and pregnancy outcome will continue to compile, the authors believe it will be shown that this is a safe and efficient method for fertility preservation in young patients with early cervical cancer.

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