Case Report

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# Single-port access laparoscopic ovarian transposition and cryopreservation of ovarian tissue before chemo-radiotherapy in a young woman with rectal cancer

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To introduce the first case of single-port access (SPA) laparoscopic ovarian transposition (LOT) and cryopreservation of ovarian tissue before chemo-radiotherapy in a young woman with rectal cancer. We report our experience of SPA-LOT and cryopreservation of ovarian tissue with only minimal skin incision. Patient successfully underwent SPA-LOT and cryopreservation of ovarian tissue before chemo-radiotherapy in a reasonable time without operative complication in order to relocate their ovaries outside the radiation field. A concomitant ovarian wedge resection was performed for ovarian cryopreservation. After surgery and chemo-radiotherapy, she continued to have regular menstrual cycles. For a preservation of ovarian function, SPA-LOT and cryopreservation of ovarian tissue before chemo-radiotherapy is feasible with only minimal skin incision.

**Key words:** Single-port; Laparoscopic ovarian transposition; Cryopreservation

## Introduction

Preservation of ovarian function is an important concern in premenopausal cancer patients, especially fertility-desire young women, whose treatments include radiation therapy to pelvic structures that incorporate the ovaries. Ovarian transposition was developed to displace the ovaries from their normal anatomic position and away from the direct radiation portal, with the goal of maintaining long-term ovarian function. Historically, ovarian transposition was typically performed for premenopausal patients undergoing pelvic irradiation for Hodgkin's disease at the time of staging laparotomy.[1] With the popularization of laparoscopic surgical techniques, instead of laparotomy, preservation of ovarian function by laparoscopic ovarian transposition (LOT) before pelvic irradiation has been demonstrated to be a safe and effective procedure for young patients with malignancies.[2-4]

Recently, with improvements in surgical expertise with optimal instrumentation, interest in minimally invasive surgery has increased. Single-port access (SPA) laparoscopic surgery is one of those innovative techniques. Compared with conventional laparoscopy, the SPA surgery offers better cosmetic results due to reduced number of inserted trocars. Additionally, operative complications related to the trocar insertion such as epigastric vessel injury, operative wound infection, and hematoma and visceral organ damage may be avoided by reducing the number of ancillary ports penetrating the abdominal wall. Besides, it has been expected that this approach has several advantages, such as faster return to normal activity, shorter length of hospital stay, lower cost, and reduced pain.[5,6]

In this report, the authors introduce the first case of SPA-LOT and cryopreservation of ovarian tissue as a means to preserve fertility in a 26-year-old woman with rectal cancer before concurrent chemotherapy and radiation therapy

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(CCRT).

## Case Report

An otherwise healthy 26-year-old female noted watery diarrhea, lower abdominal pain, and a 5 kg weight loss for 1 month. A colonoscopy revealed an encircling ulcerative mass in the distal rectum, at approximately 9 cm from the anal verge. Multiple biopsies of the mass showed an invasive, moderately differentiated adenocarcinoma. Physical examination by a digital rectal exam revealed a 75% circumferential mass with complete fixation. Magnetic resonance imaging showed a fungating mass at 9 cm from the anal verge with extensive perirectal fat infiltration and direct invasion of posterior circumferential resection margin. In addition, multiple enlarged lymph nodes were detected in the perirectal area, both pelvic side wall, and along the superior rectal vessel. On the gynecologic examination, there was no abnormal finding. The serum level of carcinoembryonic antigen and CA 19-9 was 0.63 ng/mL and 37.4 U/mL, respectively. Other laboratory tests showed no specific abnormality. Her height, weight, and body mass index were 164 cm, 48 kg, and 17.9 kg/$m^2$, respectively. Based on results of these imaging studies and pathologic reports, the patient was diagnosed as locally advanced rectal adenocarcinoma and CCRT was planned. Before the onset of radiation therapy, the patient was referred for ovarian transposition and cryopreservation. The extent of the radiation field was discussed with the gynecologic oncologist before the procedure to ensure that the transposed ovaries would be outside of the treatment portals.

SPA system was performed according to a technique previously described by our group.[7,8] Briefly, a Foley catheter was placed into the bladder, and a uterine manipulator was inserted into the endometrial cavity after general endotracheal anesthesia. After a 1.5 cm vertical intra-umbilical skin incision, the Alexis® wound retractor (Applied Medical, Rancho Santa Margarita, CA, USA) was inserted into the peritoneal cavity through the umbilicus. A 7½ surgical glove was fixed to the outer ring of the wound retractor. After making a small incision in one of the finger tip portions of the glove, two 5 mm trocars and 11 mm trocar were inserted. A rigid 30 degree, 5 mm endoscope, conventional laparoscopic instruments, and Harmonic Ace (Ethicon Endo-surgery, Cincinnati, OH, USA) were used. Surgical procedure of ovarian transposition was performed in the usual fashion. The peritoneum of both pelvic sidewalls was incised, and the retroperitoneal spaces were developed. The common, external, and internal iliac vessels were identified. The ovarian vessels and ureters were traced on both sides (Fig. 1A). Under the direct vision of the ureters, the uteroovarian ligament was electrocoagulated and divided with a Harmonic Ace. The same procedure was performed on the mesovarium. The dissection was continued to an area outside of the true pelvis. At this time, the ovarian vessels could be turned laterally with a sufficient angle to maintain appropriate blood supply. The tunnel beneath peritoneum was made from the end of dissection to the level of the anterior superior iliac spine (Fig. 1B). The mobilized ovaries and tubes were passed through this tunnel and anchored to the peritoneum out of the tunnel, with Vicryl 2-0 continuous suture. The upper and lower poles of the ovaries were marked with hemoclips (Fig. 1C). A concomitant ovarian wedge resection was performed for ovarian cryopreservation. Approximately one third to half of the left ovary was excised using laparoscopic scissors (Fig. 1D).

Before dissecting the ovarian cortical tissue for cryopreservation, all visible follicles were aspirated with an 18 gauge syringe needle that was attached to a 10 mL syringe. The aspirates were flushed in oocyte washing medium (CooperSurgical/Sage, Trumbull, CT, USA) and searched for cumulus–oocyte complexes under the dissecting microscope. Following follicle aspiration, the ovarian cortical tissues were isolated in the oocyte washing medium, cut into 4 $mm^3$ (2×2×1) pieces, and searched for the presence of additional oocytes. Immature oocytes were matured in an organ tissue culture dish (60×15 $mm^2$; Falcon, Franklin Lakes, NJ, USA) containing 1.0 mL of In vitro maturation medium (Coopersurgical/Sage) supplemented with a final concentration of 75 mIU/mL of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) at 37°C in an atmosphere of 5% CO2 in air with high humidity. Ovarian tissue cryopreservation was performed as previously described.

SPA-LOT and cryopreservation of ovarian tissue was performed without a conversion to conventional laparoscopy or laparotomy. The operative time was 100 minutes and estimated blood loss was 10 mL. There was no perioperative complication. The patient was discharged on postoperative day 2 without complication. After the surgery, patient was evaluated and consulted by a reproductive endocrinology and infertility specialist. She was scheduled to undergo pelvic irradiation and combination of 5-fluorouracil and leucovorin. On postoperative day 10, she underwent the first dose of CCRT. She completed whole process of scheduled CCRT for 5 weeks without any complication. The patient re-

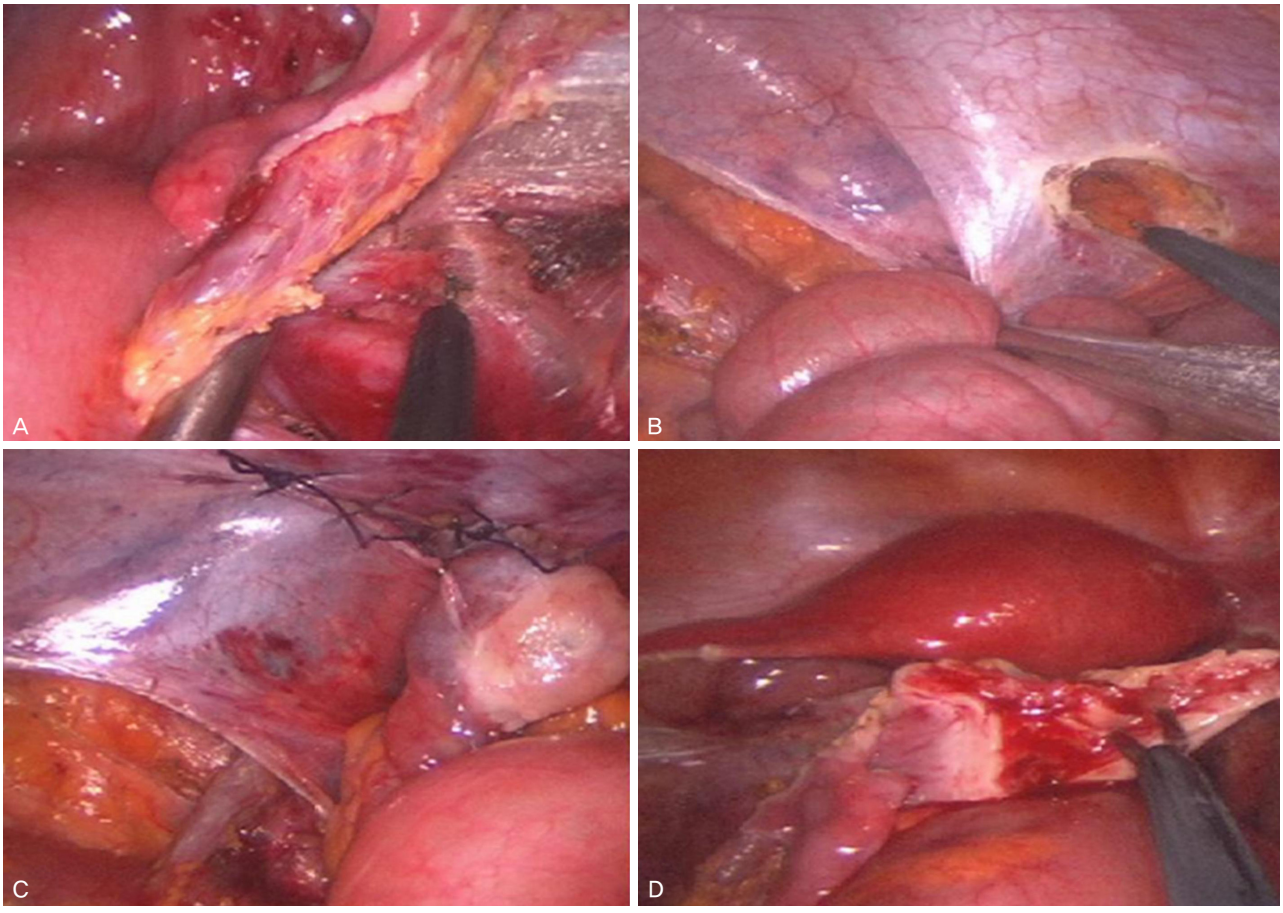


**Fig. 1.** Intraoperative view of single-port access laparoscopic ovarian transposition and cryopreservation; (A) the ovarian vessels and ureter were traced, (B) tunneling of peritoneum, (C) attachment of relocated ovary with intracorporeal suturing and clipping, (D) ovarian wedge resection for cryopreservation.

ceived a total dose of 4500 cGy to the pelvis, complemented by a 450 cGy boost to the mesorectum, in 25 daily fractions of 180 cGy each over 5 weeks. Treatment was delivered using 10 MV photons, 5 days a week. The ovaries were determined to be outside of the radiation fields, as visualized by the radiographic clips placed at the time of laparoscopy (Fig. 2A, 2B). The fields for external radiation were localized with a radiotherapy simulator (Fig. 2C, 2D). We used 2 times of GnRH analogue for CCRT. She was planned to undergo surgery 6 weeks after completion of CCRT. Ovarian function was assessed by measurement of serum FSH and LH levels at immediately after surgery and CCRT.[9] The values were 6.6 mIU/mL and 124 pg/mL, respectively. It was considered normal when the FSH and LH level was between 1.5-33.4 mIU/mL and 30-330 pg/mL. Her menstrual cycle was resumed at 5 months after CCRT with normal flow and without dysmenorrhea.

## Discussion

Only a few short series of LOT have been reported[1-4,10] and, recently, Pahisa et al.[11] demonstrated that LOT was a safe and effective procedure for the preservation of ovarian function in young patients with early cervical cancer undergoing adjuvant radiotherapy after surgery by a prospective study with long term follow-up. The laparoscopic approach enables the patient to return to normal activity and to start radiation within days of the procedure. In addition, young women who preserve her fertility require minimally invasive surgery which has minimum operation scar and reduced postoperative pain. For this reason, SPA-LOT is expected as a surgical option for these demands with minimum invasion.

In this report, we could perform SPA-LOT and ovarian cryopreservation in a reasonable time without operative

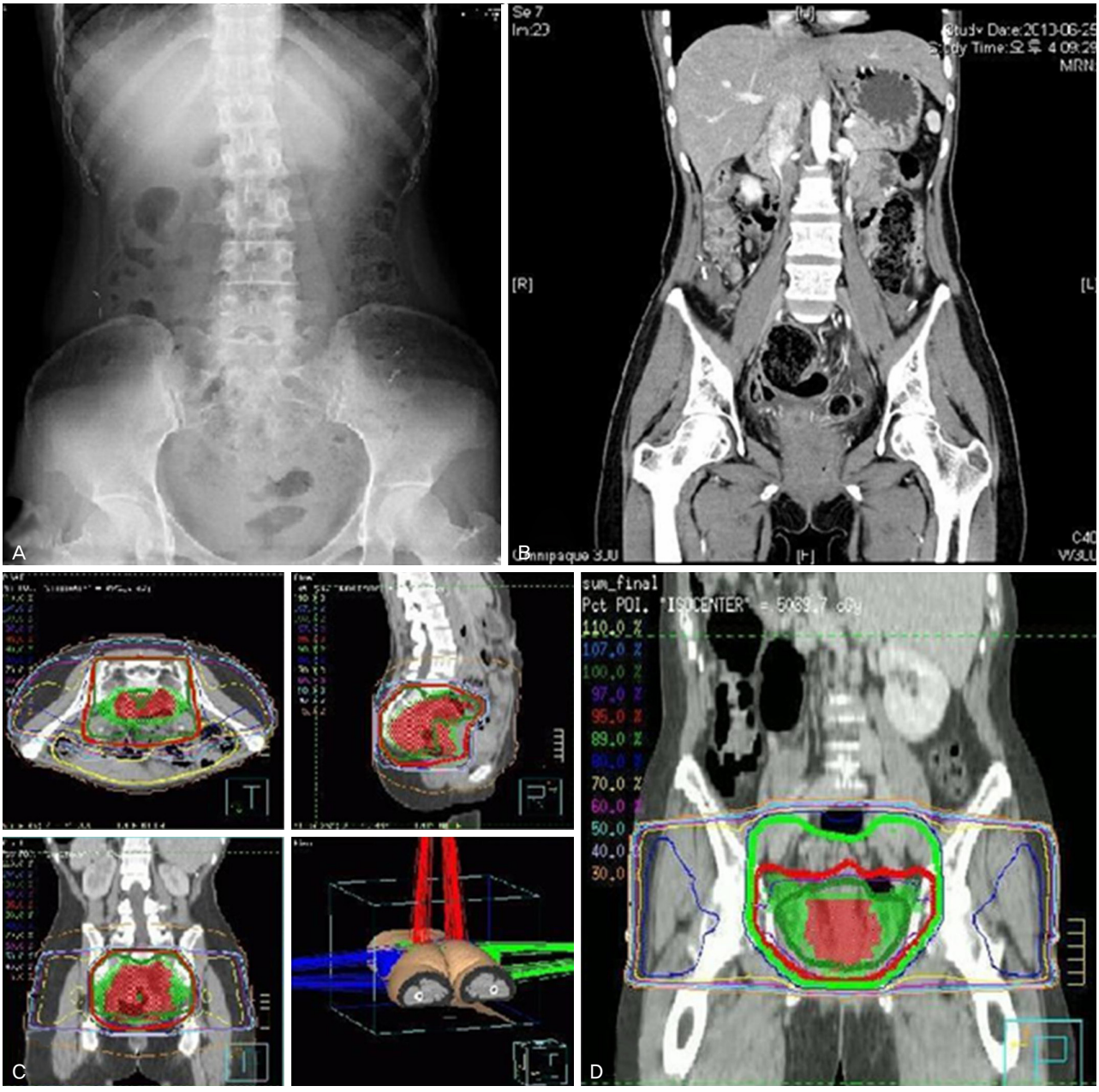


**Fig. 2.** (A, B) The ovaries were determined to be outside of the radiation fields, as visualized by the radiographic clips placed at the time of laparoscopy. (C, D) The fields for external radiation.

complication. To successfully perform LOT, suturing for the detachment of ovary and sufficient dissection of ureter are essential. However, the SPA surgery has systemic limitations, including a crush between instruments or between instruments and endoscope, a limited amount of instruments, and limited mobility of straight laparoscopic instruments because surgical instruments work through only one port. These technical problems cause lower accuracy of the operation compared to conventional laparoscopy. The authors have solved the technical problems in the SPA surgery using conventional laparoscopic instruments. A 40 cm length, 5 mm diameter, and 30 degree angled endoscope and a 90 degree light cable adaptor were used to avoid collision between endoscope and surgical instruments. Additionally, the authors made a middle portion of a toothed biopsy forcep slightly curved thereby avoiding the collision of surgical instruments.

For traction of tissue, the 2-mm grasper was added and this instrument was flexible so that adding it did not cause a crash between other surgical instruments. For performing double tying, an articulated instrument such as the Roticulator™ (Covidien, Mansfield, MA, USA) was used. Its handle was not too big so the operator could avoid the collision between instruments. Additionally, 3 cm length tunnel was made at the peritoneum for a detachment of the ovary. The mobilized ovaries and tubes were passed through this tunnel and anchored to the peritoneum out of the tunnel with suturing and surgical clips. In this report, the authors focused on the introduction of minimally invasive surgery for LOT. Therefore, after surgery, quantitative analysis of ovary-stimulating or ovary-producing hormones as well as assessment of subsequent pregnancy outcome is additionally needed.

In conclusion, SPA-LOT and ovarian cryopreservation using single multi-channel port could be feasible procedure in young cancer patient who desire preserving of ovarian function with only minimal skin incision. Prospective randomized trials will permit the evaluation of potential benefits of this minimally invasive surgical technique.

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