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Robot-assisted laparoscopic radical trachelectomy using three robotic arms

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Radical trachelectomy is an alternative method to preserve the fertility of young women with early stage cervical cancer. Abdominal radical trachelectomy has been replaced with laparoscopic radical trachelectomy in selected patients due to several advantages of laparoscopic surgery compared to laparotomy. Recently, as surgical technology has significantly advanced, robot-assisted procedures have been performed. However, there are only four case reports of robot-assisted radical trachelectomy where four robotic arms were used. This report may be the first to describe robot-assisted laparoscopic radical trachelectomy which uses only 2 robotic instruments ports and 1 assistant port while preserving the ascending branches of both uterine arteries.

Key words: Cervical cancer; Robot; Radical trachelectomy

Introdction

Radical trachelectomy became the method of choice to preserve fertility of young women with early stage cervical cancer.[1-4] There are only a few reports on robot-assisted surgery published in the past few years.[1-4] In 2007, the first robot-assisted laparoscopic abdominal radical trachelectomy was performed,[2] and then Chuang et al.[3] reported a case of robot-assisted radical trachelectomy with bilateral pelvic lymphadenectomy. In this report, we described two cases of robot-assisted laparoscopic radical trachelectomy performed on patients with stage 1b1 and stage 1a1 cervical cancer. We spared bilateral uterine arteries by employing pelvic lymphadenectomy and using four ports: three robotic arms and one assistant trocar.

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Case Report

The first patient, a 34-year-old unmarried woman, was referred to Severance Hospital in September 2008 due to invasive adenocarcinoma in the uterine cervix. On the colposcopy, about a 1.5 cm sized exophytic lesion was noted at the 11 o'clock direction of the exocervix (Fig. 1A). On the magnetic resonance imaging (MRI), there was no visible mass or enlarged lymph node (Fig. 1B). After the pelvic examination was performed, the clinical stage was determined as stage 1b1 according to the International Federation of Gynecology and Obstetrics (FIGO).

In the second patient, a 41-year-old married woman (gravida 0), the pathology results after the large loop excision of transformation zone showed microinvasive cervical cancer and invasion depth was less than 0.1 cm. On the MRI, there was no visible mass on the cervix or an enlarged lymph node except for a 5.5×3.9 cm sized myoma with low signal intensity at the posterior body of the uterus. On the flurodeoxyglucose positron emission tomography/computed tomography, no definite lesion or abnormal uptake to suggest distant metastasis was noted. After the pelvic examination was performed, the FIGO

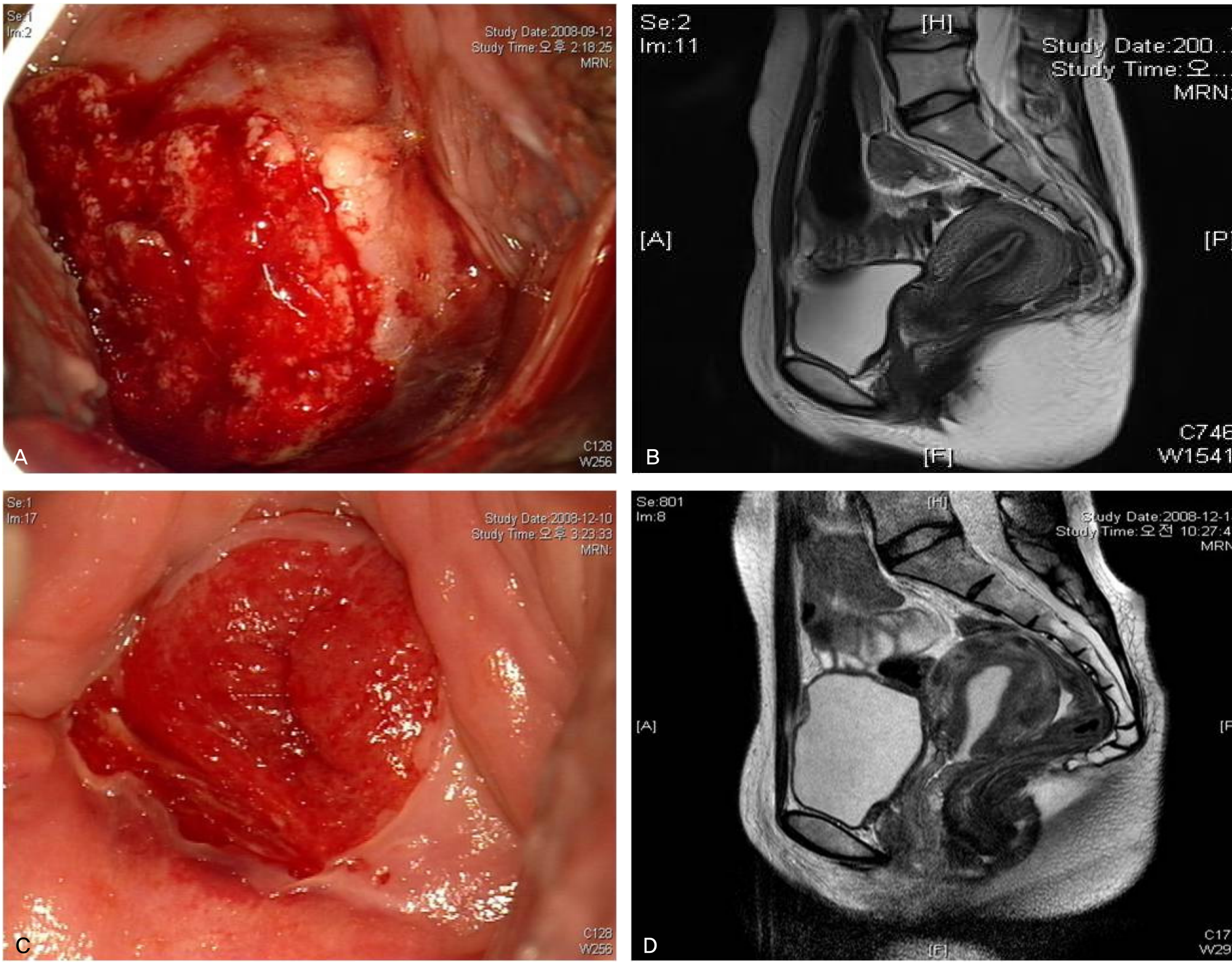

Fig. 1. (A) On the colposcopy, about 1.5 cm sized villoglandular lesion of the cervix was revealed. (B) On magnetic resonance imaging, no clearly visible lesion was found in the uterine cervix. (C) Colposcopic finding of the cervix after three months of follow-up. (D) Magnetic resonance imaging (T2WI) after three months of follow-up.

stage was determined as stage 1a1. Informed consent was obtained from each patient before performing robot-assisted laparoscopic radical trachelectomy.

In the first case, the operation time was 480 minutes and the estimated blood loss was 300 mL. A total of 22 pelvic lymph nodes were removed. The removed cervix was 30 mm long, and the vaginal cuff was 15 mm (Fig. 2C). Each parametrium was 30 mm long. No residual invasive cancer was found except for adenocarcinoma *in situ* with a free margin. The Foley catheter was removed on postoperative day 8. She was discharged on postoperative day 10. After three months, the surgical wounds were healing well (Fig. 1C). MRI results also revealed no evidence of recurrence and 0.8 cm sized remnant cervix (Fig. 1D).

The second case spent 335 minutes and lost 300 mL of blood. Bilateral paracervical lymph nodes were removed. The removed cervix was 30 mm long, and the vaginal cuff was 15 mm. Each parametrium was 30 mm long (Fig. 2D). The final pathology result was microinvasive squamous cell carcinoma with a free margin. The Foley catheter was removed on postoperative day 3, and the patient was discharged on postoperative day 5. After three month, the surgical wounds were healing well on the colposcopy.

1. Surgical technique

Under general anesthesia, the patient was placed in the lithotomy position. In the first patient, the cervical lesion was excised using an electronic loop to prevent spillage of cancer cells before operation. A vaginal sponge, which was held by forceps, was used to delineate the vaginal fornices and to prevent leakage of

CO_2. After placing the patient in a steep Trendelenburg position, a 1.2 cm intraumbilical vertical skin incision was made and a 12-mm trocar was inserted through the umbilicus to hold the camera. After inspecting the pelvic cavity, two 8-mm trocars were introduced in the lower quadrants of the abdomen, lateral to the epigastric arteries, 2~3 cm below the umbilical level. The fourth assistant port (12 mm) was placed at the midpoint between the umbilicus and left robotic arm. Once all four ports were in place, the surgical cart was positioned between the patient's legs, behind the second assistant port. Three robotic arms were docked to the trocars. The operative field was surveyed and peritoneal washing cytology was performed. The uterus was lifted by sutures using 1~0 vicryl, and was anchored under bilateral round ligaments to make wider spaces without a manipulator (Fig. 2A). The robotic pelvic lymphadenectomy began with an incision made lateral to the infundibulopelvic ligament from the pelvic brim to the round ligament. After identifying the ureter and pelvic vessels, pelvic lymph nodes were dissected along the external iliac artery. The external iliac vein and lymphatic tissues were dissected and retracted laterally, and the obturator and hypogastric lymph nodes were dissected as described previously[1]. After dividing the posterior leaves of the broad ligaments, bilateral ureters were dissected and the ureters were pulled laterally to dissect and divide the anterior ligament, lower parametrium, and paracolpium. Then, we dissected the bilateral uterine arteries, and transected the descending branches after suturing with 2~0 polysorb® (Syneture, Mansfield, MA, USA) while preserving the ascending branches for blood supply to the uterine cor-

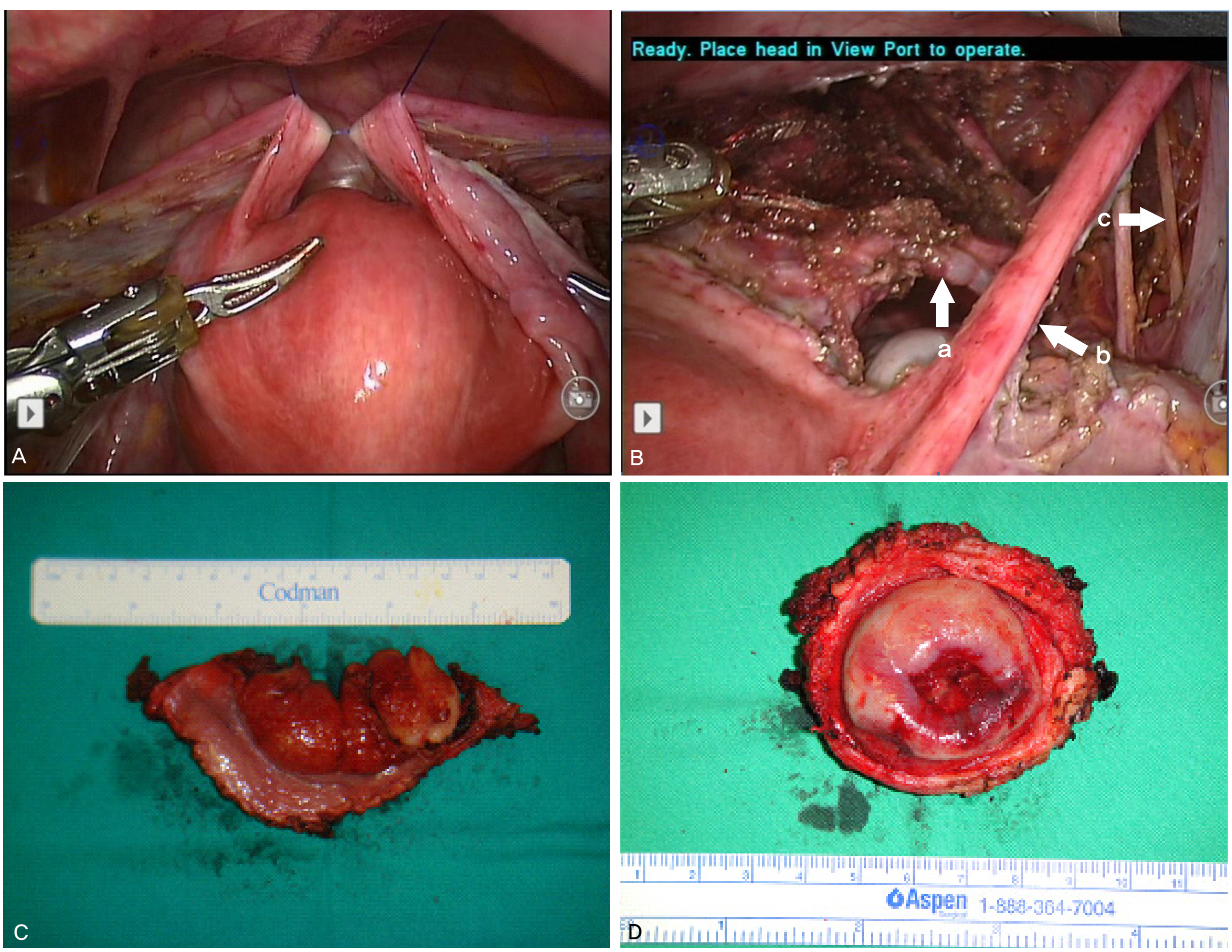

Fig. 2. Photographs of operative field. (A) The uterus was lifted by trans-abdominal suturing without manipulator. (B) The ascending branch of the uterine artery is preserved (B-a). Round ligament (B-b), obturator nerve (B-c). (C) Specimen of robot-assisted laparoscopic trachelectomy in the first patient. (D) Trachelectomy specimen of the second patient.

pus and isthmic portion of the cervix (Fig. 2B). The cervix and parametrium were transected at the level of the internal os of the uterine cervix. The vaginal wall was transected by tracing the shape of an indwelling sponge stick held by forceps. The amputated specimen was pulled out vaginally. A permanent cervical cerclage was performed with a 2~0 prolene suture. Lastly, the vagina was sutured to the remaining cervix with a total of 12 mattress sutures using 1~0 vicryl.

Discussion

Compared to a conventional laparoscopy, robot-assisted laparoscopy offers more benefits, including improved dexterity with multi-dimensional articulated instruments, intuitive movement, three-dimensional view, and tremor filtration.[1] Furthermore, Kim et al.[1] reported that the operator at the remote console can dissect tissues with finer and more delicate manipulation. Surely there are some disadvantages, including high cost, lack of tactile feedback, larger incisions, increased operation time associated with instrument exchange, and bulkiness of the equipment.[1] However, robot-assisted laparoscopy is a new technological trend, and the advancement of robotic technology will return interests to patients over a conventional laparoscopy.

So far, only four reports of robot-assisted laparoscopic radical trachelectomy have been published. In three reports the uterine artery was transected and 5 ports was used including 3 robotic instruments ports.[2,3] Only in one report the uterine artery was preseved.[4] From a fertility perspective, the obstetric outcomes of radical trachelectomy involving transection of the uterine arteries are still controversial.[5-9] Several reports showed successful outcomes of pregnancies after transection of the uterine arteries.[5] However, impaired uterine perfusion by transection may result in complicated obstetric outcome in others.[6-9] In addition, the role of cerclage in preventing preterm birth is also controversial.[8] Therefore, we decided to keep uterine perfusion and perform a permanent cerclage in our operation.

To the best of our knowledge, there is no report about the robot-assisted laparoscopic radical trachelectomy that employs the uterine tenting suture technique and saves the fourth arm or uterine manipulator, thus using only three robotic arms and one assistant port. The procedure described in this report also spares bilateral uterine arteries. Advantages of our method include reduced cost as it involves a less number of ports, fewer incisions, and more cosmetic benefits. A major problem in the first case was longer operating time compared to previous reports.[2-4] This may be attributable to the fact that it was our first experience. However, the learning curve required to master the use of the robot was considerably shorter than the time to learn and adopt a conventional laparoscopy.[1] In the second case, the operating time was significantly reduced under the influence of our experience.

In conclusion, we suggest that robot-assisted laparoscopic radical trachelectomy preserving the uterine arteries is feasible procedure in selected cervical cancer patients with only minimal skin incisions.

References

1. Kim YT, Kim SW, Hyung WJ, Lee SJ, Nam EJ, Lee WJ. Robotic radical hysterectomy with pelvic lymphadenectomy for cervical carcinoma: a pilot study. Gynecol Oncol 2008;108:312-6.
2. Persson J, Kannisto P, Bossmar T. Robot-assisted abdominal laparoscopic radical trachelectomy. Gynecol Oncol 2008;111:564-7.
3. Chuang LT, Lerner DL, Liu CS, Nezhat FR. Fertility-sparing robotic-assisted radical trachelectomy and bilateral pelvic lymphadenectomy in early-stage cervical cancer. J Minim Invasive Gynecol 2008;15:767-70.
4. Burnett AF, Stone PJ, Duckworth LA, Roman JJ. Robotic radical trachelectomy for preservation of fertility in early cervical cancer: case series and description of technique. J Minim Invasive Gynecol 2009;16:569-72.
5. Palfalvi L, Ungar L, Boyle DC, Del Priore G, Smith JR. Announcement of healthy baby boy born following abdominal radical trachelectomy. Int J Gynecol Cancer 2003;13:250.
6. Shepherd JH, Spencer C, Herod J, Ind TE. Radical vaginal trachelectomy as a fertility-sparing procedure in women with early-stage cervical cancer-cumulative pregnancy rate in a series of 123 women. BJOG 2006;113:719-24.
7. Petignat P, Stan C, Megevand E, Dargent D. Pregnancy after trachelectomy: a high-risk condition of preterm delivery. Report of a case and review of the literature. Gynecol Oncol 2004;94:575-7.
8. Burnett AF. Radical trachelectomy with laparoscopic lymphadenectomy: review of oncologic and obstetrical outcomes. Curr Opin Obstet Gynecol 2006;18:8-13.
9. Bernardini M, Barrett J, Seaward G, Covens A. Pregnancy outcomes in patients after radical trachelectomy. Am J Obstet Gynecol 2003;189:1378-82.