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Robotic-assisted single incision myomectomy in large myoma cases

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Summary

Introduction: Laparo-endoscopic single-incision surgery (LESS) has been developed and gradually adopted for both benign and malignant gynecological procedures. However, LESS has been hindered for use in procedures like myomectomy by limitations in natural architecture and instrumentation, especially in suturing. The da Vinci system features a single-site platform and wristed needle driver, which may help overcome conventional LESS limitations. This case report study describes the feasibility of this robotic single-site (RSS) platform in large myoma cases and offers suggestions. *Results:* Two cases of myomectomy with large myomas (with maximum diameters of 160 and 120 mm) with different locations, were addressed by RSS. Operative time was 180 and 240 minutes. Estimated blood loss was 200 and 150 ml. Pathologic analysis revealed uterine leiomyomas of 910 and 870 grams. No serious peri- or post-operative complications occurred. *Discussion:* Myomectomy with large myoma has presented a surgical challenge. RSS myomectomy appears to be a safe and feasible technique for it regardless of its localization. Advantages include less postoperative pain, fast recovery, less impact on quality of life, and improved cosmesis. LESS surgery has been challenging concerning suturing and multi-laparoscopic or multi-port robotic myomectomy can be difficult to extract myoma, especially with morcellation. RSS could be a solution that enables ease of manipulation and extraction.

Key words: Robotic single-site; Myomectomy; Large myoma; da Vinci surgical system.

Introduction

Minimally invasive surgery (MIS) is safe and feasible for benign and malignant gynecological tumors. Laparo-endoscopic single-incision surgery (LESS), is the most recent development in MIS, and has been performed for various cases including myomectomy. It results in less pain, speeds recovery to daily life, and produces greater patient satisfaction because of the near-invisible scar. However, LESS it is extremely challenging because it requires a surgeon who is experienced in intracorporeal suturing accomplished with limited triangulation and instrumentation. This barrier for myomectomy has been reduced somewhat with the availability of the barbed suture. [1,2]. Nevertheless, when considering large or localized myomas, LESS surgery remains limited due to its lengthy learning-curve, lack of triangulation, interference of instrument on myoma, large area of manipulation of suturing, and the requirement to close several intramural myoma layers.

The robotic-assisted single-site (RSS) platform for single incision laparoscopic surgery has been recently introduced. The platform incorporates the original benefits of the robotic system including three-dimensional vision, dexterity, and full surgeon control of the instrument and endoscope, and further features triangulation with curved cannula and intuitive hand-control of the auto-assigning of arms. The RSS also features a wristed needle driver. These features could be helpful for more comfortable performance of suturing during myomectomy and for specimen removal using a single umbilical incision.

The safety and feasibility of RSS hysterectomy has been reported in three studies [3-5] and RSS myomectomy in one study [6]. RSS used for myomas exceeding 100 mm has not been reported. The present authors report two cases of myomectomy involving large myomas with different locations using the da Vinci surgical system with a single-site platform. The advantages and limitations of the approach are reported, with helpful tips offered.

Case Report

Both cases were performed at Ewha Women's University Hospital in 2015. Patient characteristics and operative outcomes are summarized in Tables 1 and 2.

Case 1

A 41-year-old woman had a body mass index of 23.3 kg/m^2, gravida 0, para 0, and a history of chronic pelvic pain and voiding difficulty with no previous abdominal history. Pelvic ultrasound and magnetic resonance imaging (MRI) revealed the uterus, which measured 60×41 mm, with a subserosal myoma (160 mm maximum diameter), and normal-appearing adnexa bilaterally (Figure 1). The patient underwent a RSS myomectomy

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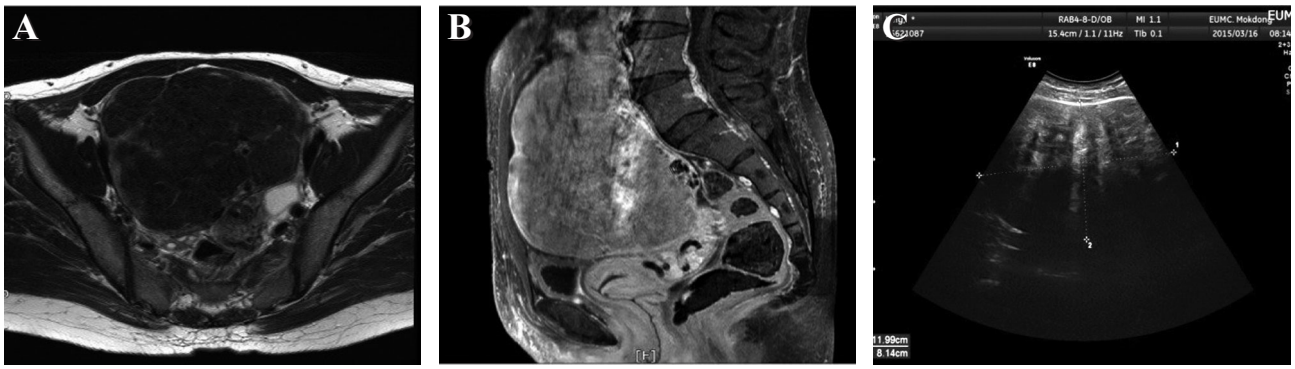

Figure 1. — Pelvic MRI and ultrasound findings in Case 1. There is large myoma overriding the uterus in coronal and sagittal planes o (A, B). The uterus is not shown because of large myoma by transvaginal sonogram (C).

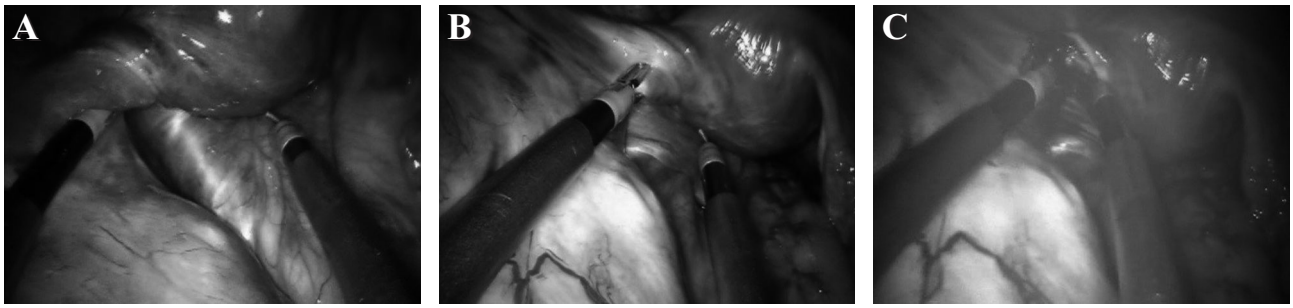

Figure 2. — Operative findings in Case 1. After heading bipolar forcep and monopolar hook, the authors found twisted myoma peduncle (A, B), cauterized, and incised it with two instruments (C, D). The incised uterine wall is sutured layer-by-layer by wristed needle driver (E, F).

Table 1. — *Baseline characteristics of the patients.*

Characteristic	Case 1	Case 2
Age (years)	41	40
BMI (kg/m^2)	23.3	27.2
Indications	Chronic pelvic pain, voiding difficulty	Pelvic pressure, hypermenorrhea dysmenorrhea
Previous abdominal surgery	None	None
Gravidity	Gravida 0, para 0	Gravida 0, para 0
Pathology (myomas)	Subserosal myoma 160 mm in largest diameter	Intramural myoma 120 mm
Size of uterus (mm)	60*41	81*39
Weight of uterus with leiomyoma (g)	910	870

Table 2. — *Perioperative and postoperative outcomes.*

Variable	Case 1	Case 2
Docking time (min)	2.5	2.7
Total operative time (min)	180	240
Estimated blood loss (ml)	200	150
Hospital stay (days)	2	2
Complications	None	None

procedure. The surgical procedure was successfully performed in a skin-to-skin time of approximately 180 minutes using a single 25-mm intra-umbilical vertical incision. Once 12-mmHg pneumoperitoneum was established and the RSS trocar was inserted, the docking time was 2.5 minutes. Before the single-site instruments were inserted, the cannula was widened to avoid tearing of the uterine wall by instruments. A bipolar forceps and monopolar hook were passed over the uterine myoma to locate the stalk, which was cauterized using the bipolar forceps and cut by the monopolar hook (Figure 2). The uterine serosal wall was sutured layer-by-layer with the wristed needle driver. The excised large myoma was pulled down in an extra-large endobag with the bilateral assistance of the bipolar forceps and wristed needle driver (Figure 3). To extract the myoma, the authors opened the bag through the wound retractor positioned in the umbilicus, and cut and removed the myoma in pieces. The single-site port was reinserted with three straight and reusable trocars to clean the blood and check the pelvic cavity.

Postoperatively, estimated blood loss was 200 ml and the hemoglobin level was slightly decreased. The patient had minimal pain, passed gas in 20 hours, and was discharged two days after surgery. Pathologic analysis demonstrated a 910-gram uterus with leiomyomas. No other postoperative complications occurred.

Case 2

A 40-year-old woman (body mass index 27.2 kg/m^2, gravida 0, para 0) had a history of pelvic pressure symptoms, hypermenor-

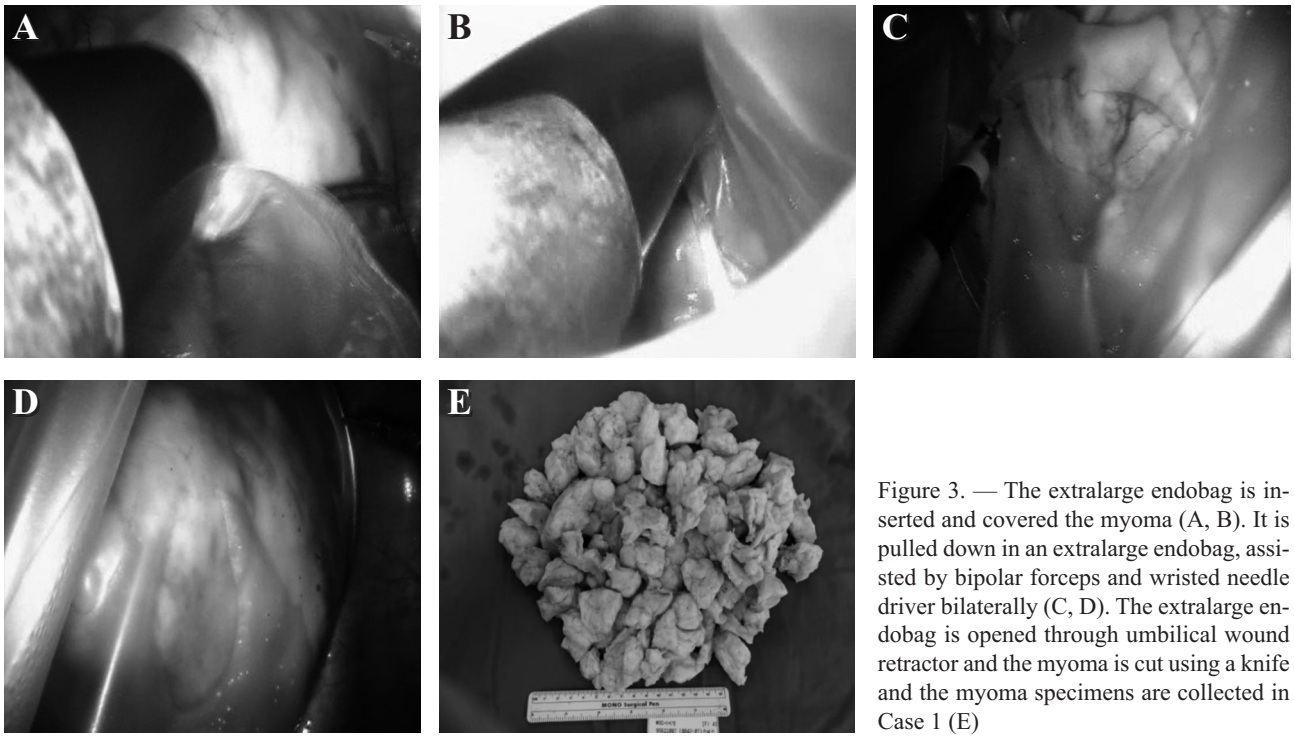

Figure 3. — The extralarge endobag is inserted and covered the myoma (A, B). It is pulled down in an extralarge endobag, assisted by bipolar forceps and wristed needle driver bilaterally (C, D). The extralarge endobag is opened through umbilical wound retractor and the myoma is cut using a knife and the myoma specimens are collected in Case 1 (E)

Figure 4. — Pelvic MRI and ultrasound findings in Case 2. There is a large myoma in posterior wall of uterus in coronal and sagittal planes (A, B). The myoma is located in mid-portion of uterus by transvaginal sonogram (C).

rhea, and dysmenorrhea with no previous abdominal history. Pelvic ultrasound and MRI revealed the uterus to measure 81×39 mm, with an intramural myoma having a maximum diameter of 120 mm, and normal appearing adnexa bilaterally (Figure 4). The patient received RSS myomectomy. The surgical procedure was successfully performed in approximately 240 minutes (skin-to-skin time) via a single 25-mm intra-umbilical vertical incision. Once 12-mmHg pneumoperitoneum was established and the specific single-site trocar inserted, docking time was two minutes 40 seconds. Before the single-site instrument was inserted, the cannula was widened to ensure the uterine wall was not torn by instruments. Bipolar forceps and monopolar hook were used to check the myoma broad stalk. The uterine serosal wall was cut three to four cm apart from the stalk and the uterine myoma was removed using the bipolar forceps and monopolar hook (Figure 5). The uterine wall was sutured in four layer-by-layer with a wristed needle driver. The excised large myoma was pulled down in an extra-large endobag assisted by the bipolar forceps and wristed needle driver bilaterally. To extract the myoma, the bag was opened through wound retractor in the umbilicus, and the myoma was cut and removed in pieces. The single-site port was reinserted with three straight and reusable trocars to clean the blood and to check the pelvic cavity.

Postoperatively, estimated blood loss was 150 ml and the hemoglobin level was slightly decreased. The patient had minimal pain, passed gas in 21 hours, and was discharged two days after

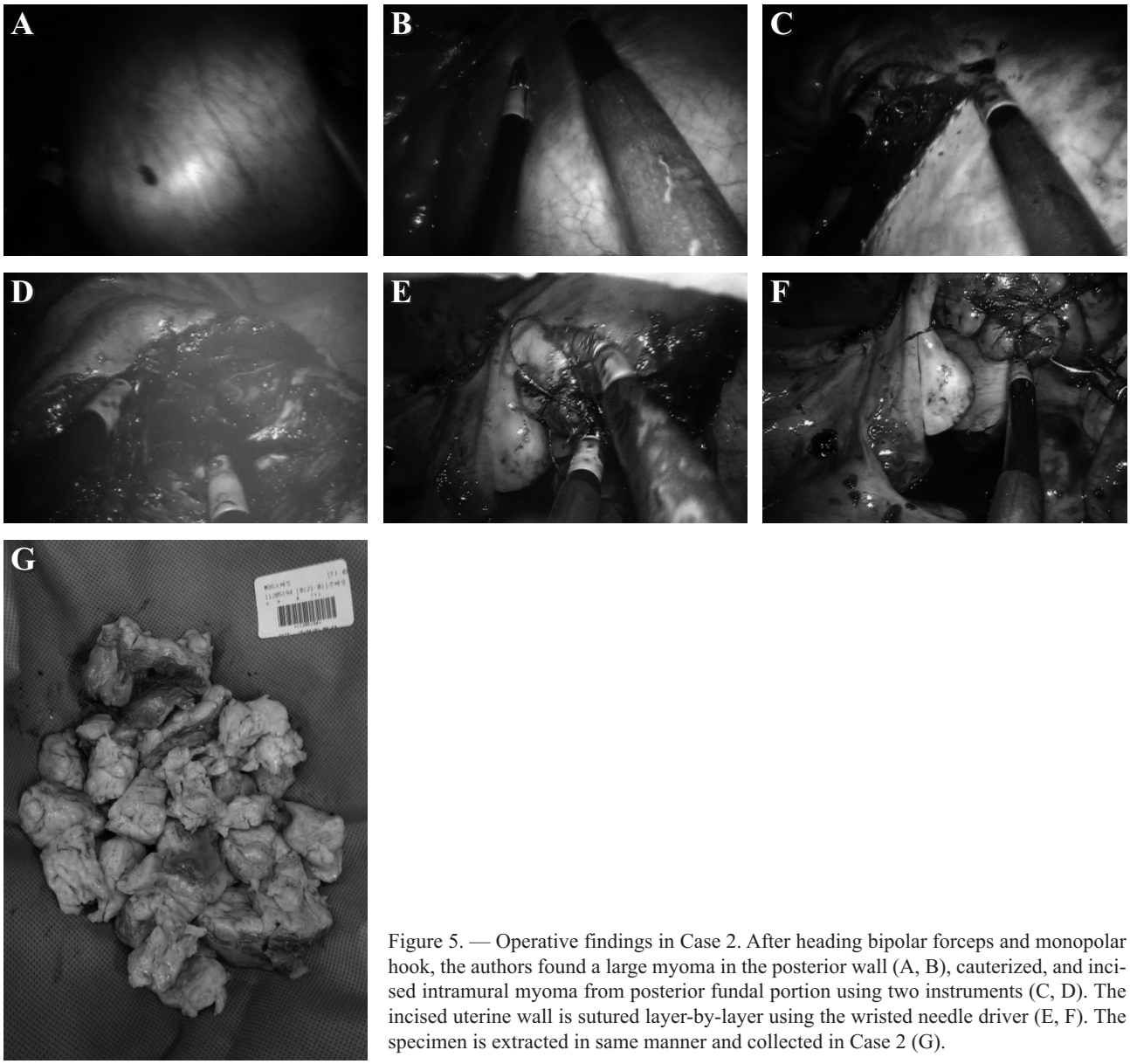

Figure 5. — Operative findings in Case 2. After heading bipolar forceps and monopolar hook, the authors found a large myoma in the posterior wall (A, B), cauterized, and incised intramural myoma from posterior fundal portion using two instruments (C, D). The incised uterine wall is sutured layer-by-layer using the wristed needle driver (E, F). The specimen is extracted in same manner and collected in Case 2 (G).

surgery. Pathologic analysis demonstrated a 870-gram uterus with leiomyomas. No other postoperative complications occurred. The uterus and scar were checked one month later. The uterus appeared normal by a transvaginal sonogram (Figure 6).

Discussion

LESS surgery has become gradually more prevalent in gynecology. However, the wide acceptance of LESS is hindered by drawbacks that include reduced triangulation and internal/external clashing of instruments. Development of RSS instrument and accessories represents a substantial evolution. Compared to the standard LESS procedure, RSS may present several advantages that include increased dexterity, range of motion, instrument and scope stability, ergonomics, and decreased instrument clashing. All these technical improvements have shortened the learning curve for single-site procedures, and might enable wider utilization of single-site procedures.

With the present authors, as experience accumulated with the RSS procedure (> 50 cases), the docking time decreased to under three minutes, with easier handling of both the cannula and assistant trocar, and with one incision already been cut by a knife in the umbilicus. The approach does not produce more abdominal pain after finishing the operation and helps the patient recover to daily life.

If the size of myoma exceeds 100 mm, it is very difficult to position the laparoscopic or multi-port robotic instrument to avoid the myoma. However, the RSS instrument

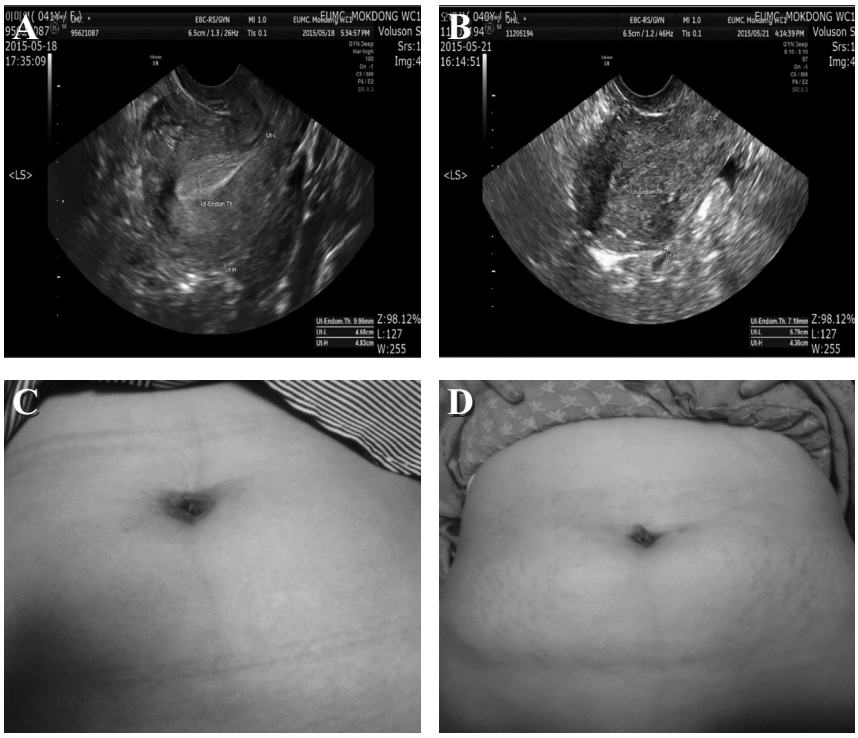

Figure 6. — Postoperative uterus has a normal aspect (A, B) and wound is not visible in both cases (C, D).

can be positioned over the myoma by means of the moving telescope. The authors removed both large subserosal myomas at the level of the stalk. Intramural myomas have not reportedly been suitable for LESS because of the need for multiple sutures to repair the deep myometrial defect [7]. However, in the present cases, removing the intramural, large myoma located deep in the uterus was feasible using the newly developed wristed needle driver and the successful suturing of the four layers of the uterine wall.

RSS myomectomy is very helpful to remove large myomas. After the recommendation of the Food and Drug Administration, limiting the use of laparoscopic power morcellation, extraction of myoma has become very challenging. In the present cases, myoma removal utilized an extra-large endobag. The bag is usually used for large myomas, but has previously been very difficult to do especially with LESS. However, the present authors covered the myoma with a bag and used the robotic bipolar forceps and wristed needle driver to deposit the myoma in the bag. The RSS instrument provided useful assistance and helped prevent spread of the myoma cells in the abdominal cavity.

After removing the specimen, the pelvic cavity could be irrigated and suctioned after positioning three robotic trocars in the single-site port. The operation is easily finished and operation time is decreased, except for cauterization. Remaining limitations are the capability of cauterization and instrument power when dealing with heavy tumors.

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