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A comparison between reduced-port robotic surgery and multiport robot-assisted laparoscopy for myomectomy

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ABSTRACT

Objective: To compare the surgical outcomes between reduced-port robotic surgery (RPRS) using the Octo-Port channel and multiport robot-assisted laparoscopy for myomectomy.
Study design: This prospective study compared and analyzed data from 15 consecutive women who underwent RPRS for myomectomy and 15 consecutive women who underwent multiport robot-assisted laparoscopy to treat symptomatic uterine myoma from January 2016 to June 2016. The patients were treated by two surgeons at two institutions.
Results: The two study groups did not differ demographically. The differences in surgical outcomes, such as docking time, console time, hospital stay, estimated blood loss, Hb change, myoma count, and weight, also did not differ between the two groups. On the contrary, the number of port site was only 2 in RPRS compared with 4–5 in multiport robot-assisted laparoscopic myomectomy.
Conclusion: RPRS for myomectomy seems technically feasible and safe, with short-term perioperative outcomes similar to those from multiport robot-assisted laparoscopic myomectomy.

Introduction

Uterine myomas are common pelvic tumors and can cause menorrhagia, pain, and infertility. It is well established that laparoscopic approaches yield shorter hospitalization time, faster recovery, decreased blood loss, fewer complications, and fewer expenses compared to abdominal approaches [1]. The cost of robot-assisted laparoscopic myomectomy (LM) is about 2.5 times that of conventional LM in South Korea's medical system. Although there are limitations such as high cost and non-commercialization, there is an attempt to implement robotic-assisted LM because of the advantages of robotic surgery. Currently, robot-assisted LM requires placement of multiple operating channels throughout the anterior abdominal wall. These ports are often located higher on the abdominal wall compared with those used for conventional laparoscopic surgery, causing a cosmetic dilemma. Recently, single-incision laparoscopic surgery (SILS) and robotic surgical systems have been integrated into modern surgical practice and have reshaped the field of gynecologic surgery [2,3]. However, SILS myomectomy is not widely performed due to its technical difficulty. The da Vinci Single-Site® platform (Intuitive Surgical, Sunnyvale, CA, USA) was designed to overcome the shortcomings of SILS and has been used to perform gynecologic operations, cholecystectomies, and some urological procedures [4–6]. However, the robotic single-site platform has several limitations, including reduced extracorporeal triangulation and a limited repertoire of non-articulating instruments and electrosurgical options compared with conventional multiport robotic surgery [7,8]. Reduced port robotic surgery (RPRS), which incorporated the da Vinci Single-Site® platform with a single robotic port, was introduced for left-sided colorectal cancer [9]. However, this approach is not widely used due to several limitations, including inhibition of wrist movement and limited range of motion of the semi-rigid robotic instruments [10].

In order to achieve satisfactory cosmetic results and to overcome these limitations, we tried an alternative method for RPRS using a multi-port robotic arm inserted into the laparoscopic single-port platform, instead of semi-rigid single-site robotic instruments.

Herein, we used the Octo-Port system (DalimSurgNet, Seoul, Korea), which was originally designed for SILS, thereby easily allowing us to perform RPRS for myomectomy using multiport instruments. This is the first time this RPRS method has been

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described. Therefore, the aim of this study was to compare the surgical outcomes between RPRS using the Octo-Port system and multiport robot-assisted LM.

Materials and methods

Study design and participants

This was a prospective, multicenter, nonrandomized study of patients with symptomatic myoma who underwent RPRS and multiport robotic-assisted LM. From January 2016 through June 2016, 15 consecutive patients underwent RPRS for uterine myomas using the da Vinci® surgical system at Kangbuk Samsung Hospital (KBSMC), and 15 consecutive patients underwent multiport robot-assisted LM for symptomatic uterine myomas at Ajou University Hospital (AJOUMC) in Korea.

Inclusion criteria were as follows: women with symptomatic myomas, such as menorrhagia, pelvic pressure/pain, or infertility; appropriate medical status for laparoscopic surgery; and women between 19 and 50 years of age. Exclusion criteria were as follows: women with a dominant pedunculated subserosal myoma (International Federation of Gynecology and Obstetrics (FIGO) classification type 7); women who had six or more myomas (this definition does not include myomas which do not need separate suture procedure after myomectomy); women with the largest myoma >10 cm; women who need concomitant complex surgical procedures at the time of robot-assisted LM, such as severe adhesiolysis due to endometriosis or other previous surgery; women with any suggestion of malignant uterine or adnexal diseases; women with major medical comorbidities or psychiatric illnesses, which could affect follow-up and/or compliance; and women who refused to participate or give consent to the procedures.

The research protocol was approved in accordance with the ethical standards of the Declaration of Helsinki (IRB: 2016-01-083-004). Patient demographic data were collected prospectively from the KBSMC and AJOUMC gynecologic disease databases and included data on age, body mass index, parity, previous abdominal surgery, myoma characteristics (number, largest diameter, and location) and chief complaint. Myoma location was categorized according to the FIGO classification system. Perioperative details included docking time (time from first incision to complete docking of the robotic arms to the trocars), console time (time required for the surgeon to perform the procedure at the console), surgery conversion, and postoperative complications.

The largest myoma was categorized based on the greatest diameter of the largest myoma reported on preoperative imaging with ultrasonography, computed tomography (CT), or magnetic resonance imaging (MRI). Myoma weight was estimated by the pathologist. Conversions were defined as either (1) addition of trocars or (2) conversion to laparotomy.

Technique

All robotic surgeries were performed using the da Vinci robotic surgical system. Two surgeons (KWY, PJ) performed all surgeries for all cases included in this study.

While under general anesthesia, each patient was placed in the dorsal lithotomy position. At the start of surgery, an approximately 3-cm vertical umbilical incision was made via an open Hasson approach for the RPRS cases. Before the Octo-Port was positioned at the incision, an 8.5-mm robotic cannula or 12-mm laparoscopic cannula was introduced through the 5-mm rubber channel of the Octo-Port, after the cap component was removed. During this process, to prevent CO_2 gas leakage, an iodine-impregnated incision drape (Ioban®) was used to cover the cannula and channel (Fig. 1). After achieving pneumoperitoneum via insufflation of CO_2 to 14 mmHg, the patient was placed in the Trendelenburg position at 20°. An 8.5-mm or 12-mm da Vinci endoscope with a 0°-angled view was then inserted. An 8-mm conventional robotic port was inserted into the 12-mm channel of the Octo-Port. An additional 8-mm conventional robotic port for the Endowrist® system was inserted into the usual robotic port site on the patient's right abdomen while under direct visual observation. The robotic system's patient-side cart was positioned centrally between the patient's legs and docked at the camera port. The second assistant, positioned between the patient's legs and the patient-side cart, manipulated the uterine elevator to provide an effective surgical field. Multiport protocols require a 12-mm trocar at the camera's umbilicus, a 5-mm assistant port, and two or three 8-mm lateral robotic trocars at each lower quadrant of the abdomen, 2–3 cm below the umbilical lever, and a 5-mm conventional trocar between the umbilicus and the left robotic arm for the bedside assistant. The bedside assistant provided assistance for all procedures, such as suction, irrigation, and tissue retraction.

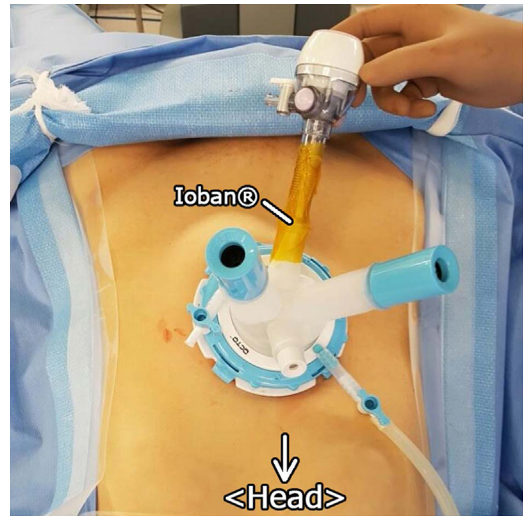

Fig. 1. To prevent CO_2 gas leakage, an iodine-impregnated incision drape (Ioban®) was used to cover the cannula and channel.

Using fenestrated bipolar forceps (Intuitive Surgical, Sunnyvale, CA, USA) and Hot Shears™ monopolar curved scissors, a hysterotomy was made over the myoma (Fig. 2). The incision was made on a longitudinal or horizontal axis according to the surgeon's preference and the patient's condition. A layer-by-layer dissection was carried out to identify and enter the plane between

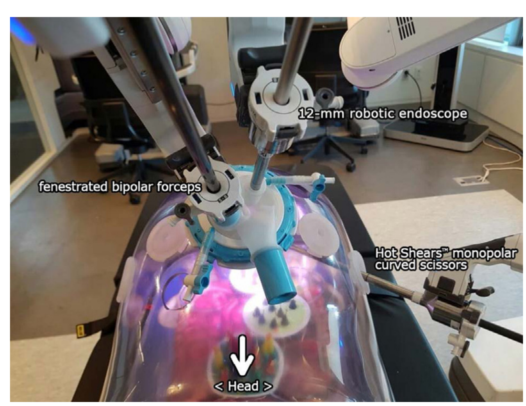

Fig. 2. For better understanding, this is a picture demonstrating the port insertion using da Vinci® Xi™ Surgical System and simulation unit.