

Robotic hysterectomy with pelvic lymphadenectomy for early endometrial cancer in a patient with situs inversus totalis using 3D-CT analysis: a case report

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Background: Pelvic lymphadenectomy should be considered the standard of care for endometrial cancer patients with intermediate-risk. In such cases, lymph node assessment may be performed via a minimally invasive approach. Situs inversus totalis is a congenital condition wherein the major visceral organs are reversed or mirrored from their normal anatomical positions. Reports state that performing surgery on patients with this condition is difficult due to the anatomical abnormality. However, few clinical studies have been conducted to evaluate the efficacy of robotic surgery for endometrial cancer patients with situs inversus totalis because it is technically challenging. **Case presentation:** A 69-year-old woman with situs inversus totalis (gravida 2 para 2) was brought to our hospital due to a uterine tumor. Endometrial biopsy showed grade 1 endometrioid carcinoma. Using 3 dimensional -computed tomography reconstruction, her common iliac arteries and veins were found to be reversed or mirrored from their normal positions. She underwent hysterectomy with pelvic lymphadenectomy using the multi-articulated arms or 3 dimensional high-definite vision of the da Vinci® surgical system, and 19 lymph nodes were harvested. She was followed up for 24 months without signs of recurrence. **Conclusion:** The multi-articulated arms or 3 dimensional high-definite vision of the da Vinci® surgical system may be a feasible and safe approach for performing a pelvic lymphadenectomy on patients with situs inversus totalis using 3 dimensional computed tomography analysis.

Keywords

Situs inversus totalis; Robotic hysterectomy; Pelvic lymphadenectomy; Early endometrial cancer

1. Introduction

Situs Inversus totalis (SIT) is rare congenital condition, that occurring in one out of 10,000-20,000 people [1], wherein the major visceral organs are reversed or mirrored from their normal anatomical positions [2]. Reports state that performing surgery on patients with this condition is difficult due to the mirror image seen in two-dimensional totally laparoscopic surgery of the upper abdomen [3–5]. Contrarily, lower abdominal surgery using two-dimensional laparoscopic surgery for SIT is not considered difficult. Although hysterectomy is relatively easy because of the normal

uterine position, pelvic lymphadenectomy can result in major bleeding because the positions of the common iliac arteries and veins are reversed [6]. The use of minimally invasive surgery (MIS) for endometrial carcinoma is increasing every year. According to Recommendation 4.10 of The European Society for Medical Oncology (ESMO) guidelines, minimally invasive surgery is recommended in the surgical management of low- and intermediate-risk endometrial cancer [7]. The multi-articulated arms or 3D high-definite vision of the da Vinci® surgical system was reported to be useful for patients with gynecologic cancer [8].

Few clinical studies have been conducted to evaluate the effectiveness of robotic surgery in patients with endometrial cancer. In this study, we report the case of a 69-year-old SIT patient who underwent robotic hysterectomy with pelvic lymphadenectomy. Written informed consent for publication was obtained from the patient.

2. Case presentation

A 69-year-old woman with SIT (gravida 2 para 2) was brought to our hospital due to a uterine tumor. She was hypertensive and had no pertinent family history. She appeared healthy on physical examination. Her height, weight, and body mass index were 150 cm, 62 kg, and 27.5 kg/m², respectively. Dextrocardia, situs inversus totalis, and a 40 mm × 30 mm uterine tumor were noted on CT scan- (Fig. 1) 3D-CT, reconstruction showed that her common iliac arteries and veins were mirrored from their normal positions. Endometrial biopsy showed grade 1 endometrioid carcinoma. Magnetic resonance imaging (MRI) showed an endometrial tumor. Surgical excision via robotic assisted hysterectomy with pelvic lymphadenectomy was performed. Mariani A *et al.* and Gilani S *et al.* have reported that pelvic lymph node metastasis rate was 15% in a patient with endometrial cancer which tumor diameter was > 2 cm, we have usually performed pelvic lymphadenectomy in a patient with early endometrial cancer > 2 cm [9, 10]. A total of 19 lymph nodes were harvested using the da Vinci Si (Surgical System; Intuitive Surgical, Inc.,

Sunnyvale, CA, USA). Histological examination of the specimen confirmed stage IA endometrial carcinoma based on the 2009 International Federation of Gynecology and Obstetrics staging system and a TNM staging of a pT1aN0M0. This staging was based on the findings of a histological subtype of- endometrioid carcinoma, grade 1, with no lymphatic vessel stromal invasion, no myometrial invasion, and tumor size (2 cm). No metastasis was found in lymphatic tissue (0/19).



Fig. 1. Dextrocardia is evident on Chest radiography.

Adjuvant therapy was not administered. She had an uneventful postoperative recovery. Complete clinical remission was obtained after 24 months. The patient provided informed consent for publication of this report.

2.1 Procedure

The patient was placed in a steep Trendelenburg position. The uterine manipulator is not usually used for endometrial cancer at our hospital.

A 12 mm trocar for the introduction of the camera and intraperitoneal inspection was inserted sub-umbilically. Carbon dioxide pneumoperitoneum was subsequently generated to keep the intra-abdominal pressure below 10 mmHg. The two instrument ports (8 mm trocar) were placed on the right side, and one port was placed in the patient's far left side. Subsequently, the assistant port was placed on the patient's left side. Modified hysterectomy and bilateral salpingo-oophorectomy were performed as per usual manual procedures. After identifying the ureter crossing over the common iliac artery, the positions of the common iliac arteries and veins were identified based on the 3D-CT image (Fig. 2), and pelvic lymph node dissection was performed (Fig. 3A,B,C). The pelvic lymph node dissection included the lymph nodes near the bifurcation of the external and internal iliac arteries to the deep circumflex vein. The operation

lasted for 226 minutes, and the blood loss was 5 mL.

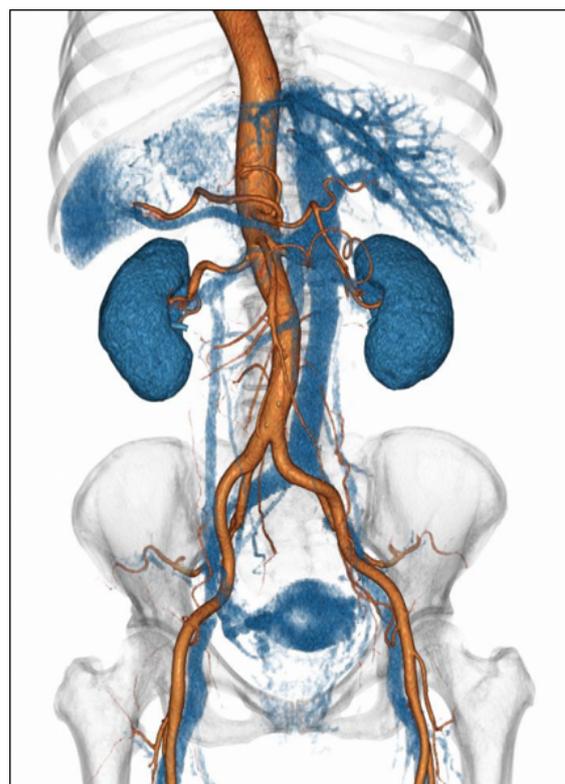


Fig. 2. 3-D CT reconstruction; The common iliac arteries and veins were reversed or mirrored from their normal positions.

3. Discussion and conclusion

In this study, we reported the use of robotic hysterectomy and pelvic lymphadenectomy on an SIT patient using 3D-CT analysis. The etiopathogenesis of the reversal of abdominal and thoracic viscera is unknown. According to a retrospective study of an SIT patient, performing surgery was difficult due to the mirror image shown in the two-dimensional totally laparoscopic surgery of the upper abdominal surgery [3–5]. Cao *et al.* reported that robotic surgery for gastric cancer is a safe and feasible alternative to laparoscopic surgery and can be successfully used to treat gastric cancer in patients with SIT and multiple anatomic variations [3].

In contrast, only a few clinical studies have been conducted to evaluate the effectiveness of robotic surgery for endometrial cancer patients with SIT. MIS for endometrial carcinoma is recommended by ESMO guidelines [7]. The number of performed MIS for endometrial cancer is increasing annually-since the procedure is associated with significantly less pain, minimal blood loss, fewer complications, shorter hospital stay, and a faster return to normal activities than open surgery [8, 11].

MIS provides many advantages, including a magnified view of anatomic structures. First, during pelvic lymph node dissection for gynecologic malignant disease, we always ex-

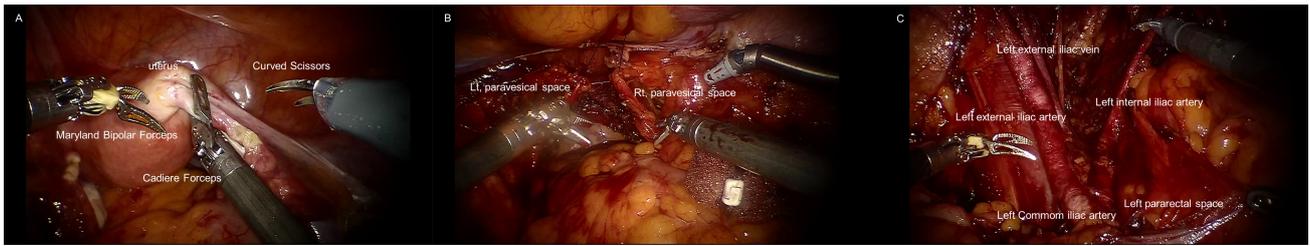


Fig. 3. Robotic hysterectomy and pelvic lymph adenectomy with SIT. Uterus (A), paravesical space (B), the common iliac artery, external artery and vein and internal iliac artery on the left side (C).

plore the paravesical and pararectal retroperitoneal space. We tried to explore the pararectal space in this case; however, it was difficult to open the space due to the reversed positions of the common iliac arteries and veins. The operation was made more difficult because of the abnormalities the patient had. It is important that during this procedure, the orientation of pelvic structures should begin with identification of the sacral promontory. This is the summit of the pelvis, which can be used as a fixed point of reference for pelvic lymph node dissection. In this case, while using the da Vinci Si system, the surgeon's right hand controlled a Curved Scissors for dissection, while Cadiere Forceps and Maryland Bipolar Forceps were respectively controlled by the right hand and the left hand for retraction. The superiority of the 3D view with depth perception, ergonomic position and the wristed control system assisted in overcoming difficulties. While robotic surgery was difficult in this case, laparoscopic surgery would have been even more difficult due to hand tremor amplification, uncomfortable ergonomic positions for surgeons, and restricted ranges of instrument movement.

Laparoscopic surgery on SIT patients has disadvantages, including the 2-dimensional surgery, camera shake, and restrictions due to long and straight laparoscopic instruments in the pelvic space [12, 13]. Another major issue is the need for surgeons to undergo special training for this type of surgery. Laparoscopic surgery also has limited ergonomics in all areas of surgery [14].

More recent 3D visualization systems in laparoscopy have provided excellent image quality. This level of magnification can significantly enhance the surgeon's ability to safely perform surgery on SIT patients with inverted common iliac arteries and veins. The use of 3D laparoscopy leads to shorter surgery times, shorter hospitalization, and less postoperative pain.

Notably, preoperative information on blood vessels can be obtained radiographically, and pelvic lymphadenectomy is preferred. In this study, preoperative evaluation using 3D-CT images showed promising results in the treatment of SIT patients [15].

The multi-articulated arms or 3D high-definite vision of the da Vinci® surgical system may be a feasible and safe approach for performing a pelvic lymphadenectomy on patients

with SIT using 3D-CT analysis.

Abbreviations

3D-CT, 3Dimensional computed tomography; ESMO, European Society for Medical Oncology; MIS, Minimally invasive surgery; MRI, Magnetic resonance imaging; SIT, Situs inversus totalis.

Author contributions

YH, EK wrote the manuscript. MN, MK, KY and TI performed follow-up and collected the data. All authors read and approved the final manuscript.

Ethics approval and consent to participate

IRB approval.

Mie gynecologic oncology survey was approved by the Ethics Committee of Mie University Hospital.

IRB approval was not required in this case report under three case.

The patient provided informed consent for publication of this report.

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Conflict of interest

The authors declare that they have no competing interest.

Data availability

The datasets used and analyzed in this study are not publicly available (to maintain privacy) but are available from the corresponding author on reasonable request.

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