Intraoperative near infrared fluorescence for detecting sentinel lymph nodes in the robotic surgical approach of endometrial cancer

Fabio Barra[1,2], Franco Alessandri[3], Giulio Evangelisti[1,2], Claudio Gustavino[3], Simone Ferrero[1,2], Maria Grazia Centurioni[3]

[1]Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DiNOGMI), University of Genova, Genova, Italy; [2]Academic Unit of Obstetrics and Gynecology, [3]Unit of Obstetrics and Gynecology, IRCCS Ospedale Policlinico San Martino, Genova, Italy

Correspondence to: Fabio Barra, MD. Academic Unit of Obstetrics and Gynecology, IRCCS Ospedale Policlinico San Martino, Largo R. Benzi 10, 16132 Genoa, Italy. Email: fabio.barra@icloud.com.

Abstract: In recent years sentinel lymph node (SLN) mapping has emerged as an attractive investigational approach for the treatment of gynecological cancers, and in particular, endometrial cancer (EC). In fact, radical lymphadenectomy may have no therapeutic benefit in patients with early-stage EC who have low probability of lymph nodes involvement; subsequently, SLN mapping may decrease unnecessary lymph node dissections. In recent years, the number of minimally invasive procedures for gynecologic oncology has increased, with robotic procedures rising remarkably. Robotic SLN evaluation by intraoperative near infrared fluorescence (INIF) imaging system (Firefly™, Intuitive Surgical Inc., Sunnyvale, CA, USA) is an innovative surgical tool, which allows for a rapid conversion from the normal robotic view to that for detecting fluorescent indocyanine green (ICG). The aim of this video is to describe the use of this tool and technical outcomes of SLN dissection during our single-center experience in the robotic surgical approach of patients with early endometrial cancer.

Keywords: Sentinel lymph node (SLN); endometrial cancer (EC); robotic-assisted laparoscopic hysterectomy; lymphadenectomy

Introduction

Endometrial cancer is the most common gynecologic malignancy. The mainstay of treatment for endometrial cancer (EC) is total hysterectomy with bilateral salpingo-oophorectomy (1,2). In recent years sentinel lymph node (SLN) mapping has emerged as an attractive investigational approach for the treatment of this neoplasia. In fact, because radical lymphadenectomy may have no therapeutic benefit in patients with early-stage EC who have low probability of lymph node involvement (3); subsequently, SLN mapping may decrease unnecessary lymph node dissections (4). Recently, the number of minimally invasive procedures for gynecologic oncology has risen, with the frequency of robotic procedures showing a marked increase (5). The aim of this video is to describe the use of this tool and the technical outcomes (e.g., rate of detection, main localizations) of SLN dissection during our single-center experience in the robotic surgical approach of patients with early endometrial cancer.

Operative technique

Overall, 36 women with apparent preoperative FIGO stage I endometrial cancer at preoperative magnetic resonance imaging (MRI), and a previous biopsy demonstrating a low-grade (G1) endometroid histology underwent robotic-assisted laparoscopic total hysterectomy with bilateral
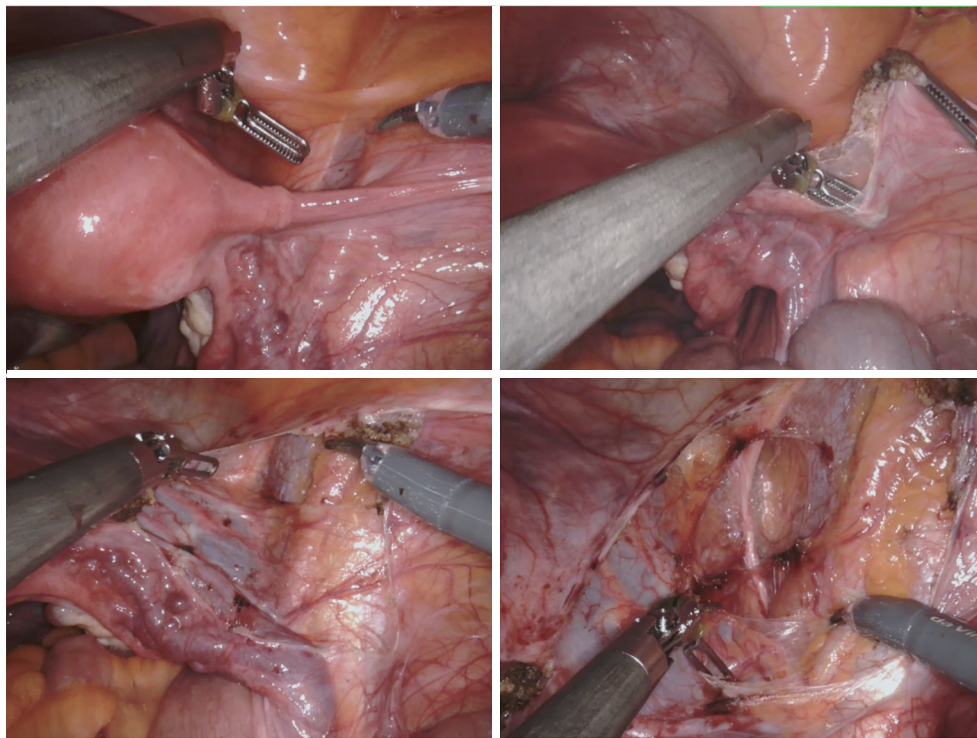
Figure 1 Dissection of pelvic pararectal and paravesical spaces.

salpingo-oophorectomy plus sampling of uterine SLNs, and were included in this feasibility study.

During our robotic experience using the da Vinci Xi™ platform (Intuitive Surgical Inc., Sunnyvale, CA, USA) immediately after the anesthesia and the robotic docking and prior to the insertion of a uterine manipulator, 4 mL of indocyanine green (ICG) 1% dye were slowly injected superficially (0.1 cm) and deeply (1 cm) into the cervix at the 3 and 9 o'clock positions by a spinal needle.

The INIF imaging system is a tool developed to detect the fluorescent light from ICG through a robotic-assisted surgical approach. Specifically, its equipment includes a fluorescence-capable illuminator, a camera head, and an endoscope. Other systems with similar function have been developed for conventional laparoscopy. The INIF image system enables rapid conversion from the normal robotic view to that for detecting fluorescent ICG, and this procedure can be promptly completed by holding the camera control pedal at the console and then sliding the finger switch. Moreover, it affords the ability to maintain the usual visualization without any dye in the field (unlike isosulfan blue) and thus enables direct visualization of the SLN (in contrast to radioisotope, which requires a Geiger counter inserted into the field).

At the beginning of the surgical procedure, the pelvis was carefully evaluated, and a peritoneal washing was obtained; then, an accurate dissection was performed by opening the pararectal and paravesical spaces (*Figure 1*). Various nodal regions (e.g., the external iliac, obturator, and presacral regions) were explored for identifying the fluorescent SLN (approximately after 20 min after the tracer injection) by the INIF camera. The SLNs of both pelvic sides were removed (*Figures 2,3*) in order to be histologically evaluated according to the standardized ultra-staging protocol (6) (*Figure 4*).

Comments

Our experience in lymphatic mapping and SLN detection by INIF during robotic-assisted laparoscopy for treating patients with EC was favorable. Overall, we performed the procedure in 36 patients with apparent uterine-confined disease at preoperative imaging (MRI) and a previous biopsy demonstrating endometroid histology. A total of 95 surgical specimens suspected to be SLNs were extracted and sent to pathological evaluation; 92 specimens (96.8%)
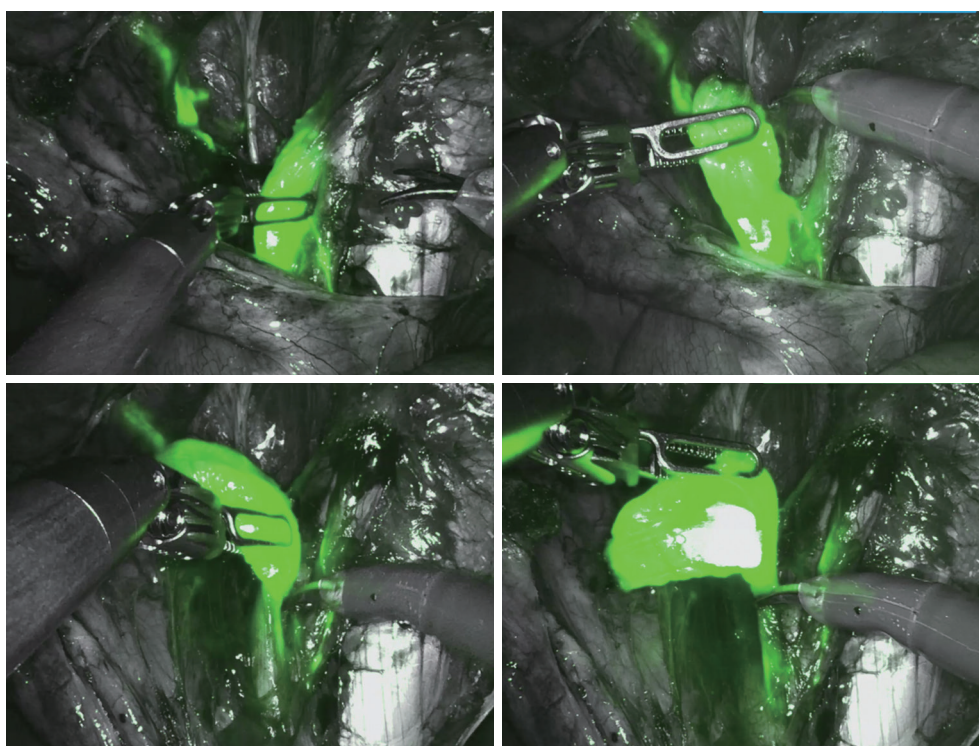
Figure 2 Dissection of a sentinel external ilium lymph node.

Figure 3 Sentinel lymph node sample (largest diameter 20 mm) after extraction.


Figure 4 Intraoperative near infrared fluorescence for detecting sentinel lymph node in the robotic surgical approach of endometrial cancer (7).

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had a certain pathological diagnosis of nodal tissue, and thus were mapped for side and specific localization. Overall, 49 (53.3%) SLN specimens were removed from the left side, and 43 (47.7%) were removed from the right side. The SLNs were most commonly identified by surgeons in these two locations: the external ilium (n=45/92, 48.9%) and the obturator/internal ilium (n=23/92, 25.0%) (*Figure 5*). We identified at least 1 SLN in 94.4% of the subjects (n=34/36), whereas a bilateral mapping was successful in 86.1% of the subjects (n=31/36); the mean time to identify an SLN was 23.4 min (range, 8–47 min). There was no significant difference in the surgical time for extracting the SLNs from each pelvic side (P<0.001).

In conclusion, this technique has been demonstrated to be feasible, safe, reliable, and time efficient, allowing for the
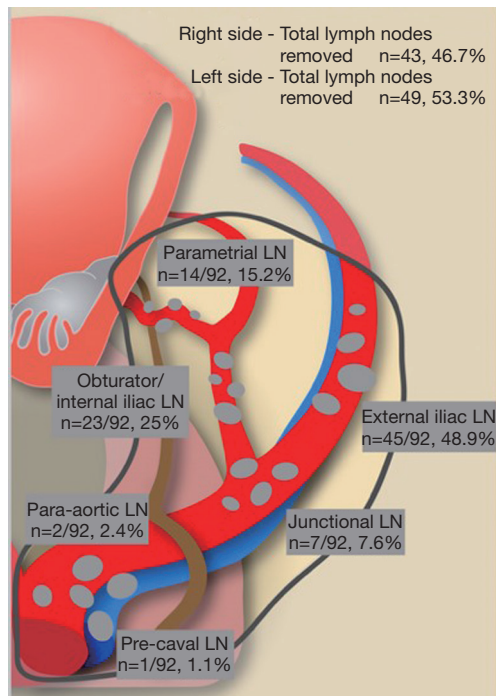
Figure 5 Main localizations of sentinel lymph nodes during the robotic-assisted surgical approach for endometrial cancer

identification of SLNs with elevated detection rates in this setting.

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Footnote

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