Laparoendoscopic Single-Site Isobaric Hysterectomy in Endometrial Cancer

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INTRODUCTION

Laparoscopy is becoming a standard surgical treatment for early stage endometrial cancer, resulting in survival rates similar to laparotomy.[1] Gynecological surgery is a minimally invasive approach, able to both reduce postoperative pain and improve cosmetics in a safe manner. In this context, several laparoendoscopic single-site (LESS) hysterectomies have been described in recent literature for the surgical management of early stage endometrial cancer[2,3] Preliminary data show the feasibility of this approach and the benefits in terms of postoperative pain.

Isobaric laparoscopy is a valid alternative to pneumoperitoneum in patients with contraindications to its induction. The isobaric technique allows surgeons to avoid the risks of intraabdominal pressure and to retain the advantages of minimally invasive access.[4] Therefore, the use of the isobaric technique eliminates postoperative shoulder pain, typical of pneumoperitoneum classic laparoscopy. In addition, the isobaric technique also allows the surgeon to perform an epidural anesthesia and continuous suction of blood loss or peritoneal fluids, without compromising the stability of the work chamber.[4] The technique can be applied to any patient, even in the presence of pneumoperitoneum-contraindicating diseases. Several studies have demonstrated that pneumoperitoneum may have hemodynamic, metabolic, and neurologic effects. Pneumoperitoneum causes positive pressure in the abdominal cavity and a reduction of venous return to the heart, resulting in peripheral venous stasis. Moreover, large quantities of CO_2 used for the pneumoperitoneum induction pass in the blood stream causing hypercapnia. As a consequence, the reduced cardiac preload and the strong secretion of stress hormones by the kidneys and adrenals determine heart failure in predisposed patients. Venous stasis increases the thromboembolism risk in patients with blood dyscrasias. Hypercapnia due to insufflation of CO_2 with subsequent respiratory acidosis can affect patients suffering from respiratory pathologies. Hence, the use of pneumoperitoneum has contraindications in high-risk patients affected by severe cardiovascular insufficiency, advanced chronic obstructive bronchitis , glaucoma, blood dyscrasias, obesity, and neurologic diseases.[5]

To our knowledge, this is the first report that describes a LESS hysterectomy performed via isobaric technique on a conscious patient who received epidural anesthesia and a TAP (Transversus Abdominis Plane) block anesthesia. The TAP block was developed for postoperative pain control in gynecological and abdominal surgery, but can also be used for analgesia during surgical procedures as described by our team.[6,7]

CASE STUDY

A 39-y-old woman with untreated chronic hypertension and a body mass index (BMI) equal to 34, affected by early clinical stage endometrioid endometrial cancer, was admitted for isobaric LESS-hysterectomy *plus* bilateral salpingo-oophorectomy. The patient underwent a staging magnetic resonance imaging (MRI) and a transvaginal ultrasound with a clinical FIGO result (International Federation of Gynecology and Obstetrics) stage IA.[8] The gasless technique was preferred to standard pneumoperitoneum due to the patient's severe obesity and untreated chronic hypertension. The team of anesthesiologists chose the TAP-Block analgesia, because the isobaric laparoscopy allows the use of local anesthesia. This technique is known for its positive outcomes in gynecologic surgery, as it minimizes intra- and postoperative opioid use, length of stay, and postoperative nausea and vomiting.[7]

The procedure was performed via a multichannel single port (Olympus Winter & IBE GMBH, Hamburg, Germany) inserted into the umbilicus through an open access. The Laparotenser (Lucini Surgical Concept, Milan, Italy) was the surgical instrument used to replace classic pneumoperitoneum-inducing devices: it elevates and retracts the abdominal wall, creating a large intraabdominal operative space. The

procedure was performed using the Trendelenburg position up to 30 degrees. Initially, 2 curved needles (Pluriplan) with blunt tips were introduced subcutaneously through 2 very small (2-mm) incisions in the supra-pubic skin. The Laparotenser has 2 particular devices: the lifting device that allows the operator to lift with minimum effort and movement, and a divaricator device composed of needles in the terminal part, which can appropriately distribute the tissue tensions during the procedure. The divaricator exploits the elastic properties of the tissue that lies between the needles. In addition, the unique tips will not apply any cutting force in the tissue, avoiding trauma. The needles are suspended from a mechanical arm attached to a rigid pillar, and the arm is elevated as far as to obtain optimal exposure without using

Figure 1. External vision of laparoendoscopic single-site port (A) and isobaric elevator with the 2 needles positioned in the subcutaneous tissue (B).

Figure 2. External surgical field.

pneumoperitoneum **(Figures 1, 2)**. Intraabdominal visualization was obtained with a 5-mm, 30° telescope with flexible handling (Olympus Winter & Ibe GmbH). Standard straight 5-mm instruments, such as graspers, cold scissors, suction/irrigation instruments, and a multifunctional device that grasps, coagulates, and transects simultaneously (PKS Cutting Forceps; Gyrus ACMI, Hamburg, Germany) were used. Following coagulation of the tubes, an intrauterine manipulator was used. The coagulation and section of the round ligaments was performed to allow entry into the retroperitoneal space **(Figure 3)**. The ureter was visualized, and a hemostatic clip was positioned bilaterally at the origin of the uterine artery and at the ovarian vessels. An adequate margin of the vagina was ensured before the colpectomy was performed using a bipolar hook **(Figure 4)**. The uterus and adnexa were taken out through the vagina with the manipulator in situ. The frozen section of the uterus confirmed the diagnosis of endometrioid endometrial well-differentiated cancer infiltrating < 50% of the myometrium, so that pelvic and aortic lymphadenectomy was not performed according to our internal guidelines.[9]

During surgery the patient was conscious and felt no pain. On a scale from 0 to 10 her degree of pain was

Figure 3. Single-port isobaric retroperitoneum opening.

Figure 4. Single-port isobaric vesico-vaginal space dissection.

rated as 0, according to the Numeric Rating Scale.[10] No vascular or visceral injuries and no intraoperative port-site bleeding occurred during the surgical activities. No hematoma or subcutaneous injuries were found upon removal of the Laparotenser tool. The operation time was 150 min with an estimated blood loss of 30 mL. No wound hematoma, wound infection, or delayed bleeding were observed postoperatively. The patient reported complete satisfaction with the cosmetic appearance and postoperative pain control. During the hospital stay, the patient quantified pain using the Numeric Rating Scale: she declared "2" in the first 6 h after the surgery and "1" in the following hours. She did not experience any shoulder pain typical of standard laparoscopy, and she never asked for routine analgesic drugs during the postoperative period. She was mobilized and discharged the day after the surgical procedure with optional analgesic therapy. No postoperative complications were reported in the first 30 d.

Definitive histology confirmed the frozen section diagnosis. She was declared disease-free after a 9-mo follow-up.

DISCUSSION

Laparoscopy is becoming a standard surgical treatment for early-stage endometrial cancer, resulting in survival rates similar to those of laparotomy.[1] The advantages of performing total laparoscopic hysterectomy or a laparoscopic-assisted vaginal hysterectomy, such as a shorter hospital stay, decreased pain, and quicker resumption of daily activities, have previously been reported.[11,12] Efforts have been made to further reduce the invasiveness of the laparoscopic approach through single-port surgery and the so-called mini-laparoscopy, in which instruments of $\leq$ 3 mm are used. Preliminary studies have confirmed the feasibility of this new technique.[2,3,13]

We describe the first total single-port isobaric hysterectomy performed on an early-stage endometrial cancer patient in TAP-block analgesia. The patient declared complete satisfaction with the cosmetic appearance, postoperative pain control and quality of life. No postoperative complications were reported in the first 30 d, and after 9 mo of follow-up, she is disease free.

Isobaric laparoscopy could be very useful in endometrial cancer patients with a high BMI and associated comorbidities (cardiovascular disease, advanced chronic obstructive bronchitis, and neurologic diseases). The population of women with early clinical stage endometrial cancer are often excluded by a minimally invasive pneu-

moperitoneum-inducing laparoscopic approach, because of the pneumoperitoneum-related contraindications.[14,15] The combinations of LESS surgery and isobaric technique might be the solution in all these cases.

The present case highlights the feasibility of LESS and the isobaric hysterectomy in TAP-block anesthesia for early clinical stage low-risk endometrial cancer. Intraoperative parameters, such as operation time, estimated blood loss, and postoperative outcomes, hospital stay, cosmetic result, and disease-free survival, are comparable to those obtained through standard laparoscopy. We also observed a decreased opioid use during surgery and the absence of postoperative anaesthesia-related neuro-vegetative symptoms. These additional benefits make this technique an attractive alternative to classic laparoscopy which does not allow the use of TAP-block analgesia. Larger prospective studies need to confirm these results and to compare the gasless LESS procedures with the conventional gas-based LESS hysterectomy.

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