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CASE REPORT

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An easier ureteral tunnel approach during laparoscopic-assisted radical vaginal hysterectomy

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Abstract Identification and mobilization of the ureters is the most difficult part of the Schauta operation and is the most risky and time-consuming step in laparoscopic radical hysterectomy. Since February 2003 we have used a modified technique of laparoscopic radical hysterectomy for managing seven cases of stage IB1 cervical cancer. This technique is based on that described by Querleu–Dargent, but it includes a modified step to treat the parametria and the ureteral tunnel. Both ureters are identified and isolated by placing vessel loops. The ends of the vessel loop are placed into the vagina through the anterior colpotomy previously performed. Once in the vaginal route, gentle traction of the vessel loops allows easy identification and dissection of the ureter. Caudal parametrial management is the most time-consuming of the laparoscopic approaches, and a high risk of ureteral damage is always present. Depending on vaginal conditions, managing the proximal parametrium and ureters is difficult, and Schuchardt's incision may be necessary. Laparoscopic vessel loop isolation of the ureters allows easier and safer vaginal management of the ureteral tunnel during laparoscopic vaginal radical hysterectomy.

Keywords Laparoscopic-assisted radical vaginal hysterectomy · Ureteral tunnel · Vessel loop

Introduction

Three major variants of modified radical hysterectomy using laparoscopic surgery have been described. Laparoscopic lymphadenectomy combined with Schauta–Amreich hysterectomy, in which the laparoscopic step is limited to lymph node assessment and radical hysterectomy, is fully performed in the vaginal route according to the Schauta–Amreich technique. Schuchardt's incision is frequently used in this technique to make the operative field wider and to open paravisceral spaces [1]. Complete laparoscopic lymphadenectomy plus radical hysterectomy have been described by Canis et al. [2] and Nezhat et al. [3]. Between these two techniques are different grades of a combined laparoscopic and vaginal approach, including the coelio-Schauta procedure [1], in which the laparoscopic step includes uterine vessel and paracervical ligament transection before the vaginal approach, and the Querleu original procedure [4], in which the goal of laparoscopic assistance is mobilization of the bladder and terminal ureters from the vagina and from the proximal part of the cardinal ligament to ensure the safety of the vaginal step of the operation.

In this report we describe our variant technique for the parametrial approach. The rationale for this technique is to avoid Schuchardt's incision, to identify and mobilize the ureters, and to avoid the riskiest and most time-consuming step of the laparoscopic ureteral tunnel dissection.

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Case report

From February 2003 to December 2004 we used a modified laparoscopic radical hysterectomy technique to manage seven cases of stage IB1 cervical cancer. This technique is based on that described by Querleu and Leblanc [4], but it includes a modified step to treat the parametria and the ureteral tunnel. This modified laparoscopic radical hysterectomy is reported in detail as follows.

The lithotomy position with abduction and extended legs at 45° is preferred. A Veress needle is placed in the left upper quadrant in the midclavicular line just below

the costal margin. Insufflation is brought up to 25 mmHg before insertion of a 12-mm umbilical trocar. After insertion of this trocar, intraperitoneal pressure is reduced to 14–15 mmHg. Two 5-mm ports are placed lateral to the inferior epigastric artery, 1 or 2 cm below the umbilical level. Finally, a 10-mm trocar is placed midline, halfway between the umbilicus and the xiphoid. This will be used to place the laparoscope while ancillary instruments, including an EndoGIA stapling device, will be used through the 12- and 5-mm ports. The laparoscope and the right 5-mm port are controlled by the assistant, while the 12-mm umbilical port and the left 5-mm trocar are used by the surgeon. We used Hourcabie's hysterophore [5] for uterine cannulation. This device allows maintenance of a good pneumoperitoneum after a colpotomy is performed. A Foley catheter is routinely placed.

This installation allows proper vaginal access, a better panoramic view of the pelvis, and safer ergonomy for the surgeon and the assistant. Should lumboaortic lymphadenectomy be done, a 10-mm port is placed in the midline between the symphysis pubis and the umbilicus. The laparoscope is changed to this port, and an interxyphoumbilical port is used for bowel retractors.

Laparoscopic lymphadenectomy

After thorough inspection of the peritoneal cavity, the patient is placed in the Trendelenburg position between 15° and 20°. The procedure begins with an incision of the pelvic peritoneum including the round ligament, crossing the obliterated umbilical artery, up to the infundibulopelvic ligament. The ovarian ligaments in the case of salpingo-oophorectomy are coagulated and cut. A blunt instrument is used to enter and develop the paravesical space and the obturator fossa. Gentle traction of the umbilical artery allows easy identification of the uterine artery. The pararectal fossa is easily entered by blunt dissection but is not completely developed. Parametrial limits are identified, and parametrial nodes may be precisely dissected if necessary. Lymph node dissection includes the common iliac nodes, the interiliac nodes, the obturator area, the external iliac lymph nodes, and the retroiliac nodes between the dorsal aspect of the external iliac artery and the psoas muscle just over the lumbosacral nerves. Lymph nodes are collected into an endoscopic bag that was placed in the pouch of Douglas at the beginning of the lymphadenectomy. The endoscopic bag is removed through the 12-mm umbilical trocar to prevent contamination of the abdominal wall. The entire contents of the bag are sent to the pathologist for frozen section. The paraaortic lymph nodes are removed when frozen sections show pelvic node involvement. The rationale is that metastatic extension to the paraaortic nodes is less than 1–2% when pelvic nodes are free of disease [6–9].

Laparoscopic division of the uterine artery and management of the paracervix

The ureter is identified at the point where it crosses the iliac vessels from the pelvic brim to the level of the uterine artery. The ureter is left attached to the undersurface of the peritoneum to avoid vascular impairment. The pararectal space is completely developed by gentle blunt dissection between the ureter medially, the hypogastric artery laterally, and the uterine artery ventrally. When both paravesical and pararectal spaces are completely developed to the level of the levator muscle, the cardinal ligament is clearly defined between both the paravesical and pararectal spaces. The uterine artery from the roof of the paracervix and its origin at the hypogastric artery is easily identified, skeletonized, and secured. We prefer using clips rather than bipolar cautery to control the uterine artery at this level. However, bipolar cautery seems to be safe and has been widely used for this purpose by other authors [1, 4, 10].

Once the uterine artery has been cut, the paracervix may be managed. The ligament is stretched by medially pushing the bladder and rectum by placing two forceps in the paravesical and pararectal spaces. Although bipolar cautery or clips may be used, we favor using the EndoGIA stapler, introduced by the 12-mm umbilical trocar. This allows introducing the stapler in the right angle parallel to the pelvic wall following the umbilicococcygeal axis of the paracervix according to Dargent [1] to avoid damaging the parietal branches of the hypogastric artery.

Vesicouterine plica, rectovaginal space, and uterosacral ligaments

The next steps of this technique focus on preparing the vaginal approach to the ureteral tunnel. The aim of the dissection of the vesicovaginal plane is to identify the caudal limit of the vesicouterine ligaments and to perform a colpotomy in the anterior face of the vagina that is wide enough to let us place and bring out the end of two vessel loops. The posterior peritoneum is incised toward the uterosacral ligaments. The ureter is identified and separated from the peritoneum down to where it crosses the uterine artery, just at the beginning of the ureteral tunnel. The rectovaginal space is developed, and both uterosacral ligaments are cut. A mechanical stapler such as the EndoGIA or similar is a good alternative to bipolar cautery of the uterosacral ligaments.

At this point, just the ureteral tunnel and the parametria remain to finish the procedure. Both ureters are identified and isolated by placing vessel loops (Fig. 1). Different colors are used for the right and left ureters to identify them more easily during the vaginal portion of the procedure. The ends of the vessel loops are placed into the vagina through the anterior colpotomy previously performed (Fig. 2). Grasping forceps with the ends of the vessel loops are gently brought out so that the

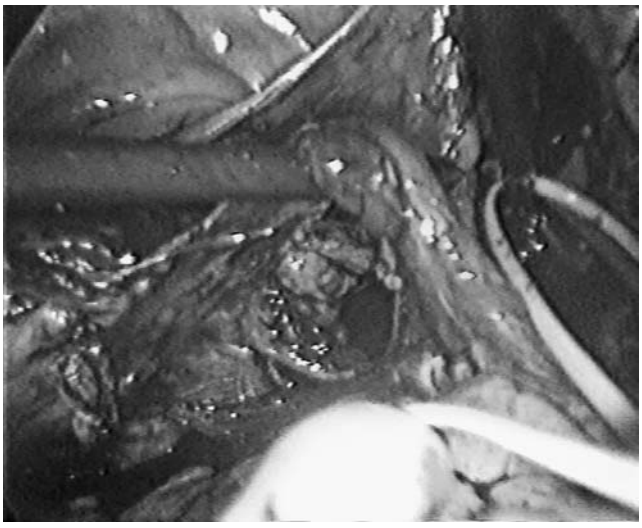

Fig. 1 The right ureter is identified and isolated by placing a vessel loop

Fig. 3 Gentle traction of the right side vessel loop shows the knee of the ureter

second assistant may clamp them with a mosquito forceps or similar.

Vaginal step

The vaginal cuff is made directly, and Schuchardt's incision is unnecessary. The uterine fundus is gently grasped and turned out (Döderline maneuver). The parametria and vesicovaginal ligament are exposed by pulling the cervix and the fundus to the contralateral side. Gentle traction of a vessel loop will show the knee of the ureter, which may be easily unroofed with a dissector forceps (Fig. 3). Conventional Faure forceps are used to clamp the left parametria and vesicouterine ligament. The same procedure is used to manage the contralateral ureter, and the specimen is removed. Finally, the colpotomy is closed with monofilament absorbable sutures.

Our previous experience with laparoscopic or laparoscopic-assisted radical hysterectomy before this modified technique consisted of 13 cases from September 1998 to January 2003. The operating time was shorter with this new approach compared with our previous experience: 250 (240–270) min vs. 300 (292–345) min ($p < 0.006$). The bladder catheter was removed on the 1st postoperative day except for a patient who had a bladder injury that was immediately sutured by the vaginal route. In this case, the Foley catheter remained in place for 7 days.

Neither urinary fistulae nor bladder malfunction were noted. A postoperative abdominal wall 5-mm lateral

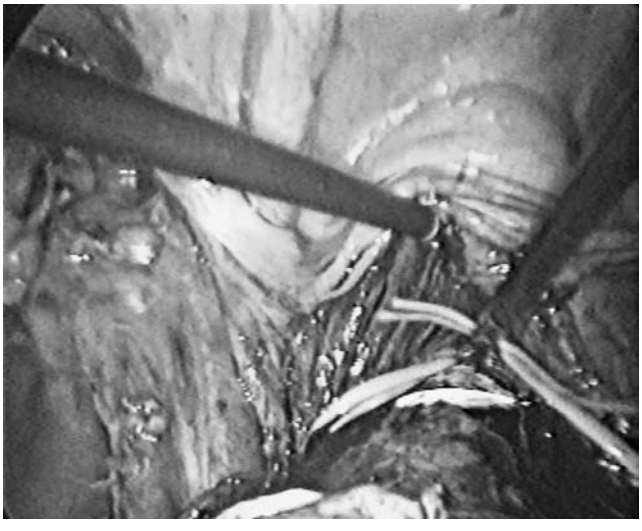

Fig. 2 The ends of the vessel loops are placed into the vagina through the anterior colpotomy

Table 1 Operating time, intraoperative and postoperative complications, number of lymph nodes, and length of hospital stay

Case	Operating time (min)	Intraoperative complications	Postoperative complications	Number of nodes	Hospital stay (days)
1	235	None	None	10	5
2	240	None	None	14	4
3	285	Bladder[a]	None	17[b]	7
4	250	None	Port site hematoma[c]	15	8
5	240	None	None	13	5
6	270	None	None	10	4
7	240	None	None	28	4

[a]Injury solved by vaginal route
[b]Pelvic and paraaortic lymphadenectomy were performed
[c]Hemoglobin < 7 g/dl; transfusion was needed

port-site trocar hematoma was seen in case 4 on the 2nd postoperative day. This was managed expectantly after two units of blood were transfused due to a symptomatic anemia (hemoglobin 6.4 g/dl).

Technical data including operating time, intraoperative and postoperative complications, number of lymph nodes, and hospital stay are shown in Table 1. Preoperative and postoperative hemoglobin and hemoglobin balance are shown in Table 2.

Frozen section from one patient showed metastatic involvement of one parametrial node, and paraaortic lymphadenectomy was performed. No involvement was seen at the paraaortic nodes. Postoperative coadjuvant pelvic radiotherapy was done in this case. Final paraffin pathology confirmed the frozen section in all cases, so neither false-negatives nor false-positives were seen when performing frozen section of the lymph nodes.

Discussion

Some techniques of laparoscopically-assisted radical vaginal hysterectomy have recently been described. Their feasibility has been demonstrated by several teams [1–4, 11, 12]. Combining vaginal and laparoscopic approaches means combining the advantages and eliminating the drawbacks. The development of paravisceral spaces improves uterine mobility. Laparoscopic division of the uterine artery allows a relative bloodless vaginal access. Lymphadenectomy can only be performed laparoscopically. The preferential use of either route for other steps depends on the surgeon's training and the patient's individual features. In our experience, an appropriate combination of vaginal and laparoscopic steps may reduce the operating time of laparoscopically-assisted radical vaginal hysterectomy.

Whatever the blend of vaginal and laparoscopic techniques, the rationale of laparoscopic-vaginal hysterectomy is that the surgeon is able to take advantage of the benefits of both routes in the same patient. Laparoscopy is well suited to lymph node and paravisceral space dissection, giving easy and direct access to the origin of the uterine artery. The drawbacks are a long operating time, mainly due to a more difficult management of the ureteral tunnel, the parametria and vesicouterine ligament, and the vaginal cuff. The vaginal route allows easier access to the latter, but in some cases Schuchardt's incision may be necessary or only a limited dissection of the ureter may be achieved [4]. Our technique allows easy identification of the ureteral knee at the vaginal step. Isolation of the ureter by placing a vessel loop is a very easy laparoscopic step, and gentle traction of the vessel loop on the vaginal route allows a very simple ureteral knee identification and ureteral tunnel dissection. This simple modification of the technique reduces operating time. In fact, caudal parametrial management is the most time-consuming of the laparoscopic approaches, and a high risk of ureteral damage is always present. Conversely, in the absence of prolapse or when mobilization or vaginal access is limited, vaginal management of the proximal parametrium is difficult [4], and Schuchardt's incision may be necessary. However, Schuchardt's incision is frequently associated with greater morbidity such as pain, infection, and fever [1].

In our setting, frozen section of the lymph nodes seems to be a feasible technique. We noted neither false-positive nor false-negative cases, thus indicating good accuracy of the procedure. In addition, pathologic evaluation does not modify the operating time because while the pathologist studies the frozen section, the surgeon may continue performing the radical hysterectomy.

In conclusion, laparoscopic identification and isolation of the ureters by placing vessel loops enhances the vaginal management of the ureteral tunnel during laparoscopic radical hysterectomy, thus enabling a safer and time-saving procedure.

Table 2 Blood loss: preoperative and postoperative hemoglobin (Hb) and hemoglobin balance

Case	Preoperative Hb (g/dl)	Postoperative Hb (g/dl)	Hb balance (g/dl)
1	11.4	9.3	2.1
2	12.9	8.7	4.2
3	14.6	10.4	4.2
4	12.9	8.8	4.1
5	11.4	6.7	4.7
6	13.5	8.3	5.2
7	13.2	11.1	2.1

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