Surgical Principles of Endometrial Cancer

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10.1 Introduction

Worldwide, endometrial cancer (EC) is the sixth most common malignant disorder with approximately 290,000 new cases annually. In Europe it is the fourth common woman cancer in terms of incidence [1].

Prognostic factors identified are histological type (endometrioid or not), stage (Table 10.1), grade, lymphovascular space invasion, the depth of myometrial invasion, and lymph node involvement.

Preoperative data (estimation of the depth of myometrial invasion, cervical involvement, lymph node enlargement on magnetic resonance imaging (MRI) and histology defined on the endometrial biopsy) allow to assess a priori the stage and the EC risk of recurrence for stages FIGO I in four groups (ESMO classification, Table 10.2) [2].

For early stage EC, a hysterectomy with bilateral salpingo oophorectomy is the cornerstone of treatment. The decision to perform a lymphadenectomy depends on the local practice and the risk of nodal disease (determined a priori by the preoperative or intraoperative data).

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Table 10.1 Revised 2009 FIGO staging for endometrial cancer

Stage I—limited to the body of the uterus Ia—no or less than half myometrial invasion Ib—invasion equal to or more than half of the myometrium
Stage II—cervical stromal involvement (endocervical glandular involvement only is stage I)
Stage III—local and/or regional spread of the tumor IIIa—tumor invades the serosa of the body of the uterus and/or adnexa IIIb—vaginal involvement and/or parametrial involvement IIIc—pelvic or para-aortic lymphadenopathy IIIc1v—positive pelvic nodes IIIc2—positive para-aortic nodes with or without positive pelvic nodes
Stage IV—involvement of rectum and/or bladder mucosa and/or distant metastasis IVa—bladder or rectal mucosal involvement IVb—distant metastases, malignant ascites, peritoneal involvement

Table 10.2 Définition des groupes à risque de récidive sur la base des données histologiques définitives selon les recommandations ESMO- ESGO-ESTRO 2016

Critères	Groupe à risque de récidive
Type 1/stade FIGO IA/grade 1-2/sans emboles lymphovasculaires	Faible
Type 1/stade FIGO IB/grade 1-2/sans emboles lymphovasculaires	Intermédiaire
Type 1/stade FIGO IA/grade 3 avec ou sans emboles lymphovasculaires Type 1/stade FIGO IA-IB/grade 1-2/avec emboles lymphovasculaires	Intermédiaire- élevé
Type 1/ stade FIGO IB de grade 3 avec ou sans emboles lymphovasculaires Tumeurs de type 2 Stades FIGO II ou III sans reliquat tumoral	Élevé

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Although the stage can be presumed preoperatively, EC is by definition surgically staged.

10.2 Principles

Surgery for cancer of the uterus is based on several basic principles:

10.2.1 No Morcellation

The specimen must be handled carefully to avoid any release of tumor cells and fragmentation is prohibited.

10.2.2 Surgical Approach

10.2.2.1 Rational

Whereas there is no difference in terms of major complications between abdominal hysterectomy and laparoscopically assisted vaginal hysterectomy or total laparoscopic hysterectomy, the laparoscopic approach is associated with a significantly shorter hospital stay, less pain, and quicker resumption of daily activities [3, 4], without clear difference between robotic-assisted surgery and conventional laparoscopy [5, 6].

Early-stage EC can be treated effectively with either total laparoscopic hysterectomy (TLH) or laparoscopy-assisted vaginal hysterectomy (LAVH) [5, 6]. Both LAVH and TLH can be performed in early-stage EC, with similar surgical outcomes [7].

Moreover, in obese patients, it has been suggested that robotic-assisted surgery reduces operating time, blood loss, and increases the number of lymph nodes removed compared to the conventional laparoscopy [8]. Obesity therefore appears to be good indication for robot-assisted surgery since it has been reported to be a common cause of laparoconversion. However, the experience of the surgeon also needs to be taken into consideration indicating that a good laparoscopist has little benefit by transforming to robotic system.

Moreover, obese patients may benefit more from TLH than from LAVH in terms of shorter operating time [7].

10.2.2.2 Recommendations

Since the oncological safety of the laparoscopic approach has now been demonstrated in several randomized studies [9, 10], hysterectomy and bilateral salpingo-oophorectomy should be performed by laparoscopy in patients with no contraindications to laparoscopy (e.g. large-volume uterus, insufficient mobility, significant myometrial invasion of the tumor) to avoid the risk of uterine rupture [11].

10.2.3 Type of Hysterectomy

The main goal of surgery is therapeutic by removal of the tumor. In addition, uterine resection allows determination of prognostic factors and hence decisions on the adjuvant treatment.

Hysterectomy must be:

- total, because of the risk of cervical invasion,
- extrafascial, because of the presence of myometrial fibers in the uterine fascia making extension possible at this level,
- nonconservative, even if the tubes and ovaries appear normal, as they may contain micro metastases. However, in young patients with grade 1 intramucous endometrial adenocarcinoma, ovarian preservation is not associated with an increase in cancer-related mortality.

10.2.4 Lymphadenectomy

10.2.4.1 Rational

Lymphadenectomy is historically recommended to ensure proper individual staging.

The major lymphatic trunks are the utero-ovarian (infundibulopelvic), parametrial, and pre sacral trunks that drain into the hypogastric, external iliac, common iliac, presacral, and para-aortic nodes. Complete lymphatic exploration then comprises of pelvic and para-aortic lymphadenectomy.

Randomized studies have been published suggesting that pelvic lymphadenectomy has no impact on overall and disease-free survival in patients with early stage EC. An Italian randomized trial of pelvic (and in 30% para-aortic) lymphadenectomy versus no lymphadenectomy in 540 women also did not show any difference in rates of relapse or survival [12]. In the UK, the MRC ASTEC trial, which randomized 1400 women undergoing surgery for presumed Stage I endometrial cancer to pelvic lymphadenectomy or no lymphadenectomy, showed no therapeutic benefit [13]. Both studies have been criticized because of a limited effort with respect to the extent of dissection and lymph node evaluation, because of the high proportion of low-risk patients, and because of no direct decision on adjuvant therapy based on lymphadenectomy result.

However, these results have been discussed in light of studies demonstrating that para-aortic lymphadenectomy associated with pelvic lymphadenectomy is associated with longer overall survival for patients with intermediate- or high-risk EC when compared with pelvic lymphadenectomy alone [14]. But again, this was a retrospective study and prospective data are awaited for. In addition, adjuvant therapy was not comparable in the two groups. In patients who underwent both pelvic and para-aortic lymphadenectomy, 77% received chemotherapy, whereas this was given in 45% of patients who underwent pelvic lymphadenectomy alone. This suggests that undergoing both pelvic and para-aortic lymphadenectomy is beneficial in comparison with patients who will undergo pelvic lymphadenectomy alone; it does not imply that extensive lymphadenectomy improves survival in comparison with no lymphadenectomy.

However, since low-risk tumors (well differentiated and <1/2 myometrial invasion) have positive nodes in less than 5% of cases, it is now well accepted that these patients do not require full surgical staging [15]. Lymphadenectomy should be considered in women with intermediate or high-risk factors. Although a direct survival benefit of lymphadenectomy has not been clearly documented, the procedure identifies node-positive patients that may benefit from adjuvant treatment [16]. Preoperative exploration aims at identifying risk factors supporting lymphadenectomy. Deciding lymphadenectomy is also possible during surgery. Intraoperative assessment mainly involves assessment of myometrial invasion. Grading on frozen section is possible, though suboptimal compared with postoperative grading.

10.2.4.2 Recommendations

As a minimal approach, any enlarged or suspicious lymph node should be removed.

For high-risk patients pelvic lymphadenectomy is recommended due to a high rate of lymph node involvement and its positive impact on survival [14, 17]. Outside clinical trials, lymphadenectomy is mainly performed for staging purposes in

high-risk cases. There is little evidence to support a therapeutic benefit, but it should be used to select women with positive nodes who may benefit from adjuvant therapy. An international trial of the role of lymphadenectomy to direct adjuvant therapy for high-risk endometrial cancer (STATEC) is planned. The ongoing ENGOT-EN2-DGCG/EORCT 55102 trial aims to answer this question by comparing survival in patients with stage I–II grade 3 endometrioid EC or type 2 EC without metastatic node after randomization to adjuvant chemotherapy or no further treatment.

For patients with low or intermediate risk, lymphadenectomy is not recommended based on ASTEC and Italian trials [12, 13].

10.2.5 Sentinel Lymph Nodes

10.2.5.1 Rational

The lymphatic drainage pathways of the myometrium are:

- for isthmus and mid-corpus (drainage is similar to the cervix): lymphatics following the uterine vessels in broad ligament to the pelvic ganglia (and more particularly those in external iliac subvein position),
- for fundal and cornual areas: drainage pathways follow the lumbosacral ovarian pedicle (in the infudibulo-pelvic ligament) to drain into the para-aortic nodes above the inferior mesenteric artery and below the left renal vein and rarely to the iliac nodes [18].

Burke et al. first described in 1996 the sentinel lymph node (SLN) biopsy applied in patients with EC [19]. The potential interest of the technique of SLN in EC is to reduce morbidity of complete lymphadenectomy (lymphedema, seroma), but also allow for node ultrastaging (search for micrometastases) on a limited number of nodes.

Three routes of administration have been described:

- subserosal intraoperative injection as originally described,
- cervical injection (pre- and/or intraoperative): most reproducible but main criticism is that this approach reflects the drainage of the cervix and not the tumor,
- hysteroscopic intraoperative submucosal injection: in close proximity to the tumor; some authors emphasize the potential risk of tumor cell dissemination in connection with intracavitary hypertension (tubal dissemination) and cervical dilation (lymphatic dissemination), but it should be noted that the pressure used during hysteroscopy for the injection of the tracer is very low. So there would be no increase in the incidence of positive peritoneal washings after diagnostic hysteroscopy.

There are several techniques to detect the SLN:

- colored detection (patent blue or indocyanine green (ICG), with a better detection rate),
- isotopic detection (technetium) with lymphoscintigraphy,

– combined detection (colored and isotopic).

Detection may be preoperative (by lymphoscintigraphy or SEPCT, real-time 3-dimensional single-photon emission computed tomographic) or intraoperative (color (blue channels and sentinel nodes) and/or isotope (hot sentinel node)).

Ultra-staging can identify micro-metastasis (between 0.2 and 2 mm) and isolated tumor cells (≤0.2 mm).

10.2.5.2 Recommendations

While the accuracy of the SLN procedure has been validated in patients with early-stage EC at low and intermediate risk of recurrence, its low accuracy for high-risk EC makes SLN unsuitable in such cases [20]. Based on those findings, SLN biopsy could be a trade-off between systematic lymphadenectomy and no dissection at all in patients with EC of low or intermediate risk, avoiding the morbidity of full dissection and the under treatment of node-positive patients.

Besides, considering aberrant drainage territories, SLN biopsy could be useful in current management of patients with early-stage EC. However, its safety should be confirmed and expert experience is needed before implementation in routine practice is recommended.

10.3 Techniques

10.3.1 Hysterectomy

Since 1988, the classification of EC established by the FIGO is based on the pathological findings after primary surgery.

10.3.1.1 Prerequisites

Laparoscopy is the standard surgical approach for early stage EC with a normal sized uterus [21]. It can be a TLH or a LAVH in which the laparoscopic time can be limited to the first dissections or go to the dissection-section of the uterine artery.

Instrumentation for Laparoscopy

In addition to the standard instrumentation for any operative laparoscopy, a uterine manipulator is useful for uterine mobilization, valves for the exposition of the cul-de-sac, and vaginal occlusion to avoid gas leakage.

The American Association of Gynecologic Laparoscopists (AAGL) has developed a classification of laparoscopic hysterectomy [22]. The abbreviated classification describes five types of laparoscopic hysterectomies:

Type 0 Laparoscopic-directed preparation for vaginal hysterectomy.
Type I Occlusion and division of at least one ovarian pedicle, but not including uterine artery(ies).

Type II Type I plus occlusion and division of the uterine artery, unilateral or bilateral.
Type III Type II plus a portion of the cardinal-uterosacral ligament complex, unilateral or bilateral.
Type IV Complete detachment of cardinal-uterosacral ligament complex, unilateral or bilateral, with or without entry into the vagina.

Positioning

Ideally, the patient lies in the following position: supine position, Trendelenburg position with a 15t entry into the vaginasation, valves for the exposition of the cul-de-sac and vaginal tions, or go to the dissection-section of the uterine arteries recommending access to the vagina and buttocks protruding generously over the edge of the table to allow manipulation of the uterus using a manipulator. The patient is supported by spacers over the shoulders to prevent slippage due to the Trendelenburg position. Skin and vaginal disinfections are the first step.

The chief surgeon stands to the patient's left. The patient is lying on her back in the Trendelenburg position, at an angle of 15 degrees, with her legs slightly apart to allow the use of valves for exposure of the cul-de-sac. An endo-uterine manipulator is placed after possible cervical dilation. To reduce the risk of uterine perforation, the endo-uterine manipulator can be put under laparoscopic control. Some have advised for tubal occlusion before placing the uterine manipulator considering the potential risk of transtubal dissemination using such device [23].

Initial Steps

A pneumoperitoneum is established by the use of Palmer needle or through an open-technique laparoscopy. Two 5-mm lateral trocars and one 10- to 12-mm midline trocar are inserted. The two lateral trocars should be placed on a line joining the anteroposterior iliac spines, two or three fingers through the inside of them, outside the epigastric vessels and the midline trocar on the midline midway between the pubis symphysis and the umbilicus. For ergonomic purposes, the mid-trocar is ideally positioned above the level of the lateral trocars. Repositioning of trocars during the surgery should be avoided to limit the risk of parietal metastases. A balloon trocar reduces the incidence of unintended extraction of the trocar (and hence the repositioning). If the uterus is oversized, the trocars should be placed higher. The second assistant positioned between the legs must push the fundus upward and always on the side opposite that of the dissection.

Visual exploration should pay particular attention to:

- gastric area, diaphragmatic dome, liver capsule,
- retroperitoneal reflection next to the para-aortic axis,
- pelvic peritoneum including pouch of Douglas,
- Uterine serosa, adnexa.

This exploration should look for carcinomatosis or secondary lesions. Any tumoral protruding through the uterine serosa constitutes a contraindication for

laparoscopic approach. Biopsy of any suspicious lesion is recommended and if the surgical management is modified, intraoperative pathological examination is performed. Peritoneal cytology is not recommended anymore.

The patient is placed in Trendelenburg position in order to allow better exposure of the pelvis with regression of the intestines.

10.3.1.2 Simple Hysterectomy: Total Extrafascial Nonconservative Hysterectomy [21]

This technique is considered in stage I disease and involves several steps:

Coagulation and Section of the Round Ligament

The round ligament must be put under traction by opposite tractions, and with intrauterine manipulator help. Coagulation and section must be middle, after locating the triangle formed by the uterine side, the round ligament, and the extern iliac vessels.

Opening of the Anterior Leaflet of the Broad Ligament

The entire section of the round ligament results in the intrusion of carbon dioxide between the two peritoneal layers. The incision of the anterior leaflet of the broad ligament is followed by coagulation-section to the right edge of vesicouterine peritoneal reflection.

Fenestration of the Broad Ligaments and Coagulation/Section of the Infundibulopelvic Ligament

In depth the front of the posterior leaflet of the broad ligament, the triangular avascular area is perforated. The window thus formed is then enlarged by opposite traction. This action, carried out in a safe area, causes isolation of the infundibulopelvic ligament, facilitating its coagulation and sectioning.

Posterior Dissection and Vesicouterine Dissection

The dissection of the posterior leaflet of the broad ligament peritoneum is then continued until proximity of the uterosacral ligaments. The uterosacral ligaments should not be sectioned yet and only the peritoneum is incised. This is the prime time for spotting the right ureter if it has not been spotted in the section of the infundibulopelvic ligament.

Then, the vesicouterine fold must be opened until a lower limit defined by the movable valve cannulator and dissected in an avascular plane: uterus must be pushed to the promontory and anterior valve of the intrauterine manipulator inserted in the vesicouterine cul-de-sac. Laterally, the vesicouterine detachment continues in the front opening of the broad ligament.

Uterine Vessels Dissection (with Ureter Identification) and Coagulation of the Uterine Vessels

A careful coagulation and section of the uterine vessels perpendicularly, at distance from the ureter, is executed. The cervico-vaginal vessels, lower in the parametrium, should not be forgotten.

Opening of the Vagina: Circular Colpotomy

Mobile cannulator valve is maintained in the vagina into the previous cul-de-sac where it protrudes. Vaginal section is carried out using the monopolar energy. The movable valve acts as a block on which the closed monopolar scissors cut the vaginal wall. Back, dissecting the peritoneum next to the upper union of the utero-sacral ligaments (torus uterinum) has the effect of distancing the uterosacral ligaments. These are preserved while opening the posterior vaginal cul-de-sac.

Uterine Extraction and Vaginal Closure

When the uterus is externalized vaginally, the cannulator secures the uterus. Oncological rules prohibit fragmentation, thus only the additional traction by Museux or Pozzi forceps are tolerated. A sterile glove placed intravaginally ensures the seal and prevent leakage of carbon dioxide.

Closure of the circular colpotomy can be performed by laparoscopy. However, the vaginal route is fastest and has been suggested to reduce the risk of vaginal dehiscence [24]. Special attention should be paid to the corners in order firstly to achieve hemostasis and also not to include in the ureter which can be identified upstream of this step. Vaginal suture can be secured by a thread overedge No. 0 braided absorbable.

In case of LAVH, the laparoscopic time is more or less limited before moving to vaginal time. The various steps that can be performed vaginally are here described.

Colpotom

The use of valves allows a good exposure. To perform the vaginal cuff, vaginal section is carried out using Kocher forceps and cold scalpel by pulling on the cervix.

Vesicouterine Dissection

Then vesicovaginal dissection until vesicouterine cul-de-sac is performed in an avascular plane.

The cervix is pulled down and the front valve exerts counterpressure towards the vaginal vault.

Vaginal bank is seized with toothed forceps and towed up. Scissors are oriented at 45 al vault.e. out using Kocher forceps and cold scalpel by pulling on the cervix. ided absorbable.l attention should be paid to the corners in order firstly to the seal ace created by dissection. The anterior peritoneal cul-de-sac is viewable as a thin transverse white edging and can be opened with scissors.

Posterior Dissection

Then posterior dissection until Douglas cul-de-sac is performed in an avascular plane.

The cervix is pulled up and the posterior valve exerts counter pressure towards the vaginal vault.

Vaginal bank is seized with toothed forceps and towed down to visualize the fibrous tract dissecting then the cul-de-sac of Douglas. The opening is done with

scissors and the by introducing finger to open the Douglas and to place the posterior leaflet that will protect the rectum.

The anterior and posterior valves assigned to aid define the base settings on each side. A lateral valve can be placed in the lateral side.

Uterine Vessels Ligation and Section and Coagulation/Section of the Infundibulopelvic Ligament

Usually, this time is laparoscopic.

Verification of Hemostasis and Closure

The vagina is closed be an over edge with 2 X points in the corners.

10.3.1.3 Radical Hysterectomy

It is considered in cases where overt cervical extension is present or suspected.

The radical hysterectomy involves removal of the uterus, the parametria, and the vaginal vault.

The Querleu classification [25] which is used for patients with cervical cancer defines four main categories based on anatomical landmark (ureter, internal iliac vessels, pelvic wall), according to extent of removal of paracervix.

- *The type A* consists in a paracervical resection medial to the ureter but lateral to the cervix (halfway) (cervix removed in toto). It is an extrafascial hysterectomy in which the position of the ureter is determined by palpation or direct vision after opening the ureteral tunnels without freeing the ureters from their beds. The bladder and rectal pillar are not transected.
- *The type B* consists in a paracervical resection at the level of the ureter. The ureter is unroofed and rolled laterally. The neural component of the paracervix is not transected; there is only a resection of the fibrous component. The bladder and rectal pillars are resected at a distance from the uterus. There are subcategories: *B1*, as described; and *B2* with additional lateral paracervical lymph node dissection.
- *The type C* consists in a paracervical resection at the level of the hypogastric vessels (resection of entire paracervix). The ureter is completely mobilized, and the rectal and bladder pillars are resected. There are two subcategories: *C1*, dissection with nerve sparing (Vagina: at least 15–20 mm) and *C2* without nerve sparing dissection (the paracervix is transsected lower than the deep uterine vein).
- *The type D* consists in a paracervix resection at the level of the pelvic sidewall (exenterative procedures). There are two subcategories: *D1*, resection of the entire paracervix at the pelvic sidewall along with the hypogastric vessels exposing the roots of the sciatic nerve; *D2*, D1 + adjacent fascial or muscular structures.

10.3.1.4 The Radical Hysterectomy Involves Several Steps [26]

Opening of Spaces

Lateral Peritoneum
The incision of the peritoneum is performed just above the external iliac vessels, from the paracolic fossa to the round ligament of the uterus, which is sectioned.

Pelvic Ureter
The adnexa must be pulled medially with an atraumatic grasper. The pelvic ureter is identified on the deep surface of the peritoneum. The ureter is not dissected at this stage of the procedure.

Paravesical Fossa
The umbilical artery is dissected and then pulled medially with an atraumatic grasper. The paravesical space is opened using simple divergent traction of the graspers, one toward the external iliac vessels and the other toward the umbilical artery. This plan is usually easy to find. The dissection requires no cauterization, as it is performed in a bloodless plane. It is pursued until the latero-vesical pelvic wall, the plane of the levator ani muscles and overlying pectineal ligament. This step can be facilitated by placing the uterine fundus under tension by retracting it cranially, anteriorly and toward the opposite side with the uterine manipulator. Posteriorly, dissection of the umbilical artery is pursued down to its origin on the internal iliac artery.

Pararectal Fossa
This opening is facilitated by the identification of the iliac arterial bifurcation. The dissection begins medially to the limits of the internal iliac artery, which is followed to the floor of the levator ani muscles. Cauterization of the small arteries arising directly from the internal iliac artery is sometimes required. As for the opening of the paravesical fossa, this step can be facilitated by placing the uterine fundus under tension by retracting it toward the opposite side with the uterine manipulator.

Parametrium Treatment

Uterine Artery Division
The uterine fundus is retracted cranially, anteriorly, and toward the opposite side. At the superior limit of the parametrium, the uterine artery is identified. It is clipped or cauterized at its origin, and then sectioned.

Division of the Parametrium: According to the Categories of Querleu Classification
Type B consists in sectioning the parameter plumb with the ureter. Its advantage is essentially the preservation of the bladder innervation.

Type C: the parametrium is individualized between paravesical fossa forward and outside pararectal fossa and back and within. The base of the parameter is then

coagulated against the pelvic wall with the bipolar forceps before being severed so that the paravesical and pararectal fossa are not separated.

Freeing Pelvic Ureter: According to the Categories of Querleu Classification

Dissection of the Bladder

The uterine fundus is placed in median and posterior position. The vesicouterine space is opened (as for simple hysterectomy), identifies the external bladder pillar and divides it. The anterior border of the parametrium is thereby freed from the bladder wall.

Parametrial Ureter

The uterine fundus is retracted cranially, anteriorly, and toward the opposite side. The parametrial ureter is first freed laterally, and is then freed from its attachments to the parametrium. This requires careful coagulation-section of ureteric vessels from the uterine vessels. The section of the tissue adjacent to the uterine artery plumb with the ureter allows dissection and the section of dissected parameter within the ureter (Type B).

Juxtavesical Ureter

The ureter is dissected down to its entry into the bladder. The internal bladder pillar is identified and divided. The release of the ureters before they enter into the bladder provides completely individualization of the parametria and the paravagina forward.

Posterior Step: According to the Categories of Querleu Classification

Rectovaginal Space

This step involves opening the rectovaginal space and laterally freeing the uterosacral ligaments on each side at a distance from the uterus. It enables the surgeon to cauterize and section the paravaginal attachments.

Uterosacral Ligaments

The uterosacral ligaments are then sectioned 2 cm from the posterior surface of the uterus.

Vaginal Step/Closure

Colpotomy

The vaginal incision is performed laparoscopically or transvaginally more than 2 cm from the cervix or the tumor. It allows the one-piece removal of the uterus and parameters.

Vaginal Suture

Vaginal suture is secured by a thread overedge No. 0 braided absorbable.

The Radical LAVH [27]

The preliminary laparoscopic surgical time of the LAVH is a time for exploration, pelvic lymphadenectomy. Similarly, laparoscopic identification of uterine arteries and their coagulation-section, coagulation-section of round and infundibulopelvic ligaments is performed.

The use of valves allows to drive back the vaginal walls and expose the bottom of the vagina and cervix.

Achievement of Vaginal Cuff

A cuff of about 2 cm is usually carried out in a circular manner with Kocher forceps. The vaginal incision is circular and done with a cold scalpel, slightly upstream of Kocher forceps.

Anterior Steps

The clamps are pulled down to open the space between the anterior vaginal wall and the posterior surface of the bladder. Vesicovaginal dissection must be done in an avascular plane to vesicouterine cul-de-sac, without penetrating intrafascial.

After the dissection, the pillars of the bladder will be cut with identification and dissection of the ureter. The pillars are individualized between the vesicovaginal space and paravesical fossa. The opening of the paravesical fossa is in contact with the vaginal wall tensioned by clamps. The detachment is then expanded to put in place a valve in this space. Similarly, a valve will lift the bladder base. The bladder pillar which is located between the vesicovaginal space and the paravesical space is tensioned.

Once identified the ureter, the bladder pillar is cut, mid-distance between the surgical specimen and the bladder base. The sheath of the ureter is opened, and the ureter is dissected to push it up.

It remains only to treat the uterine artery. The operative time was often initially prepared by laparoscopy. We can then, by simple traction, bringing the artery in the operative field.

If laparoscopic preparation was not done, we will bind and cut the uterine artery to its crossing with the ureter. This crossing is identified in the portion of the inner pillar next to the ureter. It is at this level that is the afferent limb of the arch of the uterine artery that can quite easily pick a dissector. The vessel is then doubly bonded and then cut. The uterine artery to be sectioned as high as possible.

Once released, the uterine artery, bladder, and ureter base terminal are distant frankly, and the front surface of the parameter completely unobstructed.

Posterior Steps

Back, dissection begins at the midline to open the cul-de-sac. The perirectal fatty tissue acts as a guide on the orientation of the section plane. After opening Douglas, this opening is enlarged in order to put in place a valve to rule out the rectum. Tensioning by the valve allows to visualize the start of opening of pararectal fossa. Opening pararectal fossa made in the same manner as that of paravesical fossa with a dissector moved into contact with the vaginal wall. The opening of this fossa is

generally easy and bloodless. Then we can individualize between the Douglas cul-de-sac and pararectal fossa, the recto-uterine ligaments. These are cut from the bottom up to the level of their insertion on the surgical specimen. The posterior surface of parameter is thus released.

Parameter Treatment

The parameter section is adapted to the degree of radicality of the hysterectomy. Vaginally, we can go up to type B.

After parameter section, the surgical specimen is no longer retained by the broad ligament, the peritoneum vesicouterine cul-de-sac.

End of the Procedure

The broad ligament is sectioned.

The specimen is then extracted. Radicality of resection and hemostasis is checked.

Vaginal vault is closed by a circular hemostatic continuous suture made on the vaginal section, leaving a small central opening for spontaneously draining the operating area.

The final stage surgery is laparoscopic.

10.3.1.5 Complications

Hemorrhagic

It is essential to achieve complete hemostasis, especially at the level of the uterine artery and vaginal vault.

Urinary

The presence of hemorrhagic urine is a warning sign that may indicate bladder lesions. A bladder lesion is detected by the blue test. The proximity of the ureter with the uterine pedicle and with the infundibulopelvic ligament constitutes a good reason to always identify the ureter during the dissection and check its integrity. In the presence of a serious cautery of the ureter, it may be intact though cause a fistula when necrosis at the cautery level occurs.

For radical hysterectomy, postoperative morbidity mainly includes ureterovaginal fistula (1–3%) and vesicovaginal and voiding disorders [28]. Fistulas can occur early after surgery, due to direct trauma of the organ or later, secondary to necrosis.

In immediate postoperative phase, retention due to nerve trauma is common, but almost always spontaneously reversible. It is less common after Type B and if the paravaginal resection is limited down.

Digestive

The reposition of bowel loops out of the surgery field in early surgery should be done with caution and bowel handling should always be done de visu.

Parietal

Eventration on trocar orifice is possible, especially in obese patients.

10.3.2 Lymphadenectomy [29]

10.3.2.1 Pelvic Nodes

The pelvic lymphadenectomy is a technique to remove lymph nodes located between the iliac bifurcation above, the inguinal ring to bottom, the depth obturator nerve, the external iliac artery laterally, the umbilical artery medially.

This procedure can be performed if patient conditions allow transperitoneal laparoscopy. Alternatively, median or extended Pfannenstiehl laparotomy can be decided.

Peritoneal incision is made at the round ligament and is then extended along the round ligament and along the infundibulopelvic ligament. The external iliac artery and vein are identified as well as the psoas muscle with genitofemoral nerve laterally. Then the umbilical artery must be dissected until the internal iliac artery.

The common iliac arterial bifurcation is identified and crosses the ureter, left medially. The obturator nerve is then spotted deep in the paravesical fossa. Lymph node chain located between these limits is removed avoiding fragmentation to limit the risk of seepage and dissemination.

10.3.2.2 Para-aortic Lymphadenectomy

The para-aortic dissection is a technique to remove lymph node tissue laterocaval, precaval, inter-aorto-caval, pre-aortic, latero-aortic, and at the bifurcatio aortae. This procedure can be performed if the specific conditions of the patient permit by laparoscopy extra- or transperitoneal or by median laparotomy.

The limits of the dissection area are: lumbar ureters laterally, aortic bifurcation caudally, and the left renal vein cranially. Removal of retrovascular nodes does not belong to a standard para-aortic lymphadenectomy.

The dissection must be sus- and sub-mesenteric.

Transperitonal Route

One approach can consist in incising the peritoneum just above the aorta after mobilization of the bowels. Alternatively, the different steps of another approach are:

Pelling Right Colic

The incision is made in the crossing between the right colon and the wall; it bypasses the cecum and rises along the ascending colon to the transverse.

Kocher Maneuver

The Kocher maneuver is performed to expose the retroperitoneum behind the duodenum and pancreas. The small intestine and colon are externalized protected by wet fields and maintained by valves.

Ligation of Right Gonadal Vein

The right pedicle infundibulopelvic is released over its entire height, separated from the ureter which is pushed outside. The right ovarian vein is tied and severed without damaging the arch of the lumbar azygo.

Dissection of Latero-caval Area, Pre-caval Area, and Inter-aorto-caval Areas

After opening the sheath of the vena cava, lymphatic tissue located along the right edge and its front face is resected. Excision of inter-aorto-caval lymph nodes is done from the bottom up. A retractor Papin can be helpful to push aside the large vessels. The upper part of this plate contains the chylous trunks. The metal clips are used to identify the upper limit of dissection and ensure proper lymphostasis. Inter-aorto-caval blade is separated from the prevertebral fascia without injuring the lumbar vessels.

Dissection of Latero-aortic Area and Pre-aortic Area

The origin of the inferior mesenteric artery must be first dissected, 3–4 cm above the aortic bifurcation on the left side of the aorta. After identifying the ureter, the left infundibulopelvic ligament is resected.

The lymphatic tissue located along the left edge and front face of aorta is resected. Posterior plan is muscle (Psoas).

Removal of the Lymph Nodes of the Promontory

Lymphatic tissue below the aortic bifurcation (in front of the sacrum and cava bifurcation) is resected taking care to presacral veins and cava bifurcation located a little lower but almost on the same plane.

Bilateral Common Iliac Lymphadenectomy

This blade is continuous with the external iliac nodes already taken, forward and outside the common iliac artery and into the ureter. The procedure ends without peritonization.

Extraperitoneal Route [29, 30]

The laparoscopic route for patients with EC is accompanied by unique challenges given its known association with obesity. According to the series published by the Mayo clinic [30], extra-peritoneal laparoscopy has advantages over transperitoneal laparoscopy for assessment of the para-aortic lymph nodes in patients with EC, particularly in patients with BMI higher than 35.

A 2 cm incision is made two finger-breadths medial to and three fingerbreadths superior to the left anterior superior iliac spine. The fibers of the underlying obliques and transversalis muscles are then split until the peritoneum itself is identified. The retroperitoneal space beneath the transversalis muscle is developed posteriorly until the left psoas muscle is palpated. A 10-mm trocar is then positioned in the left flank and the retroperitoneal space insufflated. Additional blunt dissection is then performed using the index finger in the first incision and the laparoscope within the port until the psoas muscle is readily visualized and until identify beyond the left ureter, the left gonadal vessels and common iliac artery. A 5-mm subcostal trocar is then placed under direct visualization and a 10-mm third trocar placed in the initial

incision. Improper placement will handicap the ability of the surgeon by reducing the operating area, or else result in perforation of the peritoneum, making this approach difficult or impossible.

Initial insufflation pressures (10 mm Hg) and flow rates (3 L/min) are low in order to minimize the risk of peritoneal perforation, and theoretically reduce the risk of pneumothorax and hypercapnia. If additional exposure is necessary the pressure can be gradually increased, although 15 mm Hg is rarely necessary. Emphysema is commonly noted in the mesentery of the sigmoid colon. However, when the lower most left flank trocar is converted to an intraperitoneal position for transperitoneal pelvic lymphadenectomy, this emphysema rapidly dissipates and does not interfere with subsequent intraperitoneal procedures.

The left ureter and adjacent infundibulopelvic ligament are readily identified just medial to the psoas muscle and allowed to retract anteriorly and out of the field by the pressure of insufflation. The dissection is pursued medially until the left common iliac artery and aorta are identified. The gonadal vein is followed superiorly into the left renal vein. The gonadal vessels are ligated and resected. At this point all critical anatomy has been identified and the para-aortic nodes between the aortic bifurcation and left renal vein are removed after identifying the inferior mesenteric artery. To remove the right para-aortic nodes, the dissection is continued medially over the aorta and down to the inferior vena cava. The right ureter can be identified just lateral to the dissection. Once isolated from the underlying inferior vena cava, the right para-aortic nodes are then stripped from the anterior peritoneum. After the nodes are removed in endoscopic bags, the lowermost trocar may be converted to an intraperitoneal position (achieved simply by advancing this trocar through the peritoneum) to be used for the transperitoneal pelvic lymphadenectomy.

10.3.2.3 Complications

Hemorrhagic

– They may be due to anatomical variations such as the presence of an anterior obturator vein accompanying the nerve. The pelvic arteries can be tortuous due to the presence of atheroma. Lethal bleeding may occur when the corona mortis, located below the obturator nerve, is harmed.
– Small wounds of the aorta or the vena cava are common. They must therefore be controlled through simple gestures of vascular surgery. Anatomical variations are frequent. They can be sources of vascular wounds. This risk can be reduced by careful study of the preoperative scanner and careful dissection.

The most common anatomical variations are: inferior polar renal arteries, renal arteries ectopic, double vena cava, retroaortic left renal vein, lower right renal artery as the left renal artery or urinary tract malformations.

The renovascular azygo lumbar arch can come from the left renal vein, the left ovarian vein or may not be displayed in the field. In case of a laceration, it can be very difficult to control.

Postoperative bleeding associated with a vascular ligation failure are rare.

Lymphatic

Lymphorrhoea is constant when dissected nodes, hence the usefulness of a good lymphostasis. Para-aortic level, it is increased when approaching the renal vein since the chylous trunks are located above. The high inter-aortocaval region and the left renal vein area are places of important collectors and lymphostasis must be particularly careful and checked.

The lymphocele are the most common postoperative complications (5–10%). The peritoneal incision must be left wide open. Peritoneal lymphocele seems more common after extra-peritoneal route, despite the peritoneal marsupialization. Drains have been reported to be useless to reduce lymphocyst formation [31].

Digestive

Direct digestive wounds by burn or instruments is possible. The risk of sigmoid necrosis by section of the inferior mesenteric artery is low.

Urinary

The risk of ureteral damage is reduced by careful handling and continuous identification of the ureters.

Parietal

Eventration on the trocar orifice is possible, especially after a transperitoneal approach in obese patients. The transplant of tumor to the trocar orifice is rare and can be limited by avoidance of fragmentation and using endoscopic bags.

Nerve

Genito-femoral nerve injury leads to hypoesthesia of the inner face of the thigh and labium majus. Obturator nerve injury can compromise thigh adduction and lateral rotation and can lead to hypoesthesia of the anteromedial face of the thigh.

Moreover, sympathetic disorders occur when sympathetic nerves are injured.

10.3.3 Sentinel Lymph Nodes [32]

For direct cervical injection, there are two different options: 4-quadrant option and 2-sided option (at 3 and 9 o 'clock) ent nerves are injured. thigh and labium majus. Obturator nerve injury can compromise thigh adduction and lateral rotation and can lead to hypoesthesia of the inner thigh.

For isotopic detection, cervical injections of radiolabeled colloids, like unfiltered technetium sulfur colloid, are administered the day before or morning before surgery. Scintigraphic images are obtained 2 h after the injections and then every 30 min to detect the SLN. Then optional lymphoscintigraphy or SPEC-CT can be performed.

The other technique using hysteroscopy consists of a peritumoral colored dye injection (5 mg) during operative hysteroscopy. Laparoscopic inspection is performed using a laparoscopic fluorescence imaging system if the ICG was used.

For subserosal injection, the detection rate appears directly related to the number of injection points.

10.4 Recurrent Endometrial Cancer

Overall, about 75% of recurrences are symptomatic and 25% asymptomatic, and neither recurrence-free nor overall survival are improved in asymptomatic cases compared with those detected at clinical presentation. Most (65–85%) recurrences are diagnosed within 3 years of primary treatment, and 40% of recurrences were local [33].

The treatment of recurrent endometrial cancer depends on the tumor biology (referring to the disease-free interval), number of lesions, resectability and the general condition of the patient.

Isolated recurrences in the vaginal vault, pelvis and para-aortic area in nonirradiated patients still have a chance to be cured [34]. These patients deserve maximal–combined-treatment. In contrast, the outcome of widespread recurrent EC with a short disease free interval, in the range of few months or 1 year, is dismal. Here, surgery has no chance to alter the course of the disease and improve the chances of the patient. Only palliative surgery may in some cases relieve symptoms.

The number of lesions at recurrence, the location and the disease-free interval determine the treatment modalities.

In fact, isolated vaginal recurrences of endometrial cancer can be treated with radiotherapy and have an excellent prognosis (81–88% survival) [34–36]. However, survival is lower when high-grade lesions cause the relapse [37]. Therefore, for vaginal or pelvic nodal recurrence, chemotherapy with RT could be considered in patients with high-risk features for systemic relapse [34].

Isolated para aortic recurrences can be treated with surgery followed by radiotherapy. In order to avoid spilling and trocar metastasis, an open procedure is preferred. This approach also allows to explore the abdominal cavity. Individual case experience shows that this approach can cure patients.

For bulky lesions (>4 cm diameter), surgical resection or chemotherapy prior to radiotherapy may improve local control [34].

Some endometrial cancers, typically low-grade tumors, have a tendency towards a more indolent behavior with late (systemic) recurrences and more isolated disease. When the patient is fit enough and when complete resection is possible without extensive surgery and its associated side effects, resection till no residual disease is a reasonable approach. Robust evidence however on a survival benefit does not exist. But, the resection will allow determination of biomarkers such as the presence of hormonal receptors and remove cell clones harboring new genomic changes that may alter the tumor biology to a higher-grade disease.

Patients with isolated pelvic recurrences in irradiated field may survive thanks to exenterative surgery. Even when systemic disease is excluded and when the recurrence is centrally not invading the pelvic wall, the chance for cure is around 20–40% [38, 39].

10.5 Conclusion

The surgical management of EC aims to be adapted to each stage and histological type. We are moving towards a de-escalation therapy on early stages. However, preoperative staging could be further improved, to avoid over- or under-treatment and their consequences. The technique of sentinel node, of which the assessment remains ongoing, deserves further study.

Minimal invasive surgery also reduces the rate of complications, especially in obese patients, and should be implemented as much as possible.

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