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Learning objectives

1. To provide a pictorial essay of common and advanced gynecologic surgical montages and their clinical indications.
2. To illustrate these techniques with CT and MRI, not only describing normal post-operative appearances but also the radiological appearances of potential complications and early recurrence.

Background

In this work, we sum up our case-based experience concerning common and advanced gynecologic surgical procedures in oncologic patients, such as exenteration, trachelectomy, omental transposition flap, neovagina or neobladder reconstruction, apart from more classic techniques as hysterectomy, omentectomy, lymphadenectomy…

Both diagrams and CT and MR cross-sectional imaging are also provided.

Imaging findings OR Procedure details

**CYTOREDUCTIVE (DEBULKING) SURGERY**

Standard therapy against advanced ovarian cancers consists of a thorough primary surgical cytoreduction followed by chemotherapy. Debulking procedures only improve survival when optimal cytoreduction can be achieved. Women with optimally resected tumor have, on average, a 20-month improvement in median survival compared to those with suboptimal resection (1).

Because of this, an extreme effort should be made to achieve maximal tumor cytoreduction, to the point of no macroscopically visible disease if possible (ideal), or to less than 1 cm of residual disease (optimal cytoreduction).

The rates of achievement of such optimal cytoreduction vary from institution to institution. Results are affected by the surgical team’s experience, technique, effort, enthusiasm, and by their institutional policies concerning the need and use. Expert surgeons achieve optimal cytoreduction in at least 75 percent of cases of radical aggressive surgery (1).
SURGICAL PROCEDURE

Extreme surgical procedures that may be considered for optimal surgical cytoreduction include a radical pelvic dissection, omentectomy, bowel resection, diaphragm stripping and/or hepatic resection and splenectomy Fig. 1 on page 13, Fig. 2 on page 13, Fig. 3 on page 14.

In the absence of obvious stage IV disease, a full staging procedure is performed. Biopsies are taken from all suspicious areas or if suspicious areas are not apparent, multiple random biopsies are performed. The most difficult areas should be assessed and approached first: if they cannot be resected to a diameter of 1 cm or less, further surgery, other than resecting the ovaries to prove the origin of tumor, is not indicated(1) Fig. 4 on page 15.

- OMENTECTOMY

The omentum is resected rather than biopsied. Resection of the omentum, especially when replaced by densely packed metastases (omental cake), is performed even when optimal cytoreduction is not possible in order to decrease tumor bulk and postoperative ascites formation (Fig. 5 on page 15).

- BOWEL RESECTION

A thorough assessment of the intraabdominal findings should be performed prior to attempted resection. Bowel surgery is of little value if there are other areas of grossly unresectable disease, except to relieve gastrointestinal obstruction.

If the procedure provides an opportunity for maximal cytoreduction rectosigmoid colon resection should be attempted in women with bulky abdominal disease, to prevent recurrence (frequent sanctuary). The technique usually performed for dealing with a "frozen" pelvis obliterated by ovarian cancer is modified posterior exenteration. This operation is an en bloc resection of the pelvic peritoneum, uterus, tubes, ovaries, and a segment of rectosigmoid (Fig. 6 on page 15).

- LYMPH NODE SAMPLING

Pelvic and paraaortic node sampling is always performed even in early stage disease (Fig. 7 on page 16, Fig. 8 on page 17). There is controversy about performing systematic pelvic and paraaortic lymphadenectomy or resection of bulky nodes only. Two large randomized trials have evaluated this issue and neither showed a statistically
significant survival advantage with systematic lymphadenectomy, which have more morbidity (1)

- **SPLENECTOMY**

  If tumor nodules extend into the splenic hilum, splenectomy can be justified if optimal cytoreduction is then possible (Fig. 9 on page 17)

- **DIAPHRAGMATIC AND HEPATIC DISEASE**

  Parenchymal hepatic metastases are not necessarily a contraindication to initial cytoreductive surgery (Fig. 10 on page 17, Fig. 11 on page 18). Aggressive cytoreductive surgery includes removal of diaphragmatic disease. Diaphragmatic disease can be approached by stripping or scraping the peritoneal surface. Alternatively, the liver can be partially retracted, the hepatic ligament divided, and the affected portion of the membranous diaphragm resected using ultrasonic dissection, electrocautery, or argon beam laser. Most complications are due to breaching the pleural cavity and can be managed by chest tube or thoracentesis.

**PRESURGICAL ROLE OF IMAGING**

There are reports of the effectiveness, for some advanced ovarian cancer patients, of first administering a neoadjuvant chemotherapy followed by an interval cytoreduction (1); reportedly, these patients showed equal or better prognosis compared with those who underwent the primary cytoreductive surgery first. One potential advantage of this approach is the avoidance of aggressive surgery in women with chemoresistant disease, who have a poor outcome regardless of treatment. If the patient then has a response to therapy, and becomes a more appropriate surgical candidate, tumor debulking may be considered after chemotherapy.

Especially in these cases is where the image plays a key role predicting suboptimal cytoreduction (2). The criteria for neoadjuvant chemotherapy are:

- large volume ascites (>1000 mL) (Fig. 12 on page 18)
- large mesenteric involvement (Fig. 13 on page 19)
- bulky (>1 cm to 2 cm) in the upper abdomen (Fig. 14 on page 19)
- extrabdominal disease (Fig. 15 on page 19)
- suprarenal adenopathy,
- large parenchymal liver disease or diaphragmatic disease
POSTSURGICAL ROLE OF IMAGING

Clinical experience and aggressiveness of the surgeon are key determinants of optimal surgical resection. The intraoperative quantification of residual disease diameter is estimated by the surgeon, and has a subjective component(1). Prospective clinical trials often require a postoperative CT or MRI before initiating chemotherapy; however, the accuracy of imaging for assessing residual disease has not been validated either.

Poor correlation between the surgeon’s estimate of residual disease and postoperative imaging could be due to the surgeon's underestimation of residual disease, rapid regrowth of the tumor following surgery, or postoperative changes and inflammation following surgery.

Patients treated for ovarian cancers are followed-up with serial measurements of CA-125 and either CT scan or MRI of the abdomen and pelvis. The incorporation of functional imaging techniques (PET-TC and DWI) has allowed to leave second-look laparotomy, detecting recurrences measuring 5 mm or less(3)( Fig. 16 on page 20 ). The exact magnitude of the clinical impact of detection of microscopic disease has yet to be properly studied. The majority of ovarian cancer recurrences are within the abdomen and thus potentially amenable to cytoreductive surgery. However, the benefit of secondary cytoreduction in women with a documented or suspected recurrence of EOC is unclear because of the lack of large, randomized trials examining this issue.

Based upon available data, secondary surgical cytoreduction is best considered only for those patients who have all of the following characteristics (4)

- An extended progression-free interval of at least 12 months
- Potentially can be rendered free of all gross residual disease
- Response to first-line therapy
- Good performance status
- Locally recurrent EOC

As with the primary treatment, excision of all gross residual disease is the critical prognostic factor. Review of outcomes after secondary cytoreductive surgery showed survival of patients with optimal debulking (#1 cm) was 16 to 61 months versus 8 to 27 months in those with suboptimal cytoreduction (4)

HISTERECTOMY
Hysterectomy is the most commonly performed gynecologic procedure. Radical hysterectomy refers to the excision of the uterus en bloc with the parametrium (ie, round, broad, cardinal, and uterosacral ligaments) and the upper one-third to one-half of the vagina (Fig. 17 on page 20). The surgeon usually also performs a bilateral pelvic lymph node dissection. Removal of the ovaries is not always part of a radical hysterectomy; they may be preserved if clinically appropriate.

**INDICATIONS.**

Radical hysterectomy is performed as a primary therapy for (5):

1. Stage IB or IIA cancer of the cervix (Fig. 18 on page 21).
2. Selected patients with stage II adenocarcinoma of the endometrium in whom radical surgery seems feasible (Fig. 24 on page 26).
3. Upper vaginal carcinoma, uterine or cervical sarcomas, and other rare malignancies confined to the area of the cervix, uterus, and/or upper vagina.
4. The procedure is also a potential salvage therapy for women with cervical cancer who have been treated with irradiation and subsequently develop a small central pelvic recurrence or have a small central area of persistent disease. In these cases, the procedure may offer curative salvage treatment as an alternative to exenterative surgery.

**HYSTERECTOMY IN CERVICAL CANCER**

The most common indication for radical hysterectomy and pelvic lymphadenectomy is early stage invasive cancer of the cervix, FIGO stages IB and IIA (tumor without parametrial invasion) (Fig. 18 on page 21 and Fig. 19 on page 22). If tumor invades parametrium (IIB) or extends to pelvic wall and/or involves lower third of vagina, rectum or bladder, surgery is contraindicated, and treatment of choice is radiotherapy. The five year overall and disease free survival rates for a primary surgical approach to treatment are similar to those with radiation therapy (83 and 74 percent, respectively) (5).

Metastatic disease in lymph nodes decreases survival and occurs in approximately 15 percent of women with stage IB disease and 25 percent of patients at stage IIA (5) (Fig. 20 on page 23 and Fig. 21 on page 24).

**TRACHELECTOMY**
Radical trachelectomy is defined as partial or complete surgical removal of the cervix and parametria(6, 7). Radical trachelectomy with pelvic lymphadenectomy is a conservative but curative surgical procedure for early (stage IB1 or lower) carcinoma of the cervix. It is a surgical procedure that combine local radical surgery with maintenance of fertility potential in young women. Approximately 30% of women with cervical cancer are less than 35 years of age.

Surgical procedure (Fig. 22 on page 24, Fig. 23 on page 25): The cervix and upper vaginal vault are resected. The residual corpus uteri is anastomosed to the remainder of the vaginal vault. A cerclage suture is placed around the corpus uteri at the anastomosis. This suture maintains the competency of the uterus in any subsequent pregnancies.

Radical trachelectomy has been shown to have a lower mortality and morbidity but comparable curative rates to the more traditional hysterectomy.

HYSTERECTOMY IN ENDOMETRIAL CANCER

Patients with stage II endometrial cancer (ie, endometrial cancer extending to the endocervix) may be treated with radical hysterectomy and bilateral pelvic lymphadenectomy. The adnexae are always removed in these patients(5)(Fig. 24 on page 26 and Fig. 25 on page 27).

EXENTERATION

It is an ultra radical surgical procedure, consisting in bloc resection of pelvic structures, including the uterus, cervix, vagina, bladder, and rectum, in a greater or lesser degree (8) (Fig. 26 on page 27).

It is salvage procedure, offered as a last hope of cure to women with recurrent uterine, vulvar, or vaginal cancers. It is used in very selected cases with recurrent gynecologic cancer with central pelvic disease in absence of nodal, peritoneal or distance spread. Women with either ovarian or endometrial cancer, both of which have a propensity to spread beyond the pelvis, are poor candidates for exenterative surgery and radiation is not an option. Most candidates for this procedure have a diagnosis of recurrent cervical cancer that has previously been treated with surgery and radiation or radiation alone.

Survival rates at five year are approximately 50 per cent. The operative mortality is 3 to 5 percent(8).
INDICATIONS

• **CERVICAL CANCER**: Women with cervical cancer who develop a central recurrence (vaginal apex or pelvis without side wall involvement) after primary RT or after surgery followed by RT are the usually candidates for exenteration if a complete evaluation fails to reveal metastatic disease(Fig. 27 on page 29)

• **VULVAR CANCER**: Primary exenterative surgery is not appropriate for most women presenting with advanced vulvar cancer, but there is a limited role for exenteration in women whose cancer recurs, or in whom the cancer has destroyed the urethra, bladder, or anus.

• **OVARIAN AND ENDOMETRIAL CANCER**: Women with either ovarian or endometrial cancer, both of which have a propensity to spread beyond the pelvis, are poor candidates for exenterative surgery.

• **OTHER CANCERS**: Exenteration has also been used for vaginal carcinomas, rhabdomyosarcomas, and other miscellaneous rare tumors. Severe radiation necrosis, rarely seen with modern technology, has also been an indication for exenteration

CONTRAINDICATIONS

• **ABSOLUTE**
  • peritoneal metastasis(Fig. 27 on page 29)
  • Pelvic sidewall extension(Fig. 29 on page 30)
  • skip metastasis to the bowel,
  • metastases at other distant sites, such as pulmonary or liver metastases.(Fig. 28 on page 29)

• **RELATIVE**
  • metastasis to retroperitoneal nodes,
  • direct tumor invasion of adherent bowel loops,
  • relapse within a year or persistent disease after radiotherapy
  • hydroureter or hydronephrosis.

TYPES

• **TOTAL** (Fig. 31 on page 31, Fig. 37 on page 36)Total exenteration refers to removal of the uterus, tubes, ovaries, parametrium, bladder, rectum or rectal segment, vagina, urethra, and a portion of the elevator muscles. It can be added perineal phase, resecting the anus, urethra, and portions of the vulva, may also be required
• ANTERIOR (Fig. 32 on page 32, Fig. 38 on page 37): In an anterior exenteration, the rectum is spared.

• POSTERIOR (Fig. 6 on page 15): In a posterior exenteration, the bladder and urethra are preserved. This is a kind of surgery which is rarely performed alone, and usually takes part of cytoreductive surgery.

RECONSTRUCTION PROCEDURES

• BOWEL ANASTOMOSIS

The decision to perform an end-sigmoid colostomy or a low rectal anastomosis is based on the level of the resection, the length of the rectal stump, and the extent of other concomitant procedures.

• CONSTRUCTION OF AN OMENTAL FLAP

Omental flap filled the cavity and serves to carpet the raw exposed surfaces of the exenterated pelvis.

Omentum is freed starting at the hepatic flexure, with a 4- to 6-cm band left attached at the splenic flexure, and the freed omentum is then placed along the left paracolic gutter into the pelvis, where it is stitched into place as a "lid" to keep small bowel out of the pelvic defect (Fig. 33 on page 33).

• URINARY DIVERSION

Several options exist for urinary diversion, and the choice of continent versus non-continent urinary diversion is based on assessment of the patient’s ability to care for a continent pouch and availability of the right colon and ileum with the ileocecal valve.

A Modified Ureteroileal Anastomosis Technique (Bricker urinary diversion) is the most commonly used choice (Fig. 34 on page 34, Fig. 35 on page 34).

It is a noncontinent diversion with an ileal urinary conduit in which the ureters are implanted in an isoperistaltic manner into a segment of small bowel, one end of which is brought out as a cutaneous stoma.

• VAGINAL AND PELVIC RECONSTRUCTION.
Several methods for vaginal and pelvic reconstruction have been described:

- Skin graft with omentum
- Myocutaneous grafts
- Rectus (VRAM)
- Gracilis
- Intestinal.

Following vaginectomy in combination with exenteration, reconstruction with skin flaps is inadequate due to poor vascularity, dead space, and lack of pelvic support. Myocutaneous flaps bring bulky vascularized tissue into the pelvis, which reduces the chance of the empty pelvis syndrome developing. Vertical rectus abdominis myocutaneous (VRAM) flap have the smallest incidence of necrosis and is the most commonly used choice (10) (Fig. 36 on page 35).

COMPLICATION FOLLOWING GYNECOLOGIC SURGERY

Extensive gynecologic surgery often entails meticulous dissection near the bladder, rectum, ureters, and great vessels of the pelvis. The risk of complications depends upon the extent and approach to surgery and patient characteristics. Understandably, the more common complications from this surgery relate to injuries to these viscera and occur during extensive resections for the treatment of cancer or when anatomy is distorted due to radiotherapy. Complications of gynecologic surgery include hemorrhage, infection, and visceral damage (bowel injury, fistulas, urinary tract complications).

- COMPLICATIONS AFTER PELVIC EXENTERATION (8)

Almost every patient develops at least 1 complication, and approximately 40-50% experience a major complication that requires further diagnostic and therapeutic procedures. The operative mortality rate is 2-5%.

The major early postoperative complications include blood loss, sepsis, wound dehiscence, and anastomotic breakdown at the level of the bowel, urinary pouch, or ureteral sites (Fig. 39 on page 37).

The rate of late complications is lower, but approximately one third of patients experience fistula, bowel obstruction, ureteral strictures, renal failure, pyelonephritis, and chronic bowel obstructions, flap necrosis and stomal necrosis.

- URINARY TRACT COMPLICATIONS
The prevalence of urinary tract injuries is higher following radical hysterectomy with lymph node dissection for pelvic malignancy than after total abdominal hysterectomy for benign indications (11). Bladder laceration, which is usually recognized and corrected at primary surgery, is the most common injury.

Predisposing factors include distortion of the pelvic anatomy by adhesions due to previous surgeries, radiation therapy, or pelvic inflammatory disease. The stage of the underlying malignancy, obesity, diabetes mellitus, and postoperative infection are other predisposing factors for urinary tract complications.

Ureteral injuries may occur due to direct trauma during surgery or secondary to ischemia from stripping of the periureteral fascia (Fig. 40 on page 38).

Bladder and ureteral injuries may heal without complications or lead to urinoma, ureteral stricture and obstruction, and ureterovaginal or vesicovaginal fistula (Fig. 41 on page 39).

- **BOWEL INJURY**

In gynecologic surgery, both the small bowel and the rectosigmoid colon are at risk for injury. The prevalence of bowel injury is higher in patients with adhesions from previous surgery, radiation therapy, pelvic inflammatory disease, or endometriosis. Further complications of bowel injury include perforation, peritonitis, abscess formation, bowel obstruction, and fistula formation (Fig. 42 on page 40 and Fig. 43 on page 41).

- **FISTULA**

A fistula is defined as an abnormal communication between two epithelial surfaces, connecting an abscess cavity or hollow organ to the body surface or to another hollow organ. Fistulas can be early as well as delayed complication of cancer treatment, secondary to bowel or urinary tract injury.

The nature of a fistula is related to the type of malignancy or surgery and to any associated radiation therapy. The prevalence of fistulas is higher following radical hysterectomy and radiation therapy for cervical cancer (11).

Fistulous connections may be vesicovaginal, rectovaginal, enterocutaneous enterovesical, enteroenteral, entero vaginal or ureterovaginal with the most common being vesicovaginal and rectovaginal fistulas.
Because of improved technique with faster imaging and better resolution, CT and MR imaging are replacing conventional barium studies and IVU as the primary imaging methods for the evaluation of postsurgical fistulas (Fig. 44 on page 42)

Images for this section:

Fig. 1: Photograph shows retroperitoneal approach during debulking surgery
Fig. 2: Diaphragmatic disease can be approached by stripping or scraping the peritoneal surface
Fig. 3: Photograph shows miliary peritoneal dissemination of ovarian tumor

Fig. 4: Ovarian cystadenoma stage III. Bilateral ovarian implants (red arrows), in posterior cul-de-sac and meso-rectum (yellow arrow), and plaque-like perihepatic implants (blue arrows)

Fig. 5: Omental cake in patient with primary ovarian cancer and extensive peritoneal involvement
Fig. 6: Patient 45 y.o. with papillary serous ovarian cystadenocarcinoma grade II. Calcified relapse in posterior cul-de-sac, with mesorectum invasion (red arrow). Modified posterior exenteration was performed. Blue arrows show the ridges of resection in rectosigma.
**Fig. 7:** Periaortic lymph node in papillary serous ovarian carcinoma grade III. Both DWI and PET-CT are valid techniques for evaluation. Picture shows paraaortic lymphadenectomy.

**Fig. 8:** Pelvic lymph node in papillary serous ovarian carcinoma grade III. Picture shows pelvic lymphadenectomy.

**Fig. 9:** Implant in splenic hilium, clearly visible in PET, but hardly visible DWI because of the physiological hiperintensity of spleen.
Fig. 10: Subdiafragmatic implant

Fig. 11: Tumor deposit along the fissure of the hepatoduodenal ligament (arrows). PET shows only one lesion, being difficult to differentiate between a hepatic deposit and peritoneal implant. At DWI, two adjacent milimetric lesions are depicted, suggesting peritoneal implants.
**Fig. 12:** Primary ovarian carcinoma with extensive peritoneal carcinomatosis and massive ascites

![Primary ovarian carcinoma with extensive peritoneal carcinomatosis and massive ascites](image1.png)

**Fig. 13:** Multiple mesenteric implants, using PET and DWI

![Multiple mesenteric implants, using PET and DWI](image2.png)

**Fig. 14:** Recurrent ovarian carcinoma with bulky implants in the upper abdomen

![Recurrent ovarian carcinoma with bulky implants in the upper abdomen](image3.png)
**Fig. 15:** Primary ovarian carcinoma with extensive peritoneal carcinomatosis and supradiaphragmatic implant

**Fig. 16:** Peritoneal dissemination of recurrent ovarian adenocarcinoma with pelvic implants. The image serves to demonstrate the utility of DWI sequence, despite its low anatomic resolution because of its high tissue contrast in the detection of implants less than or equal to 5 mm, which pass unnoticed in anatomical T2 sequences. T2WI shows hysterectomy and oophorectomy, with no apparent alterations. In DWI implants show a high signal, which contrasts with the low background signal. In merger, being represented in red implants, ADC value less than $1 \times 10^{-3}$ mm$^2$/s.
Fig. 17: Hysterectomy
Fig. 18: Stage Ib1 squamous cell carcinoma of the uterine cervix in a 38-yo woman without involvement of parametrium or vagina
**Fig. 19:** Same patient (Fig 18) underwent radical hysterectomy. Image taken shortly after surgery shows vaginal cuff (blue arrow) without complications except for the presence of a small lymphocele (yellow arrow).

**Fig. 20:** Malignant presacral node in squamous cell carcinoma of the uterine cervix -PET-TC was negative for malignant adenopathies (not shown). Sagital T2-WI of the uterus
shows cervical cancer (arrow) B Axial T2 -WI and DWI ( b = 600 s/mm2) show a small lymph node, difficult to detect on T2-WI but shows up clearly hyperintense on DWI

**Fig. 21:** Same patient than fig 20 Surgical intervention was started by lymphadenectomy. The intraoperative pathology report was positive. It was decided not to perform a hysterectomy, instead a bilateral oophoropexy was carried out (placement of both ovaries in paracolic gutters, surgically clipped) and an omental flap was constructed in pelvis for subsequent treatment with radiotherapy After completion radiation treatment, sagital T2-WI shows remission of the primary tumor
Fig. 22: Diagrams of the trachelectomy technique.
**Fig. 23:** End-to-end anastomotic appearance after trachelectomy. Sagittal T2-weighted image shows the corpus uteri anastomosed to the upper vaginal vault.
Fig. 24: Stage IIB adenocarcinoma of endometrium in a 56-yo woman. Sagittal and axial T2-WI of the uterus show a mass filling the endometrial cavity extending to the endocervix (arrow)

Fig. 25: Acute post-hysterectomy pelvic collections (arrows)
Fig. 26: Gross fixed specimen from total pelvic exenteration.

Fig. 27: Vaginal fornix recurrence after radical surgery and radiotherapy for cervical cancer. A axial T2-WI; B DWI, and C PET/TC show no remarkable alteration except for an abnormal ADC value in the right vaginal fornix, measuring $1.3 \times 10^{-3}$ mm$^2$/s. Six months later, D axial T2-WI; E DWI, and F PET/TC. ADC value in right vaginal fornix had decreased to $1.1 \times 10^{-3}$ mm$^2$/s and PET/TC depicted a hypermetabolic focus. Recurrent disease was surgically proven and total exenteration was performed.
Fig. 28: Fundus relapse of cervical cancer previously treated by radioteraphy, that invades cecum and sigmoid colon (arrows)
Fig. 29: Supraclavicular metastases diagnosed in preoperative study from a central cervical recurrence

Fig. 30: Pelvic recurrence of cervical cancer with invasion in pelvic sidewall causing ureter dilatation
Fig. 31: Total exenteration with perineal phase
Fig. 32: Anterior exenteration

Fig. 33: Construction of an omental flap
Fig. 34: Construction of an ileal conduit
**Fig. 35:** Coronal and axial MIP CT urogram shows Bricker urinary diversion with bilateral catheters.
Fig. 36: Vertical rectus abdominis myocutaneous (VRAM) flap
Fig. 37: Vaginal recurrence after radical surgery and salvage radiotherapy for cervical cancer in a 74-year-old woman. Cervical stump and vaginal recurrence, affecting stroma, and urethrovaginal and rectovaginal septa (red arrows). Total infralevator exenteration with perineal phase was performed: radical cystectomy, low anterior resection, and total vaginectomy and urethrectomy. Pelvic defect was filled with an omental flap (green arrow). Postsurgical CT, showing a little collection in hypogastric due to construction of omental flap (yellow arrow) and postsurgical pelvic collection (blue arrow).

Fig. 38: Recurrence of cervical squamous cell carcinoma in a patient with stage IVA (red arrow). Initial RM, 6 and 12 months after chemo-radiotherapy and postsurgery RM. Significant reduction in tumor size with vesicovaginal fistula formation (yellow arrow). One year after treatment, MR shows the appearance of a mass of soft tissue around the fistula, urethrovaginal septa and bladder wall, suggesting a relapse (blue arrow). As there was no involvement of posterior vaginal wall or rectovaginal septum, anterior exenteration was performed. Anterior exenteration includes hysterectomy, radical cystectomy, vaginectomy and urethrectomy. The reconstruction includes omental flap (white arrow) and myocutaneous flap becoming a neovagina (green arrow).
Fig. 39: Patient underwent anterior exenteration. Image taken shortly after surgery shows abdominal wall hematoma in abdominal rectus muscle area (red arrow), and around VRAM graft (blue arrow). The hematoma resolved over time without intervention and the myocutaneous graft was viable.
Fig. 40: Right ureteral injury as a complication of hysterectomy. Delayed axial image from CT urography shows jet of contrast material (red arrow) extending from injured right ureter. Large amount of urinomatous ascites is present, with some layering of contrast material present dependently in pelvis.
**Fig. 41:** Right ureteral stricture in a patient who had undergone radical hysterectomy. Coronal MIP CT urogram shows distal ureteral stricture (blue arrow) without hydronephrosis because of previous placement of a catheter.
Fig. 42: Contrast-enhanced CT scan shows postoperative bowel perforation and peritonitis. There is oral contrast material (arrowhead) in the peritoneal space mixed with fluid bowel contents and gas.
Fig. 43: Small bowel obstruction due to postsurgical adhesions in a patient who had undergone Cytoreductive surgery 2 years earlier. Coronal reformatted CT image demonstrates demonstrates small bowel adhesions to the presacral soft tissues in the pelvis (arrow).

Fig. 44: A: Patient with stage IB2 adenocarcinoma of endocervix. Patient presented with suspected endometrial cancer by hysteroscopy, and was treated with radiotherapy after radical hysterectomy. B and C: Due to surgery and posterior radiotherapy a vaginal fistula formed. Sagital and axial CT urogram shows pass of contrast material (red arrow) extending from baldder to vagina (vesicovaginal fistula) D:It was decided to treat it with a catheter and posterior surgical reparation.
Conclusion

A great variety of surgical techniques in gynecologic oncology is reviewed. Imaging plays an important role not only in determining the most appropriate surgical technique, but also in the follow-up, for both complications and early recurrence are easily depicted.

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