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Chapter 7

Pelvic Exenteration for the Management of Pelvic Malignancies

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Abstract

Pelvic exenteration is a surgical procedure first described by Brunschwig in 1948 as a curative or palliative treatment for pelvic and perineal tumors. It is actually a radical operation, involving en bloc resection of pelvic organs, including reproductive structures, bladder, and rectosigmoid. In patients with recurrent cervical and vaginal malignancy, it is associated with a 5-year survival of more than 50%. In spite of advances in surgical management, consequences such as stomas, are still frequently unavoidable for radical tumor excision. Most candidates for this procedure have been diagnosed with recurrent cervical cancer that has previously been treated with surgery and radiation, or radiation alone. Complications of pelvic exenteration are more severe than those of standard resection of a colorectal carcinoma, so it is not commonly performed, including wound infection, wound dehiscence (also described as burst abdomen) the creation of fistulae (perineal-fecal, uretero-vaginal, between conduit and perineal wound), urinary tract infections, perineal hernias and intestinal obstruction. Patients need to be carefully selected and counseled about risks and long-term issues related to the surgery. A comprehensive evaluation is required in order to exclude unresectable or metastatic disease. Evolution of the technique through laparoscopy and minimally invasive surgery may result in a reduction of morbidity and mortality.

Keywords: Pelvic exenteration, gynecologic cancer

1. Introduction

Pelvic exenteration was first described by Brunschwig and his colleagues of New York's Memorial Hospital in 1948 [1] and was initially performed as a palliative surgical intervention

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for extended recurrences of gynecologic carcinomas. These tumors usually invade local tissues, such as the urinary tract and the rectum, the pelvic sidewall, and the urogenital diaphragm. Thus, an en bloc removal of the lower abdomen structures and reconstruction procedures to preserve urinary, intestinal, and sexual functions was taken into consideration.

Since Brunschwig's time, the improvement of surgical techniques (such as stapling devices, separate urinary conduits, and pelvic reconstruction), postoperative critical care units, antibiotic and thromboembolic prophylaxis, and the wisest selection of patients, have improved the morbidity and mortality rates associated with the procedure. The survival rates range from 16–60% for recurrent cervical cancer for 5 years postoperatively, 40% for uterine cancer with variations depending on the histology of the tumor, and 62% for vulvar cancer (according to Forner and Lampe's study). The postoperative survival is up to 8 months, and surgical mortality rate reaches about 23% [2].

Due to this improvement, the procedure has gained widespread acceptance in selective centers, even though it presents a negative mutilating impact [3]. A thorough preoperative examination must be performed in order to select those patients to whom the operation is appropriate. The recurrence should be confirmed by its clinical symptoms and biopsy results and a complete laboratory evaluation and a thorough imaging study (C.T., M.R.I, bone scan) must be performed to evaluate the patient's health status and the presence of metastases.

Pelvic exenteration is, therefore, a procedure that can be performed either for a tumor concerning general surgery (rectal cancer) or obstetrics (female reproductive system tumors).

2. Classification

Pelvic exenteration is actually a radical operation, involving an en bloc resection of pelvic organs, including reproductive structures, bladder, rectosigmoid, and sacrum. The patient undergoing pelvic exenteration is, usually, placed in the lithotomy position, and, through a midline incision, all the organs of the abdomen and pelvis are thoroughly explored.

Pelvic exenterations can be classified into three groups:

- **Anterior** pelvic exenteration

It involves the resection of central pelvic organs, bladder, and distal ureters bilaterally, but spares the gastrointestinal tract. The rectosigmoid, anus, and lower portion of the posterior vagina are left intact.

- **Posterior** pelvic exenteration

The procedure removes the central organs together with the rectosigmoid, but spares the anterior vagina, urinary bladder, and ureters.

- **Total** pelvic exenteration

This form is actually the combination of the previous types. It involves the evacuation of all pelvic organs, including the bladder, rectum, vagina, urethra, vulva, clitoris and anus [2]. It

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requires the creation of a urinary conduit for urine (continent or non-continent), a colostomy, as well as the reconstruction of the pelvic floor and vagina using flaps, such as the rectus abdominus or gracilis muscles [4].

- Other than those common forms, new types have been introduced, as **extended** exenterations, which include abdominosacral resection, and **individualized** approaches.

This original classification of pelvic exenteration addresses only the nature of the pelvic viscera removed. Some authors have suggested a new sub-classification that takes the levator ani muscle as a reference point and offers a better definition of the extent of resection and the anatomical changes associated with each operation [5]: supra-levator (Type I), infra-levator (Type II), combined with vulvectomy (Type III).

It is expected that not every case fits in one of the above-mentioned specific types of the procedure, therefore the technique should be be individualized (Fig. 1).

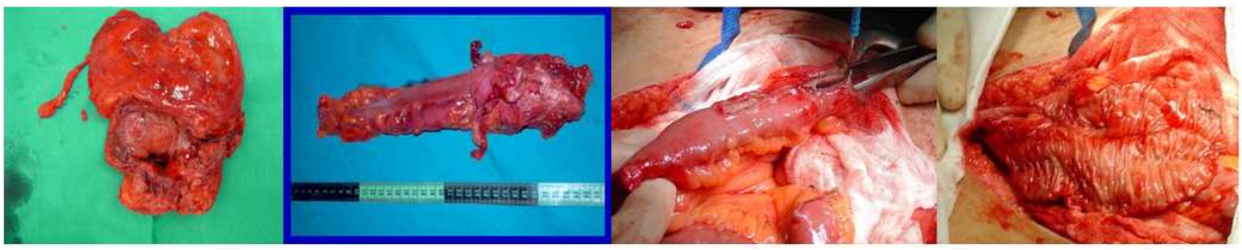


Figure 1. Total pelvic exenteration in a female patient in which bladder, rectum-sigmoid, and vagina were resected and needed a small intestine neocyst for urinary conduit.

In most patients, resection of the rectosigmoid with low primary re-anastomosis is not advisable in the irradiated pelvis, and, thus, total exenteration should be preferred. Efforts to preserve either the bladder (anterior exenteration) or rectosigmoid may evoke severe postoperative complications and often malfunction of the preserved organs; such efforts may not be advisable in some cases [6]. Anterior and total supra-levator pelvic exenteration in patients with gynecological malignancies is feasible with orthotopic reconstruction of the lower urinary tract [7].

Depending on the classification type, the procedure may include end-sigmoid colostomy or low rectal anastomosis, continent or noncontinent urinary diversion, and vaginal and pelvic reconstruction [8]. Moreover, such procedures may also be combined with intra-operative radiation therapy for improved disease control at the pelvic sidewall or possible cancer positive margins.

3. Indications

The most common indication for exenteration is cervical carcinoma that is advanced or has recurred after radiotherapy (about 70%), followed by locally advanced rectal carcinoma (about

10%) in both men and women. In these cases, it is a feasible surgical procedure, especially in selected medical centers and in selected patients with tumors of size less than 30 mm, negative surgical margins, and no lymph node involvement [9].

As postoperative complications remain high, operative procedures and their indications must be continuously revised to further reduce the complication rate in the selected cases. An international register of exenterations should be organized in order to generate prospective data on different aspects of this procedure. These oncologic data would give therapists the opportunity to advise patients and to define the indications and contraindications of this operation more precisely.

4. Contraindications

Pelvic exenteration is not feasible in all cases of gynecologic and rectal cancers. Contraindications to exenteration include incurability indications such as distant metastases, invasion of pelvic bones and major blood vessels, pelvic wall musculature involvement, and intraperitoneal disease [10].

Advanced age should not be considered as a contraindication to a potentially curable case, as in some series it is shown that duration of surgery, blood loss, length of hospital stay, and complication rates do not increase with age [11]. However, other factors such as high level BMI, hypertension, or pulmonary disease may influence the outcome [12].

On the other hand, there are considerable differences concerning indications and contraindications, preoperative staging, and adjuvant therapy for pelvic exenteration between each study [13]. Therefore, further studies are needed to specify these factors for each gynecologic tumor.

Although pelvic exenteration can be performed in cases of recurrent rectal cancer without distant metastases, several studies have demonstrated that negative surgical margin status (R0 excision) is the most important prognostic factor for disease-free survival. Recurrent disease, preoperative BMI greater than 30 and lymphatic invasion are considered as poor prognostic factors. Therefore, invasion through the greater sciatic notch, metastasis to the para-aortic lymph nodes, extensive pelvic sidewall involvement, tumor encasement of the iliac vessels, lower limb oedema, ASA IV-V and probably invasion into S1 or S2 are contraindications for the operation.

5. Complications

Most complications after pelvic exenteration are considered to be caused by a compromised healing of the irradiated tissues [14] and are classified in many categories by many studies [15, 16, 17] with a different rate of occurrence.

Early complications include, among others, pyelonephritis, venous thrombosis, lesion of the obturator nerve, abscess, partial necrosis of the gracilis flap, and chronic obstructive pulmo-

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nary disease decompensation. Late complications are fistulas (colon-skin, bladder-vagina, ileum-vagina), pyelonephritis, and incisional hernia. Ileo-ileal anastomosis failure, colostomy obstruction, pelvic peritonitis, septic shock, seroma of the lower limb, and pelvic lymphedema, when they occur, are considered as major complications.

Cooperation with general surgeons and/or urologists, intensive postoperative management, and patient selection are crucial in order to reduce the complication rates and improve the patients' survival.

6. Outcome and prognosis

The median time of recurrence, after initial treatment, is 18–24 months and occurs in 20%–30% of patients initially treated with concomitant chemotherapy for recurrent cervical cancer [18]. The overall limitation of the existing studies is the heterogeneity in the inclusion criteria and the consideration of several types of cancers (of the cervix, endometrium, vulva, and ovaries) [19]. A 5-year survival of 46% for primary advanced and 17% for locally recurrent rectal cancer has also been shown [20].

Factors that influence prognosis after pelvic exenteration are feasibility of complete microscopic and macroscopic resection (R0), lymph node involvement, lymph vascular invasion, perineural invasion, tumor grade, size of recurrence, pelvic sidewall involvement, interval between primary treatment and pelvic exenteration, total number of tumor-invaded organs, mesorectum lymph node involvement, and vascular emboli on pretherapeutic biopsies [21].

A resection with sound margins, histologically confirmed, is both mandatory and very often possible in selected cases after pelvic exenteration (85%). Patients treated with total microscopic and macroscopic resection have a 5-year overall survival of 53%, and this percentage is even higher in patients without lymph node metastases [21], so the resection margins are a significant factor for the determination of the patient's survival. Patients, whose margins were negative, had longer survival than those with positive margins. Surgical margin status is an important predictive factor for the recurrence of the disease, as well. There are several techniques in order to achieve total microscopic and macroscopic resection. R0 microscopic resection has better survival rates than total macroscopic ones, where part of the tumor is left behind, as shown microscopically. Therefore, it is accepted extending into wider planes to ensure that radical excision is achieved [22].

Many patients with locally recurrent colorectal cancer are precluded from postoperative radiation because of previous radiation's limitations or proximity to radiosensitive pelvic organs; therefore, an alternative is intraoperative radiation therapy (IORT). Complications such as delayed healing, wound breakdown, ureteric stenosis, peripheral neuropathy, and osteonecrosis can occur after this combination of treatments. Radiation therapy at the time of pelvic exenteration doesn't change survival and recurrence outcomes for cervical, vaginal, or vulvar cancer. However, patients with clinical indications for intraoperative radiation therapy at the time of pelvic exenteration have worse prognosis compared to those who do not require this procedure. The surgeon may consider performing a laterally extended endo-pelvic resection to decrease local recurrence or consider palliative treatment options [23].

7. Quality of life

Although patients report gastrointestinal symptoms and a decline in physical function after pelvic exenteration, most adjust well, returning to almost baseline functioning within a year. Patients should be counseled that many symptoms are likely to improve in the first postoperative months, as they adapt to their changed health status [24]. The systematic assessment of quality of life, sexuality, and body self-image by standardized questionnaires should be incorporated into the evaluation of the surgical outcome of such radical procedures [25].

Surgery is always a life-changing action, impacting physical, psychosocial, and sexual functions, as well as body image [26]. As part of preoperative counseling and postoperative support, the changes, especially in a woman's body image following pelvic exenteration, must be taken into consideration. Some patients report improved quality of life following surgery, with decreased narcotic requirements and malodorous discharge. Most women, however, note a decline in sexual quality of life (almost diminished), whereas body image, physical ability, and social functions are all decreased. The available data suggest that deficits in sexuality, attractiveness, and self-confidence are significantly higher postoperatively compared to preoperatively [27]. These changes are more obvious in younger patients and those who do not undergo vaginal reconstruction. However, overall function, and mental and emotional quality of life are comparable to those preoperatively and patients may report similar levels of emotional well-being and general quality of life when compared to healthy women.

During the last fifteen years, reconstructive surgery has significantly improved with a benefit on the quality of life of women. Reconstructive techniques should be carefully individualized after an adequate counseling about expectations and risks [28]. Soft-tissue reconstructions are needed to reduce complications, to secure the pelvic floor, and to reconstruct the vagina in selected patients. Commonly used flaps for perineal and vaginal reconstruction include the gracilis myocutaneous, vertical rectus abdominis myocutaneous (VRAM), and posterior thigh flaps. Thus, a muscle and fascia–sparing flap based on the deep inferior epigastric perforator artery (DIEP) seems to be a promising flap for this kind of reconstruction and could replace the transverse rectus abdominis myocutaneous pedicled (TRAM) flap, according to a study that showed a decrease in donor-site abdominal morbidity when using the DIEP flap compared with the TRAM flap [29]. The transverse musculocutaneous gracilis (TMG) flap can also be used for reconstructions after total pelvic exenteration. It does not lead to functional deficits, complicate the abdominal stomas, or weaken the abdominal wall. It reduces the length of operation and, moreover, donor defect and scars are minimal [30, 31].

In order to improve the quality of life, many techniques of continent urinary diversion have also been developed during the last decades. Such techniques improve continent mechanisms, and decrease postoperative complications and surgical difficulty (using the Studer or the Indiana technique). Today, the most popular forms of continent urinary diversions used in gynecology oncology are Mainz pouch, Indiana pouch, and Miami pouch. There are no differences in postoperative complications between patients with continent and no-continent conduits except that stone formation may be more common in patients with continent conduits [32]. Many advances of these techniques have been made, and physicians have learned to manage complications in a more conservative way [33, 34].

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8. Conclusions

Management options for pelvic cancers include surgical resection and radiotherapy, hormonal therapy, cytotoxic chemotherapy, and targeted therapy with novel biological agents, or palliative measures . When a recurrence occurs, the tumor may be locally advanced but still limited to the pelvis; however, previous treatment with high doses of radiation makes surgical resection a difficult procedure with an increased rate of complications. There is no optimal treatment regimen. Rather, one must consider the patient's performance status and prior treatment history. Patients need to be carefully selected and counseled about risks and long-term issues related to pelvic exenteration.

Many questions regarding the indication for such radical operations, the handling of irradiated tissues, and the optimal reconstructive procedures are still open and demand multi-institutional controlled trials to be answered. Laparoscopic and minimally invasive surgery and application of this technology to radical pelvic surgery, including pelvic exenteration, are challenging and may result in a reduction of morbidity and mortality.

Pelvic exenteration needs surgical experience, specialized medical centers and an interdisciplinary team, and has become an intriguing operation for advanced central pelvic recurrence in patients with gynecologic, urinary, or rectal cancer that were previously treated with radiotherapy only. Further studies on the exenterative procedures for the management of such advanced pelvic malignancies are necessary.

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