Pelvic Exenteration Put into Therapeutical and Palliative Perspective: It Is Worth to Try

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Abstract

Pelvic exenteration (PE) is one of the most drastic operations in surgical oncology, associated with severe morbidity and mortality. The objective of our study was to review our experience of PE in terms of surgical characteristics, complications, and overall survival. All patients who had PE surgery between January 1999 and December 2015 were identified. Patients with verified distant metastatic disease were excluded. Patients with advanced pelvic tumors experiencing incapacitating postradiation severe damages were included. The following parameters were recorded: age, sex, indication for surgery, tumor histology, type of exenteration, urinary tract and colon reconstruction methods, operative time, blood transfusion, intensive care unit admissions, length of hospital stay and readmissions, and characteristics of perioperative morbidity and mortality. A total of 25 patients were submitted to PE by our surgical team. Most of the patients suffered from cervical cancer followed by bowel cancer. There was no perioperative mortality. Early postoperative complications ensued in 56% of the patients. Most complications involved the urinary system. Five years survival was estimated at 38%. Most patients ($n = 9$, 36%) died due to their primary disease, 5 (20%) died because of complications following operation, and 2 (8%) died because they denied oral feeding, which was associated with depression. Patients with a variety of malignancies can benefit from PE. Meticulous surgical technique, perioperative care, counseling, and nutritional support play an important role.

Keywords Pelvic exenteration · Pelvic malignancy · Cervical cancer · Gynecologic cancer · Colon cancer

Introduction

Pelvic exenteration (PE) is one of the most drastic operations in surgical oncology, associated with severe morbidity and mortality rates. It was first described in 1948 by Brunschwig as a palliative procedure for advanced pelvic malignancies [1]. However, since then, it has evolved into a potentially curative

intervention as radical pelvic resections have demonstrated promising results in regard to survival [2].

The most common indication for PE is recurrent or persistent cervical cancer following chemoradiation [3, 4]. PE has also been broadly employed in the treatment of primary ovarian and recurrent endometrial cancer as well as in persistent vulvar cancer [3]. Moreover, non-gynecologic malignancies may require exenteration, in specific, advanced primary or locally recurrent rectal adenocarcinoma and persistent or recurrent anal squamous cell carcinoma [2].

Total pelvic exenteration (TPE) involves the evacuation of all pelvic organs, that is *en block* removal of the rectum and anus, prostate in men, uterus, vagina, and ovaries in women and removal of the urinary bladder with or without sacrectomy or coccygectomy [5, 6]. Thereafter, a reconstruction of the urinary system is warranted, either with a continent or incontinent conduit, a construction of a colostomy for stools, and a reconstruction of the pelvic floor and/or vagina with muscle flaps from the rectus abdominis or gracilis muscles. Whenever

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allowed by disease stage, less radical alternatives of the operation may be implemented in order to minimize morbidity, i.e., anterior pelvic exenteration (APE) sparing the rectum, posterior pelvic exenteration (PPE) sparing the bladder, or even supralelevator exenteration (SLE) where formation of a colostomy can be avoided with establishment of rectal continuity (low anterior resection) [5, 6]. Technological advances in surgery have recently allowed PE to be performed laparoscopically or robotically, albeit still sporadically [6, 7].

Regardless of the surgical approach, PE remains a high-risk surgical procedure linked to long operating hours, extended hospitalization, and excessive surgery-related complications. Consequently, there is a well-established need to define clear indications in order to ensure that patients will definitely benefit from this procedure as well as to identify the risks that increase the incidence of complications.

The objective of our study was to review our experience of PE for advanced pelvic malignancies in terms of surgical characteristics and surgical strategies, types, and incidence of complications and overall survival in an effort to improve outcome and to determine whether palliative operations are accompanied by acceptable or increased morbidity and mortality.

Materials and Methods

Local Ethics Committee approval was applied for but was not deemed necessary by our hospital committee due to the retrospective nature of our study. All patients who had PE surgery for advanced pelvic malignancy between January 1999 and December 2015 were identified from the hospital's registration system and were included in the study. The main indication for PE in our studies was patients with advanced pelvic malignancies in whom complete resection was deemed feasible after preoperative staging. Patients with advanced pelvic tumors experiencing incapacitating postradiation severe damages were also considered candidates for palliative PE, even when complete resection was ruled out by preoperative imaging, provided that no other treatment options existed. Patients with verified distant metastatic or extrapelvic disease were excluded from the study.

During this period, a total of 25 pelvic exenterations were carried out. The records of these eligible patients were reviewed by the authors, and the data were entered into a standardized form. For each patient, we reviewed the following clinical parameters: age, sex, indication for surgery, tumor histology, and previous treatment data. Furthermore, various surgical variables were recorded: type of exenteration (total, anterior or posterior), urinary tract and colon reconstruction methods, operative time, amount of blood transfusion, intensive care unit (ICU) admissions, length of hospital stay, and readmissions after patient discharge from hospital. We also

reviewed perioperative morbidity, in specific, types of complications and their incidence and perioperative mortality.

Perioperative morbidity involved complications within 30 days of the surgical procedure. Similarly, perioperative mortality was calculated at 30 days. Complications were graded in accordance with the Clavien-Dindo classification [8]. Finally, overall 5-year survival was recorded. Patient follow-up lasted until death or the 31st of December 2015.

Statistical Analysis

Statistical analysis was carried out using IBM SPSS Statistics for Macintosh, Version 20.0 (Armonk, NY: IBM Corp). Data are reported as median values as for skewed data with the range included in brackets. Numbers and percentages are used for categorical variables. Survival rates were calculated by the Kaplan-Meier analysis.

Results

From January 1999 to December 2015, a total of 25 patients, 21 women (84%), and 4 men (16%) were submitted to pelvic exenteration by our surgical team, led by the same surgeon (V.S.). Their mean age was 49 years (range 38–71) (Table 1). Total pelvic exenteration was performed in most of the cases ($n = 21$, 84%), anterior in 2 patients (8%) and posterior in the remaining 2 patients (8%). Most of the patients suffered from cervical cancer (72%) followed by bowel cancer (16%). All patients had undergone previous radiotherapy, either with or without combined chemotherapy. None of the patients had undergone previous surgical treatment. During this 16-year period, 40,000 general surgery operations of all types were performed in the department out of which approximately 10% were aimed to treat complications of previous gynecological cancer surgery.

In all four cases with colon cancer, PE was indicated as a primary surgical approach. In 16 patients suffering from gynecologic cancer, the procedure was indicated as palliative for the treatment of complications following previous therapy (enteric fistulas, chronic pain, radiation enteritis, etc.). Only one patient with cervical cancer was operated with curative intent, for the treatment of persistent disease.

Mean operative time was 222 min (range 180–320) (Table 1). The need for blood was estimated by the number of units of packed red cell blood transfused: a mean of 4 units per patient was required (range 0–12). End colostomy was the commonest way of gut reconstruction carried out in 20 patients (80%), and an incontinent ileal conduit was the urinary tract reconstruction of choice in most cases (19 patients, 76%). Two patients were admitted and stayed in the intensive care unit for 2 and 45 days, respectively, while mean hospital stay was 22 days (range 9–60) (Table 1). Eight patients (32%) were

Table 1 Patients' characteristics and perioperative data

Age (years)	49 (38–71)
Tumor location	
• Cervix	18 (72%)
• Gut	4 (16%)
• Vulva	2 (8%)
• Vagina	1 (4%)
Surgical intent	
• Recurrence	16 (64%)
• Palliative	5 (20%)
• Primary	4 (16%)
Histology	
• Squamous cell carcinoma	20 (80%)
• Adenocarcinoma	5 (20%)
Type of pelvic evisceration	
• Total	21 (84%)
• Anterior	2 (8%)
• Posterior	2 (8%)
Reconstruction	
• Gut	
i) End colostomy	20 (80%)
ii) Colorectal anastomosis	3 (12%)
iii) Coloanal anastomosis	2 (8%)
• Urinary tract	
i) Incontinent ileal conduit	19 (76%)
ii) Orthotopic neobladder	3 (%)
iii) Ureterostomy	3 (%)
Operative time (minutes)	222 (180–320)
Number of RBC units transfused	4 (0–12)
ICU admissions	
• Number of patients	2 (8%)
• Duration (days)	20.6 (6–45)
Reason of postdischarge readmissions	
• Reoperation	4 (16%)
• Urinary tract complications	3 (12%)
• Pulmonary embolism	1 (4%)
Overall morbidity	14 (56%)
30-days mortality	0 (0%)
Hospital stay (days)	22 (9–60)

Values are expressed either as absolute numbers (and percentages in brackets) or as median values (and minimum-maximum range in brackets)

ICU intensive care unit, RBC red blood cells

readmitted following discharge, and among them, four (16%) had to be reoperated.

Details of perioperative complications and outcome are found in Table 2. No major intraoperative complications or deaths occurred. Moreover, there was no perioperative mortality recorded within 30 days from surgery. Early postoperative complications ensued in 14 patients (56%), while 6 of

these patients suffered more than one complication. These complications were analyzed according to the Clavien-Dindo Classification. Most complications involved the urinary system: 11 (44%) patients suffered from various urinary infections, 2 (8%) presented with urinary blockage which required a temporary nephrostomy, and 3 (12%) patients suffered from urinary leak which was successfully managed with percutaneous drain with or without internal stenting. Interestingly, of the 11 patients clinically diagnosed with urinary infections, fungal infections accounted for 8 of the cases while the remaining 3 cases were attributed to *Escherichia coli*. Seven patients (28%) developed complications which related to the gut reconstruction technique. In specific, two patients (8%) developed an anastomotic leak, two (8%) intestinal obstruction, and three patients (12%) had issues stoma-related complications (ischemia, retraction, stenosis).

In patients suffering from cervical cancer, negative resection margins (R0) were achieved in 70% of the cases, whereas microscopically involved margins (R1) were noted in the rest 30%. R0 resection was achieved in all four patients with colon cancer, while R1 resection was performed in a patient with vulvar cancer. Overall, R0 resection was accomplished in 20 out of 25 patients (80%) and R1 resection in the remaining 5 patients (20%). Finally, 5-year survival was estimated at 36%. Most patients ($n = 9$, 36%) died due to their primary disease, five (20%) died because of complications following operation, and two (8%) died because they denied oral feeding.

Discussion

PE is an extremely radical operation, which was initially developed to treat patients suffering from recurrent or persistent gynecological cancers. Nowadays, indications for PE have been expanded to include almost all advanced primary or recurrent pelvic malignancies (gynecologic, urologic, or colon cancers) [9]. Increased applicability of the operation has led to innovations regarding patient selection and surgical technique in order to optimize outcomes.

Even though surgical techniques and perioperative care have evolved, due to the complexity of the operation, perioperative morbidity and mortality remain relatively high. In recent studies, perioperative mortality (defined as 30-day mortality) ranges between 0 and 25% [4, 5, 10–14]. In our study, perioperative mortality was absent, thus demonstrating that under appropriate planning and meticulous surgical technique, these procedures can in fact have zero mortality even when palliative resections are involved. On the other hand, even though perioperative mortality was absent, this does not mean the risk of death is totally eliminated at a later stage. To minimize the risks, in previous studies, it is recommended that pelvic exenteration is carried out in patients younger than 75 years of age with an ASA score less than 3 [14]. In fact,

Table 2 Characteristics of postoperative complications and outcome

Complication/outcome	Number of patients (%)
Non-surgical technique-related complications	
• Non-infectious	3
• Infectious (total)	7
a Pulmonary	2
b. Urinary tract	5
Surgical technique-related complications	
• Gut reconstruction	
a. Anastomotic leak	2
b. Intestinal obstruction	2
c. Stoma issues (ischemic, retraction, stenosis)	3
• Urinary reconstruction	
a. Leak	3
b. Obstruction	2
Surgical complication grade (Clavien-Dindo)	
• Grade I	4
• Grade II	8
• Grade III	5
• Grade IV	5
• Grade V	0
Actuarial 5-year survival	36%
Overall mortality characteristics	
• Primary disease related	9 (36%)
• Complications related	5 (20%)
• Psychological disorders (depression)	2 (8%)

we did not operate on any patient older than 75 years old, but we recognize that the physical status of the individual plays the most important role.

Maggioni et al. include good psychological balance as one of the selection criteria for candidates for pelvic exenteration [15]. This is justified considering the huge psychological impact such a procedure can have on patients. In our study, two patients died as a consequence of poor nutrition due to unwillingness to eat. Thus, we strongly believe that the importance of perioperative care must be underlined in preoperative visits. Patients need to be fully informed not only of the risks and possible complications but also for the importance of postoperative care in order for the operation to be successful. Psychological support should be readily available when needed before and after such an extensive surgical procedure. Changes in body image and function may affect daily routine, quality of life, and mood and apart from consent, counseling is a key factor for a positive outcome [9, 16]. A formal psychiatric review may also be necessary in vulnerable patients [9].

Negative resection margins are a crucial factor for good prognosis [4, 15, 17]. In regard to rectal cancer specifically, R0 can be achieved in the majority of the patients and this is very important as it can offer survival rates similar to colorectal cancer survival rates [5]. In a study by Kusters et al., R0

resection was achieved in 87% for T4 rectal cancer. In our study, all the patients with colon cancer had a R0 resection [5].

Overall 5-year survival was 36% in our department. Goldberg et al. report 47% survival for all types of cancers (gynecologic and colon), while in other studies, mean 5-year survival has been reported to be between 30 and 60% [18, 19]. For colon cancer, only survival at 5 years can be as high as 62% [5]. Palliative resections as well as the relatively high number of gynecological malignancies included in our cohort may have increased mortality rates [4, 11]. It is important to underline though that despite the high number of palliative procedures in our cohort, survival was still within the limits when compared to other studies. Involved margins, lymph node involvement, and anterior organ involvement also have a negative effect on patient survival in patients who undergo sacral resection with pelvic exenteration mainly for rectal—primary or recurrent—and anal cancers [2].

Complication rate following PE is reported to be as high as 31–92% [9]. We report an overall morbidity of 56%, thus in accordance with the current literature (Tables 1 and 2). Our commonest complications included infections and technical failures of which 52% were graded as III–IV. Interestingly, in our cohort, none of the patients experienced grade V complications. Postoperative infections constitute a common

cause of morbidity in such extensive surgical procedures. In fact, urinary tract infections were encountered in 44% of the patients who underwent pelvic exenteration in our study. It has been suggested that urinary tract infections appear more often following continent conduits rather than incontinent ones [18]. This is in contrast with the increased rate of urinary infections in our study as most patients had an incontinent urinary reconstruction. It is postulated that a continent reservoir may increase the quality of life and may reduce long term the complications such as pyelonephritis and chronic renal failure, so this should be balanced against the infection risk [20]. Urinary complications are also increased in patients who have undergone radiotherapy, and this is in accordance with our results as all our patients had undergone previous radiotherapy [20]. It is also of great interest that fungal infections were the most common infections affecting the urinary tract. Prophylactic use of antibiotics according to local guidelines and increased levels of surveillance in patients who have undergone previous radiation therapy are mandatory.

Enteric complications are also among the most common complications following PE and can exceed 20% [20]. Pelvic floor reconstruction with foreign graft materials and low rectal anastomosis has been suggested to increase fistulas and leaks and recurrence respectively [18]. Pulmonary embolism, even though not as frequent as infections and leaks/fistulas, is a clear threat after so extensive surgical procedures that require long hospitalization. In a study by Goldberg, there were 4 patients out of 103 diagnosed with deep venous thrombosis, but with appropriate management none suffered pulmonary embolism [18]. We report one case of pulmonary embolism. Mortality from pulmonary embolism has been described: 1 in a cohort of 28 patients (3.6%) 2 weeks following PE for recurrent cervical cancer [20].

Our study has some limitations. The main limitation is the retrospective nature with no control group. Moreover, the number of patients included is quite small. Unfortunately, the limited indications and the complexity of the surgical procedure do not allow the design of randomized controlled trials. Heterogeneity of malignancies for which the procedure is performed is another limitation. However, even such studies can add valuable information to the current literature.

In conclusion, patients with a variety of malignancies, i.e., colon, cervical, vulvar, and vaginal cancer, can benefit from pelvic exenteration. Albeit an extensive and radical surgical procedure, results from our study are promising in regard to morbidity and mortality even when the procedure is carried out as part of palliative care to improve quality of life. Apart from meticulous surgical technique, perioperative care plays an important role in the management of patients undergoing pelvic exenteration. Preoperative psychological counseling, especially in regard to the changes in body image following colostomies and ureterostomies as well as nutritional support,

is of great importance for better recovery and emotional acceptance.

Compliance with Ethical Standards

Local Ethics Committee approval was applied for but was not deemed necessary by our hospital committee due to the retrospective nature of our study.

Conflict of Interest The authors declare that they have no conflict of interest.

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