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Pelvic Exenteration (PE) in Gynecological Cancers: Indications, Complications and Overall Survival (OS) Analysis

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ABSTRACT

Background & Objective: The surgical procedure known as pelvic exenteration (PE) involves removing lower abdominopelvic structures as a single unit. Despite its high morbidity, this procedure is primarily used to manage advanced primary or locally recurrent pelvic cancers. Our study aims to assess our experiences with PE over the past 8 years. We identified patients who underwent pelvic exenteration for gynecological cancers between 1 January 2011 and 31 December 2019 through hospital records.

Materials & Methods: We retrospectively analyzed patient characteristics, procedural indications, surgical details, and patient outcomes. Overall survival (OS) was analyzed using the Kaplan-Meier method and log-rank test, while Cox proportional hazards regression was used to model survival outcomes.

Results: Twenty-one patients with recurrent cervical, endometrial, ovarian, and/or vaginal cancer underwent pelvic exenteration. Local disease recurrence accounted for 80.9% of procedural indications, with 80.9% originating from the cervix and 9.5% from the endometrium. Sixty-two percent underwent PE with curative intent, while 38% had palliative objectives. Wound infection was the commonest early complication, and late complications included deep vein thrombosis, lymphocyte formation, and recurrent urinary tract infections. Median survival rates were 85.7% at 6 months and 57.1% at 12 months. Our five-year OS, as calculated using the Kaplan-Meier method, was 54.3% (95% CI 34.2, 74.6).

Conclusion: Our case series demonstrates that pelvic exenteration offers approximately a 54.3% 5-year survival chance in a selected cohort of patients. Early and late complication rates align with historical descriptions. Pelvic exenteration leads to sustained survival in specific patients, and ongoing efforts should prioritize identifying those who could benefit most from this procedure.

Keywords: Pelvic Exenteration, Indications, Complications, Survival Rate (SR)

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1. Introduction

Pelvic exenteration (PE) refers to a radical surgical procedure that necessitates the removal of pelvic structures in a single unit, as described by Brunschwig (1). The indications include recurrent pelvic cancers, unresponsive disease, and treatment as a palliative intent (2, 3). The common gynecological cancers for which pelvic exenteration surgery is commonly offered include recurrent cervical, endometrial, vaginal, vulval, and less common ovarian cancers (2, 4).

The procedure is categorized as anterior exenteration, which entails removing gynecologic structures and the bladder, posterior exenteration involving the removal of gynecologic structures, sigmoid colon, and rectum, or complete exenteration, encompassing both anterior and posterior removals (4, 5). The baseline criteria for patient selection include tumors not metastasized outside the pelvis. The presence of disease extension to pelvic side walls or distant metastasis is a contraindication to the exenteration procedures (6). The intent is curative, and occasionally it is offered as palliative in patients with radiation necrosis, fistula, or tumor infiltrative pain (1). The radically of the procedure can be associated with a significant number of complications and major challenges related to physical, sexual, and psychosexual functions (7). However, with recent technical and scientific advances in options such as urinary diversion and reconstructive techniques, there are improvements in the overall morbidity and mortality associated with these procedures (8, 9). Despite the above, the current 5-year overall survival rate as reported in the literature is 30-60% (10). In selected patients, pelvic exenteration is identified as the only potentially curative treatment option with good outcomes. With a better focus on patient selection,

there can be an overall reduction in morbidity and mortality (11). Predictive factors indicating unfavorable outcomes encompass surgical margin involvement, positive lymph node metastasis, or perineural involvement (12). These being postoperative prognostic factors, there is a further need to identify preoperative performance indicators that predict better postoperative outcomes.

The objective of this study is to conduct a retrospective examination of overall survival rates and morbidity, aiming to identify factors associated with enhanced long-term outcomes in patients who underwent pelvic exenteration surgeries for gynecological malignancies at two cancer centers in Malaysia between January 2011 and December 2019.

2. Materials and Methods

2.1. Patients

This retrospective analysis involved the review of patients who had gone through pelvic exenteration over 8 years, spanning from January 2011 to December 2019, at two medical institutions: the National Cancer Institute, a cancer center, and Hospital Ampang, a tertiary specialist hospital with a Gynecological Oncology unit located in the central region of Malaysia. Following approval from the local ethics committee, medical records of individuals who have undergone pelvic exenteration due to gynecological cancer at the Department of Obstetrics and Gynecology were assessed for inclusion. Each patient underwent imaging before surgery for staging purposes and was discussed in a multidisciplinary tumor board. Patients were categorized based on the type of gynecological cancer, indication for pelvic exenteration regarding primary or recurrent disease, and the type of exenteration performed. For patients with recurrent disease, the initial or primary treatment typically begins with a radical hysterectomy followed by adjuvant chemoradiation or primary chemoradiation based on the FIGO stages. Pelvic exenteration was reserved for either curative intent for localized recurrent disease or palliative purposes in cases where symptoms significantly impaired the quality of life. All surgeries were performed by the same surgical oncology team at the Department of Obstetrics and Gynecology. The surgical approach was multidisciplinary, involving a gynecological oncologist, urologist, and colorectal surgeons as needed. Among the patients, twenty-one individuals were identified. For each identified patient, the following information was documented: age, indications, and type of pelvic exenteration. Pelvic exenteration (PE) was categorized as anterior PE (APE) if the resection included the female genitalia as a single specimen along with the lower urinary tract (bladder and urethra), posterior PE (PPE) if the resection involved the female genitalia along with the rectosigmoid, and total PE (TPE) if the resection encompassed the lower urinary tract, female genitalia, and rectosigmoid. These exenteration groups were further subdivided into type I (supralevator), type II (infralevator), and type III (with vulvectomy). Additional recorded details comprised tumor histology, duration of the procedure in hours, early complications (within 30 days postoperative), late complications (after 30 days postoperative), and the duration from the operation to mortality in months.

2.2. Definition of variables

Overall survival (OS) was defined as the duration from pelvic exenteration (PE) to death, irrespective of the cause or recurrence status. Median survival time, as well as the survival rates at 6 months, 1 year, and 5 years, were reported for this parameter. All patients were monitored from the day following PE until December 2019 or until their death. They received follow-up visits at least every 3 months during the initial 2 years, followed by visits every 6 months until the end of the fifth year, and then annually thereafter.

2.3. Statistical analysis

Kaplan-Meier survival curves were generated with a 95% confidence interval (CI) for overall survival (OS). IBM SPSS, Statistical version 28.0 was used to analyze the data.

3. Results

3.1. Patient characteristics

Between January 2011 and December 2019, 21 patients diagnosed with recurrent cervical, endometrial, ovarian, and/or vaginal cancer had undergone pelvic exenteration. Local disease recurrence prompted the procedure in 80.9% (17/21) of patients, while 14% (3/21) presented with locally advanced primary disease, and one had progressive disease. The mean age of patients undergoing pelvic exenteration was 50.8 years (ranging from 33 to 70 years). The primary tumor originated from the cervix in 17 patients (80.9%), followed by the endometrium in 2 cases (9.5%), while in the remaining 2 cases, the tumor originated from the ovary and vagina. The initial treatment of cases in the majority includes oncological surgery with postoperative concurrent chemoradiotherapy (CCRT) in 38% (13/21), followed by primary concurrent chemoradiotherapy (CCRT) in 19% (4/21) and chemotherapy in 19% (4/21) respectively. In 61.9% of cases (13/21), PE was performed as curative objective in 62% (13/21) and 38% (8/21) as palliative intent as described in Table 1. At the conclusion of the investigation, 10 patients remained alive, showing no signs of disease, with a median survival period of 16 months (ranging from 9.3 to 73.5 months).

Table 1. Baseline characteristics of the 21 study patients who underwent exenteration

Presentation of disease	[*n* (%)]
Primary disease	3 (14%)
Recurrent	17 (80.9%)
Progressive	1 (4.7%)
Age (Mean+/-SD)	50.8 ± 11.7
Primary tumor origin	[*n* (%)]
Cervix	17 (80.9%)
Endometrium	2 (9.5%)
Ovary	1 (4.7%)
Vagina	1 (4.7%)
Previous treatment	[*n* (%)]
Oncological surgery	1(4.7%)
Chemotherapy	4(19%)
Radiotherapy (RT)	1(4.7%)
Concurrent Chemoradiotherapy (CCRT)	4 (19%)
Surgery +Radiotherapy (RT)	1(4.7%)
Surgery + Chemotherapy (ChT)	2 (9.5%)
Surgery + RT+ChT(CCRT)	8 (38%)
Operative intention	[*n* (%)]
Curative	13 (61.9%)
Palliative	8 (38%)
Patients Status	[*n* (%)]
Alive	10 (47.6%)
Dead	11 (52.3%)
Lost on follow-up	0

3.2. Surgical Outcomes and Complications

The majority of cases (90.4%) underwent total pelvic exenteration (TPE), followed by anterior and posterior exenteration (4.7% each). The mean operative time was 8 hours and 45 minutes. Nine cancers were adenocarcinoma (42.8%), and 10 were squamous cell carcinoma (47.6%); papillary, clear cell, and high-grade serous were the remaining cancers' histology. Infralevator PE constituted 100 % of our cases, as described in Table 2. Major complications were characterized as events necessitating hospital readmission or both surgical and invasive interventions. According to our records, there were no intraoperative fatalities. Immediate and delayed postoperative complications are detailed in Table 3. The prevalent early complication was wound infection, observed in 5 (23.8%) patients. The remaining early complications include urinary tract infections 4 (19%), 2 fistulas, 1 pelvic abscess, and 1 gastritis/stress ulcer. Delayed (late) postoperative complications occurred in 7 (33%) patients. Common late complications included deep vein thrombosis in 3 (14.7%), lymphocyte in 3 (14.7%), and recurrent UTI in 1 patient.

Table 2. Surgical data

Type of exenteration	[*n* (%)]
Total	19 (90.4%)
Anterior	1 (4.7%)
Posterior	1 (4.7%)
Subtype of exenteration	[*n* (%)]

Type of exenteration	[*n* (%)]
Type I (supralevator)	0
Type II (infralevator)	21 (100%)
Operative time (hours) [Mean ± SD (range)]	8.54 ±1.66
Postoperative histology	[*n* (%)]
Mucinous adenocarcinoma	2 (9.5%)
Squamous cell carcinoma	8 (38%)
Adenocarcinoma	5 (23.8%)
Adenosquamous	3 (14.2%)
Clear cell	1 (4.7%)
Papillary	1 (4.7%)
Serous	1(4.7%)
Clear surgical margins	17 (80.9%)
Surgical margins involved	4 (19%)

Table 3. **Postoperative complications**

Early complication	[*n* (%)]
None	2 (9.5%)
Gastritis/stress ulcers	1 (4.7%)
Urinary tract infections	4 (19%)
Intestinal/enterocutaneous fistula	2 (9.4%)
Wound infection	5 (23.8%)
Pelvic abscess	1 (4.7%)
Late Complications	[*n* (%)]
None	2 (9.5%)
Lymphocyst	3 (14.2%)
DVT	3 (14.2%)
Recurrent UTI	1 (4.7%)

3.3. Survival Analysis

The 6-month median survival rate is 85.7%, decreasing to 57.1% at 12 months after pelvic exenteration (PE). The five-year OS, calculated using the Kaplan-Meier method, is 54.3% (95% CI 34.2, 74.6). Survival rates are highest for advanced primary cervical cancer (66.7%), followed by endometrium (50%) and recurrent cancer cervix (42.1%). Log-rank analysis shows no statistical significance among different cancer types (P=0.373, Figures 1 and 2). Multivariate analysis using Cox regression for histology, patient age, and resection margins reveals no statistical significance (P=0.808, 0.932, and 0.560, respectively, Table 4). The final recorded observation is a patient with advanced primary cervical cancer who survived 104 months post-PE without any signs of disease.

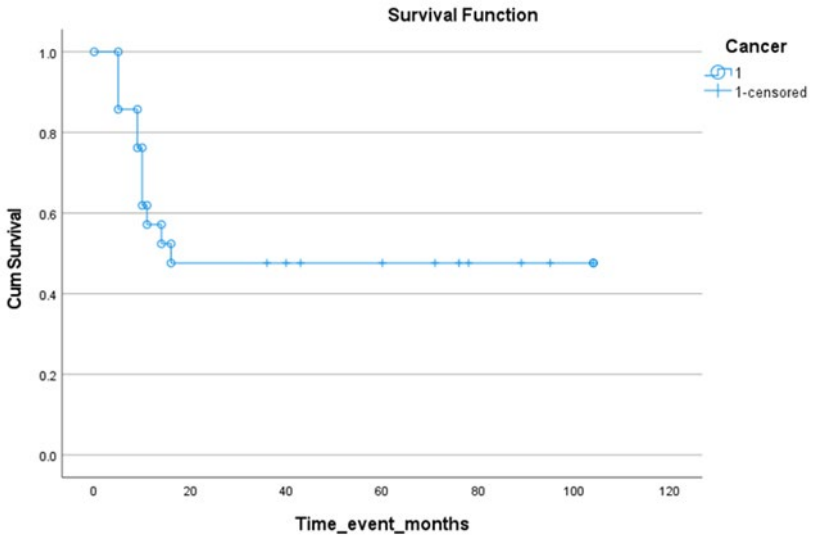


Figure 1. **Kaplan-Meier Overall Survival for the entire group**

Table 4. **Multivariate Cox regression analysis**

Multivariate analysis Variable	Hazard Ratio	95% CI	P value
Age	1.006	0.958, 1.057	0.808
Histology	0.975	.545 1.743	0.932
Resection margins	0.672	.176 2.564	0.560

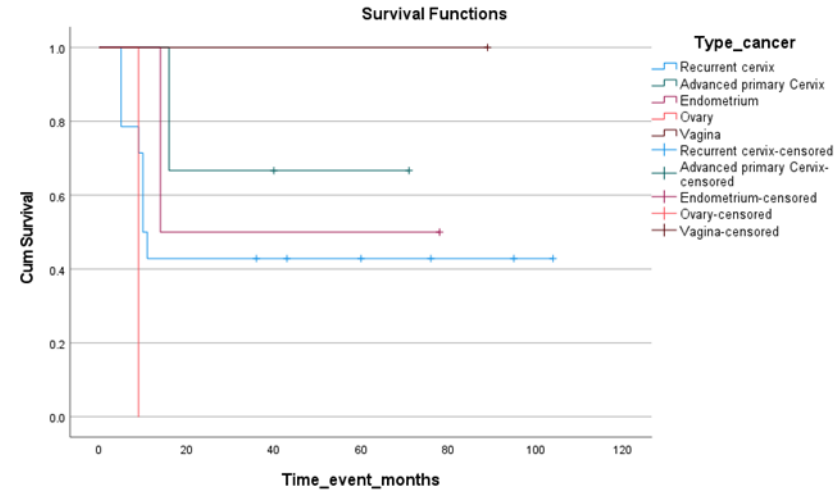


Figure 2. **Survival for the different groups of cancers**

4. Discussion

Pelvic exenteration is the most radical procedure of oncological surgeries. This procedure is undertaken to cure locally advanced and recurrent pelvic malignancies **(13)**. Our study conducted across two medical centers examined patients who underwent pelvic exenteration over an eight-year period to determine overall survival and outcomes. Overall survival (OS) at five years has been reported between 30-60% **(14)**. Our findings align closely with existing literature, demonstrating an overall survival (OS) rate of 54.4% with a median follow-up period of 37.8 months. In the current study, the most prevalent indication is cervical cancer (81%), followed by endometrial cancer (9%) **(1, 14, 15)**. This is a similar

finding as reported in literature, with cervical cancer representing the most common indication. However, many studies report vulval cancer as the second most common indication, followed by endometrial cancer (14, 15). This is probably related to country-specific demographics, as also projected by 2020 Globocan Cancer Data for Malaysia, which reported cervix cancer as the highest incidence followed by endometrial cancer (16, 17). It is postulated that the inherent tendency of ovarian cancer to spread beyond the pelvis precludes patient selection for PE (17).

It is generally estimated that patients with negative histological margins (R0) are an important factor influencing survival (1, 6). Although studies have validated this finding, multivariate analysis of our study did not support this finding. This is probably related to our small sample size. Overall immediate postoperative mortality is reported in the literature as less than 5% but with a high morbidity range from 32% to 84% as described by the PelvEx collaborative group (18, 19). It is estimated that approximately one-third of patients encounter complications, primarily comprising issues related to wound healing, illus, and intra-abdominal abscesses (19). The most common early complications reported include urinary tract infections and wound infections. The late complications as frequently reported include sepsis, renal failure, and pyelonephritis (20, 21). In our study, the most frequent early postoperative complications were wound infections (23.8%) and urinary tract infections (19%). Other complications include fistula, pelvic abscess, and gastritis. Late complications include deep vein thrombosis, lymphocyte, and recurrent urinary tract infections. Considering the radically of the procedure and prolonged hospital admission, there is a need for special attention to thromboprophylaxis. It is commonly acknowledged that experienced surgeons tend to have a reduced rate of surgical complications and lower operative morbidity (22, 23) Nevertheless, in research conducted by Jalloul, Nick (24) the surgeon's expertise did not influence the postoperative complication rate. However, it was linked to reduced intraoperative transfusions and shorter hospital stays, although it did not affect the overall survival (OS) rate or postoperative complications (24). The PelvEx Collaborative group describes the best practices to improve outcomes after pelvic exenteration surgery. It has been recommended that prehabilitation encompassing a combination of exercise, nutrition, and psychosexual intervention preoperatively is associated with accelerated post-operative recovery and a short hospital stay (18).

We recognize the retrospective nature of our study has its limitations. Another limitation of the current study is the absence of an analysis on quality of life (QOL). The pelvic exenteration (PE) procedure significantly affects various aspects of quality of life, including sexual health, body image, symptoms, communication, social matters, psychological distress, and relationship issues (22, 25). A study conducted on women with locally advanced or recurrent gynecologic cancers found that the majority expressed willingness to undergo pelvic exenteration (PE) again (25). Nevertheless, women reported decreased sexual pleasure, worsening body image, and declining physical functioning. However, there is no significant change in depression scores, mental functioning, and stoma-related QOL (26-29).

5. Conclusion

In conclusion, pelvic exenteration yielded an approximate five-year overall survival (OS) rate of 54.3%. It can provide locoregional control for patients without abdominal metastasis. Despite the significant postoperative morbidity, the procedure may be linked to long-term survival in appropriately chosen patients. Multicenter studies with large sample sizes are necessary to investigate surgical outcomes and quality of life comprehensively.

6. Declarations

Acknowledgments

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Ethical Considerations

This study was approved by the ethical committee of International Medical University, with approval number IMU 523/2021.

Authors' Contributions

All Authors contributed as follows to the conception or design of the work; the acquisition, interpretation of data for the work; and drafting the work or revising it critically for important intellectual content. All authors have reviewed the manuscript and given their approval for publication.

Conflict of Interest

The authors declare no conflict of interest.

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