Original article

Pelvic exenteration for advanced malignancy in elderly patients

R. W. Radwan, M. D. Evans, M. Davies, D. A. Harris and J. Beynon, on behalf of Swansea Pelvic Oncology Group

Swansea Pelvic Oncology Group, Abertawe Bro Morgannwg University Local Health Board, Swansea, UK
Correspondence to: Mr R. Radwan, Department of Colorectal Surgery, Abertawe Bro Morgannwg University Local Health Board, Morriston Hospital, Swansea SA6 6NL, UK (e-mail: rwradwan@gmail.com)

Background: **Pelvic exenteration is an aggressive surgical procedure reserved for highly selected patients. Surgery in the elderly is often associated with increased morbidity and mortality. The aim of this study was to review outcomes following exenteration for advanced pelvic malignancy in this subgroup of patients.**
Methods: **All patients aged 70 years and over who underwent pelvic exenteration between 1999 and 2014 were included in the study. This comprised all primary rectal, gynaecological and bladder tumours. The primary outcome measure was 5-year overall survival. Secondary endpoints were postoperative morbidity and 30-day mortality.**
Results: **A total of 94 patients were included, with a median age of 76 (range 70–90) years. There were 65 rectal, 20 gynaecological and nine bladder tumours. The administration of neoadjuvant therapy was significantly different among tumour types ($P = 0{\cdot}002$). A total of 32 patients (34 per cent) developed postoperative complications, and there were six deaths (6 per cent) within 30 days of surgery. Median survival was 64 months for patients with rectal cancer, 30 months for those with gynaecological tumours and 15 months for those with bladder cancer. Five-year survival rates in these groups were 47, 31 and 22 per cent respectively ($P = 0{\cdot}023$).**
Conclusion: **Given the possibility of long-term survival, pelvic exenteration should not be withheld on the grounds of advanced age alone.**

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Background

Multivisceral pelvic exenteration can provide good long-term survival for patients with locally advanced pelvic malignancies[1–3]. The aggressive nature of the procedure requires that all patients undergo careful selection following multidisciplinary discussion. A patient's physiological and psychological reserve must be considered, alongside expectations of postoperative quality of life.

The definition of an elderly person varies considerably. The World Health Organization[4] classifies any individual aged over 65 years as elderly, whereas the UK-based National Cancer Intelligence Network[5] categorizes people of at least 75 years of age as elderly. With an increasing elderly population worldwide, more of these patients are undergoing both elective and emergency procedures. Careful consideration for surgery is necessary given their lower physiological reserve, increased presence of co-morbidities and polypharmacy[6]. It is widely considered that elderly patients are at increased risk of both postoperative morbidity and mortality compared with the younger population[7,8]. As a consequence, many elderly patients are less likely to receive the optimal cancer treatment[5,9].

The Swansea Pelvic Oncology Group comprises colorectal, urological, gynaecological and plastic reconstructive surgeons working collectively in the management of patients with advanced pelvic malignancy in a tertiary referral centre. The aim of this study was to review outcomes following pelvic exenteration in an elderly cohort, and to identify any differences in morbidity and mortality between pelvic tumour types.

Methods

This was a retrospective observational cohort study of all patients aged 70 years and over who underwent pelvic exenteration between 1999 and 2014. Data were collected from a prospectively maintained pelvic oncology unit database, and verified alongside theatre records and hospital patient management systems. Ethical approval was not required for this retrospective analysis.

Table 1 Baseline characteristics of patients with rectal, gynaecological or bladder cancer

	Rectal ($n = 65$)	Gynaecological ($n = 20$)	Bladder ($n = 9$)	P†
Age (years)*	77 (70–90)	75 (70–88)	72 (70–83)	0·122‡
Sex ratio (M : F)	31 : 34	0 : 20	2 : 7	
Neoadjuvant therapy				0·002
No	34	17	9	
Yes	31	3	0	
Postoperative histology				0·577
yp/pT4	29	10	4	
yp/pT3	24	4	4	
yp/pT2	8	6	1	
yp/pT1	3	0	0	
ypT0	1	0	0	
Node status				0·433
Negative	43	16	4	
Positive	22	4	5	
Clearance				0·351
R0	56	16	5	
R1	7	4	4	
R2	2	0	0	
CRM				0·051
Negative	57	16	5	
Positive	8	4	4	
Adjuvant chemotherapy				0·345
No	45	16	8	
Yes	20	4	1	
Postoperative complication				0·337
No	45	13	4	
Yes	20	7	5	
Length of hospital stay (days)*	16 (6–56)	23 (5–100)	21 (14–31)	0·040‡
Local recurrence				0·105
No	59	18	6	
Yes	6	2	3	
5-year survival (%)	47	31	22	0·023§

*Values are median (range). CRM, circumferential resection margin. †χ^2 test, except ‡one-way ANOVA and §log rank test.

All patients were staged at presentation with CT of the chest, abdomen and pelvis. Patients with rectal tumours also had pelvic MRI, with endorectal ultrasonography and examination under anaesthesia (EUA) if necessary. Patients with gynaecological tumours had complementary MRI assessment and also underwent PET before surgery. Patients with advanced bladder disease received MRI assessment coupled with EUA as necessary. All patients were discussed formally at multidisciplinary team meetings for planning of resection margins and consideration of neoadjuvant therapy. All patients were assessed by a consultant anaesthetist experienced in this type of major surgery, to assist with the decision to operate. Risk assessment was aided by cardiac echocardiography, exercise tolerance testing, lung function testing and cardiopulmonary exercise testing where deemed appropriate.

Anterior pelvic exenteration was defined as *en bloc* resection of the bladder with or without reproductive organs (prostate, seminal vesicles, uterus, vagina, cervix). Posterior pelvic exenteration was defined as *en bloc* resection of the rectum with or without reproductive organs, with bladder preservation (prostate, seminal vesicles, uterus, vagina, cervix). Total pelvic exenteration was defined as complete resection of the rectum (with or without sphincter preservation), genitourinary viscera, reproductive organs and regional lymph nodes[10–12].

Histopathology for all patients was reviewed and complete resection (R0) was defined by a circumferential resection margin (CRM) of 1 mm or greater. Microscopic residual pelvic disease (R1) was defined by a CRM of less than 1 mm. Patients who underwent pelvic resection despite the presence of metastatic disease were also included. All metastatic disease was deemed resectable at the time of pelvic exenteration. Data on nodal status were collected for all patients.

The primary outcome measure was 5-year overall survival. Secondary endpoints included postoperative length of hospital stay, postoperative complications and 30-day operative mortality.

Table 2 Tumour types and procedures

	No. of patients	Anterior pelvic exenteration	Posterior pelvic exenteration	Total pelvic exenteration
Rectal				
Adenocarcinoma	65	–	34	31
Gynaecological				
Vagina/vulva	13	5	1	7
Endometrium	5	0	0	5
Cervix	2	2	0	0
Bladder				
Transitional cell	7	0	–	7
Squamous cell	2	0	–	2

Statistical analysis

Differences in variables between tumour groups were analysed using the χ^2 test and one-way ANOVA. Survival curves were calculated by the Kaplan–Meier[13] method and compared using the log rank test. All statistical analysis was done using SPSS® version 20 (IBM, Armonk, New York, USA).

Results

Ninety-four patients were included in the study over a 15-year interval, 65 with primary rectal, 20 with primary gynaecological and nine with primary bladder tumours. There were 61 women and 33 men, with an overall median age of 76 (range 70–90) years (*Table 1*).

Neoadjuvant therapy

A total of 34 patients received neoadjuvant therapy, with a significant difference identified between groups ($P = 0{\cdot}002$). The majority (31) of these patients had rectal tumours, and a further three had gynaecological tumours. None of the nine patients with primary bladder tumours received neoadjuvant therapy before exenteration.

Operative details

Total pelvic exenteration was performed in 52 patients (55 per cent), 35 patients (37 per cent) had posterior pelvic exenteration and seven (7 per cent) underwent anterior pelvic exenteration (*Table 2*).

Histopathology

Complete (R0) resection was achieved in 56 of 65 rectal tumours, 16 of 20 gynaecological tumours and five of nine bladder tumours ($P = 0{\cdot}351$). Two patients with rectal tumours underwent pelvic exenteration in the presence of metastatic disease within the liver. Nodal disease was present in 22 patients with rectal tumours, four with gynaecological tumours and five with bladder tumours ($P = 0{\cdot}433$) (*Table 1*).

Table 3 Postoperative complications

Complication grade*	Rectal	Gynaecological	Bladder
I	0	0	0
II	3	2	1
III	14	4	1
IV	1	0	0
V	2	1	3

*Dindo–Demartines–Clavien classification[14].

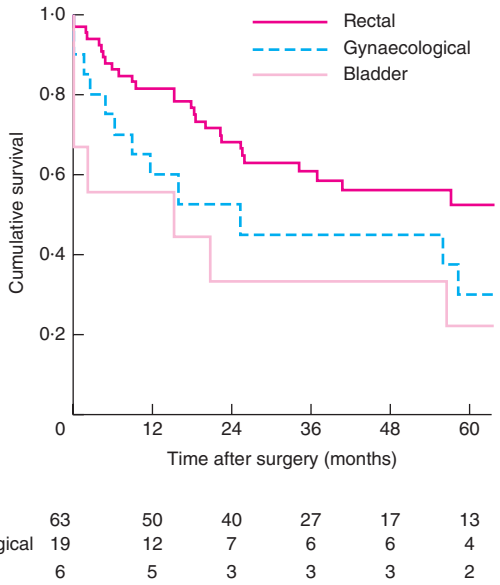

Fig. 1 Difference in survival after surgery in patients with rectal, gynaecological or bladder tumours. $P = 0{\cdot}023$ (log rank test)

Morbidity

Median (range) length of hospital stay was 16 (range 6–56), 23 (5–100) and 21 (14–31) days for patients with rectal, gynaecological and bladder tumours respectively ($P = 0{\cdot}040$). A total of 32 patients developed postoperative complications, with no significant difference between tumour groups ($P = 0{\cdot}337$) (*Tables 1* and *3*). Of these 32 patients, 13 had received neoadjuvant therapy, whereas 19 proceeded directly to surgery ($P = 0{\cdot}518$). A total of six deaths (6 per cent) were reported within 30 days of surgery. This group comprised three patients with bladder tumours, two with rectal tumours and one with a gynaecological

tumour. The cause of death was myocardial infarction in five patients and chest sepsis in one.

Survival

Overall median follow-up was 57 (range 1–149) months. For all patients, median survival was 64 months for patients with rectal tumours, 30 months for those with gynaecological tumours and 15 months for patients with bladder tumours. The overall 5-year survival rate in these groups was 47, 31 and 22 per cent respectively ($P = 0{\cdot}023$) (*Fig. 1*). In patients in whom complete resection (R0) was achieved, median survival was 97, 54 and 53 months respectively.

Discussion

This study has confirmed that exenterative surgery is an effective treatment strategy in elderly patients with advanced pelvic malignancy. When complete resection of disease was achieved, a median survival of more than 4 years was experienced by all three groups of patients, with longest times in those with primary rectal tumours.

Baseline characteristics were largely similar between groups; neoadjuvant therapy was the only significant difference in preoperative management. Almost half of all patients with rectal tumours received neoadjuvant therapy before surgery, whereas only a small proportion of those with gynaecological tumours underwent preoperative treatment. The role of neoadjuvant therapy in rectal cancer is well documented[15,16]. Furthermore chemoradiotherapy has been shown to be effective in patients with advanced gynaecological disease[17]. No conclusive evidence, however, currently exists on its role in locally advanced bladder cancer[18], and this is reflected here as all nine patients proceeded directly to surgery. Neoadjuvant therapy is often avoided in elderly patients with advanced bladder cancer as they are likely to have a degree of renal insufficiency which predisposes to toxicity with chemotherapeutic agents[19,20].

The present data demonstrate the importance of achieving negative resection margins at the time of surgery, in keeping with the published literature[1,21,22]. Not all patients with rectal cancer received neoadjuvant therapy despite having advanced disease. The unit's highly selective approach to preoperative therapy has been reported previously[23] and reflects the equivalent local recurrence rates with or without chemoradiotherapy, while reducing preoperative treatment-related morbidity.

Postoperative morbidity is one of the greatest concerns precluding surgery in elderly patients, who may have limited reserve to survive a major complication. One in three patients experienced a postoperative complication in this study; these results are similar to those achieved by other tertiary centres treating gynaecological[24] and rectal[25] tumours, despite the median age at operation being significantly lower in these previous studies. Comparisons for bladder tumours cannot be made as limited literature currently exists on total pelvic exenteration in this group.

Postoperative length of hospital stay was shortest for patients with rectal cancer, and the majority of patients in all groups were discharged within 3 weeks of surgery. These results compared favourably with published findings for younger patient cohorts[25,26], suggesting that, with appropriate perioperative and postoperative management, age is not a limiting factor.

The present data set was heterogeneous owing to the range of tumour types included in the cohort. The majority of the patients had rectal cancer, but a small group with advanced bladder disease undergoing total pelvic exenteration was worthy of inclusion as it represents one of the first reported series of such patients treated by total pelvic exenteration. The retrospective nature of the study has its limitations. The inclusion of geriatric quality-of-life assessment alongside American Society of Anesthesiologists grades would have allowed a more comprehensive analysis of outcomes. Despite this, the database has been cross-validated and updated prospectively.

Low morbidity and mortality rates can be achieved in this group of elderly patients, particularly those with locally advanced rectal tumours. Pelvic exenteration is a highly aggressive procedure, but one that should not be limited by patient age alone.

Collaborators

Other members of the Swansea Pelvic Oncology Group who collaborated in this study were: O. Hatcher, P. Bose, M. G. Lucas, J. Featherstone, U. Khot, T. V. Chandrasekaran, N. D. Carr, S. Gwynne, P. Drew and M. D. Phan.

Disclosure

The authors declare no conflict of interest.

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