Major complications following exenteration in cases of pelvic malignancy: A 10-year experience

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Abstract

AIM: To analyze the major complications after exenteration of gynecological and rectal malignancies.

METHODS: Twenty-two patients with gynecological malignancy and 6 with rectal malignancy underwent pelvic exenteration (PE) between 1996 and 2005. PE was performed for primary malignancy in 71.4% of cases (vulvar cancer in 13, cancer rectal in 5, cervical cancer in 1 and Bartholin's gland cancer in 1 case respectively and recurrent malignancy in 28.6% of cases (cervical cancer in 5, ovarian cancer in 1, uterine sarcoma in 1 and rectal cancer in 1 cases respectively). Posterior PE, total PE and anterior PE were most often performed.

RESULTS: Major complications in the operative field involving the urinary tract infection or the wound dehiscence occurred in 12 patients (42.9%). Early complications included massive bleeding from the sacral plexus, adult respiratory distress syndrome (ARDS), thrombophlebitis, acute renal failure, urinary bladder dysfunction, ureter damage, re-operation and pulmonary embolus. Urinary incontinence was observed in 2 women as a late complication. In 1 patient a nephrostomy was performed in 1 patient due to extensive hydronephrosis and 1 patient had complications connected with the gastrointestinal tract. The mortality rate was 7%, of which inter-operative mortality accounted for 3.5%. Major complications often occurred in advanced primary vulvar cancer affecting those with recurrent malignancies.

CONCLUSION: PE is more beneficial to patients with primary vulvar and rectal cancer than to those with recurrent cancer. Knowledge of the inherent complications and morbidity of PE is essential.

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INTRODUCTION

Total pelvic exenteration (TPE) has been used as a salvage therapy. Candidates are those who have failed radiation therapy or primary surgical or combined treatment of the recurrence in the central pelvis[1-3]. Pelvic exenteration (PE) is also a method of treatment in cases of locally advanced primary pelvic tumors.

PE is carried out at the site of extensive pelvic tumor, and cervical, vulvar, vaginal, ovary, rectal cancer or bladder cancer which can not be removed by standard radical pelvic surgical techniques[4]. PE may result significant complications, its major complications can affect 62% of patients[5]. The distribution of complications has changed over the years due to the advances in antibiotic therapy and improved supportive care including hyper-alimentation. At present the most threatening complications are those involving the gastrointestinal and urinary systems. Urinary fistulae and obstruction following PE are the frequent and life threatening complications, which increase the mortality and morbidity rates after PE of gynecological cancers[6].

The present study was to review the literature and report our experience with the complications arising from PE as a radical surgery in the treatment of advanced pelvic malignancies.

MATERIALS AND METHODS

Twenty-two patients with gynecological malignancy and 6 with rectal cancer underwent PE in 1996 - 2005 at the Department of Gynecology, Medical University of Gdansk, Poland. Exenteration was performed because of vulvar cancer in 13 cases, rectal cancer in 6 cases, cervical cancer in 6 cases, ovarian cancer in 1 case, uterine sarcoma in 1 case and Bartholin's gland cancer in 1 case.

The clinical and pathological records were reviewed to determine the primary disease, previous treatment, type...
of PE, postoperative morbidity and mortality as well as complications. The primary malignancies (71.4%) included advanced carcinoma of the vulva in 13 cases, rectal cancer in 5 cases, cervical cancer in 1 case, Bartholin’s gland cancer in 1 case. The recurrent tumors (28.6%) included carcinoma of cervical cancer in 5 cases, ovarian cancer in 1 case, uterine sarcoma in 1 case, rectal cancer in 1 case.

Posterior pelvic exenteration (PPE), total pelvic exenteration (TPE) and anterior pelvic exenteration (APE) were most often performed.

All the vulvar and cervical cancers were squamous cell carcinoma (SCC). Surgery was performed by a team of gynecological surgeons or together with a team of urologists in cases requiring urinary diversion. All patients were operated under mixed anesthesia consisting of conduction anesthesia (spinal or epidural) and general anesthesia. Closure of the empty pelvic cavity was achieved by mobilization of omentum from the left side of the sigmoid colon or by reperitonization using the mobilized caecum. Re-operation was needed for early and late complications. Early complications were those arising within 30 days after surgery and late complications were those over 30 days after surgery.

**RESULTS**

The clinical characteristics of 28 patients who underwent pelvic exenteration are summarized in Table 1. The mean age of the 28 patients at diagnosis was 53.3 years (range, 34-82 years).

The estimated blood transfusion during operation ranged from 240 mL to 3580 mL with a mean of 1100 mL. The operating time ranged from 4 h to 11 h and 45 min with a mean of 6 h and 36 min. Patients stayed 8 - 66 d in hospital after operation with a mean of 27 d.

The overall complication rate after PE was 53.6% (15 of the 28 patients). Wound dehiscence (wd) occurred in 9 cases (32.1%), urinary infection in 3 cases (10.7%), urinary incontinence in 2 cases (7.1%), massive bleeding in 2 cases (7.1%). ARDS, thrombophlebitis, ureter damage, acute renal failure, pulmonary embolism, reoperation, and urinary bladder dysfunction occurred in 1 case (3.6%).

The mortality rate was 7%, of which 3.5% was interoperative.

In our study, major complications often occurred in advanced primary vulvar cancer (mainly wound dehiscence), affecting those with recurrent malignancies.

**Early complications**

Massive bleeding occurred in 2 patients during operation. One patient with uterine sarcoma died of massive bleeding from sacral vessels during PPE although he received 1800 mL blood. The other patient had massive bleeding from the sacral plexus during PPE for vulvar cancer. An attempt was made for haemostasis. Disseminated intravascular clotting occurred and haemorrhage was massive and lasted for a long time. Because of the continuing bleeding and the poor general state of the patient, five large laparotomy sponges were left in the pelvis to cover the pelvic, iliac and sacral vessels under pressure. The emergency pelvic packing was successful and the sponges were removed after 24 h. Twenty-eight days after the operation, the patient was transferred to the Department of Radiotherapy for supplementary treatment.

Gastrointestinal complications occurred after APE in 1 patient with cervical cancer. During the operation it was impossible to implant the ureter into the ileum by the Bricker method because of a lack of blood supply in the isolated intestinal loop, and uretero-cutaneostomia was performed.

The patient also suffered from acute renal failure as an early complication. Two days after APE the parameters of renal failure decreased gradually and a considerable worsening was found on day 8. Acute renal failure was confirmed. One patient with recurrent cervical cancer underwent APE and died of pulmonary embolism 2 wk after discharge from hospital. Another patient underwent TPE for recurrent cervical cancer and he received re-operation because of bleeding 2 h later. Haemorrhage was identified in the venus plexus surrounding the urethra but not fully achieved and one laparotomy sponge was applied under pressure for 48 h. After removal of the sponge no further bleeding was observed.

**Late complications**

Late complications occurred as urinary incontinence in 2 patients (7.1%) with vulvar cancer after PPE. A unilateral nephrostomy was performed in 1 patient with vulvar cancer due to extensive hydronephrosis and chronic renal failure one year after PPE.

A urinary fistula was diagnosed 6 mo after PPE for recurrent cervical cancer in 1 patient. During surgery to remove the fistula, a progression of disease was diagnosed and a cystectomy was performed to create an ileal conduit.

**DISCUSSION**

Primary radiation therapy or surgery in combination with radiotherapy has been the standard treatment for years in patients with advanced cancer. Although some changes have taken place in radiation techniques, the cure rate for advanced cancer still remains disappointing. Severe radiation complications may occur in these patients and PE should be performed for salvage therapy in combination with chemotherapy and radiotherapy as the first line treatment[8].

TPE is often the only hope for women who have failed non-conservative therapy[11, 12]. PE can provide a good chance of long-term survival in carefully selected patients but the role of palliative exenteration in patients with non-resectable disease is still controversial[8]. PE is also the treatment of choice for the control of locally advanced recurrent gynecological malignancies unresponsive to therapy[8].

We have performed PPE mainly for advanced vulvar cancer without the need to make an ileal conduit in patients who had no previous operation, radiotherapy or chemotherapy.

Physiological age and absence of co-morbidity appear to be more important when patients are selected for exenteration than chronological age. Careful pre-operative staging either by computed tomography scan
or by magnetic resonance imaging can usually identify patients with distant metastases, extrapelvic nodal disease, or disease involving the pelvic sidewall (which generally precludes surgery). Recent application of intraoperative radiotherapy or postoperative high-dose brachytherapy in patients with advanced pelvic disease involving pelvic sidewall, may expand the standard indications for exenteration. However, this procedure with or without radiotherapy, should be the resection of all tumors since the site of palliative exenteration is controversial.

A successful operation can free patients from the potential discomfort caused by aggressive tumor. To a certain extent it can also reduce the pain in the pelvic area.

The most serious and common complications after exenteration are acute enteric complications (which can exceed 20%), enteric obstruction, fistulization, pelvic infection, sepsis, wound infection, pyelonephritis. Acute renal failure is a rare complication after pelvic exenteration.

Inguinal lymphadenectomy combined with PE increases the total incidence of complications in patients with vulvar carcinoma. Necrosis of the skin over inguinal and symphisis pubis areas is the most common complication which is present in 75% of cases.

The long operating time and huge blood loss associ-

### Table 1 Clinical characteristics of patients

| Patient number | Age (yr) | Year of operation | Days in hospital after surgery | Histology | Method | Blood transfusion (mL) | Operating time (min) | Complications |
|----------------|---------|-------------------|-------------------------------|-----------|--------|-----------------------|----------------------|---------------|
| 1              | 59      | 1996              | 48                            | vulvar - scc | PPE    | 240                    | 240                  | wd            |
| 2              | 48      | 1996              | 14                            | vulvar - scc | PPE    | 800                    | 315                  |               |
| 3              | 62      | 1998              | 35                            | vulvar - scc | PPE    | 600                    | 330                  | urinary infection, wd |
| 4              | 77      | 1998              | 28                            | vulvar - scc | PPE    | 900                    | 360                  |               |
| 5              | 37      | 1998              | 15                            | rectal adenocarcinoma | PPE | 600                    | 255                  |               |
| 6              | 50      | 1999              | 23                            | ovarian adenocarcinoma | PPE | 1200                   | 405                  |               |
| 7              | 65      | 2000              | 54                            | vulvar - scc | PPE    | 1500                   | 380                  | urinary infection, wd |
| 8              | 34      | 2000              | 49                            | vulvar - scc | TPE    | 1200                   | 330                  | ARDS, wd      |
| 9              | 52      | 2000              | 16                            | vulvar - scc | PPE    | 300                    | 360                  | urinary incontinence |
| 10             | 44      | 2000              | -                             | uterine sarcoma | PPE    | 1800                   | 275                  | massive bleeding- died during operation |
| 11             | 43      | 2002              | 28                            | vulvar - scc | PPE    | 1560                   | 350                  |               |
| 12             | 64      | 2002              | 28                            | vulvar - scc | PPE    | 900                    | 420                  |               |
| 13             | 63      | 2002              | 42                            | vulvar - scc | TPE    | 1420                   | 450                  | thrombophlebitis, wd |
| 14             | 53      | 2002              | 25                            | Bartholin's gland -scc | PPE    | 1100                   | 360                  | urinary infection, wd |
| 15             | 44      | 2002              | 41                            | vulvar - scc | PPE    | 1500                   | 450                  | ureter damage, wd |
| 16             | 64      | 2002              | 14                            | rectal adenocarcinoma | PPE    | 300                    | 315                  |               |
| 17             | 62      | 2002              | 16                            | cervical - scc | PPE    | 500                    | 360                  |               |
| 18             | 57      | 2003              | 28                            | vulvar - scc | PPE    | 3580                   | 420                  | massive bleeding |
| 19             | 34      | 2003              | 24                            | cervical - scc | APE    | 1285                   | 480                  | acute renal failure |
| 20             | 34      | 2003              | 8                             | rectal adenocarcinoma | PPE    | 280                    | 380                  |               |
| 21             | 74      | 2004              | 66                            | vulvar - scc | PPE    | 500                    | 330                  | wd, urinary incontinence |
| 22             | 82      | 2004              | 16                            | rectal adenocarcinoma | PPE    | 950                    | 330                  |               |
| 23             | 53      | 2004              | 10                            | cervical - scc | APE    | 1200                   | 410                  | pulmonary embolism-death |
| 24             | 48      | 2005              | 15                            | rectal adenocarcinoma | PPE    | 900                    | 435                  |               |
| 25             | 43      | 2005              | 14                            | cervical - adenocarcinoma | TPE | 1500                   | 660                  | wd, bleeding- reoperation urinary bladder disfunction |
| 26             | 56      | 2005              | 29                            | rectal adenocarcinoma | PPE | 1200                   | 705                  | urinary fistula |
| 27             | 51      | 2005              | 26                            | cervical - scc | PPE | 1200                   | 560                  |               |
| 28             | 38      | 2005              | 10                            | cervical - scc | TPE | 1800                   | 430                  |               |
| Mean           | 53.3    | -                 | 26.7                          | -         | -                  | 1100                  | 396                  |               |

Wd = wound dehiscence; ARDS = adult respiratory distress syndrome; SCC = squamous cell carcinoma
ated with exenteration increase the risk of wound infection which may adversely affect anastomosis site healing. Concomitant transfusion requirements and the entry of contaminated viscera- vagina, urethra, rectum are inherent to the operation. Most patients who undergo the procedure have advanced cancer and have received high-dose radiotherapy to the operative field. This compromises healing ability and makes the procedure even more risky. 

Experience shows that irradiation produces relative ischemia of the exposed area with diminished cellular vitality, thereby impairing the healing process. The dose of previous radiation therapy (especially higher than 4000cGy) is the most important risk factor for major surgical complications. The incidence of postoperative urinary or gastrointestinal complications is significantly higher in previously irradiated gynecological patients. 

Averette et al. reported an operative mortality of 40% is associated with surgical correction of fistula and 93% of these patients have received previous radiation therapy. The fistulized loop of bowel is attached to the pelvic floor at reoperation. In our study, fistulization after PE was found only in 1 patient with recurrent cervical cancer. This low incidence can be attributed to the majority of patients presenting primary tumors, who did not undergo primary radiation but reperitonisation at closure of the pelvic cavity to prevent small bowel prolapse. Rodriguez-Bias et al. showed that 67% of patients who did not receive prior radiation therapy and 26% of patients who did not receive prior irradiation develop postoperative complications. Other authors have implicated prior radiation therapy as a risk factor for increased morbidity after PE. 

The type of urinary diversion is also significantly related to the development of complications. A modified Indiana pouch and transverse colon for the reservoir are reported to have a lower incidence of complications than the sigmoid colon or Kock pouch. Compared to cutaneous ureterostomy and ileal conduit, a continent reservoir can decrease the incidence of complications as transverse colon, jejunum) and the creation of a continent reservoir can decrease the incidence of complications and improve the quality of life after this radical procedure. 

Urinary fistulae and obstruction following pelvic exenteration are the frequent and life threatening complications. The fistulized loop of bowel is attached to the pelvic floor at reoperation. In our study, fistulization after PE was found only in 1 patient with recurrent cervical cancer. This low incidence can be attributed to the majority of patients presenting primary tumors, who did not undergo primary radiation but reperitonisation at closure of the pelvic cavity to prevent small bowel prolapse. Rodriguez-Bias et al. showed that 67% of patients who did not receive prior radiation therapy and 26% of patients who did not receive prior irradiation develop postoperative complications. Other authors have implicated prior radiation therapy as a risk factor for increased morbidity after PE. 

The type of urinary diversion is also significantly related to the development of complications. A modified Indiana pouch and transverse colon for the reservoir are reported to have a lower incidence of complications than the sigmoid colon or Kock pouch. Compared to cutaneous ureterostomy and ileal conduit, a continent reservoir provides a better quality of life and a low incidence of pyelonephritis and chronic renal failure. However, the early complication of wound infection is higher.

Urinary fistulae and obstruction following pelvic exenteration are the frequent and life threatening complications, which increase the mortality and morbidity rates of large resections performed during PE for gynecological cancers. Major early urinary complications are significantly increased in patients who have received previous pelvic radiotherapy or have had an intestinal conduit for urinary diversion. Late complications are associated with urinary diversion, including stenosis, chronic or recurrent pyelonephritis, prolapsed stoma, incontinent or obstructed reservoir and calculi in the reservoir. 

Patients after PE are at high risk of developing cardiac complications, ARDS and pulmonary emboli. Contrary to other authors we have performed PPE mainly in advanced vulvar cancer without the need to make an ileal conduit in patients did not receive radiotherapy or chemotherapy. The majority of these patients had recurrence after prior surgery and radiotherapy. After exenteration, the 5-year survival was 40-60% in patients with gynecological cancer and 25-40% in patients with colorectal cancer. 

We present a review of complications and their percentages as cited in literature. 

**Early postoperative complications**

Intestinal obstruction rate was 5.3-21.1%, skin flap necrosis (in vulvar cancer) 75%, hemorrhage 1-16.6%, intestinal fistula 5-16.3%, enterocutaneous fistula 4.23-8.8%, urinary fistula 1-15.7%, pyelonephritis / pyelonephrosis 3.8-21.6%, wound infection 2-14%, peritonitis 4%, pelvic abscess 2.6-17.9%, stoma separation 5.8%, ureteral obstruction or necrosis 1-5%, uremia (without obstruction) 5.7%, stoma stenosis 2%, prolonged ileus 15%, postoperative psychosis/depression 1.9-5%, pelvic cellulitis 7.4%, stomal hernia 10.5%, colostomy necrosis 2.4-5.2%, loop necrosis 3.7%, iliac artery thrombosis 0.4-1.1%, arterial thrombosis 2.4%, hydronephrosis 15.4%, hypercholesteremic acidosis 7.4%, thrombophlebitis 2-8.3%, pulmonary embolus 2-4.3%, neurogenic bladder 8.3%, urinary incontinence 5.3%, cerebrovascular accident 2.2%, shock 3.3%, calculi 2%, myocardial infarction 2.2%, heart failure 0.9%, perineal evisceration 2-6%, metabolic disorders 21%, pneumonia 1%. 

**Late postoperative complications**

Intestinal obstruction rate was 4.4-15.4%, small bowel ileus 10%, hydronephrosis 1.4-21.6%, enterocutaneous fistula 1-5%, pyelonephritis 2-10.5%, colostomy necrosis 5%, perineal abscess 1-3.4%, perineal hernia 1.9-3.3%, renal calculus 0.9-6.2%, stomal hernia 3.7-5%, stomal stricture 1-5.5%, uretero-ileal stricture 1-9.2%, recurrent infection 27.2%, small bowel fistula 5.5-8%, wound dehiscence 9.8%, urinary incontinence 8.3%, chronic lymphoedema 16.6%, perineal evisceration 4%, metabolic disorders 8%, urinary fistula 3%. 

Robert et al. reported that 29% of patients after PE need re-operation. Re-operation after PE is extremely difficult and often leads to further morbidity if not mortality in such a situation. Re-operation for small bowel fistula and obstruction has 40% and 50% operative mortality, respectively. In our study, only 1 out of 28 patients (3.6%) had indications for re-operation. 

PE is a high-morbidity procedure and its major complications correlate with preoperative pelvic radiotherapy and previous pelvic surgery. However sufficient postoperative nutrition (hyper-alimentation), antibiotics and antithrombotic therapy, use of tissue less affected by radiation (such as transverse colon, jejunum) and the creation of a continent reservoir can decrease the incidence of complications and improve the quality of life after this radical procedure. 

Although significant advances have been made in radiotherapy and chemotherapy, PE still remains an important part of the armamentarium of pelvic surgery and is the primary and occasionally the only treatment for the control of advanced malignancies. 

In conclusion, PE should be considered as the treatment of choice for the control of locally advanced primary and recurrent pelvic malignancies unresponsive to therapy. An understanding of post-exenteration morbidity and complications is necessary. We are continuing to revise and update the procedures to minimize complications and increase survival.
An improved method of creating an ileac con
exenteration: a justified procedure.

Roberts WS, Plukker JT, Hopkins MP, Champion HK, Rutledge FN, Lopez MJ, Sharma S, Wheeless CR, Bladou F, Wydra D. Pelvic exenteration for gynecological malignancies: twenty-year experience at Roswell Park Cancer Institute. Int J Gynecol Cancer 2005; 15: 475-482

REFERENCES

1. Lopez MJ, Luna-Pérez P. Composite pelvic exenteration: is it worthwhile? Ann Surg Oncol 2004; 11: 27-33
2. Numa F, Ogata H, Suminami Y, Tsunaga N, Nakamura Y, Tamura H, Takasugi N, Kato H, Togakunoy A, Uchiyama T, Oka M, Suzuki T, Yamamoto M, Naito K. Pelvic exenteration for the treatment of gynecological malignancies. Arch Gynecol Obstet 1997; 259: 133-138
3. Rutledge FN, Smith JP, Wharton JT, O’Quinn AG. Pelvic exenteration: analysis of 286 patients. Am J Obstet Gynecol 1977; 129: 881-892
4. Chang HK, Lo KY, Chiang HS. Complications of urinary diversion after pelvic exenteration for gynecological malignancy. Int Urogynecol J Pelvic Floor Dysfunct 2000; 11: 358-360
5. Bramhall SR, Harrison JD, Burton A, Wallace DM, Chan KK, Harrison G, White A, Fielding JW. Phase II trial of radical surgery for locally advanced pelvic neoplasia. Br J Surg 1999; 86: 805-812
6. Hopkins MP, Morley GW. Pelvic exenteration for the treatment of vulvar cancer. Cancer 1992; 70: 2835-2838
7. Kiselow M, Butcher HR, Bricker EM. Results of the radical surgical treatment of advanced pelvic cancer: a fifteen-year study. Ann Surg 1967; 166: 428-436
8. Plukker JT, Aalders JG, Mensink HJ, Oldhoff J. Total pelvic exenteration: a justified procedure. Br J Surg 1993; 80: 1615-1617
9. Roberts WS, Cavanagh D, Bryson SC, Lyman GH, Hewitt S. Major morbidity after pelvic exenteration: a seven-year experience. Obstet Gynecol 1987; 69: 617-621
10. Bladou F, Houvaneaeghe G, Delpéro JR, Guérinel G. Incidence and management of major urinary complications after pelvic exenteration for gynecological malignancies. J Surg Oncol 1995; 58: 91-96
11. Wheeless CR. Recent advances in surgical reconstruction of the gynecologic cancer patient. Curr Opin Obstet Gynecol 1992; 4: 91-101
12. Sharma S, Odunsi K, Driscoll D, Lele S. Pelvic exenterations for gynecological malignacies: twenty-year experience at Roswell Park Cancer Institute. Int J Gynecol Cancer 2005; 15: 475-482
13. Franchi M, Donadello N. Pelvic exenteration in gynecologic oncology. Review. Eur J Gynaecol Oncol 1994; 15: 469-474
14. Crowe PJ, Temple WJ, Lopez MJ, Ketcham AS. Pelvic exenteration for advanced pelvic malignancy. Semin Surg Oncol 1999; 17: 152-160
15. Averette HE, Lichtinger M, Sevin BU, Girtanner RE. Pelvic exenteration: a 15 year experience in a general metropolitan hospital. Am J Obstet Gynecol 1984; 150: 179-184
16. Ketcham AS, Deckers PJ, Sugarbaker EV, Hoye RC, Thomas LB, Smith RR. Pelvic exenteration for carcinoma of the uterine cervix. A 15-year experience. Cancer 1970; 26: 513-521
17. Symmonds RE, Pratt JH, Webb MJ. Exenterative operations: experience with 198 patients. Am J Obstet Gynecol 1975; 121: 907-918
18. Thornton WN, Flanagan WC. Pelvic exenteration in the treatment of advanced malignancy of the vulva. Am J Obstet Gynecol 1973; 117: 774-781
19. Webb MJ, Symmonds RE. Management of the pelvic floor after pelvic exenteration. Obstet Gynecol 1977; 50: 166-171
20. Singleton HM, Soong SJ, Golder MS, Hatch KD, Baker VV, Austin JM. Clinical and histopathologic factors predicting recurrence and survival after pelvic exenteration for cancer of the cervix. Obestet Gynecol 1989; 73: 1027-1034
21. Rodriguez-Bigas MA, Petrelli NJ. Pelvic exenteration and its modifications. Am J Surg 1996; 171: 293-298
22. Orr JW, Singleton HM, Hatch KD, Partridge EE, Soong SJ. Gastrointestinal complications associated with pelvic exenteration. Am J Obstet Gynecol 1983; 145: 325-332
23. Ehrlich RM. An improved method of creating an ileac conduit: the importance of a better vascular supply. J Urol 1973; 109: 993-995
24. Penalver MA, Bejany DE, Averette HE, Donato DM, Sevin BU, Suarez G. Continent urinary diversion in gynecologic oncology. Gynecol Oncol 1989; 34: 274-288
25. Rodriguez Cuevas H, Torres A, de la Garza M, Hernandez D, Herrera L. Pelvic exenteration for carcinoma of the cervix: analysis of 252 cases. J Surg Oncol 1988; 38: 121-125
26. Shepherd JH, Ngan HY, Neven P, Fryatt I, Woodhouse CR, Hendry WF. Multivariate analysis of factors affecting survival in pelvic exenteration. Int J Gynecol Cancer 1994; 4: 361-370

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