

RAPID COMMUNICATION

## Comparison of immediate surgical outcomes between posterior pelvic exenteration and standard resection for primary rectal cancer: A matched case-control study

Varut Lohsiriwat, Darin Lohsiriwat

Varut Lohsiriwat, Darin Lohsiriwat, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

Author contributions: Lohsiriwat V is the principle investigator who contributed to acquisition of data and analysis as well as manuscript preparation. Lohsiriwat D conceived the study and critically revised the manuscript.

Correspondence to: Varut Lohsiriwat, MD, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Prannok Rd, Bangkoknoi, Bangkok 10700, Thailand. [bolloon@hotmail.com](mailto:bolloon@hotmail.com)

Telephone: +66-2-4198077 Fax: +66-2-4115009

Received: December 17, 2007 Revised: February 26, 2008

### Abstract

**AIM:** To determine the immediate surgical outcome and recovery of bowel function following posterior pelvic exenteration (PPE) for primary rectal cancer with suspected local invasion to the female internal reproductive organs, in comparison with a case-control series of standard resection for primary rectal cancer.

**METHODS:** We analyzed 10 consecutive female patients undergoing PPE for the aforementioned indication between December 2003 and May 2006 in a single institution. Data were prospectively collected during hospitalization, including patient demographics, tumor- and operation-related variables and early surgical outcomes. These patients were compared with a group of female patients, matched for age, co-morbidity and location of tumor, who underwent standard resection for primary rectal cancer in the same period (non PPE group).

**RESULTS:** In the PPE group, pathological reports showed direct invasion of the reproductive organs in 4 cases and an involvement of lymph nodes in 7 cases. A sphincter-saving operation was performed in each case. Operative time was longer (274 min *vs* 157 min,  $P < 0.001$ ) and blood loss was greater (769 mL *vs* 203 mL,  $P = 0.008$ ) in the PPE group. Time to first bowel movement, time to first defecation, time to resumption of normal diet, and hospital stay were not significantly different between the two groups. Postoperative complication rates were also similar.

**CONCLUSION:** PPE for rectal cancer was associated

with longer operative time and increased blood loss, but did not compromise immediate surgical outcomes and postoperative bowel function compared to standard rectal resection.

© 2008 WJG. All rights reserved.

**Key words:** Pelvic exenteration; Rectal cancer; Outcomes; Morbidity; Postoperative bowel function

**Peer reviewers:** Bernardino Rampone, Dr, Department of General Surgery and Surgical Oncology, University of Siena, viale Bracci, Siena 53100, Italy; Francis Seow-Choen, Professor, Seow-Choen Colorectal Centre, Mt Elizabeth Medical Centre, Singapore, 3 Mt Elizabeth Medical Centre #09-10, 228510, Singapore

Lohsiriwat V, Lohsiriwat D. Comparison of immediate surgical outcomes between posterior pelvic exenteration and standard resection for primary rectal cancer: A matched case-control study. *World J Gastroenterol* 2008; 14(15): 2414-2417 Available from: URL: <http://www.wjgnet.com/1007-9327/14/2414.asp> DOI: <http://dx.doi.org/10.3748/wjg.14.2414>

### INTRODUCTION

The incidence of rectal cancer invading the female reproductive organs has been reported to be up to 18%<sup>[1-3]</sup>. An en-bloc resection of the rectum, uterus and both ovaries, known as a posterior pelvic exenteration (PPE), is a curative procedure for this condition<sup>[4-6]</sup>. There is also certainty that PPE should be performed in every female rectal cancer patient with suspected local invasion to the reproductive organs because it is difficult to distinguish intraoperatively whether adherence to the adjacent organs is malignant or only due to the peritumoral inflammatory process<sup>[2,7]</sup>. Non en-bloc resection of the tumor invading other structures resulted in higher risk of local recurrence and poorer survival<sup>[7]</sup>.

PPE remains a radical procedure associated with significant morbidity and mortality<sup>[8-10]</sup>. Details of early surgical outcomes related to the procedure are not clearly defined in the available literature. Furthermore, most investigations<sup>[11-16]</sup> included heterogeneous patients with different surgical operations, including cases of primary and recurrent rectal cancer, and focused primarily only on patient survival rate.

The aim of this study was to determine the immediate surgical outcome and recovery of bowel function following PPE for primary rectal cancer with suspected local invasion to the female internal reproductive organs in comparison with a case-control series of standard resection for primary rectal cancer.

## MATERIALS AND METHODS

### Patients

We carried out an analysis of 10 consecutive female patients with rectal adenocarcinoma with suspected local invasion to the female internal reproductive organs who underwent PPE between December 2003 and May 2006 at the Department of Surgery, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand. Data were prospectively collected during hospitalization. The study was approved by the Institutional Ethics Committee and informed consent was obtained from all the patients. These patients were compared with a group of female patients who underwent standard resection for primary rectal cancer in the same period (non PPE group). They were matched for age, co-morbidity and location of tumor, with the ratio of 1 PPE case to 2 non PPE cases.

Rectal cancer was defined as a tumor with the lower edge located within 15 cm from the anal verge measured by rigid sigmoidoscopy. PPE was defined as an extirpation of the rectum in block with the internal genital organs and draining lymph nodes. Patients receiving neoadjuvant therapy, or who had recurrent tumor or laparoscopic resection, were excluded.

### Surgical procedure

All patients were operated on by the same surgical team in the colorectal unit. Gynecologists participated in a few cases with PPE. Each patient underwent preoperative mechanical bowel preparation using 2 liters of polyethylene glycol a day before surgery. In the operating room, all patients received general anesthesia with or without epidural anesthesia. Intravenous prophylactic antibiotics were administered. The abdominal operation was performed *via* midline incision. Standard oncological resection was performed in every patient. Adequate mesorectal excision was performed in tumors of the upper third of the rectum and total mesorectal excision in tumors of the middle and lower third of the rectum. The type of reconstruction, either straight, side-to-end or colorectal anastomosis, was left to the discretion of each surgeon. No protective stoma and pelvic drain was performed. Prophylactic intravenous antibiotics were discontinued within 24 h-48 h.

### Statistical analysis

All data were recorded including patient demographic, operative details (suspected organs involved, operative time and blood loss), pathological staging and postoperative outcomes. The postoperative outcomes, including mortality, morbidity, time to first bowel movement, time to first defecation, time to resumption of normal diet, and hospital stay, were analyzed. Patients were discharged from

Table 1 Correlation between indications, tumor location and pathologic findings in PPE group ( $n = 10$ )

Suspected organs involved	$n$ (lower: middle: upper rectum)	Pathological findings		
		Direct invasion (T4)	Perirectal invasion (T3)	Positive lymph nodes (N-positive)
Vagina	1 (1:0:0)	0	1	1
Uterus	7 (0:5:2)	2	5	4
Ovaries	2 (0:1:1)	2 <sup>1</sup>	0	2
Total	10 (1:6:3)	4	6	7

<sup>1</sup>Including 1 case of Krukenberg tumor.

the hospital when they had no fever, good ambulation, good appetite and satisfactory recovery of bowel function. All patients were scheduled for follow-up at 30 d postoperatively. Patients with T3/4 or N-positive tumors were further scheduled for adjuvant therapy.

All data were prepared and compiled using SPSS computer software (version 10.0 for Windows). Means and standard deviations were assessed. The Kolmogorov-Smirnov test was used to test for the pattern of data distribution. *t*-tests were used to compare data between the two groups when they showed normal distribution. Mann-Whitney *U* tests were used when data were not normally distributed. Pearson chi-square tests or Fisher's exact tests were used for categorical data. A *P* value of less than 0.05 was considered statistically significant.

## RESULTS

During the 2.5-year period mentioned, 64 female patients underwent various curative resection of the rectum for primary rectal cancer. Ten patients (16%), with a mean age of 57 years (range 43-81), underwent PPE. Sphincter-saving operations and R0 resection were achieved in all cases studied.

In the PPE group, pathological reports showed direct invasion of reproductive organs in 4 cases and an involvement of lymph nodes in 7 cases. Correlation between indications, tumor location and pathologic findings in the PPE group are shown in Table 1. Patient- and tumor- related variables were not statistically different between the PPE and non-PPE groups. The average operative time and blood loss were significantly greater in the PPE group (274 min *vs* 157 min,  $P < 0.001$ ; 769 mL *vs* 203 mL,  $P = 0.008$ , respectively; Table 2).

No thirty-day postoperative mortality occurred in this study. Each group had a complication rate of 10%; one intraabdominal abscess requiring a 10-d regimen of intravenous antibiotics occurred in the PPE group, one superficial surgical site infection and one anastomotic leakage requiring percutaneous drainage and bowel rest occurred in the non-PPE group. Time to first bowel movement, time to first defecation, time to resumption of normal diet and postoperative hospitalization were not significantly different between the two groups (Table 3).

## DISCUSSION

In the present series, PPE was employed in 16% of the

**Table 2** Patient- and tumor- related variables between PPE group and non PPE group (mean  $\pm$  SD)

Variables	PPE (n = 10)	Non PPE (n = 20)	P
Patient related			
Age (yr)	57.4 $\pm$ 13.5	57.8 $\pm$ 13.1	0.94
BMI (kg/m <sup>2</sup> )	22.2 $\pm$ 2.9	21.4 $\pm$ 3.7	0.58
ASA status I : II : III	30:50:20	45:50:05	0.39
Hypoalbuminemia <sup>1</sup>	50	25	0.23
Preoperative CEA (ng/mL)	36.9 $\pm$ 44.7	11.5 $\pm$ 21.0	0.12
Tumor related			
Stage I : II : III : IV <sup>2</sup>	0:30:60:10	20:20:60:0	0.30
Tumor size (cm)	6.0 $\pm$ 2.2	4.8 $\pm$ 2.0	0.16
Location of the tumor from the anal verge (cm)	9.1 $\pm$ 3.3	9.0 $\pm$ 3.0	0.93

BMI: Body mass index; ASA: American society of anesthesiologists; CEA: Carcinoembryonic antigen. <sup>1</sup>Serum albumin less than 3.5 mg/dL; <sup>2</sup>Patient with Krukenberg tumor.

female patients with primary rectal cancer, which was comparable to previous reports of 14%-28% in the literature<sup>[1,7,17]</sup>. The mortality rate after PPE is generally less than 10%<sup>[1,13,18,19]</sup>, depending on patient characteristics, comorbidity and hospital setting. The zero 30-d mortality found in the present study may be the result of the fact that all the operations were electively performed by experienced colorectal surgeons and few patients had severe co-morbidity. In order to minimize mortality, PPE should be performed in selective cases in a specialized and well-equipped medical institution.

The PPE group tended to have larger tumors and a higher preoperative carcinoembryonic antigen (CEA) level than the non PPE group. However, this finding did not decrease the rate of sphincter-saving operation because preservation of the anal sphincter mainly depends on the location of the tumor in relation to the anal verge rather than the size of the lesion<sup>[20,21]</sup>. In our experience, PPE increases the operative time and blood loss but does not increase morbidity and hospital stay time. Bannura *et al*<sup>[1]</sup> revealed that PPE was associated with prolonged operative time, increased postoperative complications and delayed hospital discharge when compared with non PPE cases. This report from Chile included 50% morbidity with an average hospital stay of 19 d in the PPE group. The high morbidity in that study may be due to one-third of PPE involving abdominoperineal excision and one-fifth receiving neoadjuvant chemoradiation. Operation for recurrent pelvic malignancy<sup>[13]</sup>, concomitant resection of bony pelvis<sup>[16]</sup>, and preoperative pelvic radiation<sup>[22]</sup> have been identified as risk factors for postoperative morbidity after PPE. The common complications following PPE include intraabdominal hemorrhage, pelvic abscess or fluid collection, anastomotic leakage, urinary tract infection, wound infection, and intraperineal fistula<sup>[23,24]</sup>.

In the present study, we found no difference in clinical recovery of bowel function between the two groups. There have been a number of independent factors influencing recovery of gut function<sup>[25-27]</sup>, including postoperative complications, narcotics administration, electrolyte imbalance, and hypoalbuminemia<sup>[28]</sup>. However,

**Table 3** Operation related variables and surgical outcomes between PPE group and non PPE group (mean  $\pm$  SD)

Variables	PPE (n = 10)	Non PPE (n = 20)	P value
Operation related			
Operative time (min)	274 $\pm$ 73	157 $\pm$ 62 <sup>b</sup>	< 0.001
Blood loss (mL)	769 $\pm$ 549	203 $\pm$ 136 <sup>b</sup>	0.008
Outcomes			
Complications	10	10	1.00
Time to first bowel movement (h)	70 $\pm$ 29	59 $\pm$ 26	0.31
Time to first defecation (d)	5.0 $\pm$ 1.2	4.6 $\pm$ 1.5	0.42
Time to resumption of normal diet (d)	5.8 $\pm$ 3.0	4.6 $\pm$ 0.9	0.09
Hospital stay (d)	11.5 $\pm$ 7.2	9.2 $\pm$ 4.1	0.26

<sup>b</sup>P < 0.01.

no published study has been able to demonstrate any correlation between prolonged operative time or increased blood loss and delayed recovery of postoperative bowel function<sup>[29]</sup>. Length of hospital stay for the PPE group and non-PPE group was not significantly different. This finding may suggest that additional non-gastrointestinal resection does not increase operative risk and hospital stay in rectal cancer surgery<sup>[30]</sup>.

In conclusion, PPE was associated with longer operative time and increased blood loss, but did not compromise immediate surgical outcomes and postoperative bowel function compared to standard rectal resection. PPE can be justified as a liberal and safe operation for primary rectal cancer with suspected local invasion to the female internal reproductive organs.

## COMMENTS

### Background

Posterior pelvic exenteration (PPE) is the gold standard operation for rectal cancer invading the female reproductive organs. There is also no doubt that PPE should be performed in every female rectal cancer patient with suspected local invasion to the reproductive organs because it is difficult to distinguish intraoperatively whether adherence to the adjacent organs is malignant or only peritumoral inflammatory process. However, PPE remains a radical procedure and could be associated with a significant morbidity and mortality.

### Research frontiers

Details of early surgical outcomes following PPE are not clearly defined in available literatures. Furthermore, most investigations included heterogeneous patients with different surgical operations, and both with cases of primary and of recurrent rectal cancer.

### Innovations and breakthroughs

The present study clearly demonstrated that PPE did not compromise immediate surgical outcomes and postoperative bowel function comparing with standard rectal resection for rectal cancer.

### Applications

PPE could be justified as a liberal and safe operation for primary rectal cancer with suspected local invasion to the female internal reproductive organs although it is associated with longer operative time and increased blood loss comparing with standard rectal resection. Further research might focus on the long-term outcomes (such as disease free survival and survival time) between the two procedures in female patients with locally advanced rectal cancer.

**Peer review**

This clinical study compares the short-term surgical outcomes between posterior pelvic exenteration and standard rectal resection. The manuscript is well-written and very informative. It has an impact on surgical management for locally advanced rectal cancer.

**REFERENCES**

- 1 **Bannura GC**, Barrera AE, Cumsille MA, Contreras JP, Melo CL, Soto DC, Mansilla JE. Posterior pelvic exenteration for primary rectal cancer. *Colorectal Dis* 2006; **8**: 309-313
- 2 **Sokmen S**, Terzi C, Unek T, Alanyali H, Fuzun M. Multivisceral resections for primary advanced rectal cancer. *Int J Colorectal Dis* 1999; **14**: 282-285
- 3 **Kruschewski M**, Pohlen U, Hotz HG, Ritz JP, Kroesen AJ, Buhr HJ. Results of multivisceral resection of primary colorectal cancer. *Zentralbl Chir* 2006; **131**: 217-222
- 4 **Gannon CJ**, Zager JS, Chang GJ, Feig BW, Wood CG, Skibber JM, Rodriguez-Bigas MA. Pelvic exenteration affords safe and durable treatment for locally advanced rectal carcinoma. *Ann Surg Oncol* 2007; **14**: 1870-1877
- 5 **Rajput A**, Bullard Dunn K. Surgical management of rectal cancer. *Semin Oncol* 2007; **34**: 241-249
- 6 **Wanebo HJ**, Begossi G, Varker KA. Surgical management of pelvic malignancy: role of extended abdominoperineal resection/exenteration/abdominal sacral resection. *Surg Oncol Clin N Am* 2005; **14**: 197-224
- 7 **Gebhardt C**, Meyer W, Ruckriegel S, Meier U. Multivisceral resection of advanced colorectal carcinoma. *Langenbecks Arch Surg* 1999; **384**: 194-199
- 8 **Kakuda JT**, Lamont JP, Chu DZ, Paz IB. The role of pelvic exenteration in the management of recurrent rectal cancer. *Am J Surg* 2003; **186**: 660-664
- 9 **Lehnert T**, Golling M. Posterior pelvic exenteration in locoregional recurrence of rectal carcinoma--indications, technique and outcome. *Chirurgie* 2001; **72**: 1393-1401
- 10 **Wydra D**, Emerich J, Dudziak M, Ciach K, Marciniak A. Emergency pelvic packing to control massive intraoperative bleeding during pelvic posterior exenteration. *Eur J Obstet Gynecol Reprod Biol* 2004; **117**: 247-248
- 11 **Kecmanovic DM**, Pavlov MJ, Kovacevic PA, Sepetkovski AV, Ceranic MS, Stamenkovic AB. Management of advanced pelvic cancer by exenteration. *Eur J Surg Oncol* 2003; **29**: 743-746
- 12 **Lasser P**, Doidy L, Elias D, Lusinchi A, Sabourin JC, Bonvalot S, Ducreux M. Total pelvic exenteration and rectal cancer. Apropos of 20 cases. *Chirurgie* 1999; **124**: 252-257
- 13 **Wydra D**, Emerich J, Sawicki S, Ciach K, Marciniak A. Major complications following exenteration in cases of pelvic malignancy: a 10-year experience. *World J Gastroenterol* 2006; **12**: 1115-1119
- 14 **Buttarelli M**, Houvenaeghel G, Lelievre L, Jacquemier J, Guiramand J, Delpero JR. Pelvic posterior exenteration with immediate colo-rectal anastomosis: is it justified and feasible in advanced stage ovarian carcinoma? *Ann Chir* 2006; **131**: 431-436
- 15 **Ferron G**, Querleu D, Martel P, Letourneur B, Soulie M. Laparoscopy-assisted vaginal pelvic exenteration. *Gynecol Oncol* 2006; **100**: 551-555
- 16 **Lopez MJ**, Luna-Perez P. Composite pelvic exenteration: is it worthwhile? *Ann Surg Oncol* 2004; **11**: 27-33
- 17 **Moriya Y**, Akasu T, Fujita S, Yamamoto S. Aggressive surgical treatment for patients with T4 rectal cancer. *Colorectal Dis* 2003; **5**: 427-431
- 18 **Fleisch MC**, Pantke P, Beckmann MW, Schnuerch HG, Ackermann R, Grimm MO, Bender HG, Dall P. Predictors for long-term survival after interdisciplinary salvage surgery for advanced or recurrent gynecologic cancers. *J Surg Oncol* 2007; **95**: 476-484
- 19 **Marnitz S**, Kohler C, Muller M, Behrens K, Hasenbein K, Schneider A. Indications for primary and secondary exenterations in patients with cervical cancer. *Gynecol Oncol* 2006; **103**: 1023-1030
- 20 **Di Betta E**, D'Hoore A, Filez L, Penninckx F. Sphincter saving rectum resection is the standard procedure for low rectal cancer. *Int J Colorectal Dis* 2003; **18**: 463-469
- 21 **Dong WG**, Zhan WH, Wang JP. [Indications and prognostic analysis of sphincter preservation operation for rectal cancer] *Zhonghua Weichang Waikexue* 2005; **8**: 294-296
- 22 **Bladou F**, Houvenaeghel G, Delpero JR, Guerinel G. Incidence and management of major urinary complications after pelvic exenteration for gynecological malignancies. *J Surg Oncol* 1995; **58**: 91-96
- 23 **Miller B**, Morris M, Gershenson DM, Levenback CL, Burke TW. Intestinal fistulae formation following pelvic exenteration: a review of the University of Texas M. D. Anderson Cancer Center experience, 1957-1990. *Gynecol Oncol* 1995; **56**: 207-210
- 24 **Turrini O**, Guiramand J, Moutardier V, Viret F, Mokart D, Madroszyk A, Lelong B, Bege T, Blache JL, Houvenaeghel G, Delpero JR. Perineal small bowel fistula after pelvic exenteration for cancer: technical guidelines for perineal fistula. *Ann Surg Oncol* 2006; **13**: 1622-1626
- 25 **Koninger J**, Gutt CN, Wente MN, Friess H, Martin E, Buchler MW. [Postoperative ileus. Pathophysiology and prevention] *Chirurgie* 2006; **77**: 904-912
- 26 **Luckey A**, Livingston E, Tache Y. Mechanisms and treatment of postoperative ileus. *Arch Surg* 2003; **138**: 206-214
- 27 **Senagore AJ**. Pathogenesis and clinical and economic consequences of postoperative ileus. *Am J Health Syst Pharm* 2007; **64**: S3-S7
- 28 **Lohsiriwat V**, Chinswangwatanakul V, Lohsiriwat S, Akaraviputh T, Boonnuch W, Methasade A, Lohsiriwat D. Hypoalbuminemia is a predictor of delayed postoperative bowel function and poor surgical outcomes in right-sided colon cancer patients. *Asia Pac J Clin Nutr* 2007; **16**: 213-217
- 29 **Chan DC**, Liu YC, Chen CJ, Yu JC, Chu HC, Chen FC, Chen TW, Hsieh HF, Chang TM, Shen KL. Preventing prolonged post-operative ileus in gastric cancer patients undergoing gastrectomy and intra-peritoneal chemotherapy. *World J Gastroenterol* 2005; **11**: 4776-4781
- 30 **Zhou XG**. Posterior pelvic exenteration in the treatment of extraperitoneal rectal cancer in females. *Zhonghua Waikexue* 1991; **29**: 537-539, 588

S- Editor Zhong XY L- Editor Lutze M E- Editor Lu W