

## Original Article

# Relationship Between Surgical Procedure and Spontaneous Urination After Rectal Cancer Surgery

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**OBJECTIVE:** The aim of this study was to determine the relationship between surgical procedures and spontaneous urination after rectal cancer surgery.

**METHODS:** We reviewed the time of removal of the Foley catheter in 91 patients with middle and lower rectal cancer who had undergone curative surgery, either abdominoperineal resection (APR) or sphincter-preserving operation (SPO), without pelvic lymphadenectomy (PL). We also reviewed the time of catheter removal in 40 rectal cancer patients who had undergone one of four types of autonomic nerve preserving (ANP) operations.

**RESULTS:** The mean time of removal of the catheter was 7.3 postoperative days (POD) in patients who underwent APR and 3.1 POD in patients who underwent SPO ( $p = 0.01$ ). The mean time of removal in patients who underwent ANP for the entire plexus without PL (type 1a) was 6.7 POD. It was 5.6 POD in ANP for the entire plexus with PL (type 1b), 13.8 POD in ANP for bilateral pelvic plexus with PL (type 2) and 15.8 POD in ANP for unilateral pelvic plexus with PL (type 3).

**CONCLUSION:** The type of operation and the volume of preserved nerves could be influential factors in the time to removal of the Foley catheter after rectal cancer surgery. [*Asian J Surg* 2005;28(1):34–7]

**Key Words:** rectal cancer, autonomic nerve preserving operation, postoperative urinary function

## Introduction

Maintenance of urinary function after rectal cancer surgery can be achieved with preservation of autonomic nerves.<sup>1–3</sup> Heald et al proposed total mesorectal excision (TME) as the best way to accomplish this with low local recurrence rates in Western countries.<sup>4–6</sup> Postoperative urinary function is maintained in all patients. Male and female sexual function is preserved in 69% of patients undergoing TME with autonomic nerve preservation (ANP).<sup>7</sup> However, pelvic lymphadenectomy (PL) is thought to be a rational procedure to control local recurrence in Japan.<sup>1,8,9</sup> Sharp dissection with scissors should be avoided in lymphadenectomy to prevent postoperative urinary dysfunction from intraoperative injury to the auto-

nomous nerves.<sup>2</sup> However, sacrifice of some parts of the nerves is unavoidable in lymphadenectomy. The aim of this study was to analyse the relationship between postoperative urinary function and surgical procedures for rectal cancer.

## Patients and methods

From 1975 to 1997, no-touch operations (curative surgery without visualization of or injuries to autonomic nerves) for the entire plexus were performed for rectal cancers. We reviewed the cases who underwent curative surgery for middle and lower rectal cancer, paying special attention to the amount of time until the removal of the Foley catheter without recatheterization. We compared the mean postoperative day

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**Table 1.** Indication for autonomic nerve preserving (ANP) operation

Rs, Ra cancer	ANP for the entire plexus without PL	Type 1 operation
Ra > Rb (50%>) cancer	ANP for bilateral pelvic plexus with PL	Type 2 operation
Ra < Rb (50%<), Rb cancer	ANP for unilateral pelvic plexus with PL	Type 3 operation

PL = pelvic lymph node dissection; Rs = rectosigmoid; Ra = middle rectum; Rb = lower rectum. PL was performed routinely for cases with T3 tumour and/or lymph node metastases.

(POD) when the Foley catheter was removed between cases of sphincter preserving operation (SPO) and of abdominoperineal resection (APR) (Study 1).

From 1998, ANP with or without PL was performed in patients with rectal cancer. For rectosigmoid and middle rectal cancer, only the plexus was visualized (type 1a operation). ANP for bilateral pelvic plexus with PL (type 2 operation) was performed for cancers where less than 50% of the cancer was located below the peritoneal reflection. Only unilateral pelvic plexus from the opposite side of the cancer was preserved with PL (type 3 operation) for cancers where more than 50% of the cancer was below the peritoneal reflection, and for lower rectal cancer (Table 1). PL was performed in cases where the cancer stage was diagnosed as T3 and/or where lymph node metastasis was suspected from preoperative barium enema, colonoscopy, computed tomography or endoscopic ultrasound. However, the final decision for preservation of the plexus was made from intraoperative findings. Potentially involved lymph nodes and tumour spread were cleared during the operation. All patients underwent preoperative urodynamic study to evaluate their preoperative urination.

The test of clamping the Foley catheter was started on the first POD. The catheter was removed after bladder sensation returned. The mean POD on which the Foley catheter was removed was compared between patients undergoing SPO and APR (Study 1) and among the three types of ANP (Study 2).

Preoperative radiation was not used in Study 1 or Study 2. Statistical evaluation was by the *t* test in both studies. Differences were considered statistically significant when *p* was less than 0.05. Informed consent was obtained from all patients.

## Results

### Study 1

We reviewed 91 cases undergoing curative surgery for middle and lower rectal cancer (Table 2). The mean POD of removal of the Foley catheter in the 35 patients who underwent SPO was shorter than that in the 56 patients who underwent APR (*p* = 0.01) (Table 3).

### Study 2

From April 1998 to April 2001, ANP with or without PL was performed in 40 patients with rectal cancer (Table 4). A type 1b operation was performed in five male patients to maintain postoperative sexual and urinary function (Table 5). The average age of these patients was 56.6 years (range, 49–63 years). Dukes' classification of all tumours is listed in Table 6. An effort to partially preserve the nerves was undertaken even in cases with Dukes' C tumours.

Urinary function was maintained after surgery in 97.5% of all patients. Only one patient with pT2 lower rectal cancer with lymph node metastasis who underwent a type 3 operation had not recovered urinary function at 1 year after the operation.

**Table 2.** Patient characteristics (Study 1)

Age	
Mean	60.7 yr
Range	40–84 yr
Gender	
Male	54 patients
Female	37 patients
Location of tumour*	
Middle rectal cancer (Ra)	29 cases
Lower rectal cancer (Rb)	62 cases
Dukes' classification	
A	20 cases
B	46 cases
C	25 cases

\*Tumour location defined according to Japanese Classification of Colorectal Carcinoma:<sup>10</sup> Ra = bowel at level between the lower margin of the second sacral vertebra and the peritoneal reflection; Rb = bowel at level below the peritoneal reflection.

**Table 3.** Relationship between abdominoperineal resection (APR) and sphincter-preserving operation (SPO)

	APR ( <i>n</i> = 56)	SPO ( <i>n</i> = 35)
Removal of the Foley catheter (mean POD)	7.3 ± 4.8	3.1 ± 3.1*

\**p* = 0.01. POD = postoperative day.

**Table 4.** Patient characteristics (Study 2)

Age	
Mean	61.6 yr
Range	41–80 yr
Gender	
Male	18 patients
Female	22 patients
Location of tumour*	
Rectosigmoid cancer (Rs)	17 cases
Middle rectal cancer (Ra)	8 cases
Lower rectal cancer (Rb)	15 cases
Type of operation	
SPO	28 cases
APR	12 cases

\*Tumour location defined according to Japanese Classification of Colorectal Carcinoma:<sup>10</sup> Rs = bowel at level between the promontrium and the lower margin of the second sacral vertebra; Ra = bowel at level between the lower margin of the second sacral vertebra and the peritoneal reflection; Rb = bowel at level below the peritoneal reflection. SPO = sphincter-preserving operation; APR = abdominoperineal resection.

Preoperative urodynamic study in this patient revealed neurogenic bladder caused by diabetes mellitus. All but one patient (93.8%) who underwent PL had recovered urinary function by the day of discharge. The mean time to postoperative normal urinary function after type 1a operations was 6.7 POD. It was 5.6 POD after type 1b surgery, 13.8 POD after type 2 surgery and 15.8 POD after type 3 surgery. The mean time to removal of the catheter in patients who underwent a type 1b operation was shorter than that in patients who underwent a type 2 or type 3 operation. However, there were no significant differences between patients undergoing type 1b or type 2 surgery ( $p = 0.148$ ) or between those undergoing type 1b or type 3 surgery ( $p = 0.083$ ) (Figure).

**Discussion**

Risk factors for urinary and sexual dysfunction have been reported to include patient age and the type of operative procedure with regard to sphincter saving and lymphadenectomy.<sup>11–13</sup> Recently, TME-ANP has reduced the operative morbidity rate and has been successful in minimizing sexual and urinary dysfunction.<sup>14</sup> Sympathetic and parasympathetic nerves are visualized and preserved in this technique, but PL is not performed. Under such circumstances, Havenga et al reported that the loss of postoperative male sexual activity was significantly associated with age at the time of operation and the type of operation (APR or low anterior resection); also,

**Table 5.** Type of autonomic nerve preserving (ANP) operation in Study 2

Type 1a	ANP for the entire plexus without PL	24 cases
Type 1b	ANP for the entire plexus with PL	5 cases
Type 2	ANP for bilateral pelvic plexus with PL	5 cases
Type 3	ANP for unilateral pelvic plexus with PL	6 cases

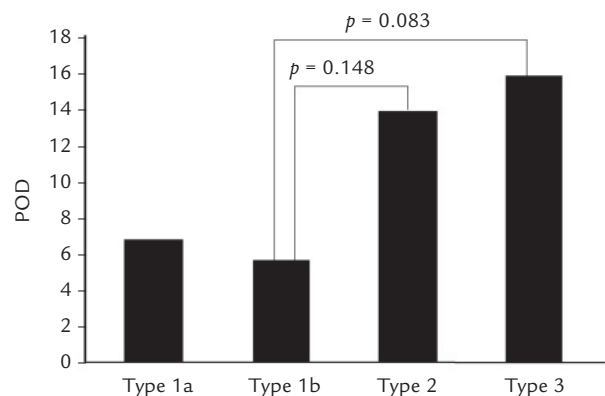
PL = pelvic lymph node dissection.

**Table 6.** Dukes' classification in Study 2

Dukes' A	9 cases
Dukes' B	11 cases
Dukes' C	16 cases
Dukes' D	4 cases

serious urinary dysfunction such as neurogenic bladder was not encountered in any of their patients.<sup>14</sup> In Study 1, the curative surgical procedure was the same as Havenga et al's approach. Recovery of urinary function was significantly associated with the type of operation, APR or SPO.

In Study 2, only one patient did not recover urinary function after type 3 ANP with PL; preoperative urodynamic study showed neurogenic bladder due to diabetes mellitus. Preservation of postoperative urinary function was achieved in 93.8% of patients who underwent ANP with PL. This suggests that PL preserving some nerves does not cause critical damage for postoperative urinary function. Time to recovery of urinary function after type 1a surgery was almost the same as that after



**Figure.** Mean postoperative day (POD) when patients had spontaneous urination after removal of the Foley catheter and the type of autonomic nerve preserving (ANP) operation. Type 1a = ANP for the entire plexus without pelvic lymph node dissection; Type 1b = ANP for the entire plexus with pelvic lymph node dissection; Type 2 = ANP for bilateral pelvic plexus; Type 3 = ANP for unilateral pelvic plexus.

type 1b surgery. This means that PL was not an influential factor in the recovery of urinary function under preservation of the entire plexus. Time to recovery of urinary function in patients who underwent type 2 or 3 operations was longer than in those who underwent type 1b operations. However, there was no prominent difference in time to recovery of urinary function after type 2 or type 3 surgery. Preservation of the unilateral pelvic plexus was effective in maintaining postoperative urinary function. The volume of preserved nerves may be an influential factor in the recovery of urinary function. Selective preservation of autonomic nerves depends on the tumour depth and the degree of lymph node metastasis. Radical lymphadenectomy of the pelvic lymph nodes is necessary to cure rectal cancer patients, especially in lower rectal cancers.<sup>9,15</sup> Preservation of parasympathetic nerves, at least the unilateral pelvic plexus, is also necessary for the preservation of postoperative urinary function.

## Conclusion

ANP surgery was useful in maintaining urinary function after rectal cancer surgery. Type of operation, APR or SPO, and volume of preserved nerves could be influential factors for the removal of Foley catheters. However, lymph node dissection was not an influential factor for the removal of the urinary catheter when the nerves were preserved.

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