

these reports, stage III included not only T1-2N+, but also T3-T4N+ patients; thus, the oncological result for stage III cannot be compared directly with the present study, but the present result for stage I was acceptable.

This study has three important limitations. First, it was a retrospective study of prospectively collected data from a relatively small number of cases. Second, this was not a long-term study, but rather an intermediate-term study with a median follow-up period of just 2.8 years. A longer follow-up period of 3–5 years is required to assess the incidence of local recurrence, DFS, overall survival, and functional results. Third, neither voiding nor sexual func-

tion was investigated. In our opinion, fine dissection under the good view of the laparoscope will lead to autonomic nerve preservation and be reflected in functional preservation. Therefore, we are now planning a new prospective study evaluating voiding and sexual function after rectal cancer surgery.

In conclusion, LAP-ISR can be recommended as a technically feasible, less invasive, and more effective sphincter-preserving procedure that is associated with acceptable functional and intermediate-term oncological outcomes in patients with cT1-T2 very low rectal cancer.

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## Rectoseminal vesicle fistula as a rare complication after low anterior resection: a report of three cases

Kentaro Nakajima · Masanori Sugito · Yuji Nishizawa · Masaaki Ito ·  
Akihiko Kobayashi · Yusuke Nishizawa · Takanori Suzuki ·  
Toshiyuki Tanaka · Toru Etsunaga · Norio Saito

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**Abstract** A rectoseminal vesicle fistula is a rare complication after a low anterior resection for rectal cancer, usually developing in the outpatient postoperative period with pneumaturia, fever, scrotal swelling or testicular pain. A diagnostic water-soluble contrast enema, cystography and computed tomography reveal a tract from the rectum to the seminal vesicle. Anastomotic leakage is thought to be partially responsible for the formation of such tracts. This report presents three cases of rectoseminal vesicle fistula, and the presumed course of the disease and optimal treatment options are discussed.

**Keywords** Colon fistula · Seminal vesicle · Urinary fistula

### Introduction

The complications of end-to-end anastomosis for lower rectal cancer include anastomotic leakage, rectovaginal fistula, intrapelvic abscess and stenosis. A rectoseminal vesicle fistula is rare. Three patients developed rectoseminal vesicle fistula and were treated over a period of 19 years. This report reviews and summarizes similar previously reported cases, while focusing on the presumed course of the disease, diagnostic procedures and treatment options.

### Patient 1

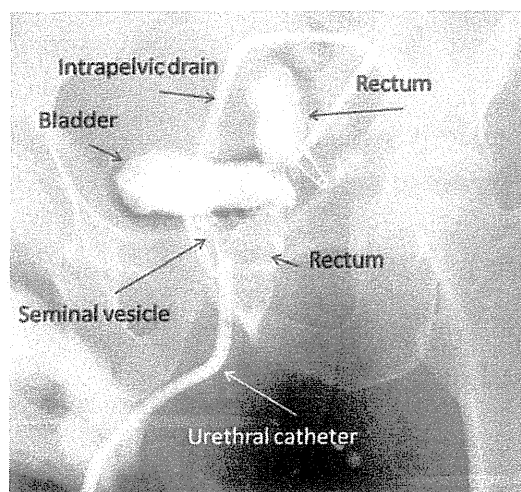
A 73-year-old male was admitted to the surgical department for treatment of rectal cancer 7 cm from the anal verge. Colonoscopy revealed a type 2 tumor of the rectum and the histopathological examination of a specimen obtained by colonoscopy revealed adenocarcinoma. Laboratory tests were normal. The preoperative staging was T3N0M0. The patient did not receive any neoadjuvant therapy.

A low anterior resection was performed with an end-to-end anastomosis. Microscopic examination of the specimen revealed well-differentiated adenocarcinoma of the rectum with adequate resection margins and no metastases in the 12 resected lymph nodes. This was a T3N0M0 tumor, according to World Health Organization (WHO) classification.

The immediate postoperative course was uneventful. The discharge from the intrapelvic drain was noted to be purulent on postoperative day 7. A water-soluble contrast enema demonstrated minor anastomotic leakage on day 14. The patient was treated conservatively with intrapelvic drainage and antibiotics. Oral diet was resumed on postoperative day 24 and the patient was discharged on day 29. He was readmitted on postoperative day 37 with acute left testicular pain, fever and pneumaturia. A vasogram followed by fistulography demonstrated a fistula from the seminal vesicle to the rectum via the anastomotic site (Fig. 1).

Computed tomography revealed air bubbles located between the rectum and seminal vesicle. Anastomotic leakage followed by coloseminal vesicle fistula after low anterior resection was diagnosed. The leakage was locally restricted, without any sign of generalized peritonitis, and was successfully treated using only urethral catheterization

K. Nakajima · M. Sugito (✉) · Y. Nishizawa · M. Ito ·  
A. Kobayashi · Y. Nishizawa · T. Suzuki · T. Tanaka ·  
T. Etsunaga · N. Saito  
Department of Colorectal Surgery,  
National Cancer Center Hospital, East,  
6-5-1 Kashiwanoha, Kashiwa, Chiba 277-8577, Japan  
e-mail: msugito@east.ncc.go.jp



**Fig. 1** A vasogram followed by fistelography demonstrating fistula from the seminal vesicle to the rectum via the anastomotic site. 136 × 128 mm (150 × 150 DPI)

and antibiotics with oral diet. The fistula had successfully healed by postoperative day 62, or 25 days after readmission.

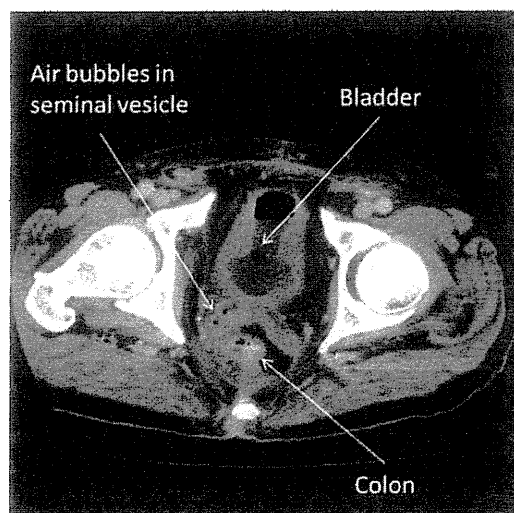
Distant metastases were found 17 months after the first operation. The patient underwent partial hepatectomy and pulmonary resection for metastases from rectal cancer. He is doing well without local recurrence at 4 years after the first operation.

#### Patient 2

A 76-year-old male was admitted to the surgical department for treatment of rectal cancer 7 cm from the anal verge. Colonoscopy revealed a type 2 tumor of the rectum and the histopathological examination of a colonoscopic specimen led to a diagnosis of adenocarcinoma. Laboratory tests yielded normal results. The preoperative stage was T3N1M0. The patient's medical history included diabetes mellitus, hypertension, angina pectoris and pulmonary hypertension. The patient did not receive any neoadjuvant therapy.

A low anterior resection was performed with end-to-end anastomosis. A microscopic examination of the specimen revealed moderately differentiated adenocarcinoma of the rectum with adequate resection margins and lymph node metastasis in one of the 12 resected nodes. This was a T3N1M0 tumor.

The patient accidentally removed the urethral catheter while the balloon was still inflated on postoperative day 7. No apparent damage was observed in the urethra at that time. He was discharged on postoperative day 11. He presented to the emergency department 1 month after first discharge with acute testicular pain, pneumaturia and a



**Fig. 2** CT showing air bubbles in and around the seminal vesicle. This slice is 1 cm above the anastomotic site. 125 × 125 mm (150 × 150 DPI)

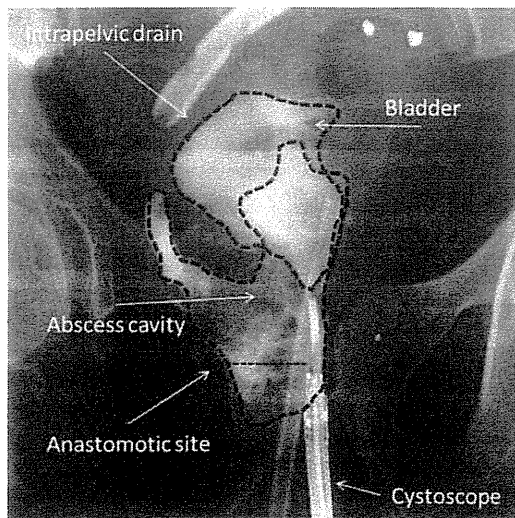
swollen scrotum. A water-soluble contrast enema demonstrated a fistula between the anastomotic site and a seminal vesicle. CT revealed air bubbles around the seminal vesicle and a series of abscesses from the seminal vesicle to the scrotum (Fig. 2). Conservative therapy with antibiotics and urethral catheterization was attempted which failed, so diverting transverse colostomy was performed on postoperative day 50 (day 39 after readmission). Healing of the fistula was confirmed at another hospital and stoma closure was eventually performed, about 14 months after the first operation.

The patient was treated for pulmonary metastases with oral tegafur-uracil. He has survived 3 years and 10 months since the first operation without local recurrence.

#### Patient 3

A 49-year-old male was admitted to the surgical department for treatment of a huge rectal cancer. Colonoscopy revealed a type 3 tumor of the rectum and a histopathological examination led to a diagnosis of adenocarcinoma. Computed tomography (CT) and magnetic resonance imaging demonstrated the tumor and adjacent abscess forming a mass 10 cm in diameter, with infiltration into the right seminal vesicle. The C-reactive protein level was elevated to 7.1 mg/dl. Pelvic incisional drainage was performed prior to the radical operation. Preoperative staging was T4N2M0.

A low anterior resection of the tumor with the bilateral seminal vesicles and diverting ileostomy were performed with end-to-end anastomosis. A microscopic examination of the specimen revealed moderately differentiated



**Fig. 3** A vasogram under cystoscope control demonstrates fistula from the ejaculatory duct to the anastomotic site via an abscess cavity. 137 × 137 mm (150 × 150 DPI)

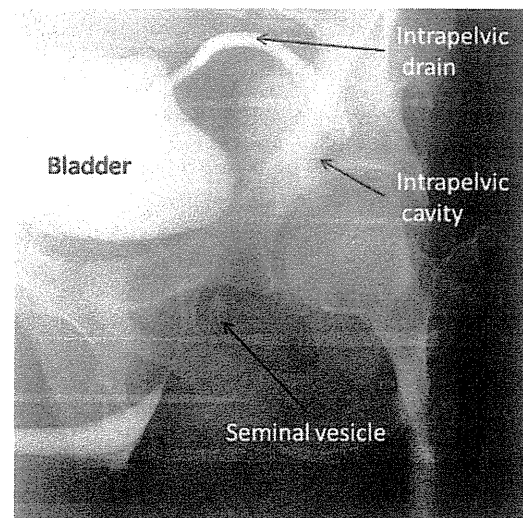
adenocarcinoma of the rectum with adequate resection margins and no metastases in any of the 44 resected lymph nodes. This was a T3N0M0 tumor.

The patient displayed fever and fecaluria on postoperative day 10. CT revealed anastomotic leakage surrounded by a cavity filled with pus and an increased air–water level. A vasogram under cystoscopic control demonstrated a fistula from the ejaculatory duct to the anastomotic site via an abscess cavity (Fig. 3). He was diagnosed with anastomotic leakage followed by creation of a fistula between the anastomotic site and the excision site of the seminal vesicles. The patient was effectively treated using lavage from an intrapelvic drainage tube and urethral catheterization with a saline flush. The abscess cavity gradually contracted and disappeared, but the fistula remained refractory. Gracilis muscle flap closure was attempted but proved unsuccessful. Additional abdominal rectus muscle flap closure achieved an improvement of the fistula.

The patient finally underwent total pelvic exenteration for intrapelvic recurrence along with intention to treat urinary division after 2 years and 6 months. He has survived 3 years since the first operation.

## Discussion

Abscess formation around the seminal vesicle is infrequently encountered in patients without apparent anastomotic leakage that have undergone concomitant resection of the rectum and seminal vesicle (Fig. 4). The usual clinical course is cloudy discharge from the pelvic drain, fever, and relatively normal results of laboratory tests, other organ function and general status. A water enema of



**Fig. 4** Retrograde cystourethrography shows fistulous communication between the seminal vesicle and intrapelvic cavity. This represents seminal vesicle fistula after concomitant resection of rectum and seminal vesicle. 125 × 125 mm (150 × 150 DPI)

the anastomotic site subsequently reveals no leakage. Cutting off the root of the seminal vesicle without ligation causes a seminal vesicle fistula and local collection of pus. Simply leaving the fistula open may be adequate as long as the fever is controlled by antibiotics. The patient usually recovers from the fistula within several weeks. The prophylactic approach includes a ligation of the base of the resected seminal vesicle.

This report presented three cases of rectoseminal vesicle fistula after low anterior resection. Low anterior resection has been performed at this institution since 1992, with more than 1100 patients treated. Three patients developed rectoseminal vesicle fistula and were treated over a 19 years period. Coloseminal vesicle fistula is particularly uncommon. The causes or origin of such fistulae include inflammatory bowel disease, low anterior resection, prostatectomy, radiation proctitis, and sigmoid colon diverticula [1–3]. Only 10 cases of seminal vesicle fistula were found among the reported postsurgical intervention cases [3–9] (Table 1).

Minor leakage was demonstrated on postoperative day 14 in the first case, and was conservatively treated using only a drainage tube. Mild residual inflammation might have adversely influenced the fragile seminal vesicle wall. Outpatient follow-up on postoperative day 37 revealed a fistula to the seminal vesicle. Denonvilliers' fascia, which is located between the rectal anterior wall and the seminal vesicle beneath the level of the peritoneal reflection, may be removed when performing total mesorectum excision [10]. Denonvilliers' fascia is a very strong tissue that divides the urinary tract and rectum. Infectious material

**Table 1** Clinical features, diagnostic examinations, and treatment of patients with postoperative coloseminal vesicle fistula

Author	Cause	Symptoms	Urine passage	Onset	Diagnostic examination	Initial treatment	Radical treatment
Goldman [4]	LAR leakage	Pneumaturia, bacteriuria testicular pain,	No	1 month	Water-soluble contrast enema	Cutaneous vasotomy	None
Kollmogen [5]	APR	Urethral discharge, fever, dysuria	No	10 days	Sinography	Antibiotics, drainage	None
Carlin [6]	Crohn's	Discharge from perineal sinus	No	15 years	CT sinography	N.S.	None
	AR	None	No	2 months	CT with rectal contrast enema	Drainage	APR
Calder [7]	Open prostatectomy	N.S.	N.S.	N.S.	Water-soluble contrast enema	N.S.	N.S.
Celebrezze [8]	Prostatic brachytherapy	Rectal ulcer	Yes	2 years	N.S.	Mucosal flap	Diversion
	Prostatic brachytherapy	Rectal bleeding	Yes	15 months	N.S.	Mucosal flap	Colostomy
Kawasaki [9]	LAR leakage	Dysuria	No	2 weeks	Water-soluble contrast enema	Conservative	Colostomy
Our cases	LAR leakage	Pneumaturia, testicular pain, fever	No	1 month	CT and vesiculography	Urinary catheter	None
	AR	Pneumaturia, testicular pain, scrotal swelling	No	2 weeks	CT and contrast enema	Urinary catheter, antibiotics	Colostomy
	LAR leakage	Fecaluria, fever, scrotal swelling	Yes	1 week	CT and vasogram	Urinary catheter, antibiotics	Muscle flap

LAR low anterior resection, AR anterior resection, APR abdominoperineal resection, N.S. not stated

may cause local tissue destruction and the formation of a fistula if this septum is resected.

The second case showed no evidence of anastomotic leakage during the postoperative course. Latent anastomotic leakage may have been present or the fragile seminal vesicle wall may have eventually collapsed, allowing passage between the seminal vesicle and anastomotic site in the outpatient follow-up period. Accidental catheter removal may have adversely affected the urinary tract, with injury of the ejaculatory duct and seminal vesicle causing fistula to the rectum. However, a seminal vesicle fistula is rarely observed in cases with accidental removal of a urethral catheter.

The third case required resection of a huge T4 mass, including the bilateral seminal vesicles. A Retzius cavity approach was selected due to the size of the tumor occupying the pelvic cavity, and the bases of the seminal vesicles were difficult to identify for ligation. Anastomotic leakage caused the abscess formed by leakage to increase in size around the remnant rectum, and become a seed of inflammation, leading to a fistula into the unclosed ejaculatory duct.

Rectoseminal vesicle fistula formation in all three cases appeared to be due to a combination of resection of Denonvilliers' fascia or the seminal vesicle itself and anastomotic leakage.

Many investigators have evaluated the safety of the double stapled technique and its role in rectal cancer

surgery. They concluded that the double stapling technique is an equivalent or even superior type of intervention with respect to speed, sterility and anastomosis safety, while also associate with fewer complications [11–20]. However, Kosugi et al. [21] reported that the incidence of rectovaginal fistula was higher in patients who were anastomosed by the double stapled technique or had concomitant resection of the vaginal wall. The current surgical reports and postoperative examinations proved no direct relationship between the double stapled technique and fistulae. However, these reports concerning rectovaginal fistula [21–23] emphasize that the double stapled technique might cause rectoseminal vesicle fistula when frustrating distal anastomosis is carelessly performed.

No diverting stoma was constructed in the first two cases. The first case recovered conservatively, but the other was treated with transverse colostomy. The third case required the construction of a diverting ileostomy, but it failed. These cases suggest that a diverting stoma cannot always prevent leakage or the formation of rectoseminal vesicle fistula. Several studies have shown the absence of a diverting stoma to be a risk factor for leakage after LAR [24–29], whereas others did not [30]. Anastomotic failure and the completion of rectoseminal vesicle fistula are thought to be influenced by an infectious environment, the viscosity of the discharge and the rectum-cavity urinary tract pressure gradient. Whether diverting the fecal stream

in itself directly prevents fistula formation between the urinary tract and fragile rectal wall remains to be proven.

The symptoms of fever, pneumaturia, scrotal swelling and testicular pain were seen in these three cases (Table 1). Some late-onset cases are described in the literature, as in the present cases. A fistula therefore needs to be considered in patients who show fever, pneumaturia, scrotal swelling or testicular pain, particularly in cases with evidence of anastomotic leakage in the postoperative period.

These three cases indicate that conservative therapy may be an option when the patients develop a rectourethral fistula arising from minor leakage. Antibiotics, urinary catheterization, and percutaneous drainage are effective in well-chosen cases. Although unsuccessful in the third patient, gracilis muscle or abdominal rectus muscle flap closure may be viable treatment options when a diverting stoma had been established in the first operation [31]. The radical diversion of either or both the urinary and fecal streams may be applicable in cases with apparent urine passage and extended infection.

## Conclusions

Pneumaturia, fever, scrotal swelling and testicular pain are signs of a rectoseminal vesicle fistula in patients following anterior resection for rectal cancer. The resection of Denonvilliers' fascia and anastomotic leakage appear to represent risk factors for this complication. These symptoms may emerge within a few days or several weeks into the postoperative period. A water-soluble contrast enema and CT are effective diagnostic examinations which may lead to appropriate therapeutic options. Local medical or surgical therapy will do well in some cases. Unsuccessful fistulae should be treated with urinary or fecal diversion, or both. Selection criteria for conservative therapy include the severity of the anastomotic leakage, extent of abscess formation and passage of urine through the fistula.

**Conflict of interest** None of the authors have any conflicts of interest to disclose.

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# Detailed Stratification of TNM Stage III Rectal Cancer Based on the Presence/Absence of Extracapsular Invasion of the Metastatic Lymph Nodes

Koji Komori, M.D. • Yukihide Kanemitsu, M.D. • Kenya Kimura, M.D.  
Tsuyoshi Sano, M.D. • Seiji Ito, M.D. • Tetsuya Abe, M.D. • Yoshiki Senda, M.D.  
Yasuhiro Shimizu, M.D.

Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, Nagoya, Aichi, Japan

**BACKGROUND:** The presence/absence of extracapsular invasion in metastatic lymph nodes has been reported as being significantly correlated with the prognosis in a wide variety of cancers. However, the influence of extracapsular invasion in the metastatic lymph nodes on the prognosis in patients with stage III rectal cancer has not yet been investigated.

**OBJECTIVE:** We investigated the presence/absence of extracapsular invasion in the metastatic nodes of the relevant main/lateral lymph node group in patients with rectal cancer to determine the usefulness of this parameter for stratifying the prognosis of patients with stage III rectal cancer.

**DESIGN:** This was a single-institution study.

**SETTINGS:** This study was conducted at a single institution.

**PATIENTS:** We enrolled 101 consecutive patients with stage III rectal cancer who had undergone curative surgery with extended lymph node dissection and investigated the presence/absence of extracapsular invasion in the regional metastatic lymph nodes to determine the usefulness of such stratification for a more precise prediction of the patient prognosis.

**MAIN OUTCOME MEASURES:** The main outcomes measured were the disease-free and overall survival rates.

**Financial Disclosures:** None reported.

**Correspondence:** Koji Komori, M.D., Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, 1-1, Kanokoden, Chikusa, Nagoya, Aichi 464-8681, Japan. E-mail: kkomori@aichi-cc.jp

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**RESULTS:** Univariate analysis revealed a significantly poorer prognosis, in terms of both the disease-free survival rate ( $p = 0.003$ ) and overall survival rate ( $p = 0.008$ ), of the pN3-extracapsular invasion-positive cases in comparison with the pN3-extracapsular invasion-negative cases. Multivariate analysis revealed the presence/absence of extracapsular invasion in the metastatic lymph nodes as the only variable that was statistically significantly associated with the disease-free survival rate ( $p = 0.011$ ).

**LIMITATIONS:** This was a retrospective study in a small number of patients from a single institution. There were no comparator groups.

**CONCLUSIONS:** Detailed stratification of pN3 cases based on the presence/absence of extracapsular invasion in metastatic lymph nodes has the potential to contribute significantly to more available prediction of the prognosis of patients with stage III colorectal cancer.

**KEY WORDS:** Extracapsular invasion; Stage III; Rectal cancer.

Lymph node metastatic status is known as one of the most important factors influencing the prognosis in patients with rectal carcinoma. For cases with TNM stage III rectal cancer, systemic adjuvant chemotherapy with regimens including oxaliplatin, such as folinic acid, oxaliplatin, and fluorouracil, has been established as the standard.<sup>1</sup> However, patients who have TNM stage III rectal cancer have come to be recognized as a heterogeneous group, and not all patients require strong adjuvant chemotherapy regimens, including folinic acid, oxaliplatin, and fluorouracil. Some of these patients have a good prognosis, similar to that of patients with stage II disease,



whereas others have a poor prognosis. Among the factors defining the lymph node metastatic status, the number of metastatic lymph nodes has been reported as one of the most important factors influencing the prognosis in patients with TNM stage III rectal cancer. Furthermore, both the number of lymph nodes retrieved and the number of positive nodes have been reported as important prognostic factors, and it has been recommended that at least a 12-node threshold should be met to improve the predictive accuracy.<sup>2</sup> However, in Japan, the regional lymph node group involved has also long been included as an important consideration for staging.<sup>3</sup>

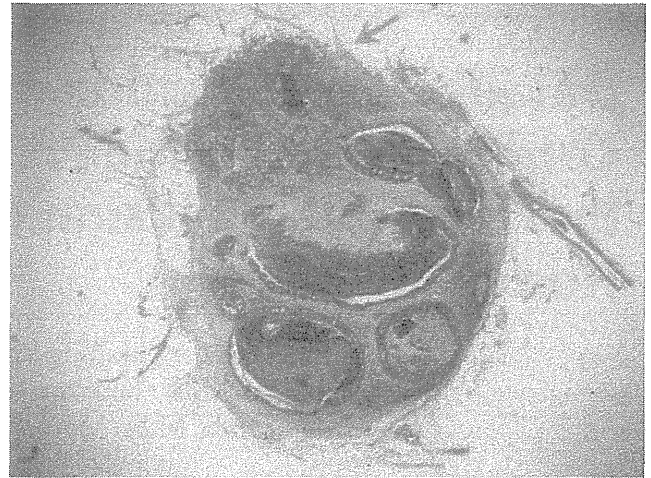
Recently, the presence of extracapsular invasion (ECI) of the metastatic lymph nodes has been reported as being significantly related to the prognosis in a wide variety of cancers.<sup>4-7</sup> However, although most reports have indicated the malignant potential of ECI in the metastatic lymph nodes, there have been no reports on the significance of the location of the metastatic lymph nodes showing ECI in terms of the regional lymph node group involved.

We investigated the presence/absence of ECI in the relevant main/lateral lymph node group in cases with TNM stage III rectal cancer to determine the usefulness of patient stratification based on this parameter for a more accurate prediction of the prognosis.

## PATIENTS AND METHODS

We enrolled 101 consecutive patients with TNM stage III rectal cancer who had undergone curative surgery with extended lymph node dissection at the Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, Nagoya, Japan, between January 1979 and December 2001. Cases with the rectosigmoid as the primary cancer site were excluded. None of the patients had received any chemotherapy or radiation therapy before the surgery. Complete dissection of all the regional lymph nodes with mesorectal excision was performed in all cases. In Japan, lateral lymph node dissection is generally indicated if the lower margin of the primary cancer is located below the peritoneal reflection or anal canal with invasion into the muscularis propria or beyond.<sup>8</sup> There were no cancer cells in the circumferential margin of resection in any of the cases.

According to the location of the lymph nodes, we classified the lymph node involvement into 3 groups, ie, involvement of the perirectal lymph nodes, intermediate lymph nodes, or the main/lateral lymph nodes, according to the Japanese Classification of Colorectal Carcinoma, Second English Edition: pN1 is defined as metastasis to 1 to 3 pericolic/perirectal or intermediate lymph nodes, pN2 as metastasis to 4 or more pericolic/perirectal or intermediate lymph nodes, and pN3 as metastasis to the main/lateral lymph nodes. The main lymph nodes consist of the ileocolic root nodes, right colic root nodes, middle colic



**FIGURE 1.** Extracapsular invasion was defined as extracapsular growth of the tumor cells, invasion of the perinodal fat, or extranodal location of tumor cells continuously, not discontinuously (red arrow).

root nodes, and the nodes along the inferior mesenteric artery proximal to the origin of the left colic artery, and the lateral lymph nodes refer to those along the internal iliac artery, common iliac artery, obturator vessels and nerves, and external iliac artery. In this study, there were 52 cases with pN3 and 49 cases with pN2 (with metastasis to 4 or more pericolic/perirectal or intermediate lymph nodes) disease. pN2 status in the TNM classification is further subclassified as pN2a (metastasis to 4–6 regional lymph nodes) and pN2b (metastasis to 7 or more regional lymph nodes); there were 32 patients with pN2a disease and 16 patients with pN2b disease in this study.

The resected lymph nodes were fixed in 10% formalin for several days, and sections were prepared across the maximum diameter of the nodes and stained with hematoxylin and eosin (H & E), with no specific immunostaining. The slides were then evaluated by simple light microscopy.

The ECI status was classified according to the distribution patterns of the cancer cells in the lymph nodes as the presence of ECI or absence of ECI. Extracapsular invasion was defined as extracapsular growth of tumor cells, invasion of the perinodal fat, or extranodal location of the tumor cells continuously. Although Ueno et al<sup>9</sup> reported extranodal cancer deposits as a prognostic factor, histological evidence of the lymph node structure in their study was based on routinely processed lymphadenectomy specimens, namely, discontinuous tumor cells. We categorized cases showing ECI in at least 1 node as “ECI-positive” (Fig. 1).

Then, patients showing ECI in at least one of the metastatic lymph nodes in the main lymph node and lateral lymph node groups were classified as pN3-ECI-positive, and those without ECI in any of the nodes in the main or lateral lymph node groups were classified as pN3-ECI-negative. After the operation, all pN3 cases

were administered oral chemotherapy with drugs such as oral 5-fluorouracil, 5'-doxifluridine, carmofur, or uracil-tegafur with leucovorin, as the most commonly used drugs, for approximately 6 to 12 months.<sup>1,10,11</sup>

We conducted a review of the hospital records to obtain clinicopathological information about the patients, including the sex and age (median, 58 years), lesion location, macroscopic configuration of the tumor, maximum tumor size (median size, 5 cm), greatest depth of invasion of the tumor (pT1 + pT2 vs pT3 + pT4), histological type of the tumor, presence/absence of lymphatic invasion and venous invasion, and the number of metastasis-positive lymph nodes. Adenocarcinomas of the rectum are graded predominantly on the basis of their glandular appearance and are classified as well or moderately differentiated or others, according to the World Health Organization histopathological classification of tumors of the colon and rectum, and the Japanese Classification of Colorectal Carcinoma.

Rectal cancer is defined as a tumor whose lowest border is located between the anal verge and the sacral promontory. Lesions are classified as upper or lower rectal cancers depending on their location with respect to the peritoneal reflection. The tumors are classified into 2 types on the basis of their macroscopic appearance: mass type or diffuse type. The mass type includes the superficial, polypoid, and ulcerated types of tumors with a clear margin, and the diffuse type includes the ulcerated type with infiltration, diffuse infiltrating, and unclassified types. The number of positive lymph nodes was categorized as less than 3 or more than 4.

All data are expressed as the mean  $\pm$  SD. The Fisher exact probability test, univariate logistic regression, and multivariate stepwise logistic regression analysis were subsequently performed to identify factors that might influence ECI-positive lymph node metastasis. The log-rank test was used to evaluate the differences in the overall survival rate and the disease-free survival rate between groups. Statistical significance was set at  $p < 0.05$ .

## RESULTS

Table 1 shows the relationship between the ECI status and clinicopathological findings. No significant differences were observed in relation to the sex, age, tumor location, tumor macroscopic configuration, tumor size, greatest depth of tumor invasion, tumor histological type, presence/absence of lymphatic or venous invasion, or the number of positive lymph nodes in pN3 rectal cancer.

Table 2 shows the results of the univariate analysis performed to identify factors that might be correlated with the disease-free survival rate. Although no significant differences in the disease-free survival rate were observed in relation to the age, tumor location, tumor macroscopic configuration, tumor size, greatest depth of tumor inva-

**TABLE 1.** The relationship between the ECI status and clinicopathological findings

	pN3-ECI positive (n = 19)	pN3-ECI negative (n = 33)	p
Sex			
Male	11(57.9)	18(54.5)	0.523
Female	8(42.1)	15(45.5)	
Age			
<58	9(47.4)	16(48.5)	0.584
$\geq$ 58	10(52.6)	17(51.5)	
Location			
Upper rectum	2(10.5)	6(18.2)	0.378
Lower rectum	17(89.5)	27(81.8)	
Macroscopic configuration			
Massive	14(73.7)	29(87.9)	0.178
Diffuse	5(26.3)	4(12.1)	
Tumor size			
<5 cm	12(63.2)	18(54.5)	0.379
$\geq$ 5 cm	7(36.8)	15(45.5)	
Greatest depth invasion			
pT1+pT2	4(21.1)	6(18.2)	0.536
pT3+pT4	15(78.9)	27(81.8)	
Histological type			
W/M	15(78.9)	27(81.8)	0.536
Others	4(21.1)	6(18.2)	
Lymphatic invasion			
Present	14(73.7)	25(75.8)	0.560
Absent	5(26.3)	8(24.2)	
Venous invasion			
Present	11(57.9)	21(63.6)	0.452
Absent	8(42.1)	12(36.4)	
No. of positive LNs			
<3	6(31.6)	14(42.4)	0.318
$\geq$ 4	13(68.4)	19(57.6)	

Values shown are n (%).

W/M = well and moderately differentiated adenocarcinoma; LNs = lymph nodes; ECI = extracapsular invasion.

sion, tumor histological type, presence/absence of lymphatic or venous invasion, or the number of positive lymph nodes in pN3 rectal cancer, the rate differed significantly depending on the sex and pN3-ECI status. Male patients, in comparison with female patients, and pN3-ECI-positive patients, in comparison with the pN3-ECI-negative patients, showed significantly poorer prognoses in terms of the disease-free survival rates ( $p = 0.024$  and  $p = 0.003$ ).

Table 3 shows the results of univariate analysis performed to identify factors that might be correlated with the overall survival rate. Although no significant differences in the overall survival rate were observed in relation to the age, tumor location, tumor macroscopic configuration, greatest depth of tumor invasion, tumor histological type, presence/absence of lymphatic or venous invasion, or the number of positive lymph nodes, the rate differed significantly depending on the sex, tumor size, and pN3-ECI status. Male patients, patients with a tumor diameter of greater than 5 cm, and pN3-ECI-positive patients showed

**TABLE 2.** Univariate analysis of the disease-free survival rates in pN3 cases

	n (%)	p
Sex		
Male	29(55.8)	0.024
Female	23(44.2)	
Age		
<58	25(47.4)	0.686
≥58	27(52.6)	
Location		
Upper rectum	8(15.4)	0.139
Lower rectum	44(84.6)	
Macroscopic configuration		
Massive	43(82.7)	0.574
Diffuse	9(17.3)	
Tumor size		
<5 cm	30(80.8)	0.253
≥5 cm	22(19.2)	
Greatest depth invasion		
pT1+pT2	10(19.2)	0.309
pT3+pT4	42(80.8)	
Histological type		
W/M	42(80.8)	0.219
Others	10(19.2)	
Lymphatic invasion		
Present	39(75.0)	0.180
Absent	13(25.0)	
Venous invasion		
Present	32(61.5)	0.378
Absent	20(38.5)	
No. of positive LNs		
<3	20(38.5)	0.072
≥4	32(61.5)	
pN3-ECI		
Positive	19(36.5)	0.003
Negative	33(63.5)	

W/M = well and moderately differentiated adenocarcinoma; LNs = lymph nodes; ECI = extracapsular invasion.

significantly poorer prognoses in terms of the overall survival rate in comparison with the female patients, patients with a tumor diameter of less than 5 cm, and pN3-ECI-negative patients ( $p = 0.024$ ,  $p = 0.047$ , and  $p = 0.008$ ).

Table 4 shows the results of multivariate analysis performed to identify variables that might be independently correlated with the overall and disease-free survival rates. pN3-ECI was identified as the only variable found to show a statistically significant correlation with the disease-free survival rate ( $p = 0.011$ ), whereas none of the examined factors were statistically significantly correlated with the overall survival rate.

Figure 2 shows the disease-free survival rates in the patients enrolled in the study. No significant differences in the disease-free survival rate were observed among the pN2a, pN2b, and pN3 cases overall (left side). However, when the pN3 patients were stratified further according to the presence/absence of ECI in the main/lateral groups of lymph nodes, ie, pN3-ECI-positive/pN3-ECI-negative, the disease-free survival rate was statistically significantly

**TABLE 3.** Univariate analysis of the overall survival rates in pN3 cases

	n (%)	p
Sex		
Male	29(55.8)	0.021
Female	23(44.2)	
Age		
<58	25(47.4)	0.185
≥58	27(52.6)	
Location		
Upper rectum	8(15.4)	0.265
Lower rectum	44(84.6)	
Macroscopic configuration		
Massive	43(82.7)	0.934
Diffuse	9(17.3)	
Tumor size		
<5 cm	30(80.8)	0.047
≥5 cm	22(19.2)	
Greatest depth invasion		
pT1+pT2	10(19.2)	0.243
pT3+pT4	42(80.8)	
Histological type		
W/M	42(80.8)	0.272
Others	10(19.2)	
Lymphatic invasion		
Present	39(75.0)	0.589
Absent	13(25.0)	
Venous invasion		
Present	32(61.5)	0.765
Absent	20(38.5)	
No. of positive LNs		
<3	20(38.5)	0.129
≥4	32(61.5)	
pN3-ECI		
Positive	19(36.5)	0.008
Negative	33(63.5)	

W/M = well and moderately differentiated adenocarcinoma; LNs = lymph nodes; ECI = extracapsular invasion.

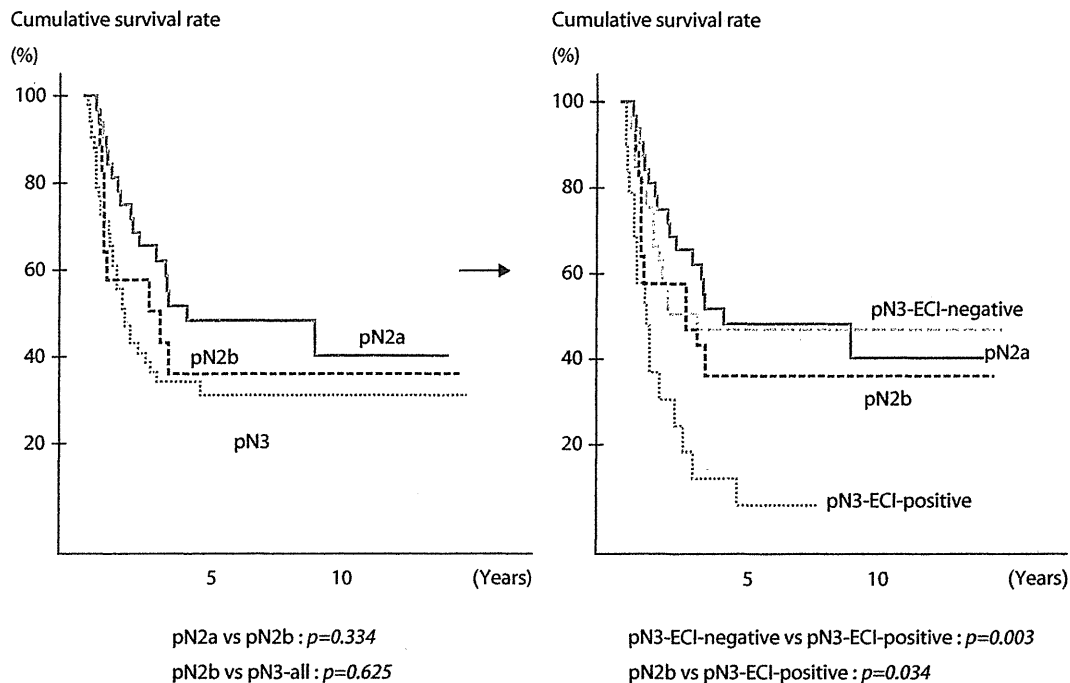
lower in the pN3-ECI-positive cases in comparison with that in the pN2b cases ( $p = 0.034$ ). The disease-free survival rate also differed significantly between the pN3-ECI-positive and pN3-ECI-negative cases ( $p = 0.003$ ).

Figure 3 shows the overall survival rates in the patients enrolled in this study. No significant differences in the overall survival rate were observed among the pN2a, pN2b, and pN3 cases overall (left side). However, when the

**TABLE 4.** Multivariate analysis of the overall survival rates and disease-free survival rates

	HR	95% CI	p
Disease-free survival rates			
Sex	0.509	0.244–1.0063	0.072
pN3-ECI	0.411	0.206–0.816	0.011
Overall survival rates			
Sex	0.481	0.229–1.009	0.053
Tumor size	0.756	0.518–1.103	0.147
pN3-ECI	0.503	0.244–1.037	0.603

ECI = extracapsular invasion.



**FIGURE 2.** Disease-free survival rates in the enrolled patients. Left, pN2a, pN2b, and pN3 cases. Right, pN2a, pN2b, pN3-ECI-positive, and pN3-ECI-negative cases. ECI = extracapsular invasion.

pN3 patients were stratified further according to the presence/absence of ECI in the main/lateral groups of lymph nodes, ie, pN3-ECI-positive/pN3-ECI-negative, the overall survival rate was lower in the pN3-ECI-positive cases in comparison with that in the pN2b cases ( $p = 0.077$ ). The overall survival rate also differed significantly between the pN3-ECI-positive and pN3-ECI-negative cases ( $p = 0.008$ ).

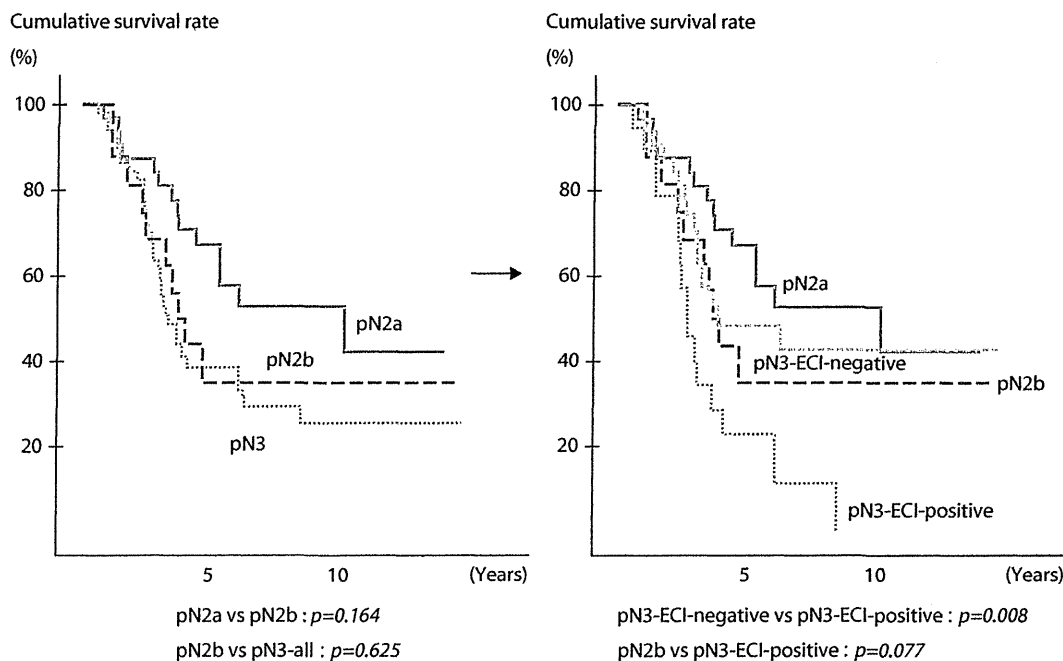
## DISCUSSION

Patients with TNM stage III colorectal cancer constitute a heterogeneous population with respect to the prognosis, with some showing a better prognosis than others. The patients have been divided into pN1, pN2, and pN3 cases according to the Japanese Classification of Colorectal Carcinoma, Second English Edition; pN1 cases have a more favorable prognosis than the pN2 or pN3 cases. In the present study, we demonstrated the absence of any significant differences in the overall or disease-free survival rates between the pN2 and pN3 cases.

Several previous studies have reported the presence of ECI in the metastatic lymph nodes as a poor prognostic factor in a variety of cancers.<sup>4-7</sup> It is significant that Fujii et al<sup>12</sup> reported that the presence of ECI in the metastatic lymph nodes may be a useful marker to identify patients with colorectal cancer who are at a high risk for disease recurrence in the short term. Furthermore, they reported that the presence of ECI in the N1 metastatic lymph nodes may be a marker of metastasis in more distant regional

lymph node groups (N2) in patients with colorectal cancer, because it possibly represents the ability of the colorectal tumor cells to disseminate to distant lymph nodes,<sup>13</sup> but no relationship was noted with the presence/absence of metastasis in the N3 lymph nodes. However, there have been no studies on the significance of the presence/absence of ECI in relation to the lymph node group involved. This study is the first to determine the prognostic significance of the presence/absence of ECI in the main/lateral lymph nodes in pN3 patients. We demonstrated that pN3-ECI positivity was the only factor that was statistically significantly associated with the disease-free survival rate. Yano et al<sup>6</sup> also reported that the presence of ECI in the metastatic lymph nodes was the only factor that was statistically significantly associated with the disease-free survival; however, their report did not refer to the location of the metastatic lymph nodes showing ECI. Heide et al<sup>7</sup> reported that the presence of ECI in the metastatic lymph nodes had a strong negative impact on the local control rate, independent of other prognostic factors, and that it was also associated with a high frequency of distant metastasis.

Two critically important implications of this study need to be emphasized here. First, stratification of pN3 cases based on the ECI status is useful. Patients without ECI in the main metastatic lymph nodes, ie, pN3-ECI-negative cases were analogous, in terms of the prognosis, to pN2 cases, whereas the prognosis was significantly poorer in the pN3-ECI-positive cases. Second, while determining the lymph node metastasis status for staging, de-



**FIGURE 3.** Overall survival rates in the enrolled patients. Left, pN2a, pN2b, and pN3 cases. Right, pN2a, pN2b, pN3-ECI-positive, and pN3-ECI-negative cases. ECI = extracapsular invasion.

termination of not only the number of metastatic lymph nodes, but also that of the lymph node groups involved has a crucial role in predicting the prognosis. Kanemitsu et al<sup>14</sup> reported that high ligation of the inferior mesenteric artery allows curative resection and long-term survival in patients with sigmoid colon or rectal cancer and emphasized that complete resection of the main lymph nodes was important. Especially, although pN3-ECI-positive was dominated in the systemic recurrence, the presence of ECI in the metastatic lymph nodes was a predictor of potential systemic involvement.

Assessment of the ECI status in the metastatic lymph nodes can be easily performed by routine staining, ie, H & E staining of tissue sections, without any need for the use of immunostaining techniques. Yano et al<sup>6</sup> also reported that the presence of ECI in the metastatic lymph nodes determined by routine H & E staining is a potent prognostic factor in patients with stage III colorectal cancer. In this study, ECI was defined as invasion of the perinodal fat or extranodal location of the tumor cells continuously, hence, not discontinuously. In Japan, most surgeons commonly separate the lymph nodes from the resected specimens before presenting them to the pathologists. Consequently, it is difficult to retrieve discontinuous tumor cells. If the resected specimens were submitted intact to the pathologists, discontinuous tumor cells could also be examined, as in the case of the extranodal cancer deposits reported by Ueno et al.<sup>9</sup> However, this is not easy and not very common in practical clinical use.

## CONCLUSION

Detailed stratification of pN3 cases based on the presence/absence of ECI has the potential to contribute significantly to more available prediction of the prognosis of patients with stage III colorectal cancer.

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## Sex Differences Between cT4b and pT4b Rectal Cancers

Koji Komori, Kenya Kimura, Takashi Kinoshita, Tsuyoshi Sano, Seiji Ito, Tetsuya Abe, Yoshiki Senda, Kazunari Misawa, Yuichi Ito, Norihisa Uemura, Yasuhiro Shimizu

*Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, Nagoya, Aichi, Japan*

We retrospectively evaluated rectal cancer surgery cases in which resection had been performed for invasion of other organs in terms of pathologic findings from the viewpoint of sex differences. We enrolled 61 consecutive patients with rectal cancer who had undergone curative surgery with resection of invaded adjacent organs. We investigated invasion of adjacent organs in terms of pathologic findings according to sex differences. Among males, 4 cases (13.8%) had received combined radical resections of more than 2 organs, while the number of such female cases was 15 (46.9%). The difference between males and females was statistically significant ( $P = 0.006$ ). Among male cases, histopathologic invasion was present in 4 (13.8%), while 9 female cases (28.1%) showed this feature. Nevertheless, there was not a statistically significant difference between males and females ( $P = 0.08$ ); the rate in females was roughly twice that in males. No significant difference was recognized in the overall survival rates between males and females, but more females than males experienced local recurrence. In cases with rectal cancer invading neighboring organs, the effect of the invasion must be carefully determined, and the most appropriate operative approach selected accordingly.

*Key words:* Rectal cancer – Invasion of other organs – Sex differences

It is important to prevent local recurrences of rectal cancer. Obtaining a sufficient circumferential resection margin (CRM) is thus a critical surgical procedure.<sup>1,2</sup> This is especially true for local advanced rectal cancer with distant invasion of adjacent organs (pT4b). Total pelvic exenteration

remains the first-line surgical treatment for pT4b cases,<sup>3</sup> but recently organ-sparing therapy has also frequently been chosen.<sup>4</sup> However, the mode of invasion in highly aggressive rectal cancer has been less well studied. We retrospectively evaluated rectal cancer surgery cases in which resection had

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Reprint requests: Koji Komori, MD, Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, 1-1, Kanokoden, Chikusa, Nagoya, Aichi 464-8681, Japan.

Tel.: +81 52 762 6111; Fax: +81 52 763 5233; E-mail: kkomori@aichi-cc.jp

Table 1 Clinicopathological findings

	Male cases (%), N = 29	Female cases (%), N = 32
Age	60 ± 9	63 ± 12
Size (cm)	3.5 ± 2.0	5.9 ± 1.9
Figure		
Polypoid type	1 (3.4)	1 (3.1)
Ulcerated with clear margin type	24 (82.8)	22 (68.8)
Ulcerated with infiltration type	4 (13.8)	8 (25.0)
Diffuse infiltrating type	0 (0.0)	1 (3.1)
Unclassified type	0 (0.0)	0 (0.0)
Histology		
Well-differentiated and moderately differentiated	27 (93.1)	30 (93.8)
Others (poorly differentiated, mucinous, and Signet-ring cells)	2 (6.9)	2 (6.3)
Surgical procedure		
Low anterior resection	14 (48.4)	14 (43.8)
Hartmann's procedure	1 (3.4)	5 (15.6)
Abdominoperineal resection	11 (37.9)	10 (31.3)
Total pelvic exenteration	3 (10.3)	3 (9.3)
TNM		
IIA	0 (0.0)	0 (0.0)
IIB	11 (37.9)	8 (25.0)
IIC	0 (0.0)	2 (6.2)
IIIA	0 (0.0)	0 (0.0)
IIIB	7 (24.2)	6 (18.8)
IIIC	11 (37.9)	16 (50.0)

been performed for invasion of other organs in terms of pathologic findings from the viewpoint of sex differences.

## Materials and Methods

We enrolled 61 consecutive patients with rectal cancer who had undergone curative surgery with resection of invaded adjacent organs at the Department of Gastroenterological Surgery, Aichi Cancer Center Hospital, Nagoya, Japan, between January 1990 and December 2001. Intraoperatively, if we recognized the primary rectal cancer as having invaded adjacent organs, combined radical resection was performed. None of our patients had received either chemotherapy or radiation therapy prior to surgery. Complete dissection of all regional lymph nodes with mesorectal excision was carried out in all cases. In Japan, lateral lymph node dissection is generally indicated if the lower margin of the primary cancer is located below the peritoneal reflection or anal canal with invasion into the muscularis propria or beyond. There were no cancer cells in the CRM in any of our cases. The resected specimens were fixed in 10% formalin for several days, and sections were prepared across the maximum diameter of the tumor and stained with hematoxylin and eosin (HE), without specific

immunostaining. The slides were then evaluated by simple light microscopy.

We conducted a review of the relevant hospital records to obtain clinicopathologic information about the patients, including sex and age, macroscopic configuration of the tumor, maximum tumor size, and histologic type of the tumor. Adenocarcinomas of the rectum are graded predominantly on the basis of their glandular appearance and are classified as well/moderately differentiated (W/M) or others (poorly differentiated, mucinous, and Signet-ring cells), according to the World Health Organization (WHO) histopathologic classification of tumors of the colon and rectum,<sup>5</sup> and the Japanese Classification of Colorectal Carcinoma.<sup>6</sup>

This study included cases with rectal cancer defined as a tumor whose lowest border is located between the anal verge and the sacral promontory and the rectosigmoid colon. Tumors are classified into 5 types on the basis of their macroscopic appearance: (1) polypoid, (2) ulcerated with clear margin, (3) ulcerated with infiltration, (4) diffuse infiltrating, and (5) unclassified. Surgical procedures are classified into 4 approaches: (1) low anterior resection, (2) Hartmann's procedure, (3) abdominoperineal resection, and (4) total pelvic exenteration. In terms of the TNM staging system, all cases were classified as having stage II or stage III tumors. Most notably, we investigated invasion of adjacent organs



Table 2 The resected organs in males and females

Male: Resection 29 cases	Resection cases	Histopathological invasion ( + )	
Seminal vesicles	14 (48.3%)	25 (86.2%)	0 (0.0%)
Prostate	2 (6.9%)		0 (0.0%)
Urinary Bladder	9 (31.0%)	4 (13.8%)	1 (3.4%): Urinary Bladder
Seminal vesicles + Prostate	1 (3.4%)		1 (3.4%): Seminal vesicles
Seminal vesicles + Urinary bladder + Ureter	1 (3.4%)		1 (3.4%): Ureter
Seminal vesicles + Prostate + Ureter	1 (6.9%)		0 (0.0%)
Prostate+ Urinary bladder + Ileum	1 (6.9%)		1 (3.4%): Ileum
Total			4 (13.8%) <sup>e</sup>
Female: Resection 32 cases	Resection cases	Histopathological invasion ( + )	
Uterus	5 (15.6%)	17 (53.19%)	0 (0.0%)
Ovary	5 (15.6%)		0 (0.0%)
Vagina	6 (18.8%)	15 (46.9%)	2 (6.3%): Vagina
Ureter	1 (3.1%)		0 (0.0%)
Uterus + Ovary	4 (12.5%)		1 (3.4%): Uterus
Uterus + Vagina	7 (21.9%)		2 (6.3%): Vagina
Uterus + Urinary bladder + Sigmoid colon	1 (3.1%)		1 (3.1%): Sigmoid colon
Vagina + Urinary bladder	2 (6.3%)		2 (6.3%): Vagina + Urinary bladder
Uterus + Ovary+ Urinary bladder	1 (3.1%)		1 (3.1%): Uterus + Urinary bladder
Total			9 (28.1%) <sup>e</sup>

<sup>a</sup>Significantly different,  $P = 0.006$ .

<sup>b</sup>Significantly different,  $P = 0.006$ .

<sup>c</sup>Significantly different,  $P = 0.08$ .

<sup>d</sup>Significantly different,  $P = 0.08$ .

in terms of pathologic findings, according to sex differences (Table 1). After the operation, TNM stage III cases were administered oral chemotherapy, with oral 5-fluorouracil, 5'-dioxifluridine, carmofur, or uracil-tegafur with leucovorin being the most commonly used drugs, for approximately 6 to 12 months.<sup>7-9</sup> None of the patients received radiation therapy.

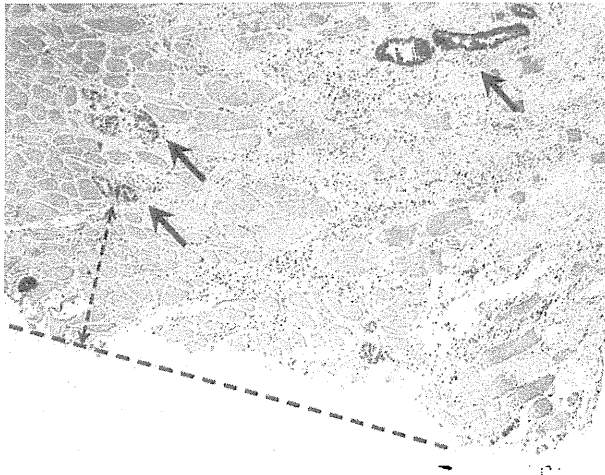
All data are expressed as mean  $\pm$  SD. The  $\chi^2$  test was subsequently performed to identify factors possibly influencing pathologic invasion and recurrence. The log-rank test was used to evaluate the difference in local disease-free survival rates between groups. Statistical significance was set at  $P < 0.05$ .

## Results

Table 2 shows the resected organs and whether histopathologic invasion was present (pT4b). In male cases, combined radical resections involved the seminal vesicles, prostate, urinary bladder, and/or ileum. The seminal vesicles were the most commonly resected adjacent organs (14 of 29 cases; 48.3%). Four cases (13.8% of males) underwent combined radical resection of more than 2 organs. In female cases, combined radical resection involved the uterus, ovaries, vagina, urinary bladder, ureters, and sigmoid colon. The vagina was the most

commonly resected adjacent organ (6 of 32 cases; 18.8%). Fifteen cases (46.9% of females) underwent combined radical resection of more than 2 organs. There was a statistically significant difference between males and females in the number of patients undergoing combined radical resection ( $P = 0.006$ ). The results (Table 2) for histopathologic invasion are shown. Histopathologic invasion was present in only 4 males (13.8%). Yet, among females, histopathologic invasion was observed in 9 cases (28.1%). The difference between males and females was not statistically significant ( $P = 0.08$ ), but the rate in females was roughly twice that in males. Figure 1 shows the partially resected posterior wall of the vagina. The cancer had spread showing discontinuity, and the shortest distance between the deepest part of the cancer and the incised surface was only 500  $\mu$ m.

Figure 2 shows the overall survival rates of the patients enrolled in this study. No significant differences in the overall survival rate were observed between T4a cases in males with and in females ( $P = 0.561$ ), or T4b cases in males with and in females ( $P = 0.728$ ). But there was a statistically significant difference between T4a cases and T4b cases in males ( $P = 0.005$ ), and in T4a cases and T4b cases in females ( $P < 0.001$ ) in the overall survival rate.



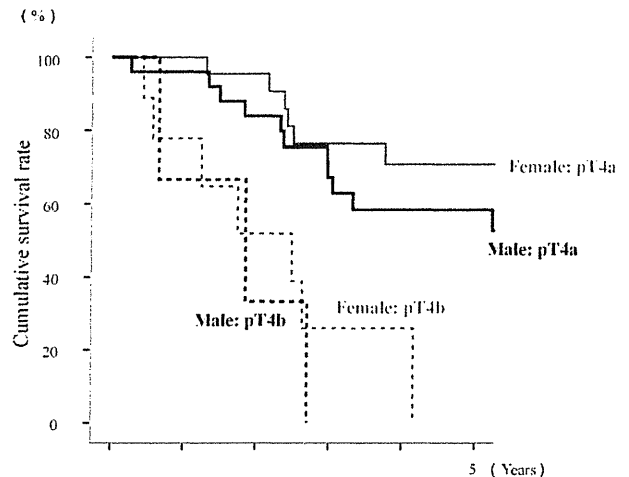
**Fig. 1** This figure shows the partially resected posterior wall of the vagina. The cancer shows discontinuous spread (black arrow), and the shortest distance between the deepest part of the cancer and the incised surface (dotted line) was only 500  $\mu\text{m}$  (dotted black arrow). H&E ( $\times 100$ ).

Table 3 shows the organs affected by recurrence in males and females. While no significant difference was recognized in local recurrence rates between males and females undergoing resection ( $P = 0.220$ ), the number of local recurrences in females receiving resection exceeded that in males.

## Discussion

Previously, we reported pathologic studies of combined radical resection of seminal vesicles in the treatment of rectal cancer, and we emphasized that it is possible to ensure a sufficiently large CRM and to thereby attenuate local recurrence.<sup>10</sup> However, most previously published reports do not make reference to sex differences. This study is the first, to our knowledge, to demonstrate sex differences in response to combined radical resection for the treatment of rectal cancer. Our data therefore have prognostic significance. Bonfanti *et al* report extensively on the organs resected for invasive colorectal cancer, providing considerable detail, but do not mention sex differences.<sup>11</sup>

Recently, many studies have examined neoadjuvant treatment with chemotherapy and pelvic radiotherapy for locally advanced rectal cancer. Neoadjuvant treatment, employing chemotherapy and pelvic radiotherapy, contributes to better outcomes, with the former inhibiting distant metastases and the latter inhibiting local recurrences.<sup>12</sup> How-



**Fig. 2** This figure shows the overall survival rates of the study patients. Male: pT4a vs. Female pT4a :  $p=0.561$ ; Male: pT4b vs. Female pT4b :  $p=0.728$ ; Male: pT4a vs. Male pT4b :  $p=0.005$ ; Female: pT4a vs. Female pT4b :  $p<0.561$ .

ever, because of the lack of pathologic findings without neoadjuvant treatment (*i.e.*, the spread of rectal cancer in the absence of other factors), this study provides data critical for determining the optimal treatment of pT4b cases.

It is of major interest that the rate of histopathologic invasion in females exceeded that in males. The reason is unclear, but in 15 female cases (46.9%) multiple organs were resected based on an intraoperative diagnosis of cT4b, making it reasonable to speculate that female anatomic structures are more susceptible to tumor invasion. This study showed tumors to be in proximity to the incised surface.

The local recurrence rate in females was approximately twofold that in males, such that the surgical margins in females were apparently insufficient. The many recurrences in our female patients prompted us to speculate that the operative method employed might be less than optimal in women. When rectal cancer invaded the posterior wall of the vagina, partial resection of the vagina was often deemed necessary, but this procedure was found to be insufficient to prevent recurrence. If intraoperative cT4b is recognized, it is essential that adequate combined resection be performed. Harris *et al* report that an aggressive surgical strategy with complete resection is predictive of long-term survival.<sup>13</sup> And, the high-potency adjuvant treatment with chemo-

Table 3 The organs affected by recurrence in males and females

	Male cases (%), N = 29	Female cases (%), N = 32
All recurrence cases	9 (31.0)	10 (31.3)
Local	1 (3.4)	4 (12.5)
Anastomosis line	1 (3.4)	1 (3.4)
Distant (lung, liver, bone)	5 (17.2)	4 (12.5)
Distant peritoneum	1 (3.4)	1 (3.4)
Lymph nodes	1 (3.4)	0 (0.0)

<sup>a</sup>Significantly different,  $P = 0.220$ .

<sup>b</sup>Significantly different,  $P = 0.220$ .

therapy is essential for pT4b cases in males and females.<sup>13</sup>

Our data showed that no pathologic invasion cases account for about 80% of resected adjacent organs in males and females. So, it is essential to rule out the cases except pT4b, but it is very difficult intraoperatively. The reasonably accurate diagnostic imaging is essential before operation.

In rectal cancer cases with invasion of neighboring organs, the effect of the invasion must be carefully determined, and the most appropriate operative approach selected accordingly.

## Acknowledgments

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## 6. 直腸癌側方郭清手技 —— 開腹\*

金光幸秀 志田 大 塚本俊輔\*\*

【要旨】自律神経温存の側方郭清術は日本において発展した術式であり、予防的郭清だけでなく、側方リンパ節転移が存在した場合も5年生存率は30～50%と報告されており、一定の治療効果が期待できる手術手技である。術野を十分に展開し、解剖学的剝離層を視認して操作をすすめることが肝要であり、的確に郭清するためには、リンパ流理解のうえに立った正しい実践が求められる。膀胱側間隙を開き腹膜外からの操作を加える腹膜外ルートから、下膀胱動静脈を払った内陰部動静脈を尾骨筋に入るまで郭清する方法が有用である。

### はじめに

直腸癌に対する手術療法の原則は、癌の主病巣と癌の転移が生じやすい所属リンパ節、すなわち中枢方向、腸管軸方向のリンパ節を一括して切除することであり、下部進行直腸癌ではこれに側方向のリンパ節切除が加わる。下部進行直腸癌は従来その局所再発が高率であることより、ほかの大腸癌と比べて予後不良とされ、治療成績を向上させるために種々の治療法が行われてきた。本邦では、中直腸動脈から内腸骨動脈周囲につながるリンパ節への転移が局所再発の一つの原因として考えられ、内腸骨血管支配領域の側方郭清による局所制御を推奨し、その結果手術療法を重視した独自の道を発展させてきた。寛骨で囲まれた狭い骨盤腔内という空間的な制約下と、リンパ節郭清と神経温存の両立性を図るという二律背反性の制約

下のもと、筋膜の系統的解剖学を導入し洗練がなされた外科手技は、癌手術の「究極型」といえる。

本稿では、先達の努力の成果である自律神経温存側方リンパ節郭清について、実際の手技上のポイントを紹介する。

### I. 側方郭清の適応

#### 1. Rb, cMP以深を適応としている

Rb, pMPでは、『大腸癌治療ガイドライン』(2010年版)で9%、筆者の前任施設である愛知県がんセンター中央病院で7.5%<sup>1)</sup>、現施設の国立がん研究センター中央病院でも9.6%の転移を認めている。術前の深達度診断がSM癌以外は確実でないため(表1)、RbではcMPから側方リンパ節郭清の適応としている。cMPでも実際にはpAである症例が混じるため、cMPの側方転移率は9.6%で、これを無視できない頻度と考えるか

キーワード：直腸癌，側方郭清，開腹手術，腹膜外アプローチ

\* Techniques of lateral lymph node dissection for rectal cancer : open surgery

\*\* Y. Kanemitsu (科長), D Shida (医長), S. Tsukamoto : 国立がん研究センター中央病院大腸外科 (〒104-0045 東京都中央区築地5-1-1).