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Radical Resection with Nerve Preserving Surgery for Rectal Cancer: Preliminary Report

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Abstract: **Radical resection with nerve preserving surgery was performed for eradication of rectal cancer and regional lymph nodes both upward and lateral pathways in order to improve survival, decrease local recurrence, and also reduce genitouriary morbidity by preservation of pelvic autonomic nerves. From December 1996 to February 1998, 17 patients were studied with average age 52.3 years (range 23-72 years). The average blood loss was 700 ml. and operative time was 281 minutes. Complications occurred in 7 patients and most of them resolved spontaneously, except one patient needed reoperation for anastomotic leakage by conversion to abdominoperineal resection. Urinary dysfunction occurred transiently in one patient and sexual potency was regained postoperatively in one of two patients who were sexually active preoperatively. Therer were no 30 days mortality and no local recurrence in 10.5 months of follow up period. This procedure appeared safe and yielded satisfactory functional preservation without adversed oncologic outcome.**

Radical surgical treatment for rectal cancer is performed with curative intent, but some patients subsequently developed local recurrence varying widely between 0-33 per cent.[1-3] Many surgeons emphasized the appropriate extent of resection that would produce a low recurrence. Moynihan 1908[4] recommended removal of lymphatic tissue surrounding inferior mesenteric artery and divided inferior mesenteric artery at the level of the aorta. Stearns and Deddish 1959[5] suggested the superiority of extended resection with wide abdominopelvic lymphadenectomy in management of rectal cancer. Among Dukes' C patients, 5-year survival of extended resection was 40 per cent compared with 23 per cent in conventional resection, although these data were not statistically significant but had shown increased genitourinary dysfunction. Subsequent studies in some centers, Enker[6] and Memorial - Sloan Kettering Cancer Center in New York, Hojo[7] and Moriya[8] at National Cancer Center in Japan, revealed the outcome of aggressive resection of pararectal lymphatic tissue (radical resection) with autonomic nerve preserving surgery for rectal cancer showing reduced genitourinary dysfunction and other morbidity while oncologic outcome of 5-year survival

was significantly better than conventional surgery. So the author is interested to study this procedure.

Materials and Methods

This study is a prospective, nonrandomized study designed to evaluate morbidity, mortality, functional and oncologic outcome of radical resection with autonomic nerve preserving surgery for rectal cancer (within 13 cm. from the anal verge by flexible colonoscopic measurement). All patients (all stage of disease) from December 1996 to February 1998 were accepted to this study except those with contraindication for operation. Pathological staging was classified according to TNM system of the AJCC and UICC 1989.[9]

Postoperatively, patients were subject to regular follow-up with clinical examination and CEA measurement every 3 months. Chest X-rays, colonoscopy, liver sonography were determined every year. Patients with elevated CEA or clinical indication of disease recurrence underwent further investigation and CT scan.

Definition of Treatment

Radical resection: The procedure is consisted of conventional resection of the rectum containing cancer segment with adequate proximal and distal margin including mesorectum, lymphatic drainage, vascular supply of the segment and wide abdominopelvic lymphadenectomy.

Lymphadenectomy[10,11] includes the following :-

1. Proximal lymphadenectomy: This dissection involved high ligation of inferior mesenteric artery and complete resection of paraaortic lymph node from just below duodenum down to aortic bifurcation.

2. Wide abdominopelvic lymphadenectomy (Radical abdominopelvic lymphadenectomy): The dissection involved resection of lymph node (lymphatic tissue) caudal to aortic bifurcation including lymphatic tissue along common iliac arteries and veins, internal iliac arteries and veins and middle rectal arteries.

3. Extended lymphadenectomy: The dissection involved removal of lymphatic tissue in the obturator space and along external iliac arteries and veins with or without internal iliac artery resection.

Nerve preserving surgery[11]

1. Complete autonomic nerve preservation: The dissection preserved both sympathetic and parasympathetic nerves.

2. Bilateral pelvic plexus preservation: The dissection removed superior hypogastric nerve and plexus.

3. Unilateral pelvic plexus preservation: The dissection involved resection of superior hypogastric nerve and plexus, and one side of pelvic plexus (inferior hypogastric plexus).

4. Complete autonomic nerve resection: The dissection involved resection of all sympathetic and parasympathetic nerves in the pelvis.

Surgical technique:[10,11]

Identification of superior hypogastric plexus: After general exploration of the entire abdomen, the dissection starts with mobilization of mesosigmoid on the left side and retraction to the right, Hypogastric plexus is a fenestrated network located between superior rectal artery and aorta. Dissection is made along this nerve plexus down to just below aortic bifurcation, to clearly identify the superior hypogastric plexus to be preserved.

Upward resection of paraaortic node: After full mobilization of left colon, the ureter is identified on both sides. Then adipose tissue and lymphatic tissue between these two ureters are resected completely from the duodenum (above) down to pelvic inlet with clear exposure of aorta and vena cava. The inferior mesenteric artery is doubly ligated and severed at the level of the aorta. The inferior mesenteric vein is ligated just below duodenum.

Identification of hypogastric nerve: The hypogastric plexus bifurcates into right and left hypogastric nerve at 2-3 cm below aortic bifurcation. These nerves run close to the endopelvic fascia laterally and join the nerve from sacral plexus to form inferior hypogastric plexus adjacent to internal iliac vein and distal to the lateral ligament.

Downward dissection: The lymphatic and adipose tissue surrounding aortic bifurcation, common iliac arteries and veins, the internal iliac arteries and veins, are resected *en bloc* with paraaortic tissue. The rectum is mobilized freely by sharp dissection from sacral fascia posteriorly, genitourinary system and lateral pelvic wall (lateral ligament). During meticulous resection of lateral ligament, pelvic nerves should be retracted laterally to clearly expose middle rectal artery in order to avoid injury to pelvic nerve. If abdominoperineal resection is selected, the dissection should be carefully preformed at the prostatic level where neurovascular bundle (supplying genitourinary sys-

Table 1 Characteristics of treatment group in radical resection for rectal cancer.

Sex	male : female 9 : 8	
Age	mean 52.3 years (23-72 years)	
Chief complaint - mostly bleeding per rectum (47%)		
Level above anal verge 7.6 cm. (SD 3.6)		
Staging	2 - T3, 4 : N0 M0	- 4 cases
	3 - T any : N1 M0	- 5 cases
	3 - T any : N2,3 M0	- 2 cases
	4 - T any N : any M1	- 6 cases (liver 5, lung 1)
Type of resection LAR 13 cases, APR 4 cases		
Type of nerve preservation	1. Complete preservation	9 cases
	2. Bilateral pelvic plexus preservation	6 cases
	3. Unilateral pelvic plexus preservation	2 cases
Active sexual life		2 cases (male only)
Synchronous lesion		2 cases
Mean follow-up 10.5 months (range 3-19 months)		

LAR = Low anterior resection

APR = Abdominoperineal resection

Table 2 Concomitant surgery with radical resection for rectal cancer.

Procedure	Cases
Cholecystectomy with chemoport insertion	1
Wedge liver resection	3
Right hemicolectomy	1
Partial cystectomy with uretero-ureterostomy	1
Total hysterectomy and bilateral salpingo-oophorectomy	2
Right oophorectomy	1

tem) lies in the postero-lateral aspect of prostate gland.

Results

A total of 17 patients were enrolled in this study. Nine were males and eight females. The mean age was 52.3, with higher in male (61.3 years) than female (47.2 years). Most of male patients [6], were sexualy inactive, only two of them were potent preoperatively. Pathological staging revealed mostly having advanced disease, stage 3 in 7 patients (41%) and stage 4 in 6 patients (35%). Five of these had metastases to liver and one had metastasis to the lung.

The resection performed was low anterior radical resection with complete and bilateral pelvic nerve plexus preservation in 11 cases. There were four cases (23%) that required abdominoperineal resection due to low level of lesion at 0, 3, 3 and 4 cm from anal verge (Table 1). In two cases unilateral pelvic plexus preservation was performed due to locally advanced disease involving pelvic side wall and one of these developed temporary urinary dysfunction. Details of concomitant surgical procedures were shown in Table 2.

Operative blood loss was averaging 700 ml (range 200-2,000) and operative time was 281 min (range 185-510 min) or an average of 4 hr 41 min (Table 4). Sexual potency remained normal in one patient (50%). Postoperative complications occurred in 7 patients and one required reoperation (5.8%) by conversion to abdominoperineal resection due to anastomotic leakage (Table 3).

Discussion

The surgical treatment of choice in treating patients with rectal cancer was conventional resection, but this resection spared mesorectum and lateral lymphatic pathway via middle rectal artery, internal iliac artery, common iliac artery to para-aortic lymph node. These lateral lymph nodes might harbor occult metastasis and caused local recurrence, so *en bloc* clearance of regional node both upward and in the lateral pathway would improve survival and decrease local recur-

Table 3 Postoperative complications in patients with radical resection.

Complication	No. cases	Treatment
Urinary retention	1	Intermittent self-catheterization for 2 month
Intestinal obstruction, partial	2	Resolved spontaneously
Anastomotic leakage	2	Abdominoperineal resection in one case, the other case had protective colostomy performed previously
Abdominal wound infection	1	Drainage, local debridement
Perineal wound infection	1	Drainage, local debridement
Impotence	1	None

Table 4 Perioperative complications compared with other reports.

	Perioerative complication			
	Bloods loss (ml.)		Timing of operation (min.)	
	Conventional resection	Radical resection	Conventional resection	Radical resection
Enker 1986[6]	17%*	10%*		
Hojo 1989[7]	1500	1900		
Moriya 1989[8]		1528		317
Enker 1992[10]		630		258
Michaelassi 1992[14]	1612	1616		
Pollar 1992[15]	650			
Enker 1995[16]		594		250
Maas 1998[17]		730	135	185
This report 1998		700		281

*blood transfusion more than 2000 ml.

rence rate. Sauer and Bacon 1950[12] showed that there were positive lateral lymph nodes in 54.5 per cent of lower rectal cancer and suggested to perford wide abdominopelvic resection. Hojo 1982[13] also reported positive lateral nodes in 8.8 per cent for upper rectal cancer and 23 per cent for lower rectal cancer and his subsequent study[7] of radical lymphadenectomy with Dukes' B and C patients showed statistically significant better 5-year survival and less local recurrence than in conventional resection (Table 5). These operations were associated with an increased surgical morbidity (predominantly bladder dysfunction, impotent, and hemorrhage), although operative mortality was not different from conventional resection. Enker 1986[6], Hojo 1989,[7] Moriya 1989[8] presented this radical resection with nerve preserving surgery for rectal cancer which confirmed evidence of less morbidity than in conventional resection.

In this study, the operative blood loss was averaging 700 ml (range 200-2,000 ml) and operative time was 281 min (range 185-510 min). These figures were lower when compared with reports from the west and Japan (Table 4). Western people have an average bigger body built and more weight more than the East, the operative procedure was more difficult so bleeding and time spent were more, also Japanese surgeon performed more aggressive resection of the pararectal lymphatic tissue in extended lymphadenectomy[18]. Anastomotic leakage occurred in 2 cases (11.7%) which was comparable with other report of 1-22.5 per cent.[14,15,17,19,20] The first case occurred in an obstructed lower rectal cancer with liver metastasis and the other had radiotherapy for cervical cancer 15 months ago. In functional outcome, especially sexual function was difficult to evaluate because most of them were inactive in sexual life or in late stage of disease. Only two patients were sexually active preoperatively and one of these had regained his sexual potency (50%). Enker 1995[16] presented his series with 86.7 per cent potency which was apparently superior to conven-

Table 5 Oncologic outcome of radical resection and conventional resection for rectal cancer.

		5-year survival		Local recurrence	
		Conventional resection	Radical resection	Conventional resection	Radical resection
Stern 1959[5]	Dukes'C	46	54		
Koyama 1984[25]	Dukes'B	62.7*	83.2*	26.1*	8.4*
	Dukes'C	30.8*	52.5*	44.3*	24.5*
Glass 1985[26]		56.5	54.5		13.3
Enker 1986[6]	Dukes'C	28.8*	48.3*		
	All stages	54.3	63.8	46	35.5
Hojo 1989[7]	Dukes'B	74.2*	88.1*	21.9*	6.3*
	Dukes'C	43.2*	61.3*	32.8*	23.6*
Michellassi 1992![14]				16.4	9.4

!performed in high risk patients
***statistically significant**

tional resection of 51.4 per cent. There was no urinary leakage in this series. Transient urinary dysfunction occurred in one patient who recovered in two months. Several reports in literature[21-24] with conventional resection showed incidence of urinary dysfunction in 30-70 per cent in which most of them resolved spontaneously.

For oncologic outcome study, the follow up period of this study was too short to evaluate survival and local recurrence. However, there was no local recurrence found in the 10.5 months follow up. The result of this procedure performed by many surgeons had shown statistically significant improvement in 5 year survival (Table 5), with lower morbidity especially genitourinary dysfunction.

Conclusion

This study showed that radical resection with pelvic nerves preserving surgery for rectal cancer did not significantly increase morbidity in the perioperative period. In addition, this procedure offered the potential advantage of minimizing local recurrence when the principal of radical oncologic surgery had been carefully observed.

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