

Effect of extended radical resection for rectal cancer

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Abstract

AIM: To discuss the rationality of extended radical resection (ERR) and to guide the surgical treatment of rectal cancer.

METHODS: Total 211 patients who underwent ERR from 1981 to 1987 (follow-up rate of 94.8 %) were selected to study the patterns of lymphatic metastasis and therapeutic effect. The control group was made of 293 patients with rectal cancer who underwent conventional radical resection (CRR) and its follow-up rate was 98.5 %. The lymph node specimens, obtained by the triple-approach lymph node resection during the radical resection of rectal cancer, were studied by conventional pathological method. The extended radical resection, guided by the patterns of lymphatic metastasis, was applied in the clinical practice.

RESULTS: The incidence of lymphatic metastasis in Chinese patients with advanced rectal cancer was 43.6 %, and that of the upper 2nd and 3rd groups and the lateral group was 14.2 %, 10.9 % and 11 % respectively. The 5, 10-year-survival rates of the ERR were 68.0 % and 47.0 %, respectively, which were much higher than those of the conventional radical resection (42.9 % and 25.3 %).

CONCLUSION: The ERR for rectal cancer removes all the lymph nodes, prevents possible metastasis and finally improves the survival rate.

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INTRODUCTION

Early in 1970s, the opinion for extended radical resection (ERR) of rectal cancer, which was suggested by some Japanese scholars, caused great controversy among the scholars who majored in colorectal cancer all over the world. In 1980s, to study the rationality of surgical treatment for Chinese rectal cancer, our hospital first got the patterns of lymphatic metastasis in Chinese rectal cancer with studying rectal normal lymphatic drainage and lymphatic metastasis of rectal cancer. And the EER, guided by the patterns of lymphatic metastasis, has been applied in our hospital for about 20 years. These caused a lot of controversy as well. Here, the patterns of

lymphatic metastasis in rectal cancer and therapeutic effect of ERR are reviewed and analyzed, then the scholar's doubts are discussed.

MATERIALS AND METHODS

Materials

All cases of advanced rectal cancer were received and treated in our hospital. 211 cases used to study the patterns of lymphatic metastasis and therapeutic effect were chosen within the patients who underwent ERR (include all upper and lateral lymph nodes cleaning) from 1981 to 1987 (follow-up rate of 94.8 %). The control group was made of 293 cases that underwent conventional radical resection (CRR) and its follow-up rate was 98.5 %. Between two groups, there was no significant difference in the clinical data such as location, pathological type, degree of infiltration, lymphatic metastasis and so on.

Methods

During operation, the upper lymph nodes were resected from the root of inferior mesenteric artery. The periaorta lymph nodes were cleaned partially. Then the lymph nodes around common, internal and external iliac arteries were resected, as well as those of obturator foramen. The inferior mesenteric artery or superior rectal artery and middle rectal artery was ligated and cut off at the root. And the rectal lateral ligament was cut off along the pelvic wall. In the Miles operation, the levator muscle of anus was cut off along the pelvic wall as well. And the connective tissue in the ischioanal fossa should be cleaned.

These lymph nodes included those of perirectum, superior rectal artery, inferior mesenteric artery and its root, middle rectal artery, and external iliac artery, common iliac artery, obturator, aorta, inferior vena cava and deep inguinal.

The lymph nodes were collected by touch and modified transparent methods. Both the nodes and the primary locus were analyzed by conventional pathological method. The survival rate of both groups was compared by direct method.

RESULTS

The patterns of lymphatic metastasis

Total 6894 lymph nodes were collected among 211 patients who underwent the extended radical resection, 32.7 nodes per patient in average. There were 92 cases (43.6 %) and 616 nodes (8.9 %) with metastasis. The metastasis rate of upper 2nd and 3rd group was respectively 14.2 % and 10.9 %. 16 cases of rectal cancer below the peritoneum reflex had lateral metastasis (11 %). The metastasis rate of the cases with >1/2 rectal circumference involved was 53.7 %, and that with <1/2 circumference involved was 26.7 % ($P<0.01$). The metastasis rate of the cases with serosal invasion was 63.5 %, and that of muscular invasion was 26.0 % ($P<0.01$). The metastasis rate of the cases with invasive type was 58.9 %, local type 32.3 % ($P<0.01$). Poorly differentiated and mucinous adenocarcinoma had a metastasis rate of 68.6%, well and moderately differentiated ones 31.8 % ($P<0.01$), invasive type of growth 70.0 %, and expanding type of growth 22.9 % ($P<0.01$). (Tables 1-5).

Table 1 Relationship between lymphatic metastasis and invasive rate

Circumference	<i>n</i>	Lymphatic metastasis (-)	Lymphatic metastasis (+)	Positive rate (%)
≤1/2	90	66	24	26.7 %
<1/2	121	56	65	53.7 % ^a

^a*P*<0.01, vs ≤1/2 circumference.

Table 2 Relationship between lymphatic metastasis and invasive depth

Depth	<i>n</i>	Lymphatic metastasis (-)	Lymphatic metastasis (+)	Positive rate (%)
Muscular	96	71	25	26.0 %
Serosa	115	42	73	63.5 % ^b

^b*P*<0.01, vs. Muscular.

Table 3 Relationship between lymphatic metastasis and macrotype

Macrotype	<i>n</i>	Lymphatic metastasis (-)	Lymphatic metastasis (+)	Positive rate (%)
Local	99	67	32	32.3 % ^c
Invasive	112	46	66	58.9 %

^c*P*<0.01, vs. invasive type.

Table 4 Relationship between lymphatic metastasis and histological type

Histological type (adenocarcinoma)	<i>n</i>	Lymphatic metastasis (-)	Lymphatic metastasis (+)	Positive rate (%)
Well and moderately differentiated	160	109	51	31.8 %
Poorly differentiated and mucinous	51	16	35	68.6 % ^d

^d*P*<0.01, vs. well and moderately differentiated type.

Table 5 Relationship between lymphatic metastasis and growth type

Growth type	<i>n</i>	Lymphatic metastasis (-)	Lymphatic metastasis (+)	Positive rate (%)
Expanding	61	47	14	22.9 %
Invasive	150	46	105	70.0 % ^e

^e*P*<0.01, vs. expanding type.

Table 6 Survival rate of extend radical resection (ERR) and conventional radical resection (CRR)

	<i>n</i> ₁	5-year-survival rate	<i>n</i> ₂	10-year-survival rate
Dukes A				
CRR	54/103	52.4 %	16/55	29.1 %
ERR	63/73	86.3 %	5/9	55.69 %
Dukes B				
CRR	32/71	45.1 %	12/43	27.9 %
ERR	28/47	59.5 %	1/3	33.3 %
Dukes C				
CRR	38/115	33.0 %	12/60	20.0 %
ERR	52/91	57.1 %	2/12	40.0 %
Total				
CRR	124/289	42.9 %	40/158	25.3 %
ERR	136/200	68.0 %	8/17	47.0 %

The therapeutic effect of the ERR

Table 6 shows that the 5- and 10-year-survival rate of patients with advanced rectal cancer who underwent ERR (68.0 % and 47.0 %) is obvious higher than that of patients with CRR (42.9 % and 25.3 %), *P*<0.05.

DISCUSSION

The lymphatic drainage of rectum and the patterns of lymphatic metastasis of rectal cancer

The research on anatomy of rectum^[1,16,19,36] had played an important role in operation of rectal cancer. Numbers of researches have showed that there are three routes of lymphatic drainage. The upper way drains the lymph of the whole anorectum, the lateral one drains that of the anal canal and the rectum below the level of peritoneal reflection, and inferior one only drains that of the anal canal^[1]. Then this result of the anatomic research has been used to guide the operations in clinical practice^[2-6, 17, 20, 23, 28,37]. Early in 1980s, our hospital first began to study the principle of lymphatic metastasis in Chinese patients with rectal cancer and showed that lymphatic metastasis followed the normal lymphatic drainage^[6, 27].

The ERR

According to the patterns, we concluded that ERR could be used for advanced rectal cancer. During cleaning of lymphatic tissue, the upper level of the cleaning should reach the root of inferior mesenteric artery, or 10 % lymphatic metastasis would have been left. For the rectal cancer beneath the level of peritoneal reflection, the lateral cleaning with internal iliac artery and obturator nodes should be carried out, or else another 10 % would have been left.

The indications for EER should be fitful. The advanced rectal cancer with no transperitoneal and distant metastasis and the one with the local invasion but resectable would be preferred. The patients must have no serious disease and could endure the surgical operation and the anaesthesia. The ERR cleaned all the upper, lateral and partial lower lymphatic tissue with potential metastasis, and thus improve the survival rate^[7, 8, 26].

The influence of EER to the immune function

For the extended radical resection, the experts in the field of rectal cancer wondered whether the cleaning of the lymphatic tissue affected the immune function of the patients. So we carried out the comparative study of the immune function, which included the "E" wreath test and the IgA, IgG, IgE determination before operation and after operation. And the results showed that the ERR have no negative influence of the immune reaction.

The problem about how to clean all the nodes with metastasis and maintain the normal ones

It was not always correct to judge whether it metastasize or not with nude eyes. That is to say, we could not confirm the Dukes stage of the rectal cancer during the operation. The misdiagnosis rate is about 25 %. The lymphatic micrometastasis^[30-32] of rectal cancer, that was a new challenge for judging the lymphatic metastasis, was investigated by Silva^[25] and Sterk *et al*^[35] using lymphoscintigraphy and lymphangiography^[34], but there is still controversy^[34]. Still now, there is no effective method to judge whether lymphatic metastasis took place in one lymph node during the operation yet^[38].

Key points of studying the principle of lymphatic metastasis

In the European scholar's studies, the metastasis rate was not so high and that of lateral way was only 2 %. But the Japanese scholars showed that the metastasis rate was 10-20 %. There

was a significant difference between them. So we thought the following conditions should be important to study the patterns of lymphatic metastasis: 1. The quantity of lymphatic nodes resected during the operation must be enough to study. 2. All the nodes should be checked out by use of correct methods. 3. The careful pathological examination should be carried out.

Whether ERR would cause more bleeding and trauma

According to our statistics, the average quantity of blood transfusion in ERR was 760 ml, and that of conventional radical resection was 700 ml. There was no significant difference between them. The common damages in rectal operation included the injuries of ureter, sacral venous plexus and pelvis autonomic nerve. During the operation, the ureters were dissociated for about 20 cm, and then the resection of lymphatic nodes was carried out directly in sight. In our study, the ureter-injury rate in the extended resection was 1.4 % (3/211), and that in the conventional radical resection was 1.7 % (5/289). There was no significant difference between the both groups. The ischemia and necrosis caused by insufficient ureter dissociation never took place in our study. To avoid the injury of sacral venous plexus, we should get familiar with the anatomy of pelvis and operate directly in sight.

Early in 1980s, Japanese experts made lots of researches on preventing these complications^[9,10,18,33]. We also began to carry out the ERR with pelvis autonomic nerve reservation from 1988. And the rate of post-operative bladder and sex dysfunction was effectively reduced. The western scholars such as Mass *et al*^[24] and Di Matteo *et al*^[29] had drawn the similar conclusions. So we ensured that the functional ERR should be one of the most satisfactory operations for advanced rectal cancer.

The relationship between the functional ERR and the total mesenteric excision (TME)

TME^[11-13] was recently paid attention to by the scholars^[15,21,22,26] all over the world. Japanese experts^[14,26] divided the cleaning of perirectal connective tissue into three regions, A, B and C, and TME was similar to A region only^[14]. Our opinion is that TME should be one portion of the functional preserved EER. Early in 1980s, when ERR was established, we mentioned that total perirectal connective tissue should be resected along the lateral wall of pelvis, so did in Miles operation. In low anterior resection (LAR) operation, the perirectal connective tissue should be resected at least beneath the lower transect of the rectum. Therefore we believe that a throughout ERR should include TME.

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