

Surgey for irradiational injury to the bowel

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Radiation damage to the bowel was clinically surveyed in the 39 patients who underwent surgery. The patients' ages were distributed in the fifth and sixth decade in the majority and damage of irradiation was based on uterine carcinoma in this series. The complications of radiation damage which necessitated surgery were bleeding, obstruction, fistulization and malignant change. No close correlation with the dosis of irradiation was found in this series. The surgical treatment was usually complex on the account of dense adhesion and tissue damage of irradiation. Reluctance of complete resection had restricted an aggressive surgery for irradiational damaged tissues vulnerable to surgical insult. Experience with the surgical treatment for the 4 patients with radiation-induced carcinoma was reported, in whom the 3 patients underwent surgery, the remaining one was non-surgery for far advanced case. It is recommended that surgical stress should be in the minimum to ameliorate patient's suffering to prevent postoperative complication by a staged or palliative operation. Radiation therapy in combination with chemotherapy is of great benefit for carcinomas of pelvic organs. Nevertheless, ominous complications by irradiation have been increasing. Late complications, such as stenosis, perforation, fistulization and bleeding, were embarrassing and sometimes necessitate surgical treatment.

In this study, the 39 patients who underwent surgical treatment following irradiation were clinically evaluated to elucidate radiation damage to the small intestine.

Patients

The 39 patients who underwent surgery after irradiation were listed in Table 1. Most of the patients comprised of carcinomas related to gynecologic organs, in which carcinomas of the uterine were the main original disease. The most affected bowel was the rectum.

The patient's ages ranged from 30 to 77 years with an average of 56.1 years old as shown in Table 2. Damage to the bowel by radiation was most frequently seen in the 5th and 6th decade.

Table 1. Patient profil

Original disease	affected sites
Uterine cancer	rectum
Operated	rectom + sigmoid colon
non-operated	Sigmoid colon
Carcinoma of the adenox	Sigmoid colin +
Vaginal carcinoma	transverse ileocecam
retrovesical tumor	small intestine
testicular tumor	
Total	

Table 2. Age distribution

age	30~	40~	50~	60~	70~	total
male	1	0	1	0	0	2
female	5**	5	11**	14	5*	
	6	5	12	14	5	42

* reoperated

** re-reoperated

The necessity of surgery was summarized in Table 3. The majority of patients complained the symptoms of bleeding and bowel obstruction, followed by fistulization and malignant change 10 years after irradiation in a few.

Table 3. The time duration until surgery after irradiation

time duration symptom	~1 year	~5	~10	10~	total
bleeding	7	5	1	1	14
bowel obstruction	6	2	2	5	15
fistulization	1	3	2	3	9
malignant change	0	1	0	4	5
	14	11	5	13	43

(including overlapped cases)

The initiation of complaints after irradiation ranged from 3 months to 24 years after irradiation of a long term duration. At relatively early stage, within 5 years after irradiation, a symptom of bleeding and bowel obstruction was found. In contrast, bowel obstruction and fistulization

were frequently seen at the late stage after 5 or more years.

The nine patients with fistulization were included, whose fistulas were rectovaginal fistulas in 4, rectovesical fistula in one, rectovaginal-vesical fistulas in 3 and rectovaginal fistula with vesicovaginal communication in one respectively. Surgical treatment aimed at palliation of patient's suffering. Curability was not predicted because of difficulty in complete and extensive resection of the involved organs.

In this series we experienced four patients with malignant change in the radiated field. Those 4 patients who were defined as radiation-induced carcinoma were consistent with the criteria that arose from the radiation field with histologic damage of irradiation to the bowel and had a 10

or more years of the time-interval from irradiation.

The 4 patients with radiation-induced carcinoma were listed in Table 4. The location of carcinoma was in the rectum below the peritoneal reflection in all cases, demonstrating the sites near the dentate line, 3.0 cm proximal in 2 and directly on the line in one except for one who did not undergo surgery. Histologic patterns were papillary tubular adenocarcinoma in 2, mucinous carcinoma and signet ring cell carcinoma in one, respectively. There was no histologic pattern of radiation-induced carcinoma. In two out of the four patients, the tumor arose in the anterior wall. The main symptom did not differ from that of ordinary carcinoma.

Table 4. The four patients with radiation-induced carcinoma

Case age sex	symptom	Locaton	size	Distance from the dentate line	Histology
56 female	constipation bloody stool	right latenal	2.4 × 1.9	3.2 cm	Pab. tub.
65 female	bloody stool	anterior	2.0 × 2.2	0	Pab. tub.
77 female	melena	anterior Rb	4.5 × 4.9	3.0 cm	mucinous
71 female	constipation	circumferential non-surgery			signet ring cell

The correlation with the dosis and the kinds of irradiation was shown in Table 5. In this series, damage to the bowel was observed in the case with Tele Co irradiation which was frequently used. No significant correlation with the dosis of irradiation was found between less than or more than 50 Gy, in spite of the small number of cases to draw a conclusion.

Table 5. Relation between damage to the bowel and the dosis of radiation

	Less than 50 Gy	more than 50 Gy
X-Ray	2	
Radium	1	2
Tele Co	3	5

Discussion

It is well known that radiation damage to the bowel differs in the stages after irradiation, diarrhea and nausea in the early stage and bleeding, obstruction, fistulization and perforation in the late stage. It is very frequent to require surgical intervention.

It is generally accepted that radiation damage to the bowel is caused by vascular injury. The frequency of radiation damage has been reported by many investigators with varying variety, 9.6 percent including 2% of severe cases by Bosch,¹⁾ and 8% including 4 percent of a demand of surgical treatment by Tanaka.²⁾

The influential factors of radiation damage to the bowel were, age of the patient, dosis of irradiation, intensity of

surgical insult, extension of primary carcinoma and internal irradiation. Roswit³⁾ emphasized that the small bowel is more sensitive to irradiation rather than the large bowel. The tolerable dosis of the small bowel to irradiation is limited to 60 Gy which causes damage in 25 to 50 percent of the irradiated patients as compared with the rectum which was fixed by the surrounding tissues. The time interval from irradiation to surgery varied from 3 months to 14 years with a wide range. Barium enema showed a finding of fine network mucosa, rigidity of the wall, thickness of mucosal fold and revealed ulceration, stenosis, fistulization in the advancing stage of the disease. On the other hand, endoscopy showed a finding of redness, edema and bleeding on the surface of the mucosa.⁴⁾

Surgeons should be aware of recurrence of primary carcinoma in the follow-up. One of the recurrent types is a fistula formation.⁵⁾ Conservative therapy is mostly of great value in palliation of complaints. Meanwhile, surgery is indispensable for the patients with bleeding, bowel obstruction and perforation. It is accepted that colostomy and bypass operation are the surgical procedure of choice and avoidance of direct manipulation of damaged bowel is recommended.

However, Wobbes⁶⁾ reported that retention in the loop constructed by bypass operation causes overgrowth of coliform bacteria. Whenever colostomy may fail to hemostasis in case of bleeding from the rectum, a resection of the rectum is required. Meanwhile, some investigators insist that aggressive surgery is mandatory for the treatment of radiation damage to the bowel because of progression of the lesion on the basis of vascular damage by irradiation.

However, the prognosis was not satisfactory because of recurrence of carcinoma.

Careful attention to anastomosis should be paid to prevent a complication of anastomosis insufficiency. No tissue damage to the cutedges of the bowel should be confirmed by intraoperative histologic examination. And also a staged operation which accompanies colostomy is recommended for the prevention of anastomosis insufficiency as cited by Sugg.⁷⁾ It is logical to emphasize that irradiation has led to the inhibition of recurrence and cancer extension. On the contrary, we must bear radiation damage to the tissues in mind. In particular, the indication of surgical treatment for a complication of radiation damage should be determined by patient-related and primary disease-related factors.

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