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Surgery for Irradiation Damage to the Digestive Tract.

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SUMMARY : The surgical outcome of radiation injury to the gut was evaluated on the basis of clinical experience. The main affected gut was the rectum in frequency. In most cases, colostomy was selected and the affected gut was left as it was. Some suffered from bleeding episode and 4 had carcinoma arising from radiation injury.

In conclusion, early resection of affected guts associated with clinical symptoms is recommended as the treatment of radiation-injured gut.

INTRODUCTION

It is accepted that radiation therapy may produce some degrees of the intestinal injury which has been classified into two categories, acute and late complications. The former consists of congestion, thickness and bleeding diathesis of the intestinal mucosa and the later comprises of massive bleeding, ulceration, stenosis and fistula fomation. The aim of this study is to clarify the incidence of radiation injury to the gut and the necessity of surgical treatment on the basis of our clinical experience with radiation injury to the gut.

MATERIALS AND METHODS

During the past 30 years from 1959 to 1988, thirty-seven patients complained of some trouble associated with previous radiation therapy. Eight out of 37 had fistula, formation, that is, rectovaginal fistula in 4, rectovesical fistula in 1, rectovesicovaginal fistula in 2 and vesicovaginal fistula in 1 respectively as shown in **Table 1.** The locations of the gut which was affected be radiation were the rectum in 25, the rectosigmoid colon in 5, by radiation were the rectum in 25, the rectosigmoid colon in 5, the sigmoid colon in 2, sigmoid colon + transverse colon + ileum in 1, the ileocecum in 2 and the small intestine in 2. Most frequntly affected site was the rectum. **Table 2** shows the primary

Table 1. Affected location and lesions of the gut by irradiation

affected location		fistula formation	
rectum	25	rectovaginal	4
rectum, sigmoid clon	5	rectovesical	1
sigmoid colon	2	rectovesicovaginal	2
sigmoid colon+tansverse colon+ileul	1	resicovaginal	1
ileocecam	2		
smal intestine	2		
Total	37		8

Table 2. Primary diseases required irradiation

Primary disease	
Carcioma of the uterus	32
Operated	13
Non-operated	19
Ovarial tumor	2
Vaginal cancer	1
Retroperitoneal tumor	1
Testicular tumor	1
Total	32

disease which required radiation. The main disease was uterine carcinoma, including the cases of proposed surgery in 13 out of 32. **Table 3** shows the cases who required surgery and the methods of operation. The surgery was mainly carried out to relieve the symptoms related to radiation injury to the lesion of the rectosigmoid region. On the other hand, the operation methods to eradicate the lesions were selected for the small intestine in 4 but one.

The main symptoms required surgery were bleeding, bowel obstruction, fistula formation and transformation to malignancy as shown in **Table 4.** The duration from the time of radiation to operation ranged from 4 months to 13 years, indicating a wide range of distribution. The symptom of bleeding occurred in an early stage within one year after initation of radiation or at least within 5 years and also transformation to malignancy associated with radiation-induced lesions appeared with the elapsed time of more than 10 years. The complaints of bowel obstruction and fistula formation were seen throughout the period.

The degrees of radiation injury to the gut were classified into the four categories as reported by Sherman. The candidates of surgery for the lesions in the rectosigmoid colon included the patients who corresponded to Sherman clasification II to IV as shown in **Table 5.** Most underwent colostomy without a resection of the site affected by radiation.

Six out of 32 patients had resection of the sites affected by radiation. However, two underwent resection of the affected rectosigmoid colons following preceeding colostomy. In this series, affected rectosigmoid colons made the removal difficult. The more severe the degree of radiation injury to the rectosigmoid colons, the lower resectability for the lesions was achieved.

The Surgical outcome was fair except for bleeding episodes which occurred in a few cases.

Table 6 showed 4 cases with carcinoma induced by radiation. All received over 45 Gy dosage of irradiation except one in whom the radiation dosage was uncertain. The time interval from termination of radiation to detection of carcinoma ranged from 11 to 23 years. The main complaints were bloody stool with defecation trouble. These lesions were resected and histologically confirmed as carcinomas with special patterns of histologic finding influenced by radiation which was charactereised with vasculitis and fibrosis in the submucosal layer originated in the radiation field.

Table 3. Surgery for the lesions affected by irradiation

Operation method	rectum sigmoid colon lesions	small intestine lesions
Colostmy	27	0
Mile's op.	6	0
Reluse of adhesion	1	0
Gut resection	0	2
Bypass op.	0	2
Gut resection+colostomy	0	1
Total	34	5

Table 4. Causes of operation required and the time interval from irradiation to operation

Causes	time interval 1y	5yrs	10yrs	<10	Total
bleeding	7	5	1	1	14
obsruction	4	2	2	4	12
fistula	1	3	2	2	8
malignant disease	0	1	0	4	5
Total	12	11	5	11	39

Table 5. Operation methods according to Sherman classification

Sherman classification		Operation method: Colostomy	Miles op	lysis of adhesion
I	0	0	0	0
II	16	11	4 (1)	1
III	8	6	2 (1)	0
IV	6	8	0	0

( ): Colostomy and Mile's by II stage op.

DISCUSSION

It is well known that irradiation in the abdomen causes the intestinal injury. The frequency is reported as being 2 to 7 percent. As repored by Friedman[3] it is accepted that tolerable radiation dosage of normal tissues is 42 Gy for the small intestin, 45 Gy for the transverse colon and 80 Gy for the rectum

respectively. It is believed that the rectum has a high tissue tolerance for radiation. Nevertheless, we are confronted with a high frequency of damage of radiation to the recutm as indicated in this series. Radiation injury is composed of acute and chronic injuries. Requirement of surgery is mainly made for the relief of complaints caused by chronic damage to the gut.

Colostomy as the operation method is generally performed to alleviate complaints. The surgical outcome is not necessarily satisfactory because organic damage to the gut is progressed, and no longer regressed, some are suffering from continuous or intermittent bleeding episode. If a resection of the affected gut is attempted to exclude such a late complication, surgical stress of a resection of the affected gut will become grave in combination with alternation of the urinary tract and pelvic exenteration.

There were some other reports[4] regarding caricnoma associtated with radiation injury. High frequency of radiation-induced carcinoma following irradiation for uterine cancer was reported[5]. In this series, 4 carcinomas were originated from previous irradiation. The criteria of radiation-induced carcinoma is that 1) cancer occurs in the field of previous irradiation 2) the tumor-burden colons has irradiation damage and histologic injury 3) the time interval appearing carcinoma should be more than 10 years. All four patients fulfilled these criteria.[6] Therefore, it is accepted that early resection is the best treatment for the affected rectum to prevent late bleeding and occurrence of carcinoma from the affected guts as far as no local and distant metastasis as well as not widely extending lesion may exist with the underlying premise of preservation of the natural anus.

As a surgical method, anterior resection could not be recommended because of wider field of irradiation. In general, the operation method of pull-through is preferred as reported by Deans[7]. At surgery histologic examination by frozen sections is necessary to determine the extent of resection except in the patients with preoperatively anal hypofunction due to anal diseases.

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