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Surgey for irradiational injury to the bowel

Masao Tomita, Teruhisa Shimizu, Noriaki Itoyanagi, Tsutomu Tagawa, Akihiro Nakamura, Masashi Muraoka, Terumitsu Sawai, Masaaki Jibiki, Toshikazu Matsuo

First Department of Surgery, Nagasaki University School of Medicine

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>
<thead>
<tr>
<th>Table 1. Patient profil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original disease</td>
</tr>
<tr>
<td>Uterine cancer Operated</td>
</tr>
<tr>
<td>34</td>
</tr>
<tr>
<td>non-operated</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>Carcinoma of the adenox</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>Vaginal carcinoma</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>retrovesical tumor</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>testicular tumor</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Age distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
</tr>
<tr>
<td>male</td>
</tr>
<tr>
<td>female</td>
</tr>
<tr>
<td>* reoperated</td>
</tr>
<tr>
<td>** re-reoperated</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Table 3. The time duration until surgery after irradiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>time duration symptom</td>
</tr>
<tr>
<td>bleeding</td>
</tr>
<tr>
<td>bowel obstruction</td>
</tr>
<tr>
<td>fistulization</td>
</tr>
<tr>
<td>malignant change</td>
</tr>
<tr>
<td>(including overlapped cases)</td>
</tr>
</tbody>
</table>

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 fistu-
la in one, rectovaginal-vesical fistulas in three and rectovaginal
fistula with vesicovaginal communication in one respec-
tively. Surgical treatment aimed at palliation of patient’s
suffering. Curability was not predicted because of diffi-
culty in complete and extensive resection of the involved
organs.

In this series we experienced four patients with malig-
nant change in the radiated field. Those 4 patients who
were defined as radiation-induced carcinoma were consis-
tent 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, demon-
strating 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 histo-
logic 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 carci-
noma.

<table>
<thead>
<tr>
<th>Case age</th>
<th>symptom</th>
<th>Location</th>
<th>size</th>
<th>Distance from the dentate line</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 female</td>
<td>constipation bloody stool</td>
<td>right lateral</td>
<td>2.4 x 1.9</td>
<td>3.2 cm</td>
<td>Pab. tub.</td>
</tr>
<tr>
<td>65 female</td>
<td>bloody stool</td>
<td>anterior</td>
<td>2.0 x 2.2</td>
<td>0</td>
<td>Pab. tub.</td>
</tr>
<tr>
<td>77 female</td>
<td>melena</td>
<td>anterior Rb</td>
<td>4.5 x 4.9</td>
<td>3.0 cm</td>
<td>mucinous</td>
</tr>
<tr>
<td>71 female</td>
<td>constipation</td>
<td>circumferential non-surgery</td>
<td></td>
<td></td>
<td>signet ring cell</td>
</tr>
</tbody>
</table>

The correlation with the dose and the kinds of irradia-
tion 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 dose of irradiation was found between less than or
more than 50 Gy, in spite of the small number of cases to
draw a conclusion.

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<tr>
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<tbody>
<tr>
<td>X-Ray</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radium</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tele Co</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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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 investigato-
rs with varying variety, 9.6 percent including 2% of severe
cases by Bosch, and 8% including 4 percent of a demand
of surgical treatment by Tanaka.

The influential factors of radiation damage to the bowel
were, age of the patient, dose of irradiation, intensity of
surgical insult, extension of primary carcinoma and internal
irradiation. Roswit emphasized that the small bowel is
more sensitive to irradiation than the large bowel. The
tolerable dose 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, thick-
ness 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.

Surgeons should be aware of recurrence of primary
carcinoma in the follow-up. One of the recurrent types is a
fistula formation. Conservative therapy is mostly of great
value in palliation of complaints. Meanwhile, surgery is
indispensable for the patients with bleeding, bowel obstruc-
tion 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, Wobbes reported that retention in the loop
constructed by bypass operation causes overgrowth of
coliform bacteria. Whenever colostomy may fail to hemos-
tasis 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.

The 4 patients with radiation-induced carcinoma were
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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 cut edges 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. 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.

References