Practical approaches to effective management of intestinal radiation injury: Benefit of resectional surgery

Nikolaos Perrakis, Evangelos Athanassiou, Dimitra Vamvakopoulou, Maria Kyriazi, Haris Kappos, Nikolaos C Vamvakopoulos, Iakovos Nomikos

Nikolaos Perrakis, Maria Kyriazi, Haris Kappos, Iakovos Nomikos, Department of Surgery, Metaxa Cancer Memorial Hospital, Piraeus 11522, Greece
Evangelos Athanassiou, Department of Surgery, University of Thessalia Medical School, Larissa 41110, Greece
Dimitra Vamvakopoulou, Nikolaos C Vamvakopoulos, Department of Biology and Genetics, University of Thessalia Medical School, Larissa 41110, Greece

Author contributions: Nomikos I, Athanassiou E, Vamvakopoulos NC contributed to study concept and design; Perrakis N, Kyriazi M, Kappos H, Vamvakopoulou D contributed to acquisition of data; Athanassiou E, Vamvakopoulou D, Nomikos I drafted the manuscript; Athanassiou E, Vamvakopoulou D critically reviewed the manuscript for important intellectual content.
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Correspondence to: Evangelos Athanassiou, Associate Professor of Surgery, University Hospital of Larissa, Larissa 41110, Greece. evangelosathanassiou@yahoo.com
Telephone: +30-241-3501560 Fax: +30-241-3501560
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Abstract

AIM: To study the outcome of patients undergoing surgical resection of the bowel for sustained radiation-induced damage intractable to conservative management.

METHODS: During a 7-year period we operated on 17 cases (5 male, 12 female) admitted to our surgical department with intestinal radiation injury (IRI). They were originally treated for a pelvic malignancy by surgical resection followed by postoperative radiotherapy. During follow-up, they developed radiation enteritis requiring surgical treatment due to failure of conservative management.

RESULTS: IRI was located in the terminal ileum in 12 patients, in the rectum in 2 patients, in the descending colon in 2 patients, and in the cecum in one patient. All patients had resection of the affected region(s). There were no postoperative deaths, while 3 cases presented with postoperative complications (17.7%). All patients remained free of symptoms without evidence of recurrence of IRI for a median follow-up period of 42 months (range, 6-96 months).

CONCLUSION: We report a favorable outcome without IRI recurrence of 17 patients treated by resection of the diseased bowel segment.

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Key words: Pelvic neoplasms; Bowel; Radiation injuries; Surgery

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INTRODUCTION

Intestinal radiation injury (IRI) is a common complication of radiation therapy for rectal, gynecologic and urologic malignancies. Despite improvements in radiation therapy, IRI...
technology, the incidence of IRI is increasing mainly as a consequence of the rapidly expanding application of radiation plus chemotherapy in the management of pelvic malignancies. It usually develops either early as acute radiation enteropathy, during or shortly after radiation therapy and resolving within 2-6 wk, or late, from 6 mo to as long as 30 years post radiotherapy as a chronic injury. Although the true incidence of IRI has not been well defined, it varies from 1.2% to as high as 37% especially in patients with rectal cancer.

Surgical management of IRI patients adopts either a conservative approach with adhesionolysis, and/or creation of diverting stomas, or a more radical operation with resection of the diseased segment of the bowel. Morbidity, mortality and recurrence rate after these two surgical options in the management of radiation enteropathy have not been well documented.

We report on the clinical presentation, pathology and outcome of 17 consecutive IRI cases managed by surgical removal of the diseased segment.

MATERIALS AND METHODS

Of the 1261 patients irradiated for pelvic malignancies in the radiotherapy department of Metaxa Cancer Memorial Hospital during a 7-year period, 83 were hospitalized for IRI and 17 (5 male, 12 female) required surgery. Their mean age was 69.3 years (range, 46-88). They were irradiated with a mean dose of 48.6 Gy (range, 40-55 Gy) for pelvic visceral organ malignancies. Their main presenting symptoms were: intractable abdominal pain in 10 patients, rectal bleeding in 5 patients, intractable diarrhea in 5, constipation in 3 and vomiting in 3. Eleven of the 17 patients had obstructive ileus and malabsorption before surgery. Table 1 provides comprehensive data of the operated patients.

Upon admission, all patients submitted to routine laboratory tests, endoscopic examination with biopsies, barium contrast studies of the small intestine and colon as required and computed tomography scans of the abdomen and pelvis. On admission they were placed on supportive measures to deal with the acute clinical situation and finally surgery was decided for failure of the conservative management approach.

RESULTS

Of the 17 patients, 12 had right hemicolectomy, 3 had sigmoidectomy and 2 underwent low anterior resection. We treated all patients by resection of a variable length of bowel and primary anastomosis and only 2 required an isolated stoma after resection. Figure 1 shows characteristic histological manifestations of the broad range of IRIIs observed in our patient group (Figure 1B-D) relative to normal tissue (Figure 1A).

No postoperative death was recorded while morbidity was seen in 3/17 patients. Two patients developed abdominal wound infection and one an enterocutaneous fistula that was treated conservatively and required prolonged hospital stay (Table 1). No evidence of recurrent IRI disease was observed during a median follow-up period of 42 mo (range, 6-96 mo).

DISCUSSION

IRI symptoms appeared 6 mo to several years after radiation therapy. Their severity was disproportional to the extent of mucosal damage projected from the histology of the resected bowel (Figure 1). The shortened bowel and its mesentry along with marked compromise of the splanchnic circulation are associated with a higher incidence of bowel injury.

The exact incidence of enteropathy lesions from radiotherapy varies considerably. When a total radiation dose of 45 Gy is delivered, chronic radiation lesions will be observed in 5% of patients. With 65 Gy of radiation, as many as 50% of patients are likely to be affected. Late injuries develop in 2%-8% of patients within 12 to 30 mo after treatment. A decreasing daily radiation dose increases the number of required sessions and minimizes radiation injury to normal tissue. Certain medical conditions, such as diabetes mellitus, hypertension and cardiovascular disease, that affect blood supply and compromise the splanchnic circulation are associated with a higher incidence of bowel injury.

In our series no postoperative death occurred and the patient morbidity was 17.7% (Table 1). Reappraisal of the surgical treatment on 48 IRI patients reported 21.7% morbidity and 4.1% mortality following small bowel resection of the radiation-damaged bowel and restorative proctectomy for rectal disease. Similar findings of 4.5% mortality and 30.2% morbidity after bowel resection on 109 operated patients with radiation enteritis and good life expectancy without recurrence of previous neoplastic disease have previously been reported.

The total dose of radiation therapy delivered to our patients never exceeded 55 Gy. In all patients adhesionolysis was performed before the definitive surgical procedure. All patients were followed for a median time of 42 mo and showed no evidence of IRI recurrence.

It is well known that acute infections secondary to mucositis of the oral cavity appear as complications after systemic chemotherapy and local radiation therapy for head and neck cancers. Potential causes of increased incidence of infections are vascular damage impairing oxygen delivery and immunologic function, lymphatic vascular injury leading to lymphedema and soft tissue necrosis. Similarly, the radiation-induced bowel injury in patients who have also received chemotherapy renders them susceptible...
to septic complications. Thus, when surgery is mandatory and resection is feasible, it should be performed, since removal of the diseased bowel segment acting as a possible source of sepsis diminishes the risk of recurrence of IRI and improves patient outcome.

Use of preventive surgical measures to avoid the harmful consequences of IRI is the most preferable choice. The 2 most common techniques utilized for IRI prevention have been the omental flap used as a sling across the pelvis and an absorbable mesh to suspend the small intestine up out of the true pelvis. Another surgical technique involves peritoneal reconstruction using the posterior rectus sheath to form a tissue shelf just at the level of the umbilicus, suturing this to the sacral promontory.

Although the long-term efficacy of the above techniques is unproven, the poly-glycolic acid mesh sling appears to be a promising method.
be the most reliable and reasonable method of keeping the small intestine out of the pelvis when postoperative pelvic radiation therapy is contemplated[24,25].

In conclusion, functional staging of IRI[26-28] may reveal either acute radiation enteritis or chronic radiation injury that should be managed conservatively. If that fails and resection of the diseased bowel is feasible[29-31], it should be adopted in all cases without exception.

### COMMENTS

#### Background

Surgical resection of the radiation damaged bowel segment and primary anastomosis whenever possible is accompanied by a better outcome in patients who failed to respond to the original conservative management due probably to the removal of a septic area following surgical resection of the original pelvic malignancy and postoperative radiotherapy.

#### Research frontiers

The reasoning of this study is the development of an area in the radiation-damaged bowel that serves as a potential cause of sepsis not responding to conservative management and requiring radical measures for effective treatment.

#### Innovations and breakthroughs

Surgical removal of a sepsis inside the abdomen is always more effective resulting in a better outcome.

#### Applications

It is always desirable to be able to treat patients suffering from serious complications of radiation enteritis with radical resection if they fail conservative management.

#### Peer review

The article is an important topic. The problem of radiation-induced intestinal injury causes important morbidity. The number of patients in this series is small. However, the results are impressive.

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