High Dose Rate Intracavitary Therapy in Advanced Carcinoma Esophagus

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Abstract
Nine patients with advanced squamous cell carcinoma of the middle third of the esophagus were treated by high dose rate intracavitary therapy. The dose delivered was 12 Gy in two sessions at 1 cm from the center of the tumor. All the patients were alive after 9 months. Six months after treatment, 4 patients had strictures which were dilated. At the end of nine months, 6 patients had dysphagia, four of whom had strictures and two had recurrence which was treated by further intracavitary irradiation. Intracavitary radiation using high dose rate, remote controlled afterloader has a significant role in palliation in patients with advanced esophageal carcinoma and avoids intubation.

Key words: Esophagus, neoplasm, therapeutic radiology.

Introduction
Carcinoma of the esophagus is a disease with poor prognosis owing to the high incidence of local recurrence and distant metastasis at the time of presentation. Most of the patients present with advanced disease and treatment is aimed only at palliation which can be provided with radiation therapy. In the past this has been attempted by external beam irradiation, with doses ranging from 40-60 Gy, but the results have been disappointing. With the advent of intracavitary therapy, attempts have been made to deliver the highest possible dose locally to boost following external irradiation in patients with early disease, with the idea of attaining a cure. However, in a country like India, where more than 90% of patients come with advanced disease, it is important to provide a symptom-free survival with the least side effects of radiation therapy. Intracavitary irradiation alone, by delivering a high local dose, may be the answer in such instances.

Material and Methods
Nine patients with advanced esophageal squamous cell carcinoma involving the middle third of esophagus were included in the study. Each patient had undergone clinical evaluation, chest X-ray, barium swallow, endoscopy, biopsy, brush cytology and CT scan or surgery. The selection criteria for the study were: (a) tumor in the middle third esophagus with length 6-10 cm; (b) preservation of lumen to at least 10 mm so as to allow unhindered passage of bougie; (c) locally dates for surgery; and (d) a good performance status (Karnofsky more than 70).

Selectron High Dose Rate (HDR) 90Co remote controlled afterloader (Nucletron, Netherlands) was used for irradiation using an afterloading catheter (Fig 1) which was placed across the tumor length.

Fig 1: Selectron bougie (Nucletron, Netherlands) with dummy pellets and guidewire.

or distally advanced disease, making them poor candidates for surgery. A 1 cm margin of safety was prescribed on either side of the tumor length to give a total treating length of 8 to 12 cm. A dose of 1200 cGy was delivered 1 cm from the center of the source, in two sessions of 600 cGy each a week apart. Calculations for the dosimetry and treatment time were done using the treatment planning system TP-11 (AECL, Canada). Isodose curves obtained are shown in Fig 2.

The patients were followed up at 1 month, 2 months, 6 months and 9 months. At each visit, the patients were questioned about the grade of dysphagia (grade I—dysphagia to solids; grade II—so semisolids, grade III—to liquids) and assessed by barium swallow and endoscopy. Brush cytology and biopsies were taken to look for local tumor recurrence in patients with endoscopic abnormalities. Patients with strictures were subjected to endoscopic dilatation using Eder-Peslow metal olives till adequate lumen was re-established.

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Results

All 9 patients were alive at 9 months after the initiation of therapy. All 9 had improvement in dysphagia; at 1 month, 4 patients could swallow solids. 5 could swallow only semisolids. Endoscopy at 1 month revealed edema, ulceration and friability at the site of primary growth in all the patients. Brush cytology and biopsies did not reveal any tumor. At 2 months, all the 9 patients continued to have relief in dysphagia with ability to swallow solids. At endoscopy, mucosal edema had subsided and ulceration had healed.

At 6 months, 4 patients had dysphagia to semisolids/solids. Recurrence of malignancy was excluded by endoscopy and biopsy. These 4 patients underwent 1-2 sessions of endoscopic dilatation. All the patients continued to be able to take oral feeds (solids 7; semisolids 2) for the next 3 months. At 9 months, 6 patients had dysphagia, 4 to solids and 2 to semisolids. Two of these had ulcerated growths confirmed on biopsy/cytology while 4 had stricture. The former received 600 cGy of intracavitary irradiation while the latter were dilated. All the 9 patients were well and on oral feeds 10 to 11 months after the start of treatment. None of the patients had any complication related to endoscopy or dilatation.

Discussion

Intracavitary therapy for the treatment of carcinoma esophagus was first attempted by Bougic in 1901. Because of technical difficulties and high risk to personnel, the procedure was abandoned. In 1979, Botterill et al proposed an afterloading technique in the treatment of esophageal cancer by intracavitary irradiation. High and low dose rate afterloaders have been used with external beam radiation to deliver the highest possible local dose. As it is not possible to irradiate the esophagus to a sufficiently high dose with external beam irradiation alone without the risk of injury to surrounding organs, the role of intracavitary irradiation gained acceptance.

Table: Summary of observations after treatment in 9 patients

<table>
<thead>
<tr>
<th></th>
<th>1 month</th>
<th>2 months</th>
<th>6 months</th>
<th>9 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>59 dysphagia to semisolids</td>
<td>Dysphagia to solids</td>
<td>Dysphagia to solids-4; to semisolids-2</td>
<td></td>
</tr>
<tr>
<td>Barium Swallow</td>
<td>Narrowing of lumen</td>
<td>Adequate patient tolerance</td>
<td>Stricture with smooth tapering ends</td>
<td></td>
</tr>
<tr>
<td>Endoscopy</td>
<td>Ulceration and edema of mucosa</td>
<td>Friability and scarring of mucosa</td>
<td>Narrowing of lumen-4; growth-2</td>
<td></td>
</tr>
<tr>
<td>Biopsy and malignancy</td>
<td>No evidence of malignancy</td>
<td>No evidence of malignancy</td>
<td>No evidence of malignancy</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>Nil if any attempt was made</td>
<td>Nil</td>
<td>Dilatation-4 patients</td>
<td>Dilatation-4; repeat intracavitary irradiation-2</td>
</tr>
</tbody>
</table>

In our series, all patients were treated by intracavitary irradiation with palliative intent, delivering a total dose of 1200 cGy/1 cm from the center of the source in two sessions a week apart. The advantages of treatment by high dose rate remote controlled afterloaders are: (a) short treatment time; (b) minimal patient discomfort; (c) no anesthesia required; (d) can be done on outpatient basis; (e) minimal personnel risk; (f) minimal irradiation of the surrounding organs; (g) minimal extra esophageal morbidity; (h) avoids intubation and maintains normal swallowing. We have used this technique only for patients who had at least 10 mm of patent esophageal lumen and those who had a good performance status. If the esophageal lumen is less than 10 mm (the diameter of the bougie = 8 mm) one can attempt dilatation before bougicage. This may, however, be associated with increased chances of ulceration and cicatrization.

Rowland and Paglierio were the first to show that intracavitary irradiation is an effective modality of palliation for carcinoma esophagus. These workers, however, did not report the follow up details of their patients. The present pilot study was an attempt to see if intracavitary irradiation alone is adequate for palliation of carcinoma esophagus in our patients and to see the survival pattern of these patients. The duration of palliation achieved in our patients ranged from 6-9 months of symptom-free survival. Although endoscopic biopsy done at regular intervals did not show any viable tumor except in two patients at 9 months, the possibility of residual tumor in deeper planes

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INTRACAVITARY THERAPY IN ESOPHAGEAL CARCINOMA

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cannot be ruled out with endoscopic biopsies. Recurrence of the disease detected on endoscopic biopsies can always be treated with further intracavitary irradiation. The problem, however, is the significant occurrence of radiation induced strictures, which is not unexpected. These strictures can be dilated without any risk, as was our experience.

Other modes of palliation like external beam radiation alone and chemotherapy have not been shown to improve the survival. In a series of 446 cases of carcinoma esophagus of whom 148 were treated by palliative radiation, Rider and Mendoza reported a survival of 5 months which was not different from the 4-month survival in untreated patients. However, all these patients had improvement in the quality of life. More than 10 agents have been tried for chemotheraphy of carcinoma esophagus, but the response is generally partial only, that too in upto 20% of patients. A combination of agents can improve the median response to upto 7 months in upto 40-50% of patients.

Although this procedure is safe, effective and associated with acceptable complications, patient selection is important to achieve high degree of palliation. Low doses of external beam therapy ranging from 24-35 Gy combined with intracavitary therapy may be more useful. The aim of external beam would be to shrink the tumor so that intracavitary therapy could be made possible. In this context, a combination of laser and intracavitary therapy can also be useful. Both these regimes need further clinical evaluation before establishing their value in the palliation of advanced carcinoma esophagus.

References

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