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Endocavitary Irradiation of Early Rectal Cancers for Cure: A Series of 123 Cases

Before discussing the conservative treatment of early rectal cancers by irradiation, the phrase 'early cancer', as used in this paper, must be defined. As the treatment is not surgical this definition is based not on pathological study of operation specimens but on clinical data only. It includes invasive carcinomas with an unequivocal, histological protocol, and those which are clinically limited and slightly infiltrating.

Rectal cancer is generally considered to be only slightly radiosensitive, because of the rather bad results obtained from external irradiation applied to advanced rectal cancers or to local recurrences after amputation. This does not, however, apply to the treatment of early rectal carcinomas by endocavitary irradiation, using contact X-ray therapy either alone, or in combination with interstitial curietherapy by radium or iridium. It may seem surprising that an adenocarcinoma, known to be rather radioresistant if treated by a classical technique of irradiation, becomes very radiosensitive and radiocurable if treated by another technique. But the radiobiological features, i.e. the dose-time and dose-volume relationships, of the two techniques are quite different.

In external irradiation with cobalt 60, a dose of 4000 rad is necessarily applied to a very large volume of tissue, including an important part of the pelvic area. It cannot be delivered in less than 4 weeks. In endocavitary irradiation, a dose of 4000 R is given in 3 minutes (contact X-ray therapy) or a dose of 4000 rad is given in 3 days (interstitial curie-therapy) on a small target

volume, not exceeding a few cubic centimetres. This is why endocavitary irradiation has a special efficacy for the limited rectal cancers.

Technique of Contact X-ray Therapy

The machine used (Philips) has the following characteristics: low voltage (50 kV); short focal distance (4 cm); high output (1500-2000 R/min in the air); important absorption of the X-ray beam in the first 2 cm; narrow, light tube, easy to handle, and capable of being introduced in a special rectoscope.

The operator holds the X-ray tube in the right hand and the rectoscope in the left. He can at any time withdraw the tube and check the position of the field of irradiation, which is circular (diameter 3 cm). It is possible to use two overlapping fields.

A small number (3-5) of short applications (2-4 minutes) are given during an overall treatment time of 4-6 weeks. The treatment is carried out in the outpatient department and is compatible with normal active life. It is easily applicable in elderly or fragile patients.

The high dose of radiation given at every application (2500-4000 R) produces a rapid shrinkage of the exophytic part of the tumour. Hence at the second and third applications the tumour has a greatly reduced volume. The dose at every sitting, the size of the field and the intervals between each application are calculated in relation to the speed of shrinkage of the tumour (Papillon 1970).

Technique of Interstitial Curitherapy

This is essentially applied to the residual lesion, or to the bed of the tumour after completion of contact X-ray therapy. Radium implant is made in the knee-chest position without general anaesthesia. Needles 4 cm in length are not sutured to the rectal wall but kept in place by a rubber drain pushed through the anus and fixed to the skin of the external margin. A dose of 2000-3000 rad is usually delivered in two or three days. Admission to hospital is necessary and anticoagulation treatment is systematically applied in order to prevent thromboembolism.

Neither of these techniques necessitates colostomy or anaesthesia. The rectal wall tolerates endocavitary irradiation very well if the technique is good and the given dose normal. After completion of treatment there is often a very mild proctitis for two or three weeks. Afterwards the

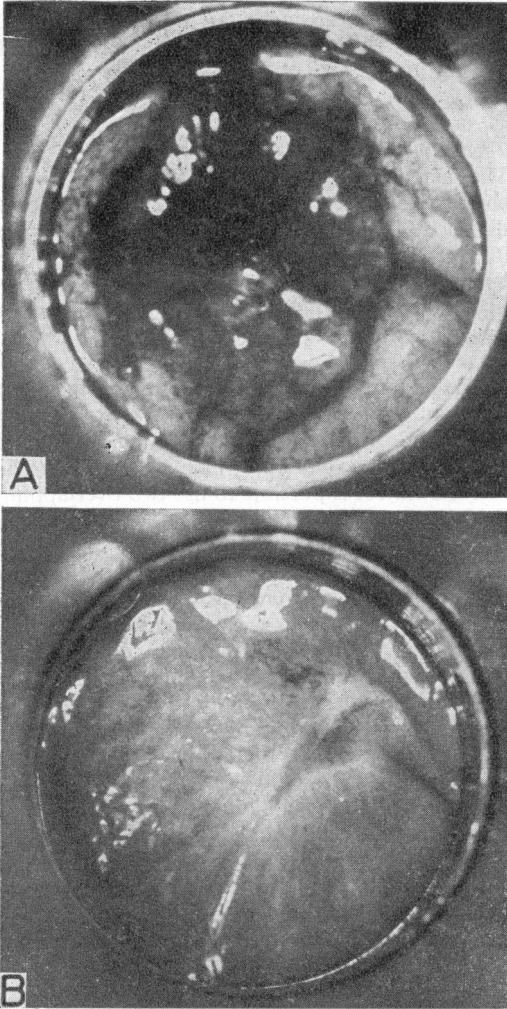


Fig 1 Well-differentiated ulcerative rectal adenocarcinoma, 1 in. (2.5 cm) in diameter, in a 70-year-old woman. A, before endocavitary irradiation. B, after contact X-ray therapy and radium implant. The patient is alive and well after more than 5 years

patient remains in good general condition with no rectal troubles, except sometimes slight bleeding due to telangiectases (see Fig 1).

Endocavitary irradiation is a purely local treatment which concerns only the rectal growth, not lymphatic dissemination. The principal objection to local methods of treatment (diathermocoagulation, local excision, endocavitary irradiation) is lack of knowledge of the presence or absence of metastatic nodes. Local treatment can only be applied to tumours where lymphatic spread is considered improbable. The rate of lymphatic spread depends on two factors:

(1) *Histological type:* Poorly differentiated carcinomas have a high rate of lymphatic involvement: rates from 55% to 81% have been reported by Dukes (1960), Grinnel (1954) and Choldine (1955). Well-differentiated carcinomas have a much lower rate of lymphatic spread (7-30%).

(2) *Local spread:* From the study of 2350 operation specimens Morson (1966) showed that, until penetration of the rectal wall has taken place, the probability of lymphatic involvement occurring is very low. One must distinguish between advanced tumours, which have spread beyond the bowel wall and have a rate of lymphatic spread of 58.3%, and limited tumours, which are still confined to the bowel wall and have a low rate of lymphatic involvement. This rate may be estimated as between 12.1% for ulcerating growths and less than 6% for polypoid, well-differentiated carcinomas.

Early polypoid tumours confined to the rectal wall tend to be local if well differentiated; they do not always need radical surgery and can sometimes be treated by conservative procedures, especially in high surgical risk patients. Strict selection is necessary before a limited rectal adenocarcinoma is treated by endocavitary irradiation. There are five criteria for selection:

(1) *Histological type:* Only well-differentiated adenocarcinomas may be accepted, because of their lower rate of potential lymphatic involvement.

(2) The total volume of the tumour must be entirely accessible.

(3) The size of the growth must not exceed 5 cm in length and 3 cm in width.

(4) The morphology and degree of infiltration must be carefully assessed. The best indications for contact X-ray therapy are polypoid carcinomas. Some limited ulcerative growths can also be treated by a combination of contact therapy and interstitial curietherapy, as long as they are slightly infiltrating and perfectly mobile.

(5) Absence of palpable metastatic nodes in the mesorectum: the first nodes to receive metastases are those situated in the perirectal tissues on the same level as or immediately above the primary growth, and there is no discontinuous lymphatic extension (Gabriel *et al.* 1935). If the location of the growth is low enough, it is possible to carry out a finger examination of the rectal wall above it. By careful palpation in the knee-chest position, a metastatic node, easily recognizable by its hardness, may sometimes be found, in which case a local procedure must be abandoned in favour of radical surgery. This systematic search for metastatic nodes in the mesorectum is not

classical; however, it is a very important way of approaching the problem of lymphatic dissemination in local treatment of growths in the lower part of the rectum.

After the completion of endocavitary irradiation, regular follow-up examinations must be made to check not only the suppleness of the scar but also the absence of nodes in the rectal wall. Obviously the discovery of a local recurrence or of a node in the mesorectum is an indication for subsequent surgery.

Results of Treatment

In Lyons between 1951 and 1967, 123 patients with rectal cancers were treated by endocavitary irradiation. All the tumours were invasive adenocarcinomas. Degenerated villous tumours and cancers in polyps were excluded.

Out of 123 patients 34 died before 5 years, 16 from intercurrent disease and 18 from rectal cancer (8 metastases, only 9 from local-regional spread; one postoperative death). Eighty-nine patients (72%) are alive and well after more than five years: 5 underwent subsequent radical surgery for failure, and 84 are disease-free after irradiation with complete conservation of the intestinal function without any sequelæ.

Conclusions

Endocavitary irradiation has many advantages: there is no mortality risk and, if properly applied, very few complications such as perforation, hæmorrhage, thrombosis, fistula, or stricture of the rectal lumen. It allows the possibility of subsequent surgery in case of failure. It is a reliable method of curing many early rectal cancers, but if it is to achieve its full curative effect selection must be very careful. It is not only a condition of effectiveness, but also a condition of relative safety in regard to the absence of metastatic nodes. In starting this treatment the radiotherapist must be fully aware of the responsibility he is taking, and must take into account the fact that he is using a nonclassical procedure for tumours which could be classically removed and cured by radical surgery.

Endocavitary irradiation must not be considered as opposed to radical surgery. Both techniques have their place. The use of endocavitary irradiation may make it possible to avoid permanent colostomy without compromising the chances of cure. The chances of success are based both on local control of the disease and on its potential lymphatic spread, which must be taken into special consideration for each case. Under these circumstances endocavitary irradiation deserves

an appreciable place in the management of early rectal cancers, especially in elderly patients and in patients with cardiovascular, hepatic or respiratory disease.

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Preoperative Irradiation of Carcinoma of the Rectum: Cleveland Clinic Experience

The main purpose of preoperative irradiation is to avoid dissemination of viable cells at the time of surgery. Our technique of preoperative irradiation for carcinoma of the rectum is as follows. An 800 rad tumour dose calculated at the centre of the rectum is delivered daily for three consecutive days to a total of 2400 rad. A cobalt 60 teletherapy unit is used in all cases at a source skin distance of 80 cm. A resection is then performed 10–15 days later. Two posterior oblique ports 8 × 15 cm are utilized, with wedges. Results are shown in Table 1.

Table 1

Results of preoperative irradiation of carcinoma of the rectum at the Cleveland Clinic

Dukes stage	No. of cases	No. alive and well for 5 years or more	Percentage survival rate
A	5	4	80
B ₁	12	9	75
B ₂	9	8	89
C	17	4	24

No serious complications have developed. If we consider the group of cases included in Dukes A and B stages and correct the 5-year survival for postoperative death, the cure rate at 5 years is 87.5%. Only 3 patients died of cancer and 2 of them had anaplastic carcinoma. There are 21 cases in Dukes B₁ and B₂ stages; of these 81% are alive and well after 5 years or more. We feel that this result compares favourably with reported results in the literature.