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Technical Note

Perianal synovial sarcoma treated postoperatively with Iodine-125 brachytherapy: Technical details

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ABSTRACT

PURPOSE: A 23-year-old lady had an incompletely excised perianal sarcoma. Brachytherapy as the sole treatment, rather than further surgery or external beam radiotherapy, was considered to be the best option with the least morbidity.

METHODS AND MATERIALS: Although brachytherapy techniques with iridium-192 for anal and rectal carcinoma are well described using a perianal template, the size of the template was not suitable for a two-plane implant that needed to be *in situ* for about 4 days. An anal canal applicator was designed, which carried three templates about 15 mm apart inside it, to ensure accurate alignment of the tubes, and an inferior template that was 90 mm from the perianal skin. Three inner and three outer tubes of iodine-125 seeds were designed to treat a 2 o'clock h wedge of perianal tissue as a temporary implant. A thin metal shield was placed around a hole to protect the uninvolved anal canal. The tubes were inserted under general anesthetic and delivered a dose of 59 Gy at 0.8 Gy/h over 75 h. A spinal anesthetic was maintained for the duration of the insertion.

RESULTS: The treatment was well tolerated, and the patient is well and clear of disease 6 years later with minimal morbidity.

CONCLUSIONS: Iodine-125 is a low-energy isotope, readily available in our unit, that can be easily screened to reduce morbidity to surrounding normal tissues. In the form of seeds, it provides a flexible system that can be adapted to different tumor sites as required, as illustrated in this case.

Keywords: Synovial sarcoma; Perianal sarcoma; Brachytherapy; Iodine-125; Postoperative treatment

Introduction

Synovial sarcoma is a high-grade malignant tumor, accounting for about 8% of soft tissue sarcomas (1). Although the age at presentation can range from 5 to 87 years (2), it is most frequently seen between the ages of 15 and 35 years (3). It is most often found in the extremities and only reported in the abdomen and pelvis in 3−7% of cases (2, 4). Wide local excision of the tumor is the optimal treatment combined with radiotherapy for involved or close margins (4). Adjuvant chemotherapy is not a standard treatment option for adult tumors (2).

Single-plane or occasionally double-plane low-dose-rate (LDR) iridium-192 (^{192}Ir) (5−10), pulsed-dose-rate (11, 12), and high-dose-rate (13) interstitial implants have been used as a boost to external beam radiotherapy (EBRT) in the treatment of anal canal carcinomas, with or without chemotherapy. Doses of 36−50 Gy EBRT have been used (5, 6, 8, 11, 12) followed by a boost of 20−30 Gy some weeks later, after tumor shrinkage. A perineal template is used for the implant. Iodine-125 (^{125}I) has also been used as a permanent implant boost for recurrent colorectal carcinoma (14, 15).

There are no recorded cases of a perianal sarcoma being treated with brachytherapy. We report on a patient with a perianal synovial sarcoma treated postoperatively with a

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novel LDR technique using two planes of ^{125}I seeds as a temporary implant for the whole treatment. The technical details and challenges are described.

Methods and materials

A 23-year-old female had a slow-growing perianal mass for the last 6 months, thought to be a perianal abscess, which was incised and biopsied. The histology showed a synovial sarcoma; consequently, a wide local excision of a 20-mm tumor was performed. To preserve the anal sphincter, close margins were taken. The histology of the mass was a biphasic synovial sarcoma with involvement of the superficial and medial margins. The other histological margins ranged from 0.3 to 2.2 mm. On examination, she had a 30-mm scar at the anal verge at 5 o'clock when in the lithotomy position but no evidence of residual disease.

There were several options for further management, such as close monitoring only, further surgery that would involve an abdominoperineal resection with a permanent colostomy, external beam radiation, and radiation with brachytherapy to the local area of close and involved margins.

^{125}I seeds are readily available in the department at Groote Schuur Hospital, Cape Town, South Africa, where they are used to treat tumors in and around the eye, as well as in the oral cavity and oropharynx. A batch of seeds, Amersham model 6711, with an initial apparent activity of 5.2 mCi is received every 6 weeks, and therefore, a variety of activities is available. The energy is 0.028 MeV, and the half-life is 59.4 days. The principal photon emissions are 27.4 and 31.4 keV X-rays and a 35.5 keV gamma ray. Also emitted are 22.1 and 25.2 keV fluorescent X-rays from the silver rod. The half-value thickness of lead for ^{125}I is 0.025 mm. Thus, a 0.25-mm lead sheet will provide more than 99% reduction in exposure. The half-value layer for ^{125}I is about 20 mm. ^{125}I seeds are used as temporary implants, remaining *in situ* for less than a week and can therefore be used several times during their half-life, thus making the procedures cost effective. With the low energy, the seeds can be easily screened to protect surrounding sensitive structures and the techniques can be adapted to different tumor sites. The patient was offered brachytherapy using ^{125}I seeds as a temporary implant for the whole treatment. EBRT was not considered necessary as only the local area required treatment and there was no macroscopic tumor to shrink.

It was decided to treat a 10-mm thick wedge of perianal tissue from 4 to 6 o'clock, that is, on either side of the scar, extending 20 mm superiorly toward the rectum. This would require three inner nylon tubes, each containing ^{125}I seeds and being 5 mm apart, attached to an applicator inserted in the anal canal. In addition, three outer tubes of ^{125}I seeds were to be inserted through the perianal skin 10 mm apart and 10 mm peripheral to the inner tubes in the anal canal (Figs. 1 and 2). The challenge was to maintain the distance of 10 mm between inner and outer tubes throughout their length, hence the necessity of designing an appropriate template.

A nylon mold in the shape of the anal canal was machined in the workshop, and it was extended and splayed out superiorly so as to be retained in the rectum by the superior sphincter. It had a central hole of 10 mm to allow flatus to pass. The initial device had a Perspex template (Maizeys Plastics (PTY) Ltd, Plastic Fabrication company, Western Cape, South Africa) attached inferiorly so as to align the introduction of the outer trains correctly (Fig. 3). The position of the template was unsuitable as the nylon material was rigid and impinged on the adjacent skin of the buttocks. It would have been uncomfortable for the patient for the anticipated 4 days of insertion.

The template was removed from the inferior end of the mold, and an impression of the space between the buttocks was made with soft modeling material. This would form an extension to the anal canal mold, could carry the template, and be tolerated for the duration of the treatment. An anterior and posterior plaster of Paris cast was made of the anal canal mold and extension. When the cast had set, the two parts (negative) were separated, and the mold (positive) was removed (Fig. 4). Three additional templates were prepared with a 10-mm diameter central hole, three inner holes, 5 mm apart, and three outer holes 10 mm apart from the inner holes and from each other. These were designed to carry the plastic tubing with the ^{125}I seeds. The three templates were positioned in the plaster of Paris negative 15 mm apart to ensure the correct positioning of the tubes when implanted. Six introducer needles were inserted through the six holes in the templates; these would form the channels in the mold for introducing the tubes containing the ^{125}I seeds (Figs. 5 and 6); only two of the templates are shown together with the outer Perspex template. A Perspex rod was inserted through the central hole. To protect the uninvolved anal canal, a thin piece of lead sheeting was placed around the rod from 6.30 to 3.30 (Fig. 7). The rod was removed leaving the shielding in place and an

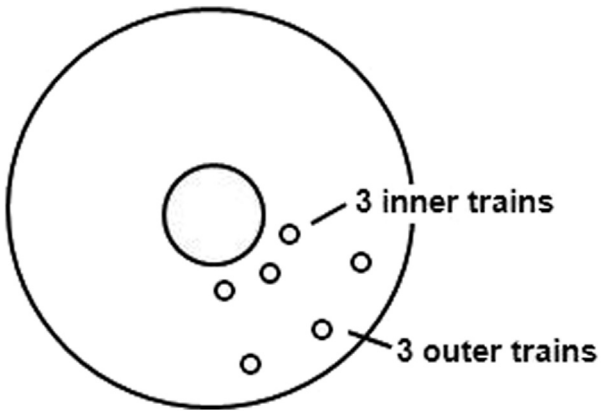

Fig. 1. Design of implant.