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INTERSTITIAL ^{125}I IMPLANTATION IN THE RETREATMENT OF RETROPERITONEAL SOFT TISSUE SARCOMA

Report of a case

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Abstract

Interstitial ^{125}I was succesfully used in the retreatment of a large recurrent malignant schwannoma in the retroperitoneum. After an average tumor dose of 160 Gy the tumor calcified and the patient is well, without disease 2 years later.

Key words: Therapeutic radiology, interstitial; ^{125}I, soft tissue sarcoma, retroperitoneal space.

Retroperitoneal schwannoma is a rare type of soft tissue sarcoma which occurs as a solitary lesion, or in association with von Recklinghausen's disease. Half of the lesions are large and deeply situated at the time of diagnosis (7). Most authors agree (3, 4, 6), that whenever possible, en bloc radical local excision or major amputation is the treatment of choice. Tumors located in the abdomen, retroperitoneum, or thorax have a comparatively worse prognosis, and in the series of GHOSH et coll. (7), only 27 per cent of patients survived 5 years following laparotomy or thoracotomy for abdominal and thoracic malignant schwannomas. Little data exist supporting the curative role of radiation therapy in the definitive management of unresectable retroperitoneal schwannoma. ARIEL (2) reviewed the subject and concluded that radiation therapy can offer significant palliation in the treatment of malignant nerve sheath tumors, but no cures have been observed. In a limited number of cases, external beam radiation therapy alone has been tried with occasional success in unresectable malignant schwannoma. DAS GUPTA (4) reported 5-year salvages in 2 of 6 patients treated with radiation therapy alone from the University of Illinois series. In the Memorial Hospital series (4) 54 patients with malignant schwannoma received curative initial courses of radiation therapy. Although 28 of 48 evaluable treated patients survived 5 years without evidence of disease, only one of the cures could be attributed to radiation therapy alone. The remainder required wide excision for residual tumor following radiation failure. More reliable information is available on the results of radiation therapy in the definitive treatment of soft-tissue sarcomas (including retroperitoneal schwannomas). In a series from the Massachusetts General Hospital, SUIT (12) noted local tumor control of soft-tissue sarcomas in only 7 per cent (2/27 patients) treated with a total radiation dose of less than 65 Gy and improved local control of soft tissue sarcoma in 63 per cent (17/27 patients) treated with a total radiation dose of 65 Gy or more. Results are inferior to this for the larger, high-grade soft-tissue sarcomas such as the typical retroperitoneal malignant schwannoma. Unfortunately, in the retroperitoneum and spinal region, required curative doses in excess of 45 to 50 Gy cannot be easily or safely delivered without great risk of radiation-induced gastrointestinal, genitourinary, or spinal cord complications. The higher doses required for local control and the inherent normal-tissue-tolerance limitations of external beam megavoltage radiation therapy may explain the failure of this modality to adequately control retroperitoneal soft-tissue sarcomas.

Case report

In April, 1977, a 37-year-old male presented with a 2-year history of intermittent low-back pain radiating down the right posterior thigh and calf to the lateral malleolus, and recent difficulty in getting his urine started. On examination, there was lumbar list to the left. He had right lower extremity pain with forward flexion and straight-leg raising. There was atrophy and weakness of the right gluteus and right calf muscles, and weakness with dorsal-flexion of the right great toe. There was sensory loss in the L5, S1 dermatome pattern. Right achilles reflex was absent. Radiography of the lumbosacral spine showed destruction of the right pedicle, transverse process, and right half of the

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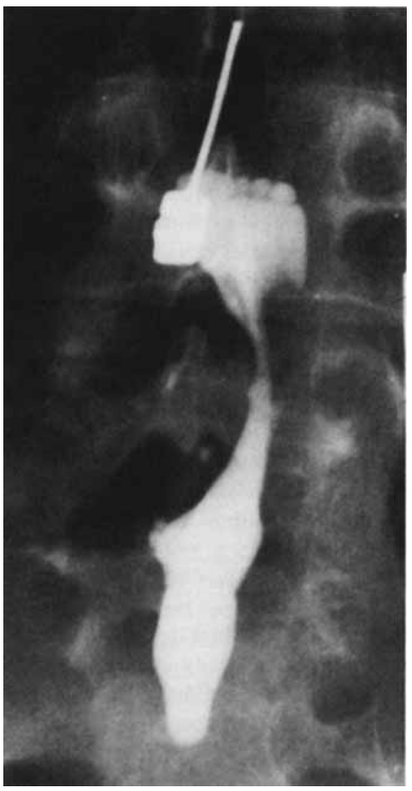
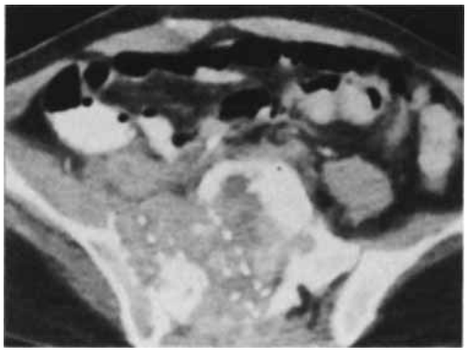


Fig. 1. Myelography. Large extradural defect extending from L4 to S1 on the right side.



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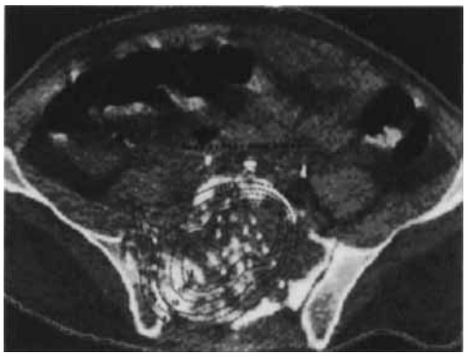

b

Fig. 3. a) Computed tomography shows the ^{125}I seeds within the tumor mass. b) Computed dosimetry showing the isodose curves. The 0.08 Gy/h (8 rad/h) isodose line encompasses all the seeds. This delivered an average dose of 160 Gy in the tumor volume.

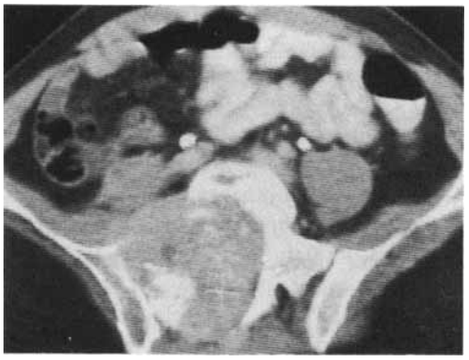

Fig. 2. Computed tomography of the lumbosacral area. Large tumor mass involving the vertebral bodies of L4, L5, and S1 on the right side as well as involvement of the right sacro-iliac joint and extension across midline to the left.

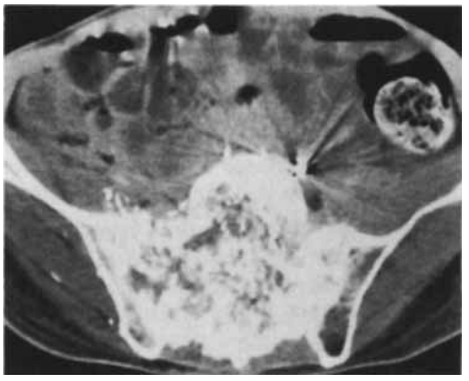

Fig. 4. Computed tomography of the lumbosacral area 18 months following implantation. Complete calcification within the tumor-bearing area and reconstruction of previously destroyed bone.

body of L5. There was also involvement of the right sacral wing with enlarged sacral foramina. Myelography revealed a large extradural defect starting from L4 on the right and extending to L5 (Fig. 1).

Laminectomy of L4 and L5 was preformed, at which time an epidural tumor was found, which started at the L4 level and extended down into the sacral canal. The tumor was also extending into the right paraspinous muscle tissue. At the level of L5 it was felt to be arising from the right S1 nerve root. The dural sheath was completely encased in tumor. A subtotal resection of the tumor and rhizotomy of the right S1 root was performed. Post-operatively, the patient had good relief of his pain and there was no change in his neurologic findings. Light microscopy and electron microscopy confirmed the diagnosis of malignant

schwanomma. The tumor bearing area was irradiated with a dose of 50 Gy delivered through a single posterior port measuring 11 cm × 18 cm using a ^{60}Co machine.

The patient was well until May, 1981, when his pain returned and computed tomography (CT) of the lumbosacral region showed progression of disease. The patient received 8 cycles of DTIC, adriamycin, and cyclophosphamide followed by 3 courses of cis-platinum. By September, 1982, the patient started having pain in the left lower extremity as well. Repeat CT of the lumbosacral region showed progression. Between September 1982 and January 1983, multiple bilateral hypogastric embolizations were performed in an attempt to control the tumor. Following this procedure, the pain got worse and the patient become paraparetic with loss of bladder and bowel control.

In February, 1983, the patient was re-evaluated. Computed tomography of the lumbosacral area showed a large tumor mass destroying vertebral bodies of L5 and S1 on the right side and extending onto the right sacroiliac joint and across midline to the left (Fig. 2). Urography showed lateral displacement of the right ureter in front of the right sacro-iliac joint with marked right hydronephrosis. It was now decided to treat the recurrent disease with interstitial irradiation using ^{125}I permanent implantation.

Technique

An anterior retroperitoneal approach was used to implant the tumor. Before the exposure of the tumor, a ureteral stint was placed on the right side through cystoscopy. This was done as a therapeutic procedure for right hydronephrosis, as well as to identify the right ureter during the implant. After proper retroperitoneal exposure of the tumor, 229 ^{125}I seeds of 14.8 MBq each were permanently implanted into the tumor (Fig. 3), giving an average dose in the tumor volume of 160 Gy.

The severe pain which the patient developed following the bilateral embolization of the hypogastric arteries was controlled with epidural morphine sulphate through a pump. The bladder was managed with intermittent catheterization and irrigation. A colostomy was performed to correct the loss of bowel control. The patient was regularly followed with repeat CT of the lumbosacral region. At two years following the ^{125}I implantation, there was complete recalcification of the lesion (Fig. 4). The patient regained nervous function, became ambulatory with the use of a cane and could go back to full-time work.

Discussion

Brachytherapy has several advantages over external beam therapy in the treatment of retroperitoneal malignant schwannoma. With external-beam radiation, doses in excess of 45 to 50 Gy cannot be delivered easily or safely to a large retroperitoneal tumor volume without exceeding the tolerance of normal vital structures. Suit (12) has pointed out that doses greater than 65 Gy result in greater local control of soft-tissue sarcomas, and we feel that even higher doses in the range of 80 Gy to 150 Gy will result in more reliable local control and cure. Clearly, these doses are beyond the range of megavoltage external beam therapy, but can easily be delivered with brachytherapy techniques. During the past decade, there have been significant advances in brachytherapy, for example the use of removable afterloading interstitial ^{192}Ir implants and permanent ^{125}I seed implants (10). Accumulated experience and the development of modern brachytherapy instruments such as the Kumar-Mick applicator has led to the routine implantation of larger tumor volumes than could be accomplished by older techniques. ^{125}I is an ideal isotope to use for high-dose, large volume irradiation of retroperitoneal tumors close to the spinal cord because of its low gamma photon energy of 35 keV (9) which results in rapidly decreasing radiation dose outside the implanted volume (1). This spares structures such as small bowel, kidney, and spinal cord from unacceptable radiation damage. There is an additional theoretical, radiobiologic advantage (8, 11) because the ^{125}I provides a source of continuous low dose-rate irradiation which may be more effective than daily pulsed high dose-rate irradiation in treating the hypoxic portion of large, slow-growing necrotic tumors.

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