

Fitzpatrick P J & Rider W D. Half body radiotherapy.

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Half-body radiotherapy was developed to treat wide-spread cancer for palliation and cure. The largest single dose that the whole body can reasonably tolerate is 3 Gray (Gy). This has a cell lethality of 90 percent whereas 8 Gy kills 99.5 percent of cells. We found that if the body is divided into upper and lower halves, each can be irradiated with single fractions up to 10 Gy if four to six weeks are allowed between treatments for the bone marrow to recover. [The *SCJ*® indicates that this paper has been cited in over 85 publications.]

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"Why don't you treat all of me at one time and save me the necessity and hardship of these repeated visits to the hospital?" commented Mrs. K. in 1971. This lady, a patient riddled with metastases from breast cancer, was nonresponsive to hormone manipulation. The painful lesions were irradiated with doses ranging from 4 to 10 Gray (Gy) in a single treatment. Rarely did a week pass without us having to treat one or more of these painful metastases, so when she complained of intense pain in much of the lower half of her body (and after obtaining the consent of her son who is a physician) we delivered 6 Gy in a single exposure from a 60-Cobalt unit to the lower half of her body. The response was dramatic, with her pain completely relieved within 24 hours. Pain then developed in the upper half of her body, and she asked for similar treatment. Four months later the upper half of the body was treated with a similar dose. Again, there was a dramatic relief of symptoms but other metastases developed and the patient died five months later.

Following Mrs. K.'s treatment in June 1971, other patients with advanced progressive and symptomatic cancer, refractory to other treatment methods, were irradiated with a wide-field technique; both the dose of irradiation and field size were gradually increased. Eventually, one-half of the patient's body was irradiated with a dose of 10 Gy in a single exposure. This paper reported the preliminary ex-

perience with 140 half-body radiation treatments in 82 patients with advanced stages of cancer.

Total body irradiation was first employed in the treatment of cancer more than half a century ago. Doses from 1 to 3 Gy in single or multiple fractions were used, with the greatest benefits reported in the lymphomas. Radiobiological evidence suggests that a single dose of 3 Gy has a cell lethality of 90 percent; but at 8 Gy 99.5 percent could be realistically expected. Thus, if a tumour has a doubling time of 3 months, one might anticipate a remission of approximately 30 months following a dose of 8 Gy; for longer doubling times like 6 months the equivalent remission might be five years. This would indeed be useful palliation.

Total-body irradiation with 8 Gy is lethal to the bone marrow, but it has been known for at least 25 years that by protecting part of the hematopoietic system from the radiation, recovery is possible. We hypothesized that, in treating one-half of the body bone marrow, stem cells from the unirradiated marrow in the other half would circulate and repopulate the areas that had been lethally irradiated. At the same time, we felt that the more "fixed" metastatic cancer deposits were unlikely to migrate as quickly as the labile bone marrow cells.

All patients developed some degree of bone marrow depression, which reached its maximum between 14 and 21 days, with recovery usually in 28 to 42 days. Thus, it was possible to treat the second half of the body. Acute radiation syndrome followed approximately 90 percent of treatments to the upper half but only 50 percent of treatments to the lower half of the body. The major limiting factor was the radiation tolerance of the lung, with doses greater than 8 Gy leading to radiation pneumonitis.

Radiotherapy is a potent weapon in the battle against cancer. Orthodoxy in radiotherapy, like orthodoxy in medicine, must be challenged. We demonstrated that 8 Gy could be delivered to both halves of the body if four to six weeks elapsed between treatments. Relief of pain was usual and frequently occurred within 24 hours. Since then, half-body radiotherapy has been used worldwide to palliate tumours and is being explored as an adjuvant treatment in the management of other cancers.<sup>1,2</sup>

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2. Duchesne G M & Harmer C L. Hemibody irradiation in lymphomas and related malignancies. *Int. J. Radiat. Oncol. Biol. Phys.* 11:2003-6, 1985.