

Clinical Multifield Controlled Comparison of the Hyperthermia and Low Dose Radiation to Full Dose Radiation of Chest Wall Recurrences.

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ABSTRACT

The present study compares in an homogeneous population of tumor and patients, the effect of low doses of radiation (2000 and 4000 rads) plus heat to that of full dose radiation therapy alone (5000 rads, as usual therapy for chest wall recurrences of breast adenocarcinoma). Each chest wall was divided into 3 areas, treated according to these regimes for chest wall recurrences in both previously treated and unirradiated fields. So far 12 fields have been treated using this protocol. Results show that 4000 rads plus hyperthermia are as effective and less toxic than 5000 rads alone. A dose of 2000 rads plus heat, was less effective and not toxic. In our clinics 5000 rads plus hyperthermia has been instituted as standard treatment for previously unirradiated recurrent disease.

Keywords: Radiation, Hyperthermia, Dose, Responses

1. INTRODUCTION

Recent studies (Arcangeli 1980, Baker 1980, Corry 1982, Fazekas 1981, Kim 1979, Lindholm 1982, Manning 1979, Marmor 1980, U 1980) involving a combination of hyperthermia and x-irradiation have made a serious effort to measure the additional therapeutic effect of hyperthermia when added to conventional radiation therapy, invariably showing improved tumor hyperthermia control. In most reports a comparison with radiation alone controls is made. The objective of this limited series is to determine under carefully controlled homogeneous clinical conditions the probable therapeutic benefit of adding hyperthermia to an effective radiation dose,

when compared with a full therapeutic dose of radiation used as control, in a practical clinical situation (chest wall recurrences of breast adenocarcinoma).

2. Methods

Patients selected for this study had superficial recurrence of breast carcinoma despite hormone and chemotherapy, present in both previously untreated and previously irradiated areas. Disease in previously untreated areas was treated to 5000 rads at the rate of 800 rads per week in 4 fractions, without hyperthermia. Disease in previously irradiated areas was treated as shown in Table I. Tumor temperature was maintained at 42-45°C for one hour, with air cooling to keep normal skin at 38°. Thermometry was performed at every patient treatment using microthermocouples (100 microns) implanted in 2 areas of tumor and at normal skin. Heating was accomplished using 915 or 300 MHz external microwave applicators.

Five patients available for follow-up from six weeks to six months following completion of the treatment are included in this study. Each patient had one area treated with radiation alone and at least one area treated with radiation plus hyperthermia, for a total of 12 treatment areas.

3. RESULTS

No acute complications were experienced. Overall complications appeared to be radiation dose related and were minimal. Tumor response was graded as complete (100% regression), partial (at least 50% reduction in tumor volume) or none, determined 6 to 8 weeks following completion of treatment. Response in all areas was either complete or partial. Four areas treated with 20 radiation fractions and 10 hyperthermia sessions all showed complete response, as compared with 3 complete and 2 partial responses in areas receiving 5000 rads (See Table II). It was our impression from observations and measurements during and in the first few weeks following treatment that tumor response was slower in fields treated with radiation alone.

4. DISCUSSION

In their study, Kim (1982), reported 78% overall tumor control rate after combined therapy as compared with 26% after radiation alone. There was wide variation in radiation dose, hyperthermia treatment duration, and number of fractions. Arcangeli (1983) reported long-term results directly comparing radiation with thermoradiotherapy in 57 patients with tumors of various type and site in at least 2 areas. Both rate and duration of tumor response were increased by heat; with 7 patients surviving at 18 months showing 0/7 recurrences after combined treatment but 3/7 in areas treated by radiation alone. The authors conclude that an optimal treatment should result by adding 5 to 7 sessions of moderate hyperthermia to a full conventional radiotherapy course.

Our current series demonstrates that under conventional clinical conditions hyperthermia is a useful adjuvant to radiation therapy. 4000 rad plus hyperthermia appeared more effective than 5000 rad radiation alone. Side effects of combined treatment were less than for radiation alone. Having thus concluded that: 1) combined treatment with hyperthermia and low dose radiation is at least as effective as full dose radiation alone, and 2) addition of hyperthermia adds nothing to the side effects of radiation therapy alone; we now recommend combined hyperthermia-full dose radiation therapy for areas of previously unirradiated chest wall recurrence of breast adenocarcinoma.

TABLE I
PROTOCOL

PREVIOUS RADIATION THERAPY	TREATMENT
LESS THAN 5000 RADS OR 5000 RADS MORE THAN 1 YEAR AGO	20/10
MORE THAN 5000 RADS OR 5000 RADS LESS THAN 1 YEAR AGO	10/10
DESCRIPTION OF TREATMENT	
20/10	
20 XRT FRACTIONS OF 200 R. JS OVER 5 WEEKS FOR 4000 RADS TOTAL	
10 Δ FRACTIONS AT 43°C FOR 1 HOUR TWICE WEEKLY	
10/10	
10 XRT FRACTIONS OF 200 RADS OVER 5 WEEKS FOR 2000 RADS TOTAL	
10 Δ FRACTIONS AT 43°C FOR 1 HOUR TWICE WEEKLY	

TABLE II
CHEST WALL RECURRENCES
INTERNAL CONTROL STUDY
MULTIFIELD COMPARISON

	5000 RADS	4000 RADS + Δ	2000 RADS + Δ
No. FIELDS	5	4	3
CR	3	4	2
PR	2	0	1
MARKED SKIN RESPONSE		LESS SKIN SIDE EFFECTS (REDNESS - DESQUAMATION)	NO VISIBLE SIDE EFFECTS
SLOWER TUMOR REGRESSION		FASTER TUMOR RESPONSE	

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