

## 2155 Efficacy of Total Skin Electron Beam Therapy in Early Stages T1-2 Mycosis Fungoides : Results of a Long-Term Follow-Up

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**Purpose/Objective:** We report in a retrospective analysis our experience in the treatment of early staged Mycosis Fungoides (MF) by Total Skin Electron Beam therapy (TSEB), with respect to relapse-free, overall survival rate. Prognostic factors were studied in uni and multivariate analyses.

**Materials/Methods:** From 1975 to 2000, fifty-seven patients were uniformly treated with TSEB in a curative intent. The disease was classified using the TNM UICC staging system, 24/57 with T1 and 30/57 with T2 disease, 37 N0 and 20 N1. Twenty-five patients (43.8%) received therapy prior to TSEB: PUVA (12/25), topical nitrogen mustard (7/25), systemic chemotherapy (4/25), topical (12/25) or systemic (4/25) steroids, interferon (4/25) or retinoids (4/25). Parapsoriasis was noticed in the medical history in 27 out of 57 patients (47.3%). Radiotherapy was delivered through a 4 (2/57) to 6 (55/57) MeV electron beam treatment to a mean total dose of 30 Gy. Patients lied on a mobile couch and irradiation was delivered during the moving of the couch. The dose distribution was controlled by TLD dosimetry. Underdosed areas were boosted with fractionated and separated electron fields. The fractionation schedule was 8x3 Gy for 35 patients, 15x2 Gy for 15 patients and 17x2 Gy in 5 patients, over a mean period of 9 weeks. No patients received photon beam irradiation.

**Results:** The median age was 61 years, and the mean follow-up was 114 months (range 14-300). Three months after completing TSEB, a complete response (CR) was observed in 87.5% of T1 and 84.8% of T2 patients. A complete disappearance of itching and clinical symptoms was registered in all patients. A complete and significant response was registered more frequently in T1 patients ( $p < 0.05$ ), N0 ( $p = 0.024$ ) and age under 60 ( $p = 0.012$ ). With respect to OS, in an univariate analysis, the achievement of CR three months after completion of TSEB ( $p = 0.04$ , RR=2.7), T1 stage ( $p = 0.03$ , RR=3) and age younger than 60 ( $p = 0.001$ , RR=4.35) correlated with prolonged survival. The subsequent multivariate analysis demonstrated age ( $p = 0.001$ , RR=4.35) as the only significant prognostic factor. T stage ( $p = 0.059$ , RR=2.65) and completion of first CR after TSEBT ( $p = 0.063$ , RR=2.49) did not reach a significant threshold.

Thirty-one patients (54.4%) relapsed within a mean time of 2 years after the end of radiotherapy, with no correlation with gender, history of parapsoriasis or therapy before TSEB, maximal dose delivered or the interval between diagnosis of MF and beginning of TSEB. Out of the 31 patients who relapsed, 12/31 were treated by a second TSEB within 16.7 months (range 1-156) and 7/31 by selected electron beam irradiation (24 Gy) on small lesions. The others benefited from PUVA (2/31), topical (2/31) or parenteral (4/31) chemotherapy, or interferon (7/31). The rate of second relapse thereafter, over the mean 86 month-period of follow-up of these 31 patients, reached 29% regardless of the treatment schedule administered. Moreover, modalities appeared to be non cross-resistant and relapsing subjects could be salvaged. Among our population, 7/57 patients developed a second malignancy, leading to death in 6/7 cases. Transformation of MF was a contributing factor to death in only 1 out of 57 subjects. The tolerance of the procedure was excellent, with 14/57 subjects with WHO grade 3 acute skin toxicity, without infectious or haematological disorders. No late complications were registered

**Conclusions:** TSEBT is the only potential curative modality for early stage MF, providing symptomatic relief in nearly all cases with acceptable toxicity. For relapsing patients, skin-targeted treatments (with a particular emphasis on radiotherapy) yield as many second CRs as systemic drugs. The occurrence of second malignancies in our cohort is suspicious, but maybe without real meaningful correlation.

	5-year RFS	10-year RFS	5-year OS	10-year OS	15-year OS
T1	75%	56%	100%	89%	64%
T2	28%	21%	82%	50%	25%
age under 60	81%	40%	92%	84%	72%
age above 60	40%	27%	88%	46%	22%

## 2156 Outcome and Patterns of Failure in Primary Breast Lymphoma: A Multicenter Rare Cancer Network Study

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**Purpose/Objective:** To assess the outcome and prognostic factors in patients with breast lymphoma treated by radiation therapy (R R. Epelbaum<sup>3</sup>T) and/or chemotherapy (CX).

**Materials/Methods:** Between 1970 and 2000, 84 patients with Ann-Arbor stage I (n = 46), II (n = 33), III (n = 1), or IV (n = 2) primary breast lymphoma were treated in 21 member institutions of the Rare Cancer Network (2 patients could not be

classified). Median age was 64 years (28-90). There was only one man. According to the WF classification, 51 patients had high grade, 6 intermediate, and 27 low grade lymphoma. Initial surgical approach was mastectomy in 20 patients, conservative surgery in 41, or biopsy in 23. Thirty-four patients benefited from combined modality treatment (CX + RT), whereas 24 were treated with CX alone, 21 with RT alone; and 5 patients received neither CX nor RT following surgery (conservative surgery in 3, mastectomy in 1, and biopsy in 1). The median RT dose was 40 Gy (12-55). The median follow-up period was 56 months (9-188).

**Results:** Following treatment, local control was achieved in 71 of 84 patients. Ten patients in CR developed local relapse following a median period of 17 (2-61) months. Systemic lymphoma progression with or without local disease was observed in 46 patients (including 2 patients where systemic disease could not be controlled). Most of the systemic relapses included lymph nodes (n = 13) and/or central nervous system (CNS; n = 12) localizations. Median time to systemic progression was 22 (4-140) months. The 5-year overall survival (OS), lymphoma-specific survival (LSS), disease-free survival (DFS), and local control were 51%, 55%, 40% and 87%, respectively. In univariate analyses, prognostic factors influencing significantly the LSS were the type of surgery (mastectomy worse) and the administration of RT (better). Regarding the local control, patients receiving combined modality treatment had the best outcome. In multivariate analyses, the favorable independent prognostic factors influencing the LSS were younger age, low grade, and stage I disease. Only one patient developed grade III/IV radiation-induced lung toxicity.

**Conclusions:** The outcome of primary breast lymphoma, even with combined modality treatment, is mediocre. CNS seems to be an important site of relapse. Therefore this and other prognostic factors should be taken into consideration in the overall management. Excellent local control is obtained using combined modality treatment.

**2157 Dose to Cardiac Pacemakers and Implanted Defibrillators from Beta and Gamma Coronary Artery Brachytherapy**

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**Purpose/Objective:** Vascular brachytherapy is now established as effective in the prevention of in-stent restenosis after coronary artery angioplasty. A substantial proportion of patients with coronary artery stenosis requiring this procedure may also have cardiac dysrhythmias requiring either implanted pacemakers or implanted cardioverter defibrillators (ICD), which are susceptible to damage from relatively low levels of ionizing radiation. Furthermore, testing an ICD may require extensive electrophysiological studies since the damage may not be readily apparent. We therefore attempted to determine the absorbed dose from both beta and gamma vascular brachytherapy to determine if additional safeguards might be required for those patients who have implanted electronic devices.

**Materials/Methods:** The computerized tomographic (CT) scans of 10 patients who had implanted pacemakers and ICDs were reviewed and digitized using the ADAC Pinnacle3 brachytherapy module. We considered the maximum absorbed dose would be due to the longest allowable source in the target vessel using the approved dose specifications (for Ir-192 we used the Gamma-V convention of 1400 cGy at 2 mm from the source with a 14 seed source train; for Sr-89 we considered a vessel of diameter 4 mm using a 40 mm source train with a prescribed dose of 2300 cGy.) We then determined the absorbed dose for the point of the electronic device closest to the source train. In order to evaluate the maximum possible dose to an ICD, we also ascertained the dose to the chest wall immediately superior to the brachytherapy source train. Data regarding the tolerance of the circuitry was obtained from the manufacturer.

**Results:** The absorbed dose to the chest wall, and the actual device are shown in Table 1.

For the Medtronic Gem 7227 and Gem AT 7276 implanted defibrillators, the manufacturer specifies a threshold for damage of 100 cGy.

**Conclusions:** The dose to the electronic circuitry from beta radiation appears to be negligible. The dose from gamma radiation to a device in the left chest wall for a source in the stented artery may be significant if the electronic device is in close proximity to the vessel, but did not exceed the manufacturer's stated tolerance in any of the cases studied. We suggest that, if gamma brachytherapy is considered for a patient with an implanted electronic device in the inferio-medial portion of the left chest wall, a CT should be obtained to determine the distance from stent to the presumed lesion. From this information, the dose can be determined and the risk of damage may be minimized.

Isotope	Chest Wall Dose (cGy)			Pacemaker/ICD Dose (cGy)		
	Maximum	Median Dose	Standard Deviation	Maximum	Median Dose	Standard Deviation
Sr-89	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ir-192	39.0	25.7	9.93	7.4	2.5	2.5

**2158 Development of a New Intravascular Brachytherapy System to Prevent Restenosis After Percutaneous Transluminal Angioplasty**

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