Total Body Skin Electron Irradiation for Mycosis Fungoides: Experience with "Translational Technique"

MUKOZİS FUNGOİDESTE TÜM BEDEN CİLT ELEKTRON IŞINLAMASI: "TRANSLASYONAL TEKNİK" TECRÜBESİ

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Summary

Mycosis fungoides is the most common form of cutaneous T-cell lymphoma. In our department, between January 1995 and January 1999, we treated six patients with mycosis fungoides by total body skin electron irradiation to evaluate its influence. Total body skin electron irradiation was applied by using "translational technique". Daily doses of 4 Gy were given in total seven fractions as conventional fractionation scheme. There were 4 patients with stage I disease, 1 patient with stage II, and 1 patient with stage IV disease. Except stage IV patient, we obtained good cutaneous results. According to our observation, in early stage mycosis fungoides total body skin electron irradiation can provide good cutaneous response, but for stage IV only moderate pallation can be obtained.

Key **Words:** Total body skin electron irradiation, Mycosis fungoides

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Özet

Mukozis fungoides cilt T-hücreli lenfomasımn en sık izlenen formudur. Bölümümüzde, Ocak 1995 ile Ocak 1999 tarihleri arasında mukozis fungoidcsli altı hastayı tüm beden cilt elektron ışınlamasının etkilerini değerlendirmek amacıyla tedavi ettik. Tüm beden cilt elektron ışınlaması translasyonal teknikle uygulandı. Konvansiyonel fraksiyonasyon şeması şeklinde, toplam 7 fraksiyonda günlük 4 Gy'lik dozlar verildi. Evre I hastalıklı dört, evre II hastalıklı bir, evre IV hastalıklı bir hasta vardı. Evre IV hasta hariç, iyi cilt cevabı elde ettik. Sonuç olarak erken evre mukozis fungoideste, tüm beden cilt elektron ışınlaması iyi cilt cevabı sağlayabilir fakat evre IV hastalıkta orta derecede palyasyon elde edilebilir.

Anahtar Kelimeler: Tüm beden cilt elektron ışınlaması, Mukozis fungoides

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Cutaneous T-cell lymphoma refers to a spectrum of closely related T cell lymphoproliferative disorders in which the predominant clinical manifestations involve the skin (1). Mycosis fungoides (MF) is one of the major subgroup of this land of cutaneous disorders. In MF malignant cells have an immunophenotype characteristic of mature T cells which show epidermotropism (2-4). Incidence of MF increases with age and occurs more frequently in men (5). Slow progression reveals three phases respectively: premyotic, myotic, fungoid. Premyotic phase (in other terms patchy appearance) resembles other dermatoses, particularly plaques of psoriasis, eczema and fungal infection (6,7). In mycotic and fungoid phase, atypical lymphoid cells infiltrate the skin to form palpable lesions. Cutaneous ulceration and secondary infections are not uncommon in these phases (8). Whatever the phase of the disease, radiotherapy especially total body skin electron irradiation (TBSEI) must be taken into consideration. Various treatment techniques have been used since the introduction of TBSEI treatment. For this reason we present our last three year

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experience with TBSEI in ME This study was undertaken to analyze the influence of total skin dose on response and skin toxicity.

Materials and Methods

Between January 1995 and January 1999, we applied TBSEI to five patients with histologically confirmed MF. Stanford staging system was used (9). High dose rate electron beams (4MeV) from a Philips SL-25 linear accelerator were used for TBSEI. Parallel plate ion chamber, solid water phantom and "Farmer" electrometer were used for output measurements (cGy/MU). All superficial areas of the skin were irradiated by electron. Before treatment, dose uniformity in the dosimetric aspect, the flatness, and symmetry of the longitudinal and vertical axis have measured in addition to output, percentage depth dose and skin dose. The skin dose measured on an Alderson Rando, phantom with Victoreen TLD (thermolumicent dosimeter) reader system and TLD-100. We used the "translational technique" for irradiating patients (10). Patients were adapted to electron beam that could cover entire transverse dimensions of the cases. Arms and legs were supported with foams to obtain same level with body. Patients were laid on a moving couch, which was 10 cm high from the floor and operated manually after each radiotherapy session, and irradiated from supine and prone positions in 8 different fields (four anterior and four posterior). Treatment fields matched appropriately in order to obtain dose homogeneity and moved predetermined position in every fraction, so ± 15% dose homogeneity was obtained for all patients. Source skin distances for patients were ranged between 192.5 cm to 203.5 cm due to body thickness. For this reason radiation fields on patients skin were also ranged 50.6 cm x 50.6 cm to 53.5 cm x 53.5 cm. During each radiotherapy session TLD-100 dosimeters were placed on patients both anterior and posterior skin surface. Mean dose distribution on the anterior surface of one case was shown in Figure 1. Results of obtained beam profile for one beam (on vertical and horizontal axis) can be seen in Figure 2. 4 Gy/daily doses were given each treatment field in seven fractions with the total dose of 28 Gy. Treatment dose calculation was made according to 85% isodose line while using 2 mm thick bolus for each patient. Eye shielding was applied every patient, but nail beds were separated. Shielding obtained by means of lead sheets with 4 mm thickness. These plaques customized for each patient and inner side was covered with wax. Supplemental radiation was administered to treatment fields such as both axilla and inter-gluteal section with the dose of 10 Gy in two fractions. This boost dose was given at the completion of TBSEI treatment without any delay.

Results

There was no treatment delay or death related to TBSEI. Median follow-up was 24 months (ranged 8 to 36 months). Median age was 53 years (ranged 48 to 67). Male/female ratio was 3:1. Patient characteristics can be seen in Table 1. Dose distribution for each patient can be seen in Table 2. Except one case with stage IV disease, we obtained excellent results with TBSEI. Although skin lesions having regressed, stage IV patient have developed pansitopenia due to bone marrow involvement. This case was lost due to generalized Candida albicans infection 8 months after completion of TBSEI. Median survival was 22 months for all stages (ranged 8 to 36 months). Treatment related toxicity was mild, radiotherapy was well tolerated. Three patients developed moderate erythema of the skin that resolved within 2 weeks after the completion of treatment. Another one developed bullous lesions on dorsum of right hand that completely resolved 3 weeks after treatment. All the patients developed dry skin. No systemic side effects were observed.

Discussion

Total skin electron therapy is a complex method of delivering superficial radiotherapy to entire skin surface. MF is the most common malignancy treated in this manner (11). Treatment of MF with TBSEI is proposed and various techniques have been developed and applied successfully (12,13). Basically these methods fall into two general categories:

a. Translational technique in which a horizontally placed patient is translated relative to a beam of electrons of sufficient width to cover the transverse dimensions of the patient and,

b. Large field technique in which standing patient is treated with a combination of broad beams

Table **1.** Patient characteristics of six cases treated with TBSEI

	Gender	Symptom duration (year)	Symptom	Previous treatment	Stage	Treatment result
1	Female	6	pururitus + squamation	No	I	NED*
2	Male	4	pururitus + erytrodermi	Topical CS** + PUVA***	I	NED
3	Male	8	pururitus + erytrodermi	Topical CS	I	NED
4	Male	20	pururitus	Topical CS + PUVA	II	NED
5	Male	7	pururitus + squamation	CHOP**** (3 cycles)	IV	Exitus lethalis
6	Female	8	pururitus + squamation	Topical CS	I	NED

NED: No evidence of disease, CS**: Corticosteroid, PUVA ***• Psoralen ultraviole A, CHOP****: Cyclophosphamide, Doxorubicin, Vincristine, Prednisone*

Table 2. Dose distribution (%) on several reference points for each patient measured by using TLD

Patient number	Dose on a reference point (%)				
	Umblicus	Eye	Mid-point of sternum	Shoulder	Tip of a toe
1	100	4	102	93	92
2	100	4	101	95	90
3	100	3	105	92	92
4	100	3	107	90	94
5	100	3	103	91	94
6	100	4	102	91	91

produced by electron scattering and large SSDs (2 to 6 m.).

The translational technique has been described by a number of investigators (10, 14). In this technique patient lies on a motor-driven couch and is moved relative to a downward-directed beam at a suitable velocity. Alternatively, patient may be stationary and the radiation source can be translated horizontally. This method can be applied in clinical base therefore we preferred to choose translational technique.

Both local control and long-term survival in early stage MF are better with TBSEI (15-18). Kim et al observed that patients with stage II disease have survival results similar to those with stage I disease like our cases (19). They also proposed that patients younger than 58 years had better results (19). Our findings are consistent with these data. Jones et al. treated 17 patients with stage IV disease. They reported complete cutaneous remission rate as 60%. But if there was blood involvement, like our one case, result was worse (20).

Rosenblatt et al proposed to use 2.4-3 Gy daily doses (total 24-30 Gy) given twice weekly over a period of four to six weeks with lower skin toxicity (21). But we obtained similar results with 4 Gy daily doses given over one week. Romani et al reported disseminated parakeratosis in a single case but we also did not observed such a morbidity related to TBSEI (22). Altough Becker et al reported

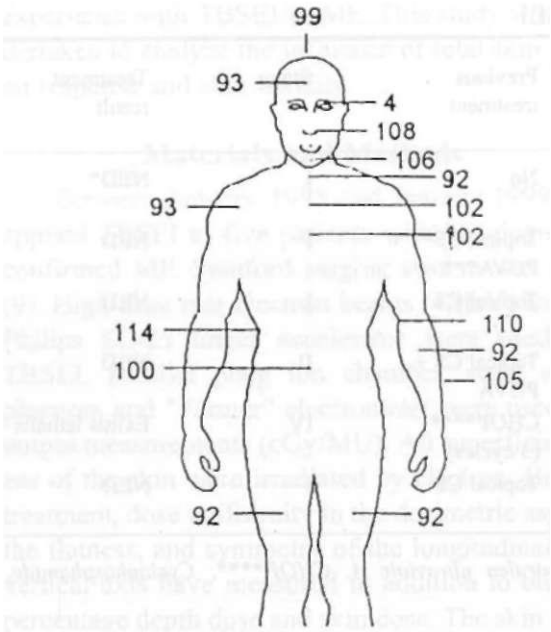

Figure 1. Mean radiation dose distribution on the anterior surface.

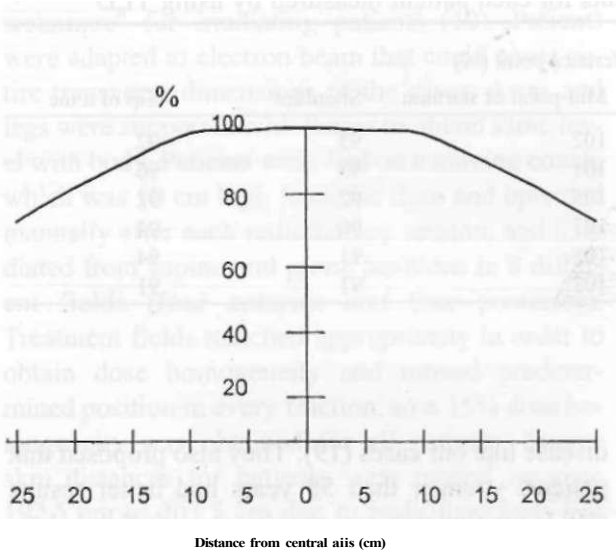

Figure 2. Mean depth dose profile of crossing fields at ssd = 200 cm and d = 0.5 cm.

generalized xerosis, scattered telangiectasies and partial allopecia with multiple courses of high-dose TBSEI, our cases revealed none of these late effects except skin dryness (23).

As a result; TBSEI, which treating the epidermis and dermis while sparing more deeply situated tissues, can be an effective and curative modality in early stages of MF. For advanced stages this method may provide good palliation. But, this therapy should only be administered at centers where there are qualified team, and sufficient volumes of patients to justify the cost and time required to develop and maintain it.

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