Total Skin Electron Therapy (TSET): For Cutaneous T Cell Lymphoma

Dr Ajay P Rao,

Consultant and Head - Radiation Oncology,

Cytecare Cancer Hospitals, Yelahanka, Bangalore

INTRODUCTION

Cutaneous T-cell lymphoma (CTCL) is a heterogeneous group of rare non-Hodgkin lymphoma (NHL) characterized by uncontrolled clonal proliferation of malignant T-lymphocytes in the skin. Mycosis fungoides(MF) is the most common CTCL subset, which, combined with the more advanced Sézary syndrome (SS), accounts for >60% of all CTCL cases. A recent Surveillance, Epidemiology and End Results analysis demonstrated an annual incidence rate of MF of about 5.6 per million persons, which has stabilized since 1995. The median age at diagnosis is 55–60 years, with the incidence increasing with advancing age. Males and African Americans are more commonly affected.

Patients with early-stage Mycosis fungoides(MF) disease present with limited patches and plaques suspicious only to the experienced physician, while late-stage MF is characterized by severe disease including tumours, ulceration, systemic involvement and death. Stage at diagnosis, including lymphatic and extracutaneous disease involvement, are important prognostic factors for disease progression and have been incorporated in the staging of MF/SS. Most patients present with early-stage disease and thus have a good prognosis for long-term survival. Nonetheless, Mycosis fungoides is considered to be an incurable disease requiring lifelong treatment.

Skin-directed therapies, such as topical steroids, chemotherapy, retinoids, imiquimod phototherapy, photochemotherapy (PUVA) and radiotherapy (RT), are the recommended first-line options for stage IA–III MF and most patients can look forward to a normal life expectancy. RT, in particular total skin electron beam therapy (TSEBT), has a long history in the treatment of MF and is considered to be the most effective single modality treatment for MF.

RADIATION TECHNIQUE IN TSET

Radiation Technique was first employed in the early 1900s, and TSEBT has been used to treat Cutaneous T-cell lymphoma(CTCL) since 1951. The neoplastic T-cells in Mycosis fungoides are extremely radiosensitive, with high

response levels seen even with low doses of RT. In addition, RT has the advantage of simultaneously treating large extents of disease while penetrating deeper skin layers. Both photons and electrons can be used in MF; however, electrons are particularly effective due to their short, well-defined range, thus optimizing dose delivery to the skin surface, as well as a more rapid dose fall off that limits RT exposure to deeper, healthy tissues.

When a significant amount of body surface is involved with a disease such that the entire skin surface requires irradiation, TSEBT is employed. TSEBT is a technically challenging RT technique requiring significant physics and dosimetry support as well as special commissioning of a linear accelerator. Accordingly, TSEBT is typically offered only at large institutions or facilities with a large population of MF patients. The objective of TSEBT is to provide a relatively homogeneous RT dose to the entire skin while limiting toxicities. Acute adverse effects are normally limited to the skin, hair, and nails with minimal serious long-term complications. To minimize toxicity, external and internal eye shields are used with further consideration of lips, fingernail, scalp, and testes shielding.

TSEBT can be administered using large electron field techniques (i.e., the Stanford technique), rotational techniques, or techniques where the patient is shifted during irradiation. Currently, the Stanford technique is the most commonly employed TSEBT method. Conventional-dose (cd) TSEBT consists of 30–36 Gy delivered over a period of 8–10 weeks. During irradiation, patients stand in an upright position on a static base. Electron beams with 6–9 MeV energy are usually used (depending on the depth of skin infiltration) to treat 3 anterior and posterior treatment positions, each with superior and inferior beam angulations. Two treatment cycles are delivered per week, with one cycle consisting of irradiating anteroposterior and 2 posterior oblique fields on day one, followed by posteroanterior and 2 anterior oblique fields on day two. A boost is often given to areas that may be “underdosed”, including the perineum, plantar surfaces, medial thigh, inframammary fold, behind pannus, and/or scalp.

CYTECARE’S EXPERIENCE IN TSET

LINAC VERSA HD at Cytecare

TSET is one of the challenging techniques which requires expertise in Physics and modificat ions in executions which is not there in most of the Linear Accelerator centres. Cytecare has been a pioneer in constituting TSET which is one of the kinds in Karnataka.

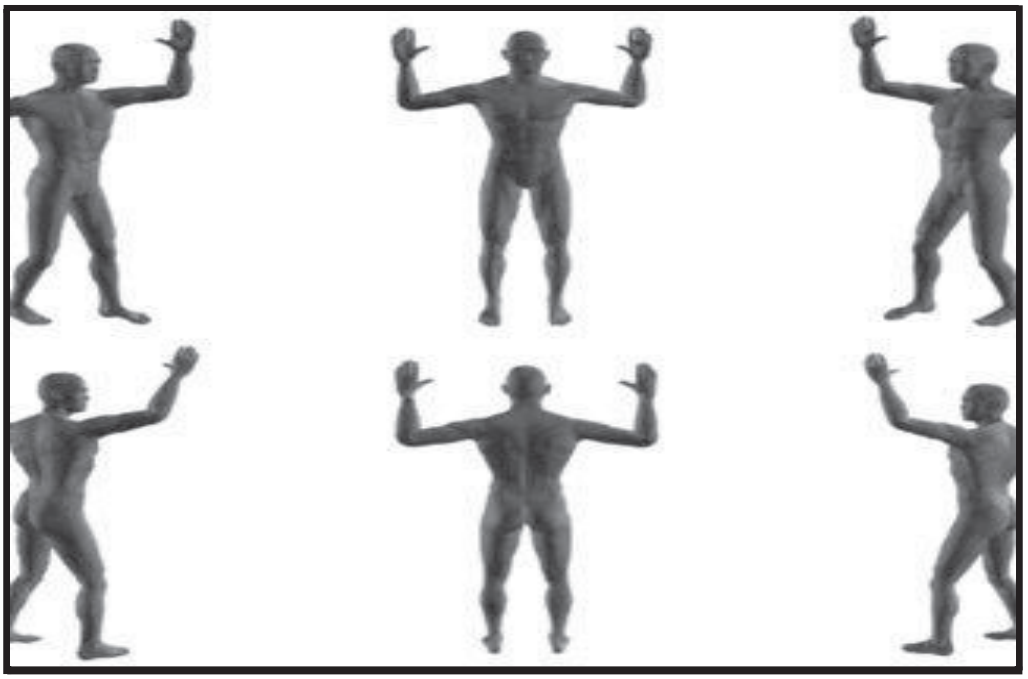
Patient Story:

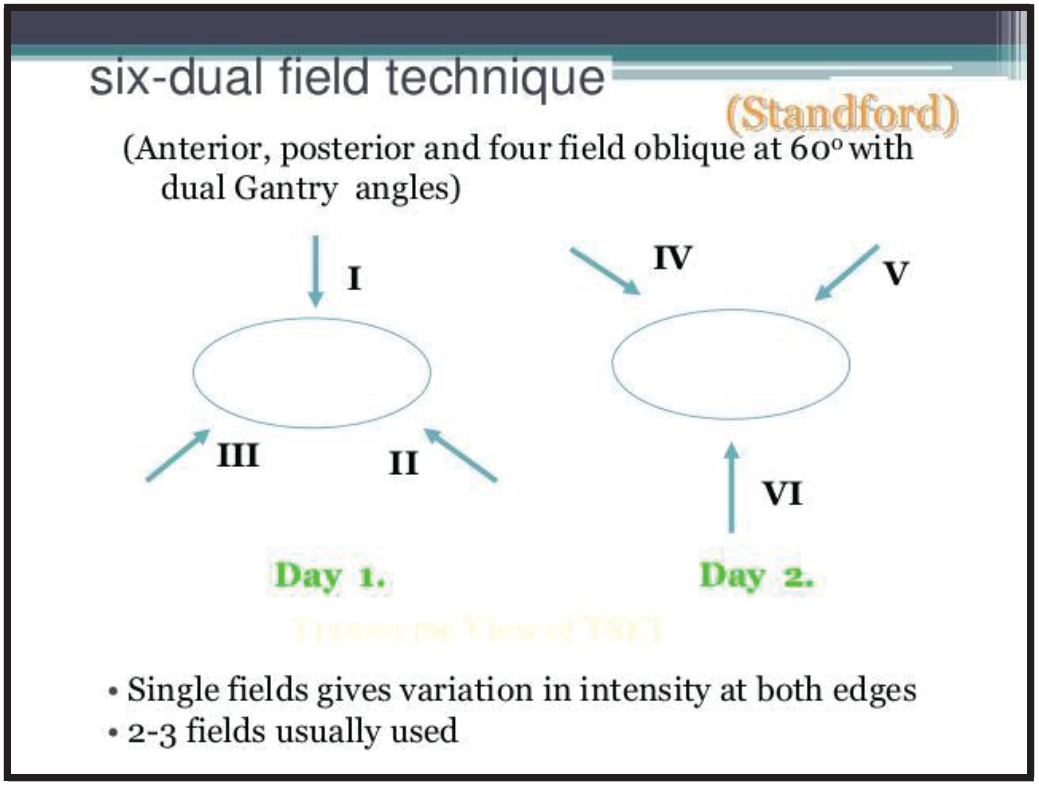
Patient X, a 71-year-old gentleman with no comorbidities, noticed a swelling involving his left forearm, which was painless and reddish in colour. It was gradually increasing in size, and he was advised a wide local excision. He underwent the same, and the histopathology was reported as features consistent with a cutaneous lymphoma with the tissue comprising monotonous tone cells arranged in clusters. This was subjected to immunohistochemistry which revealed the cells to be CD45 CD3 and CD4 positive while being negative for ALK-1, CD20 CD10 CD5 CD 2 CD7 and CD8. The features were suggestive of cutaneous T-cell lymphoma. He was thereafter investigated for other sites of involvement. A CT scan of the thorax and abdomen revealed no specific, except for bilateral lung nodules with evidence of bronchiectasis suggesting an infective pathology. Following this, he was advised only observation.

However, more recently, the patient noticed nodules developing over his anterior abdominal wall and similar nodules with induration seen over his manubrium sterni and also the scapula around the scapular region. These were painless, nonpruritic but progressively increasing in size. He was planned for PET CT staging, which showed multiple foci of cutaneous thickening involving, upper chest on both sides, the upper abdomen on the left side, gluteal and scalp region. No hepatosplenomegaly, no metastatic lymph nodes; marrow. He was planned to start with chemotherapy.

Treatment

The patient was advised to start with chemotherapy followed by 6MEV-HDR Total Skin Electron Therapy (Stanford technique); to a dose of 30 Gy in 30 fractions- 1 Gy/ 3 fields/day (total 6 fields), augmentation boost doses of 2 Gy were administered to the scalp, bilateral soles of the foot; perineum during the course of treatment.





Outcome:

The patient tolerated the Total Skin Electron Therapy with no major toxicities. Initial Assessment post six weeks has shown excellent response in terms of symptom control; skin lesions have markedly reduced and peeled off with new skin regeneration.

Conclusion

TSET is the most effective treatment modality for Cutaneous T-Cell Lymphoma. It is a technically challenging and demanding treatment modality and requires stringent quality assurance and teamwork.