Total Skin Electron Irradiation (TSEI) in Kathmandu Cancer Center Hospital.

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Total skin electron irradiation (TSEI) is a special radiotherapy technique aiming to deliver a homogeneous dose to a patient's entire skin while sparing all other organs from a significant amount of radiation. As TSEI is an accepted and effective means, specifically for Mycosis fungoides and cutaneous lymphoma, it remains a consequential treatment in palliative and chronic control of the early-stage disease. However, it is a complicated treatment requiring a skilled multi-disciplinary team. To ensure that all skin surfaces are exposed to the radiation beam, patients stand in various positions by following methods such as the Stanford technique. Depending on institutional protocol, patients are positioned on either a rotary or a stationary stand at a source-to-surface distance (SSD) of 3 to 5 m.

Kathmandu Cancer Center Hospital (KCC) has an Elekta Synergy linear accelerator having electron beam energy from 4 MeV to 15 MeV. TSEI in KCC is carried out on 6 MeV electron beams with 40×40 cm^2 field size (at 1 m SSD) at a SSD of 330 cm behind a 5 mm thick beam degrader.

Figure 1 (a) Patient positions during TSEI treatment1. [[1]Total skin electron beam treatment patient leaflet. C.C.f.O.-N.F. Trust; 2008] (b) Tilting of gantry required during positioning.

Figure 2: (a) 2 mm lead equivalent spectacles, (b) Nails shielded using lead sheets and bolus.

The dosimetric characteristics are verified experimentally using a parallel plate ion chamber. The basic dosimetric parameter consists of beam profile, depth dose curve, hinge angle, and electron beam output in the treatment plane. Patients are treated in six different upright patient positions using dual-angle fields, and the prescribed dose is 36 Gy in 9 weeks with fractionation of 4 Gy per week. The total body irradiation of 2 Gy is achieved by irradiating the patients in six different positions, as shown in figure 1. in 2 days. Patients are treated for 4 consecutive days while the remaining 3 days of the week are taken as rest.

The PDD curve of 6 MeV electron beam corresponding to electrometer reading (percentage dose) and chamber depth (mm) are obtained for a constant SSD 330 cm and field size 40 cm × 40cm. The estimated most probable electron beam energy, Ep,0 at the patient surface plane, is 4.96 MeV. Eyes are shielded using 2 mm lead equivalent spectacles, while the toes, nails and finger nails are shielded using a combination of bolus and 2 mm lead sheet (figure 2). Patients are treated in standing six upright positions, and for each upright position, dual fields are used to cover the whole body by the field size. For the treatment of the upper and lower parts of the patient, the gantry has to be tilted up and down with an appropriate hinge angle of 18°. Although all the body parts are

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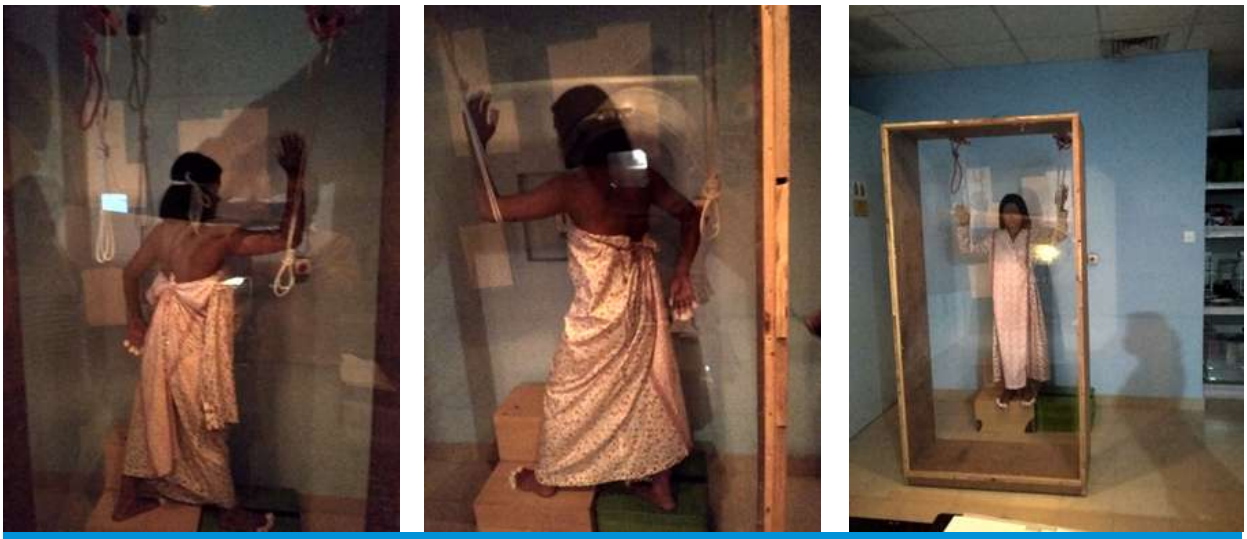

Figure 3: Various treatment positions of patient during TSEI treatment.

irradiated during the treatment, the sole of the feet remains unexposed to the radiation. So the sole of the feet is irradiated separately, with the feet kept in a water bath and the electron beam irradiated from a 180° tilted gantry (figure 3). Similarly, the scalp is found to be inadequately irradiated, so an electron scalp boost can be given.

Three patients with mycosis fungoides have already been treated in our center following the modified Stanford TSEI technique. It was observed that the disease disappeared within a few months of the radiation therapy for all of the patients. Information and techniques about the treatment procedures are shared in detail with the patient before the treatment. Toxicities like reddening of skin, swelling, tiredness, vomiting, and hair loss were seen in the patients during and after the time of treatment (figure 4).

Treatment of diseases like mycosis fungoides is still a challenge, and these diseases should be managed by a skilled multi-disciplinary team. TSEI is a curative treatment with acceptable non-life-threatening toxicities.

Figure 4:Pre- and post- treatment condition of a patient

Congratulations ! Mr Dinesh Babu

SCMPCR congratulate Mr Dinesh Babu for receiving the Meritorious Medical Physicist Award 2022. He works as a medical physicist cum radiological safety officer at Thiruvarur Medical Centre, Tamil Nadu. He has been teaching medical physics to postgraduate students, paramedical and radio diagnosis students for over 12 years. He supervised the decommissioning of various telecobalt units in India. He commissioned a new linear accelerator in a rural institute, and as a result, economically weaker section patients benefited from a new technical treatment. He completed his master's degree in physics from Madurai Kamaraj University and his postgraduate diploma in radiological physics (45th Batch) from Bhabha Atomic Research Centre, Mumbai. He loves learning and upgrading new technologies. He is an active member of the association of medical physicists of India.