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Editorial

Total skin electron irradiation—The technique where the electron beams are still irreplaceable

During the last 2nd ESTRO forum, held in Geneva, Switzerland in April 2013, an interesting debate about the relevance and usage of electron beams in modern radiation therapy took place.[1] For decades, electron beams have been an important and natural tool in radiotherapy (RT) but in recent years their importance has been drastically diminished due to developments in photon beam RT.[2,3] During the debate, the first lecturer presented a vision of conventional RT based only on photon beams, while the second speaker argued in favour of a renewed potential for electron beams arising from technological improvements, as an interesting alternative to photon-only therapy. Specifically, the new possibilities for electron beams discussed were mostly related to intensity-modulated photon–electron radiation therapy (IMPERT) techniques[4,5] and the use of electron beams during intra-operative RT (IORT).[6–8]

Although the debate participants agreed that the use of electron beams for IORT is rational, the use of IMPERT caused much controversy and disagreement among the speakers, particularly with regards to the expense of the technique and its therapeutic rationale. The general impression after this debate was that although electron beams should continue to be used, its use should be limited to specialized units that enable the delivery of specific treatments such as IORT.

Unfortunately, scant attention was given to a very important aspect of this debate: the future of electron beams in RT. For instance, sometimes it is necessary – as occurs in mycosis fungoides (MF) and Sezary syndrome (SS) – to deliver high doses to a large skin surface while minimizing the dose to other tissues located below the surface of the skin.[9] According to the EORTC recommendations, the non-homogeneity of dose distribution in the air in the treatment plan for these cases should not exceed ±10% and the total photon contamination in electron beam ought not to exceed 0.7 Gy.[10] Although photon beams can be used to deliver radiation doses to a large skin surface, photon beam RT fails to meet the dose restriction criteria in areas other than the skin.[11] The only technique that meets these criteria when treating large areas of skin is electron beam radiotherapy.

This special issue is dedicated to a method to irradiate large skin surfaces by electron beams called Total Skin Electron Irradiation (TSEI). TSEI is commonly used to treat patients with MF and/or SS. MF is the most common form of primary cutaneous T-cell lymphoma. It is characterized by a distinctive long-term course and malignant T-cell proliferation. MF diagnosis is not easy, mainly due to the atypical clinical presentation of the disease in its early stages. In this issue, Olek-Hrab and Silny[12] describe a variety of diagnostic methods that are helpful in recognizing and diagnosing MF and SS. Bertoni et al.[13] discuss all the treatment options for MF and SS, while Moraes et al.[14] focus on the results of RT treatment for these diseases. The aforementioned studies are supplemented by a study carried out by Kazmierska[15] in which the author present an analysis of the impact of different RT fractionation schemes on final outcomes, and by the work of Parida,[16] who discusses the advantages and implications of using high dose rate TSEI.

TSEI can be delivered in various geometric conditions (i.e., the patient's positioning with respect to the irradiation source).[17,18] The most commonly used geometric conditions are: (i) large electron fields techniques, exemplified by the Stanford technique,[19] (ii) rotational techniques based on one large field,[20] or a combination of two fields (rotary-dual technique),[21] and (iii) techniques that involve shifting the patient during irradiation.[22]

In this special issue, Diamantopoulos et al.[23] describe the first treatment of MF in Greece using the Stanford technique. Evans et al.[24] describe their institutional experience with the rotational TSEI technique, while Hensley et al.[25] analyze dosimetric aspects of the rotary-dual technique as implemented at the Heidelberg University Hospital. Although MF is a disease that manifests mainly in adults, cases in children have also been reported and Skorska[26] reviews the published studies of MF in children, with a special emphasis on the technical aspects of patient positioning and immobilization. Regardless of the TSEI technique, it is essential that the dose delivered to the patient's skin be carefully reported. In this issue, Guidi et al. review the relevant literature on in vivo dosimetry methods used in TSEI and their results obtained with the various methods.[27]

In this editorial, we have attempted to emphasize the controversy over the future of electron beams. Although the role of electron beams in modern radiation therapy has undoubtedly decreased due to improvements in dose delivery through photon beams, there are still many clinical situations in which electron beams are irreplaceable, including mycosis fungoides and Sezary syndrome, for which one of the therapeutical options is total skin electron irradiation. This special issue of the Reports of Practical Oncology and Radiotherapy presents some of the most relevant papers on this interesting subject.

Conflict of interest

None declared.

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