Neutron radiotherapy in South Africa

Neutron radiotherapy: a different perspective

To the Editor: As the director of one of the longest running neutron radiotherapy programmes in the world (27+ years and 2 900 patients treated) and a member of an international team that reviewed the iThemba laboratories particle radiotherapy programme on behalf of the National Research Foundation in 2010, my view of neutron radiotherapy and the iThemba-Faure facility differs from that of Abratt.[1,2]

Fast neutron radiotherapy has not proved to be the panacea in cancer therapy as was hoped in the 1970s and 1980s. Most early clinical trials showed no advantage to fast neutron radiotherapy over standard photon radiotherapy for common tumours; therefore, interest waned. Long-term side-effects of the early studies were often more severe with fast neutrons, but this was largely attributable to primitive treatment facilities (e.g. laboratory-based, fixed horizontal beams, primitive collimation and blocking). The University of Washington and iThemba facilities have more sophisticated isocentric rotational gantries with movable floors and multi-leaf collimators which allow treatment configurations comparable with conventional photon radiotherapy. This allows for more normal tissue sparing, resulting in a lower incidence of side-effects than quoted in the older literature.

Salivary gland malignancies are one example where improved outcomes have consistently been reported.[3] As Abratt noted, the initial, multi-centre randomised trial accrued only 32 patients before it was closed for ethical reasons. At closure, there was a statistically significant improvement in local and regional control in the neutron-treated group and a trend towards improved survival. With longer follow-up time, the survival curves came together (everyone eventually dies of some cause). However, the cause of death differed with the largest factor being local/regional disease in the photon-treated group and distant metastases in the neutron-treated group. The improved local/regional control in the neutron-treated group allowed time for the manifestation of distant metastases. Since 2000, our research group has documented its research outcomes in 25 articles and invited book chapters. Recently, we showed that 80% of salivary gland tumours with inoperable, skull-base disease can be controlled with a multi-leaf collimator and a Gamma Knife boost.[4] We also use our neutron beam to treat inoperable sarcomas, anaplastic thyroid cancers, mucosal melanomas, and other 'radioresistant' tumours in selected clinical situations.

There is a continuing role for high linear energy transfer (LET) radiotherapy in treating human malignancies. The University of Washington, through the Seattle Cancer Care Alliance and ProCure, is building a proton radiotherapy centre that will be operational in 2013. However, we intend to keep our neutron radiotherapy facility operational as we feel that there are many instances where this will better serve patients. The iThemba-Faure neutron facility needs to be maintained as a resource for Africa, with improved patient recruitment for increased utilisation and sufficient resource allocation for optimal programme functioning.

George E Laramore
Radiation Oncology
University of Washington
Seattle, WA, USA
georgel@uw.edu

1. Laramore GE, Emery R, Reid D, et al. University of Washington clinical neutron facility: report on 26 years of operation. AIP Conference Proceedings 2010;1412:311-318. [http://dx.doi.org/10.1063/1.3665329]
2. Abratt RP. The fast neutron therapy programme for patients in South Africa should come to an end. S Afr Med J 2012;102(2):58.
3. Laramore GE, Krall JM, Griffin TW, et al. Neutron versus photon irradiation for unresectable salivary gland tumors: final report of an RTOG-MRC randomized clinical trial. Int J Radiat Oncol Biol Phys 1993;27(2):235-240.
4. Douglas JD, Goodkin R, Laramore GE. Gamma knife stereotactic radiosurgery for salivary gland neoplasms following neutron radiotherapy. Head Neck 2008; 30(4):492-496. [http://dx.doi.org/10.1002/hed.20729]