Neutron radiotherapy in South Africa

Neutron radiotherapy should continue

To the Editor: Abratt's letter[1] needs a response. We are currently – or have been directly – involved in treating patients with fast neutrons for decades; some with more than 20 years' experience in proton therapy, and others working at major hospitals with modern, high-end facilities for radiotherapy with photons and electrons.

Prof Abratt's opinion was held in the late 1980s when severe late effects of fast neutron therapy (FNT) were recognised, resulting in the early enthusiasm for this modality abating. FNT was introduced into clinical practice after careful radiobiological work, particularly by LH Gray. FNT, the first high linear energy transfer (LET) radiation used in radiotherapy, has not fulfilled the early optimistic laboratory-based expectations. Initial treatment beams had inferior physical characteristics. However, clinical FNT now has facilities with high-energy beams, individually shaped fields, isocentric beam delivery and full 3D treatment-planning systems and image guidance, and it can be applied safely at dedicated centres. However, well-trained personnel are needed who understand the particles' biological effects and complex physical behaviour.

Proven indications for FNT are limited and will benefit few patients. However, for some indications, neutron therapy remains superior to other modalities, despite advances in oncology. The early closure of the one prospective clinical trial,[2] due to the unexpected demonstration of superior results of FNT over conventional low-LET radiotherapy for salivary gland tumours, precluded more patients being recruited. Had the trial continued, it may have led to a better understanding of the effects of neutrons on survival. Nevertheless, today, FNT is the standard and established evidence-based treatment for adenoid cystic carcinoma of the salivary glands, and should be maintained for patients who will benefit from high LET FNT. This knowledge is advantageous for such a rare disease; in most other similar situations, treatment is based on opinion rather than facts from randomised trials. Other FNT indications should be regarded as research or prescribed as an individual treatment decision.

Research is another important role for neutron therapy facilities, e.g. basic physics (interactions of neutrons with biological materials), dosimetry, technological developments and radiobiology, clinical trials and treatment application.

Few highly industrialised countries have the financial and technical capacity to explore carbon ion therapy, which combines a high LET effect with an excellent dose-distribution profile. Their clinical results will take time to guide the radiotherapy community in its use and prove the superiority of delivering expensive high LET radiation.[3,4] FNT history also shows that new developments which excite great enthusiasm may not always be justified; they need careful evaluation over time before becoming irrefutably beneficial for patients. The medical community must accept this less exciting period as essential. It is easier to demonise neutrons and conclude that they should not be used than to spend a long time learning how to use them safely.

Prof Abratt rightly notes the effective and safe use of proton (low LET) therapy but that is not a relevant argument against FNT. Different particles are needed for optimal treatment of different tumours.

iThemba LABS offers high LET radiation to South Africa and its neighbours at a fraction of the cost of carbon ion facilities. It has the infrastructure and knowledge to deliver this therapy safely, and its neutron therapy facility is regularly used for patients from Europe. Prof Abratt calls for fiscal responsibility – it would be fiscally irresponsible not to use South Africa's high LET facility and to send patients overseas for such therapy.

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