The new era of radioiodine treatment

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The therapeutic effect of the radioisotope iodine-131 in destroying iodine-concentrating thyroid cells has been harnessed for more than 60 years in the treatment of benign and malignant thyroid diseases. Accumulated experience in large numbers of patients has confirmed the long-term safety and efficacy of radioiodine in the treatment of hyperthyroidism.^{1,2} Coupled with this is increasing evidence that hyperthyroidism is itself associated with significant long-term morbidity and mortality. Overt hyperthyroidism is a significant risk factor for the development of atrial fibrillation (AF), as well as for congestive cardiac failure, and other cardiovascular morbidities.³ Several large epidemiological studies have shown that there is significantly increased vascular mortality in hyperthyroidism, reflecting increased deaths from cardiovascular and cerebrovascular causes.^{4,5} Realisation that overt hyperthyroidism is not a 'benign' disorder in terms of its long-term consequences, together with evidence that even in Graves' disease long-term remission with antithyroid drug treatment alone is the exception rather than the rule, has led to increasing reliance upon radioiodine as the means of achieving definitive cure of hyperthyroidism.⁶ Radioiodine is now considered the treatment of choice in relapsed Graves' disease and in toxic nodular hyperthyroidism.⁷

Subclinical hyperthyroidism (defined biochemically as low serum thyroid-stimulating hormone with normal free T4 and free T3) is also now recognised to be associated with the risk of AF and perhaps vascular mortality.⁸⁻¹⁰ While evidence is so far lacking that therapeutic intervention ameliorates these adverse effects, there is nonetheless an increasing trend in the UK and USA for treatment of subclinical hyperthyroidism with radioiodine.^{9,11,12} An additional, and relatively recent, indication for radioiodine is the treatment of benign goitre in euthyroid subjects. Increasing evidence suggests that clinically significant goitre shrinkage can be achieved with one or more doses of radioiodine and, while surgery remains the treatment of choice in the majority of cases requiring intervention (in contrast to the situation in hyperthyroidism), radioiodine has a clear role in those who decline, or are medically unfit for, thyroidectomy.^{13,14}

These established and newly recognised indications are discussed in the recently updated UK guidelines for the use of radioiodine in benign thyroid disease.¹⁵ These guidelines, produced under the expert guidance

and chairmanship of Professor Tony Weetman, have highlighted established and emerging indications for this treatment. They outline up-to-date evidence for best practice in terms of dosing, follow up, radiation protection and management of complex patients such as those with associated thyroid eye disease.

The practical aspects of radioiodine administration are also set to change. 'Seamless' treatment for hyperthyroidism and goitre is achieved when the thyroid specialist holds the appropriate (and legally required) certificate for administration of radioiodine from the Administration of Radioactive Substances Advisory Committee (ARSAC). These certificates are issued on behalf of health ministers under the Medicines (Administration of Radioactive Substances) Regulations 1978 but are usually known as ARSAC certificates. Some endocrinologists, as well as nuclear medicine physicians, are so qualified, but clinical oncologists have historically carried a large load, prescribing over 2,000 treatments per annum in the UK, a process requiring additional patient referral and consultation. However, with the reorganisation of cancer services in 1995, and the need for 'site specialisation', clinical oncologists now focus on malignant disease.¹⁶ A survey of members of the Royal College of Radiologists (RCR), conducted in 1999 and updated internally in 2003, demonstrated an unanimous desire to pass this work to physician colleagues.¹⁷ Endocrinologists have been enthusiastic in wishing to take on this task and, in an example of true interprofessional cooperation, a structured and rigorous training programme has been developed. Approved by the Royal College of Physicians and the RCR, this has involved close cooperation with members of the Institute of Physics and Engineering in Medicine, and liaison with ARSAC and with professional groups including the Society for Endocrinology and British Thyroid Association.

The objective of training is to allow thyroid specialists (when appointed to consultant posts and with the full support of the trust's medical physicists) to be in a position to apply to ARSAC for a certificate to administer radioiodine for the treatment of benign thyroid disease. The trainee is required to attain an in-depth knowledge of radiation safety and protection issues by attending a training day, studying the theoretical and practical aspects of radioiodine administration and the legislation involved, and by producing a record of 'mentored' cases where radiation issues are discussed

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with the patient. Enthusiastic support has been apparent among many colleagues including medical physicists in providing mentored experience and training, reflecting true collaboration between disciplines. Over 150 endocrinologists have registered for training, and some have already been successful in ARSAC applications. This approach has also been championed by the royal colleges as a role model for 'credentialing', a newly emerging term which encompasses circumscribed educational programmes for specialists post-certificate of completion of training (CCT) (or senior trainees pre-CCT) to gain 'extra' experience and expertise of relevance and added value to their employing NHS trusts.

The new era of radioiodine treatment has dawned and hopefully offers significant improvements for patients in the practical delivery of this treatment and in the clinical science underpinning its use in patient management for those with thyroid disease.

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