Therapeutic aspects of multinodular toxic goitre

S.E.M. Clarke (London)

Toxic multinodular goitre (Plummer’s disease)

In patients with multinodular goitres, there is an increased likelihood of the development of multiple focal areas of thyroid autonomy resulting in elevations of free T4 and free T3 levels. This form of toxic nodular goitre is particularly common in geographical areas where endemic goitre is prevalent. Germany, Austria and Switzerland are countries with a previous history of dietary iodine deficiency, and there is a higher prevalence of multinodular goitre in these countries compared with the UK (1).

Patients may also develop a single nodule, which on isotope imaging is demonstrated to show increased uptake with suppression of the remainder of the gland. Uninodular toxic goitre is diagnosed using conventional biochemical tests and radionuclide imaging with Technetium-99m (99mTc) or Iodine-123 (123I).

The presenting symptoms of uninodular or multinodular toxic goitre are similar to those of toxic diffuse goitre, but with the absence of eye signs, thyroid acropachy or pretibial myxoedema. This tends to be a disease of old people and, in the elderly, the clinical presentation may be non-classical with minimal signs and symptoms apart from tachycardia that may progress to atrial fibrillation and heart failure.

Patients with toxic nodular goitre are generally considered to be ideally suited for 131I therapy. A short period of treatment using anti-thyroid medication is recommended in patients who are extremely symptomatic, and in the elderly. It is essential to ensure that the normal thyroid tissue is suppressed at the time of 131I therapy, and this will require an adequate period of discontinuation of anti-thyroid medication before radioiodine treatment. In patients with mild to moderate elevations of thyroid hormone levels and who are relatively asymptomatic, direct treatment with radioiodine may be considered.

In addition to treating the thyrotoxicosis in toxic nodular goitre, a reduction in nodule size is achieved (2). In patients with large goitres, several doses of radioiodine may be required to render the patient euthyroid.

Practical aspects of therapy

Patients who have been selected for 131I radioiodine treatment should have the implications of therapy explained clearly. It is generally considered good practice to render the patient euthyroid before treatment, as 131I radioiodine administration will cause a transient elevation in free T4 and free T3 levels approximately 7 days following administration. In the symptomatically well-controlled patient this will have little effect, but in symptomatically toxic patients, this further elevation of thyroid hormone may trigger palpitations, atrial fibrillation and heart failure. This is a particular problem in the elderly. Symptomatic control may be achieved using beta blockade. Since carbimazole blocks the organification of iodine within the thyroid, carbimazole therapy should be discontinued at least 48 hours before therapy is undertaken to ensure adequate residence time of 131I within the follicular cells.

There has been controversy as to whether pretreatment with carbimazole, methimazole or propylthiouracil reduces the subsequent efficacy of radioiodine. Santos et al have found that pretreatment with propylthiouracil reduces the effectiveness of radioiodine treatment in patients with Graves’ disease. The same effect was not observed with methimazole pre-treatment (3).

The requirement to admit patients varies considerably across the world. In many countries in Europe, admission is required for doses of 185MBq and above. In the USA, doses up to 1000MBq may be given as an outpatient. Admission should be considered for the elderly with a risk of heart failure.

Before therapy, patients should be asked to sign a consent form and should be informed of restrictions on working, contact with children and pregnancy before doing so, both verbally and in writing (4). The length of time for which restrictions should be observed varies by country, but time should be taken with the patient before treatment to ensure that appropriate restrictions are understood and will be adhered to.
Pregnancy and breast-feeding are absolute contraindications to radioiodine therapy, and it is recommended that a pregnancy test should be undertaken in women of childbearing years who are about to receive radioiodine therapy and in whom pregnancy may be an issue.

The restrictions on work and contact with small children will also depend on national dose limits, and these should be discussed with each patient individually.

Studies are now being undertaken following radioiodine therapy, and these data confirm that with adequate precautions, the dose to family members is minimal.

In patients in whom thyrotoxicosis is not well controlled before radioiodine therapy, it may be necessary to re-commence anti-thyroid medication for a short interval following treatment. All patients should be given written instructions about the precautions to be observed. In addition, the need to avoid pregnancy for 4 months following radioiodine treatment should be emphasized to female patients.

131I may be administered in liquid form or as a capsule. The advantages of the capsule are those of radiation protection for staff administering the radioiodine; the disadvantages are those of expense and loss of flexibility in dose. Unusually, 131I radioiodine may be given intravenously in patients in whom vomiting is a problem. 131I should be administered in a designated area by trained staff in accordance with the national regulations.

Patients should be encouraged to drink large volumes of fluid for a 24-hour period following radioiodine therapy to lower the radiation dose to the bladder.

Dose considerations

The determination of the activity of radioiodine to be administered in patients with thyrotoxicosis remains a topic of controversy. The controversy centres around whether it is possible to avoid hypothyroidism and successfully treat hyperthyroidism by using careful dosimetry calculations. Although much has been written on this subject, there appears to be no consensus as to the optimal protocol for deciding the dose. Current practice therefore ranges from the use of careful dose calculation to a fixed-dose protocol.

References

1 Subcommittee for the study of endemic goitre and iodine deficiency of the European Thyroid Association (1985) Goitre and iodine deficiency in Europe. Lancet, i, 1290.