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The advent of ultrasound-guided ablation techniques in nodular thyroid disease: Towards a patient-tailored approach

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Surgery is the long-established therapeutic option for benign thyroid nodules, which steadily grow and become symptomatic. The cost of thyroid surgery, the risk of temporary or permanent complications, and the effect on quality of life, however, remain relevant concerns. Therefore, various minimally invasive treatments, directed towards office-based management of symptomatic nodules, without requiring general anaesthesia, and with negligible damage to the skin and cervical tissues, have been proposed during the past two decades. Today, ultrasound-guided percutaneous ethanol injection and thermal ablation with laser or radiofrequency have been thoroughly evaluated, and are accessible procedures in specialized centres. In clinical practice, relapsing thyroid cysts are effectively managed with percutaneous ethanol injection treatment, which should be considered therapy of choice. In solid non-functioning thyroid nodules that grow or become symptomatic, trained operators may safely induce, with a single session of laser ablation treatment or radiofrequency ablation, a 50% volume decrease and, in parallel, improve local symptoms. In contrast, hyperfunctioning nodules remain best treated with radioactive iodine, which results in a better control of hyperthyroidism, also in the

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long-term, and fewer side-effects. Currently, minimally invasive treatment is also investigated for achieving local control of small size neck recurrences of papillary thyroid carcinoma in patients who are poor candidates for repeat cervical lymph node dissection. This particular use should still be considered experimental.

Is there a need for minimally invasive treatments for thyroid nodules?

Benign thyroid nodules

Thyroid nodules and nodular goitre constitute a common clinical problem in everyday endocrine practice. In the general population, thyroid nodules are evident at physical examination in 3–7% and by ultrasound evaluation in 20–70% of people [1–7], with a prevalence similar to that at autopsy [8]. The risk of thyroid nodular disease increases with age, is more prevalent in women than in men, occurs more frequently in iodine-deficient regions and in people who experience secondary exposure to ionizing radiation [7,9,10]. The incidence of new nodules is estimated at about 0.1% per year, with nearly a 10% lifetime probability of being diagnosed with a thyroid nodule [9,11–13]. Most are small and benign, and remain asymptomatic and do not warrant treatment. A proportion of them, however, grow over time and cause local symptoms, anxiety, or both. Against this extensive, albeit most often harmless, clinical problem, no effective medical treatment is currently available. The long-term use of thyroid-stimulating hormone (TSH)-suppressive therapy, with levothyroxine or with thyroid hormone derivates, is of questionable efficacy, potentially associated with increased somatic [14] and psychiatric morbidity [15] and subsequently mortality [16], and is therefore discouraged by specialist societies [12,13]. Thus, if needed, surgery has, until now, been the therapeutic solution for thyroid lesions which, after a variable follow up and a number of clinical, laboratory and ultrasound controls, are symptomatic

Abbreviations

AFTN	autonomously functioning nodules
CEUS	contrast-enhanced ultrasound
DTC	differentiated thyroid cancer
FT3	free triiodothyronine
FT4	free thyroxine
^{131}I	radioiodine
LAT	laser ablation treatment
mL	millilitre
mm	millimetre
MIT	minimally-invasive treatment
MTC	medullary thyroid cancer
PEIT	percutaneous ethanol injection treatment
PTC	papillary thyroid carcinoma
PTMC	papillary thyroid microcarcinoma
RCT	randomized-controlled trial
RFA	radiofrequency ablation
Tg	thyroglobulin