Objective: To determine the diagnostic value of $^{131}$I SPECT/spiral CT (SPECT/CT) on nodal staging of patients with thyroid carcinoma at the first ablative radioiodine therapy.

Methods: Fifty-seven patients were studied using SPECT/CT 3-4 days after receiving $3.96 \pm 0.5$ GBq of $^{131}$I for radioablation of thyroid remnants after a thyroidectomy for differentiated thyroid carcinoma (DTC). In addition to planar whole-body scintigraphy, SPECT/CT of the neck was performed using a hybrid camera combining a double-head SPECT camera with either a 2-slice (n=23) or a 6-slice (n=34) spiral CT scanner. The planar scans and the SPECT/CT images were evaluated for cervical tracer uptake independently of each other and of the clinical findings.

Results: SPECT/CT led to a revision of the original diagnosis in 28 of 143 cervical foci of radioiodine uptake seen on planar imaging. In particular, SPECT/CT reclassified as benign 6 of 11 lesions considered to be lymph node metastases and 11 of 15 lesions considered to be indeterminate. Furthermore, SPECT/CT allowed the identification of 11 lymph node metastases classified as thyroid remnant or as indeterminate on planar imaging. Based on this revision, SPECT/CT yielded a gain in information on nodal stage in 20 of the 57 patients studied (35%; P<0.03). SPECT/CT altered nodal stage from N0 to N1 in 2 of 20 patients and from indeterminate (Nx) to N1 in 6 of 30 patients. The result was a change in risk stratification conforming to the classification proposed by the International Union Against Cancer in 14 patients (25%).

Conclusions: SPECT/CT determines lymph node involvement at radioablation performed for thyroid cancer more accurately than does planar imaging. SPECT/CT may alter management in roughly one quarter of patients with thyroid carcinoma by upstaging or downstaging their disease.

COMMENT

The standard treatment of differentiated thyroid carcinoma (DTC) includes total thyroidectomy (Tx) and radioablation with $^{131}$I. For the follow-up of patients with DTC, the demonstration (or exclusion) of regional lymph node metastases (LNMs) plays a major role since patients with LNMs are considered as high-risk patients. With the development of imaging techniques, foci of $^{131}$I uptake (by planar scintigraphy) in the neck can now be related more precisely to their morphological location with the use of hybrid cameras combining a dual-head SPECT camera with a CT scanner. In the present study, data acquisition was obtained under TSH stimulation (54 patients without replacement therapy after Tx; 3 patients after rhTSH injection). Immediately after performing the planar scintigraphy, a SPECT/CT scan was acquired using a spiral CT camera. On planar imaging, 143 cervical foci of $^{131}$I uptake were found. In 28 of these foci (19.5%), the SPECT/CT led to a revision of the original diagnosis. In particular, 6/11 lesions considered to be LNMs and 11/15
lesions considered to be indeterminate were reclassified as benign. Furthermore, SPECT/CT allowed for the correct identification of 11 LNMs misinterpreted as a thyroid remnant or originally classified as indeterminate on planar imaging. In 24 out of 57 patients, the diagnosis reached by planar scintigraphy was revised or specified by SPECT/CT. SPECT/CT also yielded a gain in information on nodal stage in 20/57 patients (35%). The change of nodal stage resulted, in turn, in a revised risk stratification of such patients with consequences for their long term follow-up in 14/57 cases (25%). Specifically, 9 patients were regrouped as low-risk and 5 as high-risk patients.

One inherent weakness of this study was the absence of information from neck ultrasonography, although it is known that small LNMs may escape detection by ultrasound and enlarged lymph nodes could also represent inflammatory changes which are difficult to differentiate from metastatic lymph node involvement.

The results presented in this interesting clinical study suggest that SPECT/CT should be used as a routine procedure in patients with DTC at the first post-Tx radioablation. By upstaging or down-staging residual disease, SPECT/CT may alter the management of up to one quarter of patients with DTC.

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See Figure below

FIGURE 4. Imaging results in patients classified as N0 (A) or Nx (B) by histopathology. “Nx” denotes classification as indeterminate.