ALL FORMS OF THYROID NODULE CALCIFICATION SEEN ON COMPUTED TOMOGRAPHY ARE ASSOCIATED WITH MALIGNANCY

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SUMMARY • • • •

BACKGROUND

Several published studies show that a combination of sonographic features such as solid texture, hypoechogenicity, microcalcifications, macrocalcifications, and intranodular vascularity predict that a nodule is more likely to be malignant (1-3). This study examines the patterns and clinical importance of the calcification of thyroid nodules seen on preoperative computed tomography (CT).

METHODS

This was a retrospective review of all patients who had a thyroidectomy performed by a single head and neck surgeon at a tertiary referral center from January 2004 through May 2010. Most patients had the thyroidectomy because they had a large or substernal goiter or cytologic studies suggested malignancy. The CT scans were evaluated by two experienced head and neck surgeons and a radiologist who had no knowledge of the original CT interpretation or histopathological diagnosis.

The thyroid calcifications were put into one of four categories: (1) peripheral calcifications (coarse curvilinear eggshell-like pattern); (2) coarse calcification (large, amorphous calcifications >2 mm); (3) single punctate calcification (intranodular single microcalcification <2 mm); or (4) multiple punctate calcifications(multipleintranodularmicrocalcifications <2 mm). If a lesion had punctate calcifications and another pattern, the nodule was classified as just punctate microcalcifications. The calcification type on CT was compared with the histopathological findings.

RESULTS

During the study period, 488 patients underwent thyroidectomy, and 383 (78.5%) had a preoperative CT scan available for review. The average age was 49.3 years, with a male-to-female ratio of 1 to 2.54. A total of 114 (29.8%) of patients were found on histopathology to have thyroid cancer. Intrathyroidal calcifications were noted in 125 (35%) of patients. Most of the benign lesions with calcifications were associated with nodular goiter (65 of 70; 93%) and most of the malignant calcified lesions were papillary thyroid carcinoma (59 of 65; 91%). Calcifications were noted in 57% (65 of 114) of the malignant nodules and 26% (70 of 269) of the benign nodules. When calcification was seen in a clinically solitary thyroid nodule, the nodule was malignant in 35 of 42 patients (83%).

Clinical

THYROIDOLOGY

CONCLUSION

There was a strong association between CT-detected calcifications and thyroid malignancy, especially with singleormultiplepunctate calcifications (52 of 54; 70%) or patients in whom calcifications were noted within a solitary nodule. Nearly all of the microcalcifications were associated with papillary carcinoma (49 of 52; 94%). Peripheral or egg-shell calcifications were associated with malignancy in 22% (2 of 9) cases. Of the cases with coarse dystrophic intranodular calcifications, 21% (11 of 52) were associated with a malignant nodule. Although CT imaging is not commonly obtained and not recommended by the 2009 revised ATA guidelines for the evaluation of a thyroid nodule (4), these findings provide additional information to help guide the selection of nodules for biopsy and/or extent of surgery.

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In the past few years, several guidelines (4,5), including the 2009 ATA guideline do not recommend preoperative cross-sectional anatomic imaging with CT scanning or magnetic resonance imaging. There are clinical scenarios to obtain preoperative cross-sectional imaging to fully assess: (1) the extent of substernal goiter, (2) tracheal narrowing, and (3) nodal involvement, especially deeper than the tracheal esophageal groove, in the anterior mediastinum, or high in level 2 (under the mandible). This report provides the CT equivalent of what we already know about the increased risk of malignancy with sonographic evidence of microcalcifications and macrocalcifications of thyroid nodules. This report supports that most of the malignant calcified lesions were papillary carcinoma (91%) but that calcification is also associated with follicular carcinoma (3 of 5; 60%) but less commonly in follicular adenoma (3 of 26;12%). Of the 31 follicular neoplasms on cytology, 6 of these nodules had calcifications and half had cancer. Thus, this CT study confirms sonographic evidence that microcalcifications are highly associated with papillary thyroid carcinoma and either egg-shell or dystrophic calcifications are also associated with thyroid malignancy, but with less frequency. Thus, when a preoperative CT scan of a large goiter or a substernal goiter shows thyroid nodules with calcifications, especially punctate single or multiple microcalcifications, these nodules should be biopsied to help guide the extent of surgery.

- Stephanie L. Lee, MD, PhD

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