Cystic Appearance of Cervical Lymph Nodes Is Characteristic of Metastatic Papillary Thyroid Carcinoma

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Received 22 March 2001; accepted 26 August 2002

ABSTRACT: Purpose. The usefulness of high-resolution sonography in diagnosing cervical lymph node metastases from papillary thyroid carcinoma was investigated. The accuracy of a particular sign, cystic change within a node, in establishing the diagnosis was assessed.

Methods. The sonographic findings in 63 patients with enlarged cervical lymph nodes were retrospectively reviewed. The patients had undergone high-resolution gray-scale and color Doppler sonography followed by ultrasound-guided fine-needle aspiration (FNA) in all patients and surgical excision in 27 patients.

Results. Abnormal sonographic features were present in the lymph nodes of all 63 patients. In 14 (70%) of 20 patients with papillary thyroid carcinoma, sonography depicted cystic changes. This pattern was not found in any of the other 43 patients, in whom FNA revealed either metastasis from another malignancy (22 patients) or benign reactive lymphadenopathy (21 patients). Among the 63 patients, there were 43 true-negative, 14 true-positive, 6 false-negative, and no false-positive results in the diagnosis of metastatic papillary thyroid carcinoma using the presence or absence of an intranodal cystic area on sonography. These results yielded a 70% sensitivity, 100% specificity, 100% positive predictive value, 88% negative predictive value, and 90% overall accuracy for this criterion.

Conclusions. Cystic changes within a cervical lymph node are highly suggestive of metastatic papillary thyroid carcinoma. © 2002 Wiley Periodicals, Inc. J Clin Ultrasound 31:21–25, 2003; Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/jcu.10130

Keywords: cervical lymph node; papillary carcinoma of thyroid; high-resolution ultrasonography; cystic changes; fine needle aspiration; color Doppler ultrasonography

Metastatic cervical lymphadenopathy is a common finding in patients with head and neck carcinomas, and its detection is crucial in the management of these patients. Sonographic evidence of enlarged and abnormal lymph nodes in a patient with a proven thyroid malignancy usually leads to neck dissection in addition to thyroidectomy; but if only normal or slightly enlarged lymph nodes with a normal echotexture are demonstrated, patients can be spared neck dissection.¹

The sonographic differentiation between a normal and an abnormal lymph node is based on the node’s size, shape, border sharpness, echotexture, and vascular patterns. The reported sensitivity of sonography in detecting a lymph node abnormality is almost 97%; however, the specificity is much lower, at 32%. When sonography is combined with fine-needle aspiration (FNA), the specificity increases to 93%.²³ Although criteria for the diagnosis of normal nodes are well established, overlap between metastasis and various other pathologic conditions still exists. In this study, we
evaluated the usefulness of high-resolution sonography in diagnosing cervical lymph node metastases from papillary carcinoma of the thyroid and assessed the accuracy of a specific sign in establishing the diagnosis.

**PATIENTS AND METHODS**

The sonographic studies of 63 patients (20–66 years of age; 43 women and 20 men) with reported sonographically abnormal cervical lymph nodes were retrospectively reviewed. A lymph node was considered normal when it appeared slender or oval with a well-defined contour, a uniformly hypoechoic internal architecture, and a narrow hilum, seen as a thin echogenic line. A lymph node was considered abnormal when it had a globular shape, ill-defined borders, a non-uniform echotexture, or no normal hilum. The presence of occasional calcifications or cystic changes was considered abnormal as well.2–11 On color Doppler sonography, a normal lymph node usually displayed a small vessel within the hilum; an abnormal lymph node displayed diffuse hypervascularity and chaotic vessels with an uneven distribution.12–15

All sonographic examinations had been performed using commercially available ultrasound equipment (XP-10, Acuson, Mountain View, CA; and Power Vision 7000, Toshiba, Tokyo, Japan) with high-resolution 7.5–10.0-MHz linear-array transducers. The sonograms were independently reviewed by 2 experienced radiologists (A. K. and J. W.) to confirm the presence, location, and features of lymph node abnormalities.

The abnormal lymph nodes were categorized according to their location: submental, submandibular, parotid, upper jugular, mid-jugular, lower jugular, supraclavicular fossa, and posterior triangle, as described by Hajek et al.4

Ultrasound-guided FNA and cytologic analysis had been performed in all patients. Histopathologic findings were available in the 27 patients who underwent surgery (43%). Based on the cytologic and histopathologic findings, the patients were assigned to 1 of 3 diagnosis groups. One group (20 patients) had histopathologically proven cervical lymph node metastases from papillary thyroid carcinoma. A second group (22 patients) had cytologically proven cervical lymph node metastases from other local malignancies (medullary carcinoma of the thyroid in 6 patients, head and neck squamous cell carcinoma in 7 patients, and lymphoma in 5 patients) or from distant malignancies (4 patients). The clinical management in these patients (chemotherapy or surgery) was based on the FNA results. The cytologic findings in the final group (21 patients) were suggestive of benign reactive lymphadenopathy. These patients underwent clinical follow-up. The sonographic findings in the 3 diagnosis groups were compared.

**RESULTS**

Sonographic lymph node abnormalities were identified in all 63 patients based on pre-established sonographic criteria.4–15 In the group of 20 patients with papillary thyroid carcinoma, 16 patients (80%) had enlarged nodes in the mid-jugular territory, 3 patients (15%) in the supraclavicular fossa, and 1 patient (5%) in the submandibular region. In the group of 22 patients with other metastatic malignancies, 14 patients (64%) had enlarged nodes in the mid-jugular territory, 4 patients (18%) in the supraclavicular fossa, 2 patients (9%) in the submandibular region, and 2 patients (9%) in the lower jugular territory. In the group of 21 patients with benign reactive nodes, 11 patients (52%) had enlarged nodes in the mid-jugular territory, 8 patients (38%) in the lower jugular territory, and 2 patients (10%) in the submandibular region.

Analysis of the sonograms in the group with papillary thyroid carcinoma revealed cystic changes in 14 (70%) of 20 patients. In 7 of the 14 patients, the change consisted of a single cystic area located at the periphery of the node (Figure 1), and color Doppler sonography demonstrated hypervascularity in the solid portion of the node. In 3 other patients, there were multiple cystic areas in the periphery of the node (Figure 2), and color Doppler sonography demonstrated hypervascular.
vascularity in the remaining central solid portion of the node. The other 4 patients had almost complete cystic replacement of the node with only a small peripherally located remnant of normal lymphoid tissue (Figure 3A); color Doppler sonography demonstrated hypervascularity in the septa that separated the cystic areas (Figure 3B). The 6 patients (30%) without cystic changes had enlarged round nodes containing calcifications. Cytology revealed the correct diagnosis in all 14 patients with cystic changes and in 4 patients without cystic changes.

In the group with other metastatic malignancies, the lymph nodes were enlarged and round without a normal hilum and with hypervascularity on color Doppler examination. None showed cystic changes.

In the group of patients with benign reactive lymph nodes, the nodes were enlarged, more globular, and less slender in shape than normal nodes but had well-defined borders. The nodes had a normal homogeneous echo pattern and a thin, linear echogenic hilum. Color Doppler examination in these patients demonstrated a central vessel, sometimes branching, within the nodal hilum. No cystic changes were identified in any of the patients in this group.

Among the 63 patients, there were 43 true-negative, 14 true-positive, 6 false-negative, and no false-positive results in the diagnosis of meta-
static papillary thyroid carcinoma using the presence or absence of an intranodal cystic area on sonography. These results yielded a sensitivity of 70%, specificity and positive predictive value of 100%, negative predictive value of 88%, and overall accuracy of 90% for this criterion.

**DISCUSSION**

The detection of cervical lymphadenopathy often presents a clinical dilemma. In a patient with a known thyroid malignancy, sonographic detection of abnormal lymph nodes may indicate metastatic disease requiring more extensive surgery.\(^1,2\) Although ultrasound-guided biopsy is necessary to reach a definite diagnosis,\(^3,4\) not every enlarged node should undergo biopsy. Only nodes suspicious for cancer based on established sonographic criteria should be further evaluated. These criteria include morphologic changes such as enlargement, globular shape, ill-defined contour, nonhomogeneous internal architecture including cystic changes and calcifications, and absence of an echogenic hilum\(^5-11\) as well as color Doppler abnormalities such as hypervascularity and chaotic vessel distribution within the node.\(^12-15\) Awareness of the different sonographic appearances of benign versus malignant cervical lymph nodes is essential for further management. In a patient without a known malignancy, if an enlarged node is otherwise sonographically normal, follow-up will be sufficient.

This study describes an additional sonographic finding associated with papillary carcinoma of the thyroid: cystic changes within the lymph node. Such changes can consist of a small solitary cystic area, multiple peripheral cystic areas, or almost complete replacement of the node by cystic formation. The changes appear to be characteristic of metastatic papillary thyroid carcinoma, with a positive predictive value of 100% and negative predictive value of 88%. Therefore, careful examination of the thyroid should be carried out whenever a cystic lesion is encountered in a cervical lymph node. In 10–13% of patients with thyroid carcinoma, the sole initial manifestation is an abnormal cervical lymph node. The cystic changes represent liquefaction necrosis.\(^16\)

Our results are in accordance with those of previous studies\(^17-19\) that reported cystic changes on sonography in cervical lymph node metastases from thyroid carcinoma. However, in a study by Hatabu et al,\(^18\) FNA was positive in only 33% of patients, while in our study, FNA revealed the correct diagnosis prior to surgery in 18 (90%) of 20 patients. The cystic nature of metastatic papillary thyroid carcinoma has also been demonstrated on CT and MRI, as reported by Som et al.\(^20\)

The findings in the present study differ from those reported by Ahuja et al.\(^21\) Most (81%) of their patients with cervical lymph node metastases from papillary thyroid carcinoma had enlarged solid lymph nodes with or without calcifications. Only 30% of our patients had calcifications, while 70% of our patients had cystic changes as described above.

The differential diagnosis of a cystic cervical mass should include a branchial cyst.\(^22-24\) Nodal metastases from papillary thyroid carcinoma tend to undergo cystic degeneration and to grow in an obvious papillary pattern. However, the cystic changes can be so pronounced as to result in their misdiagnosis as branchial cysts. The presence of papillae, nuclear abnormalities, and psammoma bodies provides clues for the diagnosis of nodal metastases, which can be easily confirmed with a thyroglobulin stain.\(^27\) Branchial cysts, which are rare, are usually located above the carotid triangle, whereas metastases from papillary thyroid carcinoma occur in a lower location. Color Doppler sonography can distinguish avascular branchial cysts from highly vascular lymph node metastases.\(^12-15\) Liquefaction within lymph nodes assuming a cyst-like appearance has also been reported in inflammatory conditions such as tuberculous lymphadenitis,\(^24\) lymphoepithelial cysts in acquired immunodeficiency syndrome,\(^25\) and lymph nodes containing metastatic squamous cell carcinoma.\(^23,26\) However, none of the above conditions were detected in our series.

In conclusion, cystic changes in cervical lymph nodes are highly suggestive of metastatic papillary thyroid carcinoma. Ultrasound-guided FNA should be performed to confirm the diagnosis. If an ultrasound-guided needle biopsy cannot be performed (for technical reasons), the cystic changes should be regarded as positive evidence of metastatic disease, especially in a patient with a known thyroid tumor, and surgery should be contemplated.

**REFERENCES**

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