Clinical Review: Thyroid Cancer Mimics on Surveillance Neck Sonography

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Sonography of the neck is a critical tool in monitoring patients after near-total thyroidectomy for differentiated thyroid cancer. Sonography has proven to be among the most sensitive imaging techniques for the detection of recurrent or residual cancer in the thyroidectomy bed and metastatic cervical lymph nodes. It is important for the sonologist to be familiar with normal postsurgical findings and other disease processes that may imitate malignant lesions. We describe the typical sonographic appearance of benign lesions that can resemble recurrent thyroid cancer.

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Abbreviation: FNA, fine-needle aspiration.

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Findings Related to Surgery

Suture granuloma

Suture granulomas are benign inflammatory lesions that form in response to the nonabsorbable suture commonly used for thyroidectomy (1). Ultrasound shows an irregular, heterogeneous, soft tissue lesion with central or paracentral echogenic foci due to suture material rather than calcifications (Figure 1). These foci are typically 1 mm or more in diameter and may appear paired (2). The lack of vascularity helps differentiate these lesions from cancer metastases.

Chronic granulomatous lesion

Similar to suture granulomas but less common, chronic granulomatous lesions are benign inflammatory lesions that form after thyroidectomy but have no foreign body or suture material on pathology. They also appear as hypoechoic, poorly marginated lesions with one or more central echogenic foci, but they tend to be larger than suture granulomas and may have complex cystic regions and peripheral vascularity (Figure 2). These lesions typically occur within the sternocleidomastoid muscle or adjacent superficial soft tissues, which are uncommon sites of recurrence for thyroid cancer in the absence of gross extracapsular spread at the time of initial resection (3).

Traumatic neuroma

Traumatic neuromas represent a postsurgical proliferation of injured nerves occurring in a previously operated field (4–6). After thyroidectomy, these may be found in the lateral neck and are near but not typically in direct contact with the carotid artery (7). If located in the lower lateral neck compartments, continuity between the neuroma and cervical plexus may be visible (5). Compared to metastatic lymph nodes, they tend to be fusiform and ill-defined, are less likely to have echogenic foci (5), but may have a central hyperechoic area (7), lack cystic spaces, and are avascular (Figure 3). The nerve may be visualized entering or exiting the lesion. When attempted for diagnosis, fine-needle aspiration (FNA) with slow advancement of the needle into the periphery of the lesion may elicit a sudden, sharp, radiating pain consistent with nerve stimulation and is diagnostic. FNA should be avoided if the lesion has the characteristic appearance and location of a traumatic neuroma.

Surgical clip

Metal surgical clips have a bright linear appearance that can mimic calcifications. They may show reverberation artifact behind the clip rather than distal acoustic shadowing (Figure 4).

Abbreviation: FNA, fine-needle aspiration.
Findings Not Related to Previous Surgery

Reactive lymph node
Reactive lymph nodes develop secondary to benign proliferation of lymphoid tissue in response to local or remote infection or inflammation and are most commonly noted in the submandibular region (level II). Reactive nodes are enlarged and may show an increase in their vascularity, but they typically maintain their oval shape, smooth and homogeneous hypoechoic cortex, and central vascular branching pattern (Figure 5) (8, 9). In contrast, a metastatic lymph node is commonly round and hypoechoic, lacks an echogenic hilus, and may have irregular cortical thickening. Metastatic nodes may have peripheral and central rather than just hilar vascularity and can demonstrate cystic change and calcifications (10). FNA may still be indicated if reactive lymph nodes are suspected because this appearance can overlap with other malignancies, particularly lymphoma.

Parathyroid adenoma
Although normal parathyroid glands are too small to visualize on ultrasound, a hyperplastic parathyroid gland or parathyroid adenoma can resemble a paratracheal (level VI) lymph node. Adenomas take on many shapes but are most commonly oval to round (11, 12). They are usually homogeneously hypoechoic, solid, and noncalcified; variants include heterogeneous echogenicity and cystic change. Identification of the arterial supply of the parathyroid gland, which may include a feeder (“polar”) vessel along the long axis with peripheral “rim” or “arc” flow around the capsule (Figure 6), is an important differentiating feature from a lymph node, which has central arterial supply (13, 14). FNA with assay of needle washout for PTH can be performed as needed to clarify the diagnosis.

Schwannoma
A schwannoma is a benign, encapsulated nerve sheath tumor that arises from Schwann cells (15). Sonography shows a spindle-shaped hypoechoic lesion with smooth borders and internal chaotic vascularity that may resemble malignancy; central cystic areas may also be present (8). Identification of the affected nerve entering or exiting the lesion is a key differentiating feature of these lesions (Figure 7). Similar to a traumatic neuroma, FNA will cause radiating sharp pain as soon as the needle enters the periphery of the schwannoma and should be avoided because of the characteristic demonstration of the nerve. If indicated, magnetic resonance imaging demonstrates hypointense signal on T2-weighted images and hypointense signal on T1 images (16).
Esophageal diverticulum

Due to the anatomical proximity of the thyroid and esophagus, diverticula caused by anterolateral or posterior protrusion of pharyngeal mucosa through muscle at the pharyngoesophageal junction may be seen on neck sonography (Figure 8). The most commonly detected diverticula are behind the posterior left lobe (17). If a diverticulum fills with air during the examination, gas admixed with fluid may cause echogenic foci that could be interpreted as calcifications (17–19). However, with swallowing, these echogenic areas move as air shifts. Ultrasound in the longitudinal plane may reveal communication with the esophagus (18, 19), which may be better visualized by ingestion of water during the examination (17, 19). Barium esophagram can confirm the diagnosis.

Cervical thymus

During fetal development, the thymus descends from the third and fourth pharyngeal pouches into the anterior mediastinum (20). The superior aspect of the thymus may be visible by sonography in the lower central neck in children and less commonly in adults due to atrophy of the gland after puberty. The visualized portions of the thymus will have a fusiform or triangular shape with well-defined borders (Figure 9). The parenchyma has multiple punctuate or linear hyperechoic areas representing fat that may mimic microcalcifications (21).

Silicone lymphadenopathy

Silicone used in breast and joint prostheses can be released into surrounding tissues and sequestered in lymph nodes, causing a foreign-body reaction. Ultrasound of an involved node demonstrates characteristic findings of a hyperechoic appearance with limited penetration of sound, absent vascularity, and distal dirty acoustic shadowing (Figure 10), termed a “snowstorm appearance” (22, 23). If caused by leakage from a breast implant, the abnormal lymph nodes will be found in the distribution of the mammary nodal chain and will be evident in the ipsilateral supraclavicular and axillary nodes.

Figure 5. A, Sagittal sonogram of an enlarged reactive level II lymph node that maintains an ovoid shape and fatty hilum. B, Sagittal sonogram of another reactive level II node demonstrates central branching vascularity.

Figure 6. Sagittal view (A) shows a hypoechoic focus (asterisk) that on transverse view (B) demonstrated peripheral vascularity and a polar vessel (arrow), suspicious for a parathyroid adenoma. FNA with PTH washout demonstrated an elevated PTH level.

Figure 7. Longitudinal sonogram of a schwannoma (S) with a nerve root exiting the tumor (arrow).
Sarcoidosis

Sarcoidosis is a multisystem granulomatous disease that can cause lymphadenopathy with round, heterogeneous lymph nodes that may contain speckled or peripheral calcifications and appear suspicious for malignancy on grayscale imaging (Figure 11). As with other mimics for metastatic adenopathy, they are relatively avascular. In addition, while recurrent thyroid cancer is typically unilateral, sarcoid tends to involve lower lateral compartment (levels IV and Vb) lymph nodes bilaterally (8).

Conclusion

This pictorial essay highlights both common and unusual findings that may be encountered when performing and interpreting neck sonography on patients who have undergone thyroidectomy. Although not exhaustive of all potential thyroid cancer imposters, these images emphasize the need to maintain a broad differential diagnosis of findings on surveillance ultrasound, particularly in patients with low or undetectable thyroglobulin levels. Although FNA may be required to definitively characterize many of these lesions, fastidious ultrasonography may clarify the etiology.

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