

36 Thyroid

Thyroidectomies

One major task of the surgical pathologist evaluating a thyroid specimen is to identify the infrequent thyroid neoplasm from among the vast majority of harmless thyroid nodules—an effort that is shared with the cytopathologist, endocrinologist, and surgeon. Thorough inspection and appropriate sampling of the thyroid is central to the diagnosis and subsequent treatment of thyroid lesions.

The thyroid gland has a relatively simple anatomy. As illustrated, its shape resembles that of a butterfly with open wings: two expanded lateral lobes are bridged at the midline by the isthmus. In some specimens, a small triangular midline lobe (i.e., the pyramidal lobe) is also present. When present, the pyramidal lobe extends superiorly from the isthmus. The two most common resections of the thyroid are total thyroidectomy, in which the entire gland is removed intact, and hemithyroidectomy, in which a single lobe is removed by an incision through the isthmus. Orientation of these specimens is seldom problematic. The isthmus can be used to identify the inferior and medial aspects of the gland, and the posterior surfaces of the lateral lobes have a concave shape caused by the trachea.

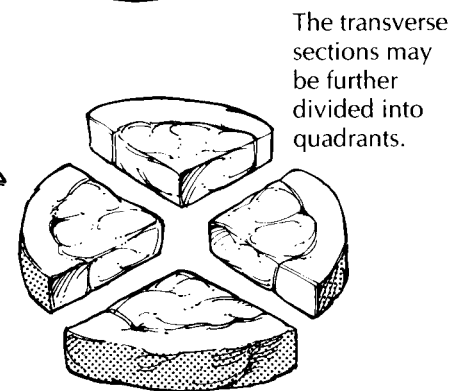
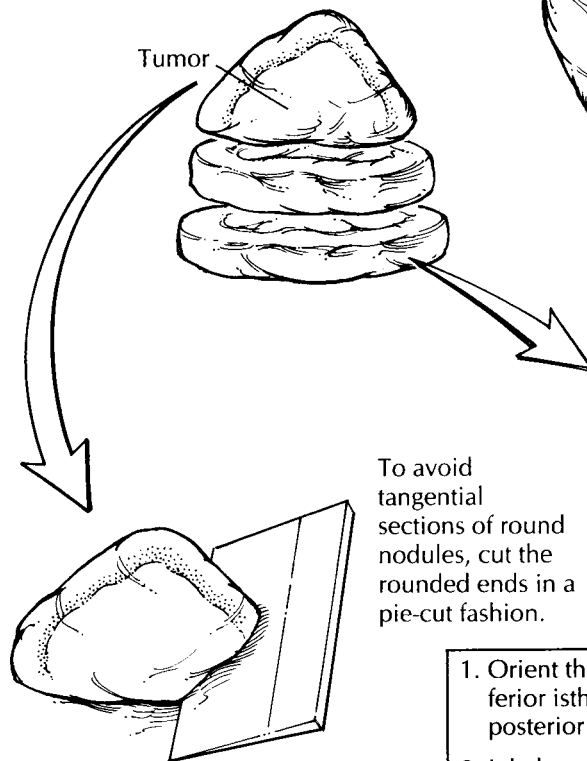
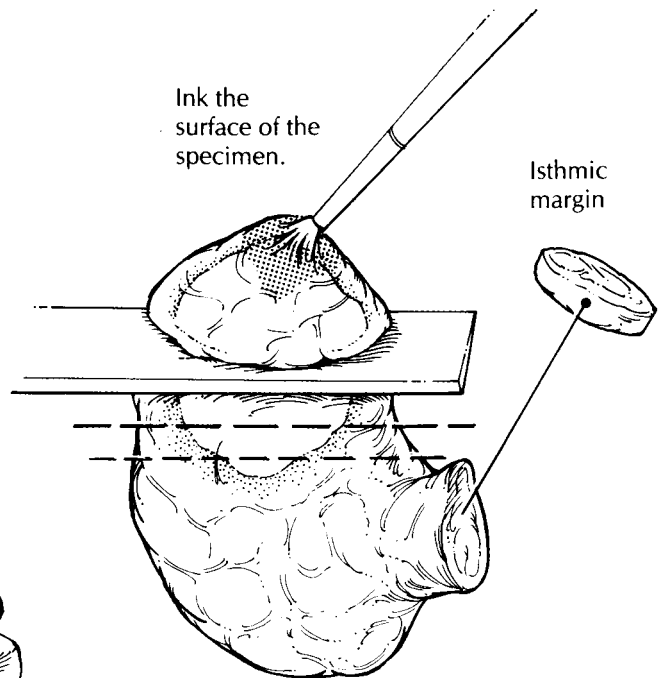
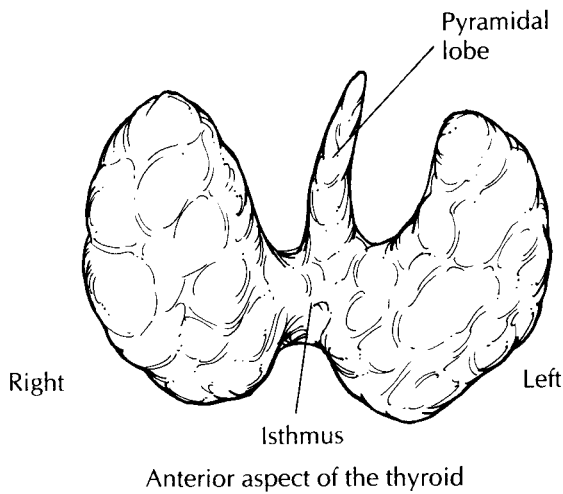
Once the specimen has been oriented, it should be weighed and measured. Describe its shape, contours, and symmetry. Be sure to note the presence and appearance of any extrathyroidal tissues. In particular, inspect the posterior aspect of the specimen for parathyroid glands and lymph nodes, and inspect the anterior aspect for fragments of adherent skeletal muscle. Palpate the specimen to assess the consistency

of the thyroid and to localize any focal lesions before cutting the specimen.

Paint the outer surfaces of the thyroid with ink; and in the case of hemithyroidectomy, remove the isthmic margin as a thin shave section. Although the specimen can be serially sectioned in either the coronal, sagittal, or transverse plane, the relationship of a focal lesion to the thyroid capsule is often best demonstrated by cutting perpendicular to the long axis of each individual lobe. Once the thyroid is sectioned, sequentially lay out the individual slices in such a way as to maintain the proper orientation of the specimen.

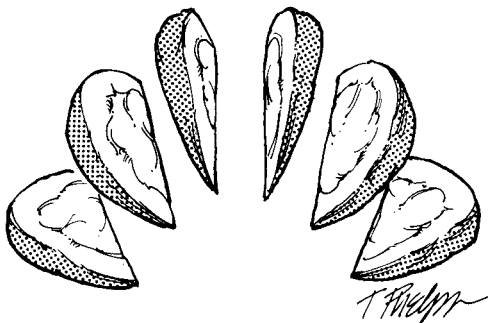
Carefully inspect the cut surfaces of the specimen. Assess whether the thyroid is diffusely or focally abnormal. For diffuse lesions, ask yourself the following questions: Is the gland symmetrically or asymmetrically involved? Is the lesion confined to the thyroid, or does it extend beyond the capsule of the thyroid into the surrounding soft tissues? Is the lesion cystic or solid, soft or hard, well demarcated or poorly defined? If an isolated lesion is identified, record its size and location, and determine if it is surrounded by a capsule. Keep in mind that the presence of a discrete nodule does not exclude the presence of additional lesions. Always look for multifocal lesions. Gentle palpation of each slice will sometimes reveal small but firm carcinomas that are not apparent simply by looking at the cut surface.

Imprints of the tumor allow quick and easy evaluation of its cytologic features and will nicely supplement the histologic findings of a frozen section. Simply touch the surface of a glass slide to the cut surface of the tumor, or smear a small piece of the tumor between two slides, and immediately fix the slides in 95% alcohol. These



Thyroidectomy

1. Orient the gland by identifying the inferior isthmus and the concavity of the posterior aspect of lateral lobes.
2. Ink the outer surfaces.
3. In hemithyroidectomies, shave the isthmic margin.
4. Serially section the lobes transversely.
5. Submit sections to demonstrate the normal parenchyma, any identifiable lymph nodes, parathyroid glands, the interface of the tumor and adjacent parenchyma, and the interface of the tumor and capsule. For an encapsulated thyroid neoplasm, submit the tumor capsule in its entirety to show the interface of the tumor with the surrounding thyroid parenchyma.



slides can be used for Diff-Quik or hematoxylin and eosin staining.

Sections for histology should be taken to demonstrate the following: (1) all components of a lesion (e.g., solid areas and cystic areas); (2) the interface of the tumor (and its surrounding capsule) with the adjacent non-neoplastic thyroid parenchyma; (3) the relationship of the tumor to the thyroid capsule and extrathyroidal soft tissues; and (4) the presence of parathyroids, lymph nodes, and normal-appearing thyroid parenchyma (one or two sections from each lobe). Since the histologic evaluation will be hampered if the tissue blocks are thick and bulky, you may want to consider fixing the slices in formalin until they are firm enough to section thinly. Although these general guidelines should direct the sampling of any thyroid lesions, two frequently asked questions deserve special consideration:

1. *How many sections do I need to submit to avoid sampling error?* This question often arises in cases of multinodular goiters and encapsulated nodules. In multinodular goiters, the thyroid is often massively enlarged, and its cut surface may show numerous nodules, hemorrhage, calcification, scarring, and even necrosis. In these instances, try to avoid the common error of submitting too many sections. Instead, document the finding with a photograph and a detailed gross description. Sampling a multinodular goiter should be limited to one or two sections selectively taken from the periphery of each nodule (up to five nodules per lobe). Conversely, the more common error when sampling encapsulated nodules is to submit too few sections. Your primary task in sampling these lesions is to make sure that areas of transcapsular or vascular invasion are not missed. Since these areas usually cannot be seen by the naked eye, they can easily be missed unless the peripheral portion of the nodule is extensively sampled. The more capsule sampled, the greater chance of finding invasive foci. Therefore, the tumor–capsule–thyroid interface of any encapsulated nodule should be submitted in its entirety for histologic evaluation.

Similarly, thyroids removed from patients with one of the multiple endocrine neoplasia (MEN) syndromes should be extensively sampled for histology. Many pathology laboratories are beginning to receive thyroids prophylactically removed from young patients with germline mutations of the *ret* proto-oncogene. Even though

these glands may appear grossly normal, each lobe should be blocked and submitted in its entirety in an effort to detect C-cell hyperplasia and small medullary carcinomas. In your gross report, note those sections taken from the middle third of each lobe, as this area is where C-cell hyperplasia and small medullary carcinomas are most likely to be detected.

2. *How can I avoid tangential sections of a round nodule?* Tangential sections through a round nodule may give the artifactual microscopic impression that the tumor infiltrates the capsule. Whereas tangential sectioning is usually not a problem at the equator of a nodule where the knife easily passes perpendicular to the tumor capsule, it becomes increasingly difficult to avoid as one approaches the rounded ends of the nodule while bread-loafing the specimen. One method to minimize tangential sectioning is to cut these rounded ends like a pie rather than a loaf of bread.¹⁸ Decapitate the rounded ends from the tumor nodule, place the flat surface of each end on the cutting board, and then, as illustrated, direct each cut perpendicular to the tumor capsule as though you were dividing a pie into equal pieces.

Regional neck lymph nodes are usually removed separately by the surgeon and submitted as separate specimens. These should be anatomically oriented, and each level should be carefully dissected (see Chapter 10). Each lymph node identified should be submitted for histologic evaluation.

Important Issues to Address in Your Surgical Pathology Report on Thyroidectomies

- What procedure was performed, and what structures/organs are present?
- What is the size of the lesion, and where is it located? Is the tumor multifocal? If so, record the number of tumors and the size of each.
- What are the histologic type and grade of the tumor (e.g., follicular, papillary, medullary, anaplastic)?
- For encapsulated neoplasms, does the tumor infiltrate its surrounding capsule?
- Is vascular invasion present?
- Is the lesion confined to the thyroid, or does it extend beyond the thyroid capsule into the extrathyroidal soft tissues?

- Are any abnormalities present in the non-neoplastic thyroid tissue (e.g., nodular hyperplasia, thyroiditis, C-cell hyperplasia)?
- Is evidence of metastatic disease present? Record the number of lymph nodes with metastases and the total number of lymph nodes examined. If present, note the presence of tumor extension into the extranodal fat.
- If identified, note the presence and number of parathyroid glands. Whenever possible, the location of the gland(s) should be specified.