

38 Adrenal Glands

Adrenalectomies

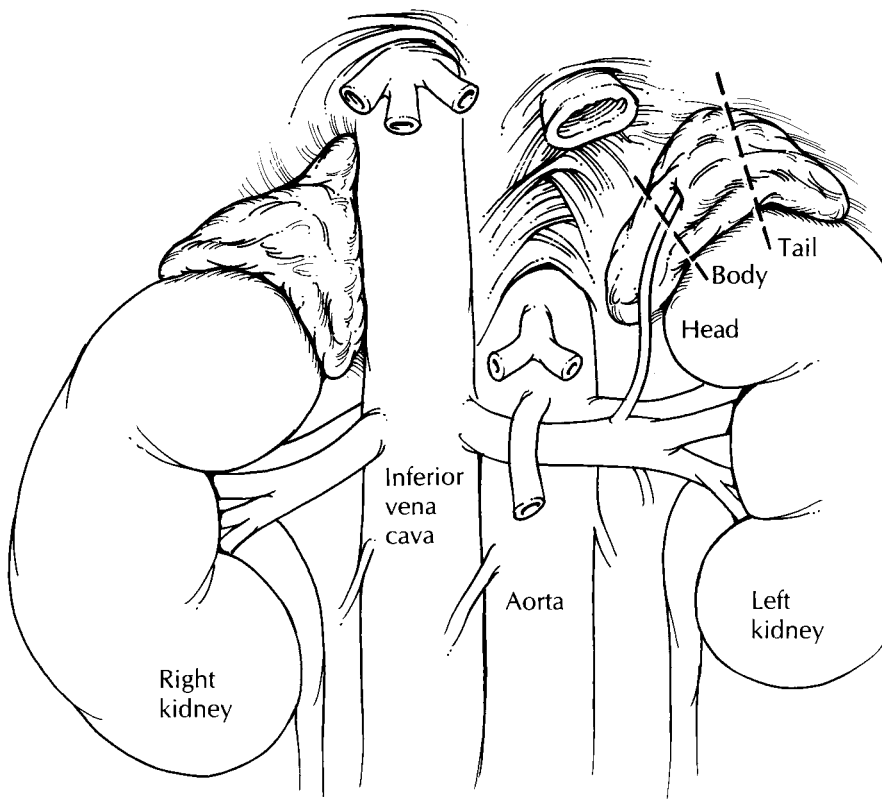
Extrinsic hormonal influences and intrinsic pathologic processes have profound and predictable effects on the size, color, and shape of the adrenal gland. For example, the pathogenesis of hypercortisolism is frequently suggested by the size and color of the adrenal cortex, and the distinction between benign and potentially malignant cortical neoplasms is often based on the dimensions and weight of the tumor. Therefore, careful examination of the gross specimen plays an important role in recognizing and interpreting pathologic processes involving the adrenal gland.

A thorough evaluation of the specimen requires a certain familiarity with the anatomy and weight of the normal adrenal gland. As illustrated, the right adrenal gland has the shape of a pyramid and the left adrenal gland the shape of a crescent. The average weight of each is approximately 4 g in the adult. Weights of 6 g or more are abnormal. Specimen orientation is easily achieved by locating the concave surface of the specimen. This concavity is the point at which the adrenal abuts the ipsilateral kidney, and thus it represents the inferolateral aspect of the specimen. The adrenal gland is considered a tripartite structure composed of a head, body, and tail. The head is the thickest and broadest portion of the adrenal and is situated most medially. The middle third represents the body. The thinnest and most lateral third represents the tail. Unlike the kidney, blood does not enter the adrenal at a single vascular pedicle. Instead, numerous small arteries pierce the cortex at multiple sites. Most of these vessels are too small to appreciate grossly. In contrast, the adrenal is drained by a

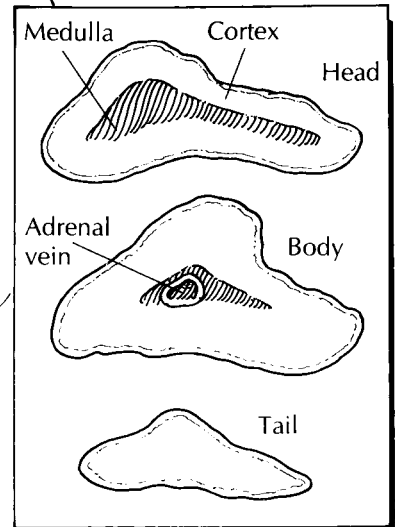
single vein. This vein exits the adrenal at the junction of the body and the head of the gland and is usually visible to the naked eye, especially when filled and distended by tumor.

Examine the contours of the adrenal gland. Be sure to ink the soft tissues overlying any areas where tumor bulges from the surface of the adrenal, since these areas represent soft tissue margins. Look for and sample the adrenal vein. The entire specimen should then be measured and weighed. Distinguishing between a benign and malignant adrenal neoplasm is often done by weight. It is therefore critical that you accurately weigh the intact fresh specimen before it is fixed and before tissue is procured for additional studies. For tumors between 50 and 100 g we recommend that you carefully remove any extraneous soft tissue not near margins closely approached by the tumor before weighing. If the gland appears enlarged, determine and document whether this enlargement is due to a solitary mass, multiple nodules, or diffuse hyperplasia. Extended resections of primary adrenal tumors may also include portions of adjacent kidney, liver, and/or abdominal wall. The presence and appearance of these structures should be noted, and their relationships to the adrenal tumor should be described.

Unless otherwise indicated, the adrenal should always be sectioned in the transverse plane. This plane of sectioning optimizes evaluation of the relative sizes of the cortical and medullary compartments. Serially section the adrenal gland at 2- to 3-mm intervals perpendicular to the long axis of the specimen. Keep in mind that although the adrenal gland is removed as a single structure, it is both structurally and functionally compartmentalized into a steroid-secreting

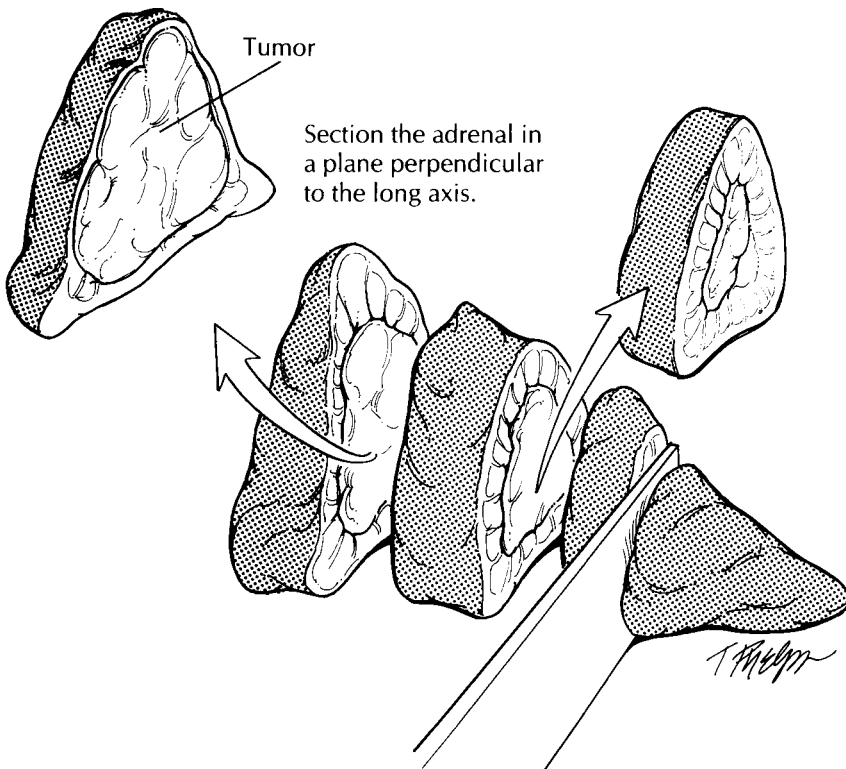


Relative sizes of the cortex and medulla



Adrenalectomy

1. Orient the specimen. The concave surface of the adrenal represents the inferolateral aspect of the gland.
2. Carefully weigh the specimen, and document the size of any nodules.
3. Ink the specimen. If a tumor is present, dissect away any extraneous soft tissues not near a closely approached margin and document the weight of the tumor. Section it perpendicular to the long axis of the gland.
4. Measure the thickness of the cortex and medulla in the head, body, and tail.
5. Submit sections of the tumor to show its relationship to the capsule and to the adjacent adrenal tissue.
6. Submit sections of grossly uninvolved adrenal tissue.



Section the adrenal in a plane perpendicular to the long axis.

cortex and a chromaffin-positive medulla. This compartmentalization will become most apparent when the adrenal is sectioned. The medulla is seen as an inner gray or white band confined mostly to the head of the adrenal. This central band is sharply demarcated from the outer yellow-brown cortex. The inner zone of the cortex is typically brown, while the outer zone of the cortex is often yellow. The inner zone corresponds to the lipofuscin-laden zona reticularis and the outer zone to the lipid-laden zona glomerulosa and zona fasciculata. Measure and record the thickness of these compartments at three levels—the head, body, and tail. Remember to document the exact dimensions of any tumors and to record the appearance of the tumor's cut surface: What is its color? Is it necrotic and/or hemorrhagic? Is it encapsulated? Does it extend beyond the adrenal and into adjacent tissues?

Before the specimen is fixed in formalin, ask yourself if fresh tissue should be specially processed. For example, adrenal cortical neoplasms are sometimes evaluated for steroid content. Viable fresh tissue from these tumors can be snap frozen in liquid nitrogen and stored in a -70°C freezer for easy retrieval if tissue is later needed for biochemical analysis. Fresh tissues from adrenal medullary neoplasms have historically been processed in dichromate fixatives (e.g., Zenker's solution) to preserve cytoplasmic chromaffin granules. Today, this practice has limited value because these same catecholamines can be more precisely characterized and quantified from the patient's serum. Perhaps the strongest indication for special tissue processing is if the tumor was resected from a young patient. For adrenal tumors from pediatric patients—where a primitive neuroblastic tumor is often suspected—fresh tissue should be set aside for cytogenetic, molecular (e.g., N-myc amplification), and ultrastructural analysis (see Chapter 39).

Sections from a tumor should be taken to demonstrate the relationship of the tumor to the adrenal, to the tumor capsule, and to any associated soft tissues and visceral organs. Do not

forget to take sections from the surgical margins, including an appropriate margin from all structures represented in the extended resection (e.g., abdominal wall, kidney) and from the perirenal fat overlying a bulging tumor. Large adrenal tumors should be sampled to include all components contributing to its often variegated appearance on cut section. For the uninvolved adrenal gland and for specimens that do not have a discrete lesion, submit a representative section from the head, body, and tail. To best demonstrate the cortex and medulla, these sections should be taken perpendicular to the long axis of the gland.

Regional lymph nodes will generally not be found in the specimen but may be separately submitted by the surgeon. Any lymph nodes that are present should, of course, be sampled for histologic evaluation.

Important Issues to Address in Your Surgical Pathology Report on Adrenalectomies

- What procedure was performed, and what structures/organs are present?
- What are the dimensions and weight of the adrenal gland?
- For focal tumors: From which compartment (cortex or medulla) does the tumor appear to arise? What are the dimensions and weight of the tumor? Is the tumor benign, malignant, or of uncertain malignant potential? Does the tumor infiltrate vessels, the tumor capsule, and/or the surrounding tissues? What is the status of the surgical margins? Has the tumor metastasized to regional lymph nodes? If so, how many lymph nodes were removed, and how many are involved by tumor?
- For diffuse processes: Which compartment (cortex or medulla) is expanded? Is the compartment uniformly enlarged, or is the enlargement due to multiple nodules?