

# Minimally Invasive Adrenalectomy



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## KEYWORDS

- Minimally invasive • Laparoscopic adrenalectomy • Adrenal incidentaloma
- Posterior retroperitoneoscopic adrenalectomy • Adrenal metastases

## KEY POINTS

- Minimally invasive adrenalectomy is the preferred method for benign, accessible adrenal masses.
- Adrenal imaging and biochemical evaluation are essential for characterization of adrenal lesions.
- Patient selection for laparoscopic transabdominal and posterior retroperitoneoscopic adrenalectomy (PRA) should be based on anthropometric parameters and characterization of the adrenal mass.
- Minimally invasive adrenalectomy has been shown to be safe and efficacious for adrenal metastases; however, open adrenalectomy is recommended in suspected or confirmed primary adrenal malignancy for best oncologic outcome.

## INTRODUCTION

With the increased use of abdominal imaging, adrenal neoplasms are being identified more frequently.<sup>1,2</sup> Autopsy studies have evaluated the frequency of incidental adrenal masses and found that they are present in up to 6% of patients. There is an increasing prevalence with age, as adrenal masses are present in less than 1% of patients younger than 30 years and up to 7% of patients older than 70 years.<sup>3–8</sup> Minimally invasive adrenalectomy through a laparoscopic transabdominal approach was first introduced in the early 1990s and has transformed the management of adrenal tumors.<sup>9</sup> Since then, minimally invasive adrenalectomy has been shown to have less blood loss, earlier patient mobility, decreased length of stay, and faster return to regular

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The authors have nothing to disclose.

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activity.<sup>10–12</sup> These advantages have led to increased frequency of surgery and evolution of indications for adrenalectomy.<sup>13–15</sup>

Laparoscopic adrenalectomy has become the gold standard for removal of benign adrenal masses. This article discusses the management of incidentally discovered adrenal masses, indications for surgery, and surgical approaches, with a focus on the transabdominal and retroperitoneal methods.

## PATIENT EVALUATION AND INDICATIONS FOR ADRENALECTOMY

The initial presentation of an adrenal mass is frequently an adrenal incidentaloma, defined as the identification of an unsuspected adrenal mass when imaging is performed for other indications. Adrenal incidentalomas have been reported in up to 5% of patients undergoing abdominal computed tomographic (CT) scans for other indications.<sup>16–18</sup> Most adrenal masses are benign, although biochemical evaluation is recommended in all patients with adrenal incidentalomas.<sup>2,19,20</sup> Indications for adrenalectomy include a hormonally active adrenal tumor or a suspected or confirmed malignancy.<sup>2,20,21</sup> Adrenal malignancies may be either a primary adrenocortical carcinoma (ACC) or metastases from another primary cancer.

### *Imaging of Adrenal Masses*

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The increased frequency and technological advances in abdominal imaging have led to the increased identification of adrenal masses. Most often the imaging is obtained for other indications and is not optimized for evaluating the adrenal glands.<sup>17</sup> However, some characteristics can be identified to broadly determine the nature of the lesion. Common characteristics attributed to benign adrenal neoplasms are size less than 4 cm, smooth contours with planes between organs intact, and a homogenous density; in contrast, malignant neoplasms are frequently greater than 6 cm in size, have irregular borders without clear planes, and are heterogeneous.<sup>1</sup>

Benign adrenal adenomas contain high amounts of intracytoplasmic fat; approximately 70% of adrenal adenomas are rich in lipids.<sup>22</sup> This high lipid content allows for the use of densitometry, measured as Hounsfield units (HU), to distinguish benign and malignant lesions on unenhanced CT.<sup>1</sup> Initial reports used an HU threshold of less than 0 to indicate a benign lesion, with high specificity (100%) but poor sensitivity (47%).<sup>23</sup> A meta-analysis of 10 studies that evaluated 495 adrenal lesions (272 benign and 223 malignant) by unenhanced CT found that an HU threshold of less than 10 had a sensitivity of 71% and specificity of 98% for the diagnosis of an adrenal adenoma, without further radiologic imaging.<sup>24</sup> This method has become the standard for initial evaluation of incidental adrenal lesions without intravenous contrast.<sup>1</sup>

Approximately 30% of adrenal masses may have an indeterminate HU (between 10 and 30), necessitating contrast-enhanced CT with delayed washouts.<sup>1</sup> Because of neovascularization, malignancies tend to have increased contrast accumulation; as a result, intravenous contrast washes out from adenomas, both lipid rich and lipid poor, more quickly than from adrenal malignancies and pheochromocytomas.<sup>25</sup> Contrast washout can be calculated in 2 ways: absolute percentage washout (APW) requires both noncontrast and contrast scans ( $[(\text{enhanced HU} - \text{delayed HU}) \div (\text{enhanced HU} - \text{noncontrast HU})] \times 100$ ), whereas relative percentage washout (RPW) can be calculated based on an initial CT scan with contrast and delayed scans only ( $[(\text{enhanced HU} - \text{delayed HU}) \div \text{enhanced HU}] \times 100$ ). In adrenal protocol CT scans, initial noncontrast imaging is followed by contrast imaging; a 15-minute delayed scan is then performed. Adrenal masses with initial noncontrast HU less than 10 do not warrant contrast imaging.<sup>2,26</sup> A 2002 prospective study of 166 adrenal

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