



CAUSES OF CUSHING'S SYNDROME

- Evaluation of the patient with suspected Cushing's Syndrome begins with a 24 hour urinary cortisol [13](#)
- Cushing's disease (excessive production of ACTH) is the most common aetiology, accounting for 65-75% of Cushing's syndrome. Most cases of Cushing's disease are result of pituitary adenomas [1](#)
- Ectopic production of ACTH from a variety of tumours (bronchial carcinoid, thymoma, oat-cell carcinoma, phaeochromocytoma, islet cell tumour, and prostate cancer) accounts for 10-15% of Cushing Syndrome [1](#)
- Primary adrenocortical disease accounts for the remaining 20-30% of Cushing Syndrome, including benign adenoma (10-15%), adrenocortical carcinoma (5-10%) and adenomatous hyperplasia (5%) [1](#)



ELEVATED ACTH LEVELS

- Once Cushing's syndrome is confirmed biochemically, imaging is directed by the measurement of ACTH levels. [1-4](#)
- When plasma ACTH and cortisol levels are increased, this suggests an ACTH dependant cause of Cushing's Syndrome. Further evaluation is based on the 'High-Dose Dexamethasone Suppression Test'.
 - If cortisol is suppressed pituitary disease is the most likely diagnosis and MRI of the pituitary is indicated. [1-4](#)
 - When the biochemistry data suggests an ectopic ACTH syndrome, a CT scan of the abdomen and chest should be performed as the initial radiographic evaluation for the variety of tumours responsible for this syndrome. [1-4](#)

PITUITARY IMAGING WITH MAGNETIC RESONANCE IMAGING

- Magnetic resonance imaging (MRI) is the imaging modality of choice for localisation of pituitary adenoma in pituitary-dependent Cushing's disease (53-75% sensitivity for detecting corticotroph tumour). [5-9](#)
- MRI with gadolinium, facilitates diagnosis of microadenoma and increases the confidence with which cavernous sinus invasion can be diagnosed or excluded. [9,10](#)
- Advantages of MRI: superior soft tissue resolution (depicts the anatomy of the pituitary gland, infundibulum, optic chiasm, cavernous sinuses and neighbouring vascular structures accurately and noninvasively). [5-9](#)
- Disadvantages of MRI: expensive and limited availability.
- CT has a 47% sensitivity and 74% specificity for the identification of pituitary microadenomas and most commonly reveals a hypodense lesion that usually fails to enhance with contrast administration. [5,6](#)
- Petrosal sinus sampling may be indicated: [1-5,11](#)
 - In patients with clinically suspected pituitary microadenoma but normal MRI.

CT OF ABDOMEN AND CHEST IN ECTOPIC ACTH PRODUCTION

- A radiological search for occult ACTH producing tumour should only be made after exclusion of Cushing's disease [14](#)
- 40-50% of functioning pituitary microadenoma's may not be visible on MRI
- Inferior Petrosal Sampling should be undertaken to exclude a pituitary cause of hypercortisolism (not visible on conventional MRI) prior to a radiological search for an ectopic ACTH-secreting tumour [14](#)
- Imaging of the thorax and abdomen with computed tomography will yield the highest detection rate in searching for an occult ACTH-secreting neoplasm [14](#)





SUPPRESSED ACTH LEVELS

- A low or undetectable level of ACTH suggests primary adrenocortical disease and in such cases, CT of the adrenals is the investigation of choice. [1-4](#)

COMPUTED TOMOGRAPHY OF THE ADRENAL GLANDS

- Most sensitive method for detecting adrenal tumour in a patient with ACTH-independent Cushing's syndrome. [1-4](#)
- As the size of the adrenal mass is the most important feature distinguishing benign adenoma from adrenocortical carcinoma, a CT scan is all that is required in most cases. [12](#)
- May differentiate between adenoma and hyperplasia, but hyperplastic adrenal glands have a variable appearance and CT diagnosis of adrenal hyperplasia is not very reliable: [1-4](#)
- Nodularity and bilateral gland enlargement suggests hyperplasia.
- Nodule and contralateral atrophy suggests functioning adenoma.
- Nodule in otherwise normal gland may be either hyperplasia or functioning adenoma.





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14. Findling J, Raff Hershel **Cushing's Syndrome: Important Issues in Diagnosis and Management** J Clin Endocrinol Metab 2006; 91(10):3746-3753 (Review Article)





FURTHER READING

1. **Cushing syndrome.** Current Probl Surg, July 2001;489-545.

Website

For more information go to www.imagingpathways.health.wa.gov.au

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