FDG PET/CT Characteristics of Adrenal Benign and Malignant Lesions

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LEARNING OBJECTIVES
1. Pictorial review of clinical features of major adrenal benign and malignant lesions characteristics in FDG PET/CT.
2. Tabular review of general guidelines for adrenal lesions to assist benign versus malignant determination.

INTRODUCTION
Between 2 – 7% of patients have incidental adrenal masses on imaging studies in the general population. Most of these incidental adrenal lesions are benign non-hyper functioning adenomas that require no treatment. On FDG PET/CT the incidence of malignant adrenal lesions increases due to common metastatic spread in lung cancer, breast cancer, renal cell carcinoma, neuroendocrine tumors and melanoma. Determining if adrenal lesions are benign or malignant can be paramount in directing cancer treatment to be curative or palliative. We selected FDG PET/CT cases with strong key representative findings to help illustrate benign and malignant adrenal lesions. Tabular review of PET SUV values, Hounsfield units and lesion size in the different cases will be discussed.

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ADRENAL ANATOMY
CT Cross-section at level of adrenal glands
Liver
Aorta
Right adrenal
Stomach
Pancreas
Left adrenal
Spleen
Left kidney

ADRENAL ADENOMA
• Focal enlargement in the adrenal gland
• Contain varying degrees of adipose tissue
• Low or negative Hounsfield units (-20 to 30)
• FDG activity below liver

ADRENAL CYST
• Very rare 0.01% incidence
• Types (endothelial, epithelial, pseudocyst, parasitic)
• 40% cysts are pseudocyst can become malignant
• Hounsfield for fluid (0 – 15), no FDG activity

ADRENAL HYPERPLASIA
• Homogeneous diffusely enlarged glands
• SUV equal to or slightly higher than liver SUV
• Hounsfield units similar to a normal adrenal gland

LYMPHOMA
• Primary adrenal lymphoma is extremely rare
• Intense FDG activity with high SUV
• Hounsfield units are not characteristic

PHEOCHROMOCYTOMA
• Uncommon neoplasm that release catecholamine
• 85% of arise from adrenal medulla
• 0.1 – 0.3% hypertension caused by pheochromocytomas
• 90% occur sporadic, 10% endocrine syndromes
• FDG activity and Hounsfield variable

LEIOMYOSARCOMA
• Very rare malignant cancer of smooth muscle
• High SUV and Hounsfield not characteristic

HIT SYNDROME
• Heparin Induced Thrombocytopenia is rare
• Can cause bilateral adrenal hemorrhage and insufficiency
• Hematoma/hemorrhage Hounsfield (50 – 90)

MYELOLIPOMA
• Benign tumor composed of mature adipose tissue and hematopoietic elements
• Hounsfield units (-30 to -100)
• Incidence 0.1%, 3% of all adrenal tumors

METASTATIC
• Lung, breast, renal, ovary, lymphoma, leukemia and melanoma cancers are most common to metastasize to adrenals.
• 50% adrenal lesions in cancer patients are benign
• CT characteristics are highly variable

LUNG
Adrenal metastasis occur 1.3% in lung cancer.

BREAST
Metastasize to the lungs, liver, bones and brain, but rarely to the adrenal glands.

RENNAL
0.03% incidence and adrenal gland metastasis is typical site. Renal cancer SUV is variable.

GENERAL GUIDELINES

CONCLUSION
Adrenal lesions on imaging studies are common in the general public and this incidence increases in PET/CT images secondary to the oncologic patient population and frequent adrenal metastases in many cancers. Having a strong knowledge of the different characteristics of adrenal lesions on PET/CT such as sizes, Hounsfield units and SUVs, can assist in determining benign versus malignant lesions and guide the course of treatment. However, many CT characteristics of malignant adrenal lesions are variable and the advent of PET/MR imaging may better characterize adrenal lesions. The take home caveat is that adrenal lesion guidelines are not hardened rules and close follow up imaging or tissue sampling should be incorporated if suspicion remains.

References available upon request.