

# **The role of MDCT and PET/CT in evaluation of adrenal masses**

*Essay*

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Radiodiagnosis*

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# **Content**

1-Introduction and aim of work.

2-Anatomy of adrenal gland:

A- Gross anatomy.

B- Radiological anatomy.

3- Pathology of the adrenal masses.

4- Technique of MDCT and PET/CT

5- Role of MDCT & PET/CT in assessment of adrenal masses with illustrative cases

6 Summary and conclusion.

7- References.

8- Arabic Summary.

# دور الأشعة المقطعية متعددة المقاطع والتصوير المقطعي بالإصدار البوزيتروني مع الأشعة المقطعية فى تقييم أورام الغدة الكظرية

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فى الأشعة التشخيصية

بكالوريوس الطب والجراحة

كلية الطب

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# المحتوى

1. المقدمة والغرض من البحث.
2. التشريح للغدة الكظرية.
3. باثولوجيا أورام الغدة الكظرية .
4. تقنية فحص الأشعة المقطعية المتعددة المقاطع و التصوير المقطعى بالإصدار البوزيترونى والأشعة المقطعية .
5. دور الأشعة المقطعية المتعددة المقاطع و التصوير المقطعى بالإصدار البوزيترونى والأشعة المقطعية فى تقييم أورام الغدة الكظرية مع عرض بعض الحالات التوضيحية.
6. الملخص والاستنتاج.
7. المراجع.
8. الملخص العربي.

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## List of Contents

| Title                                                   | Page       |
|---------------------------------------------------------|------------|
| • <i>Abbreviations</i> .....                            | <i>i</i>   |
| • <i>List of figures</i> .....                          | <i>ii</i>  |
| • <i>List of tables</i> .....                           | <i>iv</i>  |
| • <i>Introduction and aim of the work</i> .....         | <i>v</i>   |
| • <i>Chapter 1:</i>                                     |            |
| - <i>Anatomy of adrenal glands</i> .....                | <i>1</i>   |
| • <i>Chapter 2:</i>                                     |            |
| - <i>Pathology of adrenal masses</i> .....              | <i>13</i>  |
| • <i>Chapter 3:</i>                                     |            |
| - <i>Technique of MDCT &amp; PET/CT</i> .....           | <i>34</i>  |
| • <i>Chapter 4:</i>                                     |            |
| - <i>MDCT &amp; PET/CT finding in adrenal masses</i> .. | <i>63</i>  |
| • <i>Summary and Conclusion</i> .....                   | <i>116</i> |
| • <i>References</i> .....                               | <i>120</i> |
| • <i>Arabic Summary</i> .....                           | <i>--</i>  |

## **List of figures**

| <b>Fig. no.</b> | <b>Title</b>                                        | <b>Page</b> |
|-----------------|-----------------------------------------------------|-------------|
| 1               | Normal adrenal gland                                | <b>1</b>    |
| 2               | Relation of the right adrenal gland                 | <b>2</b>    |
| 3               | Relation of the left adrenal gland                  | <b>3</b>    |
| 4               | Blood supply of the adrenal glands.                 | <b>8</b>    |
| 5               | Contrast enhanced CT of normal adrenal glands       | <b>10</b>   |
| 6               | Coronal CT scan normal adrenal glands               | <b>11</b>   |
| 7               | PET/CT physiological uptake in the adrenal glands   | <b>12</b>   |
| 8               | Adrenal cortical adenoma                            | <b>16</b>   |
| 9               | Histologic features of an adrenal cortical adenoma. | <b>17</b>   |
| 10              | Adrenal carcinoma.                                  | <b>18</b>   |
| 11              | Adrenal cortical carcinoma                          | <b>19</b>   |
| 12              | Gross photograph of neuroblastoma                   | <b>20</b>   |
| 13              | Microscopic appearance of neuroblastoma,            | <b>21</b>   |
| 14              | Gross ganglioneuroma                                | <b>23</b>   |
| 15              | Ganglioneuromas                                     | <b>24</b>   |
| 16              | Pheochromocytoma                                    | <b>26</b>   |
| 17              | Pheochromocytoma                                    | <b>27</b>   |
| 18              | Myolipoma                                           | <b>28</b>   |
| 19              | Metastatic carcinoma                                | <b>30</b>   |
| 20              | Diffuse hyperplasia of the adrenal                  | <b>32</b>   |
| 21              | Right adrenal metastasis                            | <b>42</b>   |
| 22              | Lipid-rich left adrenal adenoma                     | <b>44</b>   |
| 23              | Annihilation reaction.                              | <b>48</b>   |
| 24              | Metastatic lung cancer                              | <b>58</b>   |
| 25              | Brown fat deposition                                | <b>61</b>   |
| 26              | Physiologic muscle activity.                        | <b>62</b>   |

|    |                                                                 |            |
|----|-----------------------------------------------------------------|------------|
| 27 | PET/CT and pet images metastasis                                | <b>67</b>  |
| 28 | Collision tumors                                                | <b>68</b>  |
| 29 | Lipid-rich adenoma                                              | <b>71</b>  |
| 30 | Adrenal adenomas                                                | <b>72</b>  |
| 31 | Lipid-rich adenoma.                                             | <b>75</b>  |
| 32 | Lipid-poor adenoma.                                             | <b>76</b>  |
| 33 | Adrenocortical adenoma with hemorrhage                          | <b>77</b>  |
| 34 | Benign left adrenal adenoma                                     | <b>78</b>  |
| 35 | Adrenal adenoma                                                 | <b>80</b>  |
| 36 | Adrenocortical carcinoma.                                       | <b>82</b>  |
| 37 | Adrenocortical carcinoma                                        | <b>84</b>  |
| 38 | Primary adrenocortical carcinoma                                | <b>85</b>  |
| 39 | Left adrenal carcinoma.                                         | <b>86</b>  |
| 40 | Adrenocortical carcinoma                                        | <b>87</b>  |
| 41 | Right adrenal neuroblastoma                                     | <b>90</b>  |
| 42 | Retroperitoneal ganglioneuroma                                  | <b>91</b>  |
| 43 | Pheochromocytoma                                                | <b>93</b>  |
| 44 | Pheochromocytoma with pathologically proved hemorrhage          | <b>94</b>  |
| 45 | Pheochromocytomas with a history of neurofibromas               | <b>94</b>  |
| 46 | Pheochromocytoma with rapid washout.                            | <b>95</b>  |
| 47 | Pheochromocytoma with increased fdg uptake                      | <b>96</b>  |
| 48 | Myelolipoma                                                     | <b>98</b>  |
| 49 | Myelolipoma                                                     | <b>98</b>  |
| 50 | Myelolipoma with a history of metastatic endometrial carcinoma. | <b>99</b>  |
| 51 | Metastases                                                      | <b>100</b> |
| 52 | Adrenal metastases.                                             | <b>101</b> |
| 53 | Adrenal metastasis                                              | <b>102</b> |
| 54 | Metastatic renal cell carcinoma                                 | <b>102</b> |



|    |                                                    |            |
|----|----------------------------------------------------|------------|
| 55 | Adrenal lung adenocarcinoma metastases             | <b>104</b> |
| 56 | Metastatic disease.                                | <b>105</b> |
| 57 | Adrenal lymphoma                                   | <b>106</b> |
| 58 | Lymphomatous adrenal gland involvement.            | <b>107</b> |
| 59 | B-cell lymphoma                                    | <b>108</b> |
| 60 | Right calcified adrenal pseudocyst                 | <b>109</b> |
| 61 | Bilateral adrenal hemorrhages                      | <b>110</b> |
| 62 | Endothelial cyst with hemorrhage                   | <b>111</b> |
| 63 | Adrenal hemorrhage                                 | <b>112</b> |
| 64 | CT show dense calcification of both adrenal glands | <b>114</b> |
| 65 | Calcification of both adrenal glands               | <b>115</b> |

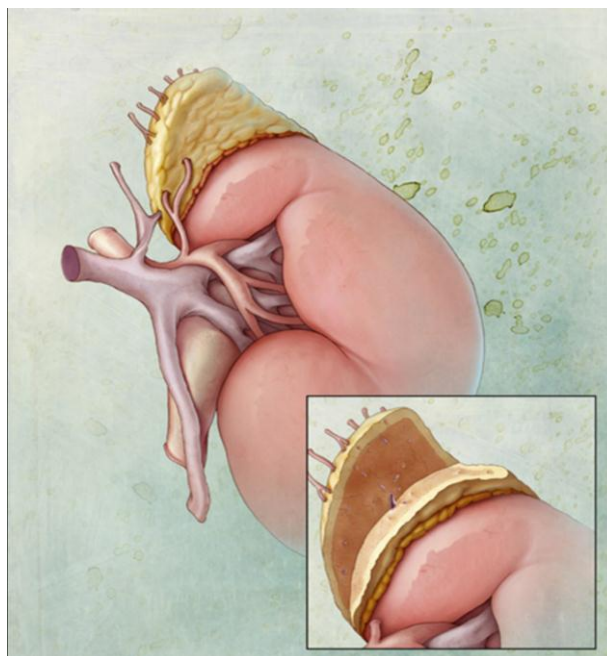
### **List of Tables**

| Table | Titles                      | <b>Page</b> |
|-------|-----------------------------|-------------|
| 1     | Neuroblastoma Staging       | <b>22</b>   |
| 2     | Percentage Washout Formulas | <b>44</b>   |

# **ANATOMY OF THE ADRENAL GLAND**

## **Gross anatomy of the adrenal gland**

The adrenal glands are complex endocrine organs named for their location (**Fig.1**), which is adjacent to the kidneys (thus the name, *ad-renal*). They are also occasionally referred to as suprarenal glands (*supra* means "above"). Located on the top of each kidney, they are orange and triangular. The normal gland weighs 5 g , encased in a connective tissue capsule and usually partially buried in an island of fat, the adrenal glands, like the kidneys, are *retroperitoneal*; that is, they lie beneath the peritoneum. (**Romans et al.,2011**).

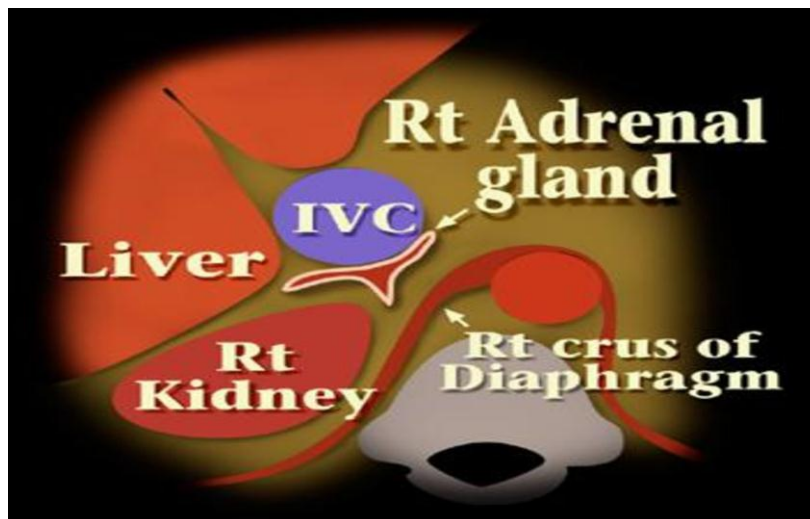


**Fig. 1** Diagram shows the normal adrenal gland (**Johnson et al., 2009**)

The adrenal glands have an arrowhead configuration, with a body, medial and lateral limbs. The normal adrenals extend 2–4 cm in the cranio-caudal direction, and the thickness of the adrenal body and limbs does not exceed 9–10 mm and 4–5 mm, respectively (*Adam et al., 2008*)

### **Right Adrenal Gland**

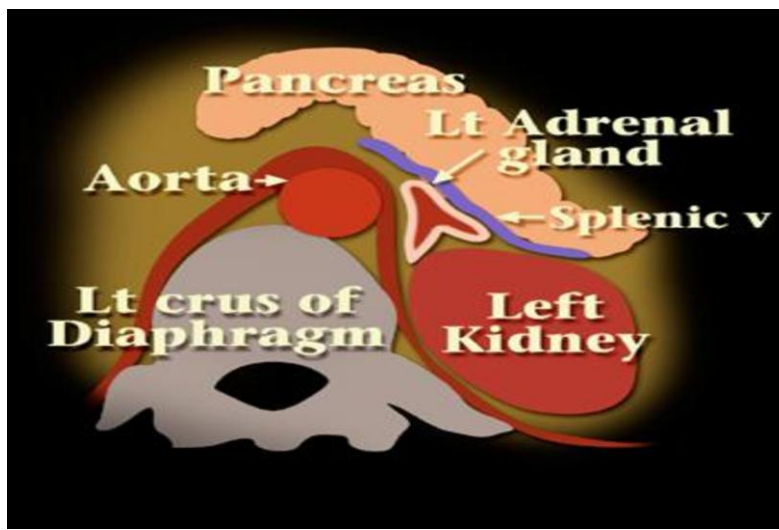
The right adrenal gland is located directly inferior to the medial portion of the right diaphragm and posteromedial to the liver (**Fig.2**). The lateral and inferior edges are closely opposed to the right kidney. The inferior vena cava is just medial to the kidney, and the right adrenal vein drains directly into the vena cava and measures approximately 6mm. (*Quinn et al., 2002*)



**Fig.2** Diagram shows relation of the right adrenal gland (*Shebel et al., 2012*)

## **Left Adrenal Gland**

The left adrenal gland is slightly thicker and larger than the right; it is primarily located at the supero-medial aspect of the kidney. It is closely opposed to and usually directly posterior to the tail of the pancreas, although its exact relationship to the pancreas can be somewhat variable. It lies just inferior to the diaphragm, and because of its medial location, it is often closely associated with the left crus. **(Fig.3)**. The spleen is anterior and superior to the left adrenal gland, and the left kidney directly lateral. The aorta is just medial, and the renal vein and artery inferior. The left adrenal vein measures approximately 30mm and drains into the left renal vein. *(Sadler, 2006)*



**Fig.3** Diagram shows relation of the left adrenal gland ( *Shebel et al., 2012*)

### **Variants :**

Small masses of adrenal cortical tissue called cortical bodies are often found near the adrenal glands. These may become attached to other organs early in embryology and migrate with these organs to be found in such places as the broad ligament of the uterus, the spermatic cord and even the epididymis (***Ryan et al.,2011***).

### **Development :**

Embryologically, the adrenals do not develop with the kidneys. They develop in the retro-peritoneum and descend, whereas the kidneys develop in the pelvis and ascend . In cases where the kidneys fail to ascend normally, the adrenal glands are still found in the expected position although their shape may be more discoid owing to lack of moulding by the kidneys during development (***Ryan et al., 2011***).

The adrenal gland has an outer cortex derived from mesoderm and an inner medulla (10% of the weight of the gland) which is derived from the neural crest and is related to the sympathetic nervous system (***Ryan et al., 2011***).

At birth the adrenal glands are relatively much larger than in adult one third the kidney at birth and one thirtieth in the adult. **(Ryan et al., 2011)**

The cortex of each gland reduces in size immediately after birth and the medulla grows comparatively little. By the end of the second month the weight of the suprarenal has reduced by 50%. The glands begin to grow by the end of the second year and regain their weight at birth by puberty. There is little further weight increase in adult life **(Standring et al., 2008)**.

### **Adrenal cortex:**

Three different zones or layers of cells make up the adrenal cortex. Starting with the outermost layer, their names are *zona glomerulosa*, *zona fasciculata*, and *zona reticularis*. Each region produces a different group or type of hormone. Chemically, all the cortical hormones are steroid. That is, molecularly, they all contain the four-ring structure of the sterol nucleus.

*Mineralocorticoids* are secreted by the outermost region of the adrenal cortex. As their name suggests, mineralocorticoids play an important part in regulating mineral salt (electrolyte) metabolism. The principal mineralocorticoid is *aldosterone*, which acts to conserve sodium ions and water in the body.

**(Romans et al., 2011).**

*Glucocorticoids* are secreted by the middle region of the adrenal cortex. Their main function is to affect the metabolism in diverse ways. They decrease inflammation and increase resistance to stress. The principal glucocorticoid is *cortisol*. **(Romans et al., 2011).**

The innermost zone of the adrenal cortex, the *zona reticularis*, secretes *gonadocorticoids*, or sex hormones. Male hormones (androgens) and female hormones (estrogens) are secreted in both sexes by the adrenal cortex, but their effect is usually masked by the hormones from the testes and ovaries. **(Romans et al.,2011).**

### **Adrenal medulla :**

The adrenal medulla secretes two *catecholamines*, about 80% epinephrine and the 20% norepinephrine. These hormones affect smooth muscle, cardiac muscle, and glands the same way that sympathetic stimulation does; they serve to increase and prolong sympathetic effects. **(Romans et al.,2011).**