

# Normal Adrenal Versus Adrenal in Acute Abdomen on MDCT

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## Abstract

**Background:** Knowledge of the range of normal size and morphology is useful for adequate interpretation of computed tomography (CT) scans in patients with suspected adrenal pathology.

**Objective:** To compare the size of normal adrenal glands with the cases of acute abdomen on Multidetector CT.

**Methods:** A total of 256 Contrast enhanced CT scans of abdomen were observed. 108 of them were for evaluation of acute abdomen and the rest were reported as normal scans. Adrenal gland measurements were taken at body (at the level of maximum thickness of body), lateral limb and medial limb (a line perpendicular the limb) in both the cases and normal patients.

**Results:** The mean maximum thickness (in mm) of the right adrenal gland body, medial limb, and lateral limb were  $5.9 \pm 1.6$ ,  $4.4 \pm 1.4$ , and  $4.8 \pm 1.3$ , respectively, and the mean maximum thickness (in mm) of the left adrenal gland body, medial limb, and lateral limb were  $6.7 \pm 1.9$ ,  $4.9 \pm 1.5$ ,  $5.1 \pm 1.6$ , respectively. In cases with acute abdomen mean maximum thickness (in mm) of the right adrenal gland body, medial limb, and lateral limb were  $6.2 \pm 1.5$ ,  $4.2 \pm 1.3$ , and  $4.9 \pm 1.7$ , respectively, and the mean maximum thickness (in mm) of the left adrenal gland body, medial limb, and lateral limb were  $7.1 \pm 1.9$ ,  $4.9 \pm 1.5$ , and  $5.1 \pm 1.9$ , respectively.

**Conclusion:** There is no significant statistical difference between various measurements of adrenals of normal and cases with acute abdomen.

**Keywords:** Computed Tomography, Adrenal Pathology, Left Adrenal Gland Body, Acute Abdomen

## Introduction

The adrenal glands also known as suprarenal glands are paired organs of the endocrine system, often asymmetric in shape. Adrenal glands are routinely evaluated for size in their imaging to ascertain its normality or abnormality (defined as enlargement of the gland which may be focal or generalized)<sup>1</sup>. Knowledge of the range of normal size and morphology is useful for adequate interpretation

of Computed Tomography (CT) scans in patients with suspected adrenal pathology.

Previously studies for evaluating adrenal gland size were performed on early generation CT scan systems which employ prolonged data acquisition times as a result low resolution images were yielded.<sup>2-8</sup> The aim of this study was to compare the size of normal adrenal glands with the cases of acute abdomen on Multidetector CT, providing

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measurements of the width of the gland and the width of adrenal limbs.

## Material and Method

This study was conducted in Department of Radiodiagnosis and Imaging of Government Medical College Srinagar and associated hospitals over a period of six months using Siemens 256 slice SOMATOM Definition Flash dual source CT scanner. This was a prospective observational study. A total of 256 Contrast enhanced CT scans of abdomen were observed. 108 of them were for evaluation of acute abdomen and the rest were reported as normal scans. Adrenal gland measurements were taken at body (at the level of maximum thickness of body), lateral limb and medial limb (a line perpendicular the limb) in both the cases and normal patients. The measurements were recorded in millimetres (mm) (Figure 1). The mean and standard deviation for each of the measurements were calculated. Chi Square test was used to measure statistical difference between normal adrenal measurements and measurements in cases with acute abdomen. All patients with clinical, biochemical, or radiological evidence of adrenal disease (including those with nodular thickening) and those with history of chronic steroid use were excluded from the study.



Figure 1. Measurements of Normal Adrenal Gland

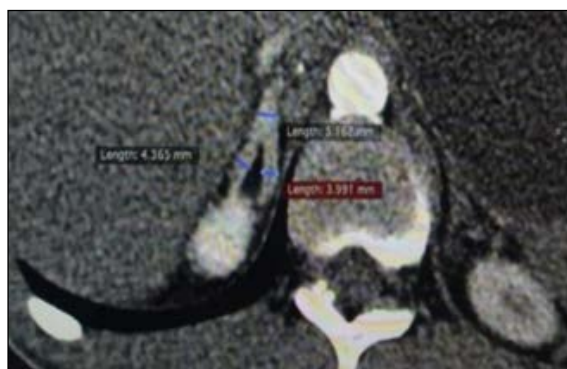


Figure 2. Measurements of Adrenal Gland in Acute Abdomen

## Results

The mean and standard deviation for various measurements are summarized in Table 1 and Table 2.

In cases with normal Scans, the mean maximum thickness (in mm) of the right adrenal gland body, medial limb, and lateral limb were  $5.9 \pm 1.6$ ,  $4.4 \pm 1.4$ , and  $4.8 \pm 1.3$ , respectively, and the mean maximum thickness (in mm) of the left adrenal gland body, medial limb, and lateral limb were  $6.7 \pm 1.9$ ,  $4.9 \pm 1.5$ , and  $5.1 \pm 1.6$ , respectively. In cases with acute abdomen mean maximum thickness (in mm) of the right adrenal gland body, medial limb, and lateral limb were  $6.2 \pm 1.5$ ,  $4.2 \pm 1.3$ , and  $4.9 \pm 1.7$ , respectively, and the mean maximum thickness (in mm) of the left adrenal gland body, medial limb and lateral limb were  $7.1 \pm 1.9$ ,  $4.9 \pm 1.5$ , and  $5.1 \pm 1.9$ , respectively.

Table 1. Mean Values, Standard Deviation, and 95% CI of various Adrenal Gland Measurements on CT (mm) in Cases with Normal Abdominal Scan

Adrenal Gland Thickness		Mean Thickness (mm)	Standard Deviation	95% CI (mm)
Right Adrenal	Body	5.9	1.6	5.7-6.1
	Median limb	4.4	1.4	4.2-4.6
	Lateral limb	4.8	1.3	4.6-5.0
Left Adrenal	Body	6.7	1.9	6.5-6.9
	Median limb	4.9	1.5	4.7-5.1
	Lateral limb	5.1	1.6	4.8-5.3

Table 2. Mean Values, Standard Deviation, and 95% CI of various Adrenal Gland Measurements on CT (mm) in Cases with Acute Abdomen

Adrenal Gland Thickness		Mean Thickness (mm)	Standard Deviation	95% CI (mm)
Right Adrenal	Body	6.2	1.5	6.0-6.4
	Median limb	4.2	1.3	4.0-4.4
	Lateral limb	4.9	1.7	4.6-5.1
Left Adrenal	Body	7.1	1.9	6.8-7.3
	Median limb	4.9	1.5	4.7-5.1
	Lateral limb	5.1	1.9	4.8-5.3

There was statistically significant difference in all the measurements between the right and left sides, left being larger than the right (P values < 0.001) in both cases with normal scans and cases with acute abdomen. On average, the left adrenal body was larger than the right adrenal body

by 0.8 to 0.9mm mm with 95% confidence interval (CI) [0.7 to 1.1] in normal cases and cases with acute abdomen respectively.

However there was no statistically significant difference in all the measurements of both adrenal glands between normal cases and cases with acute abdomen.

## Discussion

Previously studies for evaluating adrenal gland size were performed on early generation CT scan systems which employ prolonged data acquisition times as a result low resolution images were yielded.<sup>2-8</sup> There are limited studies about the normal anatomy of adrenal gland.

In our study an attempt was made to compare the differences in various measurements of adrenal glands in cases with acute abdomen with that of normal scans. No significant statistical difference was observed. However statistically significant difference was observed between various measurements of right and left adrenal gland with dimensions of left adrenal gland more than right adrenal. On an average mean body thickness of left adrenal gland was 0.8mm greater than right. Medial and lateral limbs of left adrenal gland were 0.5 mm and 0.3 mm larger than right adrenal gland respectively. Montagne et al. and Vincent et al. determined the normal range of adrenal gland thickness on CT in 60 and 55 patients, respectively, more than two decades ago.<sup>1,3</sup> The drawback of their studies was the lack of multislice CT technology, optimal CT slice thickness, the small number of study subjects.<sup>9</sup>

## Conclusion

From the above study we concluded that there is no significant statistical difference between various measurements of adrenals of normal and cases with acute abdomen. Statistically significant difference was observed between left and right adrenal. Our study is determined left adrenal larger than right adrenal as observed by John R et al. Aggarwal N et al. concluded right adrenal larger in dimensions as that of left which is contrary to our study. In view of this we further acknowledge and recommend the need for large multiethnic population based studies.

**Conflict of Interest:** None

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