

Gross Morphological Studies on the Adrenal Gland of Pig (*Sus scrofa*)

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ABSTRACT

The present study was conducted on the adrenal gland of twelve Large White Yorkshire adult pigs irrespective of their sex. The adrenal glands of pig were embedded in a mass of adipose tissue at the cranial pole of the kidneys in retroperitoneal position and they were covered by a thick white capsule. The left adrenal gland was more anterior in position than the right adrenal gland. The left adrenal gland was elongated and the right adrenal gland was triangular in shape. The right adrenal gland presents a large oval shaped impression on its cranio-ventral aspect for liver.

Key words: Adrenal gland, gross morphology, pig.

INTRODUCTION

The adrenal gland is the important component of endocrine system in mammals (Banks, 1993). The adrenal cortex secretes three main groups of hormones i.e., glucocorticoids, mineralocorticoids and androgens. The glucocorticoids regulate carbohydrate metabolism, while the mineralocorticoids maintain electrolyte balance in the extracellular fluid (Aughey and Frye, 2001). The adrenal medulla secretes amines, adrenaline (epinephrine) and noradrenaline (norepinephrine) under the control of the sympathetic nervous system (Young *et al.*, 2006).

MATERIALS AND METHODS

The present study was conducted on twelve Large White Yorkshire cross bred adult pigs irrespective of their sex. Fresh adrenal glands were collected from pigs immediately after the slaughter from AICRP on pigs, College of Veterinary Science, Tirupati. After dissection and removal of the surrounding connective tissue and fat, the distance between the adrenal gland and the

abdominal aorta was measured in situ using a flexible measuring tape as the shortest perpendicular distance between the medial border of the gland and the adjacent wall of the aorta. The adrenal glands were gently blotted dry and weighed individually using a calibrated digital electronic balance. The length of each adrenal gland was measured from the cranial to caudal extremity using a digital Vernier caliper. The specimens were washed thoroughly and they were subjected to study the gross morphological features.

RESULTS AND DISCUSSION

In the present study, the adrenal glands were embedded in a mass of adipose tissue at the cranial pole of the kidneys, which is similar to the observations reported in goat (Hakeem *et al.*, 1993), African rat (Olukole *et al.*, 2016), camel (Ye *et al.*, 2017) and guinea pig (Abass, 2017). The adrenal glands were located cranio-medially to the kidneys without any direct contact with them (Fig.1), which is in concurrence to the observations noted by Yilmaz and Girgin (2005) and Hossain (2015) in porcupine and female rabbit respectively.

The adrenal glands of pig were retroperitoneal in position in the present study, which was similar to the findings of Abass (2017)

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in guinea pig. The left adrenal was more anterior in position than the right adrenal gland in pig (Fig.1), which correlates with the findings of Al-Bagdadi (1968) in camel. In the present study, the left adrenal gland was situated closely and along the aorta and lies caudal to the periaortic lymph node. The distance between left adrenal gland and aorta varied from 1-2 cm, while the right adrenal gland was situated 5-6 cm away from aorta.

The color of both the glands was reddish-brown as reported by Nwaogu and Francis (2009) in goat. In the present study the adrenal glands were covered by a thick distinct pale white colored capsule, while in camel the capsule was reported to be pale red vascular by Al-Bagdadi (1968). The right adrenal gland of pig showed a large oval impression on the cranio-ventral aspect for liver and it was separated from it by a layer of peritoneum (Fig.1). In contrary to this, Al-Bagdadi (1968) stated that the right adrenal gland in camel was in contact with liver.

The left adrenal gland was thin and elongated in shape as reported by Ye *et al.* (2017) in camel. The left adrenal of pig showed two surfaces viz., dorsal and ventral surfaces, two borders viz., medial and lateral borders and two extremities viz., cranial and caudal extremities. The right adrenal gland was thick, broad and triangular in shape (Fig.2) as reported in European bison (Barszcz *et al.*, 2016) and camel (Ye *et al.*, 2017). In the present study, the right adrenal gland consisted of two surfaces viz., dorsal and ventral surfaces, three borders viz., medial, lateral and caudal borders and three angles i.e., cranial, caudal and medial angles. The medial border was convex, while the lateral border was concave.

The adrenal glands of pig showed a thick capsule externally and internally an outer cortex and inner medulla. The cortex is thick and appeared light brown in color while the medulla is thinner

than cortex and it was yellowish brown in color. The medulla contained large central vein (Fig.3) in the middle. These observations were similar to the findings reported in Marwari sheep by Panchal *et al.* (1998). In the present study, a distinct layer of cortico-medullary junction was noted, which demarcates the cortex from medulla (Fig.3).

In the present study, the average weight of the left and right adrenal glands was 2.74 ± 0.35 g and 2.95 ± 0.35 g respectively. The average weight of left and right adrenal glands was 12.52 ± 2.24 g and 12.39 ± 2.02 g respectively in camel (Ye *et al.*, 2017), whereas, the absolute weight and relative weight of both adrenal glands in buffalo was reported to be 33.85 ± 1.17 g and $0.05 \pm 0.001\%$ respectively (Hussain *et al.*, 2006). In the present study, the adrenal gland of right side was larger and heavier than that of left adrenal gland. In contrast to this, it was reported that the left adrenal was usually larger and heavier than that of right adrenal gland in sheep by Panchal *et al.* (1998).

The average length of the left and right adrenal glands of pig was 5.50 ± 0.23 cm and 5.75 ± 0.19 cm. The left adrenal gland was a little shorter than right adrenal gland. Very little significant difference was noticed in the length of left and right adrenal glands of pig as reported in buffalo (Hussain *et al.*, 2006), donkey (Karakuram *et al.*, 2008) and camel (Ye *et al.*, 2017). The average width of the left and right adrenal glands at their broadest part was 1.82 ± 0.19 cm and 2.14 ± 0.18 cm respectively. Whereas in camel it was 35mm and 40mm wide respectively (Al-Bagdadi, 1968), in buffalo it was 4.82 ± 0.22 cm and 4.13 ± 0.015 cm respectively (Hussain *et al.*, 2006) and in donkey it was 21.70-26.24mm and 14.40-30.27mm respectively (Karakuram *et al.*, 2008).

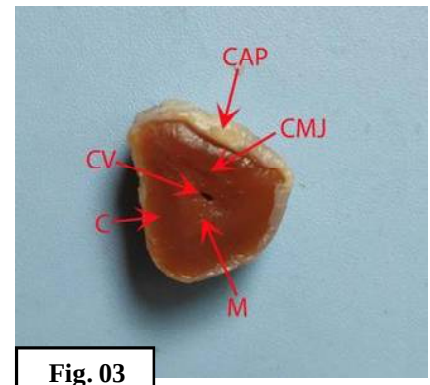
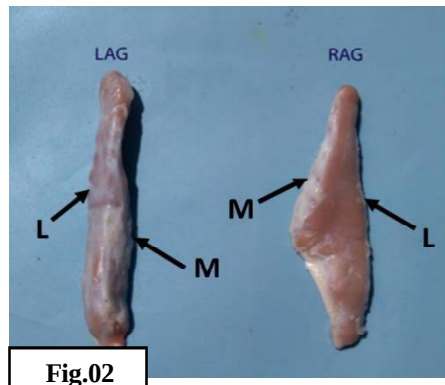
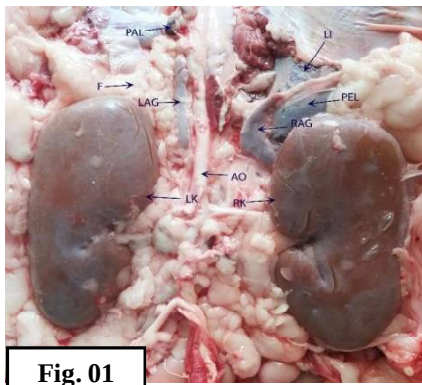


Fig.1 Photograph showing the left and right adrenal glands and their associated structures in pig. RAG-Right adrenal gland, LAG-Left adrenal gland, RK-Right kidney, LK-Left kidney, LI-Liver, PEL- Peritoneal layer, PAL-Periaortic lymphnode, AO-Aorta, F-Fat.**Fig.2** Photograph showing the left and right adrenal glands of pig. LAG-Left adrenal gland, RAG- Right adrenal gland, L- Lateral border, M- Medial border. **Fig.3** Photograph of the cross section of the adrenal gland of pig showing cortex (C) and medulla (M). CMJ-Cortico-medullary junction, CV-Central Vein, CAP-Capsule.

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