

GROSS AND MORPHOMETRICAL CHARACTERISTICS OF THYROID GLAND OF LARGE WHITE YORKSHIRE PIGS (*Sus scrofa domestica*) OF WAYANAD DISTRICT IN KERALA

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ABSTRACT

A study was undertaken to illustrate the gross and morphometric features of thyroid gland of male and female Large White Yorkshire pigs in the Wayanad district of Kerala. The study was conducted on total 12 animals consisting of two groups: male and female group, each group containing 6 numbers of animals. Topographical, gross morphological and morphometric parameters were studied. The thyroid gland appeared as a single gland but careful dissection revealed its two lobes: right and left lobes those were connected by an indistinct isthmus. The cranial lobes of thymus overlapped the lateral aspects of thyroid. The capsule was thick on the dorsal surface than on ventral surface. The lobules were clearly demarcated on the surface by interlobular connective tissue. The position of the gland varied from being situated at caudal border of larynx upto the manubrium sterni. The width of the intact thyroid gland was more in male than in the

female animals. Irrespective of the sex, the average length of the left lobe was lower than the right lobe. The average weight of the thyroid gland in female was higher than the male animal.

Keywords: Large White Yorkshire, Thyroid, Topography, Morphology, Morphometry

INTRODUCTION

Pig (*Sus scrofa domestica*) is an even-toed ungulate belonging to the family Suidae. Being an omnivorous animal, pig shares anatomical and physiological similarities including endocrine system with human beings. Insufficient supply of organ transplants in human due to lack of suitable donors necessitated use of artificial and or xenograft specimens. Pigs serve as suitable human model for different research methodologies and for screening different drugs. In all domestic animals, thyroid gland plays a very important

role in the metabolism and growth of the animal. The thyroid stimulating hormone (TSH) is responsible for production of T3 (triiodothyronine) and T4 (thyroxine) which can influence the growth of an animal. In domestic animals except pigs, the thyroid glands elicit two distinct lobes connected by a distinct isthmus. But in pigs, it appeared as a single lobed gland. The literature concerning the gross morphology and morphometry of thyroid gland of pig appears to be scanty. This study was conducted to augment information regarding the topography, gross morphology and morphometry of thyroid gland of male and female Large White Yorkshire pigs reared in Wayanad district of Kerala. Wayand is a rural district of Kerala state, southwest India. It is located at an altitude of more than 700 m from mean sea level. The average rainfall in Wayanad is 300 mm per year which gives a pleasant cold climate to this place.

MATERIALS AND METHODS

The present study was conducted on 12 Large White Yorkshire pigs of one year old collected from local slaughter houses, Sultan Bathery, Wayanad, Kerala. The pigs were categorized into two groups *viz.*, male group and female group; each group containing 6 number of animals. The thyroid gland from each animal was collected immediately after slaughter. The

topography of the gland was recorded. Then the glands were studied for gross morphology and morphometry. The weight was measured using a digital monopan balance. The maximum length, width and thickness were recorded using graduated scale and vernier caliper. The morphometric data were analyzed using SPSS software (version 24.0). Subsequent to the recording of morphometrical parameters, the glands were further studied using stereozoom microscope (Model- LABOMED CZM6).

RESULTS AND DISCUSSION

Topographically, the thyroid gland was located on the ventral aspect of the trachea just caudal to the larynx. In 80% of specimens collected, the position was just caudal to the larynx. However, in the rest of the specimens, the thyroid gland was observed much caudally and even close to the manubrium sterni. It was attached to trachea by means of a thick peritracheal fascia (Fig. 1). The cranial lobes of thymus overlapped the lateral aspects of the gland (Fig. 1, 2). The topographic relations partially agree with the reports by Oster *et al.* (2018) who stated that the thyroid in pig was located more caudal to the larynx, on the contrary, our study revealed the thyroid just caudal to the larynx in majority of specimens as explained earlier.

The connective tissue capsule

covering the gland was very thin on the ventral surface but thick on the dorsal surface adjacent to the trachea (Fig. 3). The thyroid gland appeared reddish brown to light brown in colour as described by Doley and Chakravorty (2016), Sharma (2020), Baishya *et al.* (1998) and Choudhary and Doley (2017) in pig, Jaffarabadi buffalo, Mithun, yak and Jamunapari goat, respectively. The shape of the gland was irregularly triangular. In order to accommodate passage of trachea, dorsal surface of gland exhibited concavity whereas, ventral surface appeared bulged with evident convexity (Fig. 3, 4). The intact thyroid gland had a pointed caudal end and a broader cranial extremity (Fig. 4). Similar observations were made by Romack *et al.* (1964), Singh (2007) and Doley and Chakravorty (2016) in pigs.

Before dissection, the gland appeared as a single mass. However, after careful dissection, the gland revealed its two lobes and the bridging indistinct isthmus. Gland presented distinct interlobular connective tissue septae delineating the acinar portion on gross observation. Under the stereozoom microscope, the rough, ventral surface of the gland revealed raised nodules indicating the presence of thyroid lobules and the overlying capsule (Fig. 5).

The muscles situated on the ventral aspect of the thyroid gland were

the superficial cutaneous coli muscle, the right and left sternocephalicus muscles and the right and left sternohyoideus muscles. Tracheo-bronchial lymph nodes which resembled in gross appearance to the thyroid were present near the thoracic inlet.

The morphometric parameters of the gland are shown in Table 1. In male animals, the measured values of average length, width and thickness of the intact thyroid gland were 5.33 ± 0.45 cm, 2.29 ± 0.06 cm and 1.39 ± 0.09 cm, respectively. In female animals, the average length, width and thickness of intact thyroid gland were 6.02 ± 0.65 cm, 2.05 ± 0.08 cm and 1.36 ± 0.1 cm, respectively (Table 1).

The average weight of the intact thyroid gland was 8.25 ± 0.88 g and 10.3 ± 0.99 g in male and female pigs, correspondingly. With respect to body weight of animal, the average weight of intact thyroid was 3.82 g and 4.59 g per 100 pound (45 Kg) of the body weight in male and female, respectively. This finding was in accordance with the reports of Romack *et al.* (1964) and Singh (2007) in pigs. Singh (2007) stated that the weight of the thyroid in pig ranged between 0.7-19.0 g. The weight of thyroid observed in the study was contrary to the findings by Doley and Chakrabarty (2016) in pig. Further, average weight of thyroid gland

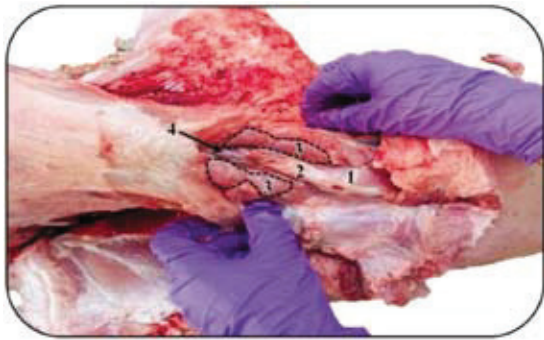


Fig. 1. Ventral neck of pig showing 1- Larynx, 2- Trachea, 3- Cranial thymus, 4- Thyroid gland



Fig. 2. Location of thyroid gland with respect to other visceral organs; 1- Larynx, 2-Thyroid gland, 3- Cranial thymus, 4- Thoracic thymus, 5- Heart, 6- Lung



Fig. 3. Thyroid gland showing 1- Ventral surface of intact thyroid gland, 2- Dorsal surface of intact thyroid gland, 3- Left lobe, 4- Right lobe

was higher in females compared to males. However, Vishen *et al.* (2019) reported that thyroid had more weight in male than in female chabro chicken.

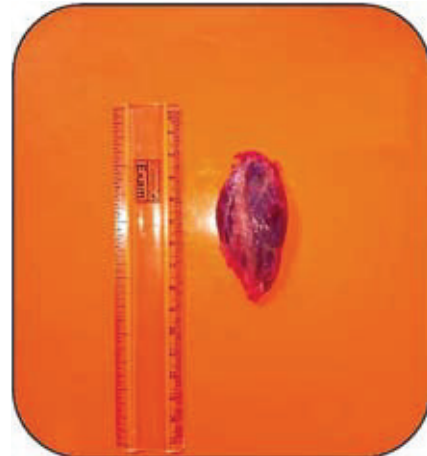


Fig. 4. Intact thyroid gland of large White Yorkshire pig before dissection. Note that the gland appears as a single mass

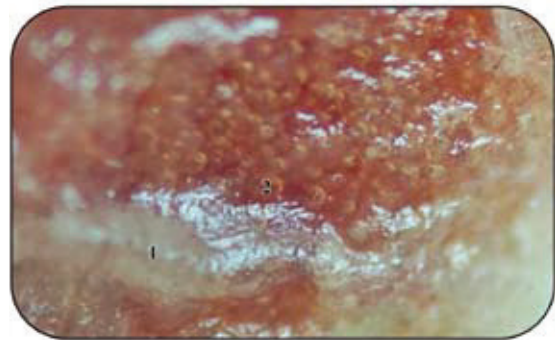


Fig. 5. Stereozoom microscopy of ventral surface of thyroid gland showing 1- Thin capsule, 2- Thyroid lobule (X5)

In males, the average length, width and thickness for the right lobe was 4.36 ± 0.34 cm, 1.63 ± 0.11 cm and 0.87 ± 0.02 cm respectively; the same parameters for the left lobe were 3.54 ± 0.38 cm, 1.72 ± 0.17 cm and 0.84 ± 0.05 cm respectively. In females, the average length, width and thickness for the right lobe was 4.3 ± 0.29 cm, 1.62 ± 0.06 cm and 0.87 ± 0.04 cm respectively; the same parameters for left lobe were 4.18 ± 0.34 cm, 1.56 ± 0.1 cm and 0.93 ± 0.05 cm respectively. The width of intact gland

Table 1. Comparison of thyroid parameters between male and female pigs (Mean \pm SE) (n=6)

| Parameters (cm) | Male | Female | t-value | p-value |
|------------------------|-----------------|-----------------|---------------------|---------|
| Length (Right lobe) | 4.36 \pm 0.34 | 4.3 \pm 0.29 | 0.116 ^{ns} | 0.91 |
| Length (Left lobe) | 3.54 \pm 0.38 | 4.18 \pm 0.34 | 1.238 ^{ns} | 0.244 |
| Length (Intact) | 5.33 \pm 0.45 | 6.02 \pm 0.65 | 0.874 ^{ns} | 0.403 |
| Width (Right lobe) | 1.63 \pm 0.11 | 1.62 \pm 0.06 | 0.108 ^{ns} | 0.916 |
| Width (Left lobe) | 1.72 \pm 0.17 | 1.56 \pm 0.1 | 0.818 ^{ns} | 0.432 |
| Width (Intact) | 2.29 \pm 0.06 | 2.05 \pm 0.08 | 2.324* | 0.042 |
| Thickness (Right lobe) | 0.87 \pm 0.02 | 0.87 \pm 0.04 | 0.039 ^{ns} | 0.969 |
| Thickness (Left lobe) | 0.84 \pm 0.05 | 0.93 \pm 0.05 | 1.178 ^{ns} | 0.266 |
| Thickness (Intact) | 1.39 \pm 0.09 | 1.36 \pm 0.1 | 0.241 ^{ns} | 0.814 |

* Significant at 0.05 level; ns-non-significant

was significantly higher in male animals compared to female animals (Table 1). The morphometric findings were partially in accordance with the observation by Singh (2007) in pigs. All the recorded values for the average width and thickness of intact thyroid gland in the present study were within the range (0.6-3.0) cm and (0.6-3.8) cm respectively, reported by Singh (2007) in pigs. However, the recorded values for the length of the intact thyroid were not in accordance to the reported range band. But those morphometric findings for the right and left lobes of thyroid were contrary to the data by Doley and Chakravorty (2016) in pigs. Irrespective of sex, the average length of left lobe was lower than the right lobe (Table 1) in the present study. These findings were contrary to the findings of Vishen *et al.* (2019) in male chabro chicken, wherein the reported average length of

left lobe was higher than right lobe. The data obtained regarding the comparative length of left and right lobes of thyroid for female pigs coincided with the observation of Vishen *et al.* (2019) in female chabro chicken.

CONCLUSION

The thyroid gland appeared as a single mass in pig; but presented two lobes connected by an indistinct isthmus. The gland had a capsule covering that was very thin on the ventral surface than the dorsal surface where it was adherent to the trachea. The morphometric parameters of the thyroid gland did not show any significant difference between male and female animals except for the width of the intact thyroid which was more in male animals. The average length of left lobe was lower than the right lobe in both male and female pigs.

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