Cibtech Journal of Zoology ISSN: 2319–3883 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/cjz.htm
2016 Vol. 5 (1) January-April, pp.1-5/Tadjalli and Faramarzi.
Research Article

GROSS ANATOMY OF THE THYROID AND PARATHYROID GLANDS IN INDIAN GRAY MONGOOSE (*HERPESTES EDWARDSII*)

***Mina Tadjalli M[1] and Abbas Faramarzi[2]**
[1]Department of Anatomical Science, School of Veterinary Medicine, Shiraz University, Shiraz 71345-1731, Iran
[2]Shiraz University International Division, Shiraz University, Shiraz 71345-1731, Iran
**Author for Correspondence*

ABSTRACT
There was no data in the literature about normal anatomical features of thyroid and parathyroid glands in adult mongooses. The information was necessary for comparative anatomic, morphologic and physiologic studies. The present study was targeted to form the baseline data of normal morphological features of thyroid and parathyroid glands in adult mongooses. Six adult mongooses (3 males and 3 females) were used to study these glands macroscopically. This study revealed that thyroid gland was located on either side of dorsolateral aspect of trachea and its lobes were flat, oval elongated in shape. Therefore, the anatomical location and morphological features of thyroid gland in adult mongoose were similar to other animals. But its shape showed some variations as compared to other animals. The mongoose parathyroid glands were small structure embedded within the thyroid parenchyma and their location in the lobes of thyroid showed considerable variation in comparison to other animals.

Keywords: *Thyroid Gland, Parathyroid Gland, Gross Anatomy, Mongooses*

INTRODUCTION
Thyroid and parathyroid glands are the endocrine or ductless glands which elaborate internal secretions or hormones. Hormones are absorbed directly into the blood stream rather than being extruded into a system of ducts (Getty, 1975). There are variations in their shape, size and exact location in different species of animals. The anatomy and histology of the thyroid and parathyroid glands was studied in dogs, cats, pigs, ruminants and horses (Getty, 1975; König and Liebich, 2014; Eurell and Frappier, 2006), albino rats (Hall and Kaan, 2005; Rosof, 2005), rats (Derobertis, 2005), Reptiles (Rivera, 2008), Falconiformes (Radek and Pasecki 2007) and Kuttand ducks (Ahmad Dar *et al.*, 2013).
However, no information is yet available on the gross anatomy of the thyroid and parathyroid glands in adult Indian gray mangoose. The present study can be further used for comparative studies of thyroid and parathyroid glands between different species of animals. Findings of this study will contribute to the anatomy literature as a valuable resource for future researchers focused on this subject and will also help other allied subjects on comparative basis.

MATERIALS AND METHODS
Six adult mongooses (3 males and 3 females) were collected. The Shiraz University guidelines for the animal right were observed for this study. They were euthanized and each head along with neck was removed and the cranial part of the neck was dissected ventrolateraly. The muscles were separated, the trachea was exposed and the anatomical positions of thyroid and parathyroid glands were studied on the trachea.
Then the length and width of the left and right lobes of thyroid gland and their connecting isthmus were measured by graduated ruler. The weight of each lobes was measured and then submerged in 10% buffered formalin solution for 72 hours. After hardening the glands, the shape and morphological feature of each lobe were recorded. Also the lobes of thyroid gland in the region of the parathyroid were removed, Trimmed and embedded in paraffin. The sections at 6μ thickness were cut, mounted and were stained by H&E. Then length and the width of the parathyroid glands were measured by micrometry under light microscope.

RESULTS AND DISCUSSION

Result

This research revealed that the thyroid gland in adult mongooses is located on either side of dorsolateral aspect of the trachea at its most cranial part. It has dark brown color and consists of left and right lobes that are connected caudally by a strand named isthmus. The isthmus extending on the ventral side of the trachea (Figure 1). In female mongoose, the flat, oval elongated lobes of thyroid gland lie on the dorsolateral aspect of the trachea extending from distal part of cricoid cartilage of larynx to 4^{th} or 5^{th} tracheal ring (left lobe) and 3^{rd} or 4^{th} tracheal ring (right lobe). Their caudal half region is connected by a thin isthmus of about 1.7±0.02 mm (Figure 3). The length and width of left lobe were 9.3± 0.05 mm and 4.4 ± 0.04 mm respectively, whereas the corresponding parameters of the right lobe were 8.4± 0.04 mm and 4.9 ± 0.03 mm respectively. Therefore, the left lobe is longer and narrower than the right lobe and lie straightly on the trachea (Figure 2).

Figure 1: Topography of the Thyroid Gland on the Trachea (TR) in the Adult Mongoose (Ventral view) L)
Left Lobe, R (Right Lobe,*) Isthmus

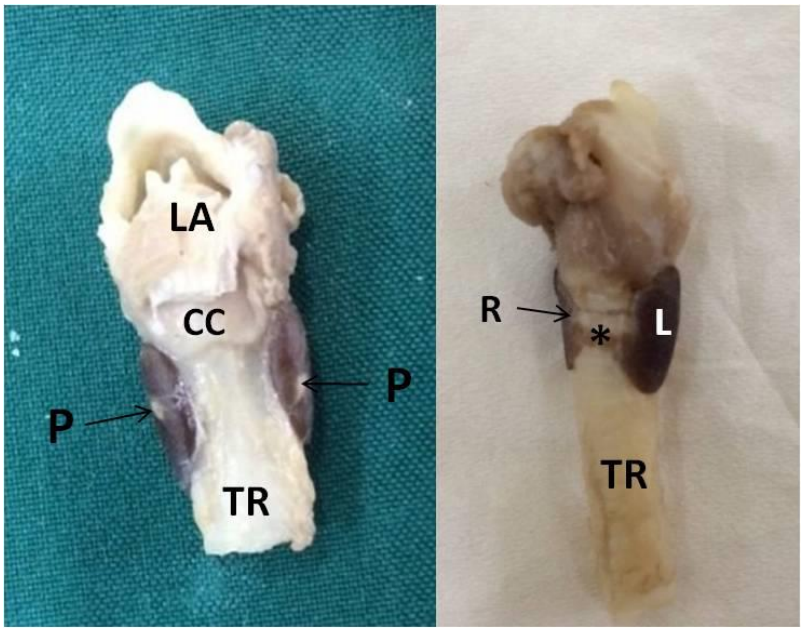

Figure 2: Thyroid Gland of a Female Adult Mongoose with Trachea (TR) and Larynx (LA), Showing Internal Parathyroid Glands (P) in the Thyroid Lobes (Ventral Aspect) CC) Cricoid Cartilage, L) Left Lobe, R) Right Lobe, *) Isthmus

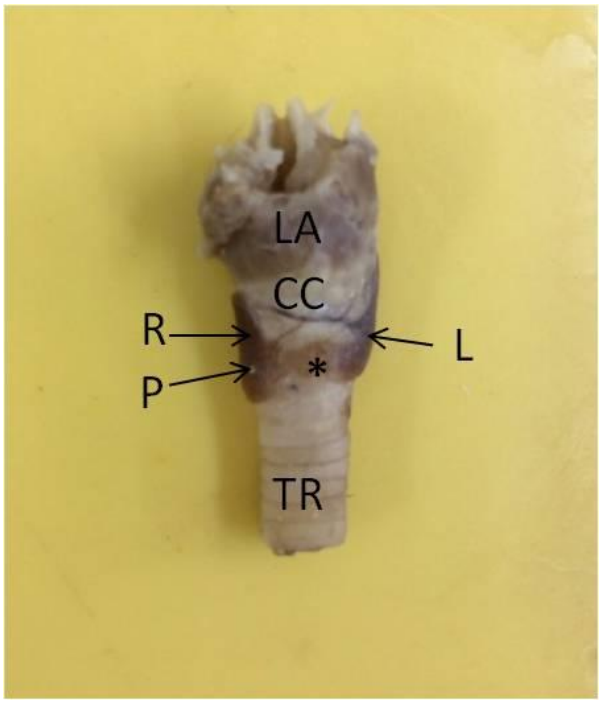

Figure 3: Thyroid Gland of a Male Adult Mongoose with Trachea (TR) and Larynx (LA) Showing Internal Parathyroid Glands (P) in the Thyroid Lobes (Ventral Aspect) CC) Cricoid Cartilage, L) Left Lobe, R) Right Lobe, *) Isthmus

In male mongoose, the left lobe is semilunar shaped with round poles and is situated obliquely on the dorsolateral aspect of trachea extending from dorsal surface of cricoid cartilage of larynx to 6th tracheal ring. So that it's caudal pole touch ventral aspect of tracheal ring. But the right lobe is flat, oval elongated

shaped with sharp cranial pole and round caudal pole. It lies on dorsolateral aspect of the first six tracheal rings.

The caudal pole of left lobe is joined to caudal half region of right lobe by an isthmus of about 10.8 ± 0.02 mm and seems that the isthmus is a continuation of caudal pole of the left lobe (Figure 3). The length and width of left and right lobes of thyroid gland in male mongoose were 10.1 ± 0.02 mm, 3.5 ± 0.05 mm and 9 ± 0.01 mm, 3.3 ± 0.07 mm respectively indicating that the left lobe is longer and little wider than the right lobe. The parathyroid glands are bilaterally, small epithelial structures. The internal parathyroid glands in the adult mongoose are pea-like pale structure that is embedded within the thyroid parenchyma. In the female mongoose they were found on the lateral aspect of middle portion of each lobe close to the its ventral border and the length and breadth were approximately 1.29 mm and 0.21 mm respectively (Figure 2). Whereas, in the male mongoose they were found on the lateral aspect of each lobe close to its caudal pole and the length and breadth were approximately 1.38 mm and 0.33 mm respectively (Figure 3).

Discussion

Although the endocrine organs vary considerably in origin, structure, position and function, they have a common characteristic feature in the absence of efferent ducts. The thyroid gland was named by Thomas Wharton in 1656 on the basis of shape. A thyroid gland is present in all vertebrates. Its major function as a gland of internal secretion is to synthesize, store and release hormones which are concerned with the regulation of metabolic rate (Gethy, 1975). The thyroid gland in the adult mongooses was located on either side of dorsolateral aspect of trachea and its location in this species of animal was similar to that in cat, dog, sheep, goat and horse (Köing and Liebich, 2014) and also crocodilia (Gardner Lynn, 1960). However, in ox, they are situated dorsally on the lateral side of the cricopharyngeal and cricothyroid muscles and in the pig is located on the ventral aspect of the trachea (Köing and Liebich, 2014) and also in turtles and snakes lie just anterior to the heart (Gardner Lynn, 1960).

But in the bird this organ lies in the vascular angle formed by the subclavian and common carotid arteries (Nickel *et al.*, 1977).

Morphological details in our study revealed that the thyroid gland in the adult mongooses consist of two lobes that are connected by isthmus. These features are similar to cat, dog, ox, sheep, goat, horse (Köin and Liebich, 2014), crocodilia (Gardner Lynn, 1960), and birds (Nickel *et al.*, 1977). But the thyroid gland in the pig (Köin and Liebich, 2014) and in turtles and snakes (Gardner Lynn, 1960) is an unpaired compact organ.

In the adult mongoose the lobes of thyroid gland were flat, oval elongated in shape that shows considerable variations in comparing to other animals. In cat, they were flat, spindle, in dog were oval elongated, in sheep and goat were spindle to cylindrical and in horse were oval and in the ox are irregularly shaped with a granular appearance that roughly resembles pyramids (Köin and Liebich, 2014), while in turtles and in snakes is spherical, ellipsoidal or ovoid in shape (Gardner Lynn, 1960).

Also in the fowl, duck and goose the thyroid gland is oval, but in the pigeon it is spindle-shaped (Nickel *et al.*, 1977). The measurements of the lobes of thyroid in adult mongoose in this study were; 9.7 mm in length, 3.9 mm breadth (left lobe) and 8.7 mm in length and 4.1 mm breadth (right lobe). Whereas in dog it measured 3 cm in length and 7 mm in width, in ox 8 cm in length and in horse 5 cm in length and 1.5-2.0 cm in width (Getty, 1975).

In fowl the total length and breadth of thyroid gland varied from 7 to 12 mm and 5 to 7 mm respectively, in duck measured 7 to 12 mm in length, 4 to 5 mm breadth, in goose is 11 to 15 mm in length, 6-8mm breadth and in pigeon it is 6-9mm in length and 2-5mm breadth (Nikcle *et al.*, 1977). The parathyroid glands produce parathyroid hormone, which regulate serum concentrations of calcium and phosphorus by regulating metabolism within bone, absorption from the gastro-intestinal tract and excretion in the urine. These glands develop from the epithelium of third and fourth pharyngeal pouches that internal parathyroid glands are also named parathyroid IV, indicating their origin (Köin and Liebich, 2014). Sandstrom in 1880, first described small epithelial bodies as parathyroid glands because of their location in relation to the thyroid. Initially the small parathyroid glands were considered accessory thyroid tissue.

Parathyroid glands are found in all vertebrates, but the number and location may be quite variable. Some glands may be buried in the thyroid tissue, in the thymus or in mandibular salivary glands (Gethy, 1975).
In the adult mongoose the parathyroid glands in the form of Pea-like pale structure embedded within the thyroid paranchyma. In the females they are found on lateral surface of middle portion in each lobe and have 1.29 mm length and 0.21 mm breadth, whereas in the males they were found on lateral surface near the caudal pole of each lobe and have 1.38 mm length and 0.33 mm breadth. Internal parathyroids in the cats are located within the thyroid paranchyma, close to the medial surface of each lobe, in dogs are embedded within the middle portion of each lobe but in the ox they are located either at the dorsal margin, the medial aspect or within the parenchyma of each lobe and in the horse internal parathyroids are found on their medial surface around the cranial half of each lobe. But in the pig they are not present (Köin and Liebich, 2014). In the sheep is usually embedded near the caudal border of the lateral lobe of thyroid (Getty, 1975). The number of parathyroid glands varied between two and four in birds. In the fowl are three in number that are irregular spheres and have 1 to 3 mm length and 1 to 2 mm breadth.
The measurements of length of parathyroid glands in duck, goose recorded 1 to 3 mm and in pigeon 1 to 2 mm. But the breadth in duck, goose and pigeon were 1 to 1.5 mm, 1 to 3 mm and 0.5 to 1 mm respectively (Nickel *et al.*, 1977). Whereas, in female kuttananad ducks the paired parathyroid glands are oval to spherical in shape and lie in contact with the thyroid at or near the caudal pole and their length and breadth were 1.13 mm and 0.94 mm respectively (Ahmad Dar *et al.*, 2013).

ACKNOWLEDGEMENTS
The authors wish to express their appreciation to the research council of the Shiraz University, international Division for the financial support and also wish to thank Mr. B. Moghisi and Gh. Yousefi for their technical assistance.

REFERENCES
Getty R (1975). *Sisson and Grossman's the Anatomy of Domestic Animals*, 5th edition, (W.B. Saunders Co. Philadelphia, USA) **2**(551), 956-957, 1591.
König HE and Liebich HG (2014). *Veterinary Anatomy of Domestic Mammals Text Book and Color Atlas*. 6th edition (Germany, by Schattauer GmbH, Hölderlins Trabe) **3** 572-575.
Eurell JA and Frappier BL (2006). *Dellman's Text Book of Veterinary Histology*, 6th edition, (A Walters Kluwer Company, Williams and Wilkins) 307-311.
Hall AR and Kaan HW (2005). Anatomical and physiological studies on the thyroid gland of the albino rat. *Anatomical Record* **84** 221-239.
Rosof JA (2005). Anexperimental study of the histology and cytology of the parathyroid glands in the albino rat. *Journal of Experimental Zoology* **68** 121-165.
De Robertis E (2005). The cytology of the parathyroid gland of rats injected with parathyroid extract. *Anatomical. Record* **78** 437-495.
Rivera S and Lock B (2008). The reptilian thyroid and parathyroid gland. *Veterinary Clinic of North America Exotic Animal Practice* **11**(1) 163-75.
Radek T and Piasecki T (2007). Topography and arterial supply of the thyroid and the parathyroid glands in selected species of Falconiformes. *Antomy Histology Embryology* **36**(4) 241-9.
Ahmad Dar F, Maya S, Chungath JJ, Ashok N, Patki HS and Prashanth Kumar KS (2013). Histomorphological study of the parathyroid gland in female Kuttanad ducks (*Anasplathyrhynchodomesticus*). *Veterinary world Organization* **6** 941-943.
Gardner LW (1960). Structure and Functions of the thyroid gland in Reptiles. *The American Midland Naturalist* **6** 309-326.
Nickel R, Schummer A, and Seiferle E (1977). *Anatomy of the Domestic Birds*, 1st edition, (Berlin, Hamburg, Verlag Paul Parey) 110-111.