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Gross morphological study of trachea in ostrich (*Struthio camelus*)

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Abstract

The current study on gross anatomy of trachea was conducted to report the gross morphological features of the trachea in adult ostrich. The trachea was characterized by a long flexible cartilaginous tube which started from the cricoid cartilage to the syrinx. At the level of syrinx it was bifurcated into right and left primary bronchi. The trachea was comprised of 220-225 individual complete cartilaginous rings without overlapping. The diameter of tracheal rings was equal from cranial to caudal part.

Keywords: Trachea, ostrich, gross morphology

Introduction

The avian respiratory system differs significantly from the mammals. It has unique respiratory structures which plays an important role in thermoregulation, voice production and gas exchange. The structural differences between the mammals and birds are presence of syrinx and air sacs (Dyce *et al.*, 1996; Al-Ahmed and Sadoon., 2020) ^[1, 2]. These complex structures are well adapted for their physiological requirements (Zwart and Samour, 2021) ^[3]. The respiratory system starts at nares. The inspired air goes from the nasal cavity to larynx through choana and passes to the syrinx and bronchi via trachea (Nickel *et al.*, 1977) ^[4]. The trachea is a long tube which is constituted by continuous cartilaginous rings. In some birds like trumpet, the trachea is coiled or tortuous (McLelland, 1990) ^[5]. Among the birds, Ostrich (*Struthio camelus*) is the large flightless bird belongs to Ratidae family. It is the fastest running bird on land which is having long neck. Ostrich is commercially important and are farmed in various parts of the world for their meat, skin and feathers (Tivane, 2008) ^[6]. The gross morphology of the avian trachea has been studied in various species such as Long-Legged Buzzard (Kabak *et al.*, 2007) ^[7]; Japanese quail and pigeon (Hena *et al.*, 2012) ^[8]; emu (Jayachitra and Balasundaram, 2015) ^[9]; Iraqi pigeon (Al-Taai, 2021) ^[10]; Gray heron (Atalgin *et al.*, 2021) ^[11]; Geese, cattle egrets and house sparrows (Sakr *et al.*, 2022) ^[12] and Starling bird (Al-Taai, 2022) ^[13]. The information regarding the gross anatomical features of the trachea of ostrich is very minimal. So, the present study is designed to provide anatomical data about the trachea of ostrich.

Materials and methods

The present study was conducted at the Department of Veterinary Anatomy, Veterinary College and Research Institute, Namakkal. The trachea was collected from three adult ostriches which were brought for the post-mortem examination. The trachea was examined for gross lesions and found normal without any pathological changes. The in-situ topography of trachea was observed. Then the whole trachea from cranial laryngeal region to the region where it bifurcates into lungs was collected. Immediately after collection, they were washed in normal saline and preserved in five per cent formalin. After fixation, the gross morphological features were studied and fixed in neutral buffered formalin for further studies.

Results and Discussion

In the present study, the trachea of ostrich was observed as a cylindrical, long flexible cartilaginous tube which extended from the caudal end of the cricoid cartilage of the larynx to the syrinx (voice box) (Fig.1). The trachea bifurcates at syrinx into the left and right primary bronchi. It was noticed along the length of the right side of neck, ventral to the esophagus which is similar to the observation of Al-Mahmodi *et al.* (2012) in turkey ^[14]; Al-Mamoori and Al-Ghakany (2015) ^[15] in Bee-eater bird and Jayachitra and Balasundaram (2015) ^[9] in emu.

The tracheal rings of the ostrich were complete rings (O) with an empty interior and the rings were connected by annular

ligaments. The findings were similar to all above mentioned birds.



Fig 1: Photograph showing the trachea of Ostrich

The tracheal rings of ostrich were equal in size and arranged individually following one another without overlapping from the beginning at larynx to syrinx. It is similar to the trachea of long-legged buzzard observed by Kabak *et al.*, 2007^[7]. In disagreement with this statement, the broad part of cartilage ring overlapped on the narrow parts of two adjacent rings in turkey (Al-Mahmoodi *et al.*, 2012)^[14] and the tracheal rings were interlocked in the notches which showed telescope-like arrangement in gray heron (Atalgin *et al.*, 2021)^[11]

In the present study, the diameter of the tracheal rings was uniform and did not show any differences in diameter from starting up to the syrinx which is similar to finding of Al-Mamoori and Al-Abdula (2016)^[16] in laughing dove. But it disagree with Al-Mamoori and Al-Ghakany (2015)^[15] in Bee-eater bird; Al-Khakani *et al.* (2020)^[17] in adult pigeon and Al-Taai *et al.* (2022)^[13] in starling bird who reported that the diameter was reduced from cranial to caudal trachea. As seen in ratites, the trachea of ostrich did not have tracheal pouch in the present study. Whereas the trachea of emu showed pouch almost in the middle and the diameter of trachea gradually increased up to certain distance, very large at the level of pouch and narrowed distally (Jayachitra and Balasundaram, 2015)^[9]. This might be due to species differences and the peculiar sound produced by such bird.

The average number of tracheal rings was noticed as 220-225 rings. In contrast, the number was 83-91 in Japanese quail (Cevik-Demirkan *et al.*, 2007)^[18]; 135-139 in Duck (Al-Ahmed and Sadoon, 2020)^[2]; 67-70 in Iraqi pigeon (Al-Taai, 2021)^[10]; 70-100 in Starling birds (Al-Taai *et al.*, 2022)^[13]. The number of the tracheal rings is related with the length of the neck in birds (Nickel *et al.*, 1977)^[4] and it might also be due to species difference.

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