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ORIGINAL RESEARCH

CADAVERIC STUDY ON MORPHOLOGY OF ADULT HUMAN CRICOID CARTILAGE IN SOUTH BIHAR POPULATION

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ABSTRACT

Background:Cricoid cartilage supports larynx and trachea. It has the form of a ring with the lower part of the signet omitted. It is smaller than thyroid cartilage, but it is thicker and tougher. Knowledge of anatomy of this cartilage is essential for those working in the field of larynx. The present study was conducted to obtain morphological data regarding human cricoid cartilage.

Materials and Methods: The present observational study included 28 adult cadaveric larynges. The laryngeal framework was carefully resected from the cricoid cartilage. Soft tissues (ligaments and muscles) were removed with care. Various morphometric characteristics were measured using an electronic Vernier calliper. The results were analysed using Microsoft Excel 2010.

Results: The average morphometric measurements were higher in males as compared to females. The inner transverse diameter of cricoid cartilage was greater than the inner anteroposterior diameter.

Conclusion: The cricoid cartilage's wide range of sizes and forms makes it difficult to standardize the firm stents used for intubation. This might be related to differences in body types between different populations, as well as race and ethnicity.

Keywords: Cricoid cartilage, Morphology, Observational study.

Note- Dr Chandra Kiran and Dr NimishaMadhu completed their tenure as tutor at ANMMCH, Gaya and conducted this study during their tenure.

INTRODUCTION

The larynx is an airway, a sphincter, and a phonation organ. The thyroid, cricoid, and epiglottis cartilages, along with arytenoid, cuneiform, and corniculate cartilages, compose the skeletal structure of the larynx.[1] Cricoid cartilage supports larynx & trachea and extends entirely around the airway.[2] It is the most inferior of the laryngeal cartilages. It has the form

of a ring with the lower part of the signet omitted. It is smaller than thyroid cartilage, but it is thicker and tougher.[3]

Cricoid cartilage diameters vary greatly. It is oval, with men having a bigger cricoid cartilage than women.[4] For those working in the fields of laryngeal surgery, such as otolaryngologists, speech therapists, anaesthetists and phoneticians, a basic understanding of laryngeal anatomy is required. The increasing use of innovative operative techniques in the treatment of laryngeal diseases necessitates a thorough understanding of the size and proportions of the larynx.[5-7] The cricoid cartilage has been the subject of just a few research.[8-10] Hence, this study is proposed.

Aims and objectives

The present study was conducted to obtain morphological data regarding human cricoid cartilage.

MATERIALS & METHODS

The present observational study was done in the department of anatomy. Twenty-eight (n=28) adult apparently normal human cadaveric larynges were included in this study. The specimen with laryngeal injury as a result of illnesses or manipulations was not considered when laryngeal specimens were cut from cadavers. From the hyoid to the second tracheal ring, all larynges were resected. Soft tissues were removed with care. The laryngeal framework was carefully resected from the cricoid cartilage. Various morphometric characteristics were measured using an electronic Vernier calliper as indicated. The results were entered into pre-tested proforma. The data was analysed using Microsoft Excel 2010.

RESULTS

A total of 28 specimens of cricoid cartilage were studied. 16 were of males while 12 were of females. The average morphometric measurements were higher in males as compared to females. The height of lamina and arch showed significant statistical difference between males and females. [Table1]

Table 1: showing morphometric measurements of cricoid cartilage

Parameter (in mm.)	**Gender**		**Significance**
	Male (n=16)	**Female (n=12)**	
Anteroposterior diameter of the cricoid cartilage	20.4±3.6	18.6±3.1	p = 0.14
Transverse diameter of the cricoid cartilage	21.7±4.5	20.2±3.9	p = 0.69
Height of Lamina	19.9±3.5	17.2±2.7	p = 0.04
Height of Arch	5.8±0.91	4.9±0.7	p = 0.01

DISCUSSION

In the present study, 16 were of males while 12 were of females. The average morphometric measurements were higher in males as compared to females. The height of lamina and arch showed significant statistical difference between males and females.

Vatansever et al (2019) found in their study that cricoid cartilage's transverse diameter was less than 1 cm, while rimaglottidis' transverse diameter was substantially smaller. All variables were greater in males other than anterior angle of the vocal folds which was larger in women. They opined that the rimaglottidis' transverse diameter was the narrowest section of the larynx. During endotracheal tube administration, clinicians must be cognizant of this.[11]

Bhardwaja et al (2021) reported a case where after swallowing fish, a patient presented with a foreign body feeling and throat soreness. On endoscopic laryngopharyngeal assessment, no fish bone was found X-ray of the neck revealed a linear opacity against the C-6 vertebral body. A computed tomography (CT) scan revealed a linear hyperdensity due to linear ossification in the midline of the cricoid lamina posteriorly. Within one week of starting anti-reflux medication, the patient's symptoms were improved. When dealing with foreign bodies in the aerodigestive tract, it's possible to come across uncommon occurrences of cartilage ossification. Appropriate evaluation using CT is needed.[12]

Anand et al (2018) conducted a study and reported that inner transverse diameter of cricoid cartilage (F: 15.05 ±1.02 mm; M: 17.52±2.64 mm) was larger than inner anteroposterior diameter (F: 12.71±0.45 mm; M: 14.11±2.55 mm). In the different dimensions assessed in the cricoid cartilages, there was a discrepancy between specimens. In virtually all cases, the average transverse diameter was larger than the average antero-posterior diameter, resulting in oval form. They suggested that laryngeal interventions and surgery may all benefit from cricoid cartilage morphometric data as well as the diagnosis and surgical treatment of subglottic stenosis.[13]

In the study done by Singla et al (2015), all of the cricoid cartilage specimens were oval in morphology. Males had greater outer and inner transverse diameters, as well as outer and inner anteroposterior diameters than females. When both men and females' sizes are compared, the outside transverse diameter is greater than the outer anteroposterior diameter. Males' cricoid arch and lamina thickness and height were found to be greater than females'.[14]

Kim et al (2017) conducted a study in Korea. Males had a superior side transverse diameter of 17.19 mm, while females had a superior side transverse diameter of 13.36 mm.[15]

The study conducted by Liu et al (2020) comprised a total of 1200 people, comprising 600 men and 600 females. The smallest cricoid diameter is the TD-in, while the longest cricoid diameter is the APD-in. Males had bigger mean cricoid diameters and cricoid angles than females. The form of the cricoid cartilage outlet varies a lot from person to person.[16]

Savitha et al (2020) observed that males had a mean height arch of 5.97±0.94 while females had a mean height arch of 4.94±1.01. Males had a mean lamina height of 21.3±1.9, while females had a mean lamina height of 17.91±2.29. Males had a mean AP diameter of 23.84±2.43 while females had a mean AP diameter of 19.18±2.34. Males had a mean outer transverse diameter of 25.53±2.23, while females had a mean of 19.29±2.52. They concluded that males had higher mean values for all cricoid cartilage characteristics than females.[17]

This research details morphological features of cricoid cartilage in the Indian population. The inner transverse diameter of cricoid cartilage was greater than the inner anteroposterior diameter in nearly all samples, with males having larger diameters than females. Males' cricoid arch and lamina thickness and height were found to be greater than that of females.

CONCLUSION

The cricoid cartilage's wide range of sizes and forms makes it difficult to standardize the firm stents used. And therefore, proper sized endotracheal tubes are needed during intubation, according to individual's sex and ethnicity to avoid unnecessary laryngeal injury.

REFERENCES

1. Standring S. The larynx. In: Gray's Anatomy, The anatomical basis of clinical practice. 40th edn. Philadelphia: London. Churchill Livingstone; 2008:577-80.
2. Hollinshed WH. Anatomy for Surgeons. The Head and Neck 3rd edn. Philadelphia. Paul B. Hoeber, INC1982. p. 425-9.
3. Romanes GJ. The larynx, In : Cunningham's Manual of Practical Anatomy vol.3 Head, Neck and Brain.15th ed. Edinburgh: Oxford UniversityPress;1986. p. 157-66. Harjeet, Jit I, Sahani D. Dimensions and weight of the cricoid cartilage in northwest Indians. Indian J Med Res. 2002;116:207-16.
4. Zielinski R. Morphometrical study on senile larynx. Folia Morphologica, 2001;60(2):73-8.
5. Eckel HE, Sittel C, Zorowka P, Jerke A. Dimensions of the laryngeal framework in adults. Surgical Radiologic Anatomy. 1994;16:31-6.
6. Jain M, Dhall U. Morphometry of the Thyroid and Cricoid cartilages in Adults. J Anatomical Soc India. 2008;57(2):119-23. 5.
7. Ajmani ML. A metrical study of the laryngeal skeleton in adult Nigerians. J Anatomy. 1990;171:187-91.
8. Joshi M, Joshi S, Joshi S. Morphometric study of cricoid cartilages in Western India. Australasian Med J. 2011;4(10):542-7.
9. Sprinzl G. Morphometric measurements of the cartilaginous larynx: An anatomic correlate of laryngeal surgery. Head Neck Surg. 1999;21:743- 50.
10. Jain M, Dhall U. Morphometry of the Thyroid and Cricoid Cartilages in Adults on Ct Scan. J AnatSoc India. 2010;59(1):19-23
11. VatanseverA ,Erçakmak BG , Demiryürek D. Revisiting the morphometry of cricoid cartilage and vocal folds. Harran Üniversitesi Tıp FakültesiDergisi (Journal of Harran University Medical Faculty) 2019;16(2):207-12.
12. BhardwajaR, Tulia IP, Shareef PK, Guptaa A, Makkara S. Cricoid Ossification Mimicking an Esophageal Foreign Body: A Victim of Overdiagnosis. Dubai Med J 2021;4:77–80.
13. Anand V, Sharma H, Sethi A, Sahoo S. Morphometric analysis of human cricoid cartilage: a cadaveric study. Int J Otorhinolaryngol Head Neck Surg2018;4:63-7.
14. Singla RA, Kaur R, Laxmi V. Morphology and morphometry of adult human cricoid cartilage: a cadaveric study in north Indian population. Int J Anat Res 2015;3(1):910-4. DOI: 10.16965/ijar.2015.109

15. Kim IS, Song CH. Morphometric Study of Cricoid Cartilage in Korean. Korean J PhysAnthropol 2017;30(1):15-20.
16. Liu S, Cheng L, Qi W, Zhang X, Dong Y. Age-related Change of the Dimensions of the Cricoid Cartilage in Adults. Annals of Otology, Rhinology & Laryngology 2020;1–8. DOI: 10.1177/0003489420940339
17. Savitha V, Menasinkai SB. Morphometric Study of Cricoid Cartilages in Adults by Dissection Method. SchInt J AnatPhysiol March 2020; 3(3): 24-7.