Computed Tomographic cranial nasopharyngeal measurements are narrow in Chihuahuas and Pomeranians compared to Dachshunds

SJCM Wijsman[1], SA Boroffka[2], E den Hertog[3], G ter Haar[2]

1. AniCura Medisch Centrum voor Dieren, Amsterdam, The Netherlands
2. AniCura Specialistische Dierenkliniek Utrecht, Utrecht, The Netherlands
3. Hertog Veterinary Research Support, Amersfoort, The Netherlands

Introduction

* Chihuahuas and Pomeranians are often afflicted with symptoms of obstructive upper respiratory tract disease and have a skull conformation that shares many similarities with dogs of common brachycephalic dogs.
* Previous cross-sectional studies have determined the dimensions and abnormalities of different parts of the upper respiratory tract in several breeds of brachycephalic dogs.
* Specific upper respiratory tract dimensions in non-extreme brachycephalic, such as Chihuahuas and Pomeranians have not been reported and the exact cause and location of brachycephalic airway syndrome (BAS) have not been established.

Objectives

* Determine transverse cross-sectional dimensions of nasopharynx, cricoid, and trachea of Chihuahuas and Pomeranians.
* Investigate whether differences exist between these two breeds and a control group of a non-brachycephalic breed (Dachshunds).

Hypotheses

* The caudal aspect of nasopharynx has smallest cross-sectional area in Chihuahuas and Pomeranians, as reported for other brachycephalic dogs.
* Chihuahuas and Pomeranians will have comparable dimensions of nasopharynx, cricoid, and trachea, but significantly smaller compared to Dachshunds.

Materials and Methods

* Retrospective, descriptive, single-center cross-sectional cohort study design.
* Computed Tomographic studies of the skull of 88 dogs were included: 42 Chihuahuas, 17 Pomeranians, and 29 Dachshunds.
* Cross-sectional transverse areas were calculated at the level of the cranial, middle, and caudal parts of the nasopharynx with the use of hand-drawn ROIs.
* The internal height and width of cricoid and trachea at level of C4 were performed, and transverse-sectional areas were subsequently calculated.
* For all nasopharyngeal locations, the TSA/weight, TSA/cricoid, TSA/trachea, as wel as cricoid/trachea ratios were calculated.
* Skull index of each dog was calculated with the formula (skull width x 100)/(skull length) to normalize measurements for skull type.

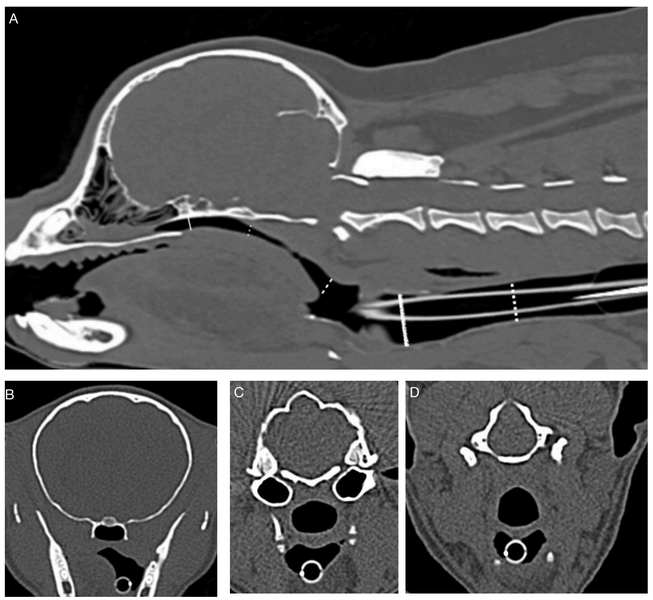
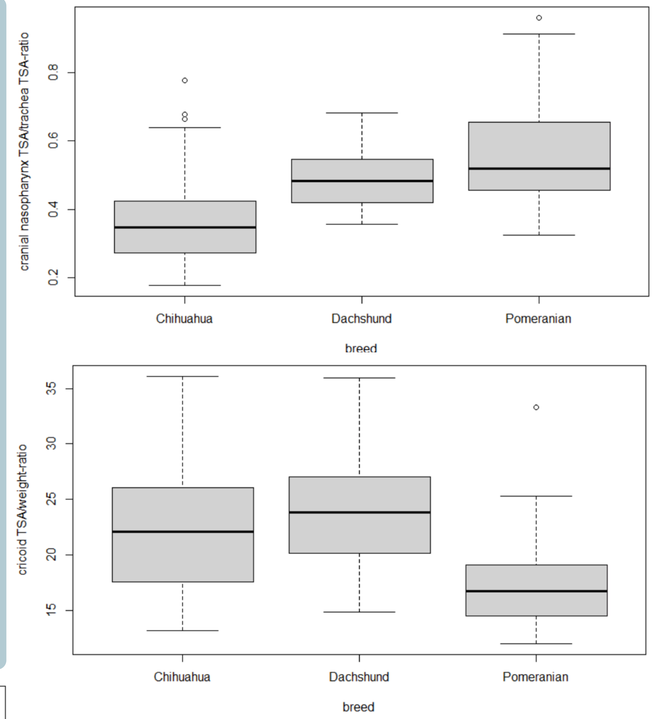
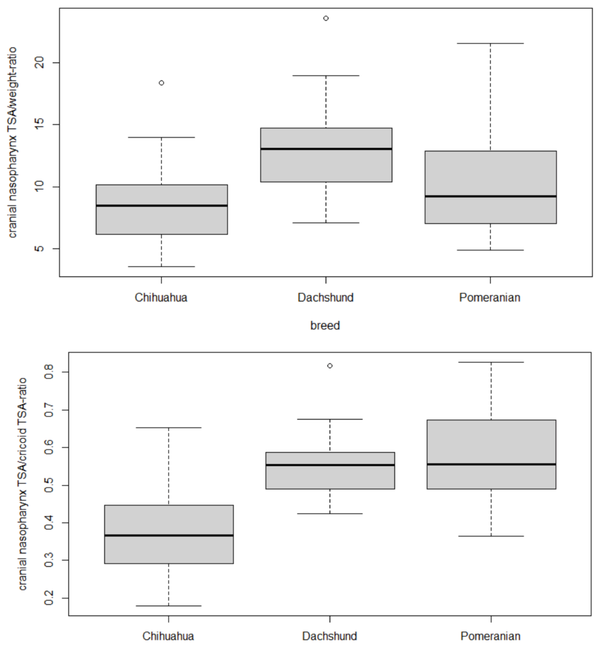


Figure 1. Location of performed measurements. A, from left to right, the TSA of the cranial nasopharynx (solid line), the middle nasopharynx (dotted line), caudal nasopharynx (dashed line), the cricoid height (thick irregular line), and trachea height (line with squares) were measured. The measurement of the cranial nasopharynx was performed just caudal to the choanae, at the level of the pterygoid bone (B). The second measurement of the middle part of the nasopharynx was measured at the level of the biggest cross-sectional area of the tympanic bulla (C). The measurement of the caudal aspect of the nasopharynx was performed at the end of the soft palate, at the level of the intrapharyngeal opening (D).

Results

* The cranial nasopharynx was the smallest part of upper airways in Chihuahuas and Pomeranians
* In Dachshunds, the smallest part of the upper airways was located at the caudal aspect of the nasopharynx.
* Chihuahuas had significantly smaller cranial nasopharynxTSA/weight ratios compared to Dachshunds (P<0.001).
* The cranial nasopharynx TSA/cricoid ratio was significantly smaller for Chihuahuas compared to both Pomeranians and Dachshunds (P < 0.001).
* The cranial nasopharynx/trachea ratio for Chihuahuas was significantly smaller than Pomeranians (P = 0.002) and Dachshunds (P = 0.008).
* Pomeranians had significantly smaller cricoid TSA/weight than Chihuahuas (P = 0.001) and Dachshunds (P = 0.003).





Conclusion

* The cranial part of nasopharynx is remarkably narrow in Chihuahuas and Pomeranians.
* Pomeranians also have small dimensions of cricoid and trachea.
* These anatomical abnormalities are important to recognize when evaluating diagnostic imaging of respiratory tract of these breeds.

Recommendations

* Prospective study including different brachycephalic and non-brachycephalic breeds to investigate whether the cranial nasopharynx of Chihuahuas and Pomeranians is also significantly smaller compared to a range of other breeds and the correlation between clinical signs and diagnostic imaging abnormalities.