

6 Summary

Computed Tomographic Anatomy of the Nose in Meso- and Brachycephalic Cats and Potential Clinical Applications

In order to enlighten the dark labyrinth of the nasal cavity, a comparative examination of brachycephalic (short-headed or round shaped respectively) and mesocephalic (normal shaped or mesocephalic respectively) cats was carried out. The study was based on 26 Persian and 18 domestic cats in total, with the chance of examining 13 animals (9 Persians and 4 domestic cats) under anaesthesia. Thus, computed tomography (CT) with concomitant intravenous contrast media application of six animals (4 Persians and 2 domestic cats) was possible. Because the animals displayed different stages of brachycephaly, and in order to adequately describe the functional-anatomical alterations, the 26 examined Persian cats were divided into four different categories by subjective criteria.

The examination was carried out with regard to clinical and morphological aspects, therefore the following methods were chosen: computed tomography compared to corresponding sheet plastinations, respectively polyethylenglycol sections; as well as three-dimensional (3D) reconstructions based on the CT data sets of the paranasal sinuses and the nasolacrimal drainage system (i. e., virtual casts) compared to conventional corrosion casts of the same animals. Additional methods employed in this study were anatomical drawings, maceration and anatomic preparation as well as exemplary anaglyph technology for demonstration of 3D objects within a 2D media.

This study presents the first complete cross-sectional anatomic descriptions of the nasal and paranasal cavities in brachycephalic cats, and – at least regarding some areas – even in mesocephalic domestic cats. Because the nasolacrimal drainage system of the cat was hitherto not described using computed tomography, this gap regarding functional anatomy and clinical diagnosis was thus closed. CT-examination of the nasal and paranasal cavity region was standardised and, for the first time, a new scanning plane of 90° towards the nasal bone was suggested – adapted to the anatomic relations of the ethmoidal bone in cats. Creating 3D models from the resulting CT data sets was established as an immense improvement for understanding the difficult spatial relations of the head.

The main problems when looking at the feline nose regarding the complex alterations in brachycephaly arise from the highly shortened facial bones and the resulting dislocation of nasal structures caused by the dorso-rotation of the teeth. Concomitant with increased stages of brachycephaly, the nares and the nasal entry get narrower; the rostral ending of the respiratory duct, the nasal conchae and the whole ethmoidal bone are pushed into an increased upright position; and the nasolacrimal drainage system is characterized by an increased angle and a steeper course. Nasal conchae material is pushed into the respiratory duct in some animals of the stage III category and thus hinders respiratory air flow. Additional paranasal cavities (Sinus conchales of the ectoturbinals 2 and 3) are developed, while the upper ethmoidal conchae are pushed up towards the frontal sinuses by the compression processes within the lower aspects of the nasal cavity. The literature survey presents the nose as a functional system, and based on this the present study focuses on all important diagnostic cross-sectional anatomic problems in brachycephalic and mesocephalic cats. Besides the nasal conchae, the nasal ducts and the paranasal sinuses, even the mucous membranes, the vasculature, regional lymph nodes and the nasolacrimal drainage system

are considered. Hence, this study presents a profound basis for all clinical problems of the nasal region. The results presented on the complex of 'brachycephaly in cats' suggest that brachycephalic animals should be classified into four categories (I – V) regarding objectionable structural criteria and use this classification interpreting the law of animal welfare ('pain breed' in terms of paragraph 11b). Cats of the category IV seem to fulfil the corpus delicti of 'pain breed'. Breeders of brachycephalic breeds should refrain from breeding with animals even of category III. According to the present study, even animals of category I and II display alterations due to dorso-rotation (slight narrowing of the nasal entry, low grade angling of the respiratory duct and the nasolacrimal drainage system, development of additional paranasal sinuses). But - in the hands of conscientious breeders - the latter add to the variety of feline breeds and are not objectionable from the veterinary point of view.