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Göran Bodegård is an all breed show judge and **Åke Hedhammar** is veterinary consultant for the Swedish Kennel Club (SKK). Both are involved in the preparation of *Special Breed Instructions* regarding exaggerations in pedigree dogs and the production of a DVD on the Brachycephalic Syndrome in preparation by the SKK.

This text is a translation of material used in Sweden to make show judges and breeders aware of their responsibility and potential impact in a reparative process.

Further actions and more specific advices on how to handle the condition have to be developed in collaboration between, judges, breeders, veterinarians and geneticists.



The Brachycephalic Syndrome

– New knowledge emphasizing the importance and responsibility of the dog show judge.

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Not all dog show judges have the same view on how impaired breathing is actually manifested or how the signs should be described and evaluated. This is a veterinary medical concern and it is correctly claimed that judges should refrain from making diagnoses in the show ring. Notwithstanding, all judges at shows in Sweden must, by a

simple inspection, make sure that “*all dogs should be able to breathe without difficulty, also when moving*”. (*)

A conformation judge must notice and assess such audible and/or visible signs of impaired breathing that naturally demonstrate themselves and can be observed in the show ring. To ensure this the Swedish Kennel Club in 2010 decided to produce instruction material in the form of a DVD to be part of the material communicated to all judges assigned to judge in Sweden any of the breeds listed in the Breed Specific Instructions regarding exaggerations in pedigree dogs. (BSI (**))

The pertinent breed clubs have been included in this and are generally eager to contribute their knowledge and experience and they support the idea of involving show judges in efforts aimed at preventing and reducing the breathing problems in their breeds.

The project group includes show judges and those with veterinary expertise as well as a professional film team. Prof G Oechtering, Leipzig, Germany who is internationally reknown for his expertise on the Brachycephalic Syndrome in dogs, has been consulted.

The theoretical basis for the project is the most current scientific knowledge about the Brachycephalic Syndrome (***) . Many new findings make it very important for judges to update and enhance their knowledge in that respect and to sincerely consider how to apply the new facts when assessing particularly the short-nosed breeds in the ring. The influence of the show judge regarding the selection of dogs used for breeding is likely to be increasingly important the more the dog show sport has developed.

The recent research findings are based mainly on Professor Oechtering’s endoscopic studies on dogs seen for veterinary care. The dogs seen at veterinary clinics are not necessarily the same as those in the show ring but neither are the two populations genetically distinct, rather parts of the same breed population.

The Brachycephalic Syndrome

In many breeds the aim has been to get flat-faced dogs and this has been achieved by selection for a shortened skull and muzzle. This head type – the brachycephalic head – is not to be considered as a normal variation but is the result of a human intention to consolidate desired physical characteristics which are expressions of a genetic mutation. Even with the selected breeding for this trait, dogs are produced with a spectrum of characteristics, including individuals having practically no nose at all. Strongly connected to the flat face characteristics is the development of malformations in the airways including pinched nostrils, elongated and thickened palate, hypertrophic and/or collapsing walls of the trachea and bronchi which cause obstructions for the flow of air. The degree of breathing impairment is varying. The brachycephalic breeds also manifest a disturbed thermoregulation capacity.

Brachycephalic animals are all, to at least some degree, affected by lifelong breathing problems which are particularly pronounced under conditions of elevated environmental temperature and during increased physical activity when insufficient airway capacity hinders an adequate gas exchange. Attacks of evidently laboured

breathing with respiratory distress, snoring and snuffling are the most common clinical signs which in the most serious cases might develop into apnoea, loss of consciousness, collapse and even death.

New scientific observations

The situation is far more complex than was previously understood.

All short-nosed breeds have one and the same genetic alteration (****) as the basic cause for the characteristic type of flat face. The alteration is defined as a genetic defect from the veterinary medical perspective, rather than merely a phenotypic (physical) characteristic since it is obviously linked to severe health problems due to disturbances in normal respiratory and thermoregulatory physiology – the Brachycephalic Syndrome.

The considerable deleterious influence of the extensive airway malformations on gas exchange has not been fully appreciated earlier when the attention was mainly focusing the anatomic effects on the nostrils and soft palate. The recent work has thus further elucidated the negative effects on the basic function of breathing, i.e. the uptake of oxygen and the elimination of carbon dioxide by the restricting anatomical changes of the airways.

Particularly important discoveries are the findings of the essential function of the nose for the thermoregulation in dogs and how this throws light on the reason for the well known deficiency in this function amongst the brachycephalic dogs. The extensively folded mucous membrane located in the front part of the dog's muzzle constitutes the main heat regulating mechanism in the dog. This membrane is as large as the external body surface in the long nosed dog and the blood circulation of it is in direct contact with the blood vessels of the brain, and in this way regulates the temperature of the brain.

The shortened nose (muzzle) of the brachycephalic breeds drastically diminishes the mucous membrane necessary for the thermoregulation. It was formerly considered that the ventilation caused by the mouth breathing was the dog's main mechanism for this important regulation. Newer research findings have shown that the air flow through the nose is very pronounced even when the dog is mouth-breathing (panting) due to increased temperature. The length of the nose is thus crucial for an adequate adjustment of the body temperature. This has not been fully understood previously and this function is of course seriously affected in short-nosed animals. (The importance of the airflow through the nose is easily shown in that a panting dog is absolutely not willing to accept covering of the nostrils!) Since short-nosed dogs are deprived of an efficient thermoregulation mechanism, they are all more sensitive to elevated ambient temperature and are therefore more easily overheated. They show a profoundly prolonged recovery time after overheating – in spite of attempts to lower the temperature by external application of cool water, etc.

The olfactory function of the nose (the sense of smell) is not interfered with to nearly the same degree in the short-nosed dog since the important area for this sense is situated further back in the nasal cavity and is not so dependent on the length of the muzzle.

It is important to understand that the genetics behind the Brachycephalic Syndrome is complex and the basic gene alteration in brachycephalic breeds is probably operating together with several other modifying genes. This is the likely explanations for the great variability of the malformations in different parts of the air passages seen across the various brachycephalic breeds and individuals. It therefore may, theoretically, be possible to retain desired external, breed-typical characteristics (the flat face) without complete expression of the internal airway malformations of the syndrome. However, the knowledge about the genetics determining the variations (exterior and interior) is still not complete.

Professor Oechtinger's investigations are based on dogs with severe clinical symptoms and he also describes possible surgical procedures. Surgery can correct some of the airway malformations but cannot, of course, reverse the defective thermoregulation due to the underdeveloped muzzle.

Our responsibility

Breeders, the breed standards and show judges have contributed to the creation and preservation of the brachycephalic head type in dogs, and thus mutually share the responsibility for the unintentional development of the Brachycephalic Syndrome with its health consequences. The breeders, the standards and the judges then also have the responsibility and potential to address and improve the situation.

It is of utmost importance for the existence and the preservation of the brachycephalic breeds that the goals of the breeding are focused on selections to reduce the risks of the Brachycephalic Syndrome and thus aim at repairing what is the unwanted result of breeding practices.

It is the responsibility and the duty of the show judge to exercise his/her influence on breeding practices by primarily only rewarding dogs showing a combination of excellent type and absence of impaired breathing and, if evident, adequate thermoregulation. As mentioned above, improvement should be possible based on the underlying complex genetics, at least considering a given breed population. Although changes of phenotype may take time, a commitment to the potentials of the genetic complexity is essential for show judges to exert their possibility to assist breeders to promote the development of healthier dogs. Judges must be able to identify the signs of respiratory distress and discomfort associated with the Brachycephalic Syndrome. The question to be raised in the ring is "How does this dog cope with its breed type legacy?"

An updated approach by show judges is of course only beneficial if the breeders have a similar knowledge of and respect for the existence of a detrimental Brachycephalic Syndrome.

() BSI Special Breed Instruction regarding exaggerations in pedigree dogs. The Swedish Kennel Club 2010; www.skkl.se*

*(**) Bodegård G: Special Breed Specific Instructions (BSI) regarding exaggerations in pedigree dogs A health protective project from the Swedish Kennel Club FCI News letter N:O 1 2011*

(***) ref: *Oechtering G. Brachycephalic syndrome; new information on an old congenital disease; Veterinary Focus/Vol 20 No 2/2010*

(***) *Bannasch D, Young A, Myers J, Truvé K, Dickinson P, Gregg J, Davis R, Bongcam-Rudloff E, Webster MT, Lindblad-Toh K, Pedersen N. 2010 Localization of canine brachycephaly using an across breed mapping approach. PLoS One. Mar 10;5(3)*

Further references

Prof. Dr. Gerhard U. Oechtering & Riccardo Schuenemann

Brachycephalics – trapped in man-made misery?

Introduction *The Brachycephalic Airway Obstructing Syndrome (BAOS) is a well-described combination of upper airway disorders in certain dog and cat breeds. Veterinarians should be aware, that it is a man-made hereditary disease, caused by exaggerated and incorrect breeding selections. This has led to fateful overemphasis of brachycephalia. The result is an almost complete loss of the nose, additional malformation of pharynx and larynx, and several other serious handicaps. Affected animals suffer from lifelong respiratory distress, particularly during elevated ambient temperatures – and most owners suffer with their pets.*

Reports on breathing difficulty in short-nosed breeds of dogs and therapeutic suggestions date as far back as the 1930s. Symptoms can vary broadly in intensity, as can frequency of dyspnoeic episodes. Snoring is the most common manifestation. In the worst cases, severe dyspnoea with life-threatening asphyxia and syncope may be seen. Most authors focus on the same specific anatomic features when characterising BAOS so as to explain reasons for the respiratory problems: narrow nostrils, elongated soft palate and everted laryngeal ventricles. However, excessive selection for expression of brachycephalia has changed and deformed the entire upper respiratory tract. New studies have shown that airway distress is caused by far more numerous constrictions in the upper airways than was previously thought.

Oechtering G.

Brachycephalic syndrome; new information on an old congenital disease

Veterinary Focus, Vol. 20, No 2, 2010

Brachycephaly is an increasingly topical subject and for many reasons veterinarians need to be thinking about it again. For a start, brachycephalic animals are gaining in popularity. In many parts of the world, brachycephalic breeds figure among those with the highest percentage growth in terms of offspring. This is true not only of dog breeds but also, increasingly, of brachycephalic cat breeds (1). Moreover, the severity of the symptoms associated with this malformation appears to have been greatly exacerbated in recent decades. This could be one of the main reasons why animals are presenting with severely obstructed breathing at an ever younger age. Previously, brachycephalic respiratory distress and exercise intolerance were considered to be due solely to the narrowing or obturation of the upper airways, leading to reduced ventilation of the lungs. Today, we believe that in dogs, the nose also plays a vital role in thermoregulation. In brachycephalic animals it is probable

that the heat-related disorders are caused more by restricted temperature regulation than by reduced ventilation of the lungs and the resulting lack of oxygen. However, non-medical, social aspects are now also part of the issue. The public and the media are well aware of subjects such as selective breeding for exaggerated features which can be detrimental to the health and quality of life in pedigree dogs (2,3). In brachycephalic dogs, the nose is being reduced in size by excessive selective breeding, to the extent that function has been drastically inhibited. As obligatory nose breathers, dogs suffer far more than humans when their nasal ventilation is restricted. All these are key reasons why veterinarians should take a new look at this "old" topic and initiate a critical debate on extreme brachycephaly in the public arena too.

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Computed tomographic imaging of the nose in brachycephalic dog breeds

Tierärztliche Praxis Kleintiere 3, 2007

Summary Introduction and objective: Inappropriate selection for extreme brachycephaly has led to almost complete loss of the nose in brachycephalic dog breeds. This structural deformity causes severe malfunction of the airways and is referred to as brachycephalic airway syndrome (BAS). The aim of this study was to examine and compare the anatomical features of the brachycephalic and normocephalic nose of dogs using computed tomography (CT). **Methods:** A total of 23 brachycephalic dogs (11 pugs, seven French bulldogs, five English bulldogs) and one normocephalic German shepherd dog were examined. Multislice CT images of all animals were evaluated. For comparison of structural differences between normocephalic and brachycephalic breeds, anatomical parameters were determined. **Results:** Extreme shortening of the craniofacial skull and thus of the nasal cavity lead to abnormal configuration of the conchae. Two main types of aberrant conchal growth were recorded: Rostral aberrant turbinates (RAT) obstructing the nasal passage and caudal aberrant turbinates (CAT) obstructing the nasopharyngeal meatus. Furthermore, all nasal conchae were characterised by a low degree of branching and crude lamellae. Measurements of the skull revealed characteristic differences among the brachycephalic dog breeds. The pug had a shorter facial skull than the French and English bulldogs. **Conclusion:** The finding that severe intranasal deformities occur in brachycephalic dogs provides new data for the understanding of the pathophysiology of BAS. **Clinical relevance:** Detailed structural analysis of rostral and caudal aberrant turbinates (RAT, CAT) is an indispensable prerequisite for planning and implementing intranasal treatment of BAS using laser-assisted turbinectomy (LATE therapy).

Strukturelle Besonderheiten der Nase brachycephaler Hunderassen in der Computertomographie

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Schmidt-Nielsen, 1970 (*Science*, vol 169)

Panting in Dogs: Unidirectional Air Flow over Evaporative Surfaces 1102 · Abstract.

In dogs which are panting due to a heat load, most of the respired air enters through the nose and leaves through the mouth. Different patterns of flow are however possible. The unidirectional flow over the evaporative (nasal) surface is an important mechanism for regulating the amount of heat dissipated in panting.

Blatt, 1972 (*Science*, vol 177)

Thermal Panting in Dogs: The Lateral Nasal

Gland, a Source of Water for Evaporative Cooling

Abstract. Two lateral nasal glands appear to provide a large part of the water for evaporative cooling in the panting dog; their function is analogous to that of sweat glands in man. Each gland drains through a single duct which opens about 2 centimeters inside the opening of the nostril. This location may be essential to avoid desiccation of the nasal mucosa during thermal panting. The rate of secretion from one gland increased from 0 to an average of 9.6 g (gland' hour)pr liter. as air temperature was increased from 10° to 50°C. Evaporation of the fluid from the paired glands could account for between 19 and 36 percent of the increase in respiratory evaporation associated with thermal panting. The fluid secreted by the gland was hypo-osmotic to plasma

Baker Chapman, 1977 (*Science* vol 195)

Rapid Brain Cooling in Exercising Dogs

Abstract: In alert resting dogs, the brain is warmer than arterial blood in the common carotid artery. When dogs run, brain temperature drops, despite a sharp rise in carotid blood temperature... The brain cooling apparently results from counter current heat exchange between warm arterial blood supplying the brain and cool venous blood draining the nose and mouth. The heat exchange occurs in the arteries at the base of the brain which form a rudimentary carotid rete in the dog, and is greatest during exercise when respiratory evaporation is at a peak. In animals with a carotid rete the brain is protected against overheating during the severe thermal stress of exercise.