Review

Brachycephaly in Cats: A Silent Problem in Feline Health

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Abstract:
Brachycephaly, morphological trait characterised by a shortened skull relative to its width, is a prominent feature of certain feline breeds, including Persians, Exotic Shorthairs, Himalayans. British Shorthairs, British Longhairs, and Scottish Folds. While selective breeding has favoured this trait due to human preferences for neotenous appearances, severe brachycephaly is associated with a wide range of health complications. These include neurological, respiratory, ocular, dental, gastrointestinal, reproductive, and dermatological disorders. This literature review explores the systemic impact of brachycephaly on feline health, highlighting the need for ethical breeding practices and improved veterinary care to mitigate its negative effects.

Keywords: Brachycephaly; Feline Health; Ethical Breeding; Skull Morphology; Cat Welfare

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1. Background

Brachycephaly is an anatomical condition where the craniofacial conformation of the skull is significantly shortened (Gleason, et al., 2022), resulting in round face and large eyes (Berteselli et al., 2023). While this trait is often considered aesthetically desirable, it poses several health risks for affected cats. In recent decades, selective breeding has intensified the severity of brachycephaly in certain breeds, leading to an increase in associated medical conditions. Despite growing awareness, the long-term implications of these abnormalities remain insufficiently explored (Farnworth, 2016; Berteselli et al., 2023).

The aim of this review is to provide a comprehensive overview of the health challenges associated with brachycephaly and to emphasize the importance of ethical breeding and responsible ownership. This literature review explores how anatomical skull conformation affects the health of brachycephalic cat breeds, assessing the severity and systemic consequences of brachycephaly while highlighting the need for ethical breeding practices and improved veterinary care.

2. Brachycephaly

Brachycephaly is a term used to describe a morphological trait in which the length of a cat's skull is significantly reduced compared to its width (Mullen et al., 2004). Therefore, the shape of the brachycephalic cat's head appears to be rounder, face is flatter from the forehead to the snout. Eyes are bulging and do not follow the shape of the skull, while eye sockets are shallower (Sieslack et al., 2021). The nasal bridge is shortened to the extent that it is almost not visible. The lower jaw appears to be disproportionately pushed forward and upwards compared to the upper jaw (Schlueter et al., 2009; Berteselli et al., 2023; Morel et al., 2024) (**Figure 1**).

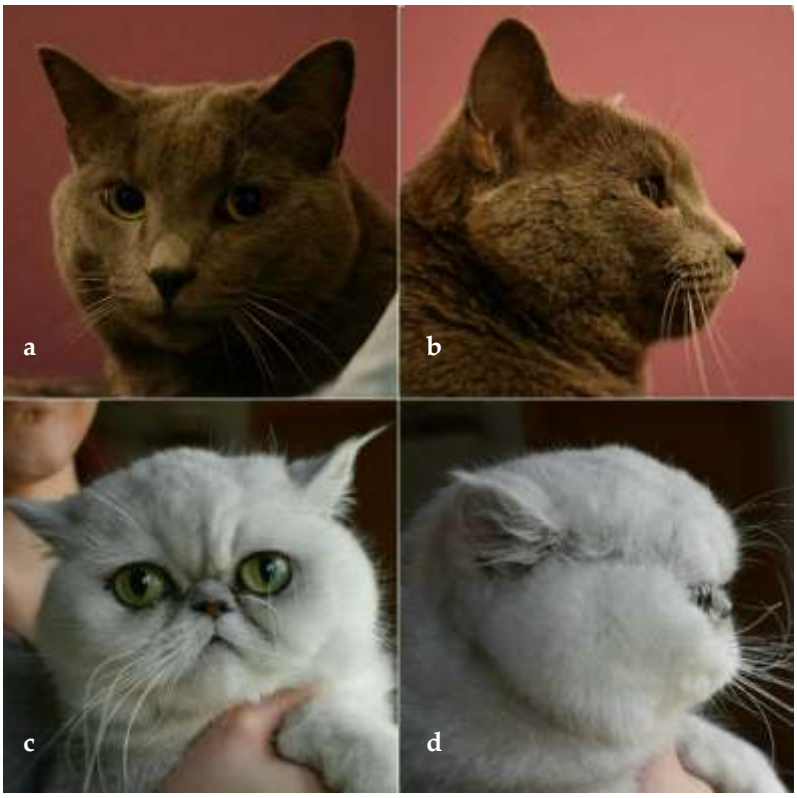

Figure 1. Comparison of the front (a) and side profile (b) in a non-brachycephalic cat, compared to a front (c) and side profile (d) ina brachycephalic cat (Photo: Jarnovič L).

It should, however, be noted, that the severity of brachycephaly in cats varies, and can be categorized into four distinct grades (Schlueter et al., 2009; Bessant et al., 2018; Anagrius et al., 2021) (**Table 1**). For classification, the cephalic index, a ratio measuring skull width relative to length, is used (Sieslack et al., 2021; Ziemann et al., 2023).

Table 1. Grading of the severity of brachycephaly in cats, with a description of each degree (Schlueter et al., 2009; Bessant et al., 2018; Anagrius et al., 2021).

Degree of Brachycephaly	Description
Mild	Subtle facial flattening with slight shortening of the skull. The nasal bridge remains moderately defined, and eyes are normal. Health issues are minimal.
Moderate	More noticeable facial flattening and narrower nostrils. Eyes may be slightly prominent. Respiratory problems such as snoring and exercise intolerance along with mild ocular and dental issues, are common.
Severe	Significant facial flattening, compressed nose, and prominent eyes. Respiratory distress, exercise intolerance, and pronounced dental malocclusion are common. Eye issues like corneal ulcers may occur.
Extreme	Severely flattened face, pushed-in nose, and bulging eyes. Severe breathing and difficulties, significant dental and neurological problems, and frequent ocular injuries are present.

2.1. Brachycephalic Cat Breeds

The condition is particularly prevalent in breeds like the Persian, Exotic Shorthair (Schlueter et al., 2009; Farnworth et al., 2016; Bessant et al., 2018; Plitman et al., 2019; Anagrius et al., 2021; Berteselli et al., 2023), Himalayan, British Shorthair, British Longhair, and Scottish Fold. These cats have been bred to emphasize features that align with human psychological preferences for "baby-like" appearances, such as large eyes and small noses (Schlueter et al., 2009; Bessant et al., 2018; Plitman et al., 2019; Berteselli et al., 2023,).

3. Impact of brachycephaly on health

Cats with extreme skull shortening exhibit a significantly compressed facial structure, often leading to respiratory difficulties. Other complications linked to brachycephaly include neurological, ocular, dental, gastrointestinal, behavioural, reproductive and dermatological disorders (Schlueter et al., 2009; Bessant et al., 2018; Plitman et al., 2019; Erjavec et al., 2020; Anagrius et al., 2021).

3.1. Neurological Issues

Cats with severe brachycephaly often experience structural deformities within the skull (Huizing et al., 2017). One notable condition is cerebellar herniation, where the cerebellum is displaced through the foramen magnum due to reduced cranial space (Huizing et al., 2017; Bessant et al., 2018; Erjavec et al., 2020; Sieslack et al., 2021). This leads to motor dysfunction, ataxia (Erjavec et al., 2020; Anagrius et al., 2021), and, in some cases, hydrocephalus that intensifies pressure on neural structures (Huizing et al., 2017). Such cats may suffer seizures, disorientation and blindness (Erjavec et al., 2020).

3.2. Respiratory Complications

Respiratory difficulties are a hallmark of brachycephaly (Bessant et al., 2018; Brunner et al., 2023). Some cats exhibit Brachycephalic Obstructive Airway Syndrome, or better known as BOAS (Farnworth et al., 2016; Anagrius et al., 2021; Berteselli et al., 2023), a combination of congenital defects like stenotic nares, elongated soft palates (Mullen, 2004), and compressed nasal turbinates (Farnworth et al., 2016; Erjavec et al., 2020; Sieslack et al., 2021). These abnormalities obstruct airflow, resulting in labored breathing, snoring, and exercise intolerance (Mullen et al., 2004; Farnworth et al., 2016; Anagrius et al., 2021; Berteselli et al., 2023; Gleason et al., 2023). Severe cases can escalate to laryngeal collapse (Mullen et al., 2004; Farnworth et al., 2016; Anagrius et al., 2021; Brunner et al., 2023) that might require, though not always successful, surgical intervention (Brunner et al., 2023).

3.3. Sleep Disturbances

Cats with severe BOAS frequently experience sleep apnoea (Mullen et al., 2004; Berteselli et al., 2023,), snoring (Farnworth et al., 2016; Anagrius et al., 2021; Berteselli et al., 2023) and restless sleep due to difficulty maintaining clear airways (Berteselli et al., 2023).

3.4. Ocular Disorders

The flattened skull structure often compresses or displaces the nasolacrimal ducts, leading to tear overflow, or epiphora (Schlueter et al., 2009; Erjavec et al., 2020; Anagrius et al., 2021; Sieslack et al., 2021; Berteselli et al., 2023). Namely, in severe brachycephalic cats, the proximity between the roots of the canine teeth and the nasolacrimal duct is significantly reduced, with the roots sometimes directly adjoining the duct. Consequently, is the duct forced to course beneath the canine teeth, forming a V-shaped trajectory before entering the nasal cavity (Schlueter et al., 2009). Protruding eyes are particularly vulnerable to corneal ulcers and entropion—a condition where the eyelids roll inward, irritating the cornea (Anagrius et al., 2021; Sieslack et al., 2021).

3.5. Oral and Dental Health

Dental malocclusion is another major issue (Ziemann et al., 2023), where the dorsorotation of the jaws causes overcrowding of teeth (Schlueter et al., 2009; Erjavec et al., 2020; Sieslack et al., 2021). This increases the risk of periodontal disease, gingival injury, and painful abscesses (Erjavec et al., 2020; Gleason et al., 2023). Traumatic occlusion, where teeth impinge on soft tissues, can lead to chronic inflammation and even pyogranulomas (Ziemann et al., 2023). These conditions make eating difficult, compromising nutrition and digestion (Gleason et al., 2023).

3.6. Gastrointestinal Problems

Respiratory stress often forces brachycephalic cats to breathe through their mouths, leading to aerophagia. This can result in regurgitation (Anagrius et al., 2021; Berteselli et al., 2023) gastroesophageal reflux, and poor digestion. Dental malocclusion further exacerbates eating difficulties, causing hypersalivation and messy eating behaviours (Gleason et al., 2023).

3.7. Reproductive Challenges

Queens with extreme brachycephaly often face dystocia (Bessant et al., 2018; Anagrius et al., 2021; Berteselli et al., 2023) or difficult labour, due to their narrow pelvic structure (Erjavec et al., 2020) and the disproportionately large head size of brachycephalic breeds (Morel et al., 2024). Caesarean sections are often required (Plitman et al., 2019), further highlighting the physical strain these traits impose.

3.8. Dermatological Concerns

Deep skin folds around the face create an environment prone to bacterial and fungal infections. Without meticulous grooming, these cats may develop painful skin conditions (Sieslack et al., 2021). Persians and Himalayans, with their dense coats, require regular grooming to avoid matting (Berteselli et al., 2023).

4. Potential causes of health concerns being overlooked

Studies indicate that the prevalence of health complications in brachycephalic cats varies by breed and severity of skull compression. Despite these findings, many prospective pet owners remain unaware of the medical challenges associated with extreme brachycephaly. Veterinarians are significantly more aware of brachycephalic dog health issues than owners and breeders (Åsbjer et al., 2024). While brachycephalic dogs often display obvious signs of breathing difficulties, in brachycephalic cats, their subtle face expressions make it difficult to recognize discomfort or respiratory distress (Berteselli et al., 2023). Unlike dogs, cats are generally less active, do not go for walks in hot weather, and tend to rest more

throughout the day. As a result, clinical signs of respiratory distress may be less pronounced or go unnoticed for longer periods. This lack of outward symptoms likely leads to an even greater underestimation of their health challenges than in dogs, making it a big silent threat to feline well-being.

5. Ethical and welfare considerations

Preventing the worsening of brachycephalic-associated health issues requires collaboration among breeders, veterinarians, cat owners and others (Åsbjer et al., 2024). Breeders should prioritize moderate facial features over extreme ones. By selecting for healthier traits, they can reduce the incidence of severe brachycephaly. Incorporating genetic screening into breeding practices can help eliminate deleterious traits and promote a more sustainable feline population (Mills, 2019; Sieslack et al., 2021; Morel et al., 2024).

5.1. The role of breeders

Breeders play a critical role in mitigating the negative effects of brachycephaly by prioritizing well-proportioned facial structures over extreme conformation. However, breeding conditions are often influenced by beauty standards set in competitions, making judges crucial in shaping breeding trends (Plitman et al., 2019). Their influence can encourage breeders to prioritize animal welfare by promoting traits that support long-term health and vitality. Genetic screening, and responsible selection of breeding pairs further help reduce the incidence of severe abnormalities (Morel et al., 2024).

5.2. Veterinary care and management

Veterinarians play a critical role in educating, diagnosing conditions and managing health problems early. Regular check-ups and preventive care are essential for detecting potential issues before they become severe. Advanced imaging techniques such as MRI or CT scans can help identify anatomical abnormalities (Huizing et al., 2017), allowing for more precise treatment planning. Additionally, specialized respiratory assessments and dental evaluations are crucial for brachycephalic cats, as they are prone to airway obstruction and malocclusions.

In severe cases, surgical interventions—though not always common—may significantly improve quality of life. Procedures such as airway correction surgery or nostril widening can enhance breathing capacity, while dental extractions may alleviate discomfort caused by overcrowding. A multidisciplinary approach, involving veterinary specialists in surgery, dentistry, and neurology, can further optimize long-term care and well-being (Morel et al., 2017).

5.3. Owner awareness and responsibility

Cat owners must be educated about the potential health risks of brachycephalic breeds prior to deciding of having one (Plitman et al., 2019). Routine veterinary check-ups, weight management, and creating stress-free environments are crucial. Owners should also be encouraged to support ethical breeding practices and avoid promoting extreme traits (Mills, 2019; Morel et al., 2024).

6. Conclusion

Brachycephaly in cats presents a significant yet often overlooked welfare concern. Affected individuals frequently experience chronic respiratory compromise due to stenotic nares, elongated soft palates, and compressed nasal turbinates, leading to Brachycephalic Obstructive Airway Syndrome (BOAS). Ocular pathologies, including corneal ulceration, entropion, and epiphora, are prevalent due to the altered orbital conformation. Severe dental malocclusions result in traumatic occlusion, periodontal disease, and feeding difficulties, compromising overall health and nutrition. Neurological abnormalities such as cerebellar herniation and hydrocephalus contribute to ataxia, seizures, and visual impairment. Unlike brachycephalic dogs, cats often mask clinical distress, leading to underdiagnosis and delayed intervention. Addressing this issue requires a multidisciplinary approach, where veterinarians must advocate for early detection and intervention, breeders must prioritize functional conformation over exaggerated traits, and owners must be informed of the in-

herent health risks. If left unaddressed, the health challenges associated with brachycephaly will persist unnoticed, reinforcing its status as a silent yet profound threat to feline well-being.

Conflicts of Interest: The authors declare no conflict of interest.

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