Brachycephalic airway syndrome (BOAS)

What is BOAS?

Brachycephalic dogs have a compressed, shortened skull and a characteristic flat face appearance. Common brachycephalic breeds include English and French bulldogs, Pekingese, Boxers, Boston terriers, pugs, and Shih Tzus. Because of their abnormal skull conformation, these dogs are prone to a number of upper respiratory problems affecting the nose, mouth, and throat. These dogs have the same bones and soft-tissues up their noses as dogs with normal shaped skulls, but compressed into a much smaller space. Together, these problems are referred to as "brachycephalic airway syndrome."

Pug skull

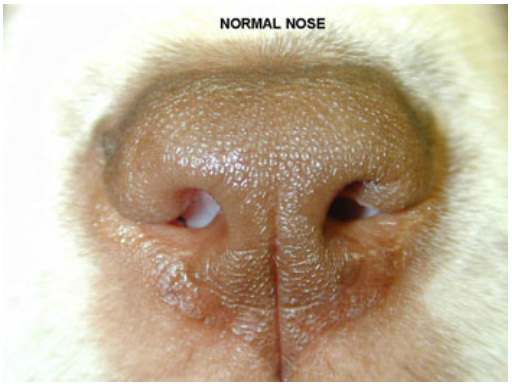
German Shepherd skull

Why do these dogs have difficulty breathing?

Brachycephalic dogs have severely compromised upper airways through which to breathe. This increases the resistance to airflow and makes it more difficult for them to exercise and regulate their temperature. The increased resistance to airflow is due to primary anatomical defects and secondary, acquired changes. The main anatomical defects include:

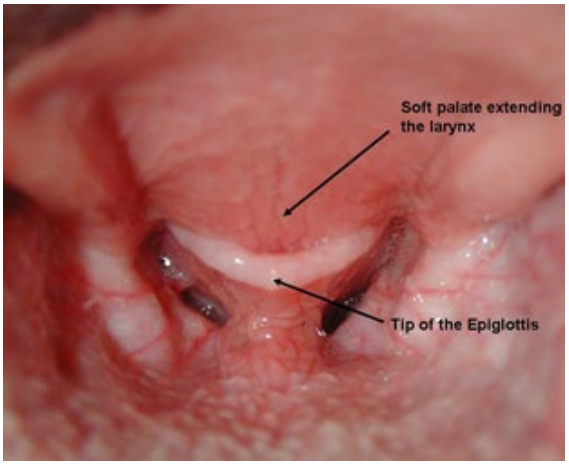
1. Stenotic nares are nostrils that are excessively narrow. Air cannot flow smoothly through narrow nostrils, so increased respiratory effort and noisy breathing result. Some dogs cannot breathe through their nose at all and become obligate mouth breathers. These dogs often cannot sleep properly because then stop breathing when they fall asleep (sleep apnoea).

Stenotic nares of a brachycephalic dog

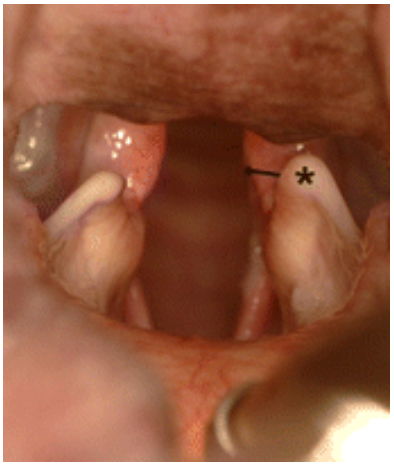


Normal nares

2. An "elongated soft palate" refers to the soft structure at the back of the roof of the mouth, behind the hard palate. In brachycephalic dogs, the soft palate is longer than normal and hangs down into the back of the throat. This elongation partially obstructs airflow into the windpipe (the larynx and trachea), resulting in laboured breathing and snoring.



Overlong soft-palate

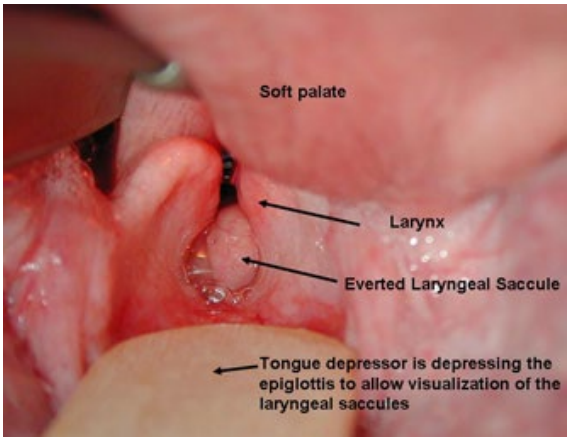


Normal dog's larynx

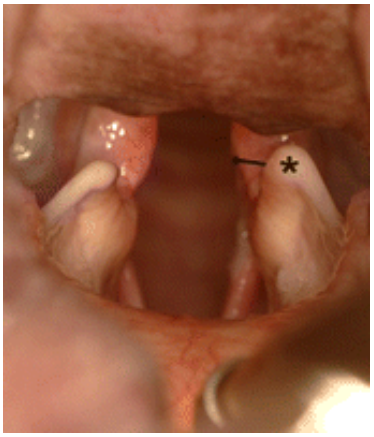
3. Brachycephalic dogs may also have increased folds of pharyngeal mucosa at the back of their mouth, nasal turbinates extending into the throat and a narrower windpipe (hypoplastic trachea).

In addition to these primary abnormalities, brachycephalic dogs often have several secondary, acquired problems:

4. Laryngeal collapse. High-speed jets of air flowing down a narrowed larynx can cause inflammation and oedema of the mucosa tissue lining the voicebox (the larynx). The mucosa can be sucked into the lumen of the larynx by the turbulent airflow and this is known as "everted laryngeal saccules" and represents the first stage of laryngeal collapse.

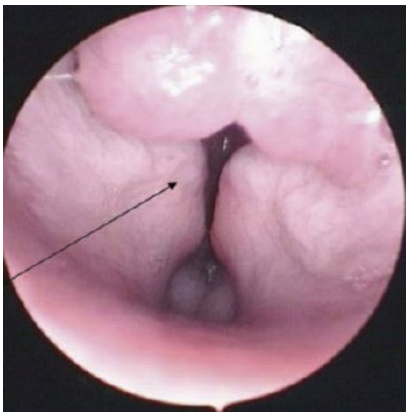


Brachycephalic dog larynx with everted saccules obstructing the airway



Normal larynx with wide airway

Over time, cartilage that supports the larynx may become weakened, eventually causing the larynx to collapse inwards, severely narrowing the size of the airway (stages 2 and 3 of laryngeal collapse). Laryngeal collapse is often associated with a progression of clinical signs and advanced cases can be difficult to treat.



- Similarly, the trachea may lose its structural support, making breathing more difficult and causing a chronic cough to develop.
- The auditory tube can become blocked and brachycephalic dogs have a high incidence of otitis media with effusion (“glue ear”) which may reduce hearing.
- The effort of breathing causes many brachycephalic dogs to develop stomach acid reflux and chronic oesophagitis (heartburn). The thick foam these dogs have in their mouth at times may be regurgitated gastric acid mixed with saliva.
- Brachycephalic dogs are also at greatly increased risk of developing pneumonia from inhaling saliva, water or food into their lungs.

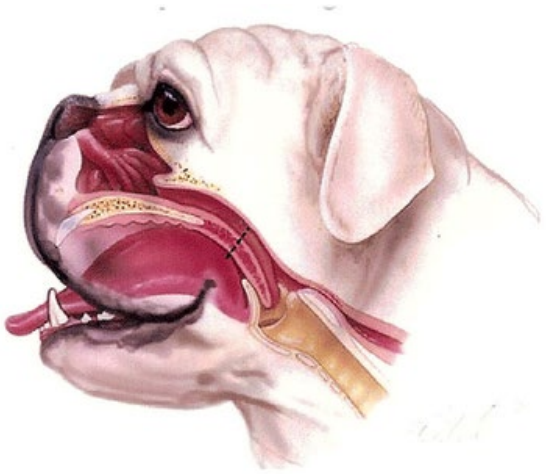
What are the signs of brachycephalic airway syndrome?

Common signs include snorting, noisy breathing, excessive panting and exercise intolerance. Some dogs have frequent sickness and regurgitation from reflux of stomach acid. Heat, stress, or excitement can often make signs dramatically worse.

Signs of brachycephalic airway syndrome may be mild, or may eventually become so severe that life-threatening respiratory distress develops. Some dogs have so much difficulty breathing that they are unable to sleep for long periods of time (sleep apnoea prevents them from sleeping). Severely affected dogs may occasionally turn blue and pass out from lack of oxygen or even die. Although these airway problems are usually apparent from a young age, most dogs are 2 to 4

years of age before they are brought to a vet for evaluation and treatment. This usually coincides with development of early laryngeal collapse.

What treatment can be performed?



Fortunately, the three main components of brachycephalic airway syndrome can be corrected surgically, usually with good to excellent results.

1. The stenotic nostrils can be widened so that air can flow easily into the nasal cavity (rhinoplasty).
2. The elongated soft palate can be trimmed to an appropriate length so that it will no longer interfere with normal air flow into the trachea (palatoplasty).
3. Everted laryngeal saccules can be removed, thus improving the size of the laryngeal lumen (saccule excision).

In some cases, enlarged tonsils are removed (tonsillectomy). Some cases require chest x-rays to check for underlying heart or lung disease such as concurrent pneumonia.

After surgery all dogs are closely monitored and may be kept sedated initially. Very occasionally airway swelling after surgery occurs (<5%) and a temporary tracheostomy tube is required for 24 hours to bypass the larynx until airway swelling resolves sufficiently.

Prognosis

The majority of cases (>90%) improve over the few weeks following surgery. Resistance to airflow in the upper airways is reduced and consequently breathing noise and effort are lower. Exercise tolerance increases and dogs with upper gastrointestinal signs (such as frequent vomiting) also improve.

These dogs are never normal but virtually all owners report significant improvements in their dog's quality of life and surgery is generally very successful at eliminating the severe, life-threatening episodes of respiratory distress.

The challenging cases are the dogs with severe secondary changes involving the larynx. Stage 2 and 3 laryngeal collapse carry a more guarded prognosis and some patients may require further "salvage" surgery such as a permanent tracheostomy or a laryngoplasty procedure to try to improve the functional size of their airway. For this reason, performing airway surgery early on in life is recommended in affected dogs to prevent the progression of the secondary changes and improve outcomes.