

# Brachycephalic Syndrome

## What is BOAS?

Brachycephalic obstructive airway syndrome (BOAS) is a condition seen in short-nosed (brachycephalic) breeds of dog such as the Pug, French Bulldog, English Bulldog and Boston Terrier. The severe shortening of the bones of the skull in these breeds results in limited space to accommodate the soft tissues of the nose and throat, leading to airway obstruction. This airway obstruction means that these dogs struggle to breathe and to cool down. This problem is typically worsened by exercise, excitement, stress and heat, and these breeds are often at risk of heat stroke and collapse.



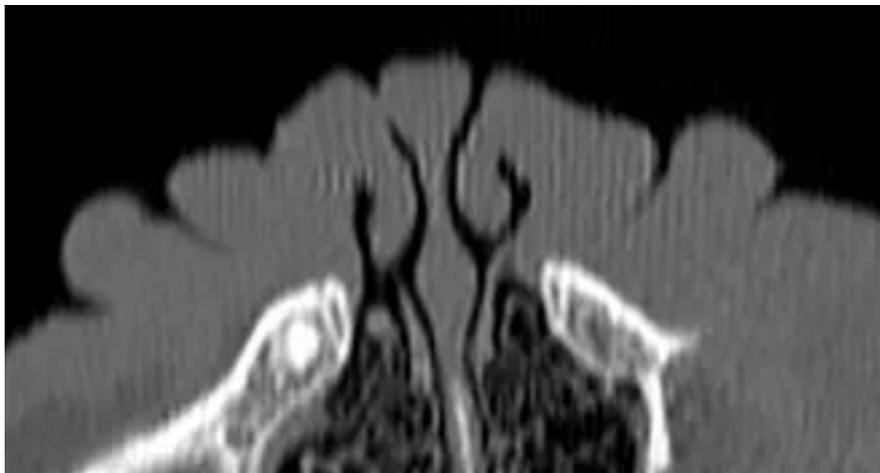
## What parts of the respiratory system are affected?

While multiple areas of the upper and lower airways are affected in patients with BOAS, most of the obstruction occurs at the level of the nose and throat.

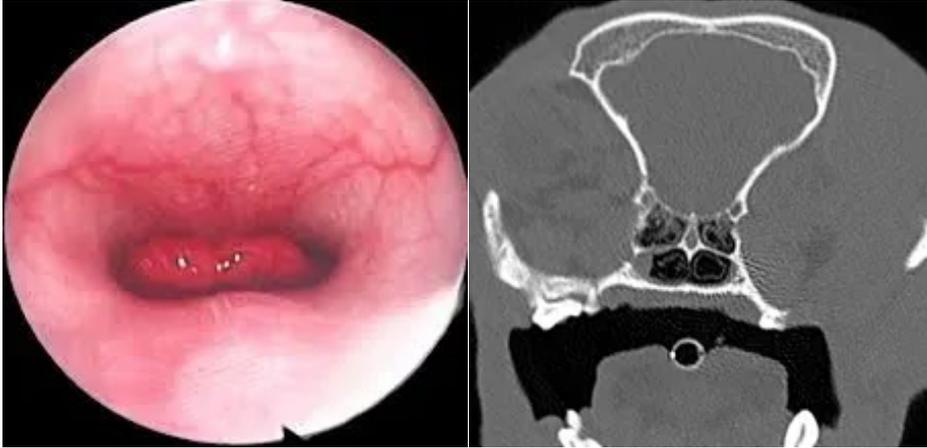


**Stenosis of the external and internal nares.**

The nostrils in brachycephalic dogs are usually severely narrowed. Obstruction occurs at the level of the external nares owing to folding inwards of the alar wing, and also at the level of the internal nares owing to contact of the prominent alar fold with the intranasal septum. Obstruction at the level of the nostrils accounts for a significant proportion of the airway obstruction seen in these dogs.



**Aberrant turbinates and nasal septal deviation.** Inside the nose there are a series of cartilages that form channels to allow airflow and heat exchange. In brachycephalic dogs there is sometimes excessive cartilage (aberrant turbinates) that can obstruct the nasal passages, impairing airflow and heat exchange. In some dogs the intranasal septum can deviate to one side resulting in narrowing of one side of the nasal cavity.



**Elongated soft palate.** The soft palate is the fleshy tissue at the roof of the mouth which serves as an anatomical separation between the nasopharynx and oropharynx (the spaces at the back of the nose and mouth respectively). In brachycephalic dogs the soft palate is invariably too long and sometimes too thick, and this results in airway obstruction and swallowing dysfunction. Dogs with an elongated soft palate exhibit noisy breathing (stertor), reverse sneezing, difficulty swallowing, and retching.

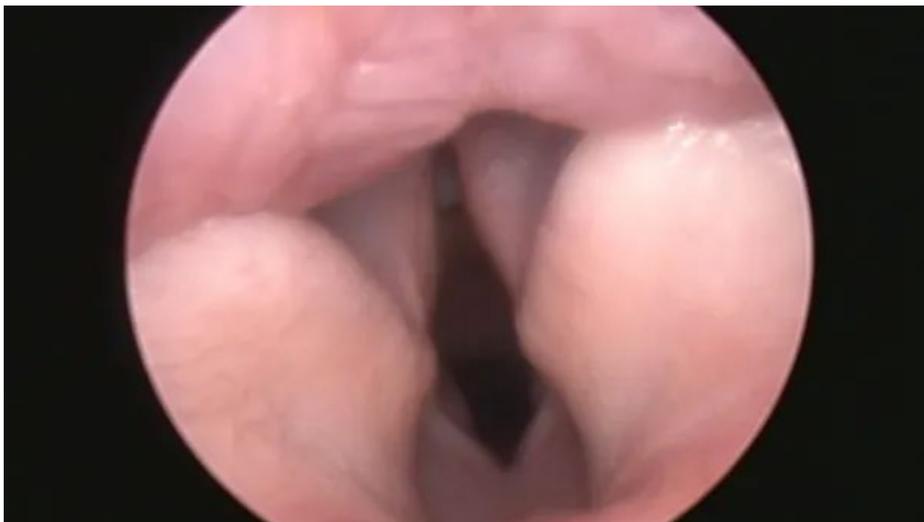


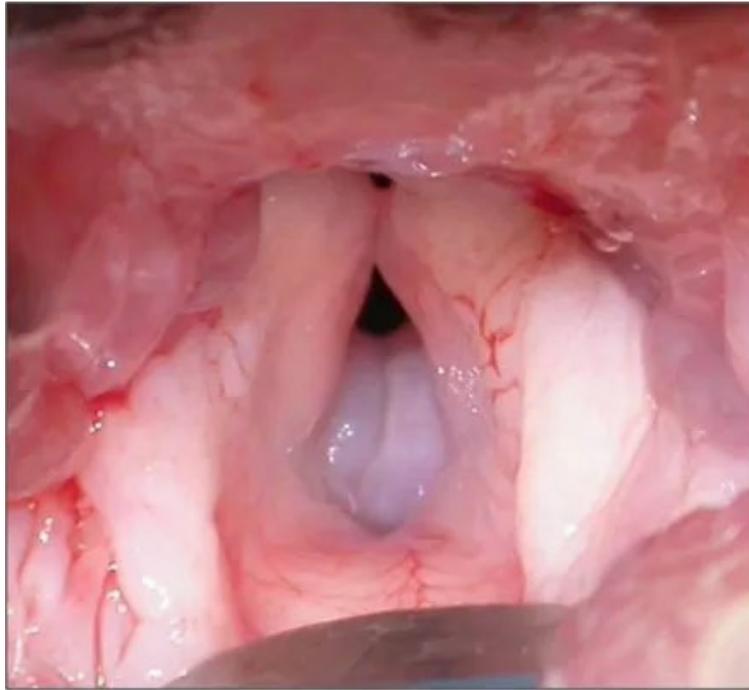
**Tracheal hypoplasia.** The trachea or windpipe in brachycephalic dogs can be considerably narrower than non-brachycephalic breeds of a similar size. The narrow diameter of the trachea impedes airflow to the lungs. In addition, dogs with tracheal hypoplasia may have impaired ability to clear mucus and debris from their airways and are predisposed to secondary respiratory infections.



Dogs with BOAS work harder than unaffected dogs to breathe (a bit like when we try to breathe through a blocked nose). This generates high pressure gradients within the airways and body cavities, which over time can lead to secondary laryngeal problems.

**Everted laryngeal sacculles.** Turbulent airflow and high negative pressures within the airways leads to swelling and bulging of the mucosal tissue between the vocal cords. This tissue can bulge into the lower half of the larynx causing permanent obstruction. The images below show a normal larynx compared with that of a brachycephalic dog with everted laryngeal sacculles.





**Laryngeal collapse.** In more advanced cases we can see inward collapse of the laryngeal cartilages resulting in severe obstruction of the entrance to the windpipe. This is usually a dynamic problem worsened by heat or exertional stress. It also tends to worsen with chronicity, which is why it is better to operate on these dogs early in the disease process before there are secondary laryngeal changes.



**How do you know if your dog is affected?**

Patients with BOAS can exhibit a number of signs relating to their respiratory system and digestive system.

- **Noisy breathing.** Most dogs with BOAS have very noisy breathing called stertor. This is a loud snoring sound which often worsens when these patients are stressed or exerted and begin to pant. Some dogs will have a wheezing or gasping sound called stridor, which is an indicator of more severe respiratory obstruction.
- **Exercise and stress intolerance.** Dogs with BOAS have physiologically adapted to cope with their upper respiratory obstruction. However, these compensatory mechanisms usually fail when these patients become excited or stressed, and oxygen delivery to critical tissues such as the brain is compromised. This results in these dogs tiring easily and getting out of breath. In severe cases we can see collapsing or fainting episodes.
- **Heat intolerance.** Dogs rely heavily on heat exchange in the nasal cavity and during panting in order to cool down. These processes are ineffective in dogs with upper airway obstruction, and patients with BOAS can overheat very quickly. Dogs with heat stroke will be seen to pant excessively, which worsens their respiratory obstruction and causes them to overheat further, leading to heat stroke. If not promptly treated, heat stroke is a life-threatening condition.
- **Sleeping disorders.** Most dogs with BOAS will snore heavily while asleep owing to vibration of the redundant soft palate at the back of the throat. More worryingly, when the mouth is closed there is partial or sometimes complete obstruction of the nose and throat, making it difficult or impossible for these dogs to breathe. Affected patients find it difficult to get into a comfortable position to sleep, and when they do sleep their breathing pattern and sleeping pattern can be interrupted. In severely affected dogs we can see obstructive sleep apnoea, whereby breathing is arrested and the dog can wake up gasping for breath.
- **Reverse sneezing.** Backwards sneezing or paroxysmal respiration is seen commonly in brachycephalic dogs. It is characterised by bouts of rapid inhalation of air through the nose. Typically the dog will stand with its head and neck extended and make snorting or honking sounds. Such episodes last from a few seconds to a minute. The cause of reverse sneezing is unknown but it is thought to be due to irritation of the back of the throat owing to the elongated soft palate in these breeds and silent gastro-oesophageal reflux. These episodes are not harmful but they can be distressing for both you and your dog.
- **Difficulty eating.** Many dogs with BOAS will have difficulty swallowing their food and can choke or gag during swallowing. This is due to their elongated soft palates and redundant pharyngeal function. Some of these patients may also have impaired function of their pharyngeal muscles.
- **Gastro-oesophageal reflux, regurgitation and vomiting.** Many brachycephalic dogs will be seen to 'vomit' white froth, typically when they are excited or stressed, a

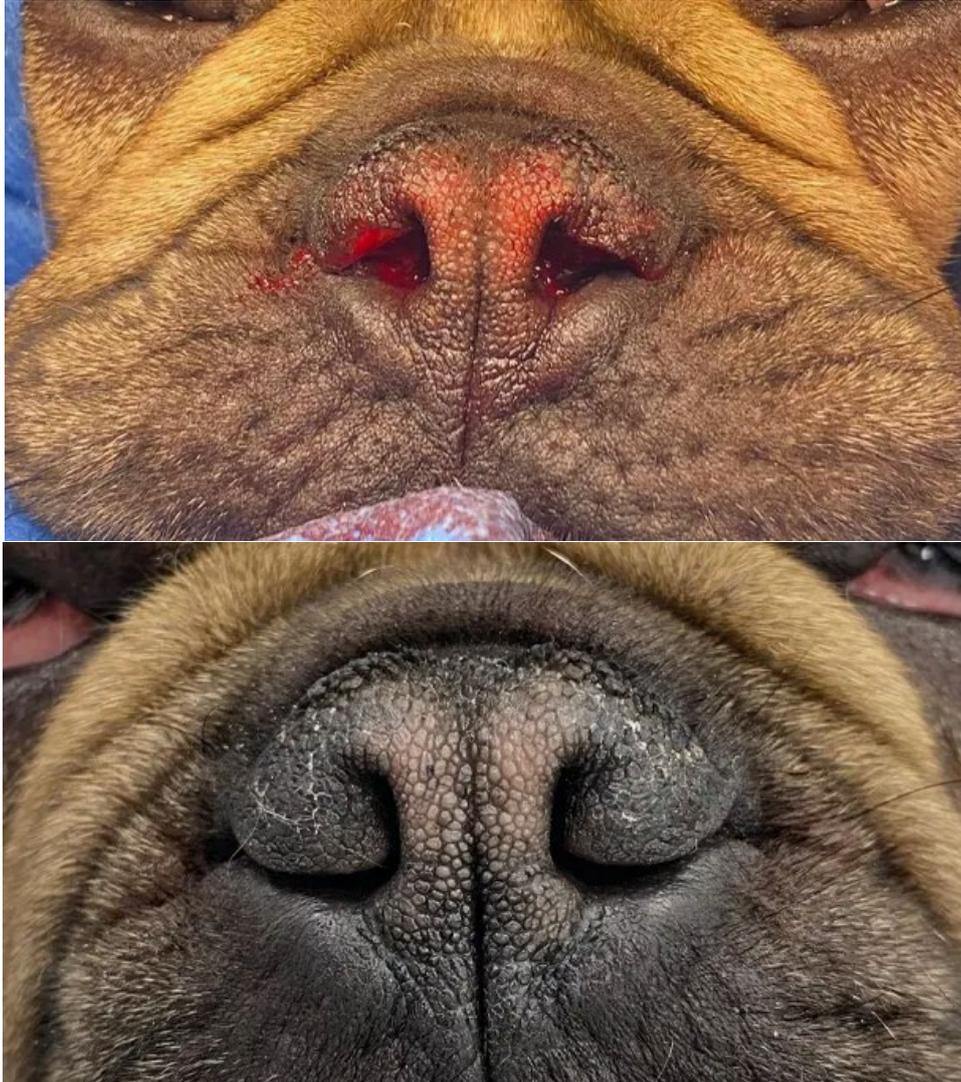
phenomenon known as gastro-oesophageal reflux. Some patients will also frequently 'vomit' undigested food shortly after swallowing or several hours later. Many of these dogs show signs of nausea such as frequent licking of their lips and excessive salivation. The white froth seen in these patients is acidic and can, over time, cause irritation and damage to the throat. There is a risk that this froth or food can be inhaled during these episodes, leading to inhalation pneumonia or, in severe cases, acute airway obstruction.

### **What can be done to help these patients?**

Dogs affected by BOAS almost always benefit from surgical correction of their upper airway abnormalities. At Swift, we have extensive surgical experience of treating these patients, and this is complemented by an equally experienced surgical nursing and ICU team.

When your dog is referred you will have a 20-40 minute consultation with the surgeon, who will examine your pet, identify the problems relating to the airway disease, and discuss the further diagnosis and surgical treatment of these patients.

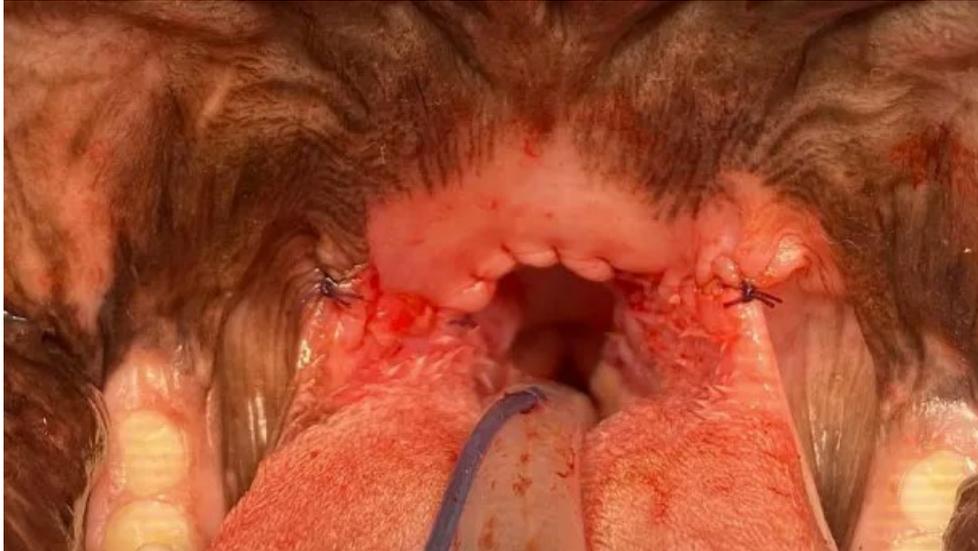
On admission to the hospital, your pet will undergo a 3-minute exercise tolerance test to allow us to better assess the severity of their BOAS. Following this we will perform an endoscopic examination of the throat (laryngoscopy), followed by a CT scan of the head, neck and chest, in order to allow us to assess the areas affected by and the severity of your pet's BOAS.



Surgical correction is performed under the same anaesthetic and typically comprises a combination of the following:

**Alavestibuloplasty.** This removal of the redundant alar wings and folds of the nostrils to permanently widen the nasal openings.

**Soft palate surgery.** Typically the elongated soft palate is shortened (soft palate resection) to create more room at the back of the throat and improve airflow. This is usually performed in conjunction with a palatine tonsillectomy. Sometimes it is necessary to modify this procedure in dogs with severely thickened soft palates in order to reduce their thickness (folded-flap palatoplasty).



**Laryngeal sacculectomy.** Everted laryngeal sacculi are routinely removed. If your pet has more advanced laryngeal collapse, further laryngeal surgery is sometimes required.

**What are the risks and benefits of surgery, and what are the outcomes following surgery?**

Anaesthetising and operating on the nose and throat does unfortunately carry some risk in these patients. At Swift we have extensive experience in the surgical management of these dogs, as well as a 24-7 dedicated ICU, which goes a long way to minimising the risk to your pet.

Most dogs that undergo corrective surgery will have substantially improved respiratory function. This means they will be much more able to cope with exercise, stress and heat, and the risk of serious complications such as heat stroke and collapse are reduced. We will usually also see a reduction or resolution in the sleeping disorders and gastro-intestinal signs commonly seen in these patients.

Some dogs, particularly those with advanced laryngeal disease, may continue to have symptoms following surgery and in some instances further interventions will be necessary. This emphasises the benefit of early recognition, diagnosis and treatment of BOAS in these patients. If you think your pet suffers from BOAS then you can ask your vet to refer your pet to us.