



## **Brachycephalic Obstructive Airway Syndrome (BOAS)**

### **What is BOAS?**

Brachycephalic dogs are dogs with short, flat heads, such as English Bulldogs, French Bulldogs, and Pugs. The flattened head shape can involve narrowing of the tubes that air flows through as the dog breathes.

Brachycephalic Obstructive Airway Syndrome (BOAS) is diagnosed when these dogs have difficulty breathing as a result of their internal and external head shape.

### **What causes the problem?**

There are several parts of the airway that can be affected, causing obstruction to breathing. Many dogs will have an abnormality in more than one of these areas. The most common sites for a problem are:

1. Narrow nostrils (so there is not much space for air to get in the front of the nose)
2. A long and/ or a thick soft palate (that can flop over the windpipe, making it difficult for air to get through the back of the throat)
3. Swollen tonsils (this is usually a secondary problem that develops over time as a result of problems 1-3). It is most common in Pugs but can happen in all breeds.
4. Collapse of the larynx (this is a secondary problem that develops over time as a result of problems 1-3)
5. Narrow windpipe (this usually only affects English Bulldogs and makes it difficult for air to get into the lungs)
6. Overgrowth of the nasal turbinates (the maze-like bony projections inside the nasal cavity) making it difficult for air to move through the back of the nose.
7. Wide, thick tongue which is too big for the mouth (takes up some of the space that would usually be used for breathing)

### **What are the symptoms of BOAS?**

- Noisy breathing (worsened by excitement, exercise, hot weather). Healthy breathing should be silent.
- Reduced ability to exercise (get tired easily or pant excessively with normal exercise) or collapse at exercise.

- Susceptibility to heat stroke.
- Stomach problems - gulping, retching, regurgitating, lip-licking. BOAS dogs have to suck so hard to get the air into their lungs they can often suck their stomach contents up into their throats and cause ongoing damage and discomfort to the oesophagus (food pipe).
- Sleep disturbance - like sleep apnoea in people. Dogs may try to sleep sitting up, may suddenly jolt awake coughing or gagging, may teach themselves to sleep with a toy in their mouth to keep their airways open

### **How is BOAS diagnosed?**

The Cambridge University Functional Grading System of BOAS is used to diagnose and classify BOAS. This is a standardised test, based on observation and auscultation (listening to different areas of the airway with a stethoscope) at rest and after a 3 minute trot test. This test can be performed during a veterinary consultation. Dogs that are known to collapse at exercise are automatically BOAS grade 3 and should not perform the trot test.

The grading system distinguishes between:

Grade 0 - BOAS free. No abnormal breathing noise. Continue to check at least annually until the dog is 2 years old, as BOAS signs can take time to develop as the dog grows.

Grade 1 - Clinically unaffected, but mild breathing signs. Breathing noise only really audible with a stethoscope. Check annually until the dog is 3 years old as BOAS signs can continue to progress with time.

Grade 2 - Moderate BOAS. Breathing noise audible without a stethoscope. Some dogs may improve with management (weight loss and use of a harness, exercise restriction) but surgery should be considered.

Grade 3 - Severe BOAS. Dogs are not only noisy but have obvious difficulty breathing (collapse, sleep apnoea, regurgitation, inability to exercise). Surgery is recommended.

The symptoms of dogs that are mildly affected may be managed with weight loss, exercise restriction and the use of a harness rather than a collar. This is usually suitable for all grade 1 dogs, grade 2 dogs that are overweight, and grade 2 dogs that are middle-aged or older with mild signs.

However, for dogs that are more significantly affected, surgery is recommended to open up the airways. Patients will vary as to which surgical procedures are needed, depending on which parts of the airway are affected.

### **I have been told that my dog is a BOAS grade 2 or 3 and that surgery might be helpful. How do I know which parts of the airway are causing the problem in my dog?**

The veterinary surgeon can get a good idea of which parts of the airway are affected by listening carefully to the breathing noise that your dog makes at rest and at exercise. Different noises suggest obstruction at different points along the airway. It can be helpful to bring video footage of your dog to the consultation, in case your dog only makes certain noises at

particular times / during particular activities and you think that he or she may not display these noises during the consultation.

To learn more about which parts of the airway are affected, your vet needs to take a closer look at the various possible problem areas. The nostrils are easily examined with the dog awake. The soft palate and larynx can only be seen when the dog is under anaesthetic. The windpipe can only be examined with an Xray or endoscope (camera).

## **What sort of surgery might be recommended?**

### 1. Nostril widening

Nostril widening is suitable for dogs with narrow nostrils that are showing signs of obstruction at the front of the nose. This usually presents as a sniffing, whistling type noise; sucking in of the skin behind the nose; and/or excessive breathing effort behind the ribs.

Under anaesthetic the veterinary surgeon cuts away a wedge of tissue from inside the nose and a second wedge on the outer edge of the existing nostril. Previous techniques involved putting tiny stitches into the new nostrils, but the current recommended technique does not involve stitching. The nose will look raw and ugly for a few weeks, but within a month or so it will become completely pigmented (black) again and look like a normal (but wider) nose again. The earlier techniques involving stitching looked more attractive straight after surgery, but only produced a moderate short term widening, whereas the new technique is much more effective.

### 2. Overlong soft palate

Dogs with a snorty, snoring type breathing noise at the back of the throat usually turn out to have a soft palate which is too long and/or too thick. It is possible to remove some of this excess tissue so that there is less obstruction to the air passing through.

The veterinary surgeon removes a section of the soft palate, making it both shorter and thinner. Bleeding is controlled with special electrocautery equipment. The new edges are stitched together with small stitches that will dissolve over the next 2-3 weeks.

### 3. Enlarged tonsils

If the tonsils are enlarged, they should be removed prior to soft palate surgery. Again, this involves the use of the electrocautery equipment.

### 4. Laryngeal collapse

Laryngeal collapse can be graded as 0, 1, 2 or 3. Dogs with laryngeal collapse normally have a high pitched, whooping type noise but laryngeal collapse can only be diagnosed properly with the dog under anaesthetic, when the veterinary surgeon can look directly at the larynx.

If there is no laryngeal collapse, there is no need to operate on the larynx.

If there is grade 1 laryngeal collapse (laryngeal sacculae eversion), the sacculae can be removed.

If there is grade 2 or 3 laryngeal collapse this can be tricky to correct. Various surgeries can be carried out to try to help, but they can be risky and are not always effective. Your veterinary surgeon will discuss this with you in further detail if grade 2 or 3 collapse is diagnosed.

### Usual surgery for BOAS

In the majority of cases, dogs that require BOAS surgery will start off by having nostril widening and soft palate surgery. The tonsils will be removed at the same time if they are enlarged, and grade 1 laryngeal collapse will be corrected if needed.

This procedure is not complicated in itself, but the area is tricky to access. Any bruising, bleeding or swelling in this area in the hours or days after surgery could temporarily cause more obstruction of the airway, so dogs having this procedure need to be kept in overnight for monitoring and medication. Ideally, this surgery is performed separately from, and in advance of, neutering. This surgery can be carried out at Acorn House by Katharine Nelson, an RCVS Advanced Veterinary Practitioner in Small Animal Surgery. The cost of surgery and monitoring is around £2000.

Whenever short-faced dogs have airway surgery there is a risk of airway swelling or regurgitation of stomach contents which can cause pneumonia. Acorn House uses careful anaesthetic protocols and monitoring to minimise the risk of complications, but owners must be aware that this type of surgery always carries a risk. If there is a complication this can require a prolonged hospital stay and intensive treatment (for example intravenous antibiotics for pneumonia, or an emergency tracheostomy for acute airway swelling). In some instances, we would recommend that very unstable dogs should be transferred to an intensive care facility. The cost of any such additional treatment is not included in the standard BOAS surgery price.

BOAS cases should be scheduled for surgery first thing in the morning, so that the dog's recovery can be monitored closely for the remainder of the day. At Acorn House, we are able to offer close monitoring up until midnight, and then checks a minimum of 4 hours apart until 7am.

### **How successful should I expect surgery to be?**

Published studies suggest that most dogs show around 50% improvement in their breathing and an 90% improvement in regurgitation after the above surgery. This would hopefully reduce grade 3 dogs to a grade 2 and grade 2 dogs to a grade 1.

Surgery will never completely eliminate airway issues in these dogs, because there are other parts of the dog's anatomy that remain uncorrected. Some dogs may continue to require exercise restriction in hot weather, medication to relieve swelling in the nasal passages at night, and/or medication to prevent regurgitation. All BOAS dogs should maintain a lean body weight as the heavier they are, the worse their breathing will be (this especially applies to Pugs).

## **What if this surgery does not lead to an adequate improvement?**

If significant problems remain after surgery, additional procedures can be performed. These procedures are more complicated and carry an increased risk of complications. For this reason, we would always recommend performing the first surgery and assessing the response before considering moving onto the later procedures.

Some of the second surgeries can be carried out at Acorn House, but the majority of them are best carried out at a specialist centre such as Cambridge University or the Animal Health Trust.

### 5. Grade 2 or 3 laryngeal collapse

Parts of the larynx can be removed to open the airway up more. If this is unsuccessful, an external suture can be used to hold the larynx open from the side. If this is unsuccessful, a permanent tracheostomy can be created so that the dog breathes through a hole in the neck, instead of through the mouth and nose. Dogs with a tracheostomy need daily care to ensure that the hole in the neck stays clean, moist and open. Dogs need to be exercised carefully to ensure that dirt, vegetation and water do not accidentally go down the hole.

### 6. Nasal turbinate overgrowth

Laser surgery can be used to trim back the obstruction inside the nose caused by the nasal turbinates. This requires specialist equipment and the turbinates may grow back in the future - sometimes this requires a repeat surgery.

### 7. Narrow windpipe and over-large tongue

Unfortunately, these problems cannot be corrected surgically.

## **What medical treatment can be used?**

Dogs with stomach signs will be treated with medication to neutralise the stomach acid so that it does not burn the oesophagus (food pipe). Usually, once BOAS surgery has been performed, the stomach problems will settle down. If they do not, permanent stomach medication will be suggested. If this is not sufficient, stomach surgery to stop the stomach being sucked up into the chest may be considered.

Dogs with persistent nasal obstruction, particularly that which causes sleep apnoea, may benefit from nasal drops every evening.

## **Can BOAS be prevented?**

The Kennel Club recommend that dogs have a BOAS score performed prior to breeding. The score must be performed after the age of 12 months. Grade 3 BOAS dogs should not be bred from at all. Grade 2 dogs can be bred from but should only be mated with grade 0 and grade 1 dogs. Further information is available on the Kennel Club website.

Brachycephalic dogs will tend to score higher if they are overweight, so maintaining a lean body weight (especially in Pugs) should be a priority.

