“I’m not podgy, I’m a Pug”: Obesity and its impact on BOAS and Safe Brachycephalic Anaesthesia

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1. Introduction

1.1 Obesity in Companion Animals

As many as 65% of pet dogs and cats are overweight or obese [1]. Obesity and overweightness reduce respiratory function and lifespan, and increase anaesthetic risk and overall incidence of disease [2–6].

1.2 Obesity in Brachycephalics

The tragic truth of brachycephalism is that these dogs already live short, unhealthy lives of lower quality than meso- and dolichocephalic dogs. We do not need to add obesity to their burden.

“Obesity in dogs is now increasingly recognised as a condition with serious welfare implications for dogs in general, and especially for brachycephalic dogs [7]. Obesity has been associated with increased risk of several diseases including joint disease, dental disease, hyperadrenocorticism, hypothyroidism, and lower urinary tract disease [8]. As a result, health and quality of life can be severely harmed [9–11], and lifespan may be foreshortened [12, 13]. Obese dogs also show decreased heat tolerance and stamina [14] and increased anaesthetic risk [15].
Obesity presents special challenges for brachycephalic dogs. Brachycephalic obstructive airway syndrome (BOAS) is a critical welfare issue that is variably associated with dyspnoea, exercise intolerance, heat sensitivity, sleep disorders or collapse [16]. Obese brachycephalic dogs have a higher risk of BOAS, and an increasing level of excess bodyweight is associated with worsening breathing problems [17, 18].”
Credit: BWG with permission from Dan O’Neill.

Many owners fail to recognize that the extreme anatomical features of brachycephalism contribute to their dogs' suffering. Furthermore, obesity is often not perceived as a medical condition, with excessive anthropomorphism complicating clinical communication and intervention [19–22]

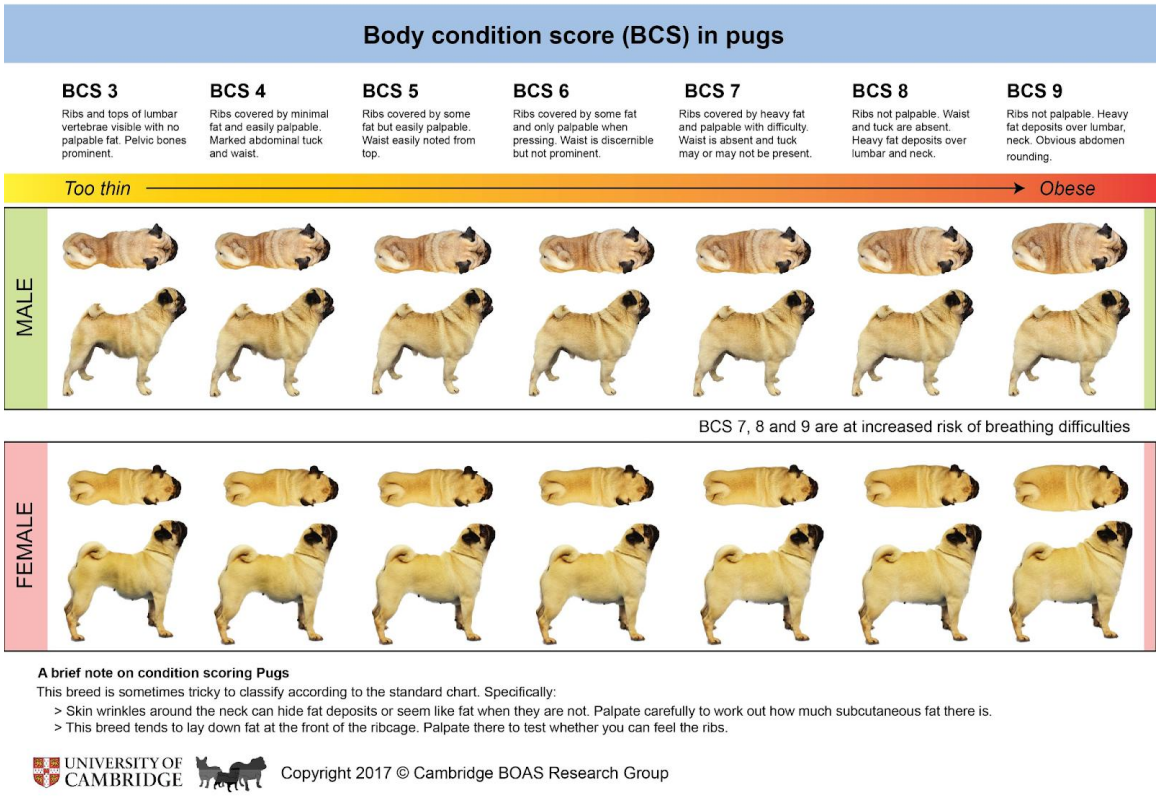


Fig 1. Pug BCS chart. Owners often do not recognise obesity. Used with permission and thanks to the Cambridge BOAS group.

2. Obesity and Anaesthesia Risks

2.1 Physiological Impacts on Respiratory Function

Obesity impacts respiratory function by lowering arterial partial pressure of oxygen, an effect reversible after weight loss [23]. Fat deposits in the thorax and abdomen mechanically reduce ventilatory capacity, increase thoracic pressure, and decrease tidal volume, leading to elevated resting respiratory rates. In overweight and obese humans, there is decreased lung compliance, reduced respiratory muscle strength, and increased airway inflammation—changes likely mirrored in dogs [24].

For Brachycephalic patients, any further increase in airway resistance is clinically significant and can push them over the edge of decompensation.
These patients already experience exponentially higher resistance to air flow due to their reduced airway radius (basic video on Poiseuille's law for explaining this to clients https://www.instagram.com/reel/C_k7WhxJunT/), so excess weight makes it extra challenging to cope with the demands of anaesthesia.

Increased airway resistance and subsequent negative inspiratory pressure is the same mechanism by which BOAS leads to aerodigestive disease.

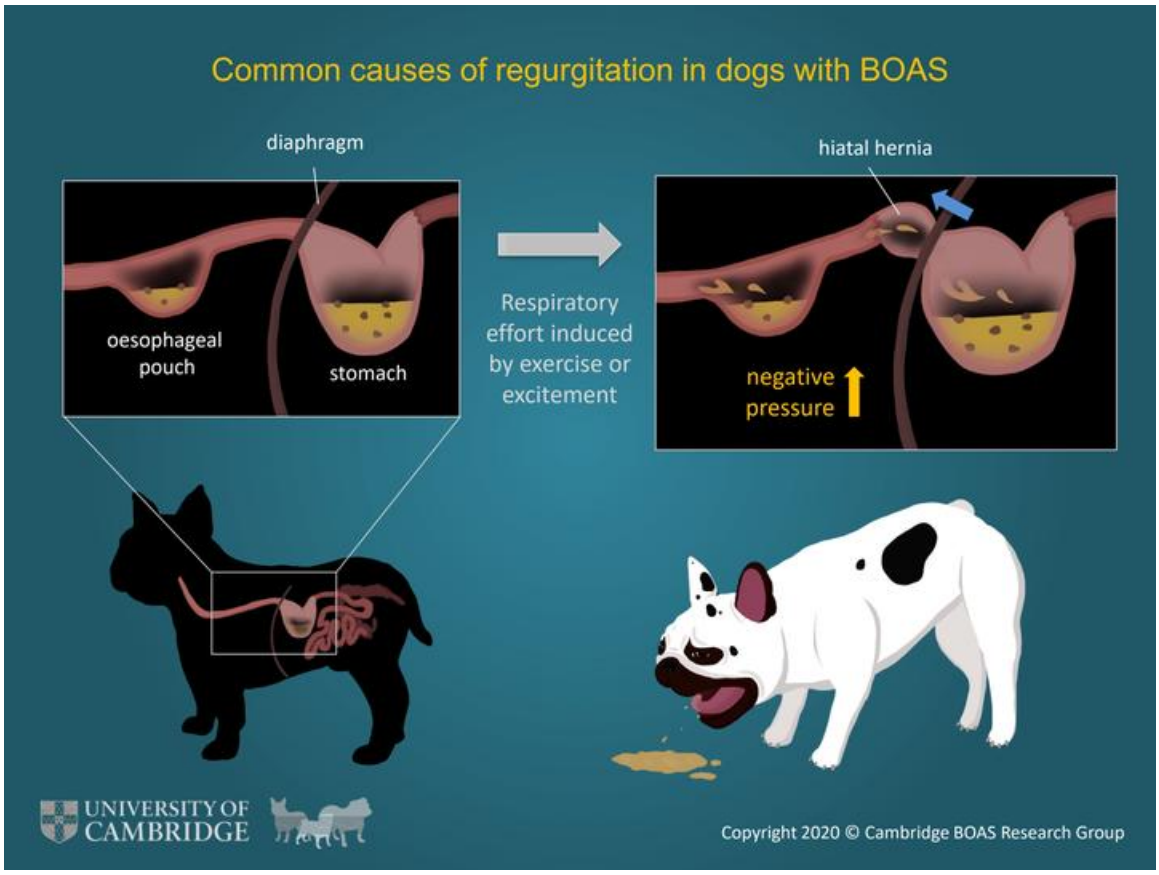


Fig. 2. How increased airway resistance leads to aerodigestive disease. Image used with permission from Cambridge BOAS Research Group

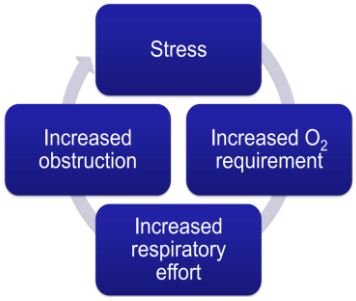
2.2 Aerodigestive Disease and Anaesthetic Risk

Increased inspiratory negative pressure creates a suction effect within the thorax, leading to regurgitation and reflux of stomach contents. Chronic regurgitation causes oesophageal injury and increases anaesthetic risk [26–30]. Strategies such as a shorter fast (<6 hours) or a small meal 3 hours prior may reduce gastroesophageal reflux disease (GORD) risk [31, 32].

2.3 Surgical Correction and Anaesthesia Safety

Brachycephalic dogs with BOAS are twice as likely to experience anaesthesia complications as non-brachycephalic dogs [34, 35]. Corrective airway surgery significantly reduces complications in future anaesthetic events. It is recommended that surgical correction be performed post-skeletal maturity but before irreversible laryngeal collapse to enhance quality of life and anaesthetic safety [36].

3. Brachycephalic and BOAS anaesthesia considerations



3.1 Risks and risk reduction

Stress is often the undoing of these dogs due to the subsequent increased respiratory effort leading to regurgitation and aspiration and/or upper airway obstruction.

Reducing stress is paramount and should be a major focus. Other risk factors should also be identified BEFORE surgery and strategies put in place to reduce risks where possible.

It is important to be aware of the long list of known and assumed risk factors. You should be familiar with the RFG scheme, the Brisk scoring chart and the anaesthetic risk studies referred to below (25, 28, 32-40).

My approach integrates a comprehensive physical examination (with emphasis on phenotypic risk factors), a BOAS history questionnaire, and video assessments of breathing during eating, sleeping, exercise, and recovery. These findings, combined with RFG (37) and Brisk scores (38) and ASA status, inform a risk grading system from 1 to 5. I then increase my grade if the patient is either significantly young or old, over or underweight, has aerodigestive disease, or co-morbidities.

Each clinician should develop an approach they are comfortable with. Although this may appear exhaustive, it is feasible within a standard consultation timeframe when preparatory steps—such as pre-consult questionnaires and video submissions—are coordinated by administrative staff.

Table 1. Known and generally agreed on risk factors for anaesthetic complications in Brachycephalic dogs presenting for BOAS surgery or other anesthesia. (34-40)

Literature supported risk factors	**Generally agreed on risk factors**
Anaesthesia duration / concurrent procedures planned	Grade of laryngeal collapse
Low or High BCS	Severity at a young age (eg: tracheal hypoplasia)
Invasiveness of the procedure	Presence of Aerodigestive disease / GORD
Use of Ketamine as an induction agent	Poorly controlled co-morbidities (eg: atope, IBD)
ASA status	Severity of BOAS (eg: RFG grade, Brisk score, clinical acumen)
Increasing Age	Use of bipolar sealing device for staphylectomy
Post operative radiographic evidence of Pneumonia	Poorly managed patient stress
Breed specific phenotypic factors eg: Neck girth, skull index, eye width, nare stenosis…	

Table 2. Example of RFG scheme for bulldogs (37)

		Respiratory noise	Inspiratory effort	Dyspnoea/ Cyanosis/ Syncope
Grade 0	Pre-ET	Not audible	Not present	Not present
	Post-ET	Not audible	Not present	Not present
Grade I	Pre-ET	Not audible to mild stertor, and/or moderate intermittent nasal stertor when sniffing	Not present	Not present
	Post-ET	Mild stertor, and/or moderate intermittent nasal stertor when sniffing, and/or intermittent gentle stertor when panting	Not present to mild	Not present
Grade II	Pre-ET	Mild to moderate stertor	Not present to moderate	Not present
	Post-ET	Moderate to severe stertor	Moderate to severe and/or regurgitation of foam/saliva	Dyspnoea; cyanosis or syncope not present
Grade III	Pre-ET	Moderate to severe stertor or any stridor	Moderate to severe	Dyspnoea; may or may not present cyanosis. Inability to exercise.
	Post-ET	Severe stertor or any stridor	Severe and/or regurgitation of foam/saliva	Dyspnoea; may or may not present cyanosis or syncope.

Table 3. Example of Brisk scheme (38)

Brachycephalic risk score

Score category				
Breed	Brachycephalic breed, NOT English or French Bulldog **0 points**	English or French Bulldog **0.5 point**		
Surgical history	No history of prior airway surgery **0 points**	History of prior airway surgery **1.5 points**		
Procedures planned	No additional procedures planned **0 points**	Additional procedures (other than airway surgery) planned **1.5 points**		
Body condition score	BCS<=2.5 **1 point**	2.5<BCS<=3.5 **0 points**	BCS>3.5 **1 point**	
Level of compromise at admission	No stertor or stertor only at exercise **0 points**	Stertor at rest **1.5 points**	Oxygen and sedation needed at admission **2 points**	Intubation needed; unable to extubate without surgery **4 points**
Admission rectal temperature	Admission rectal temperature<=100° F **1.5 points**	100°F (37.8°C)<rectal temp<=101°F (38.3°C) **1 point**	101°F (38.3°C)<rectal temp<=103°F (39.4°C) **0.5 points**	Admission rectal temp >103°F (39.4°C) **0 points**

BCS=body condition score (0-5), F=Fahrenheit, C=Centigrade

BRisk score>3= medium to high risk
BRisk score>4=high risk

3.2 Example BOAS / Brachycephalic Anaesthesia Framework

PRE-ANAESTHESIA

NOTE - pre op meds tailored to patient.
Always attempt to stabilise aerodigestive disease prior to GA.
Commonly include: Omeprazole 0.5mg/kg PO BID for 3-14 days +/- prednisolone 0.5mg/kg PO q24h +/- metoclopramide 0.5mg/kg PO q8-12h for 3-14 days.

- If concerns for FAS sedate at home/on admission with trazodone 10mg/kg PO or PR
- Ondansetron wafer 0.2-0.5mg/kg under the tongue to dissolve
- Fan in front of cage if warm day, high humidity
- Clip and EMLA leg
- Place IV catheter IF they will tolerate it without stress
- Metoclopramide 1mg/kg IV
- Dexamethasone 0.2mg/kg IV (if having airway surgery)
- Maropitant 1mg/kg IV. Give slowly and diluted.
- Esomeprazole 1mg/kg IV. Give slowly and diluted.
- Nebulise with saline (4.6 mls) + adrenaline (0.4mls 1:1,000)

PREMEDICATION

- Premed ONLY when there is a team member available to be with them at all times
- Methadone 0.1-0.2mg/kg + Medetomidine 2-3ug/kg IM
- Prop up their chin, extend neck, hold their mouths open once will tolerate this
- Pre oxygenate via mask - if will not tolerate top up dose of Medetomidine (0.1-0.5ug/kg IV) until can give O2 without stress

INDUCTION

- Be ready to intubate ASAP as during induction high risk for obstruction (ensure have small ET tubes ready)
- Have SUCTION ready during induction
- Co-induction - Midazolam 0.2mg/kg then Alfaxalone / Propofol to effect

MAINTENANCE

- Prep nares, palate and tonsils with dilute iodine, place covered ice pack in contact with palate / tonsils
- Bilateral infraorbital nerve block + spray palate and tonsils with lignocaine
- Metoclopramide CRI @ 1mg/kg/hr
- Utilise IPPV and sigh breaths to keep as close to normocapnic as possible
- Expect bradycardia and use Glycopyrrolate as needed (10mcg/kg IV)
- No active warming unless temp <35.9C (ideal is 36-37C). Cool if gets to 39C.
- Minimise Opioid doses

RECOVERY

- Clean the mouth out, replace ET tube from surgery with a clean one.
- Pack throat with Mannitol and bupivacaine soaked swabs - remove once swallowing
- Nebulise with saline (4.6 mls) and adrenaline (0.4mls 1:1,000)
- Keep mouth open. Sternal recumbency, extend neck, pillow under chin.
- Extubate as late as possible - keep tubed until very awake. If ambulatory, extubate.
  - Use bandage roll OVER the ET tube
  - Do not deflate cuff prematurely - have syringe attached, deflate last minute
  - Keep mouth open – extubate through bandage roll
- Consider additional sedation pre/post extubation to smooth recovery (medetomidine 0.1ug/kg IV bolus +/- 0.5-1ug/kg/hr CRI)
- Consider Metoclopramide CRI @ 1mg/kg/day
- Do not overheat - they will warm themselves up extremely quickly post op
- MONITOR IN RECOVERY AT ALL TIMES & BE READY TO RE-INTUBATE
- Consider owner assisted recovery if require re-intubation (before proceeding to trach tube)

4. Conclusion

Obesity represents a significant, yet modifiable, risk factor for brachycephalic patients, compounding their inherent anatomical challenges.

Brachycephalics have a higher incidence of anaesthesia complications and mortality, especially relating to stress, regurgitation and aspiration pneumonia, and upper airway obstruction.

Tailored anaesthetic plans should include pre and post operative risk reduction strategies. Proactive weight management and early surgical interventions can markedly improve both quality of life and anaesthetic outcomes for brachycephalic patients.

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