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Brachycephalic anaesthesia, part 3: the post-anaesthetic period

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ABSTRACT: This article covers the post-anaesthesia period considerations for brachycephalic breeds and discusses extubation timing, sedation and patient monitoring. It follows the previous articles on pre-anaesthesia and peri-anaesthetic considerations of these dogs.

Keywords: anaesthesia; brachycephalic; BOAS; BAS

Introduction

Recovery of anaesthesia for brachycephalic patients comes with a high risk for upper respiratory obstruction, especially following airway surgery (Downing & Gibson, 2018), and it is clear that these patients need more intense nursing care in the recovery period. A study conducted by Brodbelt et al. (2008) identified that the anaesthesia recovery period is the most likely time for mortality; early detection of problems and adequate sedation where necessary can greatly decrease the risk of anaesthetic morbidity and mortality during this time.

Patient positioning

With the sedative effects of anaesthesia drugs, many brachycephalic breeds appreciate having their head and upper body elevated with a wedge or rolled up towels as this position is similar to their compensatory wide foreleg stance when they are fully awake, known as an orthopneic stance, allowing them to take fuller breaths as seen in Figure 1.

Extubation

In anaesthesia recovery, the patient should be positioned in sternal recumbency with the head supported and the endotracheal tube (ETT) cuff still inflated. Once the patient has started to swallow and demonstrate airway control or no longer tolerates the ETT, the cuff can be partially deflated and the ETT can be removed; leaving a small amount of air in the cuff allows any

potential regurgitation fluid to be pulled from the airway. The head should remain supported and the tongue pulled forward to open the airway. A roll of tape or bandage wedged between the canines or incisors can be used as a gag to keep the mouth open as seen in Figure 2.

While it is desirable for the ETT to remain in place as long as possible to maximise oxygenation and airway patency (Fawcett et al., 2018), delayed extubation can cause regurgitation. If this occurs the head should be lowered to allow the contents to drain from the mouth, suctioned if possible and cleared of any regurgitation material (Mosing, 2016).

Post-extubation observations should include monitoring for signs of dyspnoea; increased respiratory rate and effort, or progressive stridor. Snoring, flaring of the nostrils or a paradoxical breathing pattern



Figure 1. Support in sternal recumbency to allow fuller breaths.

can signify that the patient is breathing against a partially or fully closed airway. If this happens, extend the neck and pull the tongue forward as mentioned previously (Mosing, 2016).

In the authors' experience, some brachycephalic breeds snort and reverse sneeze immediately after extubation as they try to breathe through their nose; briefly holding the nostrils closed will encourage them to take a large breath through their mouth and dislodge the soft palate. As extubation of brachycephalic dogs is probably one of the highest risk-associated periods of their anaesthesia (Bradbrook, 2016), the team must always be prepared to re-anaesthetise and re-intubate the patient if there are signs of respiratory obstruction. The same size ETT that was originally placed and one size smaller, anaesthesia induction agent and a laryngoscope should be prepared close to the patient during the recovery period (Downing & Gibson, 2018) as shown in Figure 3.



■ **Figure 2.** Use a roll of tape to keep the mouth open.



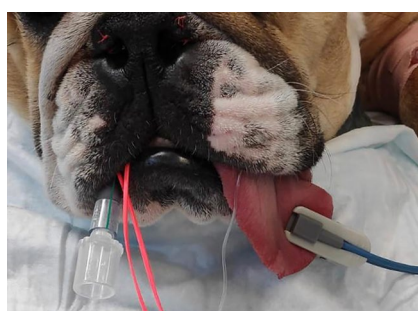
■ **Figure 3.** A tray containing everything required for emergency tracheal intubation close to the patient.

Pulse oximeter

After extubation, oxygen saturation (SpO_2) should be monitored for any signs of desaturation ($\text{SpO}_2 < 95\%$) and hypoxia. This may be caused by partial airway obstruction or an inability to maintain saturation on room air of 21% oxygen (Adshead, 2014). Due to the increased length of brachycephalic breeds' tongues, the pulse oximeter probe is well tolerated long into the recovery period as seen in Figure 4. If the SpO_2 drops below 93%, supplementary oxygen can be delivered via flow-by, a face mask if tolerated or by placing the patient into an oxygen kennel. However, as brachycephalic breeds commonly have a lower Partial Pressure of Oxygen (PaO_2), they may not 'saturate' above 95% with pulse oximetry (SpO_2) while breathing room air after extubation. A pre-anaesthesia SpO_2 may give a better indication of expectations during recovery.

Temperature

Moderate hypothermia can be defined as a temperature of $34.0\text{--}36.5^\circ\text{C}$ (Redondo et al., 2012). Hypothermia is known to cause shivering, prolong recoveries, cause coagulation deficiencies and impair platelet function (Levensaler, 2010). Normally, hypothermic patients are actively warmed in the recovery phase to decrease the time it takes to return to normothermia. However, the use of heating devices should be used with caution when recovering brachycephalic patients; even a return to normothermia can cause excessive panting which could cause vibration of pharyngeal soft tissue leading to laryngeal swelling, potentially causing airway obstruction. It should be decided at what point the patient is actively warmed to in order to avoid shivering, but also avoiding excessive panting. The authors suggest that a brachycephalic patient with a temperature $<36^\circ\text{C}$ is actively warmed until they reach this temperature. Patients that are shivering should have their SpO_2 monitored with flow by oxygen available as shivering can increase oxygen consumption.



■ **Figure 4.** A pulse oximetry probe on a bulldogs tongue in the recovery period.

Capnography

Capnography can be used once the patient has been extubated as seen in Figure 5. The capnography sampling line (without the ET tube connector) can be placed in front of one of the patient's nostrils which determine if there is airflow through stenotic airways when the patient prefers to breathe through their nose. End tidal carbon dioxide (ETCO_2) monitoring can also be performed, however there are some limitations with this technique; readings may be inaccurately low due to dilution from room air. As mentioned in the previous article, brachycephalic patients tend to have a higher ETCO_2 . With these limitations, the readings should be used as a trend and concerns should arise if the ETCO_2 continues to rise.

Sedation post anaesthesia

As mentioned in article two, sedation provided within the premedication drugs can help provide a smooth and quiet recovery. In the authors' experience, brachycephalic patients who are anxious are more like to quickly become cyanotic and have respiratory distress, therefore the provision of sedation for these patients is favoured. Suggested sedation doses can be found in the premedication section of article two and can be given prior to recovery if they were not used as premedication. The flowchart shown in Figure 6 offers a suggestion of when the RVN and veterinary team should intervene, with suggested actions that can be taken.

Discharge

Almost half of anaesthesia related deaths in dogs happen postoperatively, with most of



■ **Figure 5.** Using a side stream capnography attachment to assess the patency of each nostril.

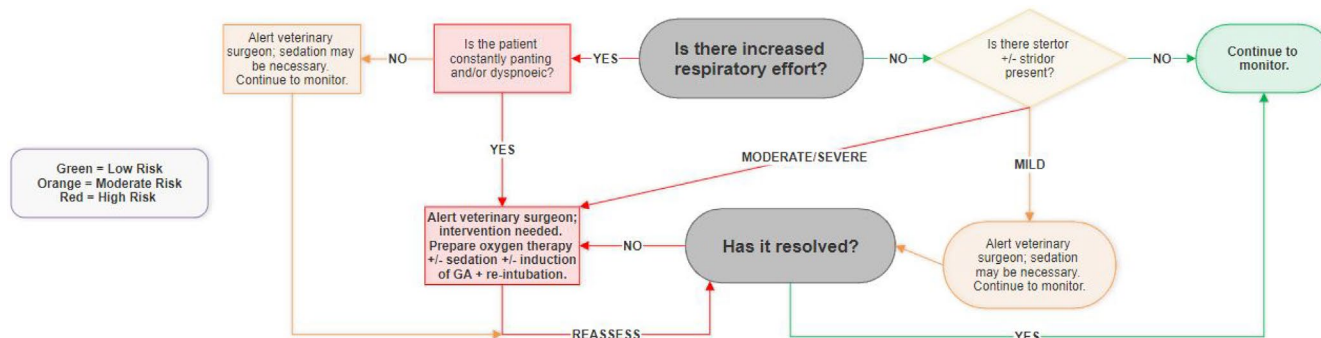


Figure 6. This flowchart can guide the RVN on when to alert the veterinary team to intervene with a brachycephalic recovery in relation to increased respiratory effort.

them occurring in the first 3 hours (Brodgelt, Pfeiffer, Young, & Wood, 2008) which suggests it is advantageous to monitor these higher risk patients for this length of time as a minimum after anaesthesia. If the patient was in any form of respiratory distress post operatively, or required emergency surgery for airway obstruction, then they should not be left unattended for the first 12 hours as many of these patients will require re-intubation. After Brachycephalic Obstructive Airway Syndrome surgery (rhinoplasty, staphylectomy etc.) soft tissue swelling can persist for a few days (Fawcett et al., 2018).

Many anaesthesia drugs like opioids, acepromazine and volatile agents can have long lasting effects on pharyngeal muscle tone (Mosing, 2016), causing relaxation of soft tissue structures that may cause airway obstruction. It is important to consider their duration of action in relation to the discharge appointment with the client. However, if the brachycephalic patient is stressed postoperatively, an early discharge from the veterinary practice may be more beneficial. Opioids can also reduce tear production for up to 36 hours (Jolliffe, 2016) and as brachycephalic breeds have reduced corneal sensory nerve fibres (Mosing, 2016)

they may be prone to corneal ulcers, so dispensing an eye lubricant for postoperative use may be beneficial.

It may be useful to have a discharge form/post-operative handout that is specific to brachycephalic breeds which explains to the owner what the signs of dyspnoea is and has the information of an emergency practice close by.

Conclusion

These patients require intense nursing post anaesthesia and a designated RVN for recovery may be advantageous.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Multiple Choice Questions

1. What position is recommended to recover a brachycephalic patient in?
 - (a) Dorsal
 - (b) Any lateral
 - (c) Tilted head down
 - (d) Sternal
2. What does flaring of the nostrils and a paradoxical breathing pattern signify after extubation?
 - (a) The patient is taking deep breaths
 - (b) The airway is partially/fully closed
 - (c) They are sleeping happily
 - (d) They are becoming hyperthermic
3. When do 50% of anaesthesia-related deaths occur in the anaesthesia recovery period?
 - (a) There is no risk, it is a peri-operative concern
 - (b) Within 3 hours post anaesthesia
 - (c) Within 3-12 hours post anaesthesia
 - (d) Within 12-24 hours post anaesthesia
4. What should brachycephalic patients be discharged from the practice with post anaesthesia?
 - (a) Eye lubrication
 - (b) A tin of low-fat food
 - (c) Wearing a harness
 - (d) Pet shampoo

For the answers to the MCQs, please go to: <http://www.bvna.org.uk/publications/veterinary-nursing-journal>