

## WHAT IS YOUR ANESTHETIC PROTOCOL?

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### CASE REPORT

Rita, a 2 year old spayed female Labrador retriever weighing 30kg, was presented with bite wounds to the neck. Rita had no previous medical history; she was vaccinated and dewormed regularly, was fed commercial canine dry food and lived in the garden and had access to roam free, unsupervised. She was found in lateral recumbency in the garden and was brought immediately to the hospital.

At presentation, physical examination revealed the following:

- Depressed but responsive
- Rectal temperature, 35.8°C
- Pulse rate, 80 bpm
- Respiratory rate, 60 bpm.
- Heart sounds were normal but cardiac rhythm was irregular and the peripheral pulse was weak with a pulse deficit.
- Mucous membranes were pale with a CRT of 2 sec.
- Auscultation revealed increased inspiratory sounds.
- Two bite wounds were present on the left side of the neck with subcutaneous emphysema.

### Additional tests

- Chest and neck radiology: Normal chest with subcutaneous emphysema in neck region and possible injury to the cervical trachea.
- CBC showed a PCV of 57% (reference interval 37-50%); Total protein was 9g/dl (reference interval 5.5-7.5). Other parameters were in reference range.
- Creatinine 1.7 mg/dl (upper reference limit 1.5 mg/dl ).
- ECG revealed approximately six ventricular premature beats (VPCs) per minute.

### AIM

To surgically explore under general anesthesia the bite wound area to assess the damage and repair it.

**WHAT IS YOUR PREANESTHETIC, ANESTHETIC AND POST-ANESTHETIC PROTOCOL?**  
See the following page for the answer.

### A. The first step is to prepare an anesthetic plan for this patient which includes:

1. Define the dog's problem list.
2. Does the dog require any preoperative measures prior to general anesthesia and surgery, or should surgical treatment be provided as soon as possible?
3. What drugs would you use for premedication of this dog?
4. What drugs would you use for induction and maintenance of anesthesia?
5. What are the special anesthetic considerations for this dog?
6. What are your considerations for the recovery period?

1. a. The dog was hypothermic, possibly due to immobility. However, progressive non-compensatory shock might be the cause for hypothermia. Some physical examination findings support the latter (i.e. hypothermia, pulse deficit, weak pulse, pale mucous membranes) but other do not (i.e., the dog was responsive and had a normal CRT).

b. Heart rate was slow possibly due to a non-compensatory shock and hypothermia, but likely due to increased vagal tone induced by the neck trauma.

c. Increased inspiratory sounds are due to partial upper respiratory obstruction due to emphysema in the neck region and injured trachea.

d. The arrhythmia (VPCs) probably a result of hypoxia, caused by the ruptured trachea, although hypoxemia due to shock might have played a role. Although primary heart diseases could have led to VPCs, these can be ruled out by auscultation, thoracic radiography, ECG and an echocardiogram.

e. The dog was probably dehydrated, because the PCV, total plasma protein and creatinine concentrations were above or at the upper reference limits and supported hemoconcentration. Since no clinical signs of dehydration were present, dehydration can be estimated at 5% based on the history. Intravenous fluid volume for replacement should be calculated as  $5\% \times 30 \text{ kg BW}$ . This volume amounts to 1.5 L that should be infused, preferably prior to induction of anesthesia. Warm IV fluids may assist in warming the animal.

f. At this stage, the dog was probably not in a condition of non-compensatory shock, but there was evidence of shock that might deteriorate if not treated properly.

2. This dog needs initial stabilization prior to general anesthesia that should include IV fluid therapy, oxygen supplementation, body warming and broad-spectrum antibiotics. Sedation and appropriate analgesia are essential to improve the dog's welfare and decrease stress level and excessive metabolic requirements caused by anxiety and pain. The animal should be monitored closely during this period and if signs of deterioration are noticed surgical intervention should be promptly done. Arterial blood gas analysis should be performed to evaluate ventilation and pulmonary function. Electrolytes and blood lactate levels should be considered in light of the suspected hypovolemia and shock.

3. Premedication should be ideally based on analgesics, namely opioids.  $\alpha$ -2 agonist such as medetomidine or  $\alpha$ -1 blockers (e.g. acetylpromazine) should be avoided because of the risk of exacerbating shock. If the animal is fractious

or aggressive, a benzodiazepine (e.g., midazolam) can be considered in conjunction with an opioid. The best choice for an opioid in this case is probably pethidine (Demerol, 4 mg/kg). Morphine should be avoided because it may cause vomiting, an especially unfavorable side effect in this case, because of the increased risk of aspiration pneumonia. Partial opioid agonists such as buprenorphine or agonist antagonists such as butorphanol, would not provide satisfactory analgesia during the procedure. Fentanyl (a full opioid agonist) might be a good though expensive choice, and the same is true for oxymorphone and hydromorphone.

4. A propofol-diazepam drug combination for induction of anesthesia and isoflurane for its maintenance are recommended for this case. Ketamine might cause adverse cardiovascular effects, most importantly, an increase in cardiac oxygen consumption; however it might be considered a reasonable alternative, especially due to its minimal respiratory and cardiovascular depression.

Recovery from total intravenous anesthesia would be significantly prolonged in this case due to the low basal metabolism resulting from hypothermia, and low glomerular filtration rate indicated by increased serum creatinine concentration. If total intravenous anesthesia is selected for technical reasons, endotracheal intubation should be performed and oxygen should be supplemented.

5. a. Successful endotracheal intubation is of major importance in this case. It will insure a patent airway, improve the ventilatory status of the dog, decrease the risk of aspiration pneumonia and improve the conditions for surgical intervention. In order to perform intubation, the endotracheal tube should be long enough to pass well beyond tracheal rupture. Secondly, it should be narrower than a tube that is normally used for dog's size. For example, the expected endotracheal tube diameter in this dog is 12 or 10 ID, but it would be advisable to use an 9 or 8 ID endotracheal tube. The length and diameter of the tube should be measured preoperatively using the radiographs performed earlier, and be confirmed visually while gently inserting the tube after induction.

Before induction, the dog should be clipped and aseptically prepared for a potential emergency tracheotomy should problems arise during induction or intubation.

b. The hydration and blood volume status of the dog should be monitored during anesthesia and corrected as needed.

c. Ventricular premature beats should decrease in rate and even disappear with improved oxygenation. However, if an increase in their rate occurs, treatment with intravenous lidocaine should be considered.

d. A persistently low heart rate should be treated with atropine if needed.

e. The ventilatory and oxygenation status of the dog should preferably be monitored by capnography and pulse oximetry and confirmed with arterial blood gas analysis, and corrected if needed by placing the dog on a mechanical ventilator.

f. Body temperature should be monitored and corrected as required.

g. The blood pressure, peripheral perfusion and anesthetic depth should be closely monitored throughout the procedure by periodic reflexes evaluation.

6. During the immediate recovery period, extubation should be performed as late as possible. The dog should be placed on supportive treatment similar to the preoperative one, with an emphasis on sufficient anxiolytics and analgesics.

The dog should be closely observed for signs of tracheal leakage (i.e., aggravation, or insufficient improvement of the subcutaneous emphysema) or respiratory distress. Analgesia should be given pending full recovery and probably until discharge from the hospital.

## REFERENCES

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