Extended patient care report for anaesthetic management of a patient undergoing ovariohysterectomy for pyometra

Abstract

Pyometra in the bitch may still be a relatively common pathological condition seen within general practice and many veterinary nurses will be familiar with the general nursing requirements for such cases. This article highlights the need for veterinary nurses to consider the various body systems affected by not only the condition itself but also potential pre-existing anatomical conformations relating to breed or body score. This article details the nursing care provided to an obese, bracycephalic bitch during the pre, peri and post-anaesthestic period of ovariohysterectomy to correct a pyometra.

Key words: pyometra, anaesthesia, brachycephalic, obesity

The patient presented with a 3 day history of anorexia, polydipsia and lethargy. The owner reported that the dog had been in oestrus approximately 4 weeks previously. A physical examination revealed pink but tacky mucous membranes, slight skin tenting and obtunded mental state. There was a small amount of serosanguinous vaginal discharge. Palpation of the abdomen was challenging due to the patient's level of obesity. A body condition score of 8/9 was recorded (WSAVA, 2011). The patient was pyrexic with a core temperature reading of 39.1°C. The patient's heart rate was 90 beats per minute. The patient was panting on initial examination so a respiratory rate was not noted. The veterinary surgeon suggested a differential diagnosis of pyometra and admitted the patient for diagnostic tests and treatment.

Signalment

Species: Canine
Breed: Pug
Age: 8 years
Sex: Female (entire)
Weight: 8.5 kg

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Diagnostic procedures

A full blood profile was performed to assess biochemistry, haematology and electrolyte parameters. The results of these along with an abdominal ultrasound confirmed the diagnosis of pyometra. There was a marked leucocytosis of 46.1 K/ul (reference range: 5.05–16.76 K/ul) where 55% were shown to be neutrophils. An elevated packed cell volume of 62% (reference range: 35–55%), hyperproteinaemia of 89 g/litre (reference range: 55–75 g/litre) and hypernatraemia at 168 mmol/litre (reference range: 135–150 mmol/litre). These parameters are highly suggestive of an inflammatory response to an infection and dehydration, commonly found in cases of pyometra (Beck, 2007). The abdominal ultrasound confirmed the diagnosis by revealing multiple distended, tubular structures containing hypoechoic fluid in the caudal abdomen. The veterinary surgeon, after discussion and consent from the owner, planned to proceed with surgical treatment of the pyometra via general anaesthetic and ovariohysterectomy (*Figure 1*).

Patient assessment and pre-anaesthetic management

Using the American Society of Anesthesiologists Physical Status Classification System (Bednarski et al, 2011), this patient was deemed to be at level 4 of anaesthetic risk, in that it had a 'severe systemic disease that was a constant threat to life'. With this in mind, the potential complications that could arise from administering an anaesthetic to this patient were discussed. These included: the patient's obese body condition, which could lead to pressure from body mass, and engorged uterus exerting pressure on the diaphragm in dorsal recumbency making normal respiration difficult; the brachycephalic breed anatomical conformation, which could lead to difficulties in intubating the patient after induction; the pre-existing dehydration which could mean a lack of circulating volume, which could reduce effective oxygen delivery to body tissues (Welsh, 2009).

This patient was administered preoperative fluid

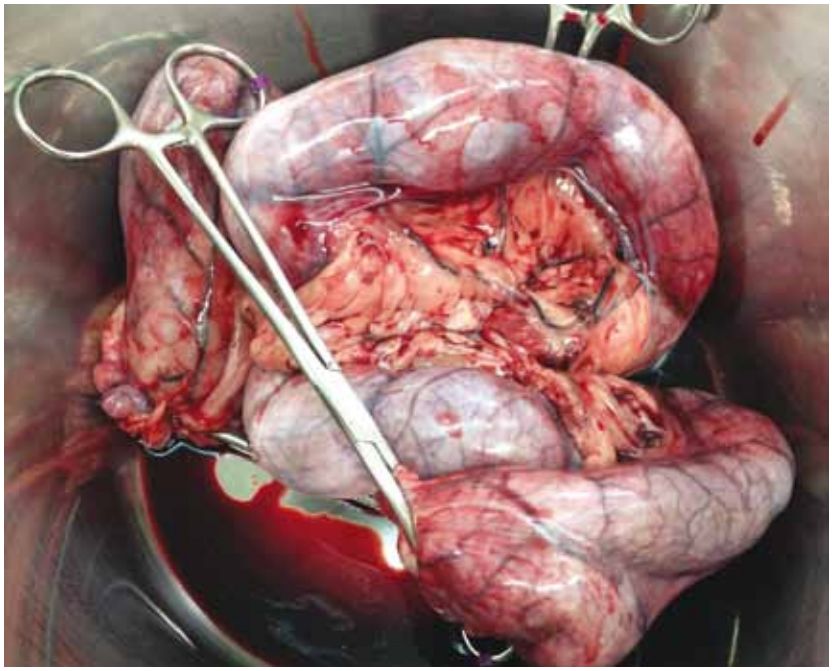

Figure 1. The pyometra post ovariohysterectomy.

therapy to correct the fluid deficit present. The clinical signs and laboratory findings prompted estimation that the patient was 8% dehydrated. Replacement fluids were administered following intravenous cannulation of the right cephalic vein. The fluid chosen was compound sodium lactate (CSL) (Aquapharm No 11, Animalcare Ltd), and this was administered at a rate of 10 ml/kg for the first 60 minutes. CSL was chosen because it is a balanced electrolyte solution and as such, would be an appropriate replacement fluid because it closely resembles plasma electrolyte concentrations (Welsh, 2009). A pre-existing fluid deficit should be corrected prior to the administration of anaesthetic agents in order to support the patient's ability to tolerate the impending cardiopulmonary depressant effects experienced during general anaesthesia (Moon, 1999; Tivers and Baines, 2010).

It became difficult to maintain the desired fluid administration rate for this patient because of its anatomical conformation; very short limbs and excessive body fat surrounding the sternum and upper limb meant that once the cephalic vein was cannulated and flexed in sternal recumbency, it caused occlusion of the vein which reduced and occasionally stopped the flow of fluid. This required close monitoring until the patient was anaesthetised for surgery and the limb could be manually extended. In cases such as these it may be beneficial to place a saphenous peripheral catheter or even a central jugular catheter for administration of intravenous fluids and medications. Jugular catheters can be maintained for prolonged periods and allow prompt intravenous access and tend to be tolerated well by the patient (Hurley, 2012); however, they must be placed aseptically under anaesthesia or sedation which, in this case, was not planned until fluid stabilisation had taken place.

Premedication

The premedication administered to this patient consisted of an intramuscular injection of acepromazine (ACP, Novartis, Surrey) and buprenorphine (Vetergesic, Ceva Animal Health). This combination of phenothiazine and opioid caused marked sedation within 10 minutes of administration. It was noted that the patient who was previously panting, now had a respiratory rate of 15 breaths per minute but was exhibiting marked stridorous and stertourous breathing. The patient was placed in sternal recumbency with its neck gently extended. Flow-by oxygen was provided to increase the patient's oxygenation. Pugs, like other brachycephalic breeds, are susceptible to complications associated with brachycephalic airway obstructive disease. This disease manifests in various ways, but is associated with anatomical components such as stenotic nares, elongated soft palates and everted laryngeal saccules. These patients present an increased anaesthetic risk due to their compromised airway (Meola, 2013). These patients should not be given deep sedation due to the excessive relaxation of the upper airway muscles which causes greater risk of airway obstruction. Brachycephalic breeds often have a pronounced vagal tone so it can be useful to provide anticholinergics, such as atropine or glycopyrrolate, within the premedication protocol to prevent bradycardia and avoid excessive salivary secretions (Cuvelliez and Rondenay, 2002; Lodato and Hedlund, 2012). Meloxicam (Metacam, Boehringer Ingleheim UK Ltd, Berkshire) was administered via subcutaneous injection for pre-emptive analgesia, along with intravenous antibiotic therapy in the form of amoxicillin clavulanate (Augmentin, Glaxo Smith Klein UK, Middlesex).

Induction

Patients with airway compromise must have their induction carefully managed and monitored during the induction phase of anaesthesia. There are risks of hypoxaemia or apnoea during this time due to the patient's anatomical conformation and the effects of sedation (Grubb, 2010). In this case, following preoxygenation for 10 minutes with flow-by oxygen, the patient was anaesthetised with an intravenous injection of propofol (Vetofol, Norbrook Laboratories Ltd, Northamptonshire). A recent study completed by Boveri et al (2013) found that patients diagnosed as obese (with a body condition score exceeding 6), should be administered reduced doses of propofol at induction to lessen risks

of post-induction apnoea. They concluded that propofol doses in animals that were significantly overweight, should be calculated according to the patient's lean body mass to provide anaesthesia adequate to facilitate endotracheal intubation. In this case the patient was administered intravenous propofol slowly (over a period of 20 seconds) to effect by the veterinary surgeon. The reduced dose administered was 0.2 mg/kg.

Prior to induction it was crucial to have all necessary equipment to hand in case of complications. Equipment was collected to include the following: laryngoscope with blade; endotracheal tubes sizes 5–9 mm; emergency drugs with correct doses drawn up to hand (atropine, adrenaline, doxapram); tracheostomy tube placement kit; dog urinary catheter size 6f (for emergency oxygen administration if conventional endotracheal intubation not possible); and an Ayre's T-piece anaesthetic circuit with capnograph attached. If intubation is challenging, the use of capnography as part of the patient monitoring process helps to provide the anaesthetist with information to assess correct placement. Accidental oesophageal intubation can occur and the caponograph will quickly illustrate this with a flat trace due to the lack of expired carbon dioxide (Adshead, 2014). The high vagal tone noted in brachycephalic breeds may cause bradycardia, which can be further exacerbated by manipulation of the trachea during intubation (Lucerno, 2006). Therefore, it is prudent to have emergency drugs at correct doses for the patient drawn up in advance and a cardiopulmonary resuscitation protocol agreed in advance with the patient's owner, should cardiac arrest follow induction and intubation.

This patient was successfully anaesthetised, no complications were encountered during induction and an 8 mm endotracheal tube was placed. General anaesthesia was maintained with oxygen and isoflurane (Vetflurane, Virbac Animal Health, Suffolk).

Peri-anaesthetic management

The anaesthetic circuit chosen was an Ayre's T-Piece, with Jackson Rees modification, to provide inhalational anaesthesia, and the patient remained stable at a maintenance level of inhalational isoflurane of 2% and oxygen at a flow rate of 4 litres per minute. This is a relatively high fresh gas flow rate which could have been significantly reduced by selecting a mini Lack breathing system which would reduce the fresh gas flow rate to 1.7 litres per minute (Orpet and Welsh, 2011). The T-piece was selected because it can be used for intermittent positive pressure ventilation (IPPV) which the mini Lack cannot. The patient remained stable post induction and was prepared for surgery.

Patient monitoring equipment was used throughout the anaesthetic period including electrocardiogram (ECG), pulseoximetry, capnograph, oesophageal temperature monitoring probe and non-invasive blood pressure measurement. The clinical parameters detected were noted every 5 minutes. Dysrhythmias may be observed when monitoring anaesthetised patients with ECG, these include sinus bradycardia or second degree atrioventricular block which may be present in patients with high vagal tone, those with hypothermia or profound hypoxaemia. Patients may have a too light plane of anaesthesia and this can be illustrated in ECG traces showing sinus tachycardia (Kruse-Elliott, 2002).

There were a variety of factors to contribute to the risk of this patient developing hypothermia while anaesthetised: the patient was likely to be anaesthetised for at least 1 hour; the nature of the surgery being a laparotomy which presents the potential need for abdominal lavage; and this was a small dog with a large body:surface ratio which would result in heat loss. To avoid perioperative hypothermia the patient was placed in a surgical cradle surrounded by an active warming device (Bair Hugger, DMS Ltd), and an electronic infusion warmer was placed close to the patient on the giving set line. This patient remained clinically stable throughout the surgical period of anaesthesia. Oxygen was continued but volatile agent was discontinued following wound closure and the patient was moved to a recovery ward for further monitoring.

Brachycephalic breeds are predisposed to developing corneal ulcers during prolonged anaesthesia, due to their anatomical conformation having prominent eyes (Adshead, 2014). To prevent this, eye lubrication (Lubrithal, Dechra Pharmaceuticals PLC, Northwich) was applied to both eyes during the anaesthetic period every 40 minutes.

Post-anaesthetic management

It is advisable to leave the endotracheal tube in place during the anaesthetic recovery of brachycephalic dogs to ensure the patient is able to breathe adequately. Inflammation and subsequent airway obstruction is a significant risk in these cases (Lodato and Hedlund, 2012). The patient's endotracheal tube was left in situ until the patient was lifting its head and swallowing. A dedicated nurse remained with the patient throughout the recovery period to observe respiratory rate and effort, cardiovascular output, signs of pain and other post-surgical complications such as haemorrhage and hypothermia. Due to the risk of respiratory obstruction, oxygen, propfol for re-induction, laryngoscope, endotracheal tubes and tracheostomy equipment remained available in case they should be required in an emergency.

Key Points

- Full clinical examination, haematology analysis and use of a detailed history will enable the clinician to administer the appropriate rates of fluid therapy to bitches presenting with pyometra.
- Brachycephalic breeds are predisposed to brachycephalic obstructive airway disease. This must be taken into account when planning the anaesthetic procedure.
- Close monitoring of these patients throughout the pre, peri and post-anaesthetic period is crucial and veterinary nurses should be aware of the potential complications that may be observed in brachycephalic breeds.
- Endotracheal tubes should remain in situ until the brachycephalic patient is able to breathe normally post anaesthetic.
- Emergency drugs and equipment should be readily available for use with patients considered to be at higher risk of complications during the anaesthetic period.

The post-anaesthetic plan for this patient was for intravenous fluid therapy to continue until eating and drinking recommenced, antibiotic therapy and continued analgesia depending on the result of regular pain scores. Post-operative pain scores can be an invaluable tool when making assessments on the analgesia required by patients (Crompton, 2010). This patient was assessed using the Glasgow Composite Pain Scale every 2 hours initially and subsequently every 4 hours. Drug and fluid administration doses were recalculated as the surgically removed, engorged uterus weighed 0.7 kg.

The patient started to vocalise during recovery, appeared dysphoric, and gentle manipulation of the surgical site was resented. These signs warranted a positive score of 10 on the pain scale prompting the requirement of additional analgesia so the veterinary surgeon administered a further dose of buprenorphine. The patient remained agitated for a further 20 minutes before settling. It may have been beneficial for this patient to have been given a constant rate infusion (CRI) of a fast-acting opioid such a fentanyl. CRIs can be used throughout anaesthesia to reduce minimum alveolar concentration (MAC) of volatile agent, in addition they can be continued throughout the patient's recovery period to provide analgesia and sedation and help to promote a smooth recovery (Taylor, 2014).

The patient was offered a small amount of highly digestible, low-fat food (Canine Prescription Diet i/d, Hill's Pet Nutrition, Inc) once fully recovered. The patient ate this food readily and was able to walk a short-distance to urinate. It may have been useful to collect a urine sample for culture and sensitivity at this point, as around 30% of dogs presenting with a pyometra have concurrent urinary tract infections (Tivers and Baines, 2010).

Patient outcome

This patient went on to make a full recovery following surgery and was discharged from the hospital 48 hours later. No post-operative complications were found after discharge. Her owners signed her up for weight management clinics in order to address her obesity. She is currently making good progress towards her target weight of 6.5 kg.

Conclusion

The author feels that this case has highlighted the requirement for veterinary nurses to have a comprehensive understanding of the various body systems that must be considered when caring for anaesthetised patients and how certain breeds and anatomical conformations of animals may require varying levels of care and support during this time. Although this patient was considered a high anaesthetic risk, the surgical procedure was vital. High-risk cases must receive constant nursing support and expected complications should be discussed prior to the procedure taking place, to allow personnel to prepare emergency equipment and medications. **VN**

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