Patient care report for feline patient with urethral obstruction

Abstract

Urethral obstruction in cats is a potentially life-threatening condition. The administration of sufficient pain relief and appropriate fluid therapy as part of a well balanced nursing care plan is vital for the care of these patients. Urinary output must be monitored following the removal of the urethral obstruction and this report discusses the considerations of an indwelling urinary catheter.

Key words: urethral obstruction, IVFT, indwelling urinary catheter, monitoring, electrolyte imbalance, metabolic acidosis

Signalment

- Species: Feline
- Breed: Domestic Short Hair
- Age: 3 years
- Sex: Male neutered
- Weight: 5 kg

History

The patient was presented with a history of frequent unproductive squatting in the litter tray for the last 48 hours, off food and vomiting, leading to collapse.

Patient assessment

On physical examination the patient was collapsed, tachycardic, hypothermic (36.8°C), hypotensive and had pale mucous membranes with a delayed capillary refill time (CRT 2s). His bladder was large, hard and painful to palpate.

Initial interventions

A 23G intravenous catheter was placed in the right cephalic vein and intravenous fluid therapy (IVFT) initiated, using Hartmann's. Blood was taken from the jugular vein for complete blood count, serum biochemistry, blood gas analysis and to measure packed cell volume (PCV)/total solids (TS).

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Further investigations

It was not possible to manually express the bladder so cystocentesis was performed using a 23G butterfly catheter for immediate relief of the pressure. The urine obtained was examined for crystals under the microscope, specific gravity and dipstick, as well as sent for culture to look for bacterial infection and sensitivity to antibiotics. Methadone (0.3 mg/kg IV) was administered as analgesia, followed by general anaesthesia induction with Alfaxan (0.2 mg/kg IV) and maintenance with isoflurane while saline was injected into the urethra to break up any blockages or flush them back into the bladder. The bladder was lavaged and an indwelling urinary catheter, with a closed collection system, was placed for 2 days and then removed. Uroliths were not seen on lateral images of the urinary tract without contrast radiography.

Discussions of nursing interventions

Urethral obstruction is a medical emergency associated with metabolic acidosis, hyperkalaemia, hypocalcaemia and post renal azotaemia (Drobatz and Cole, 2008). Treatment focuses on analgesia, correcting perfusion, metabolic imbalances and relieving urethral obstruction (Drobatz and Cole, 2008). It was crucial that the hospital environment posed minimal stress on the patient and pheromones (Feliway Diffuser, Ceva) were used, as well as all other stressors removed, such as barking dogs and loud noises (Woolf, 2012).

Fluid therapy

The type of fluid and the rate it is given has to be carefully considered. IVFT was administered to: improve hypovolaemia; correct electrolyte imbalances and metabolic acidosis; and 'flush' the urinary tract of potential obstructions.

Improving initial hypovolaemia

On presentation the patient was experiencing cardiovascular collapse. There was no history of heart disease and there was no audible murmur. The bradycardia was thought to be associated with the hyperkalaemia. Two boluses of Hartmann's were ad-

Box 1. Fluid therapy plan

1. On admission, hypovolaemic shock evident, with urethral obstruction, no evidence of cardiac disease
   Plan: shock rate bolus of fluids to improve cardiovascular system, repeat if necessary.
   *Note: vigilant monitoring required to avoid over hydration in feline patients

2. Urethral obstruction relieved and indwelling urinary catheter placed
   Plan: high volumes of urine to flush the bladder through
   10 ml/kg/hour
   10 ml x 5 kg = 50 ml/hour

3. Post-obstructive diuresis
   Plan: maintain good hydration through post-obstructive diuresis (classified as more than 2 ml/kg/hour). More than the maintenance fluid requirement is necessary (Francis et al, 2010)

   Maintenance fluid rate 50 ml/kg/24 hour
   50 ml x 5 kg = 250 ml/24hour = 10.4 ml/hour

   2 x maintenance fluid rate = 20.8 ml/hour

ministered at 20 ml/kg over 10 minutes. Heart rate, respiratory rate and effort and blood pressure were closely monitored during the fluid resuscitation for signs of overload. When peripheral pulses resumed and mucous membranes were pink with a capillary refill of 1 second the fluid rate was reduced to 10 ml/kg/hours (*Box 1*).

Correcting electrolyte imbalances and metabolic acidosis

The reduction or cessation of the glomerular filtration rate (GFR) causes post-renal azotaemia, hyperkalaemia, hypocalcaemia and metabolic acidosis (Segev et al, 2011). Hypocalcaemia occurs as a result of calcium binding to the excess phosphorus in the blood, which would normally be excreted by the kidneys (Lee and Drobatz, 2003). Hyperkalaemia is also the product of reduced excretion of potassium by the kidneys (Lee and Drobatz, 2003).

Potassium builds up in the blood and has deleterious effects on cardiac muscle, which are evident by electrocardiogram (ECG) examination (Segev et al, 2011). Spiked T waves and wide QRS complexes are typical of hyperkalaemia (Matthews, 2011). An ECG was not used for this patient; however, on reflection it would have been beneficial to have carried this out, especially as the patient presented with bradycardia.

A balanced electrolyte solution, such as Hartmann's, contains sodium chloride, calcium and potassium as lactate. The amount of potassium in Hartmann's (5 mmol/l) has previously been thought to be detrimental to the hyperkalaemic patient and sodium chloride 0.9% has frequently been the fluid of choice (Drobatz and Cole, 2008). However, studies have shown that there is no difference in the time taken to normalise potassium concentrations in hyperkalaemic patients when using sodium chloride 0.9% compared with a balanced electrolyte solution (Drobatz and Cole, 2008).

The use of sodium chloride 0.9% may be less beneficial if the patient has metabolic acidosis; the lactate within balanced electrolyte solution is metabolised by the liver and skeletal muscle into bicarbonate, which acts a buffer enabling correction of acidosis more rapidly than when sodium choloride is used (Drobatz and Cole, 2008; Cunha et al, 2010). The chloride within sodium chloride 0.9% actually worsens acidaemia by interfering with bicarbonate reabsorption within the proximal tubule (Drobatz and Cole, 2008).

The electrolyte status of the patient was analysed using an ISTAT machine every 4 hours once the obstruction had been relieved to ensure potassium levels were normal and additional electrolyte abnormalities did not occur. The dilution effect of the high rates of IVFT was adequate in this patient to reduce potassium levels quickly, without the intervention of 10% calcium gluconate or insulin and dextrose therapy. Blood glucose levels need to be closely monitored when administering insulin in hyperkalaemic patients to ensure they do not become hypoglycaemic (Matthews, 2011). An ECG would have been indicated if these additional treatments were initiated. Due to the additional loss of potassium through the urine while receiving IVFT the patient was subsequently monitored for hypokalaemia; this potassium would have been supplemented as required.

Flushing the urinary tract to remove potential obstructions

High IVFT rates aid excretion of waste products that have accumulated within the blood, as well as physical flushing of potential obstructive material, such as uroliths. Urine output was closely monitored to ensure there was not a further obstruction.

High rates of IVFT are essential to resume hypovolaemia, electrolyte imbalances and diuresis of waste products, however, the hydration status of the patient needs to be closely monitored to prevent overhydration, as well as dehydration, especially if the patient experiences post-obstructive diuresis, as discussed below.

Monitoring urine output

Monitoring the quality and quantity of urine output is an essential part of determining the physiological state of the patient, ensuring the patient is not re-obstructing, nor becoming dehydrated. The urinary collection bag was weighed every 2 hours, enabling the volume of urine to be calculated. Ideally urine output is between 1–2 ml/kg/hour (Matthews, 2011), however the phenomenon of post-obstructive diuresis may cause volumes to exceed this. Reduced GFR and therefore tubular function results in excessive urine production (Francis et al, 2010). The fluid therapy plan incorporated measuring urine output and exceeding this rate with IVFT to avoid subsequent dehydration.

Initially urine will be darker than expected in a healthy patient due to haematuria from the stretching and inflammation of the bladder, as well as catheterisation attempts (Segev et al, 2011). This was considered when reading the urine dipstick because the colour distorted the interpretation of the readings.

Management of indwelling urinary catheter

Attentive management of indwelling urinary catheters is essential for the patient's wellbeing, especially as there are several complications typically associated with their use (Oosthuizen, 2011). Correct management requires knowledge of the potential problems, how to recognise the problem and how to avoid the problem occurring (Chandler et al, 2007) (*Box 2*).

On reflection, the potential risks associated with urinary catheters were acknowledged throughout the nursing of this patient. The urine collection system was handled in a strictly aseptic manner, including hand washing as per the World Health Organisation (WHO) guidelines (Allegranzi and Pittet, 2009) and the application of sterile gloves and a closed urinary system was used. A urinary tract infection (UTI) was not suspected, however the catheter tip was still sent for culture, the results of which were negative.

A closed urinary drainage system was used to aid calculation of urine output, avoid urine scald and minimise the risk of UTI (Oosthuizen, 2011). A study on dogs by Sullivan et al (2010) reports that the use of an open or closed urinary drainage system does not affect the occurrence of nosocomial UTIs. However, the terminology used to describe open collection and closed collection drainage systems needs to be carefully interpreted. Bloor (2013) explains how an open collection system does not necessarily mean one that leaves urine to leak freely, but can mean one where the bag is disconnected from the patient, and believes that the Sullivan study was looking at a simple closed collection drainage system. Ultimately a holistic approach to the care of this patient was important. Urine leaking directly from the patient would cause urine scald, and the patient was unable to clean his wet legs and feel clean due to wearing a buster collar, and therefore a closed urinary system was chosen for this patient.

There are several reports detailing the dangers associated with urethral catheterisation. For example, Corgozinho et al (2007) discusses the trauma caused by urethral catheterisation in male cats. However, the sample group in this report only comprised 15 cats, which is relatively few, especially when considering that feline urethral obstructions is classed as a common emergency (Segev et al, 2011). Oosthuizen (2011) explains the link between the correct management of indwelling urinary and avoidance of complications, which has been demonstrated by this patient.

Box 2. Potential problems with indwelling urinary catheters

- Urinary tract infection (UTI) can be caused as a direct result of introducing bacteria in to the bladder at the time of catheterisation (Sullivan et al, 2010). The risk is therefore increased with repeated catheterisation (Chandler et al, 2007). Daily urinalysis promoted early detection of UTIs and if suspected the catheter would have been removed immediately and the tip of the catheter sent for culture, although this can take 3 days to receive results (Matthews, 2011). Indicators may have been an altered pH, protein, white blood cells on the dipstick and/or bacteria seen under a microscope. Prophylactic use of antibiotics is not recommended (Segev et al, 2011) and the application of aseptic technique when handling the urinary drainage system is paramount to minimising the occurrence of UTI's (Choong et al, 2001).

- Cystitis is often associated with urinary catheterisation, especially male cats with very narrow urethras (Chandler, et al 2007). The patient frequently visited his litter tray and squatted as if he wanted to urinate while the catheter was in place, however this resolved once it was removed.

- Blockage of the catheter is particularly relevant for cats that have obstructed initially due to urethral plugs or uroliths (Segev et al, 2011). Urine out-put may reduce and eventually cease to flow. This can be distinguished from oliguria by palpation of an increasing sized bladder as well as performing an ultrasound to ensure the tip of the catheter is positioned in the bladder. It is not recommended to flush the patient's catheter unless a blockage is suspected due to the increased risk of UTI.

- Self removal of the catheter is undesirable due to the potential for re-obstruction, trauma to the urethra and the associated risks with re-catheterisation. A buster collar was worn by the patient at all times to avoid interference and it was ensured that the tubing of the closed urinary drainage system was not restrictive to the patient, for example, it was not caught in the kennel door.

- Urethral damage is particularly applicable in male cats because of the narrow urethra (Corgozinho et al, 2007). Care must be taken to gradually advance urinary catheters, particularly when passing the ischial curve (Chandler et al, 2007). Damage can manifest from inflammation asa small amount of bleeding, to urethral rupture and uroabdomen (Corgozinho et al, 2007). The patient was monitored for signs of deterioration, but this was not applicable to him.

Table 1. Nursing care plan for feline patient post-urethral obstruction

Ability	Potential problem	Short-term goal	Nursing interventions	Monitoring
Eat adequate amounts	Anorexia Vomiting	Maintain RER (30 x 5kg)+70 = 220kcal Cease vomiting episodes	Once anti-emetic taken effect, offer prescription lower urinary diet, but remove if not eaten within 20 mins. Could try other favourite foods initially to get eating Administer anti-emetic medication on time Clean up vomitus immediately	Q2hr offer food, until eating RER, then reduce to Q4-6hr Q24hr Maropitant (1mg/kg) s/c Q1hr until anti-emetic taken effect
Drink adequate amounts	Dehydration Over-hydration Hypokalaemia following high fluid rates Intravenous (IV) catheter site inflammation	Avoid dehydration Avoid over -hydration Maintain normal electrolyte levels Avoid inflammation/ patient interference with IV site	Maintain IVFT adequate for urine output Monitor electrolytes Remove IV catheter and replace if inflammation. Keep bandaged and b/collar to be worn at all times. Monitor site/foot for swelling/pain	Q2hr check hydration status, including blood pressure Q4hr check renal parameters (urea and creatinine) Q4hr check electrolytes until normalised, then Q12hr Q4hr check heart rate, respiratory rate Q6hr un-bandage and check IV catheter placement site Q6hr flush IV catheter with heparin flush
Urinate normally	Post-obstructive diuresis Urinary catheter obstruction Urinary tract infection	Avoid dehydration Avoid obstruction Maintain hygiene of urinary catheter	Intravenous fluid therapy (IVFT) to meet urine output Monitor for blockage indicated by decrease in urine production Ensure B/collar fitted at all times, aspetic handling of urinary drainage system, e.g. WHO hand washing, sterile gloves worn	Q2hr weigh urinary collection bag, adjust IVFT accordingly Q6hr clean entry site of catheter with dilute hibiscrub Q12hr urinalysis and specific gravity Q12hr empty bag in aseptic manner
Defecate normally	Constipation	Patient to feel relaxed enough to defecate and not hold on	Replace litter tray as soon as soiled. Supply preferential litter e.g. soil if usually goes outside. Allow 'private time'.	When applicable
Maintain body temp	Hypothermia	Maintain normothermia	Maintain cardiovascular circulation, supply clean/dry bedding at all times. Active warming, including Bair Hugger, until 37°C to avoid over heating	Q2hr check rectal temp until normal, then Q6hr
Groom self	B/collar worn, unable to groom	Maintain coat and skin quality and cleanliness	Groom with soft brush, remove soiled bedding asap	Q24hr groom
Mobilise adequately	Indwelling urinary catheter minimising mobility	Urinary tubing should be free moving	Check line not stuck in kennel door and it remains firmly secured to patient with sutures Could tape line to tail if patient particularly active	Every time open kennel door
Sleep/rest	Painful	Adequate analgesia	Buprenorphine (20µg/kg IV) administered Q8hr	Q6–8hr Glasgow Pain Score
Express normal behaviour	Stressed, leading to re-obstruction	Minimise stress in environment	Remove barking dogs from area, advise all staff to be calm and quiet	At all times Q2hr check mentation

The patient showed frustration with wearing a buster collar by attempting to scratch it off and rubbing it along the kennel bars. This was eased by regular grooming with a soft brush and allowing supervised periods without the collar being worn (*Table 1*).

Key points

- Feline urethral obstruction can causes serious metabolic derangements, requiring urgent attention.
- The most significant electrolyte disturbance is hyperkalaemia, which if severe, can causes life-threatening arrhythmias.
- Specific monitoring for this condition includes electrocardiogram (ECG), frequent electrolyte analysis and urinalysis, including urine output.
- Treatment comprises fluid therapy and analgesia. Antibiotics are not indicated unless culture is positive.
- Holistic care for these patients considers the consequences of urinary catheters, for example, a buster collar must be worn meaning the patient is unable to groom.

Conclusion

The recognition of potential complications associated with urethral obstruction and the nursing care involved was paramount to the successful treatment of this patient. Strict aseptic technique when handling the urinary collection system and close monitoring of hydration status is vital. In the absence of early detection of problems including electrolyte imbalance, urinary catheter obstruction and over or under hydration, the speed of recovery becomes compromised, as does the wellbeing of the patient.

For future practice it is advisable to initiate an ECG at initial presentation and as part of on-going treatment to monitor effects of electrolyte imbalances, in particular potassium on the cardiac muscle, and to ensure any effects are resumed. It is also recommended to only flush the urinary catheter if there is a high suspicion of blockage.

Ultimately, it is recommended that a detailed nursing care plan is produced at the start of treatment which covers all eventualities, and is a document referred to by all those involved with the patient's care. **VN**

Conflict of interest: none.

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