A soaker catheter, also called a wound infusion catheter, works just like a soaker garden hose. These are flexible indwelling catheters that are imbedded near or in surgical sites and can be used to deliver repeated dosing or continuous infusions of local anesthetics. The catheter is polypropylene with a sealed distal tip and many tiny perforations along the catheter length down to the distal tip that allow drug diffusion into a tissue bed. A black marking on the catheter indicates where the perforations begin along the catheter.

Placement of wound infusion catheters is relatively straightforward technically, provided a few guidelines are followed and has become common in human medicine for providing postsurgical analgesia. Their use has been adopted in veterinary patients in the last few years. The primary advantage of the soaker catheter over more traditional analgesic regimens are that it provides local pain relief and therefore reduces the need for systemic analgesics. Less systemic analgesics results in less sedation, less risk of regurgitation/aspiration, less chance of urinary retention, faster return of appetite and less nursing care as many of these patients are ambulatory and can walk outside for elimination needs. Clinical investigations of this technique in human medicine have demonstrated improved pain control at rest and with activity, decreased opioid requirement, increased patient satisfaction and shorter hospital stay following a variety of surgical procedures. Studies in animals describe their use for ear canal ablation and a variety of other procedures such as median sternotomy, thoracotomy, limb amputation, major soft tissue tumor excision such as mastectomy and fibrosarcoma resection in cats.

**Instrumentation**

Wound infusion catheters are available commercially through Mila International Inc. (www.Milainternational.com) for approximately $20.00 USD. The distal tip of the catheters is sealed so that liquid exits only from the micropores. The catheters are available with different lengths of micropores (2, 4, 6, 7.5 and 9 inches) to allow for use in a variety of anatomical sites and sizes of patients. A black depth indicator marks a point located ½ inch (1.25 cm) from the first micropore to insure that all micropores are located below the skin. The proximal (exterior) end has a butterfly connection to fit a syringe or IV administration set.

**What are the indications for use?**

- Amputations are the most common indication
- Lateral Thoracotomy
- Median sternotomy incisions
- Large wounds, e.g. mass removal

**What about cats?**

Soaker catheters are OK to use in cats but careful dosing is required. Cats metabolize the drugs more slowly and are more sensitive than dogs to the cardiotoxic and neurotoxic effects of local anesthetics. Therefore the intermittent injection technique is recommended instead of a constant rate infusion. Wound infusion catheters have been successfully used in cats for removal of fibrosarcoma, mastectomy, limb amputation and median sternotomy.

**How is the catheter placed?**

1. Insert the catheter with the distal tip in the deepest layer of the closure and then suture in place. It is essential that all perforations are below the skin. Place a purse string suture and Chinese finger trap to secure the catheter.
2. Suture BOTH butterfly connectors to the skin. One is adjustable and should be adjusted to be located close to the exit of the catheter from the skin to help keep it from backing out. Cover with tegaderm and seal the catheter end with a Myla filter and an injection cap. Add a clear label to the soaker catheter site to avoid confusion with an IV injection cap. DO NOT SKIP ANY OF THE 4 STEPS IN SECURING THE CATHETER.
3. For aggressive dogs add an extension line and secure this to the rump or other convenient place.

**How are the drugs calculated and administered?**

Use either of two methods, intermittent injection (dog or cat) or constant rate infusion (dog only). A recent study comparing different commercial and hand-made wound infusion catheters indicated that faster injection speed (30 seconds – 5 minutes) resulted in less variable output along the catheter length, indicating that intermittent injection may be preferable to constant rate infusion.

**Intermittent injection**

Fill the catheter with local anesthetic at the end of surgery and repeat the injection every 4 hours.
• Bupivacaine can be injected 15 minutes prior to the end of surgery. Be sure to add the ‘priming volume’ and the filter volume to the calculated dose. The priming volume for ALL SIZES of catheters is 0.8mls and the filter volume is 1.0mls so this volume needs to be added to the first intra-op dose. For example: 5kg cat x 1.5mg/kg = 7.5mg ÷ 5mg/ml = 1.5mls (cat’s dose) + 0.8mls (priming volume) + 1.0 filter volume = 3.3 mls bupivacaine for FIRST DOSE ONLY. Thereafter, each subsequent dose should be the 1.5mls.

• The dose of bupivacaine to use is 1.5 mg/kg. For a large dog such as a German Shepherd (45kg, 100lb) the volume would be 13.5 ml. For a medium dog such as a Border Collie (20kg, 44lb) the volume would be 6 ml.

• For small dogs or cats the bupivacaine may need to be diluted otherwise the volume may not be sufficient to reach the entire tissue bed. For example, 2.5kg cat x 1.5mg/kg = 3.75mg ÷ 5mg/ml = .75ml …. Add .75ml STERILE WATER (do not use saline containing fluids) = final volume of 1.5ml which is more likely to be a sufficient volume to adequately bath the wound bed without going above the recommended dose.

Constant rate infusion (not for cats)
Fill the catheter with local anesthetic and start a slow infusion for the next 24-48 hours.

• Lidocaine is sufficient for this because of the constant infusion.
• For infusion the dose rate should be 2 mg/kg/hour, and the flow rate should be approximately 5 ml/hour.*** This could be reduced for small dogs that have a smaller catheter in place. The flow rate is designed to provide sufficient pressure to exit the perforations without being enough to cause a seroma.
• ***the infusion rate for lateral thoracotomies or median sternotomies should be lower; begin at 3ml/hr and monitor for tenderness and fluid accumulation and decrease as indicated.
• Calculate the total milligrams per hour for the dog (kg x 2mg).

Next check which category this fits most closely from this list:
• Five ml/hour of straight lidocaine at 2% provides 100 mg/hour
• Five ml/hour of lidocaine diluted to1.5% provides 75 mg/hour
• Five ml/hour of lidocaine diluted to 1% provides 50 mg/hour

• Choose which of these is a best fit for the dog and dilute accordingly.
  • For 1.5% solution remove ¼ of the volume and replace with the same volume of 2% lidocaine.
  • For 1% solution remove ½ the volume and replace with the same volume of 2% lidocaine.
• Example: Using a 250 ml bag of LRS or plasmalyte:
  • for 1.5% lidocaine remove 187 ml fluid and replace with 187 ml of 2% lidocaine
  • for 1% lidocaine remove 125 ml fluid and replace with 125 ml of 2% lidocaine.

• MONITOR the wound site for pain or tenderness on palpation (consider increasing the infusion) or for fluid accumulation. Fluid accumulation usually begins about 24 hrs post-op and the infusion rate should be decreased.

Complications
Possible complications associated with the use of wound infusion catheters include: seroma, edema at incision, infection (however, Abelson et al found no increase in incision complication rate with the use of wound infusion catheters compared to surgical incisions without), nystagmus after TECA, confusion with IV catheter (IMPORTANT TO LABEL), may become disconnected during CRI, cats may pull them out, local anesthetic toxicity/side effects. MONITOR FOR LOCAL ANESTHETIC SIDE EFFECTS/TOXICITY.

Points to remember
• Bury the catheter in deepest part of wound/incision
• Ensure that all micropores are below the skin
• Secure the catheter with a purse string + Chinese finger trap and both plastic tabs
• Choose dosing:
  • Intermittent injection (bupivacaine or ropivacaine 1.5mg/kg q 4hrs) vs CRI (lidocaine @ 2mg/kg/hr)
• The priming volume for all WI catheters = 0.8ml, filters = 1.0ml
• Maintain catheter for 24 – 72 hrs
• Infuse with bupivacaine 1.5mg/kg prior to removal to extend the duration of analgesia
• Assess individual for:
  • Fluid accumulation => lower infusion rate/volume
  • Pain assessment of patient at regular intervals

Tenderness to palpation => dose more frequently (if using intermittent injection – incision pain and reaction to injection can be seen when dosing interval is q 6 hours) increase the infusion rate if CRI has been lowered.
Lower Opioid doses!! – use of wound infusion catheters will lower opioid dose requirements, more signs of opioid dysphoria (or other opioid side effects such as sedation) may be observed if ‘normal’ opioid doses are used.

Case examples/studies
Case examples with be illustrated in the presentation including forelimb/hindlimb amputations, median sternotomy and lateral thoracotomy in dogs and cats.

References