Practice Pearls for Performing Perineal Urethrostomies
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- Use of magnification, delicate suture and proper instrumentation will improve success rate in urethrostomies
- The most common cause of stricture after perineal urethrostomy is failure to adequately dissect the ischiourethralis muscles from the pelvis.
- Primary revision of the original stoma is the treatment of choice for failed PU.

This session will involve an interactive discussion of tips in performing and troubleshooting urethrostomies in cats, using case material and clinical experiences to highlight the pertinent literature. The following notes will provide some background on the literature that will be covered during the discussion.

Tips for urinary tract surgery
1. Direct mucosa to skin apposition is required to avoid stricture formation
   a. Use magnification to ensure correct identification of tissue layers
   b. Tension free anastomosis must be achieved
   c. Place suture from inside to out
2. Gentle tissue handling is necessary, as trauma to the mucosa will cause necrosis and dehiscence
3. Stents may be used to encourage healing of partial defects or the prevent urine from contacting the incision during initial healing

Equipment
1. Magnifying loupes- I recommend 3.5x, wide field
2. Fine-tipped DeBakey thumb forceps
3. Delicate needle holders (Codman microvascular, Ryder, etc)
4. 5-0 monofilament absorbable suture on a small taper needle
5. Tenotomy scissors
6. 11 blade
7. Lone Star Retractor (Cooper Surgical)

Perineal urethrostomy
The feline perineal urethrostomy (PU) procedure has been performed with few alterations since the original description by Wilson in 1971. The cat is positioned in perineal position, with padding under the cranial thighs to prevent neurovascular injury during restraint. The perineal area is aseptically prepared - a step which usually requires removal of the urinary catheter (if one was placed before surgery). After draping, a urinary catheter is placed and secured. I prefer to use a 5 french red rubber catheter, securing it with either a finger trap suture or by clamping the the catheter in the penis using Allis tissue forceps. The latter technique allows you to manipulate the penis and provide tension during dissection. It is helpful to use a sterile marker to plan the incision location, tracing a fusiform shaped incision that includes the penis and scrotum, but terminates a least 1cm ventral to the anus. After incision with a #10 scalpel, subcutaneous tissue is incised until the penis is isolated. Dissection around the penis begins on the lateral side, pulling the penis to the opposite side to create tension on the site of dissection and to improve exposure in that region. I prefer to use tenotomy scissors to perform this dissection due to delicate, blunt tips that are well suited for this area. After initial dissection, the solo surgeon will benefit from placement of a self-retaining retractor using either the Lone Star retractor recommended earlier, or several pediatric Gelpi retractors. With proper retraction, the paired ischiourethralis muscles can be palpated, inserting on the ischium on either side of the penis. These muscles are isolated and either elevated off the bone using a periosteal elevator, scalpel blade or simply transected with electrocautery to minimize hemorrhage. Complete transection is ensured by an ability to pass a finger lateral to the penis and into the pelvic canal, without resistance. The procedure is repeated on the contralateral side. Next, the penis is pulled dorsally to apply tension on the ventral ligament of the penis, which is transected using tenotomy scissors. Ventral dissection is continued until a finger can be passed without resistance into the pelvic canal in this region, as well. Final dissection is performed dorsally, but is performed with more caution as this is the region in which the urethral blood supply and innervation are located. Finally, when the penis is freed 360 degrees, the bulbourethral glands (poorly developed in castrated males) are located. The retractor penis muscle is dissected from the dorsal aspect of the penis and is transected proximally and removed to expose the urethra on the dorsal surface of the penis. The urethra is then carefully incised at a distal location using an inverted 11 blade to make a small stab incision over the red rubber catheter. The tissue is thicker that you may initially expect and a firm incision is required to penetrate the urethral lumen, exposing the catheter. The urethral incision is then extended by inserting the fine tenotomy scissors into the incision and moving proximally to the
level of the bulbourethral glands. The incision may be extended approximately 1cm cranial to the bulbourethral glands to maximize urethral diameter, but incision beyond this point will place excessive tension on the stoma when suturing the perineal skin. At this point, the retractors are removed and initial sutures are placed beginning at the apex of the urethrostomy (dorsally). I place the sutures from inside to out (urethral mucosa to skin), placing one interrupted suture in the center of the urethra and the proximal aspect of the incision, followed by two more interrupted sutures at 45 degrees to the initial suture, spacing about 1-2mm between sutures. It is helpful to preplace all three sutures to maximize exposure of the mucosa for these key sutures. Successful apposition of mucosa to skin is crucial at this point, so use of magnification is encouraged and, if you are in doubt, take the sutures out and replace them. After placement of these three key sutures at the dorsal aspect of the urethrostomy, the traditional procedure involved completing the stoma by placement of interrupted sutures spaced 1-2 mm apart, creating a drainboard of urethral mucosa. The penis is then ligated and transected distally before completing the stoma.

Modifications

**Continuous pattern with absorbable suture**
A minor modification of the technique was proposed by Agrodinia and others, in which two continuous suture patterns were applied using absorbable suture material (polydioxanone). This modification allows for decreased operative time, minimizes the volume of suture material in the wound and obviates the need for suture removal, which can often require sedation. No strictures or dehiscences were noted in the 18 cases that were reported, and overall complication rate was similar to previous reports.

**Positioning/approach**
PU can also be performed with the cat positioned in dorsal recumbency- this is a major advantage in cats with bladder stones, allowing simultaneous cystotomy and PU without repositioning. To facilitate exposure of the perineum, the pelvic limbs are pulled forward and secured to the table. Although this technique is no more difficult than a perineal approach, it does require a bit of practice before you are comfortable with it.

**Postoperative care**
1. An Elizabethan collar must be placed BEFORE recovery from anesthesia, as immediate self-trauma is a common cause of immediate incisional dehiscence.
2. Analgesia with a long acting opioid such as buprenorphine can be combined with a single perioperative dose of NSAIDs in cats that show no evidence of renal dysfunction due to obstructive uropathy.
3. The wound is covered with petrolatum to minimize urine scald and removal of clots that form on the incision is discouraged as this will cause additional trauma to both the cat and the incision.
4. Maintenance of a urinary catheter may seem logical, but is generally avoided due to concerns that the catheter may cause trauma to the incision line and increase the risk of stricture formation.
5. IV antibiotics (cefazolin) are administered at the time of induction, but are typically discontinued after surgery unless indicated by specific culture and sensitivity results.
6. Recheck urine cultures are indicated every 6-12 months due to an increased risk for ascending UTI’s.

**Complications**
Despite the widespread success of PU in accomplishing patent urinary diversion in cats, a number of complications have been reported, including stricture of the urethrostomy, subcutaneous urine leakage in the perineal region, hemorrhage, urinary tract infection and incontinence. Although some of these complications can be managed conservatively, many require surgical revision to restore urinary function. Thus, almost since the inception of the PU procedure, there has been a need for revision methods.

**Revision techniques**

**Prepubic urethrostomy**
One of the original methods for salvage of failed PU surgery is prepubic urethrostomy, transecting the urethra and transposing the stoma to a caudal abdominal location, cranial to the pubis. Unfortunately, subsequent experience with this technique showed a high rate of postoperative complications, including urinary incontinence (6/16 cats) and urine scalding (7/16 cats). Six cats were euthanized within 6 months of surgery and mean survival was only 13 months.

**Subpubic urethrostomy**
A simple extension of the antepubic urethrostomy technique was presented by Ellison, et al in 1989, in which the pelvic urethra was preserved and then transposed to a subpubic position. This technique avoids the urine scald associated with pre-pubic urethrostomy in cats by placing the stoma caudal to the abdominal fat pad. Preservation of more urethral length may also contribute to improved continence with this technique and improved resistance to UTI, although no large studies have been published to date.
Primary revision
In 2006, Phillips and Holt described the results of primary revision of the perineal urethrostomy by revised dissection and mucosa to skin apposition. In this study, 8 of 11 cats had inadequate dissection to the level of the bulbourethral glands and 3 had poor apposition of skin to mucosa during initial surgery. Primary revision of the stoma was effective in 8 of 9 cats available for long-term follow-up.

Transpelvic urethrostomy
Another recent study described transpelvic urethrostomy (TPU) as an alternative salvage procedure for cats with distal urethral trauma or failed PU surgery. The caudal aspect of the ischium is removed through a ventral approach and the urethral stoma is translocated to a sub-pubic position. The advantage of this technique is that it avoids the high rate of incontinence and urine scalding that is seen in prepubic urethrostomy by preserving the intrapelvic urethra and urethral sphincter. Only 1 cat developed temporary incontinence, which resolved by 4 weeks after surgery.

Conservative therapy
As many clinicians have learned, conservative therapy with urethral catherization or urinary diversion can provide an acceptable long term solution in selected animals with urethral tears and urine leakage. A recent clinical retrospective study evaluated prognostic factors for animals with urethral trauma in 20 dogs and 29 cats. Urethral rupture was more common in males of both species, with etiology being most commonly related to vehicular trauma in dogs, and to iatrogenic injury during catheterization in cats. The presence of multiple traumatic injuries served as the only negative prognostic indicator in this series, with location of rupture, clinicopathologic findings, treatment method (surgery vs catherization) and etiology having no significant effect on outcome.

Tube cystostomy
Tube cystostomy is an accepted method for short or long-term urinary diversion. A landmark experimental study performed in an experimental model of intrapelvic urethral transection and primary repair in normal dogs showed that there was no difference in healing of urethral wounds when tube cystostomy was compared to transurethral catheters or both techniques combined. A recent follow up study on tube cystostomy in 76 animals showed that complications were common (49%), although most were treatable through non-surgical intervention. Urinary tract infection was nearly universal (16 of 17 animals that had urine culture checked after tube implantation cultured positive). Inadvertent tube removal was the most common major complication and occurred in 12/76 animals, but was typically handled conservatively (8 animals) or by tube replacement (4 animals). Only 1 animal required surgical revision due to uroperitoneum after tube removal. The most common minor complication was irritation around the tube site (7/76) or urine leakage around the tube (7/76). Complication rate was not associated with species, tube type or duration of tube retention.

References