Cystolithotomy: Surgery for Bladder Stones

Cystolithotomy (sectio alta) is the surgical removal of bladder stones via a lower abdominal incision. The term sectio alta refers to the historical techniques of bladder stone surgery, since in former times perineal surgery was common (sectio lateralis and sectio mediana).

Indications for Sectio Alta

Bladder stones (Cystolithotomy), see also transurethral cystolitholapaxy

Removal of foreign bodies in the urinary bladder

Treatment of bladder tamponade and severe bladder bleeding, which cannot be managed via transurethral surgery

Contraindications for Cystolithotomy

Contraindications for planned surgery are: coagulation disorders, untreated urinary tract infection, bladder cancer.

Surgical Technique of Cystolithotomy

Preoperative Patient Preparation

Exclusion or treatment of a urinary tract infection

Perioperative antibiotic prophylaxis

Supine position with slight hyperextension of the lumbar spine

Disinfection and draping

Insert a transurethral catheter and fill the bladder with 200–300 ml

Surgical Technique
Lower midline incision or Pfannenstiel incision

Cut the linea alba

After blunt dissection of the retropubic space (cavum retzii), insert a wound retractor

Vertical cystostomy, which is secured with sutures to prevent further tearing

Remove bladder stones, foreign bodies or bladder tamponade, control bleeding.

If necessary, perform simple prostatectomy

If needed, insert a suprapubic catheter

Close the bladder in two layers (mucosa – muscularis)

Drainage of retropubic space

Closure of the linea alba, skin closure

Care after Cystolithotomy

General measures:

Early mobilization. Thrombosis prophylaxis. Analgesia with e.g. metamizol and tramadol. Laboratory controls (Hb). Wound inspections.

Drains and Catheters:

Wound drainage 1–2 days

Foley catheter for 5 days, do cystography before catheter removal

Complications of Cystolithotomy

Urinary tract infection, bleeding, wound infection, urinoma, thrombosis, pulmonary embolism.
Urethrostomy

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Urethrostomy is a surgical procedure that creates a permanent opening in the urethra, commonly to remove obstructions to urine flow. The procedure is most often performed in male cats, where the opening is made in the perineum.[1]

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[edit]History

For many years perineal urethrostomy has been used in cattle, sheep and goats, especially young males that have been castrated at a young age, for obstruction by uroliths. However, the anatomy of the male cat is quite different and the urethra is very small in diameter.

Perineal urethrostomy in the male cat was developed in 1962 and published in the Journal of the American Veterinary Medical Association in 1963.[2] It was modified in 1967,[3] and further modified in 1971.[4]

[edit]Pre-surgical considerations

Since animals are potentially suffering from severe metabolic derangements at the time of initial presentation, animals need to be stabilized prior to surgery. Common physiologic derangements noted
on bloodwork are elevated kidneys values (azotemia) and elevated potassium levels (hyperkalemia). The presence of profound sedation, low body temperature, and/or a slow heart rate (bradycardia) are usually associated with more severe blood derangements.

Ideally, the urethral obstruction is removed or temporarily bypassed with urethral flushing (urohydropulsion) and the placement of an in-dwelling urinary catheter prior to surgery. This catheter allows urine to be removed from the body, and, along with fluid therapy, help normalize blood derangements to resolve prior to anesthesia. There are many types of catheters commonly used, including common red rubber catheters, stiff Tomcat catheters, soft and flexible Cook catheters or semi-rigid "Slippery Sam" catheters.

Sedation is usually required for urohydropulsion and the placement of a urinary catheter due to the associated pain with the procedure. A combination of injectable ketamine and diazepam is a safer option for sedation considering its reduced cardiopulmonary depression effects compared to other anesthetics. A combination of etomidate and diazepam would be an even safer anesthetic consideration, but etomidate is not commonly carried by general veterinary practitioners due to its cost.

Fluid therapy is equally essential for correcting derangements. Commonly, a fluid low in potassium, such as 0.9% NaCl, is selected. If 0.9% NaCl is not available, any other crystalloid fluid is realistic even if it contains some level of potassium. Insulin is sometimes used intravenously to temporarily reduce high potassium levels. Calcium gluconate can also be used to protect the myocardium (heart muscle) from the negative effects of hyperkalemia.

Rarely, an urethral obstruction cannot not be removed on initial presentation and emergency surgery must be performed immediately to return urethral patency and save the animal's life. These animals are at a much higher risk under anesthesia.

[edit]Surgical technique

The cat can be placed in either dorsal or ventral recumbency. An elliptical incision is made around the base of the penis and scrotum. If the cat has not been neutered previously, it must be neutered before the perineal urethrostomy can be performed. A combination of sharp and blunt dissection is started ventrally (the underside of the penis) to expose the penis’ muscular and soft tissue attachments to the pelvis. After removing these soft tissue attachments to the pelvis, dissection is continued dorsally (on top of the penis) to remove the dorsal retractor penile muscle and other soft tissue covering the site of the required urethral incision.

All of these dissection steps are necessary to free the penis from the pelvis, allowing the veterinarian to move the significantly wider pelvic urethra caudally (or rearward) so it can be attached to the skin.

After the penile body is freed, a dorsal incision is started at the tip of the penis using either a small scalpel blade or fine ophthalmic scissors. This incision is extended to a level at or above the bulbourethral glands. At this level, the urethra is considered wide enough to create an adequate stoma,
or urethral opening. The urethra is sutured to the skin for approximately 2 cm using a fine suture on a taper needle (i.e. 4-0 PDS). The remainder of the penis is amputated and any remaining skin defect is closed.

As the surgery site heals, the urethral mucosa and skin will heal together creating a permanent stoma. This stoma (opening) is much larger than the original penile urethra making it unlikely for the animal to obstruct in the future.

A urinary catheter may be placed following surgery for the initial 12–24 hours of recovery. This catheter should not be left in longer than this though, as it will increase the likelihood of stricture formation at the surgery site. Animals should wear an e-collar until sutures are removed in 10–14 days.

[edit] Post-operative complications

Initial post-operative complications include wound infection and excessive pain or bleeding. These can be controlled commonly with appropriate prescription medications or ice packs if the animal will tolerate them. A more concerning, though not common, complication is stricture, or narrowing, of the surgery site. The formation of a stricture will require additional procedures to either try and salvage the initial surgery site or create a new urethral opening (or stoma) under the floor of the pelvis (subpelvic urethrostomy) or immediately in front of the pubic bone (prepubic urethrostomy).

The most common long term complication associated with this surgery is an increased incidence of urinary tract infections.

Ureterolithotomy refers to the open or laparoscopic surgical removal of a stone from the ureter. Within the last decade, ureterolithotomy has become very rarely performed because of the advent of minimally invasive procedures for stone removal and fragmentation. Ureteroscopically, stone removal is performed via basket extraction under direct vision, while stone fragmentation is achieved with electrohydraulic lithotripsy (EHL), pneumatic contact lithotripsy (lithoclast), and pulsed dye and holmium laser lithotripsy. Alternatively, stones may be fragmented even less invasively via extracorporeal shockwave lithotripsy (ESWL).

The most recent advances in ureterolithotomy involve laparoscopic and laparoendoscopic single-site surgery (LESS).[1] However, open ureterolithotomy still has a role when such sophisticated modalities are unavailable, when other therapies have failed, and in cases involving significant ureteral strictures that prevent endoscopic access.

Laparoscopic ureterolithotomy is depicted in the video below.
Problem

Stones that cause severe pain, complete obstruction of the ureter, fever, and urosepsis require treatment that includes prompt appropriate drainage (eg, ureteral stent, percutaneous nephrostomy) and subsequent definitive stone removal. Ureterolithotomy has finite indications and is used most commonly when minimally invasive therapies have failed.

Frequency

Ureterolithotomy (surgical removal of the stone from the ureter) is performed rarely at present; however, it continues to be considered when other modalities, such as ureteroscopy with basket extraction, laser lithotripsy, EHL, or ESWL fails.

Most ureteral stones form in the kidney and migrate into the ureter. Many stones are passed spontaneously. Stones larger than 10 mm are unlikely to pass spontaneously, and some small stones often require surgical intervention, perhaps owing to irregular margins of the stone. During ureteral passage, stones most commonly become lodged at the narrow areas of the ureter, in the proximal ureter at the ureteropelvic junction, in the mid ureter where the ureter crosses the iliac vessels, and in the lower ureter at the ureterovesical junction.

Ureteral stones often present as renal colic. The pain is typically intermittent but may be constant, with radiation into the groin or testicle. The pain varies from severe to a dull ache and is more common on the left side.

Frequently, the patient constantly shifts to find the position of maximal comfort.

Ureteral stones are more common in men. Urinalysis is usually positive for occult blood.

Results on physical examination may be normal except for some costovertebral angle tenderness.

Indications

Although open ureterolithotomy has become very rare within the last decade because of the advent of extracorporeal and intracorporeal lithotripsy, it still has a role when such sophisticated modalities are lacking, when other therapies have failed, and in cases involving significant ureteral strictures that prevent endoscopic access.
Conservative treatment is possible for stones smaller than 5 mm. On occasion, pain, infection, and associated anatomical abnormalities necessitate surgical intervention for smaller stones.

First-line surgical intervention involves minimally invasive procedures. Depending on the location of the stone, experience of the urologist, and preference of the patient, either ESWL or ureteroscopy and intracorporeal lithotripsy are instituted. With the miniaturization of scopes and use of sophisticated wires, dilators, access sheaths, and stents, even cases involving complicated stones (ie, stricture with impacted stone) can be approached with ureteroscopy. Even in patients who present with sepsis and hydronephrosis due to an impacted stone, the preferred treatment is percutaneous drainage of the kidney with nephrostomy and delayed endoscopic treatment of the stone. However, in cases that involve failure or other extenuating circumstances, ureterotomy can be performed.

Contraindications

Ureterolithotomy is contraindicated in patients who are medically unfit for an open surgery or who harbor an active infection. Consider noninvasive procedures, such as ESWL, and minimally invasive ureteroscopy first. Consider ureterolithotomy only as a last resort.