

SURGERY OF THE URINARY BLADDER

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ANATOMY



- Attached to the abdominal wall via loose double-layer peritoneal ligaments
 - Ventral median ligament can be cut before cystotomy
 - Lateral ligaments should be identified and avoided during dissection
- May normally be partially located within the pelvic canal if distended
- The ureters tunnel for a short distance through the dorsolateral bladder wall
- The trigone is the area between the ureteral openings in the dorsal bladder wall and the proximal urethral opening at the bladder neck





Innervation



- Hypogastric nerve
 - $\alpha\mbox{-adrenergic}$ receptors keep smooth muscle in bladder neck and proximal urethra contracted
 - β -adrenergic receptors relax the detrusor muscle in the bladder wall
- Pelvic nerve
 - Stretch of detrusor muscle initiates reflex contraction of detrusor
 - Acts on brain stem to relax smooth and striated muscle in the urethra



Innervation



- Pudendal nerve
 - Innervates the striated muscle in the external urethral sphincter
 - Reflex or voluntary relaxation
- All innervation to the bladder merges at the pelvic plexus and enter the bladder along the dorsal surface at the bladder neck



Vascular supply

- Enters dorsally
- Caudal vesical artery
- Venous drainage via the internal pudendal veins
- Lymphatic drainage via hypogastric and sublumbar lymph nodes



SURGERY PRINCIPLES



- Heals quickly
- Monofilament suture material recommended
- Avoid nonabsorbable suture material or staples
 - Poldioxanone or polyglyconate
 - Poliglecaprone 25 not sufficient tensile strength
 - 3-0 to 5-0 in size
- Single continuous running horisontal mattress
- Suture must penetrate submucosal layer but should not penetrate the mucosa
- Augmentation with omentum







- Clean contaminated surgery
- Prophylactic antbiotics does not reduce the rate of infection unless
 - Prolonged surgery
 - Urinry tract obstruction
 - Urine leakage
 - Traumatized tissues
 - Renal failure
- Pathogens ascend from the urethra
 - E.coli
 - Proteus spp,
 - Staphylococcus intermedius
- Amoxicillin, cephalosporine



Anaesthesia

- Adequate fluid therapy essential in the perioperative period
- Evaluate and treat azotemia
- Check potassium if urinary tract obstruction or rupture
- Maintenance with isoflurane or sevoflurane
- Avoid NSAID until normovolemic and eating
- Measurement of urine output postoperatively
 - Normal urine production 1-2 mL/kg/h





Operating technique



- The bladder should be emptied either preoperatively or intraoperatively
- Stay sutures used for handling and manipulation of bladder
- Tissues should be kept moist
- Diathermy should be avoided



CATHETER BIOPSY

- Noninvasive
- Advance a urinary catheter to the level of interest
- Press catheter against tissue and aspirate with syringe
- Ultrasound guidance helpful



CYSTOTOMY

- Indications
 - Removal of calculi
 - Repair of bladder trauma
 - Resection or biopsy of bladder neoplasia
 - Repair of ectopic ureters
 - Biopsy and/or culture of the bladder wall
 - Inspection and catheterization of ureters when idiopathic renal hematuria





- Isolate the bladder from the rest of the abdomen with moistened laparotomy swabs
- Place a stay suture in the apex
- Make a ventral cystotomy in the midline
- Remove urine and blood with suction
- Extend the incision and place further stay sutures as needed
- Routine closure



CYSTECTOMY

- Indications
 - Patent urachus
 - Bladder diverticulum
 - Bladder neoplasia
 - Polyps
 - Bladder necrosis
- Percentage that can be resected unkown in dogs
- Intact trigone is essential
- Procedure same as for cystotomy





CYSTOSTOMY



- Indications for temporary cystostomy tube
 - Lower urinary tract obstruction
 - Bladder or urethral trauma
 - Postoperative after bladder or urethral surgery
- After celiotomy make a paramedian stab incision in the abdominal wall
- Make a purse-string suture in the bladder wall and make a stab incision within the suture
- Insert the distal end of the tube into the bladder and tighten the suture
 - 8-14 Fr Foley catheter, mushroom catheter or silicone gastrostomy tube





- Place 3 to 4 nonpenetrating interrupted sutures from the bladder around the tube to the abdominal wall
- Secure the external tube to the body wall with Chinese finger trap suture

- Tube has to remain in place for at least 7 days
- Aseptic technique important when emptying the bag



CYSTOPEXY



- Indicated for the prevention of bladder reflection
- Performed either via
 - Tube cystostomy
 - Incisional cystopexy



Incisional cystopexy



- Apply gentle cranial traction to the bladder
- Choose a corresponding area on the abdominal wall halfway between the linea alba and the sublumbar musculature
 - If performed on the right sided the deep circumflex iliac artery must be avoided
- Abrade the areas to be pexied with gauze swabs
- Suture the bladder to the abdominal wall with three longitudinal rows of 6 simple interrupted sutures
 - 3-0 polypropylene suture material
 - Through submucosal and seromuscular layers of the bladder
 - Through the transverse abdominal muscle of the abdominal wall

CONGENITAL BLADDER ABNORMALITIES

- Vesicourachal diverticulae
- Patent urachus
- Bladder hypoplasia
- Genitourinary dysplasia (cats)
- Trigone diverticulae
- Bladder agenesis
- Bladder exstrophy
- Urachal cyst
- Urinary bladder duplication
- Colocystic fistula





BLADDER RUPTURE

- Secondary to
 - Trauma
 - Severe cystitis
 - Bladder neoplasia
 - Urethral obstruction
 - Bladder catheterization
 - Manual bladder expression
 - Complication of bladder surgery
 - Iatrogenically after cystocentesis





- Medical emergency
- Requires stabilization before induction of anaesthesia
- All devitalized tissue needs to be resected
- The bladder suture is omentalized
- Cystostomy tube may be necessary
- Prognosis regarding the bladder only is good



BLADDER CALCULI

- Common in both dogs and cats
- Main types
 - Struvite
 - Calcium oxalate
- Urine culture always indicated
- Struvite, cystine and urate respond to medical therapy
- Calcium oxalate and silicate needs surgery
 - Catheter-assisted retrieval
 - Cystoscopic retrieval
 - Voiding hydropropulsion
 - Cystotomy (surgical or laparoscopic-assisted)
 - Lithotripsy





Voiding hydropropulsion



- Only suitable for small smooth uroliths
- General anaesthesia recommended
- Catheterize the bladder and distend it with saline
- Remove the catheter and place the patient upright
- Gently agitate the bladder and then express it
- Repeat as necessary
- Follow up with radiographs or ultrasound





- Surgical cystotomy most common method for removal of cystoliths
- Catheterize urethra and flush repeatedly in retrograde manner
- Important to visualize and inspect entire mucosa
- Routine closure
- Follow-up with radiographs postoperatively



Lithiotripsy



- Fragmenting uroliths by laser energy or shockwaves
 - Ho:YAG laser
- Longer anaesthesia
- Shorter hospitalization
- Expensive equipment
- Comparable to surgery regarding outcome



POLYPOID CYSTITIS

- Uncommon
- Female dogs
- Located cranioventrally
- May be secondary to
 - Recurrent urinary tract infection
 - Cystic calculi
- Combination of medical and surgical

management

- Partial cystectomy
- Excisional biopsy
- Laparoscopic-assisted cystoscopy
- Medical management for lower urinary tract infection







BLADDER NEOPLASIA



- Rare in both dogs and cats
 - Transitional cell carcinoma most common
 - Lymphoma, rhabdomyosarcoma, adebocarcinoma, squamos cell carcinoma, hemangioma, hemangiosarcoma, finroma, fibrosarcoma, leiomyoma, leiomyosarcoma
- Almost always malignant (97%)
- Metastases rare
- Male cats and neutered dogs may be more prone
 - Airdale terrier, Beagle, Shetland sheepdog, collie, Scottish terrier
- Predilection site at the trigone region





- Wide excision of benign bladder tumours recommended
- Transitional cell carcinoma diffuse and aggressive
- Partial cystectomy in combination with chemotherapy possible
- Poor prognosis
- MST 6 months or less



QUESTIONS?



