Urolithiasis

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Introduction

• Tennessee second largest goat population in US after Texas.

• Most common problems
  • Anemia/parasites
  • Trauma/dog attacks
  • Urolithiasis
  • Polio
  • Listeria
Introduction

- Difficult, challenging and costly problem
  - Primary objective is to select the most appropriate diagnostic and treatment plan which will result in a satisfactory outcome at least cost to the owner.
Identifying the Case

• Male, castrate?
  • Urethral diameter
    • Increase with age
    • Calcium stones often very large anyway
  • Late castration
    • Unwanted pregnancies
    • Welfare – long recovery time
Identifying the Case

• Breed
  • Typical profile
    • Neutered goat African descent > 1 year old
    • African origin breeds: Pygmy; Nigerian dwarf; Boer 146/275 (53%). Higher risk of calcium stones
    • Odds lowest for Anglo Nubian and Toggenburg.

• Diet
  • Very important indicator of type of stone
    • Struvite
    • Calcium
Identifying the Case

• Off-feed, Depressed
  • Directly related to systemic/metabolic problems
    • Hyperkalemia/hyponatremia/dehydration/azotemia

• Straining/Posturing/Vocalization

• Dribbling
  • Look for stones/gravel sticking to hair
  • Measure solubility in acid

• Tail switching

• Swelling. Perineal area/”water belly”
  • Urethral rupture
    • Necrotizing inflammation
    • Abscess formation
Factors influencing outcome

• How long has it been going on for
  • Likelihood of complications
    • Hydronephrosis
    • Ruptured bladder; azotemia; electrolyte changes

• Is the animal used for breeding
  • Look for signs of urethral rupture
    • Perineal/ventral swelling
Diagnostic approach

• Confirm diagnosis Palpation or Ultrasound
  • Check kidneys – hydronephrosis. US & BUN/Creatinine
  • Check for bladder rupture. Can cause hyperkalemia /hyponatremia
  • Check K  If > 6 give 50% dextrose (0.5ml/kg) and insulin (0.1 – 0.2 units/kg)
  • During surgery: If hypotensive, tend towards arrhythmia can give dobutamine (0.5 - 5µg/kg/min) and calcium (23% at 0.5ml – 1ml/kg over 1 hour or 1ml/10kg 10% CaCl during anesthesia
Factors influencing outcome

Primary food and water source

- Grain (Struvite - magnesium ammonium phosphate) reversible in acidic solution
- Roughage/water (Calcium phosphate or carbonate) more stable
  - Calcium carbonate most common stone
- Can be used as basis for treatment plan
Urethral process

• Remove.
  • Rarely successful as only treatment with or without ammonium chloride
  • Place animal in sitting position
  • Instill 3-5 ml lidocaine in prepuce
  • Gentle traction with sponge forceps while pulling prepuce down (unrolling a sock)

• Persistent vermiform process
  • Gently peel off attachment

• Necrosis of the tip of the penis in some cases
Urethral process removal

• Is it critical
  • If struvite: No – will dissolve with rest of stones
  • If Calcium: Try. If unsuccessful take x-ray
    • If single stone in then re-try/preputiotomy
      • May be in urethral process only
      • Lithotripsy
      • Urethrostomy
    • If “pearl string” Have to do urine diversion surgery anyway
Medical Treatment

• Ammonium Chloride
  • 0.5%-1% of the ration
  • 200-300 mg/kg/day PO SID
  • May take up to 5 days before effective decrease in urine pH
  • Toxicity. Can cause a hyperchloremic metabolic acidosis
  • Acidic urine pH not maintained - renal adaptation through bicarb
  • Can cause severe chemical pharyngitis
  • Owner compliance
Important issues

• How long has it been going on for?
• Is animal used for breeding?
• Is the urethra ruptured?
• Urethral process amputation/ammonium chloride/retrograde catheterization rarely successful.
• What is the diet? Struvite vs Calcium stones?
• Prognosis and cost
Medical Treatment: Bladder lavage with acidic solution (Walpole’s; Renacidin)

Grain diet. Struvite suspected. Financial constraints

• Obtain stone if possible to see if dissolves
• Ultrasound bladder
• Cystocentesis after sterile prep
• Lavage bladder with 50 ml multiple times
• Monitor urine pH - stop lavage when pH < 4-5
• Leave 50 ml in bladder

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Medical Treatment

• Results of Walpole’s solution study
  • 20/25 (80%) goats urethral obstruction resolved and were discharged
  • 5/25 (20%) euthanized due to failure to relieve obstruction
  • 6/20 (30%) that were discharged were reexamined due to recurrence of urethral obstruction

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Percutaneous tube cystostomy
Grain diet
Struvite suspected

Tube cystostomy via laparotomy

**Normograde** catheterization and flush uroliths

Unblock

Unblock 50/63 (76%) goats:
Urination 11 days
Hospital 14 days
< 20% re-obstruction

Failure to unblock

Continue flushing

Long term Foley PU
Vesico-preputial anastomosis
Surgical Tube cystostomy

• Inguinal abdominal incision
  1.5 – 2 inches lateral to penis.
Exteriorize bladder
Stay sutures at apex
Cystostomy ventral aspect
Flush bladder and urethra
Foley catheter placement
Foley catheter placement
Foley catheter placement
Continue flushing daily with Walpole solution
Renacidin Irrigation

• Contains Citric Acid, Glucono-delta-lactone and Magnesium Carbonate
• Targets apatite and struvite:
  • Apatite calculi are mainly calcium: action results from an exchange of Magnesium from the solution for calcium in the stone; the magnesium salts are soluble in gluconocitrate solution = dissolution of the calculi
  • Struvite calculi are composed of mainly magnesium ammonium phosphates, which are solubilized by the solution due to the acidic pH
Long term tube cystostomy

• Success rate, 84% to 86%.
• Problems:
  • Client compliance
  • Tube becomes dislodged
    • Has to be replaced quickly
    • Use short tube 8.5inch/22 Fr
  • Urine scald – usually not serious
  • Persistent low grade cystitis
  • Tube becomes obstructed with cellular and mucoid debri
calcium carbonate based on water and food supply

Large bladder on palpation or US

Survey radiographs
29 cases 85% positive

Few uroliths

Cystocentesis

Lithotripsy
Endoscopic removal

PU/ Vesico-preputial anastomosis/Marsupialization
Calcium carbonate

Large bladder on palpation or US

Survey radiographs

Many uroliths

Euthanasia
cystocentesis

Modified perineal urethrostomy/
Vesico-preputial anastomosis
Marsupialization
Vesico-preputial anastomosis

• Advantages
  • Reduce/eliminate urine scald

• Disadvantages
  • Stricture at anastomosis site

• 4 Cases completed
  • 3 cases OK.
  • 1 case died of azotemia after stricture
• Determine margins of abdominal incision
• Center should align with end of preputial cavity
• Place stay sutures in apex of bladder
• Pull apex through the abdominal incision 1.5 – 2 cm
• Anchor the bladder wall to the abdominal wall using simple interrupted; horizontal mattress or cruciate sutures
• Bladder anchored to abdominal wall.
• Should be leakage proof
• Isolate penis and amputate
• Undermine and dissect the prepuce away from the skin and abdominal wall.
• Make a circular incision around the penis at the point of entry into the preputial cavity. Remove penile stump
• Cut an appropriate size (slightly larger than 22 Fr Foley) circular opening into the bladder
• Enlarge the opening in the prepuce to match that in the bladder
• Use simple interrupted sutures to facilitate mucosa to mucosa apposition
Perineal urethrostomy

• Traditional perineal urethrostomy
  • Salvage: Stricture in 45% to 78% within 8 months

• Modified perineal urethrostomy
  • No long term *strictures* or recurrences in 3 goats (14, 15, and 26 months).
    • 1 goat urinated to the left.
    • Severe hemorrhage in one goat.

• Additional findings:
  • Easy catheterization in all goats.
Modified proximal perineal urothrostomy

• Problems
  • Immediately post op
    • Hemorrhage. May be severe/intermittent
    • Diaper type bandage sometimes necessary
  • 2-3 weeks
    • Wound dehiscence/ tissue necrosis
• Long term
  • Stricture
  • Re-obstruction due to more stone formation
Surgical positioning

• Raise table as high as practically possible. Lower head.
• Let legs hang over end of table
• Prop hind quarters up with towels
• Make 4cm incision from 1cm below anus to halfway down the perineum
• Isolate penis with blunt dissection and free from surrounding tissues to pelvic attachments
Transect ischiocavernosus muscles taking care not to cut urethra
Dorsal penile vessels

Penile stump. Leave 1-1.5 inches

Dr Karen Tobias
UT
Elevate any remaining ischial attachments.
Cutting urethra open (side view)

Dr Karen Tobias
UT.
Incise urethra, and suture mucosa to skin.

3-0 or 4-0 absorbable monofilament

Note mucosal edge
Add sutures as needed to appose mucosa to skin, and close any remaining skin wounds.
Conclusions

• Risk of postoperative stricture in nonbreeding goats with recurrent urethral obstruction may be reduced with modified proximal perineal urethrostomy
  • Transection of ischiocavernosus muscles.
  • Careful, accurate apposition of mucosa to skin.

• Long term study on a larger number of goats is needed to verify these findings.
• Bladder marsupialization
  • Success rate, 66% to 94%.
  • Incontinence, urine scald, infection, mucosal prolapse.