COLLEGE OF VETERINARY MEDICINE

Emergency Surgery in Camelids

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Surgical Emergencies

- GI / Abdominal Emergencies
  - Obstructions
  - GI Ruptures
- Traumatic Wounds
  - Hemorrhage
  - Infection
- Reproductive Emergencies
  - Dystocias
  - Uterine Torsion
- Orthopedic emergencies
  - Fractures
  - Ligament / Tendon disruption

TRAUMATIC EMERGENCIES

Traumatic Emergencies

- Dog attack – Most common
- Other wild animal attack
- Male vs. Male
- Hit by car (truck/tractor/ATV)

Hemi-Castration

Traumatic Injuries

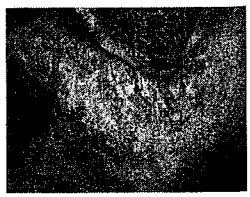
- Control Hemorrhage – 1st priority
  - Pressure
  - Tourniquet
  - Ligation
  - Cautery
  - Vasoconstrictors

Traumatic Injuries

- Treat Shock
  - Crystaloids
    - LRS
    - Hypertonic Saline
  - Colloids
    - Hetastarch
    - Plasma
  - Blood / Red cell products

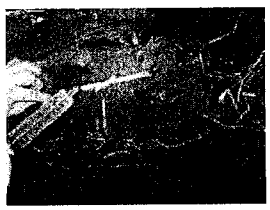
Wound Evaluation

- Fiber clipped around wound
  - Good margins
  - Avoid contamination of wound with fiber
    - Sterile lube



Wound Evaluation

- Structures involved
  - Vessels
  - Nerves
  - Joints
  - Tendons
  - Body Cavity
- Radiography
  - Foreign Bodies
  - Contrast / Probe



Tip of the Iceberg

Thoracic Wounds

- Suspect Pneumothorax
  - Radiographs to rule in/out
- Wounds should be covered ASAP
- Debridement similar to other wounds
- Oxygen beneficial
- Chest tube
  - **SLOW** evacuation of air

Abdominal Wounds

- Assume peritonitis is likely
  - Abdominocentesis
- Evaluate for GI involvement
  - Ultrasound / Radiographs
  - Exploratory

Synovial Wounds

- Radiography / Ultrasound
- Prophylactic therapy for septic arthritis
  - Broad spectrum antibiotics
  - Regional limb perfusion
- Aggressive joint lavage
  - Through and through needle lavage
  - Arthroscopy

Traumatic Wounds are Contaminated

- Good Debridement
- Lavage, Lavage, Lavage
- Culture and Sensitivity
- Broad spectrum antibiotics

Debridement

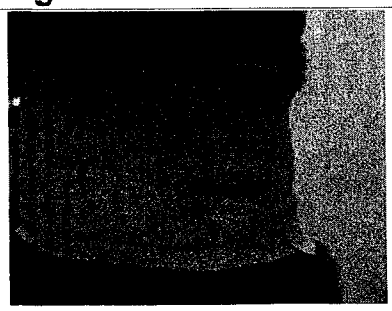
Lavage

Closure

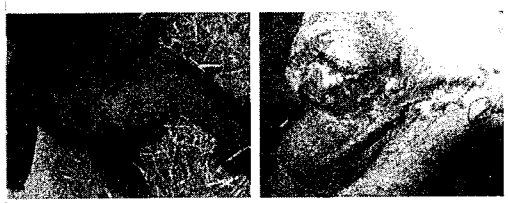
- "Golden period"
  - Acute phase
  - < 6-12 hrs old
  - Primary closure
- Chronic Wounds
  - Delayed primary closure
  - 2nd intention healing
  - Primarily closed wounds likely to dehisce

2nd Intention Healing

Analgesics



Hemi-Castration – Fail



GI EMERGENCIES

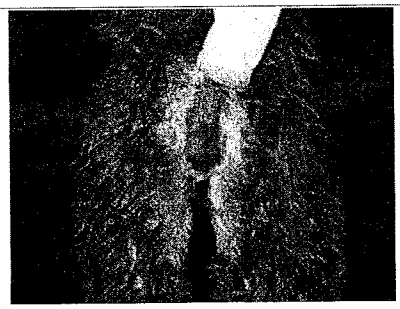
GI Lesions

- C3 Ulceration
- Intussusception
- GI Volvulus
- Atresia Ani / Coli
- Feed Impaction
- Trichophytobezoars
- Peritonitis
- Enteritis
- Adhesions

The Million Dollar Question …

MEDICAL VS. SURGICAL THERAPY

Atresia Ani



Ancillary Tests

- Biochemistry Profile
- Abdominocentesis
- C1 Chloride
- Transabdominal Ultrasound
- Abdominal Radiography

Clinical Signs

- Colic
- Rolling
- Laying with legs out to side
- Kicking @ abdomen
- Vocalization
- Bruxism
- Tachycardia
- Decreased or absent fecal output
- Tense abdomen

Metabolic Abnormalities

- Severity depends on location of obstruction
  - Proximal obstructions more severe
- HCl secreted in C3 → sequestered in C1
  - Increased C1 chloride concentration
  - Decreased C1 pH
  - Hypochloremic
  - Hypokalemic
  - Metabolic alkalosis

Metabolic Abnormalities

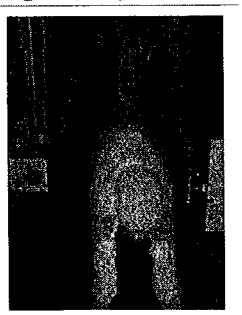
- Confounding factors
  - Chloride absorbed by C1
  - Medical causes of GI stasis can cause increased C1 chloride
  - Lactic acidosis if bowel ischemia

Abdominocentesis

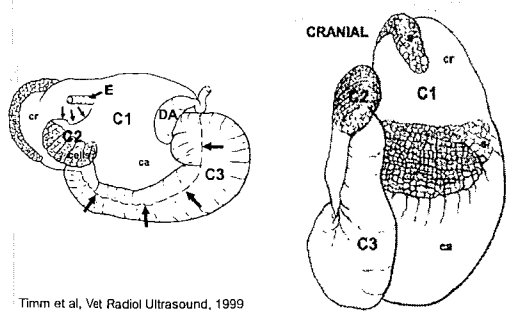
- Ultrasound guidance for identification of large fluid pockets
- Normal Values (Cebra, et al. JAVMA, 2008)
  - 250 – 1,900 nucleated cells / µL
    - (40-85% PMN's)
  - Total Protein = 1.0 – 1.4 g/dL
  - Lactate = 0.2 to 1.05 mg/dL

Abdominal Radiography

- Can be diagnostic in camelids
- More difficult to interpret than small animals
- Good technique essential

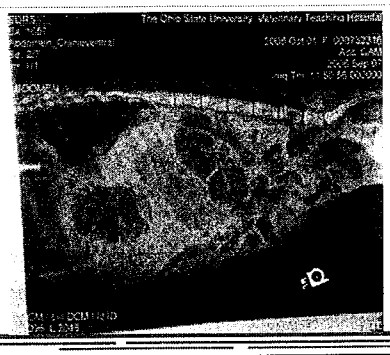


Neonatal Radiography

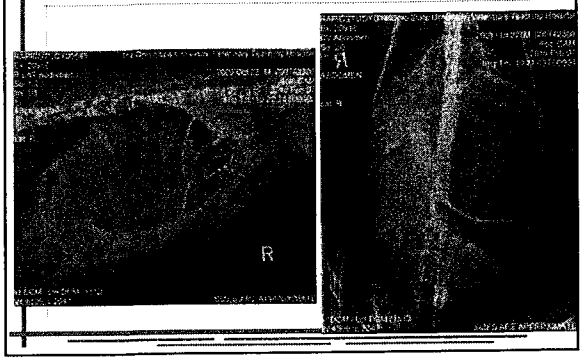


Timm et al, Vet Radiol Ultrasound, 1999

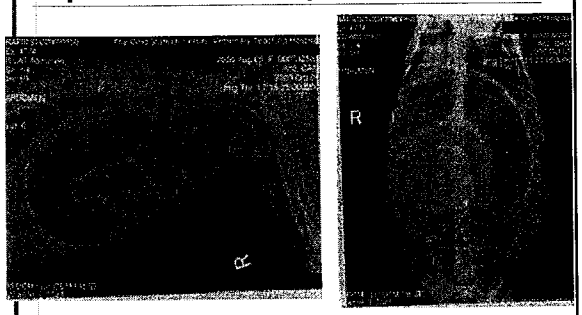
Cria Abdomen



Abdominal Rads



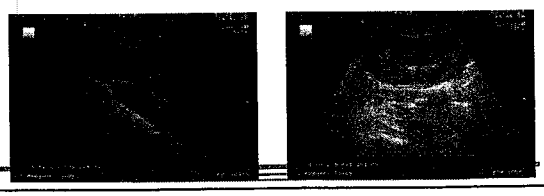
Spiral Colon Impaction



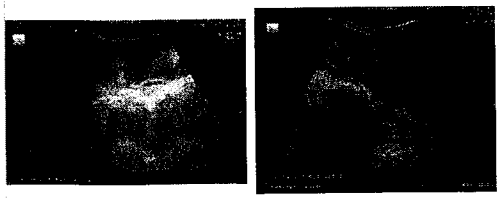
Abdominal CT

Ultrasonography

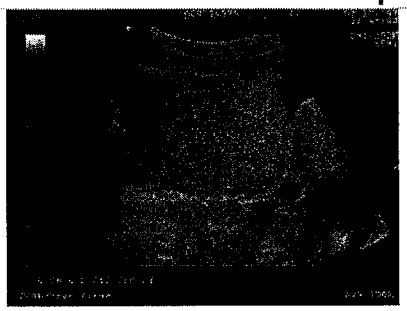
- Liver, Kidneys, Bladder
- May see lesion itself
- Distended loops of intestines
- Free abdominal fluid



Free Fluid



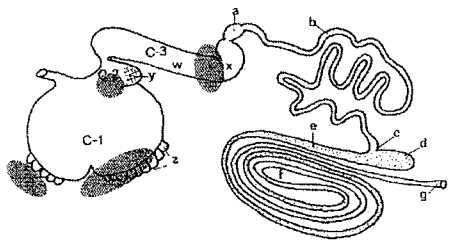
Distended Intestinal Loops



Abdominal Exploratory

- Approach depends on suspected lesion
  - **Right flank** – best overall explore
  - **Ventral midline** – caudal structures / urogenital tract, equal access to right and left
  - **Left flank** – C1 compartment, spleen
  - **Paracostal** – C3 compartment, pylorus, duodenum

GI Anatomy



Medicine and Surgery of South American Camelids, Fowler, ME.

Abdominal Exploratory

Anesthesia and Restraint

- General Anesthesia
  - Tracheal intubation
- Local Anesthesia
- Sedation

Abdominal Exploratory

Be Prepared …

- Resection and anastomosis
- Enterotomy
- Hemostasis
- Biopsy
- Shock

Abdominal Exploratory

Intestinal viability

- Compromise due to
  - Strangulation
  - Distension
- Assessment
  - Intraluminal Pressure
  - Color changes
  - Motility
  - Others

Abdominal Exploratory

Abdominal Exploratory

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Caution!

Distended bowel often develops thin, translucent walls. Dark ingesta within may cause congested, compromised appearance in healthy bowel.

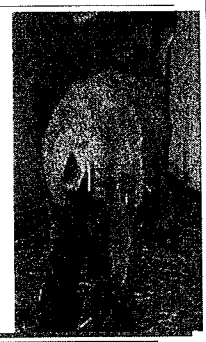
Adjunctive Therapy

- Prompt therapy is often necessary
- IV fluids
  - Balanced electrolytes
  - Hypertonic saline
  - Colloids
- Analgesics
- Antibiotics
- Be prepared to refer/transport if necessary

REPRO EMERGENCIES

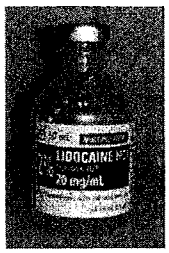
C-Section

- Indications
  - Improper positioning
  - Incomplete Cervical Dilation
  - Fetomaternal Mismatch
  - Uterine Torsion
  - Elective (not recommended)



C-Section

- Anesthesia
  - Local / Regional
    - 2% lidocaine
      - Toxicity possible
      - Dose = 4 mg/kg
      - Dilute to 1% to extend volume
  - Epidural
  - Sedation
  - General



C-Section

- Positioning
  - Depends on surgical approach
  - Standing (not recommended)
  - Right lateral recumbency
- Restraint
  - Chemical
  - Legs tied
  - Assistant @ head

C-Section

- Approach
  - Left flank preferred
  - Others
- Incision
  - Conservative in length
  - Oblique vs. Straight
  - Hemostasis

C-Section

- Uterine exteriorization
  - Using hock and metatarsus as "Handle"
  - Pull enough uterine horn out of incision to prevent abdominal spillage

C-Section

- Hysterotomy incision
  - Incision from hock to fetlock
  - New scalpel
  - Thin uterine wall
  - Avoid tearing of uterus!
  - Don't cut cria!

C-Section

- Hysterotomy closure
  - Absorbable suture
    - Chromic Gut
    - Polydiaxanone (PDS)
    - Polyglecaprone 25 (Monocryl)
  - Size = 2-0 or 0
  - Continuous Inverting pattern
    - Cushing
    - Lembert
    - Utrecht
  - Single vs. double layer

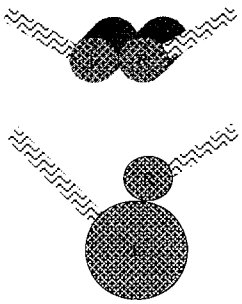
C-Section

- Body wall closure
  - Identification of muscle layers
  - Closure of all identified layers
  - Include peritoneum
  - Holding layer = fascia of external abdominal oblique
    - Prolonged absorbable suture (polydiaxanone, polyglyconate)
- Skin closure
  - Appositional pattern
  - Continuous vs. Interrupted
  - Absorbable vs. Non-absorbable sutures

Uterine Torsion

- Uterus twists along its long axis
- Can be clockwise or counterclockwise
  - Left horn pregnancy – clockwise
  - Right horn pregnancy – counterclockwise
- Late Gestation
  - Dam may not be @ term

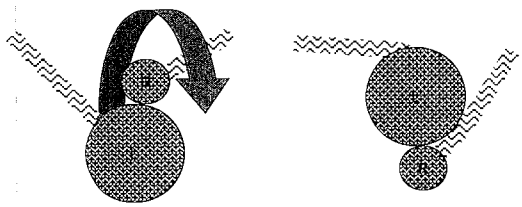
Normal Uterine Positioning



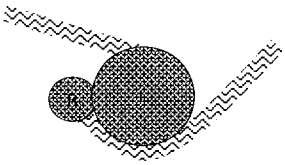
Non-Pregnant

Pregnant

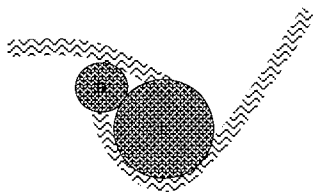
Uterine Torsion



Uterine Torsion



Uterine Torsion



Uterine Torsion

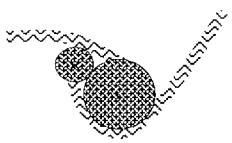
- Clinical Signs
  - Colic
    - Laying with legs to side
    - Kicking @ abdomen
    - Rolling (uncommon)
  - Tachycardia
  - Dystocia
  - Some animals display no signs

Uterine Torsion

- Sequela
  - Decreased uterine blood flow
    - Ischemia – reperfusion
    - Uterine necrosis
  - Decreased fetal blood flow
    - Fetal stress
    - Fetal hypoxia
    - Fetal death

Uterine Torsion

- Diagnosis
  - Rectal Palpation
  - Vaginal Exam (Speculum)
  - Surgery



Uterine Torsion

- Correction
  - Self correction
  - Rolling
  - Surgical correction
  - C-section

Uterine Torsion

- Rolling to correct
  - Must know the direction of the twist
  - Roll in the direction of the twist
    - Clockwise for clockwise torsion
    - Counterclockwise for CC torsion
  - Stabilize the uterus
  - "Catch the animal up with the uterus"

Uterine Torsion

- Surgical Correction
  - Indications
    - Conservative mgt. unsuccessful
    - Cannot determine direction of twist
    - Fetal compromise → C-section

Uterine Torsion

- Surgical Correction
  - Approach similar to C-section
  - Left flank preferred
  - Smaller incision (8-10 cm)
  - Fully correct torsion
    - Relapse possible

Complications of Uterine Surgery

- Hemorrhage
- Peritonitis
- Uterine adhesions
- Retained placenta
- Metritis / Endometritis
- Infertility
- Incisional Complications (infections, dehiscence, herniation)

Uterine Prolapse

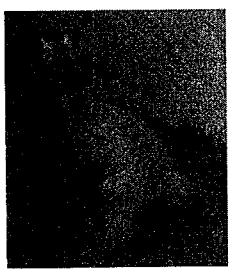
Vaginal Lacerations

- Etiology
  - Dystocia
  - Iatrogenic

- Classification
  - 1st degree – only vaginal mucosa
  - 2nd degree – fibromuscular separation b/w rectum and vagina
  - 3rd degree – full thickness tear b/w rectum and vagina

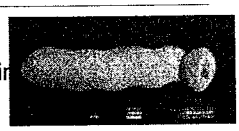
Vaginal Lacerations

- Sequela
  - Hemorrhage
  - Pain / straining
  - Vaginitis
  - UTI
  - Vaginal fibrosis / stricture
  - Rectovaginal communication
  - Peritonitis



Vaginal Lacerations

- Emergency Treatment
  - Tampon to stop bleedi
  - Epinepherine



- Surgical repair of 3rd degree lacerations
  - After the acute inflammatory phase is over

Vaginal Lacerations

- Repair of 3rd degree lacerations
  - After acute inflammatory phase is over
  - General anesthesia vs. epidural
  - Fine absorbable suture
  - Double layer closure if possible