This presentation contains potentially disturbing situations or content that may be distressing to some learners.

Gut Check

When to Cut the GI Tract, Where, and How

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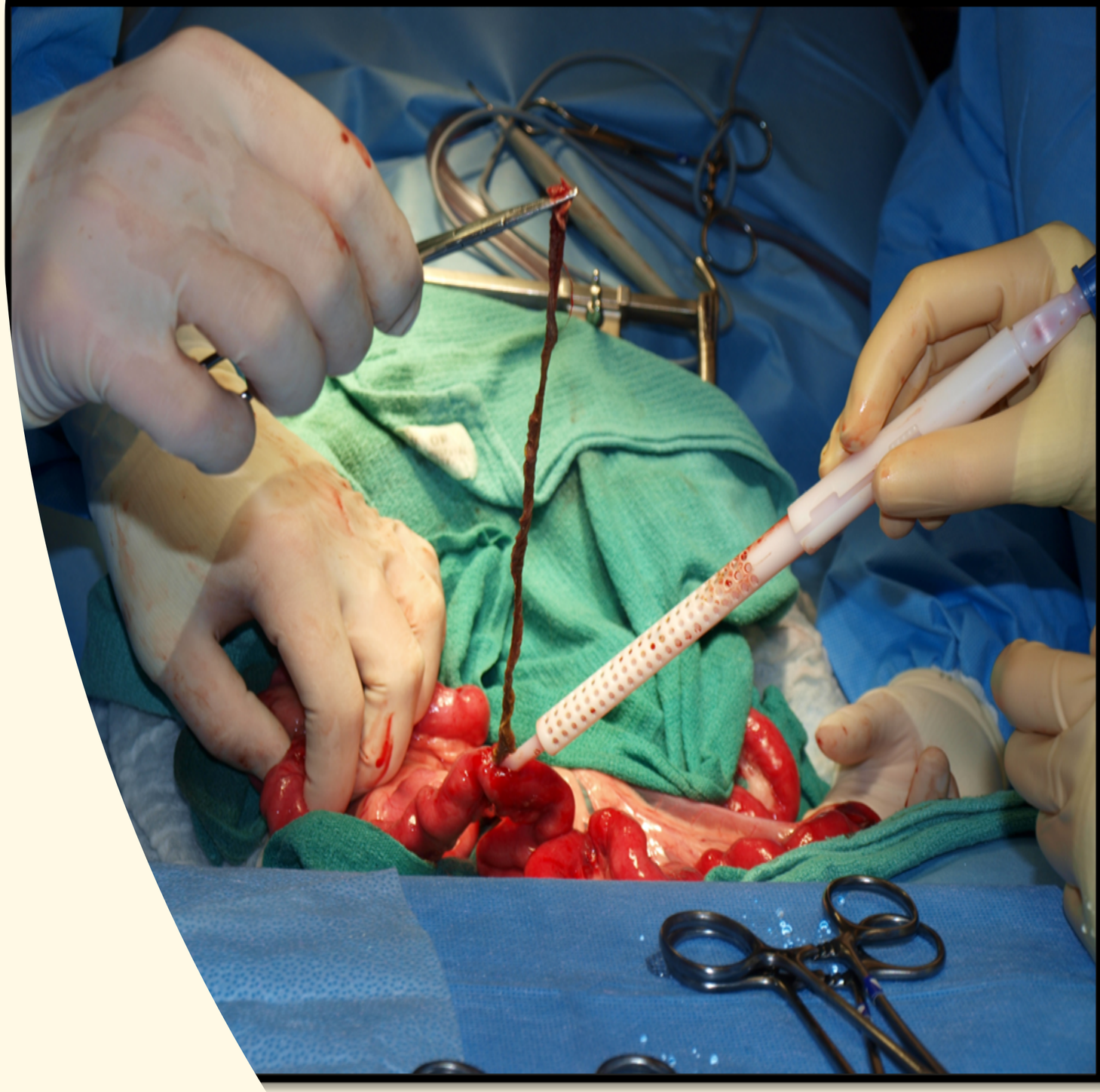
3/6/2026



Enterotomy And R&A

Diagnosis of GI Obstruction and FBs

GI Surgery Principles

Technique – Gastric Surgery

Technique – Enterotomy

Linear FB Removal

Intussusception

Technique – R&A

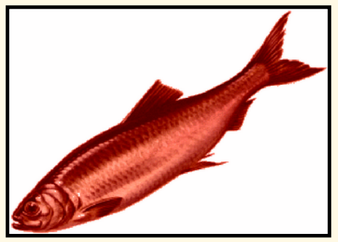
GI Surgical Disease - Diagnosis

Signalment

History → Acute/Chronic

Clinical Signs

- Vomiting or Regurgitation
- Diarrhea
- Anorexia & Weight Loss?



Physical Examination

- **Overall Impression**
  - Sick & unstable → sick but stable → ain't right, but looks pretty good → patient has no idea something is wrong

- **Specific findings**
  - Hydration status
  - Abdominal palpation
    - Comfort level
    - Abnormal palpation findings
  - Oral exam – Cats!
  - Rectal exam

GI Surgical Disease - Diagnosis

Diagnostics

Labs – CBC, Chem, Lytes, UA
Other – Parvo, fecal, etc.
Imaging
Exploratory surgery

GI Surgical Disease - Diagnosis

CBC

Chemistry & Electrolytes

- Ruling in or out GI FB diagnosis
- **Front Vet Sci. 2023 Feb** 2:10:1063080. Utility of diagnostic tests in vomiting dogs presented to an internal medicine emergency service
  - Not useful in clinically normal dogs presenting for acute vomiting

- **J Vet Intern Med. 2005 Nov-Dec**;19(6):816-21. Acid-base and electrolyte abnormalities in dogs with gastrointestinal foreign bodies
- **J Small Anim Pract. 2023 Nov**;64(11):696-703. Acid-base and electrolyte evaluation in dogs with upper GI obstruction: 115 dogs (2015-2021)

  - “Classic “ patterns may or may not be present, with low sensitivity and specificity
  - Electrolyte abnormalities resolve if underlying cause is addressed

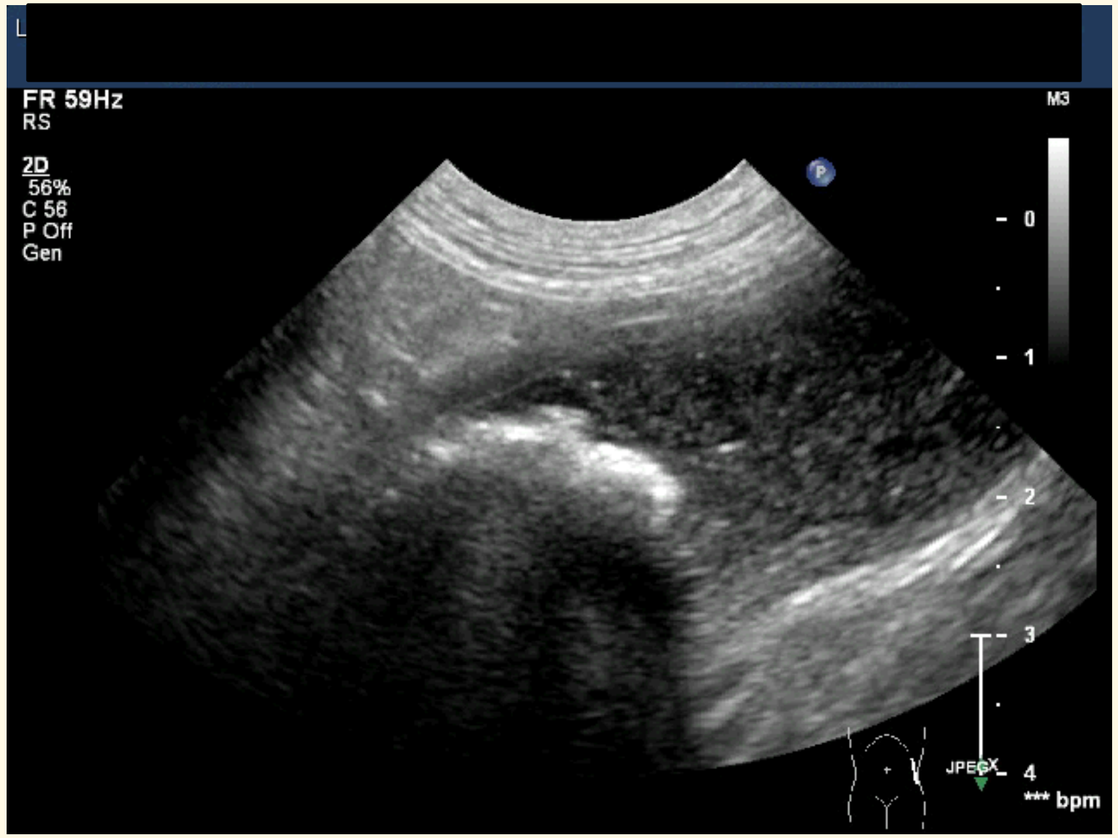
What does it change?

GI Surgical Disease - Diagnosis

Imaging

- Radiology
  - Plain
  - Contrast – positive or negative

- Ultrasound
  - Ultrasound more sensitive and specific for GI FB
  - Highly user dependent!



GI Surgical Disease - Diagnosis

Radiology – Obstructive Pattern

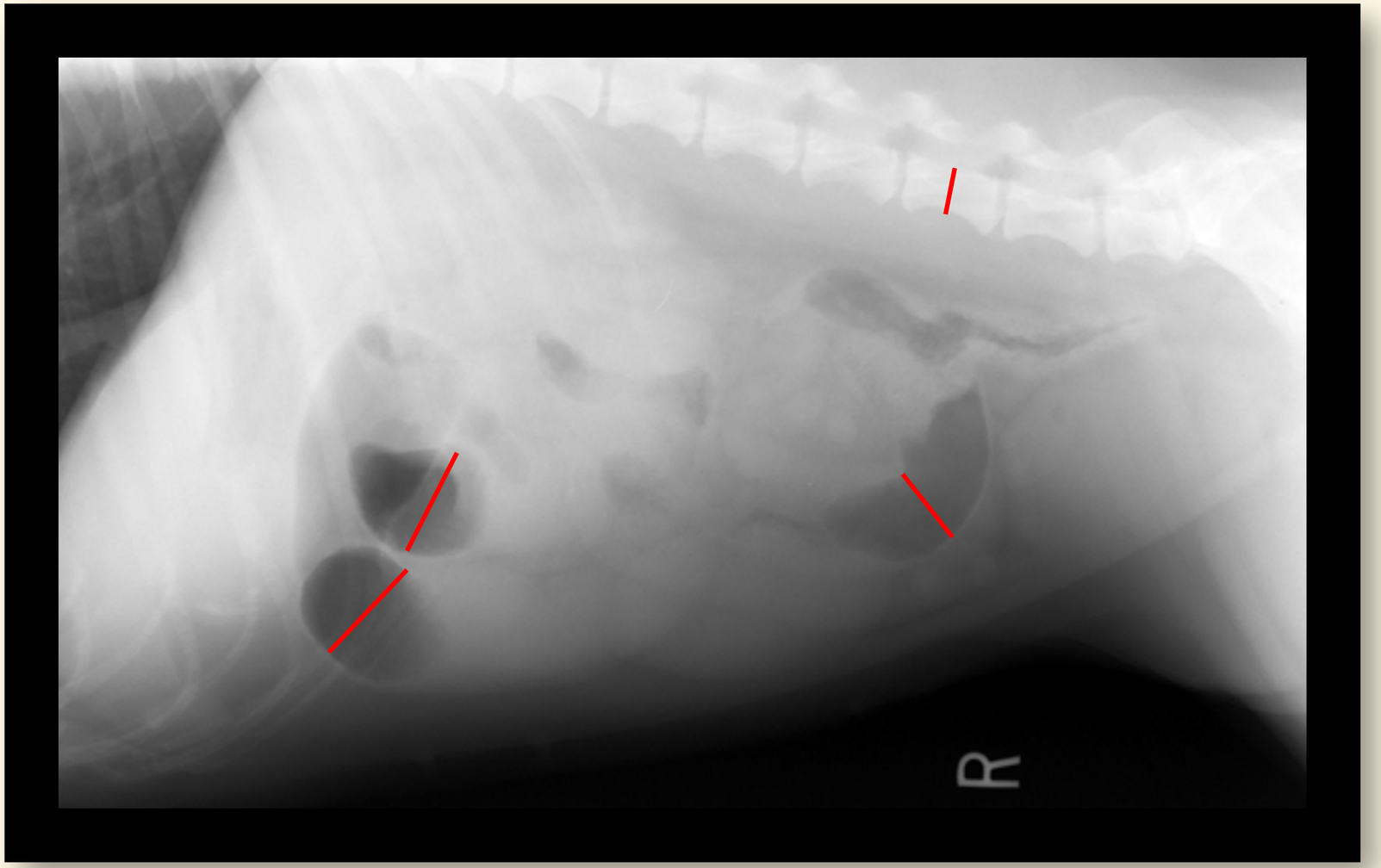
- Normal bowel diameter – Dogs
  - ≤ 2x Rib width
  - < Height of center of L2
  - ≤ 1.6x Height of center of L5

- Normal bowel diameter - Cats
  - < 12mm

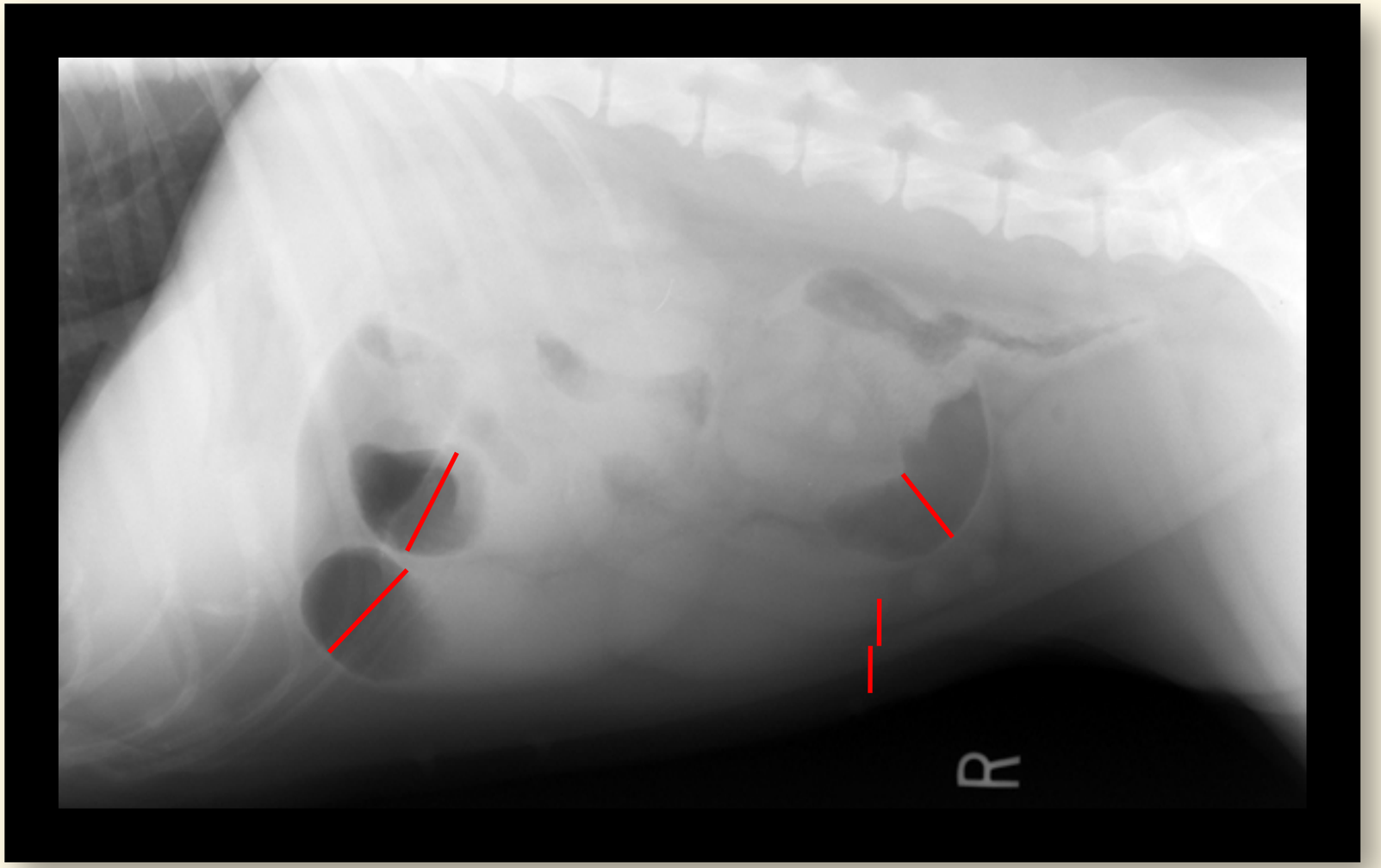
Dog – Obstructive Pattern

- Bowel Ø > 2x height of L5 body highly indicative of obstructive pattern

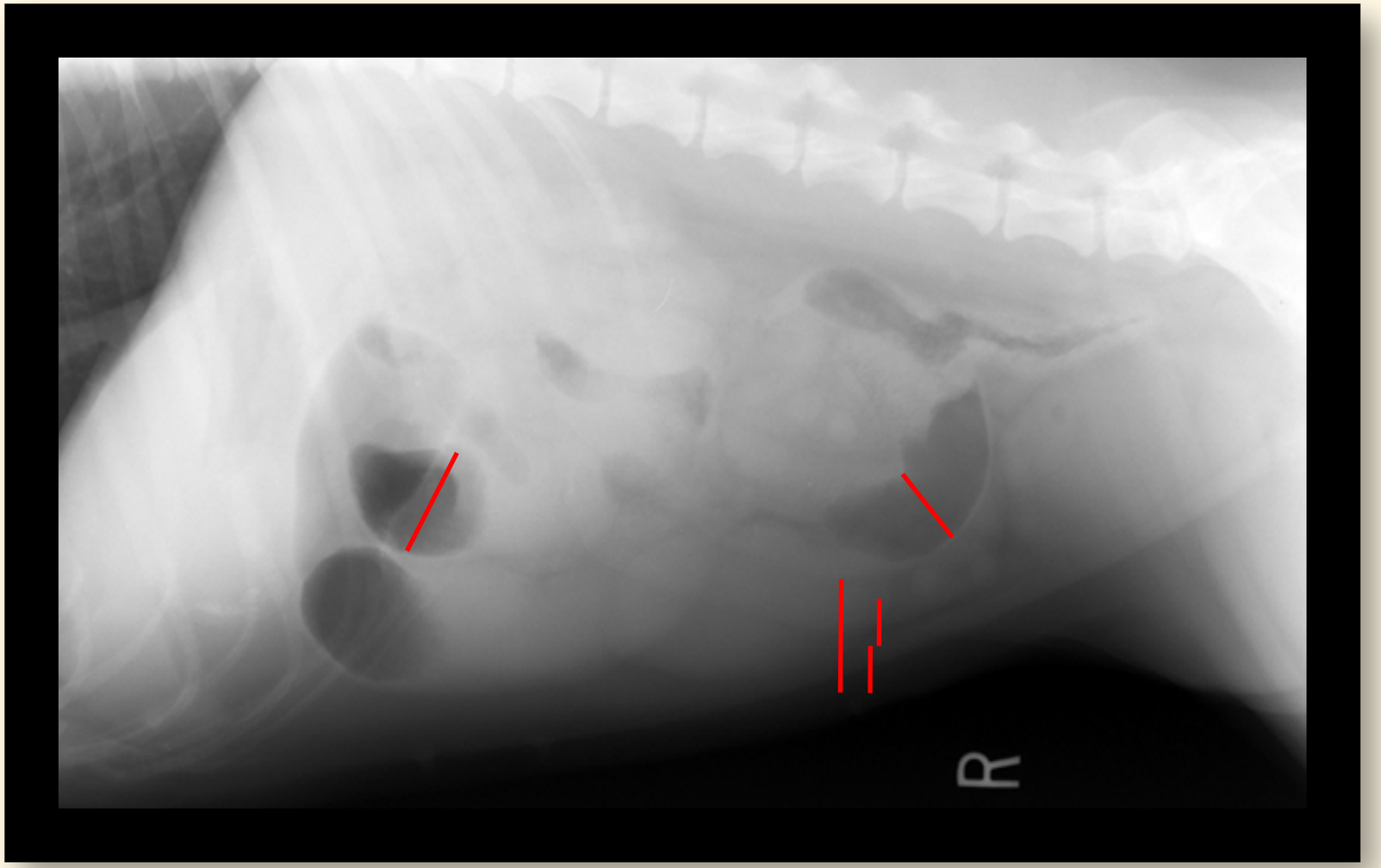
GI Obstruction



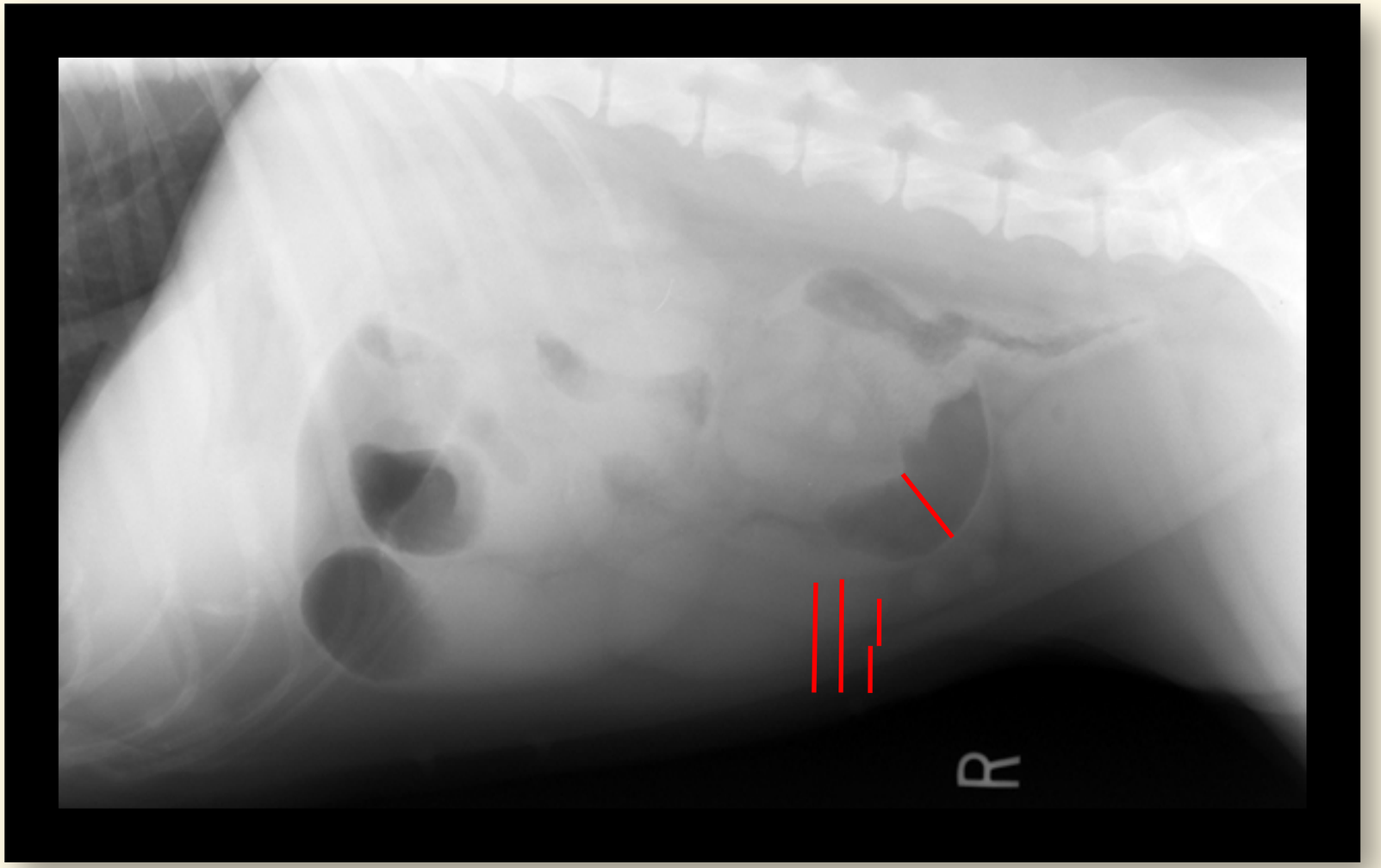
GI Obstruction



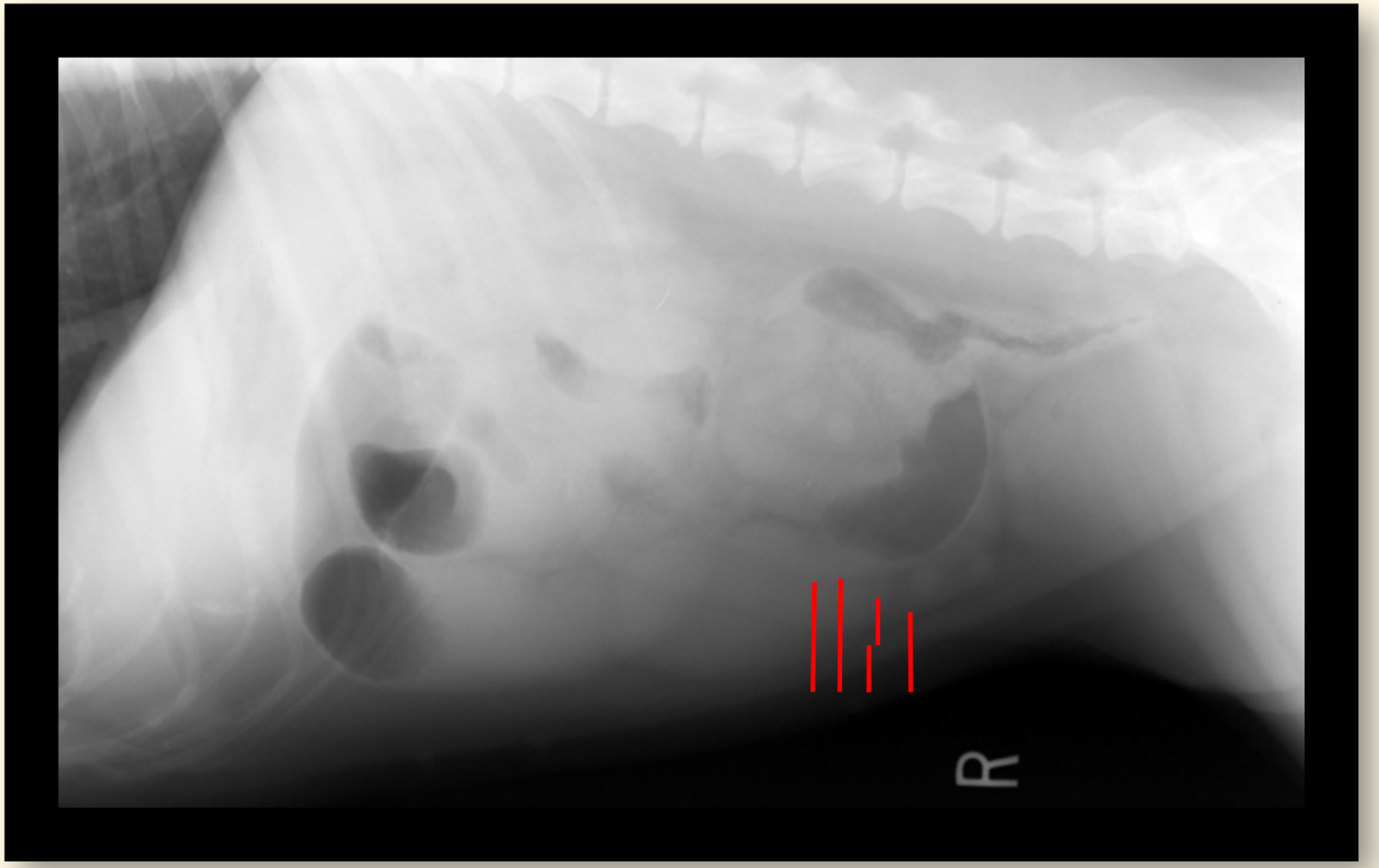
GI Obstruction



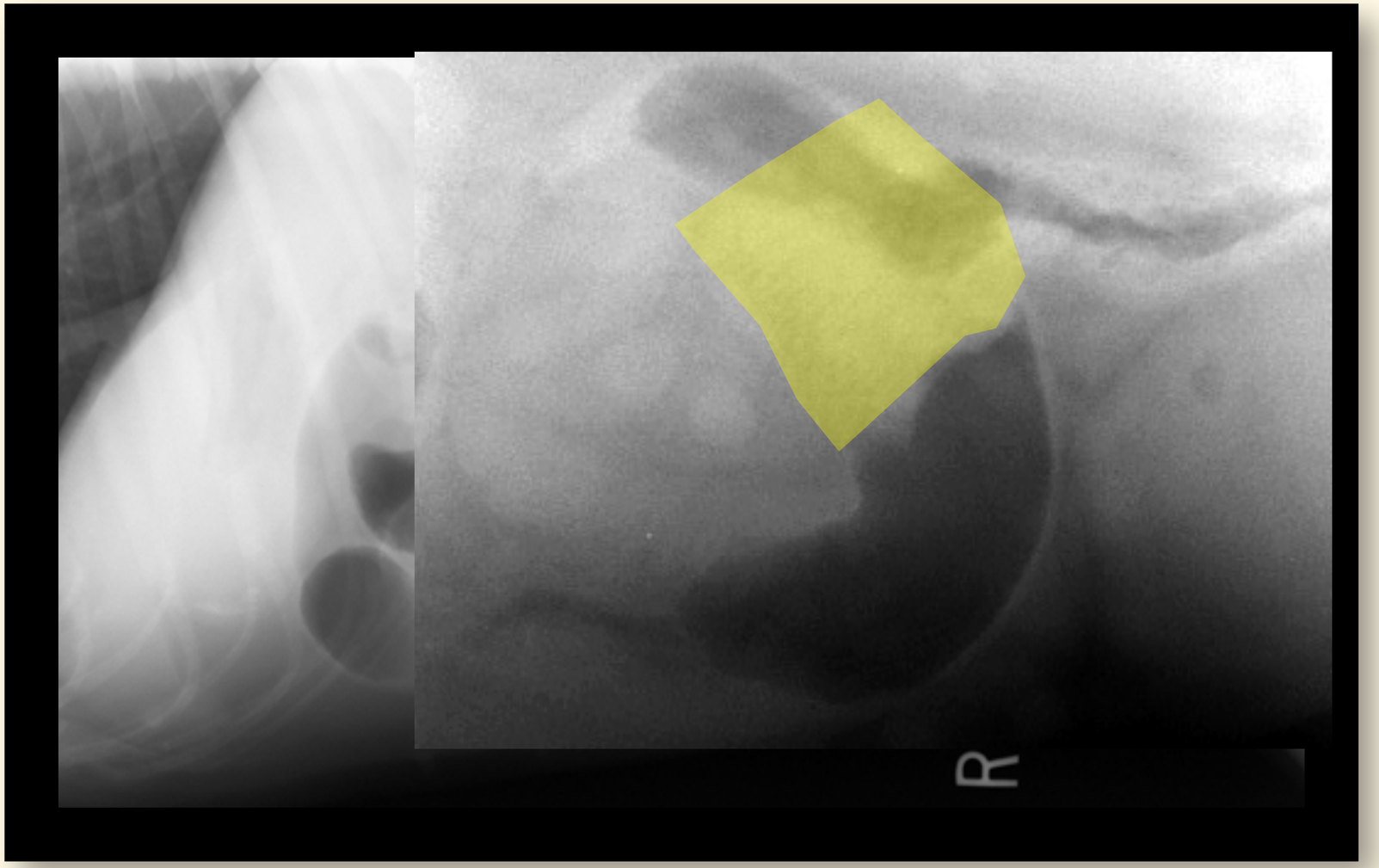
GI Obstruction



GI Obstruction



GI Obstruction



Linear GI Foreign Body

Physical Exam

- +/- Plicated or clumped bowel palpable
- Cats → Up to 50% fixed under tongue

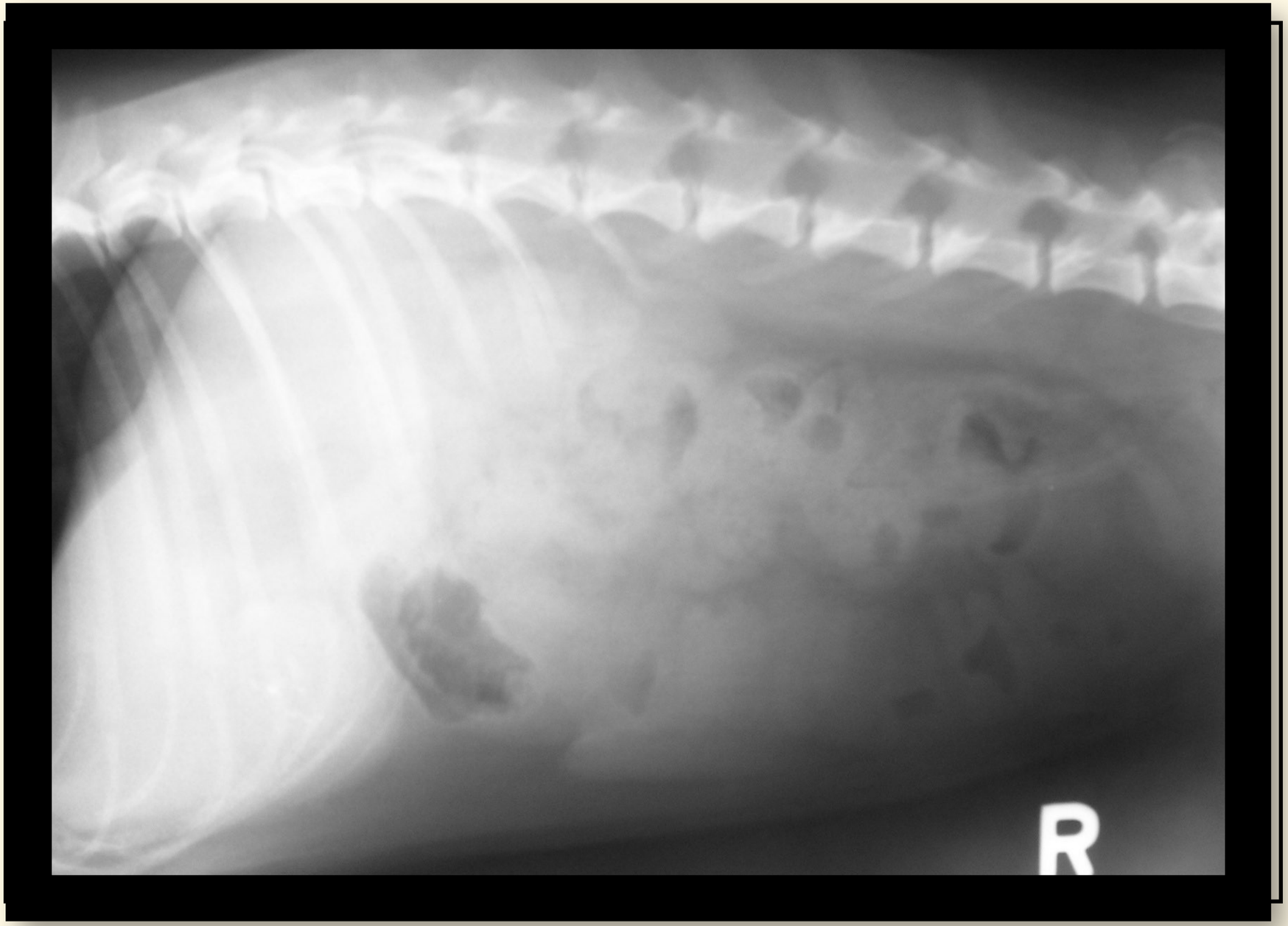
Radiographs

- Plicated bowel with gathering in (cranial) abdomen
- Small, eccentric, BIZARRE gas bubbles

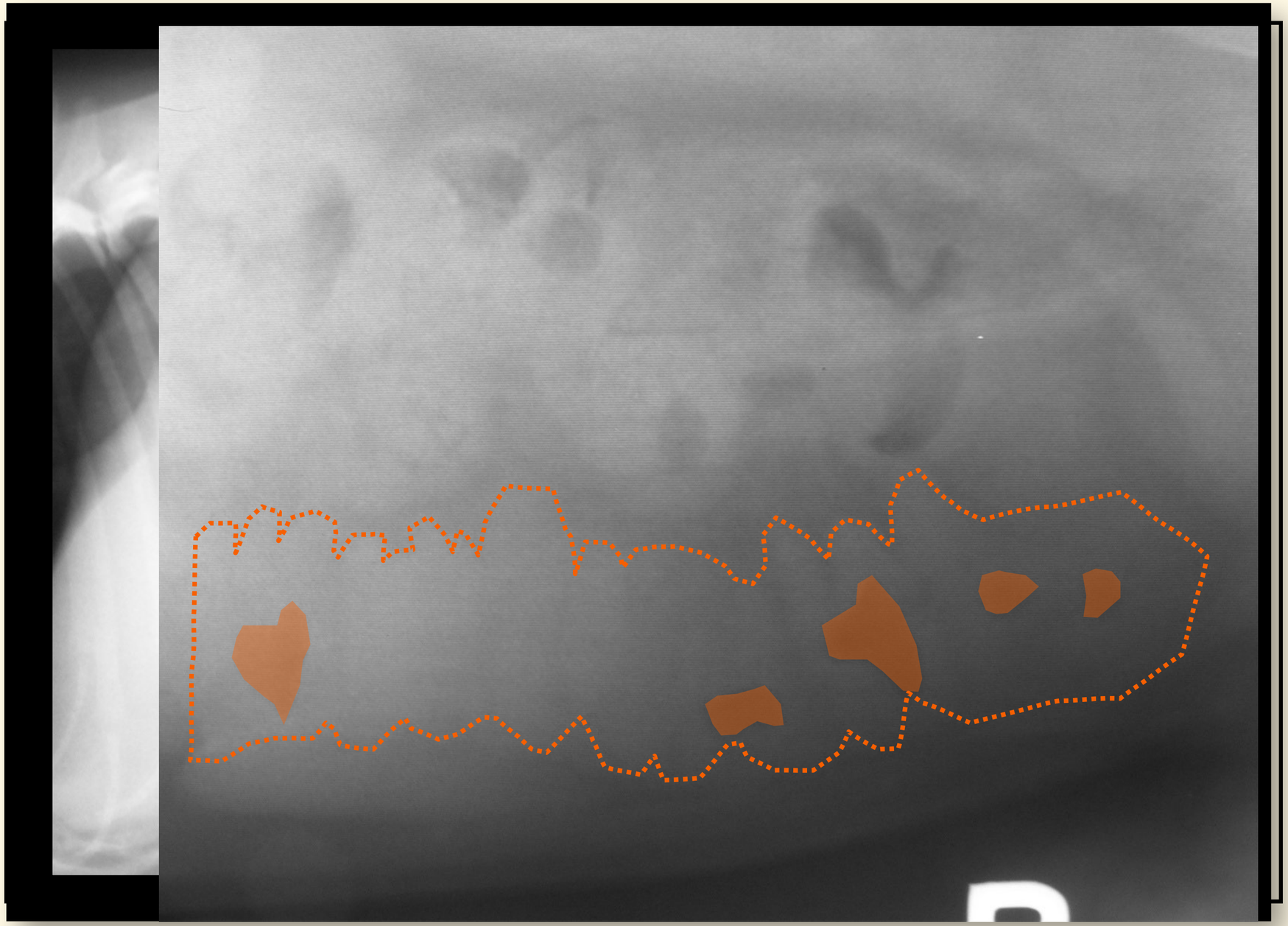
Ultrasound

- Plication of bowel around echogenic line
- Hypermotility of adjacent segments
- Free fluid?

Linear FB



Linear FB



Intussusception

Physical Exam

- Palpable tubular abdominal mass

Radiographs

- Obstructive pattern
- Tube-shaped mass effect

Ultrasound

- Multi-layered, target-like lesion
- Alternating hyper and hypoechoic parallel lines

Intussusception

Treatment

- Reduction
- Resection & Anastomosis

Complications

- Recurrence
- Ileus

GI Surgery Principles

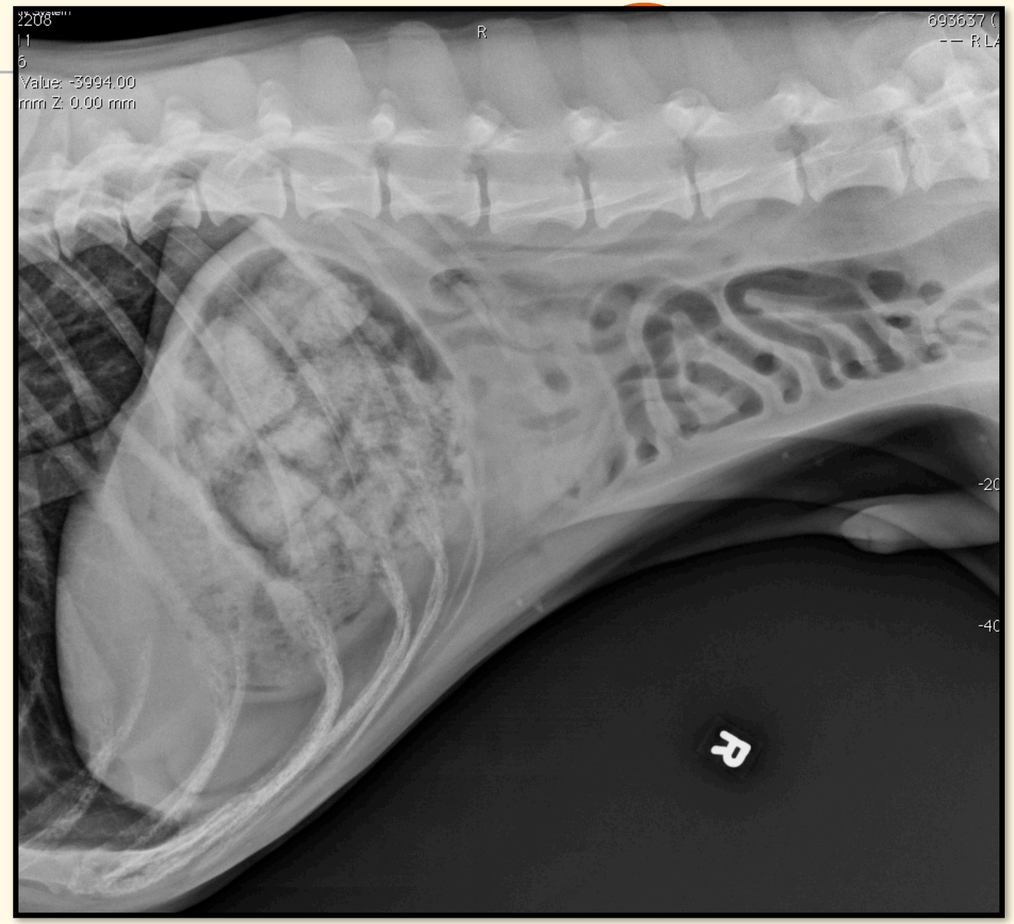
Minimize Contamination

- Clean contaminated surgery at best – try to keep it that way
- Increasing bacterial load from orad to aborad
  - Prevention, prevention, prevention

Decontamination

- Lavage – local or general

GI Surgery Principles - Gastrotomy



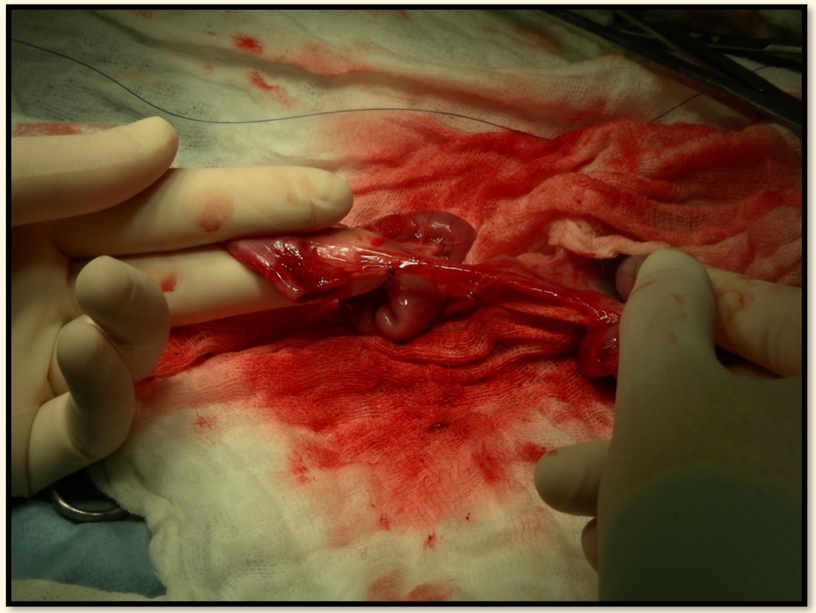
Prevention of Contamination

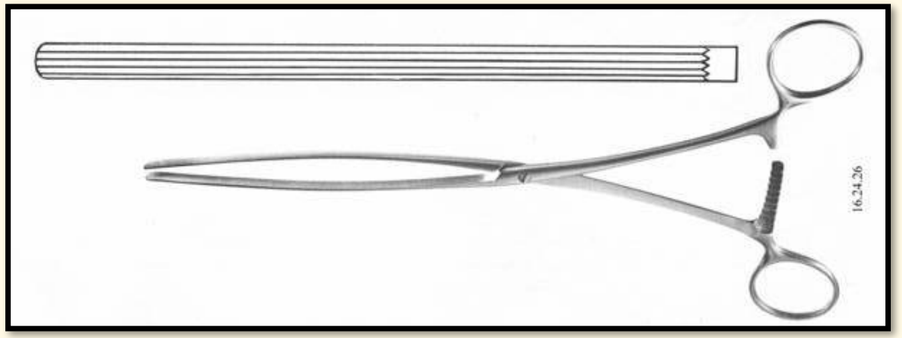
- Stay sutures
  - 4-0 or 3-0 Monofilament
  - Tag with hemostats and add tension
    - $$$$ option – Assistant
    - $ option – Secure to abdominal retractor with hemostats
- Pack it off with laparotomy sponges – pre-moisten
- Suction available to control contamination
  - Lots of gastric content? – replace with fresh tip
  - Additional lap sponge or towel as “apron”

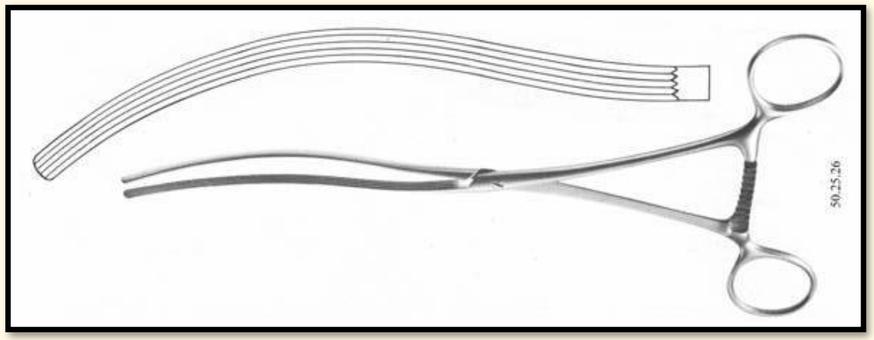
GI Surgery Principles – SI Surgery

Minimize Contamination

- Exteriorize the bowel
- Pack off surgical area – moistened gauzes or lap pads
- Milk content away from surgical site
- Occlude lumen
  - Hands
  - Doyens

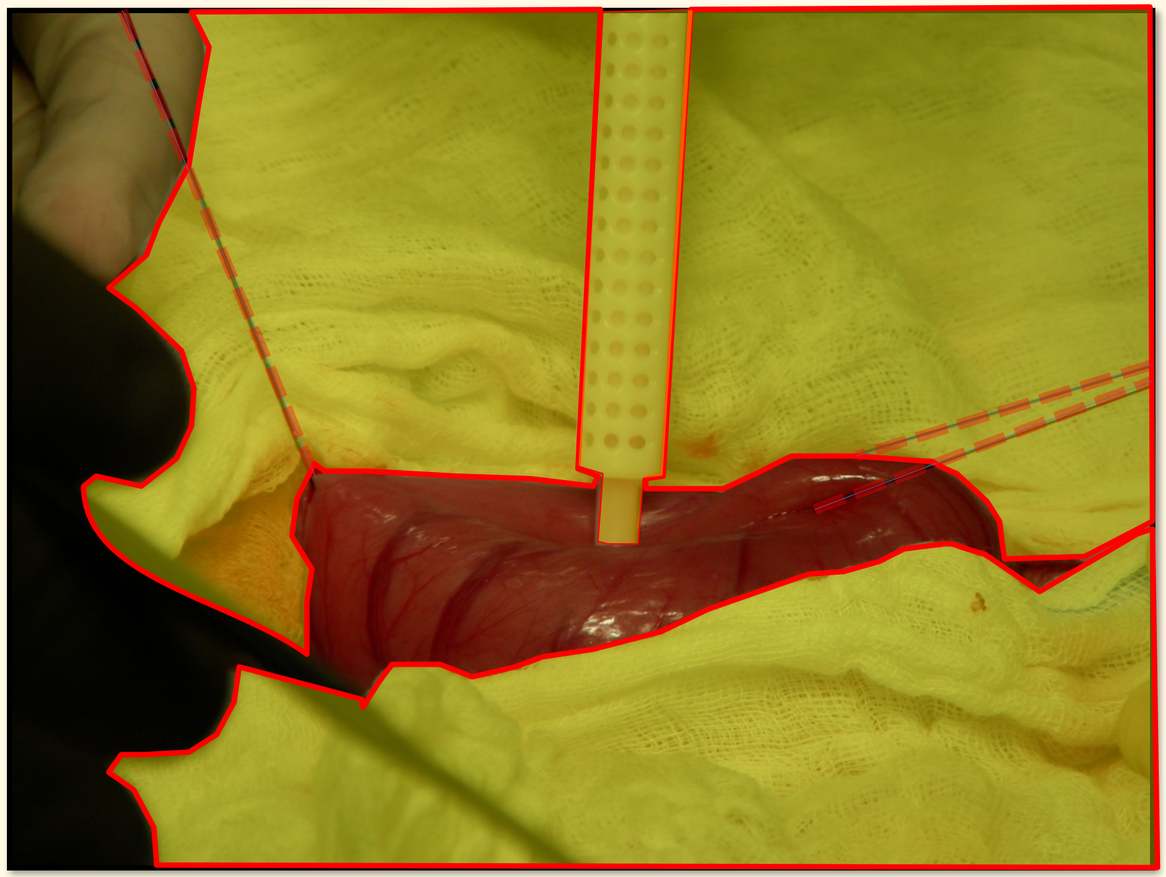






Gastrotomy

Pack off stomach

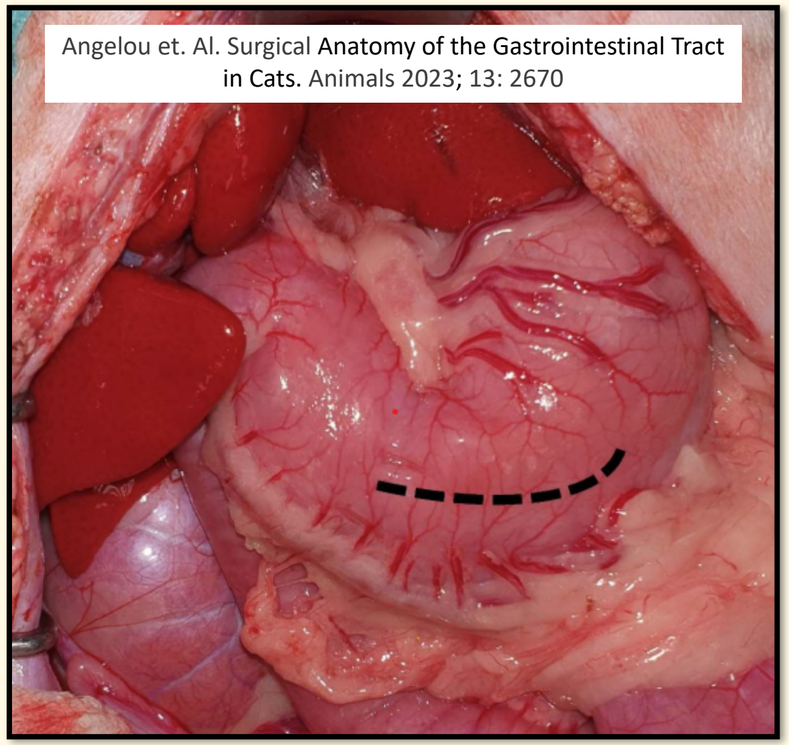


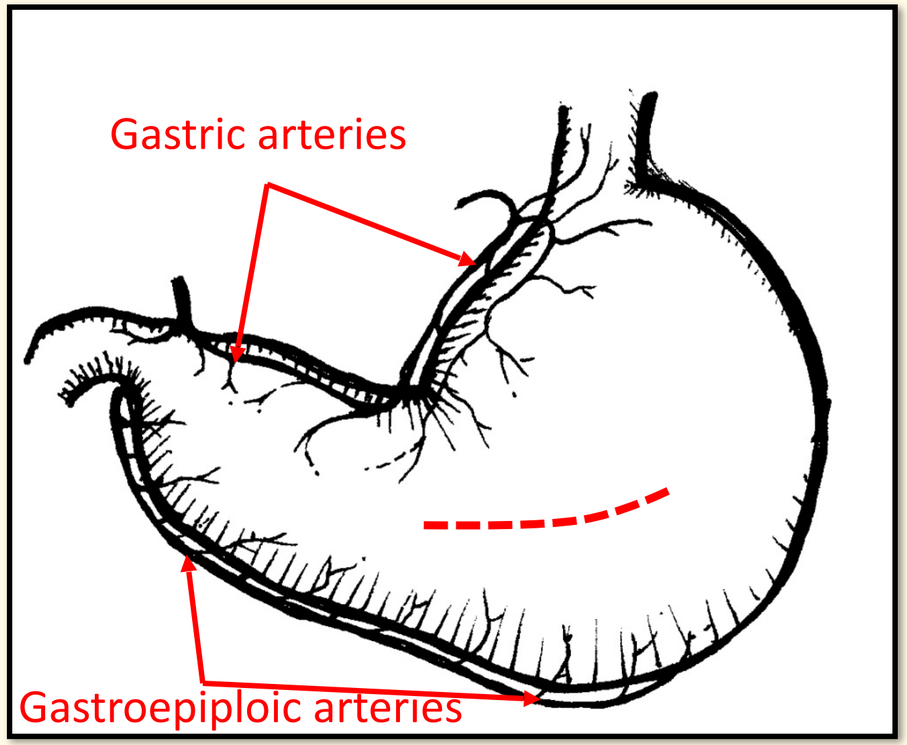
Place stay sutures

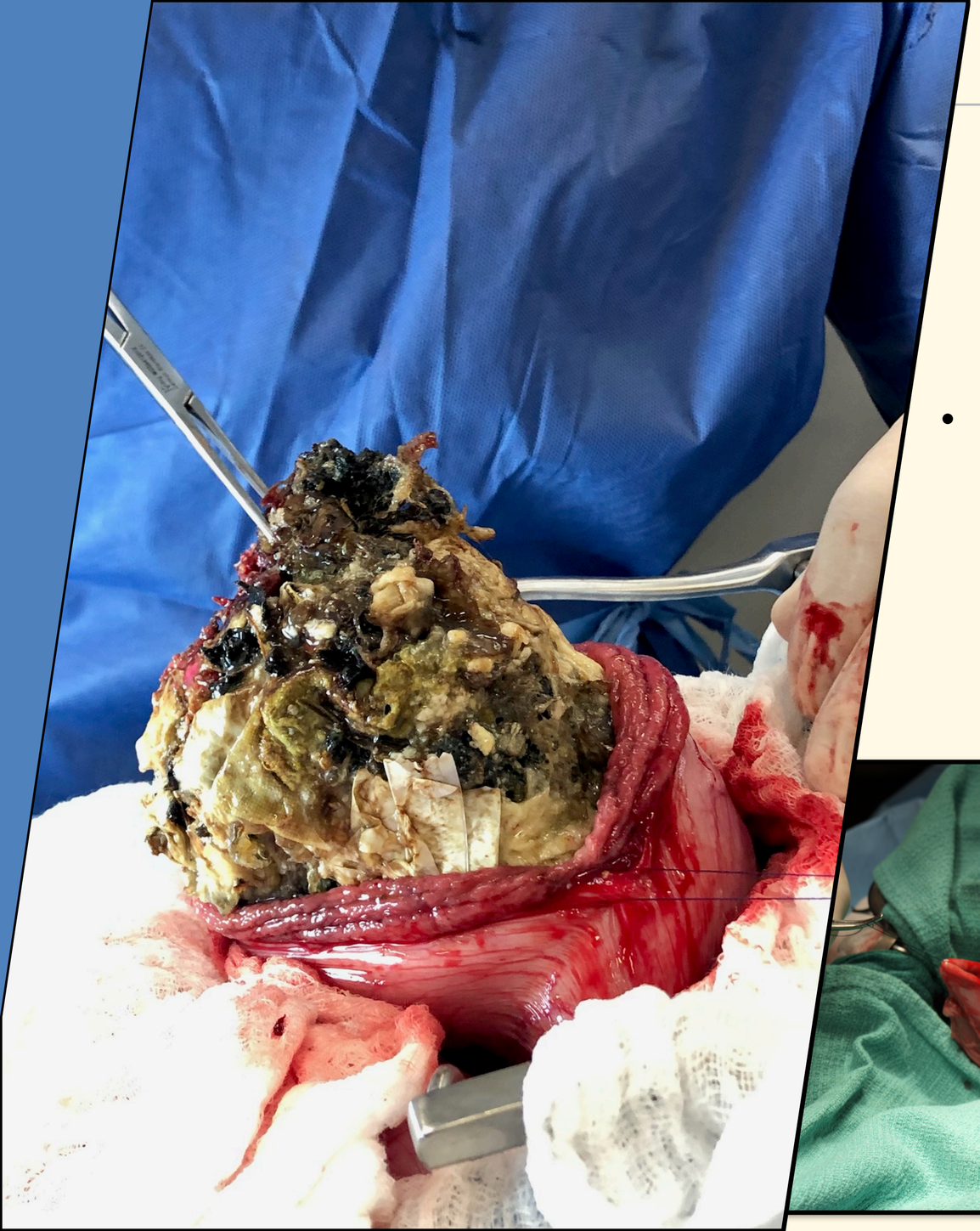
Control contamination

Gastrotomy

Gastrotomy incision in body between branches of gastric and gastroepiploic arteries

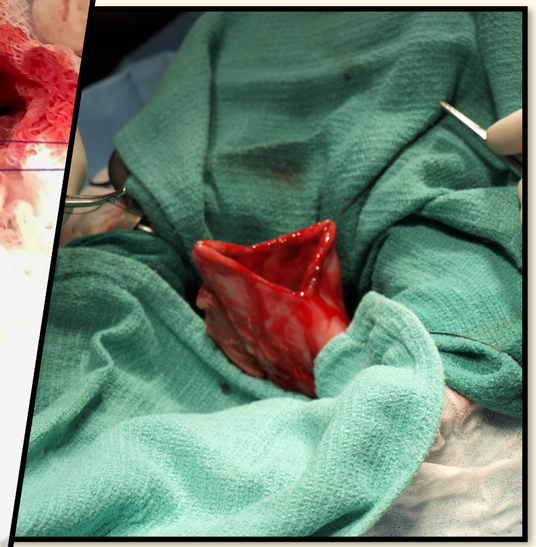


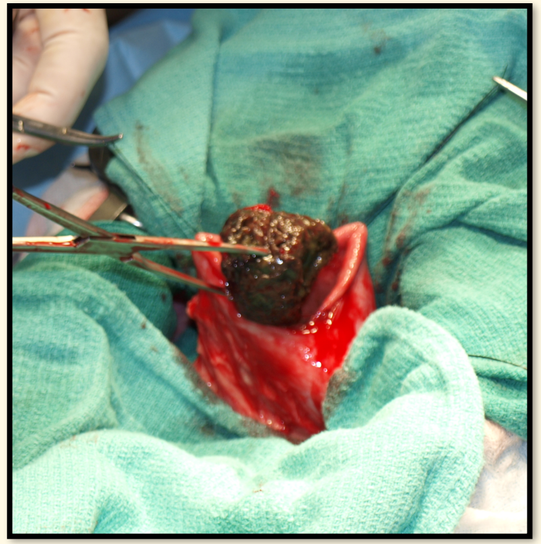




Gastrotomy

- Need to catch that stuff!





Gastrotomy

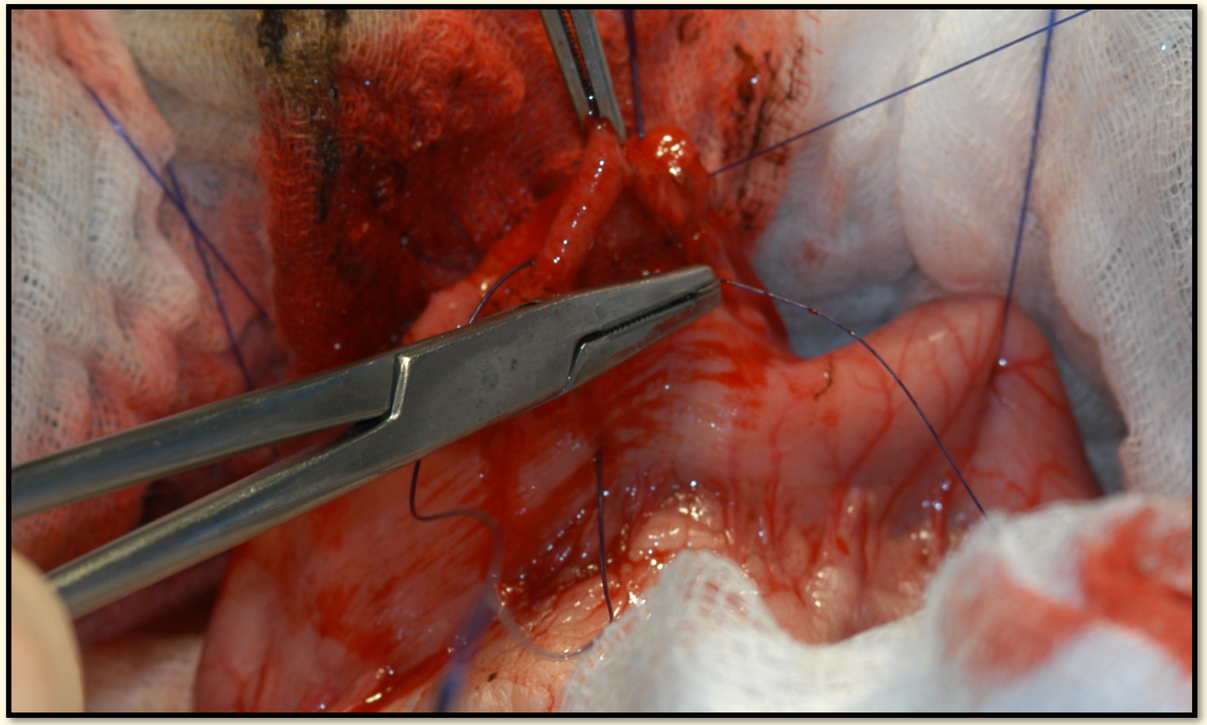
Closure

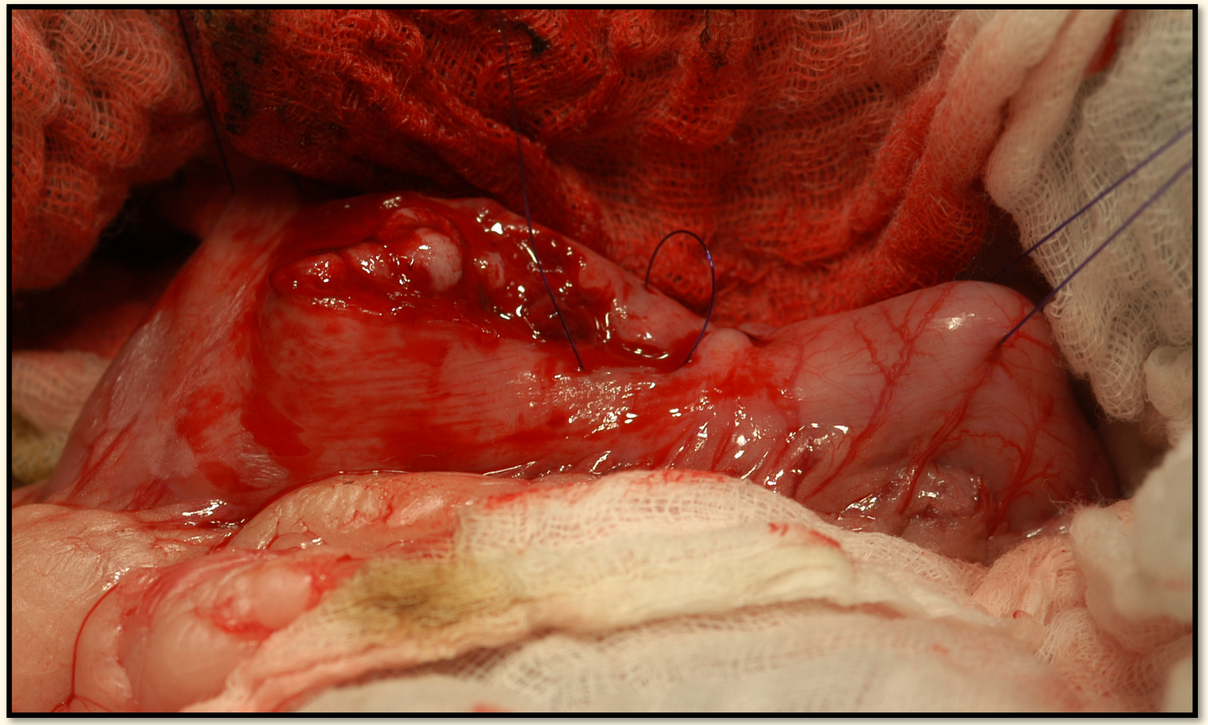
- Monofilament absorbable suture
  - 3-0 PDS or Maxon

- Two-layer closure
  - Simple continuous
    - Mucosa-submucosa complex
  - Inverting pattern oversew
    - Cushing/Connell (or Lembert)

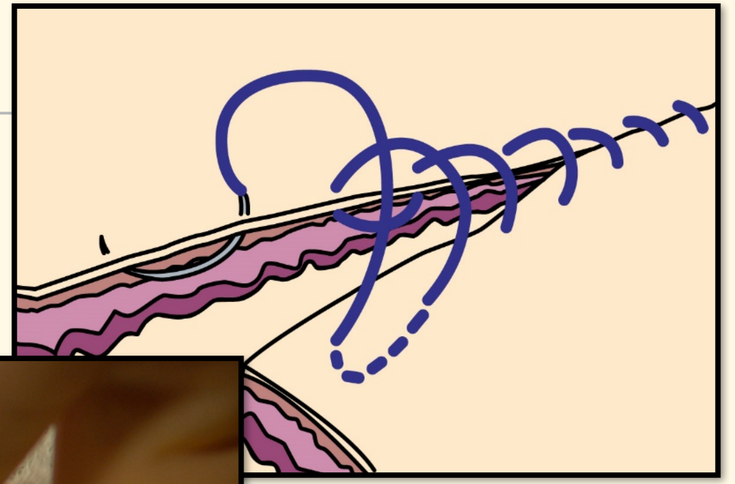
- Local lavage

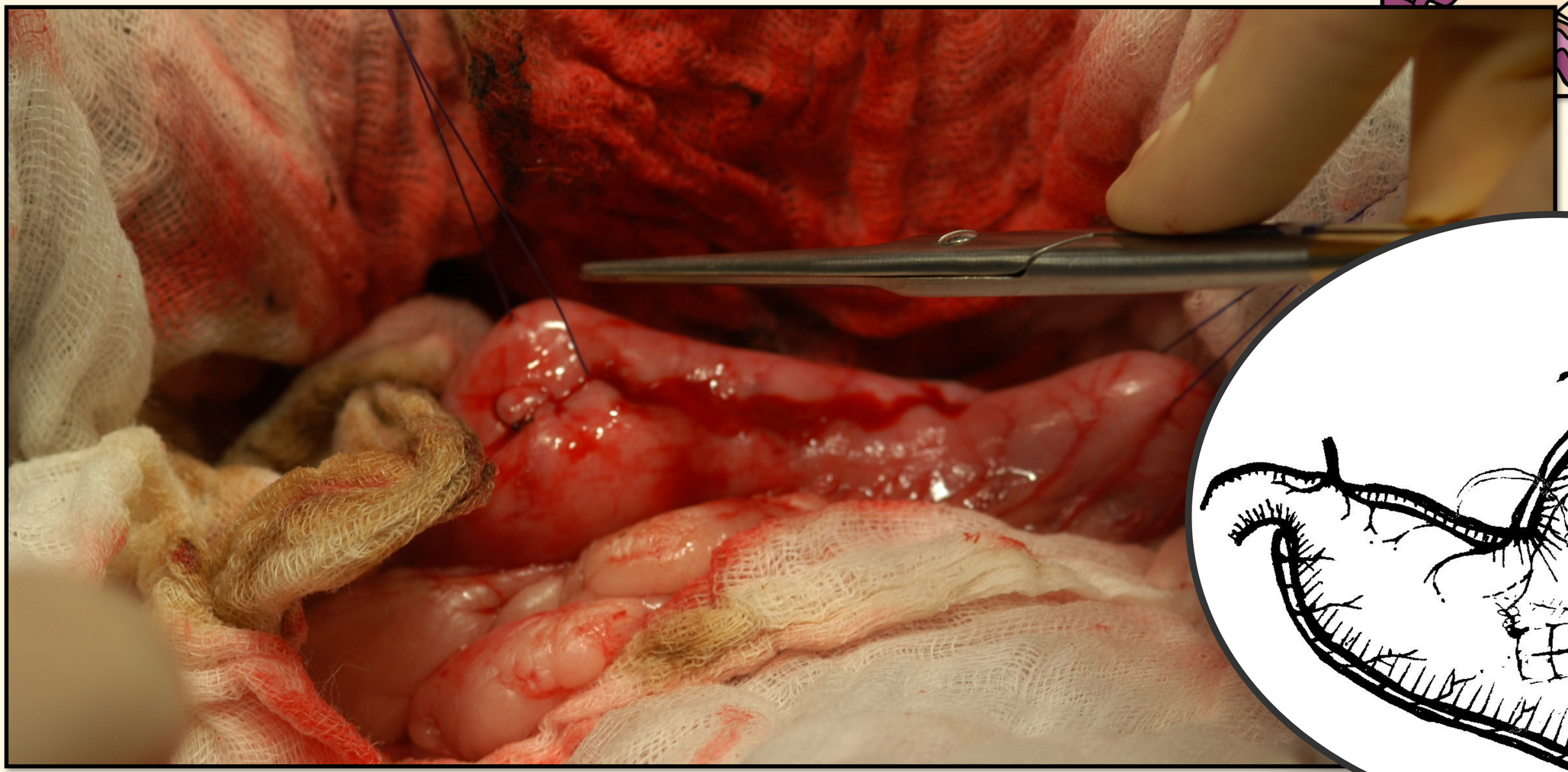
Gastrotomy Closure



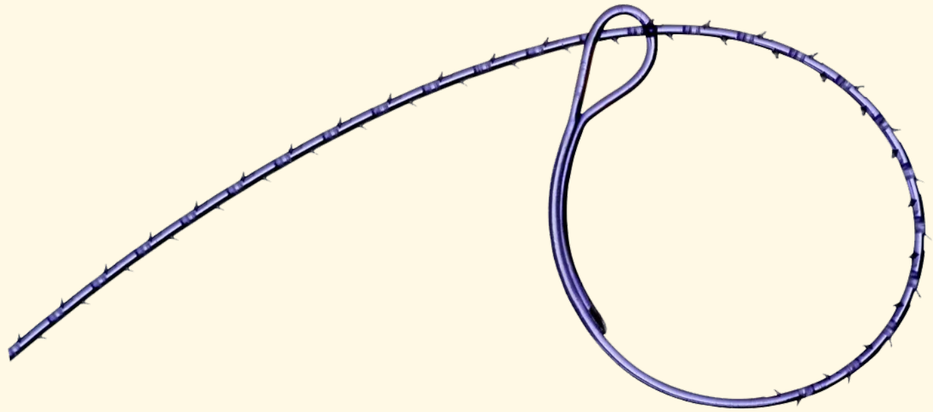


Gastrotomy Closure





Gastrotomy



Other Closure Options

- Barbed suture

- Stapling – oversew with inverting pattern
  - Not usually needed, not cost effective

- Double layer inverting closure
  - Gastric wall vessels not trapped in a finite space

- Single layer appositional closure
  - Simple continuous or Gambee
  - Shown to be safe (Velay et al. JAVMA 2023;262(2):1-5)
    - Low power study (low incidence of gastric Sx complications)
    - Suture spacing can be difficult
    - Gastric wall vessels not trapped in a finite space

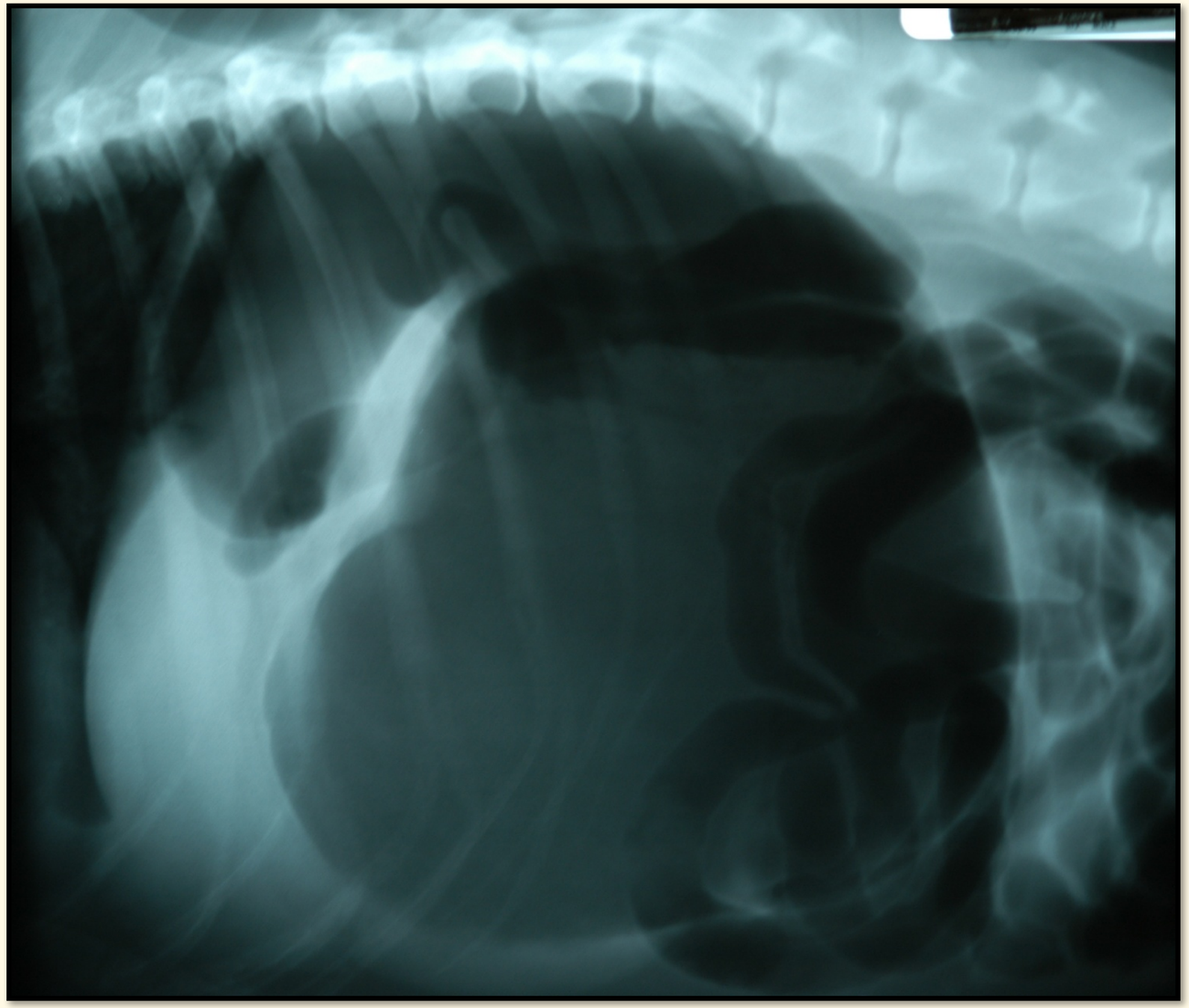
Gastropexy Indications

- Prevention of GDV - Elective
  - Appropriate breed
  - At the time of ovariohysterectomy or castration
    - > 6 months of age
- Prevention of GDV - During treatment
  - Splenectomy – 5 times risk of GDV following splenectomy – Sartor et al. JAVMA 2013
  - Inflammatory bowel disease
  - Other abdominal surgery

- You will have to decide for yourself

Gastropexy Indications

- GDV
- **Not optional** – MUST perform a gastropexy
  - Recurrence of GDV without gastropexy > 80%
  - Recurrence with gastropexy <5%



Gastropexy Techniques

Many options described

- Incisional
- Incorporating
- Belt Loop
- Circumcostal
- Cologastropexy
- Tube gastropexy

- Minimally invasive
  - Laparoscopic
  - Lap assisted
  - Endoscopically assisted

Gastropexy Techniques

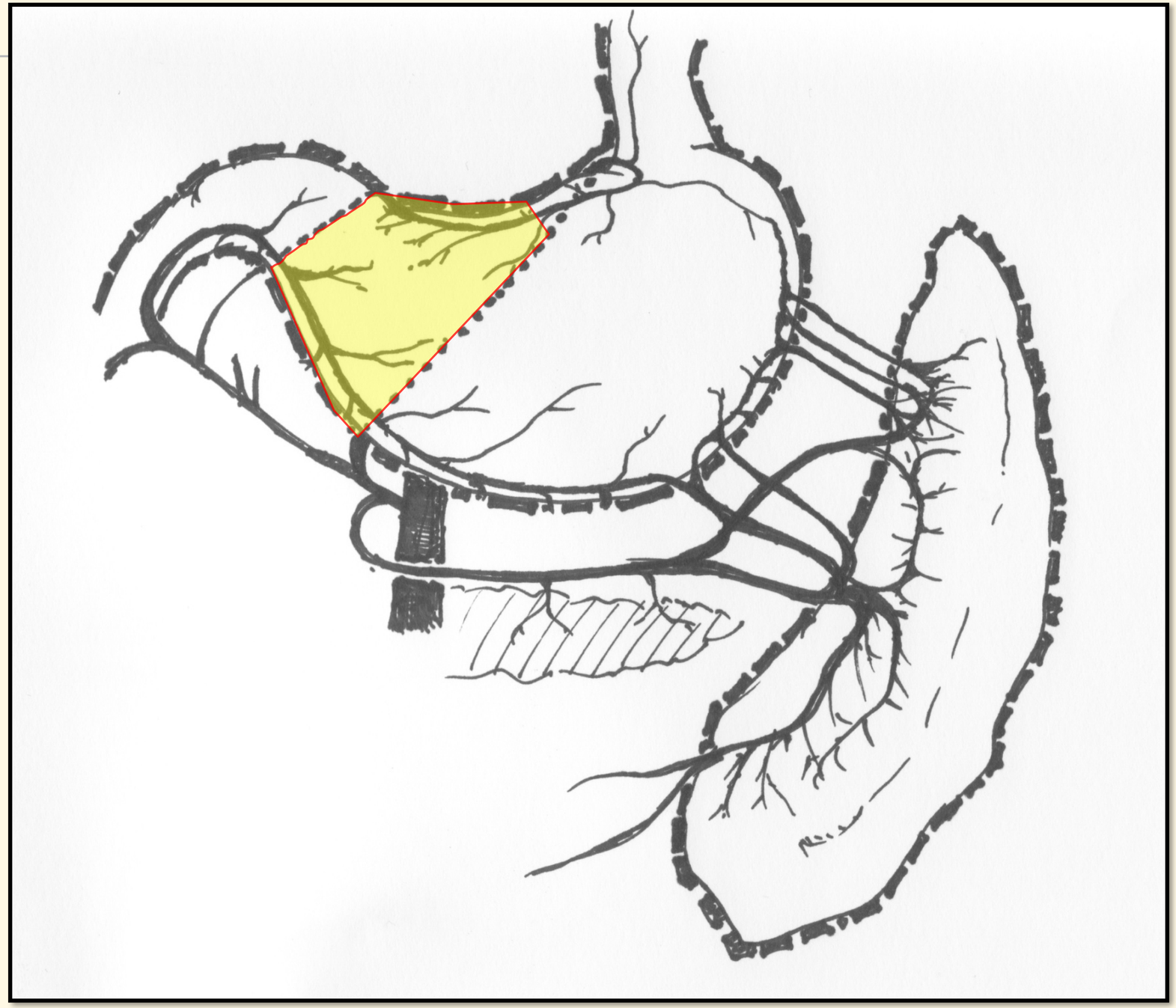
Simple, fast, safe, effective

Incisional (muscular flap) gastropexy

5 min or less

Gastropexy

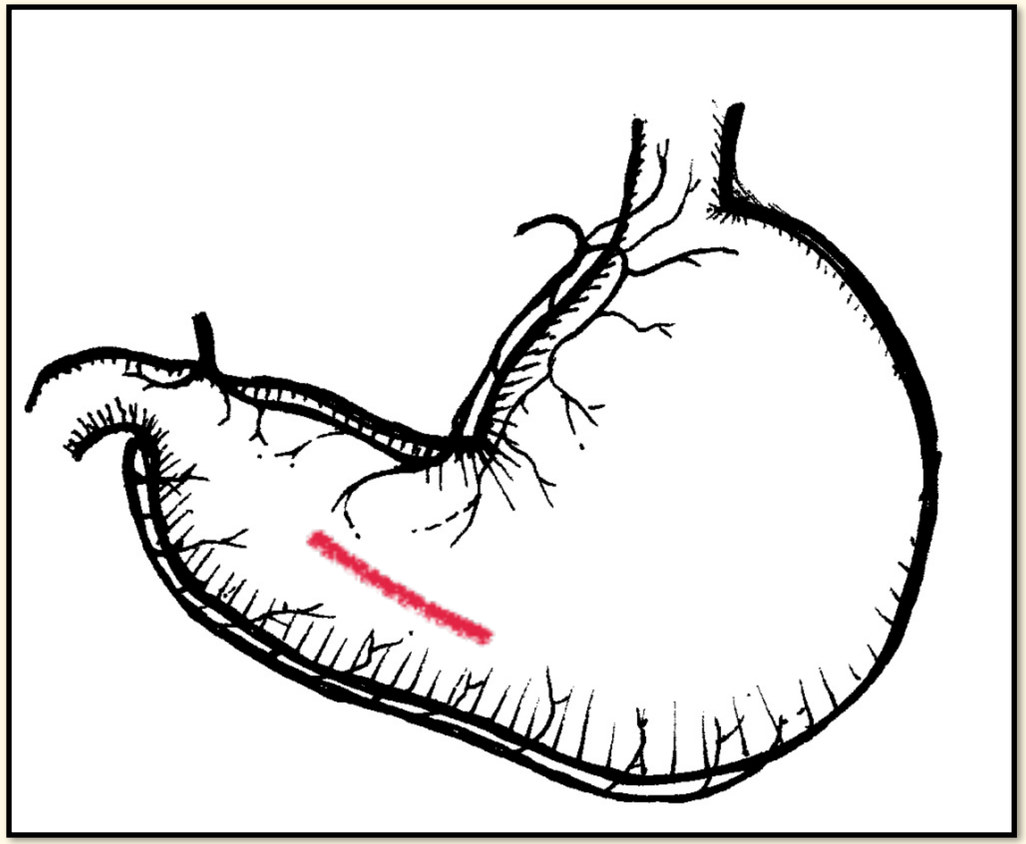
- Avascular area in pyloric antral region



Incisional Gastropexy Technique

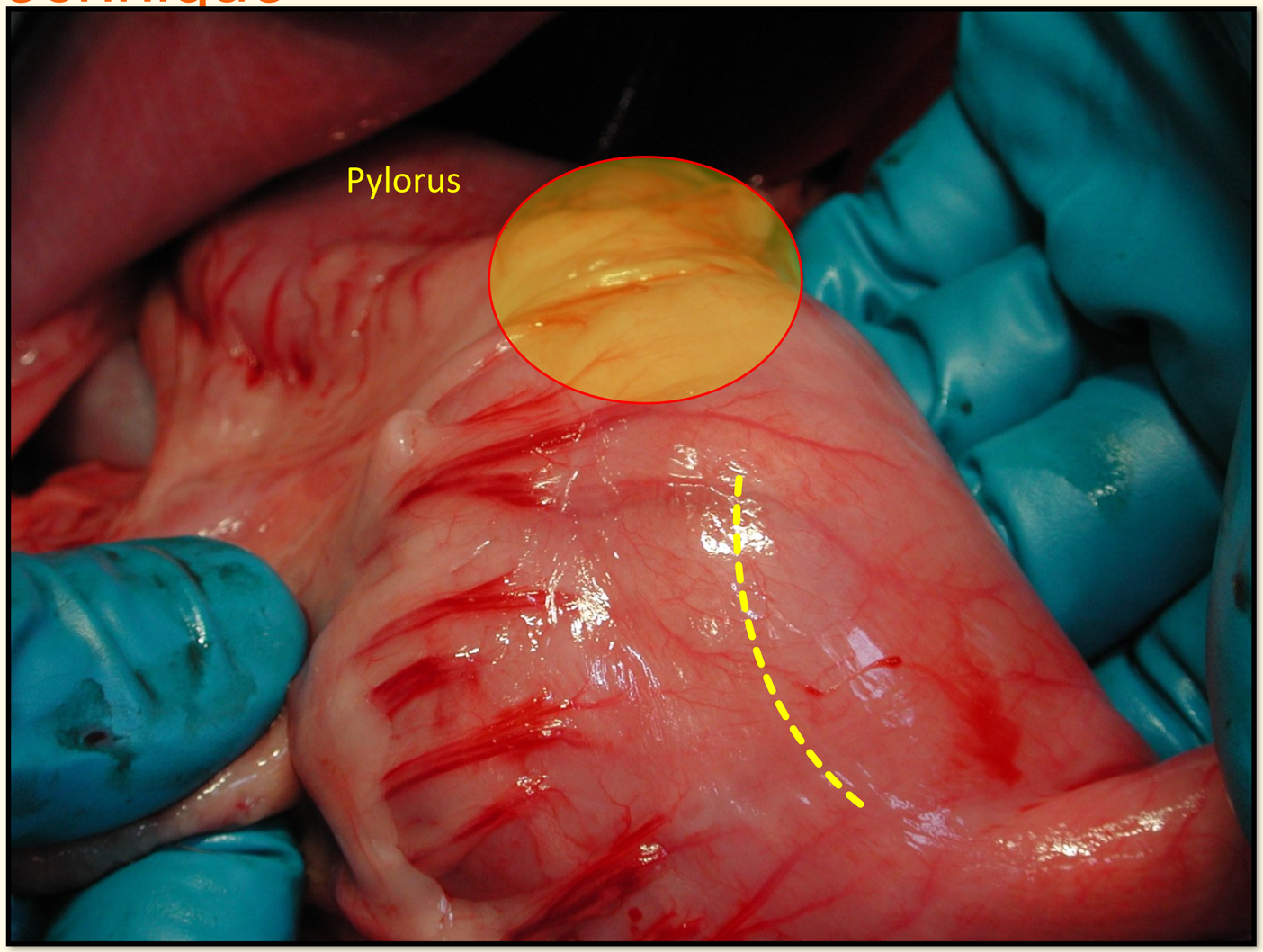
- Goal – permanent adhesion between stomach and body wall
- Matching incisions and apposition of seromuscular layer and transversus abdominis muscle
- Always on the **RIGHT** side
  - **Left** sided gastropexy does **NOT** reliably prevent GDV
- 4-5 cm length incision
- Avascular area of pyloric antral region

NOT full thickness



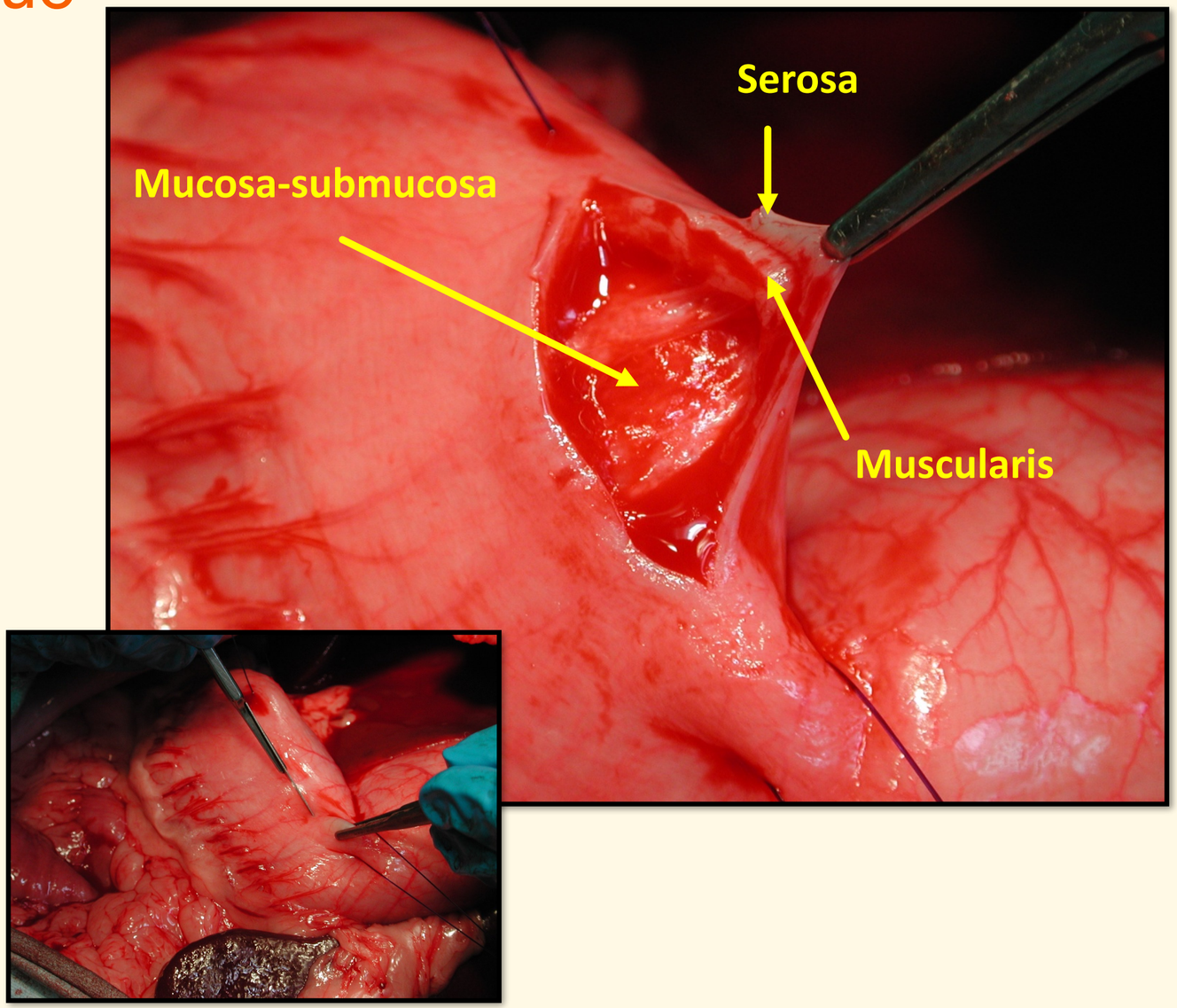
Incisional Gastropexy Technique

- Remove Balfour retractor and laparotomy sponges
- Identify correct area



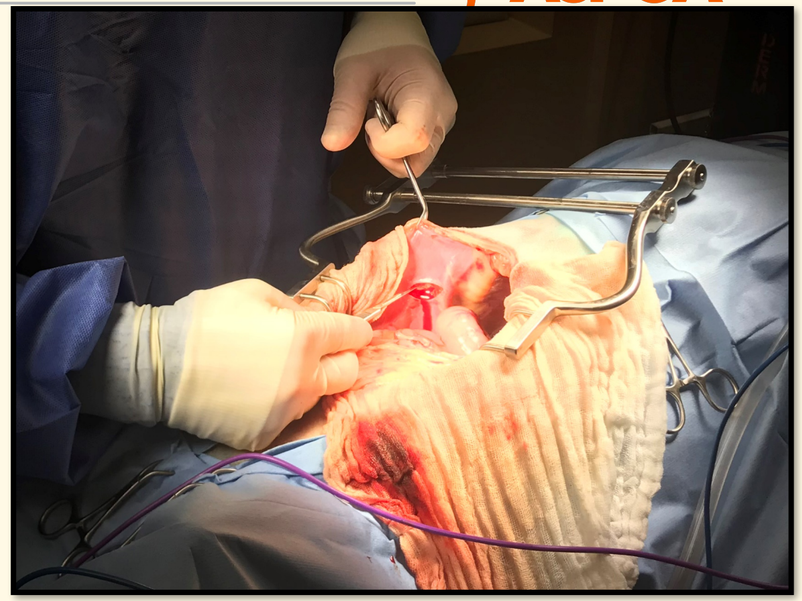
Incisional Gastropexy Technique

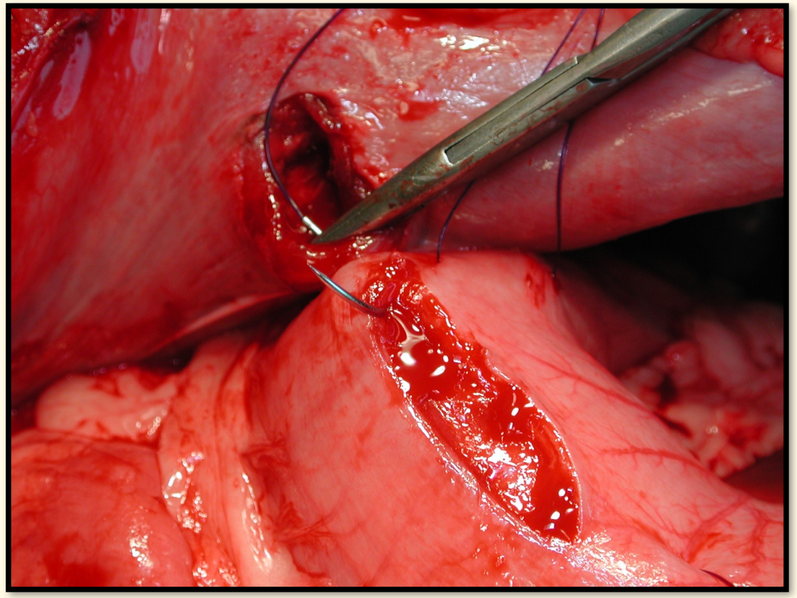
- Pinch seromuscular layer – feel mucosa slip, tent seromuscular layer up
- Incision into seromuscular layer with surgical blade
  - **4-5 cm length**
- Undermine seromuscular layer with scissors (blunt and sharp dissection)



Incisional Gastropexy Technique

- Pull stomach incision toward body wall on the right side
  - Avoid a lot of tension
  - Caudal to the last rib (1-2 cm)
- Matching incision in transversus abdominis muscle
  - Full thickness
  - Same length
  - **Some** distance dorsal to midline abdominal incision

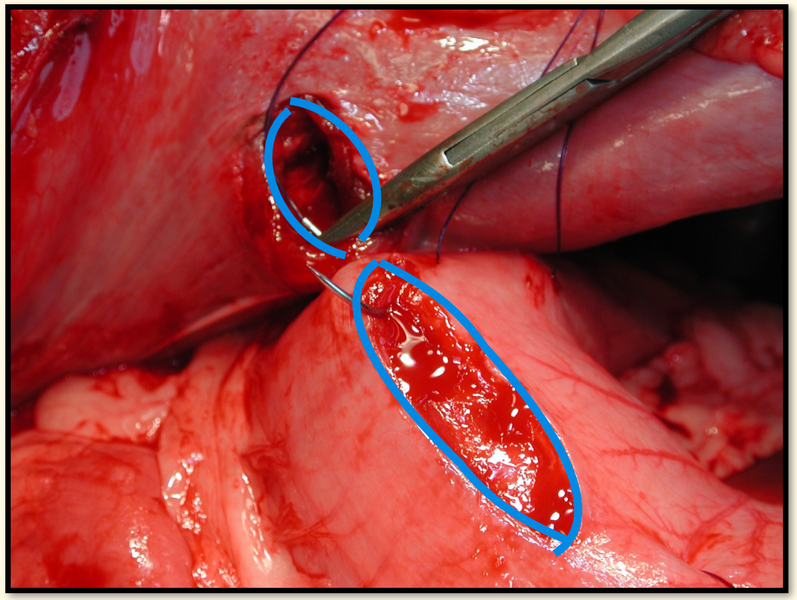




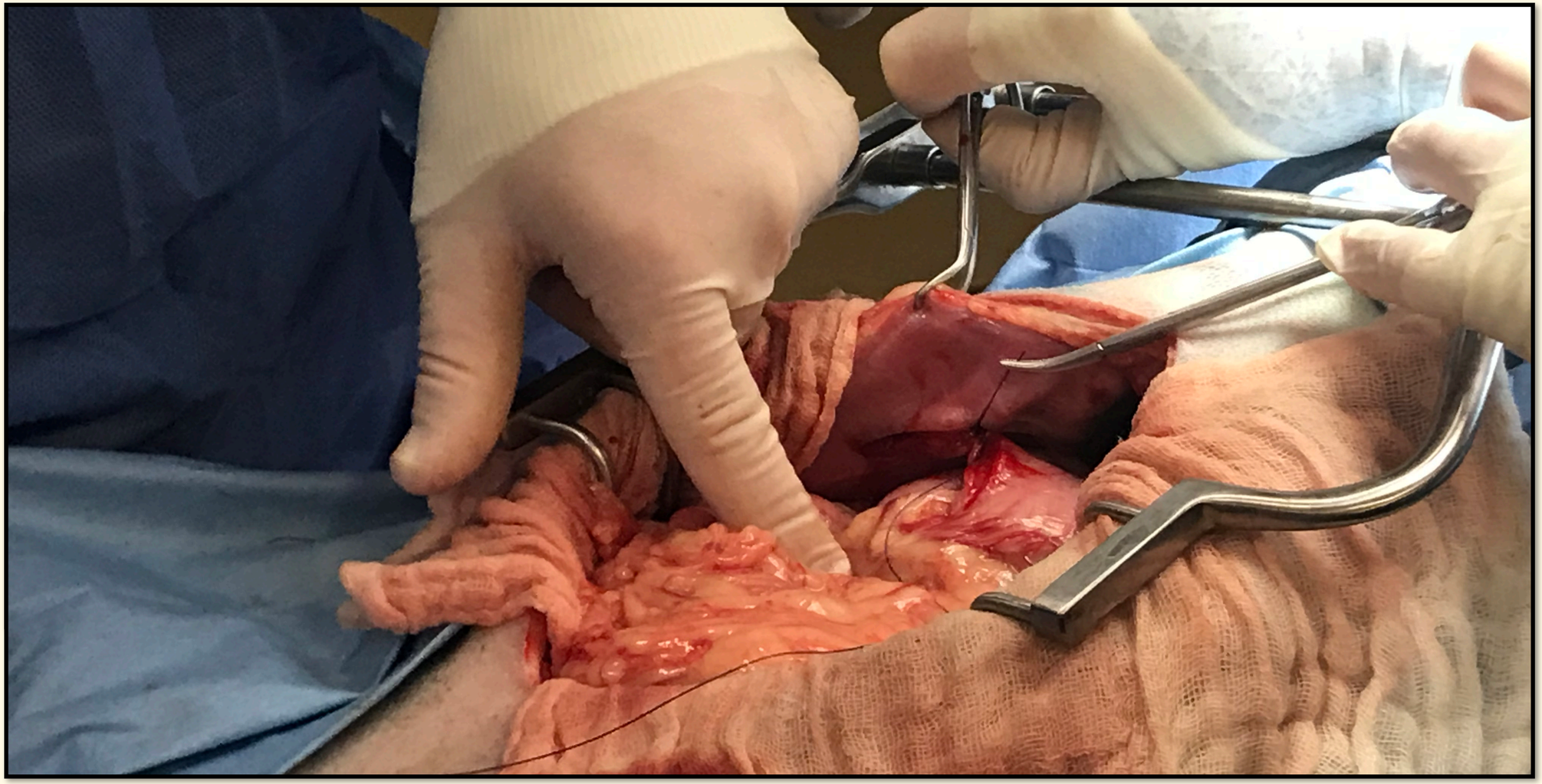
Incisional Gastropexy Technique

- Appose deep layers first
  - 2-0 PDS or similar
  - Simple continuous pattern
    - Long suture tag
  - Tie line at the end
    - Square knots or Aberdeen knot
    - DO NOT cut armed suture strand
- Appose superficial layers second
  - Same suture strand
  - Tie into initial single suture tag

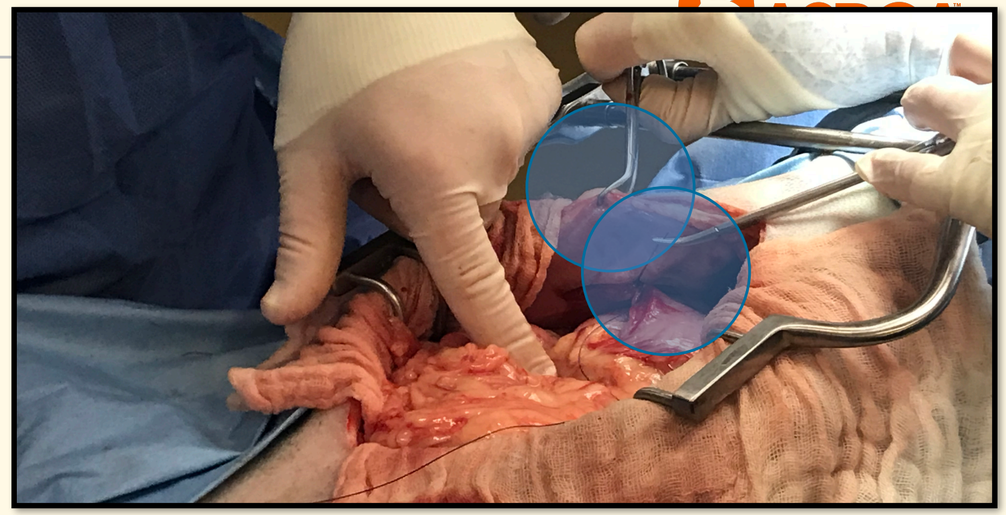
- Also described
  - Unidirectional (knotless/barbed) suture
  - GIA stapler



Incisional Gastropexy Technique



Pro Tips



- Remove falciform ligament and fat
- Decompress stomach with orogastric tube
- Pinch the stomach wall to separate tissue layers
- Elevate the seromuscular layers on each side of the incision
- Struggling to suture?
  - Towel clamp to evert transversus abdominis muscle
  - Try standing on the left side of patient for suturing
  - Leave long suture tag at the start of incision to tie back into

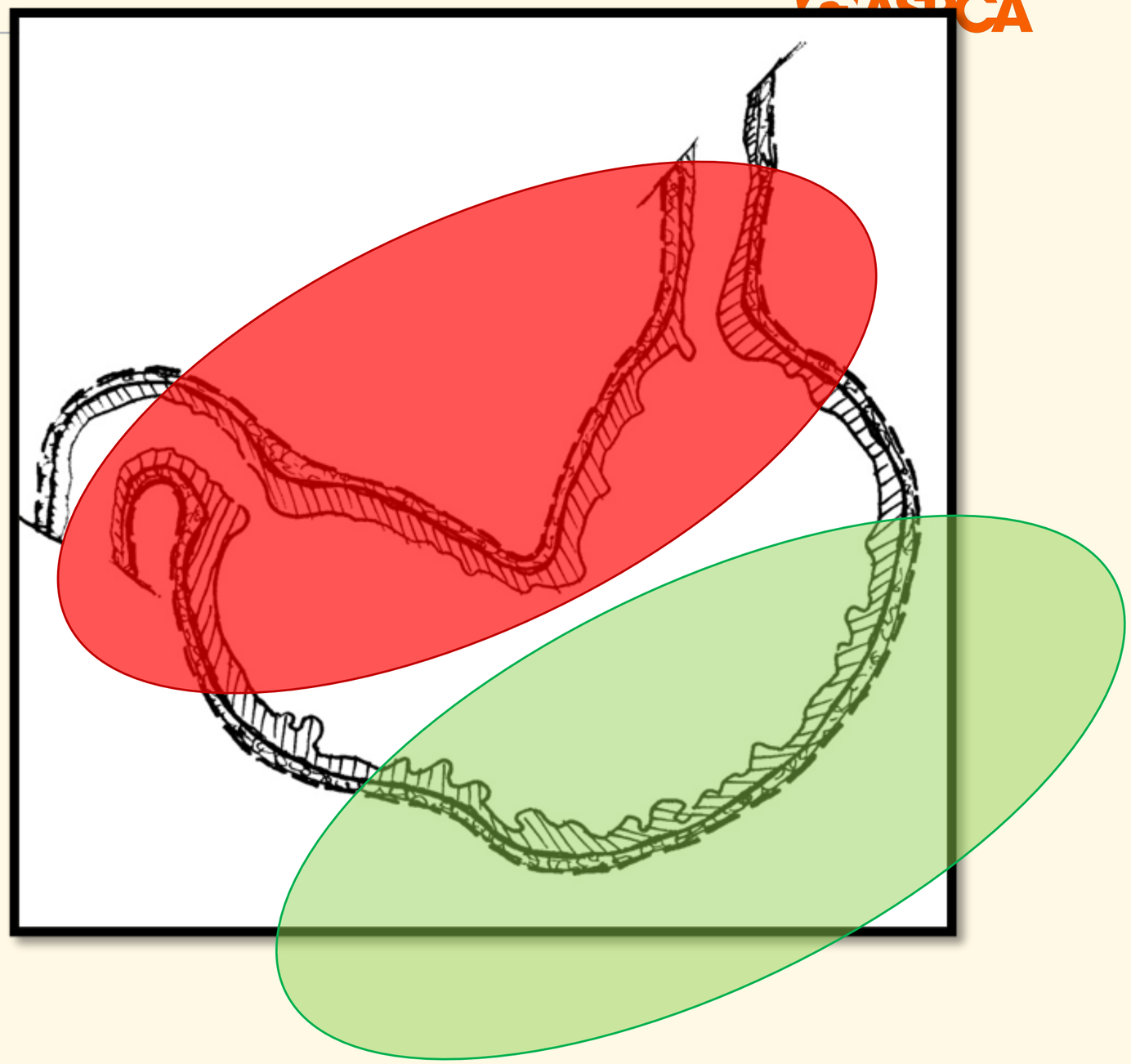
OOPS!

DO NOT PANIC!

- I entered the stomach – full thickness incision
  - Close mucosa and submucosa with simple continuous pattern
  - Finish gastropexy – Omental wrap for good measure? Why not…
- I caused a pneumothorax – body wall incision incorrect
  - Recognition is key
  - Close defect and perform thoracocentesis
  - Perform gastropexy in correct position
- Post-operative complications
  - Failure – rare if incision length is > 4 cm
  - Gastric outflow obstruction has been reported
  - GDV < 5%

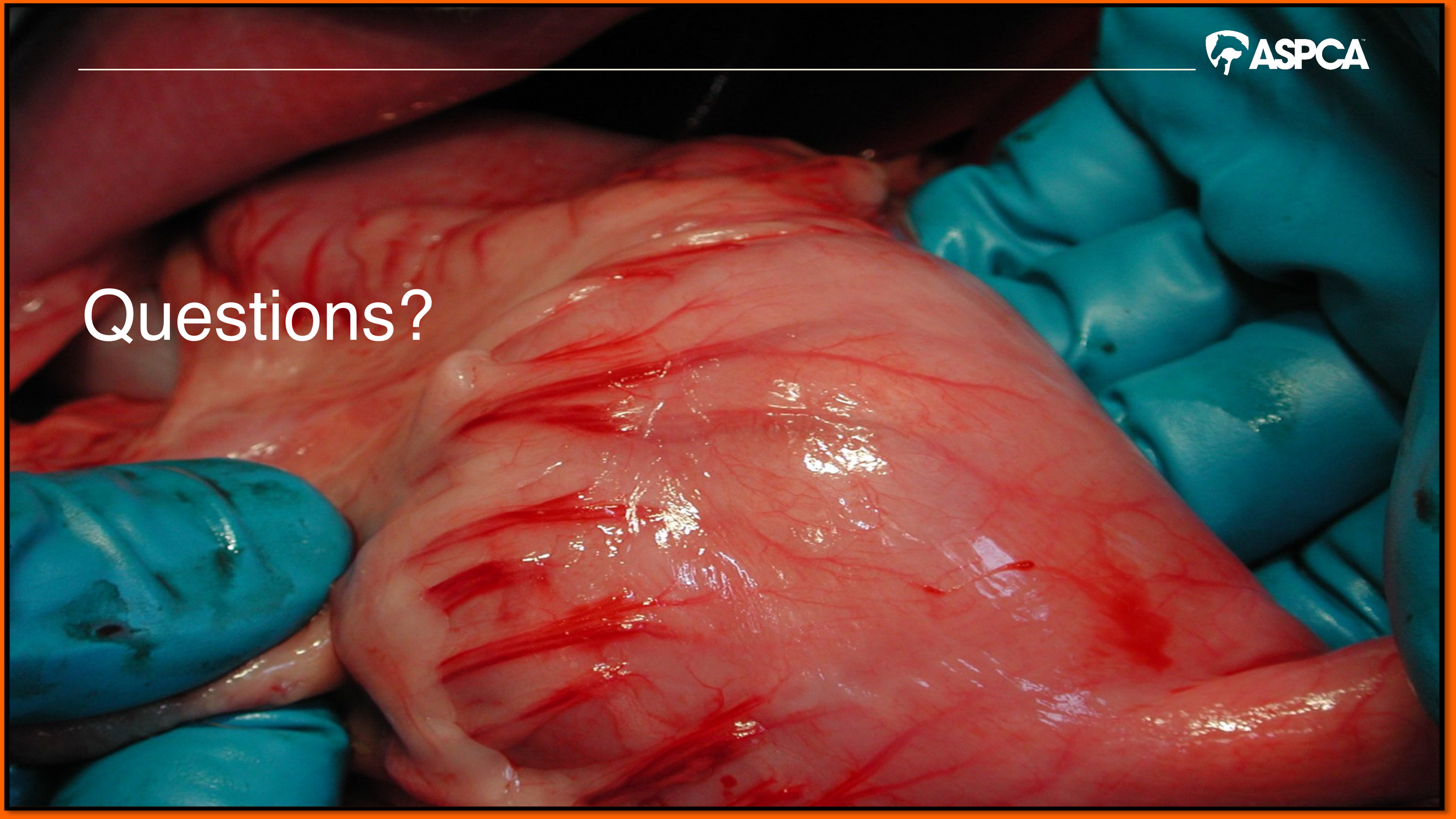
Partial Gastrectomy

- Greater curvature and fundus vs. Other
- Can be difficult to determine viability in GDV patients
  - Color
  - Mucosal slip?
  - Pulses
  - Tissue thickness
  - Arterial bleeding during resection



Partial Gastrectomy

- Closure
- Same as gastrotomy – two-layer
  - Apposition of mucosa-submucosa
  - Cushings/Connell oversew
- Stapler - TA stapler
  - GREEN cartridge – 4.8mm staple leg length (open)
  - Need to staple thick tissue
  - Blue cartridge also acceptable
    - (Blumenthal et al. Evaluation of automated staple sizes on gastric layer incorporation and intralulminal pressures for partial gastrectomy closure in an ex vivo canine model. VetMedSci. 2023;9:2586-2593)
  - Cushings or Connell oversew
    - Reinforcing staple line improves resistance to leakage ex vivo


Questions?

Enterotomy - Techinque

Antimesenteric Incision

Blade
+/- Extend with Metzenbaum scissors
In healthy intestines DISTAL to FB
Tissue tension facilitates clean cuts

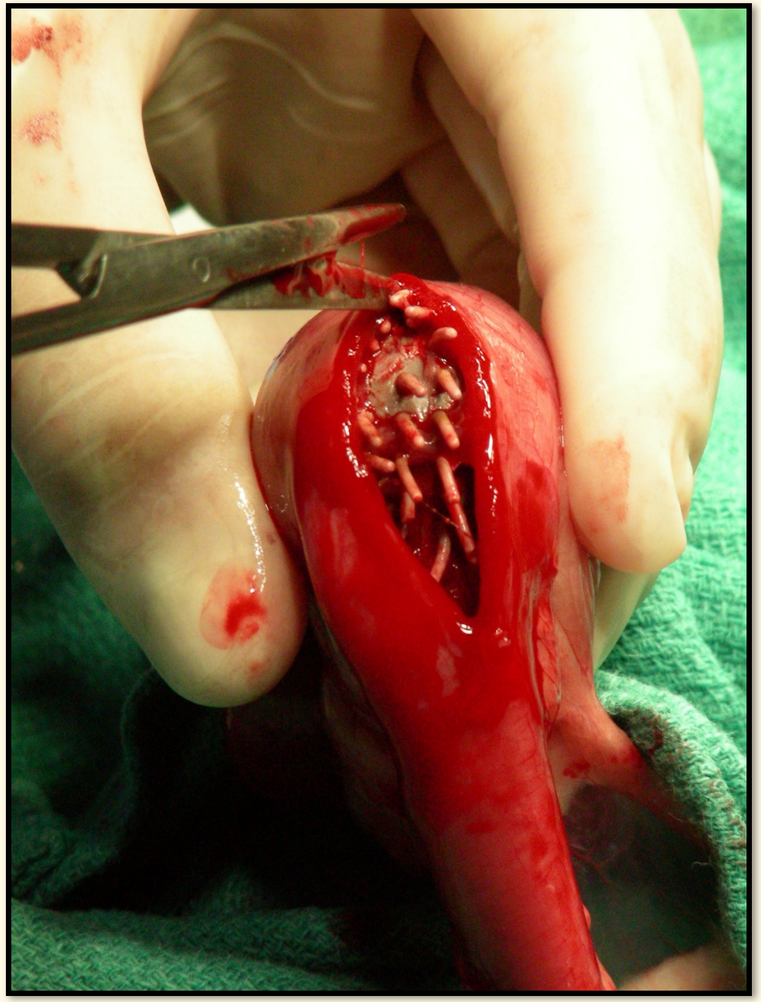
Avoid Tearing

Incision big enough
Grab and pull vs. squeeze it out

Closure

Submucosa is holding layer
Accurate layer apposition
Avoid failure

- Big bites
- Avoid mucosal eversion
- Water tight – stable at the table principle



Enterotomy - Techinque

Closure

Suture

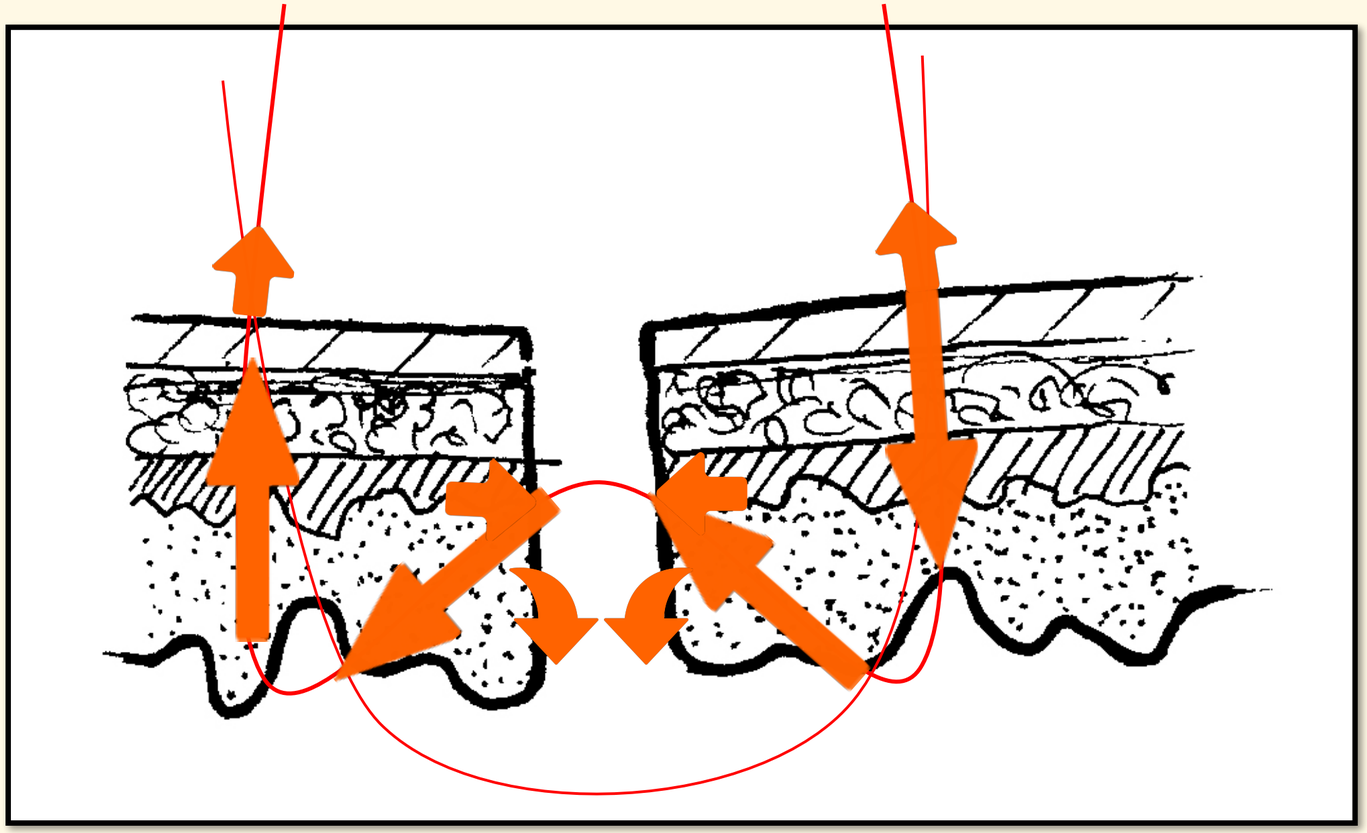
- Simple full-thickness – interrupted or continuous
- Modified Gambee

Staples

- Functional end-to-end anastomosis
  - GIA stapler +/- TA Stapler

Modified Gambee technique

- Full thickness in
- Needle back into mucosa – emerge just deep to submucosa
- Enter mucosa just deep to the submucosa
  - Into the lumen
- Full thickness out



Linear FB

Careful!

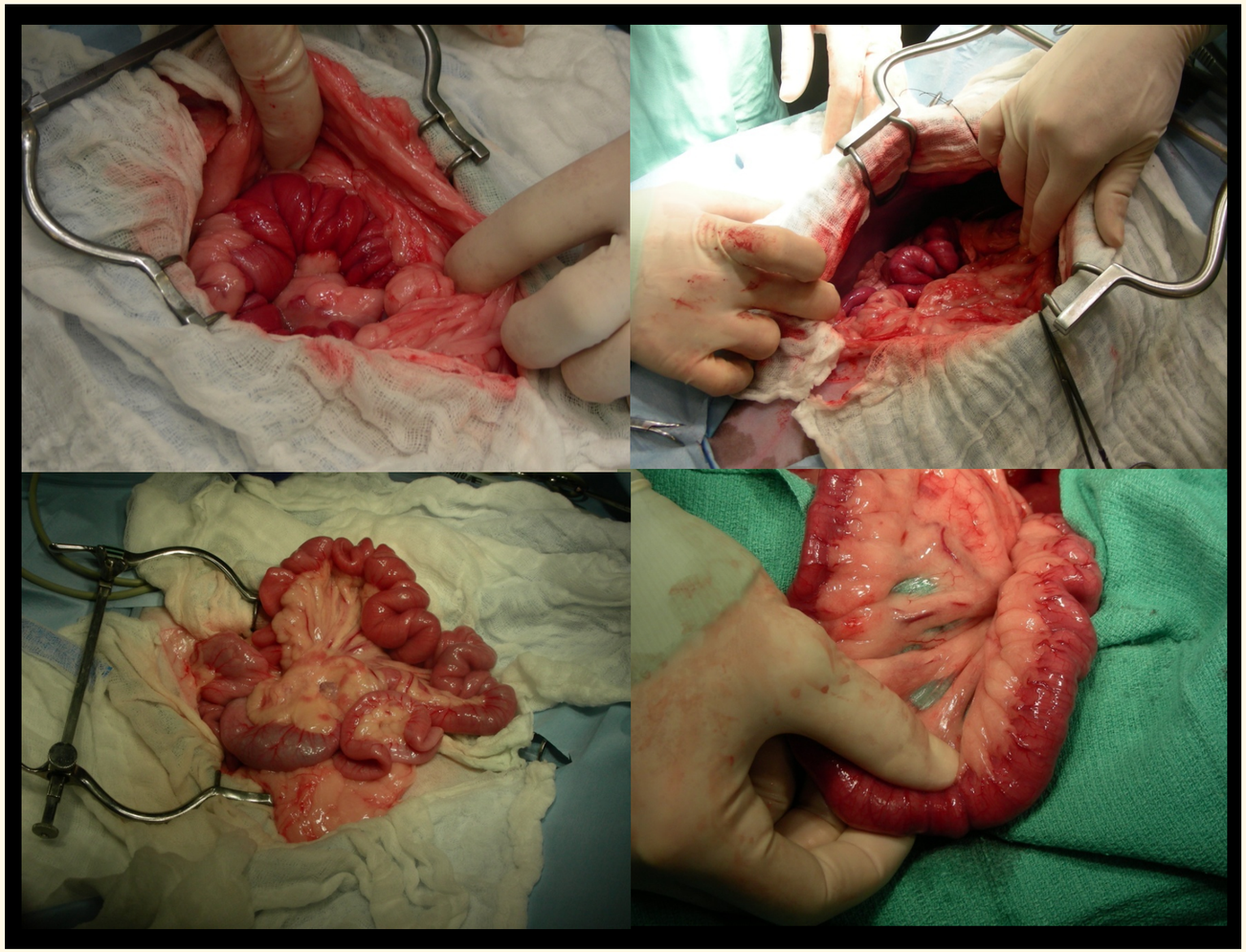
- Manipulation of bowel can lead to perforation
- Running the bowel may have to wait
- Don’t pull against a lot of resistance

Fixations

- Typically two sites:
  - Stomach (or tongue)
  - Distal
  - Can be more

Medical Treatment

- Surgery is safest option
- Fixed under tongue? Option of medical treatment
  - Not a great option
  - Resolves in ~50% of cases
  - 50% worsen
    - Often find intestinal perforation at the time of Sx
  - Only an option if there are no other options



Linear FB Removal

Gastrotomy First

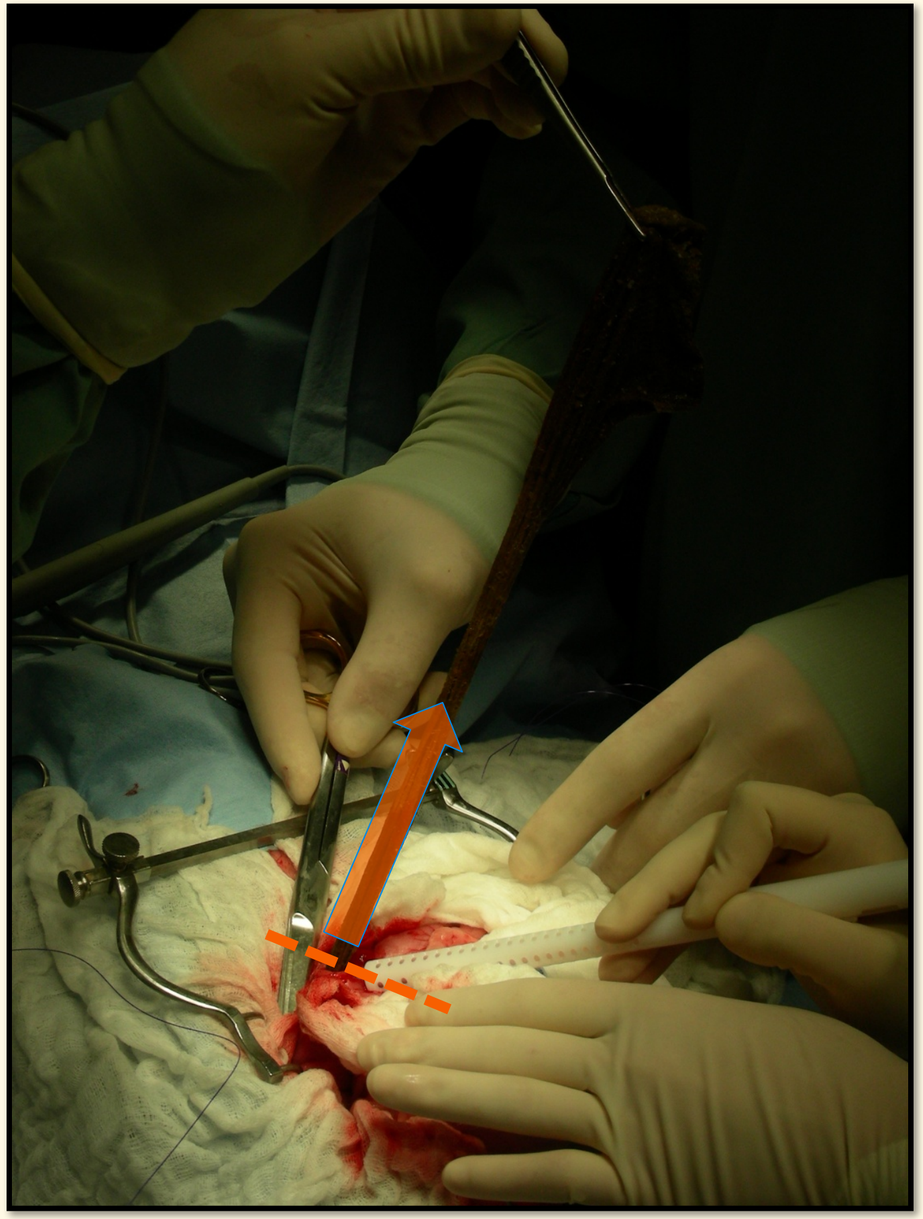
- Find the plug, gently pull
- Transect at distal end
  - Can suture red rubber to string for identification
- Leave open initially

Enterotomy Second

- Exteriorize, pack off
- Occlude distal only
- Gentle traction

Additional Enterotomies

- If needed
- Over additional “plugs” or at ½ distance



Linear FB Removal

Gentle!

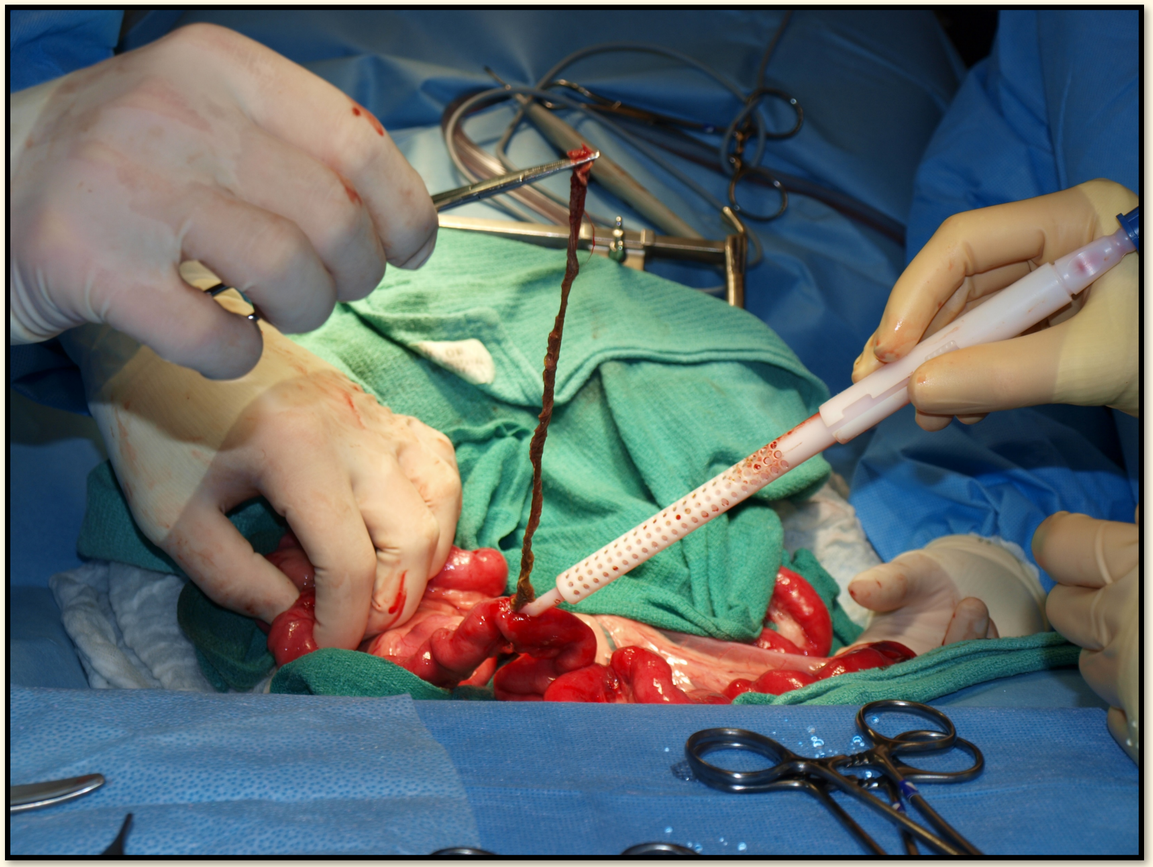
- Pull
- Milk

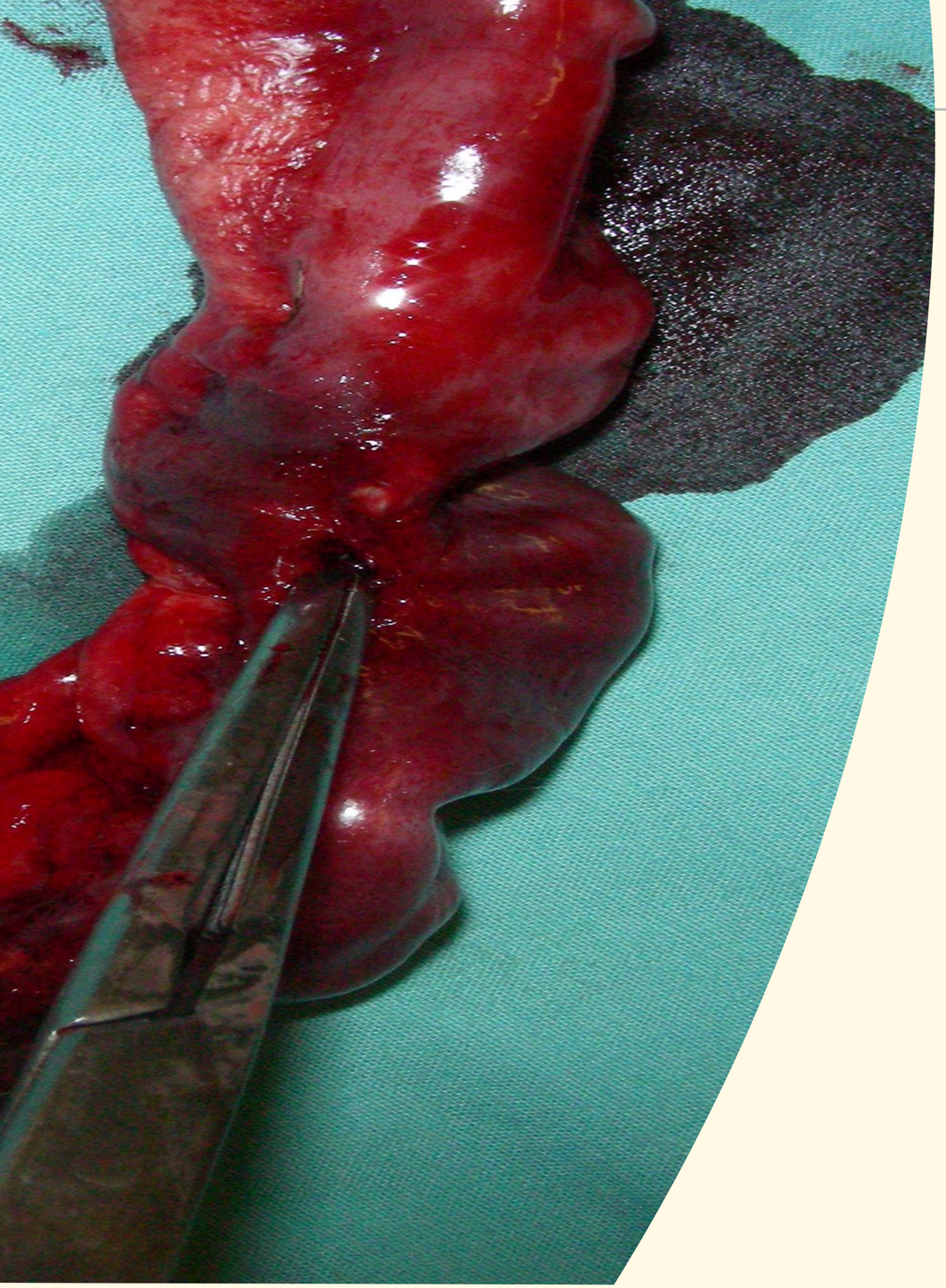
Remove it ALL

- Palpate again before closure
- Plication should have completely resolved

Closure

- Gastrotomy
- Enterotomy





Bowel Viability

Evaluation

- Visual - Appearance
- Physical – Palpation
- Mesenteric border!

Careful!

- Bruising, petechiation, hemorrhage often extensive
- Don’t prod too hard
  - Gentle palpation with finger or hemostats

How to Tell?

- No truly objective criteria
- You will know in 3-5 days…

Considerations

- Bowel is designed to regenerate – amazing healing capacity
- How extensive would resection be?
- How many R&A’s?
- The omentum is your friend

Resection & Anastomosis

Safety

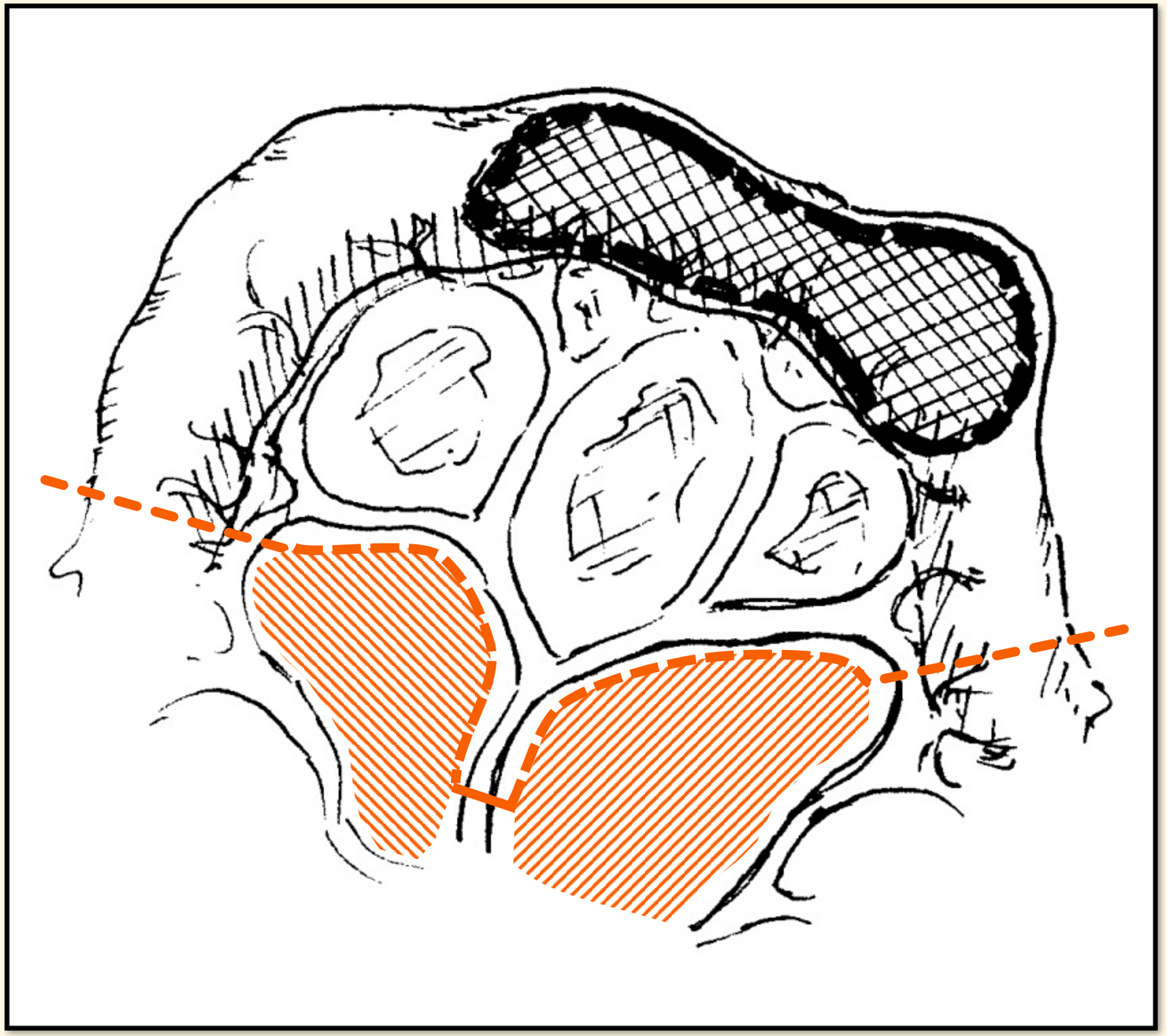
- As few R&As as possible
- Leave mesentery to suture
- Consider blood supply and perfusion

Efficiency

- Plan ahead – number and location of R&A
- Ligate as close to base as possible

Specifics

- Ligate vessels as close to the base as possible
- Dissect mesentery away from remaining vessels
- Angle bowel transection correctly



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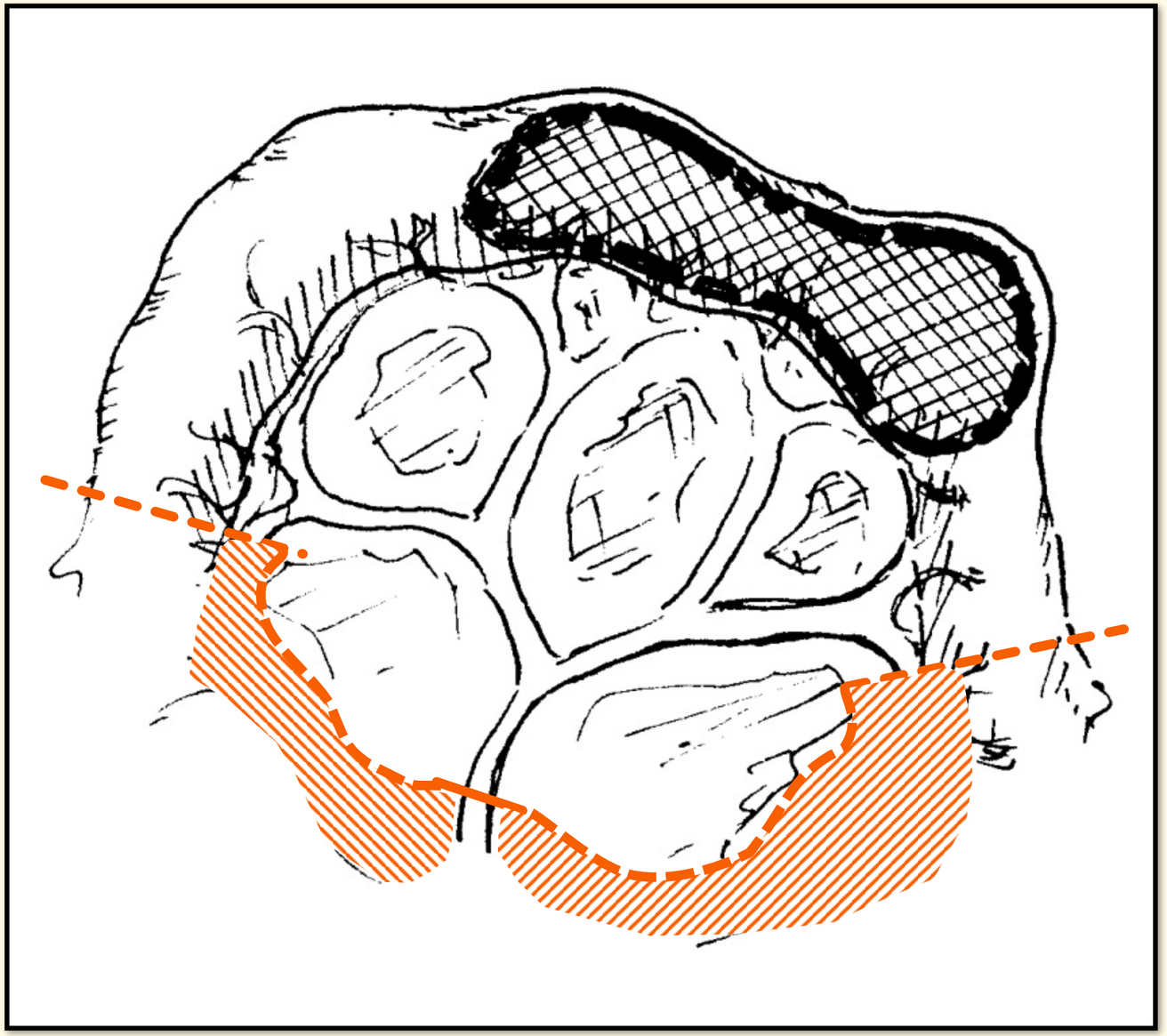
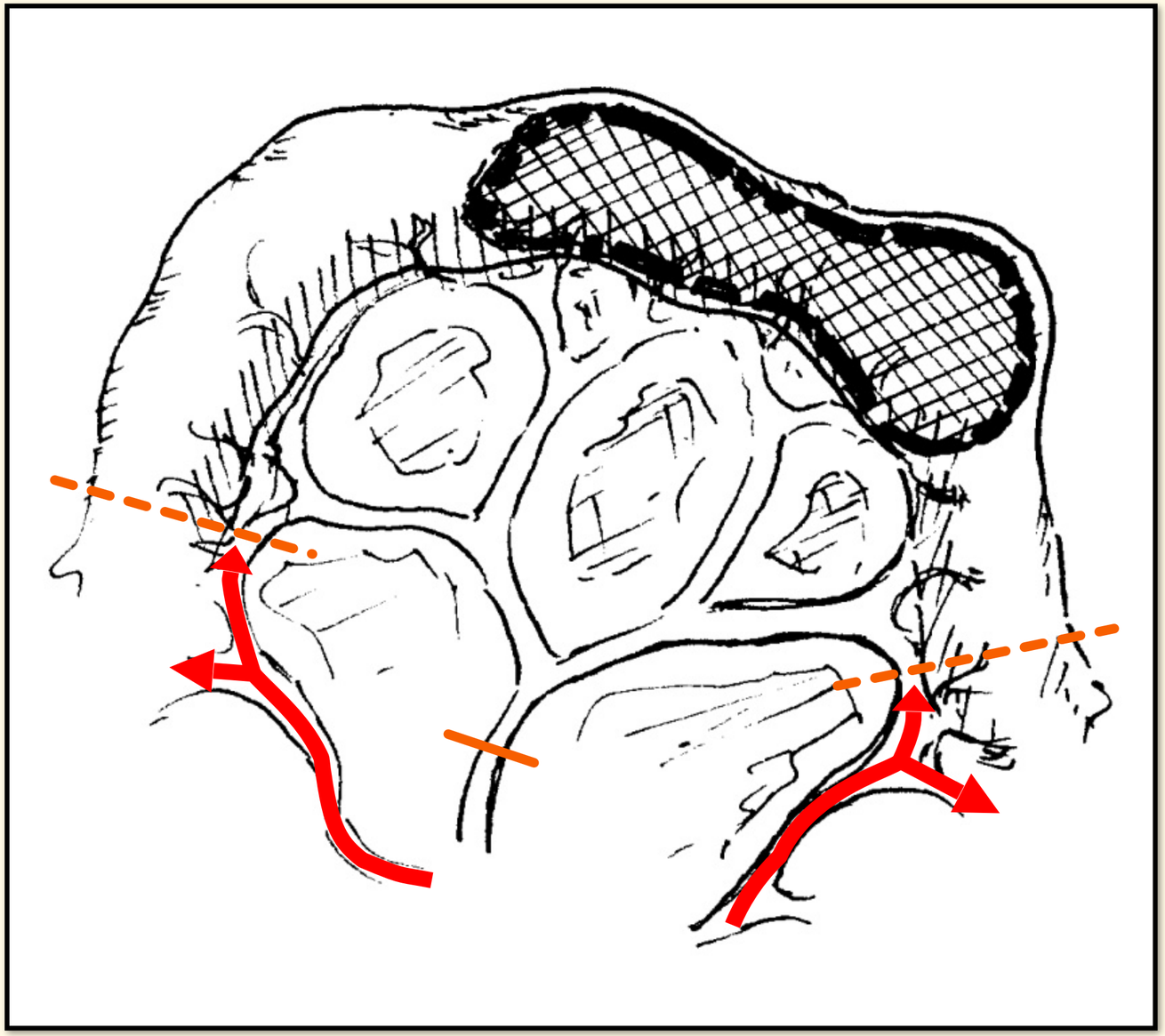
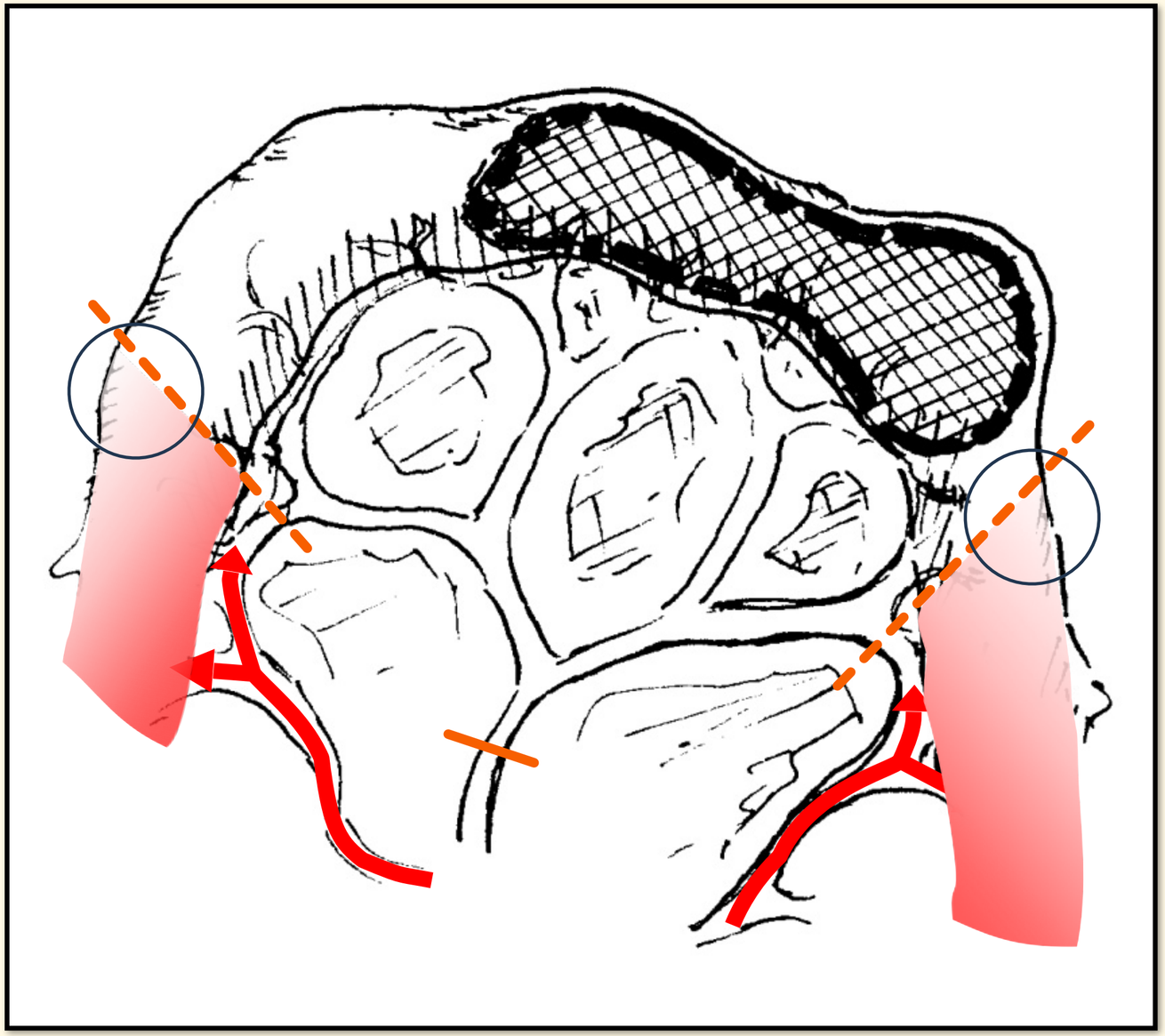




Resection & Anastomosis

Angling Bowel Transection

- Only if needed for lumen size discrepancy
- Keep distances from blood supply short
- Angle towards remaining bowel on antimesenteric side



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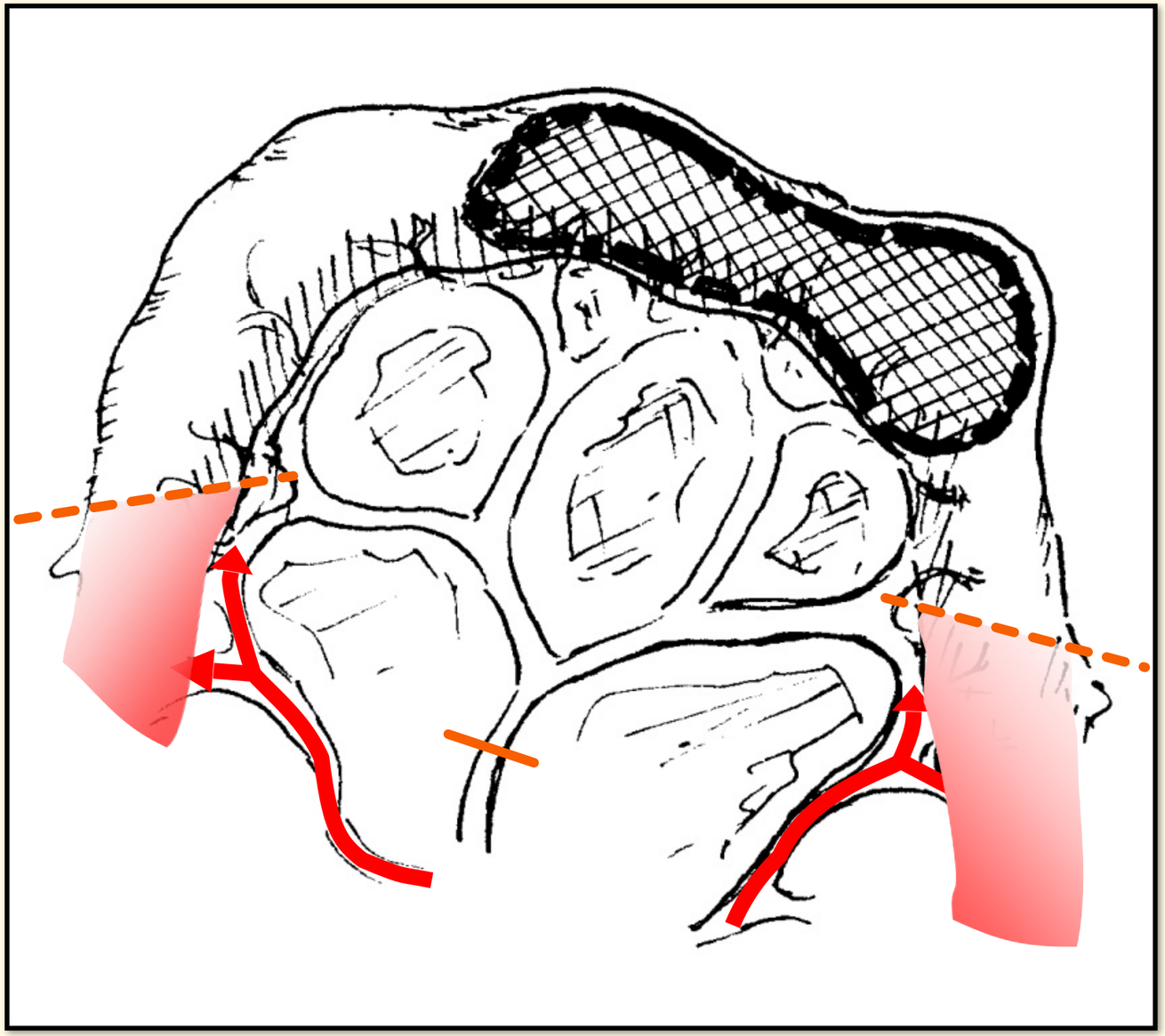

Resection & Anastomosis

Angling Bowel Transection

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Resection & Anastomosis

Closure

- Combination of modified Gambee & simple interrupted sutures
- Divide distances in halves
- Start on mesenteric side

Mesenteric Sutures

- Usually where you get leakage
- Big bites
- Full thickness
- Knots in lumen

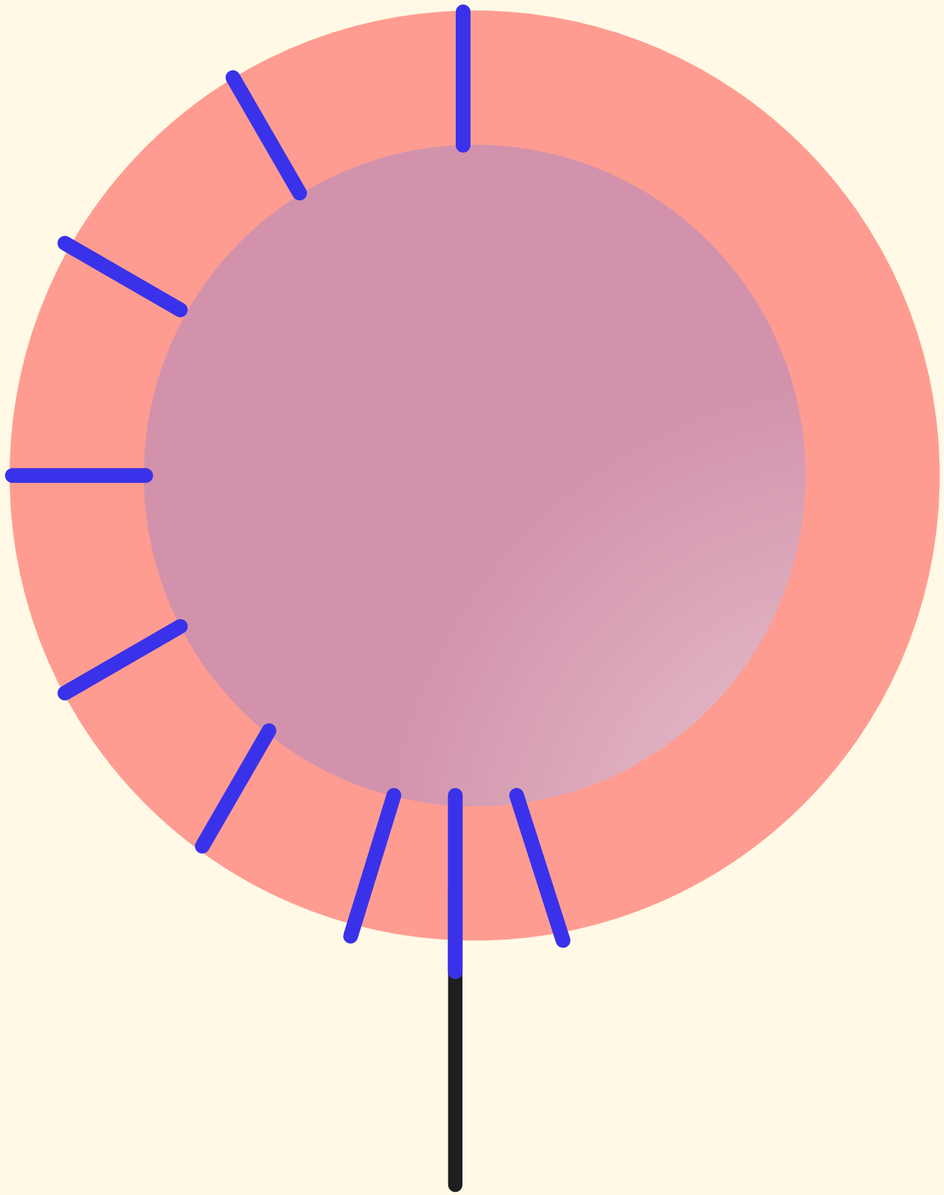
Antimesenteric Suture

- Modified Gambee

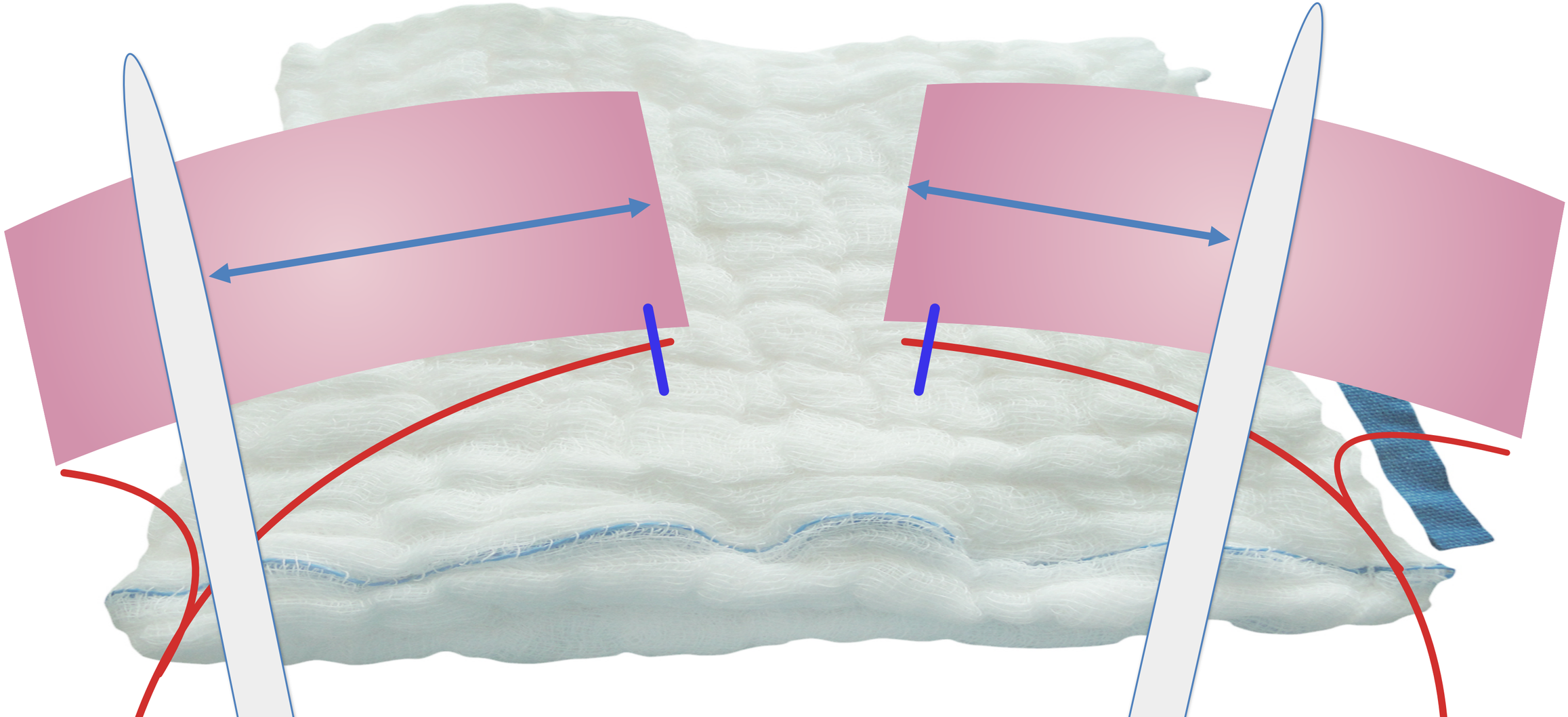
Pick a Side

- 3 or 9 o’clock sutures - Modified Gambee
- Fill in the rest – Modified Gambee or simple interrupted

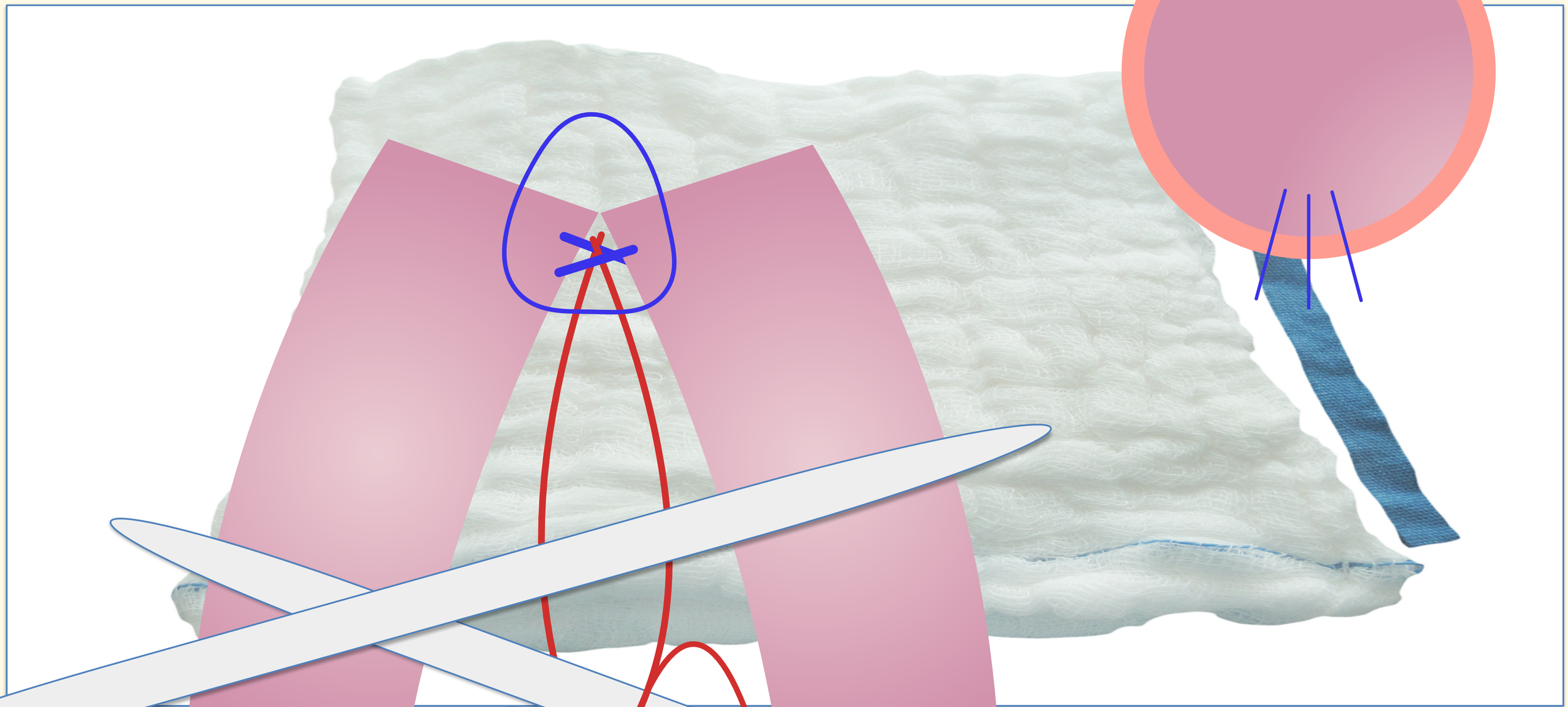
Do The Other Side



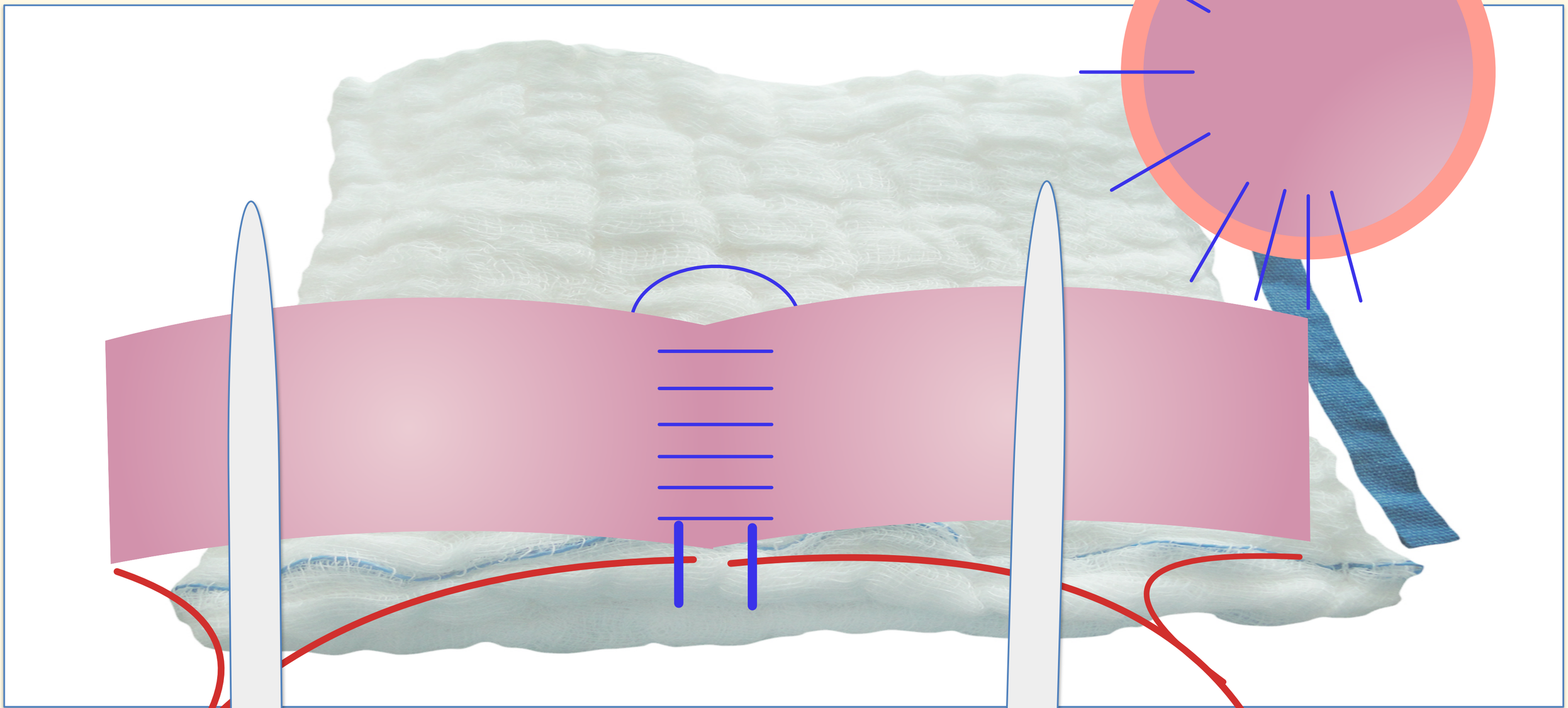
Resection & Anastomosis



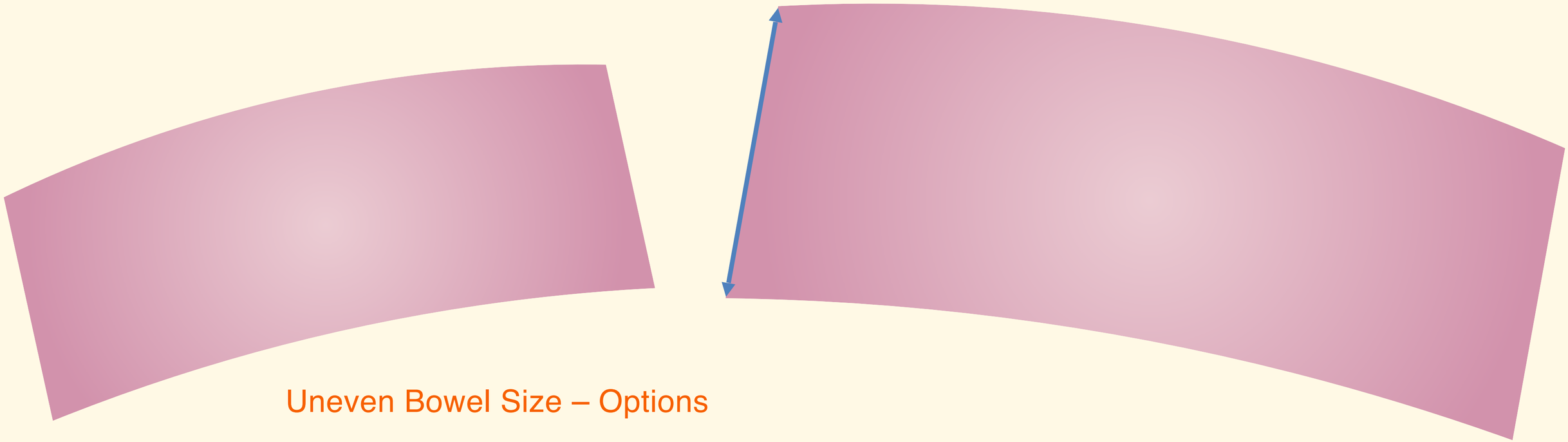
Resection & Anastomosis



Resection & Anastomosis



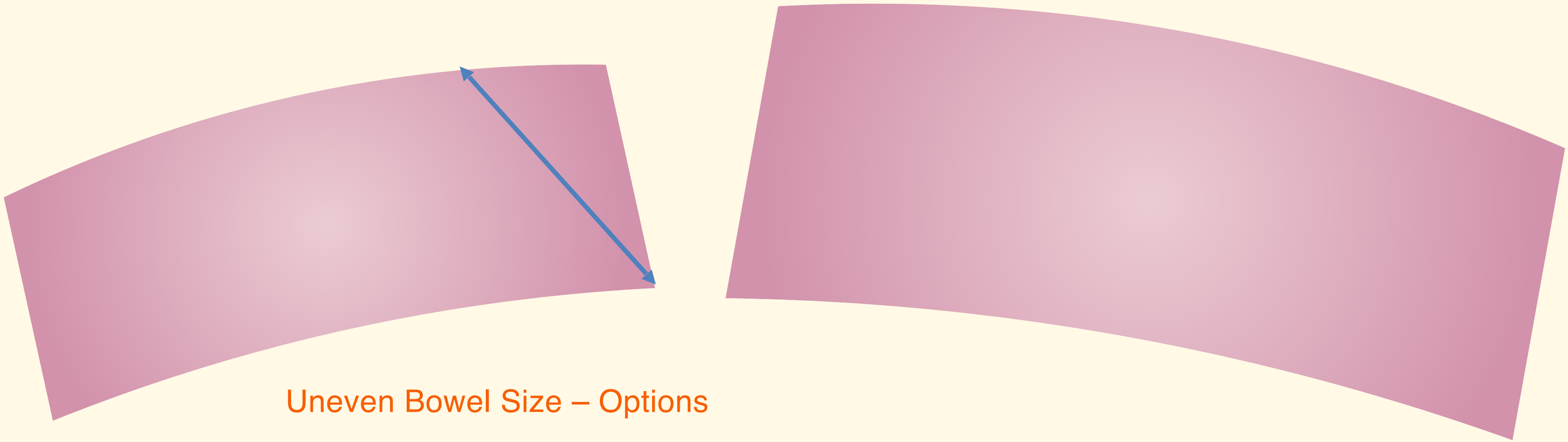
Resection & Anastomosis



Uneven Bowel Size – Options

1. Angle incision of smaller segment
2. Close antimesenteric aspect of larger diameter segment

Resection & Anastomosis



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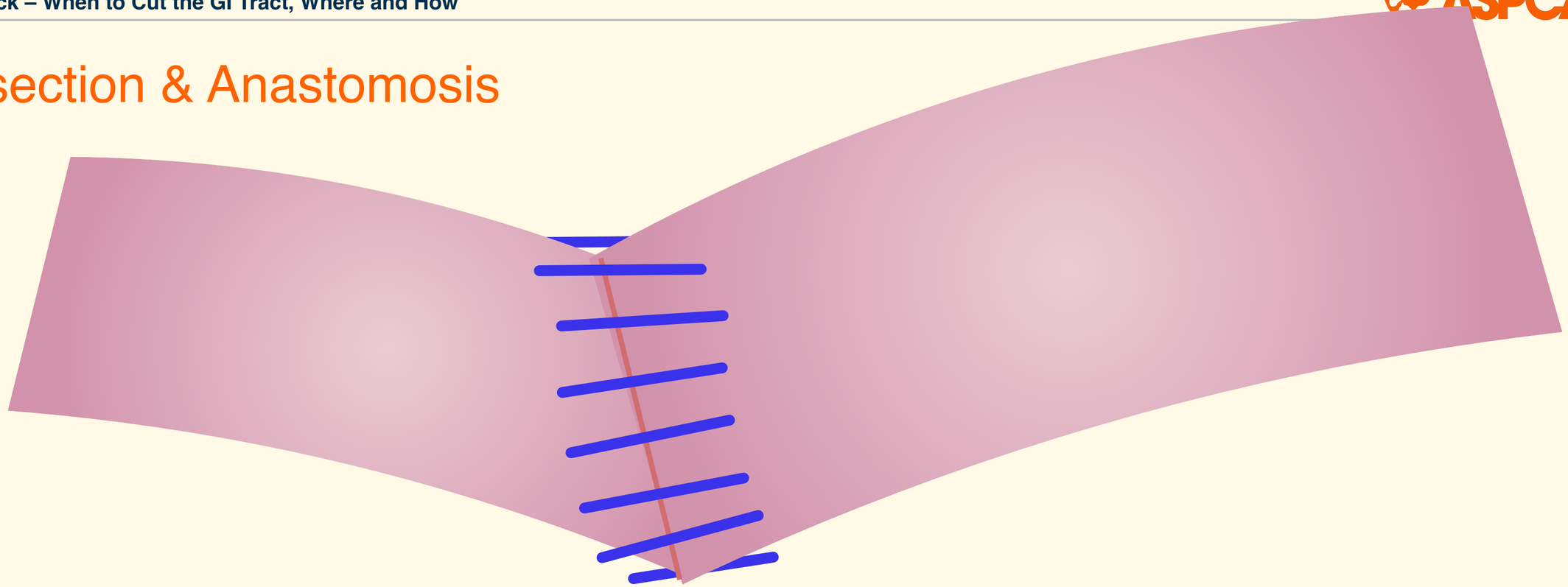

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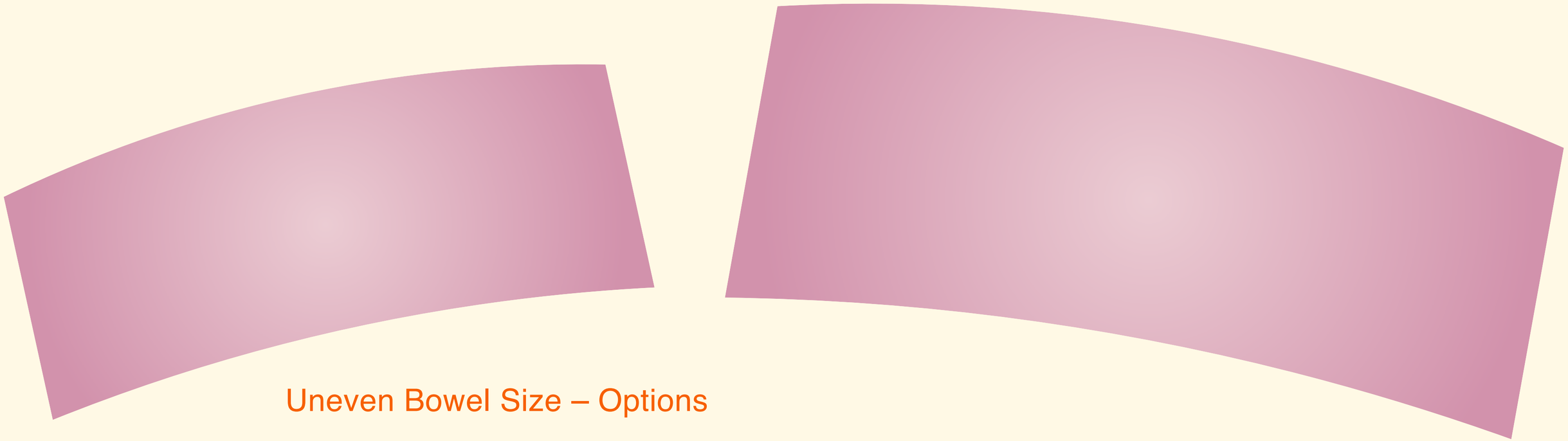

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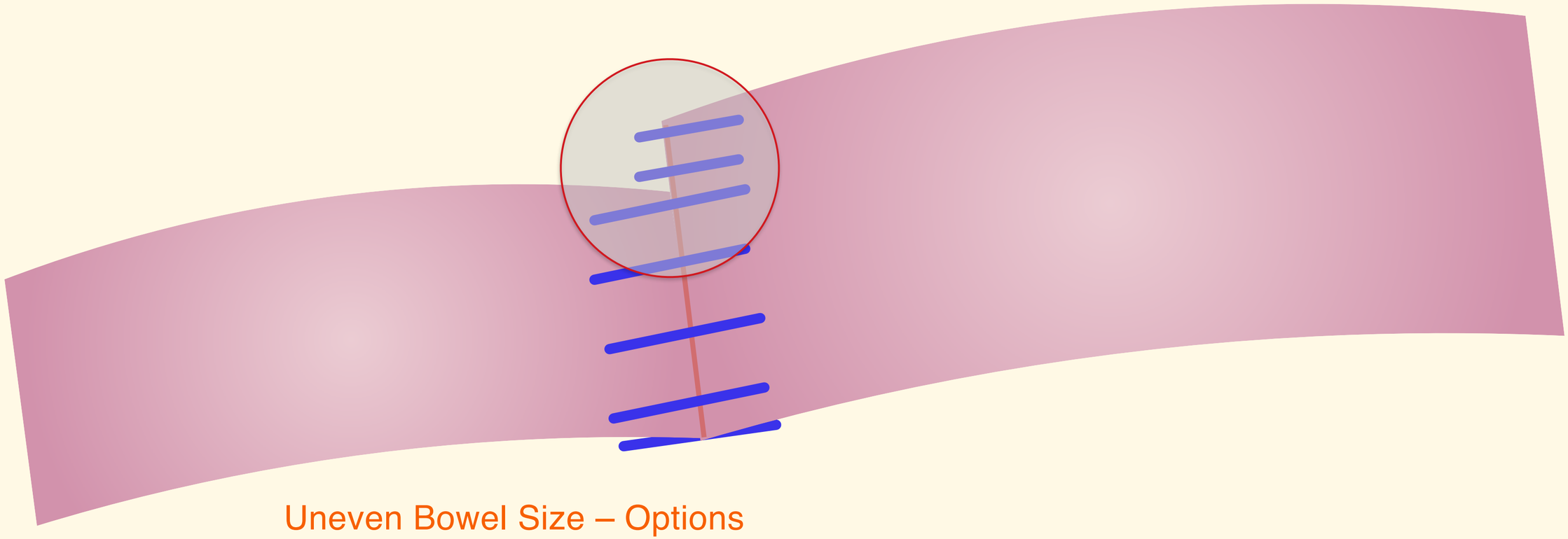

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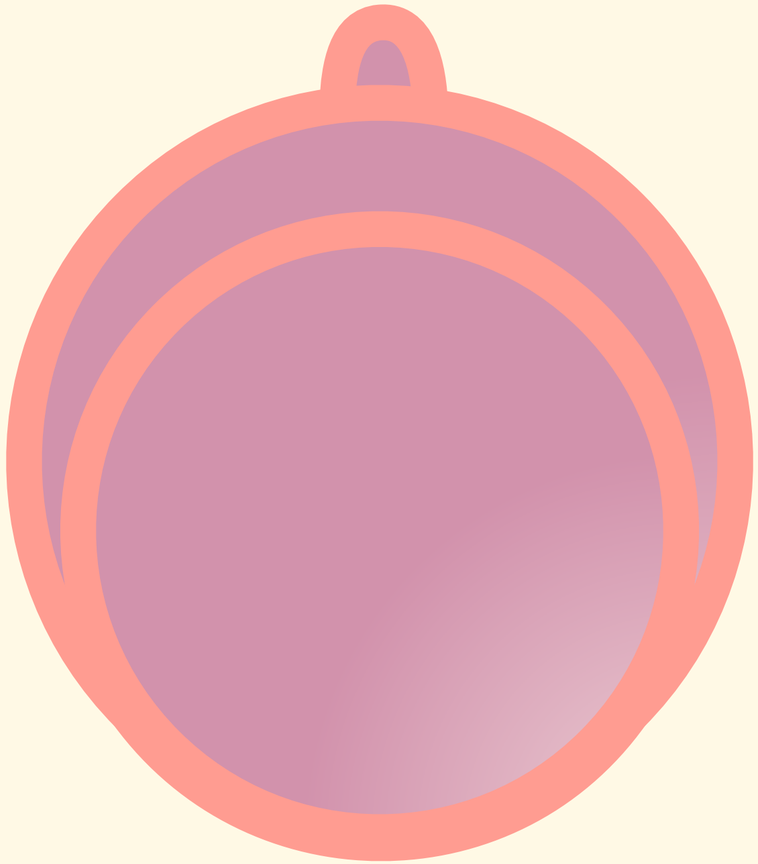
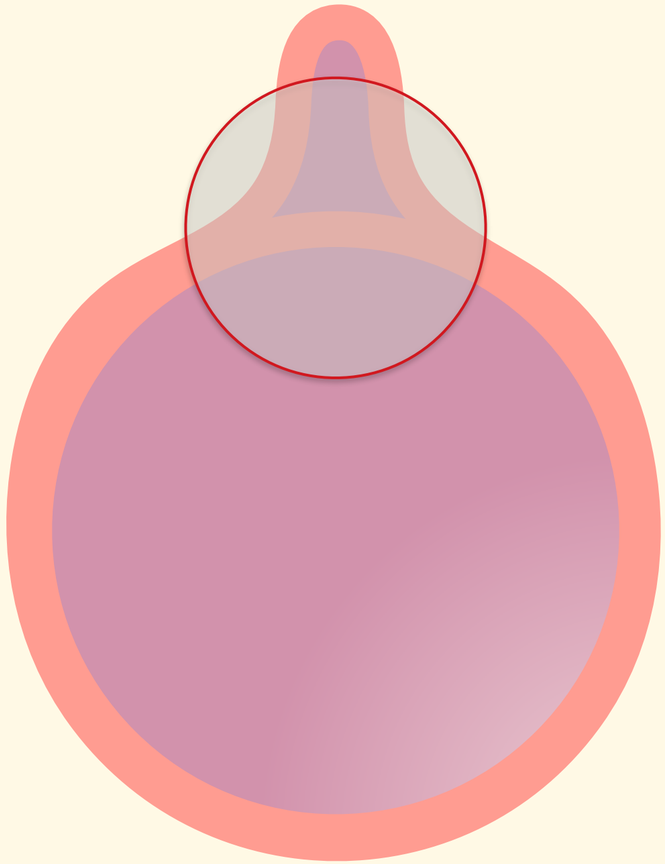
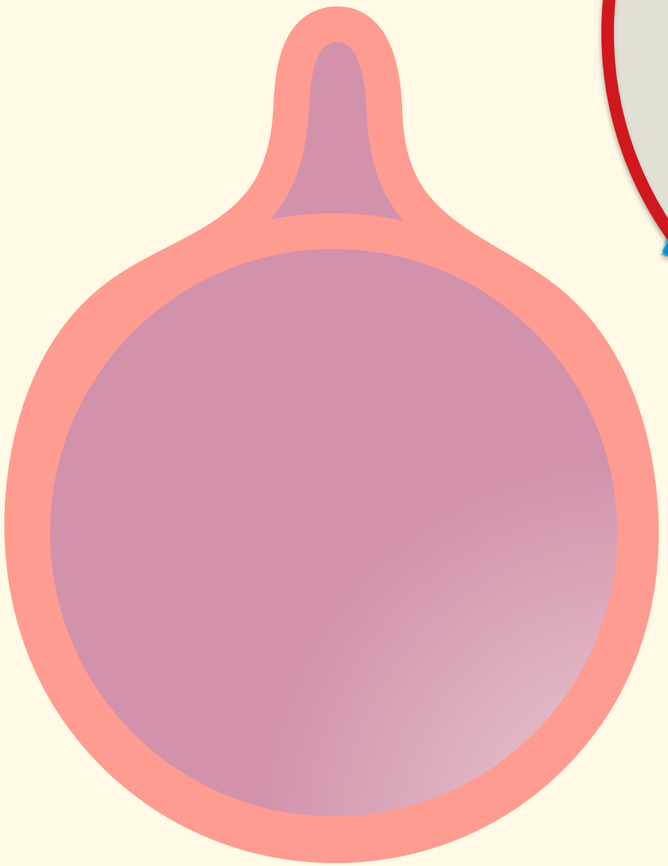
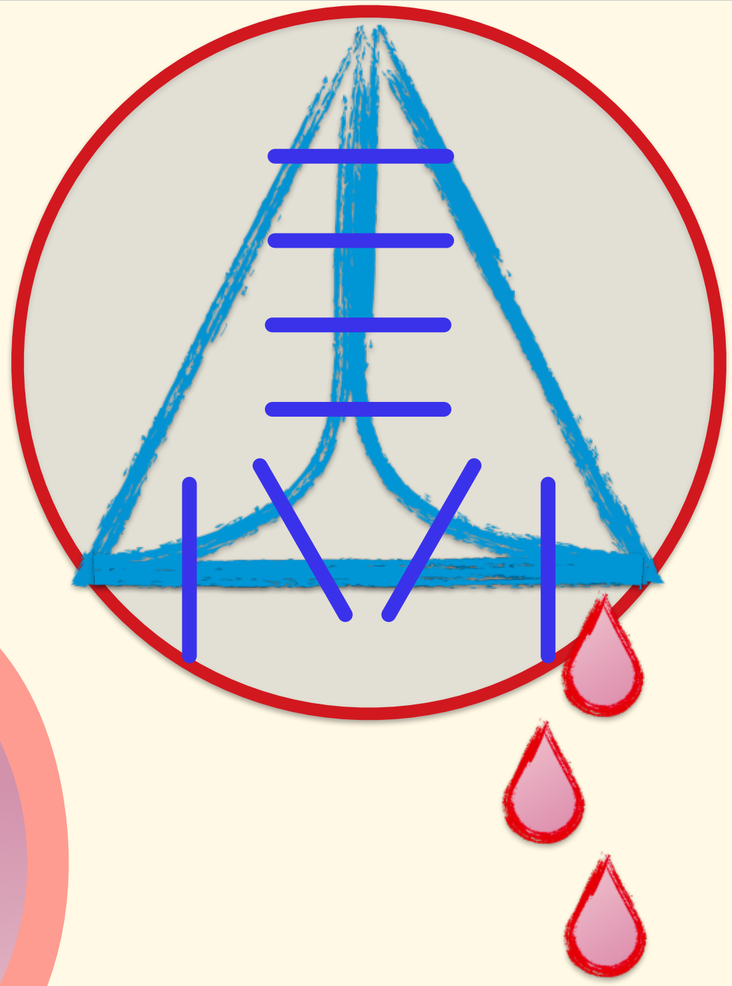


Resection & Anastomosis



Resection & Anastomosis





Resection & Anastomosis

Suture selection

- 3-0 or 4-0 Monofilament absorbable suture
  - PDS, Monocryl, Maxon
  - Needle size
- Big bites – no less than 5 mm from edge – Modified Gambee forces big bites
- Spacing – needs to be water-tight

Mesenteric rent closure

- 3-0 or 4-0 Monofilament absorbable suture
- Simple continuous pattern

Leak Testing

Resection & Anastomosis

Leak Testing

- ~10 cm segment isolated with Doyens
- 20 ml of saline injected
- Gentle pressure

- Goals:
  - Test lumen patency
  - Check for obvious leaks

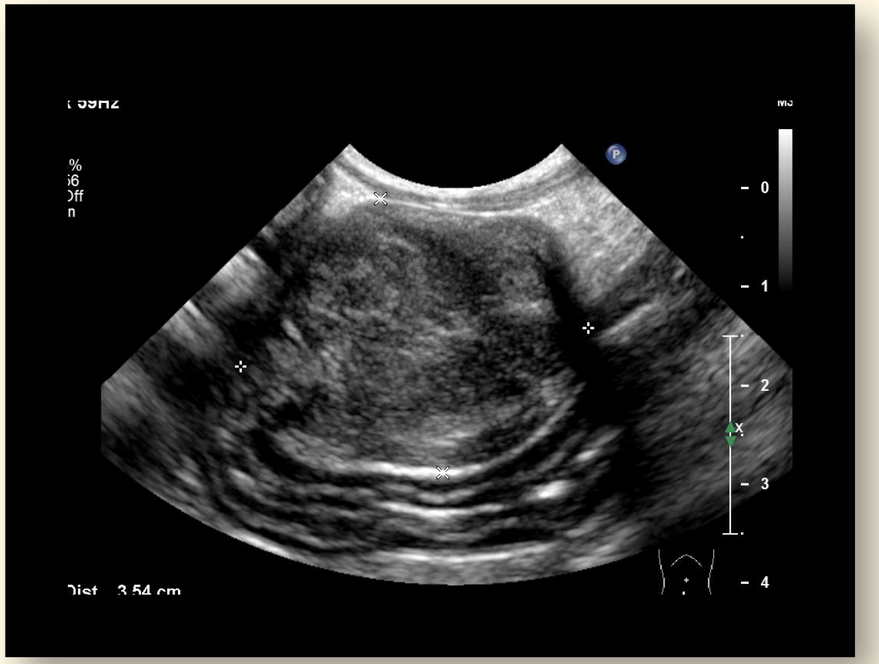
- High pressure will lead to leaks (suture holes)
- Geysers? Add sutures

- Not indicative of future success – “stable at the table”

Intestinal Neoplasia

R & A

- Resection with 4-8 cm of grossly normal tissue
- Consider lymph node biopsy



Caudal Duodenal Flexure

Tethered

- Duodenocolic ligament/fold
- Difficult to access or resect
- Transection of ligament!
  - Close to antimesenteric border of duodenum

Krebs Tenets of GI Surgery

The Omentum Is Your Friend

Prevention of Contamination is Better Than Mitigation

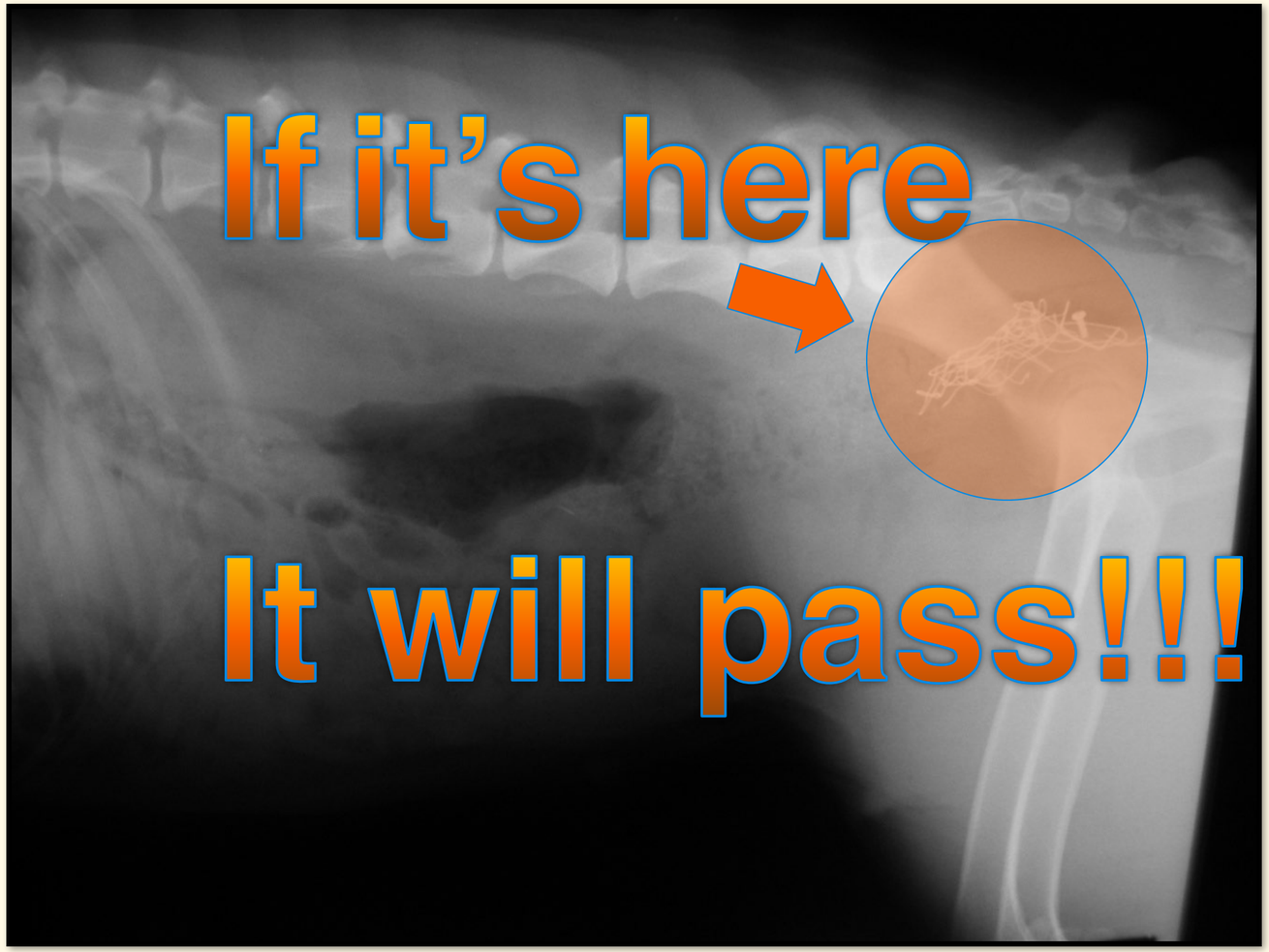
You Will Know If It’s Viable – In 3-5 Days

Zero Negative Explores = Not Enough Explores

Don’t Mess With the Esophagus & Colon

Large Intestinal Foreign Body

Don’t be THAT person

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Weather permitting, please leave pet in car during intake.
ASPCA™