



How to Avoid Complications During Pelvic Surgery: Tips and Tricks

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Disclosures

- Speaker and trainer for Medtronic
- Consultant for Touch Stone

Background

- Possible intraoperative complications
 - Structural injury
 - Bleeding
 - Bowel Ischemia (avoid mesenteric injury and use ICG)
 - Tumor perforation (Stick to the correct surgical plan and don't encroach on tumor)
 - Technical failure (eg. Stapler)

Background

- Key pelvic anatomy at risk:
 - Ureters (left side)
 - Hypogastric nerves and pelvic plexus (autonomic nerves controlling bladder & sexual function)
 - Pelvic vessels (presacral veins, middle rectal vessels, internal iliac branches)
 - Prostate/vagina in anterior dissection

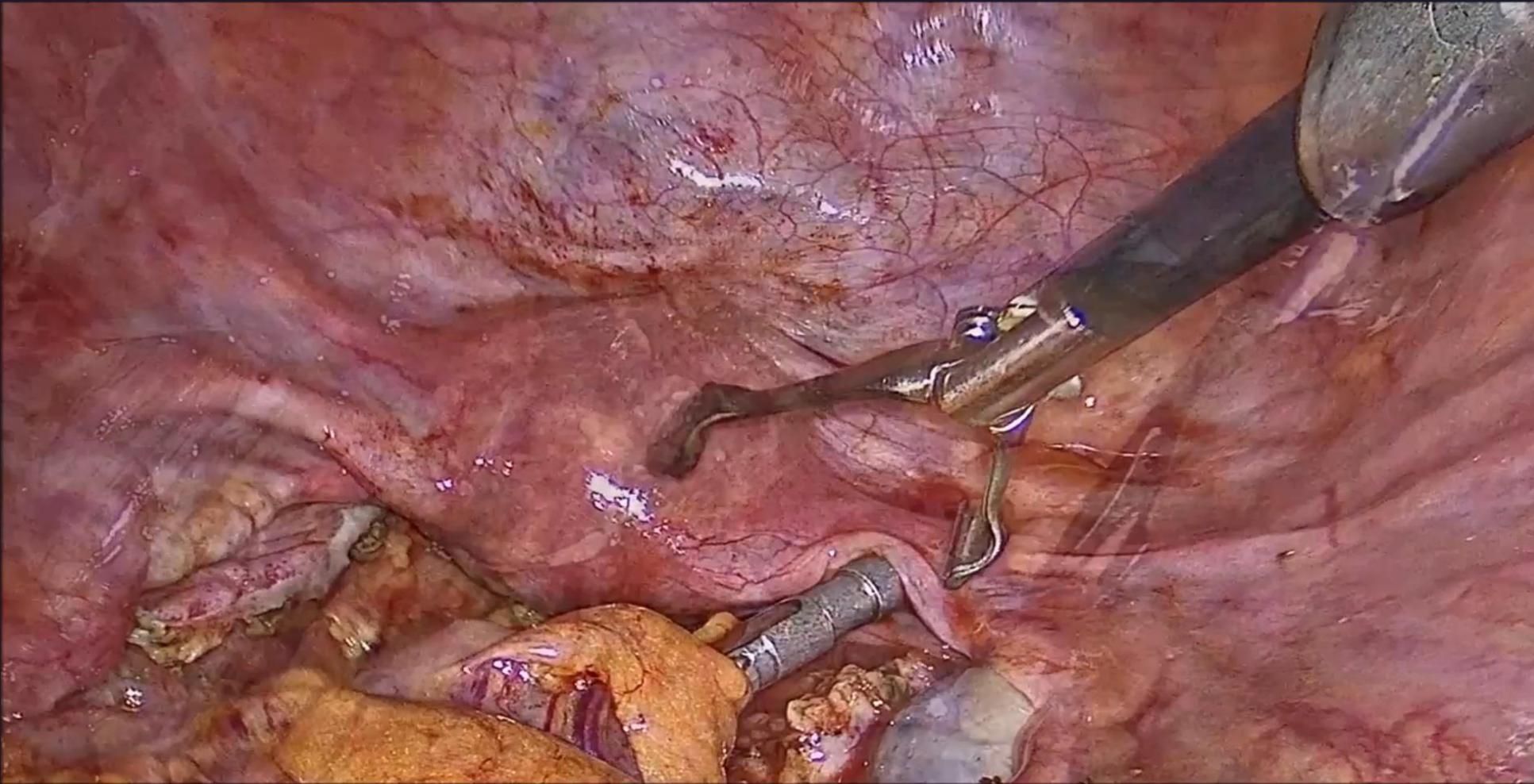
Intraoperative nightmares!!

- Hemorrhage (3-7%)
- Tumor perforation (1-4%)
- Bowel injury (1-3%)
- Ureter injury (1%)
- Urogenital injury (2%)

Preoperative Planning

- High-quality MRI to define tumor location and relation to pelvic structures
- Identify narrow pelvis, obesity, bulky tumors – anticipate difficulty
- Discuss surgical approach (open, laparoscopic, robotic)

Bowel ischemia



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Footer

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Ureteric Injury

- Areas at risk of injury :
 - Upper third from ureteropelvic junction (UPJ) to the upper sacroiliac (SI) joint
 - Middle third as it courses over the sacrum
 - Lower third from the inferior SI joint to the ureterovesical junction (UVJ) in the bladder
- Ureteral injuries tend to occur
 - At origin of the IMA from the abdominal aorta
 - Laterally at the pelvic brim
 - Between the lateral rectal ligaments
 - Posterior to prostate

Ureteric Injury Mechanisms

- Ligation or kinking while suturing
- Crushing from a clamp
- Partial or complete transection
- Thermal injury
- Ischemia from devascularization
- Occult ureteric injuries occur more often than are reported
- Maintenance of appropriate embryonic planes during dissection (dividing along the white line of Toldt)

Ureteric Injury

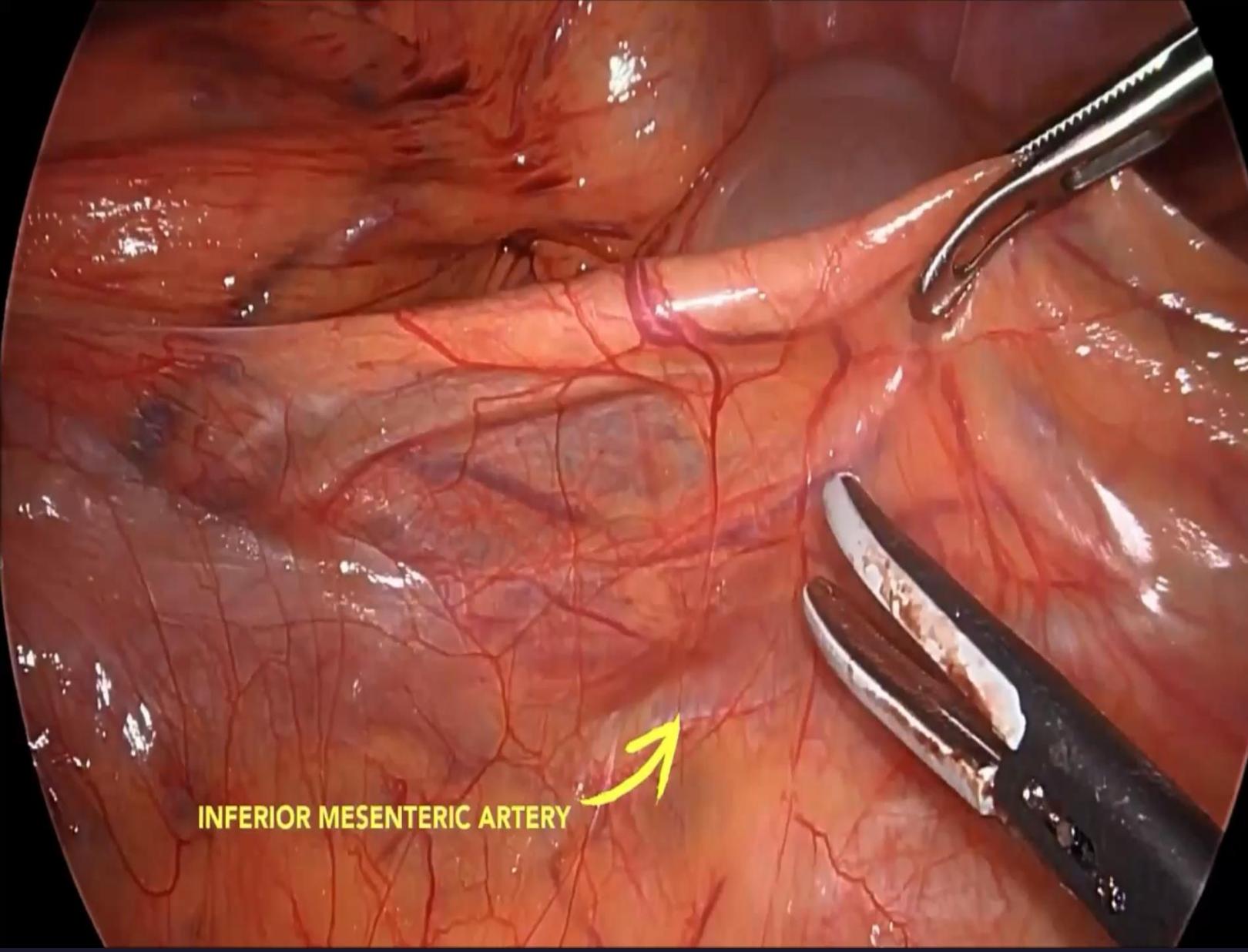
- Classification of ureteral injuries :
 - Grade I – hematoma; contusion or hematoma without devascularization
 - Grade II – laceration; less than 50% transection
 - Grade III – laceration; 50% or greater transection
 - Grade IV – laceration; complete transection with less than 2 cm of devascularization
 - Grade V – laceration; avulsion with greater than 2 cm of devascularization

Caution?

- Identification intraoperatively can allow for immediate repair and avoidance of reoperation and long-term morbidity
- The use of preoperatively placed ureteral catheters has been shown to aid with intraoperative identification of ureteral injuries
- The intravenous (IV) administration of methylene blue or indigo carmine can also aid with diagnosis of a ureteral injury, as the leakage of blue dye into the peritoneal cavity is indicative of injury

ICG





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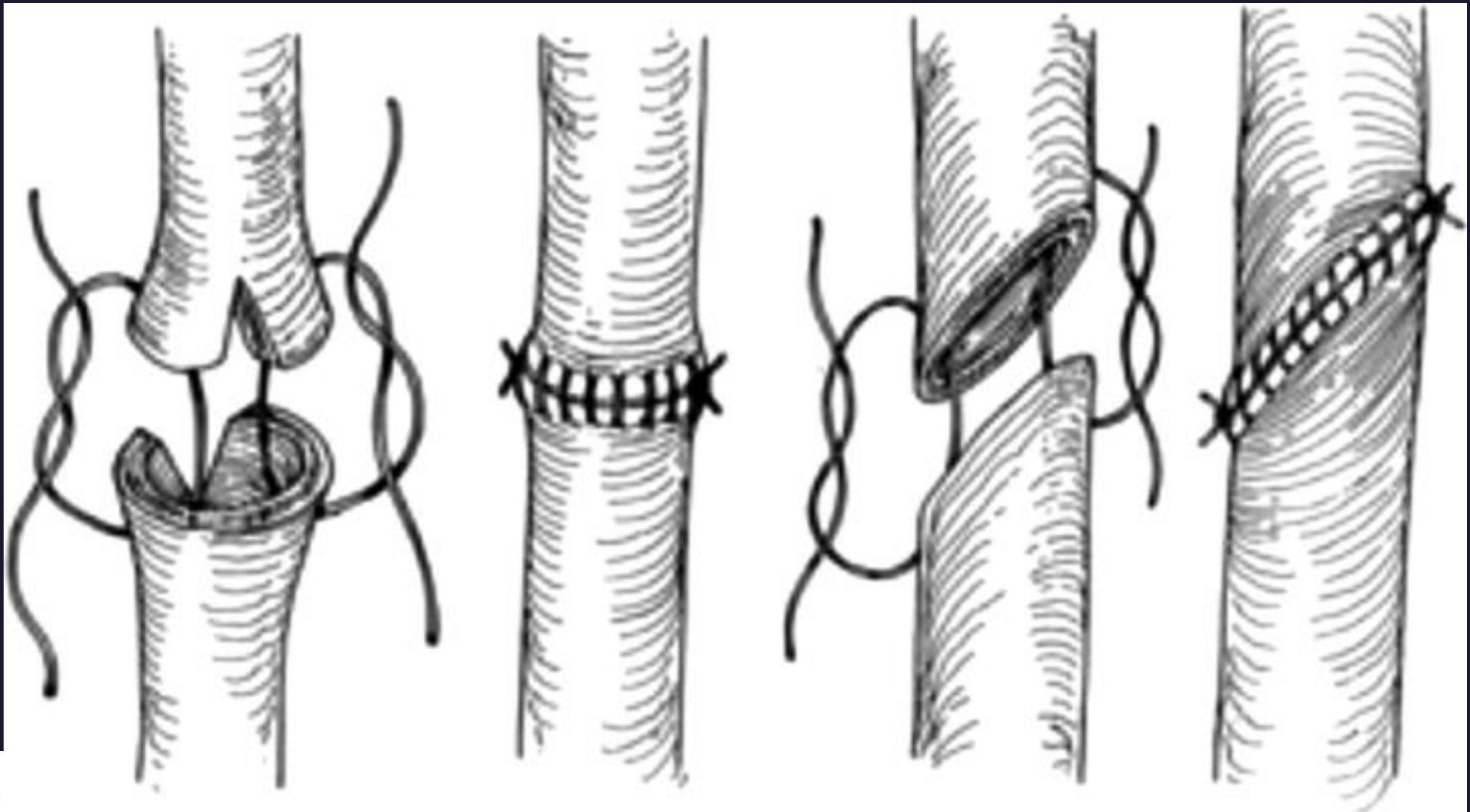
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Proximal Ureter

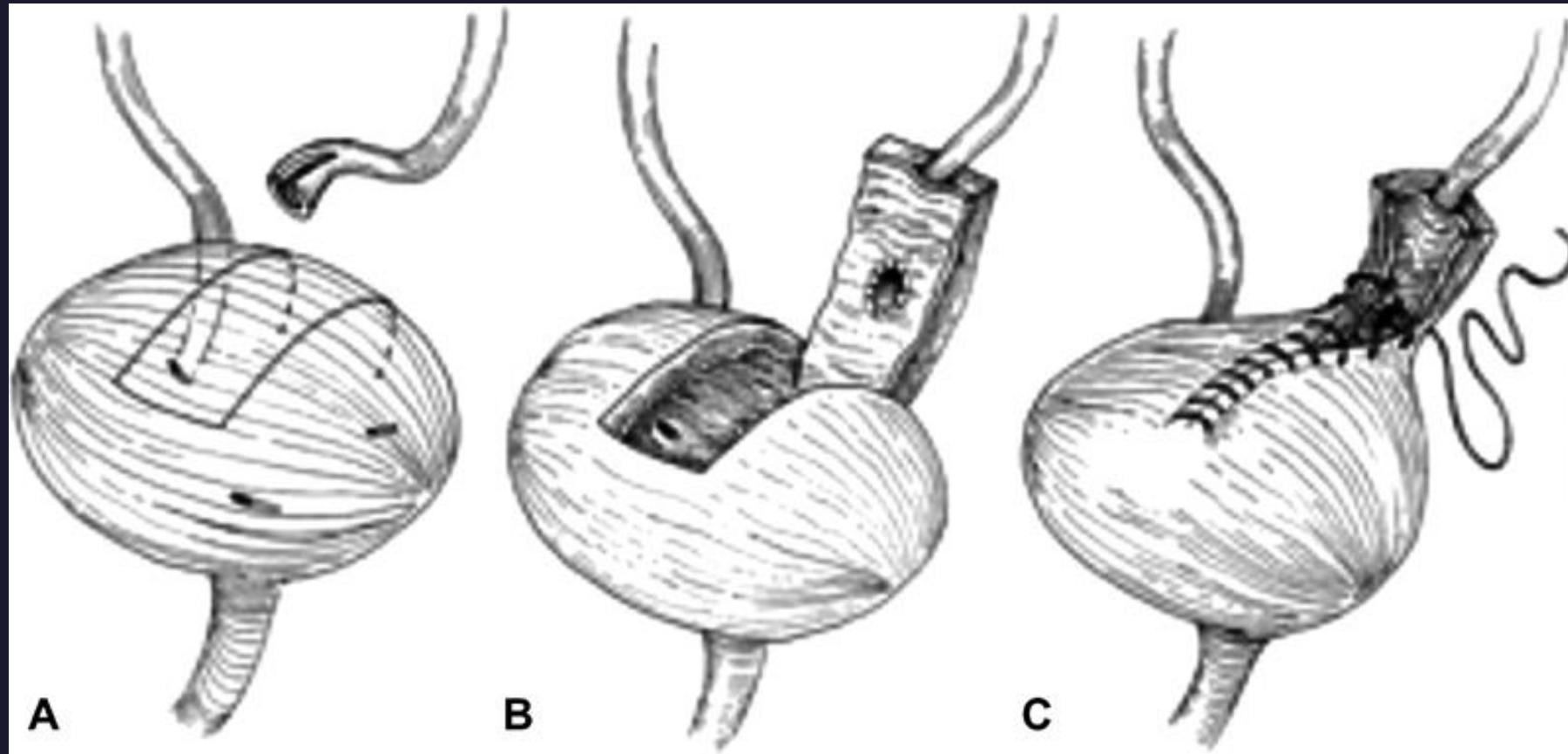
- The proximal third of the ureter : Injuries in this region account for ~2% of all iatrogenic ureteral injuries (ureteroureterostomy (UU) over a double-J stent, debridement of the ureteral edges to healthy tissue, spatulation of the edges to avoid stricture, creation of a tension-free anastomosis, and the use of absorbable sutures to prevent future stone development)
- Performance of a nephropexy, in which the kidney is mobilized and fixed to the psoas tendon, can add up to 4 cm of length to allow ureteral reanastomosis over greater lengths of distance



Middle Ureter

- The middle ureter :This anatomic zone accounts for 7% of all ureteral injuries.
- Debridement and tension-free primary UU over a stent
- In instances where a tension-free anastomosis is not possible, then bladder mobilization with performance of a psoas hitch or Boari flap creation may be considered and a Foley catheter is generally left in place for 7 to 14 days

Boari flap



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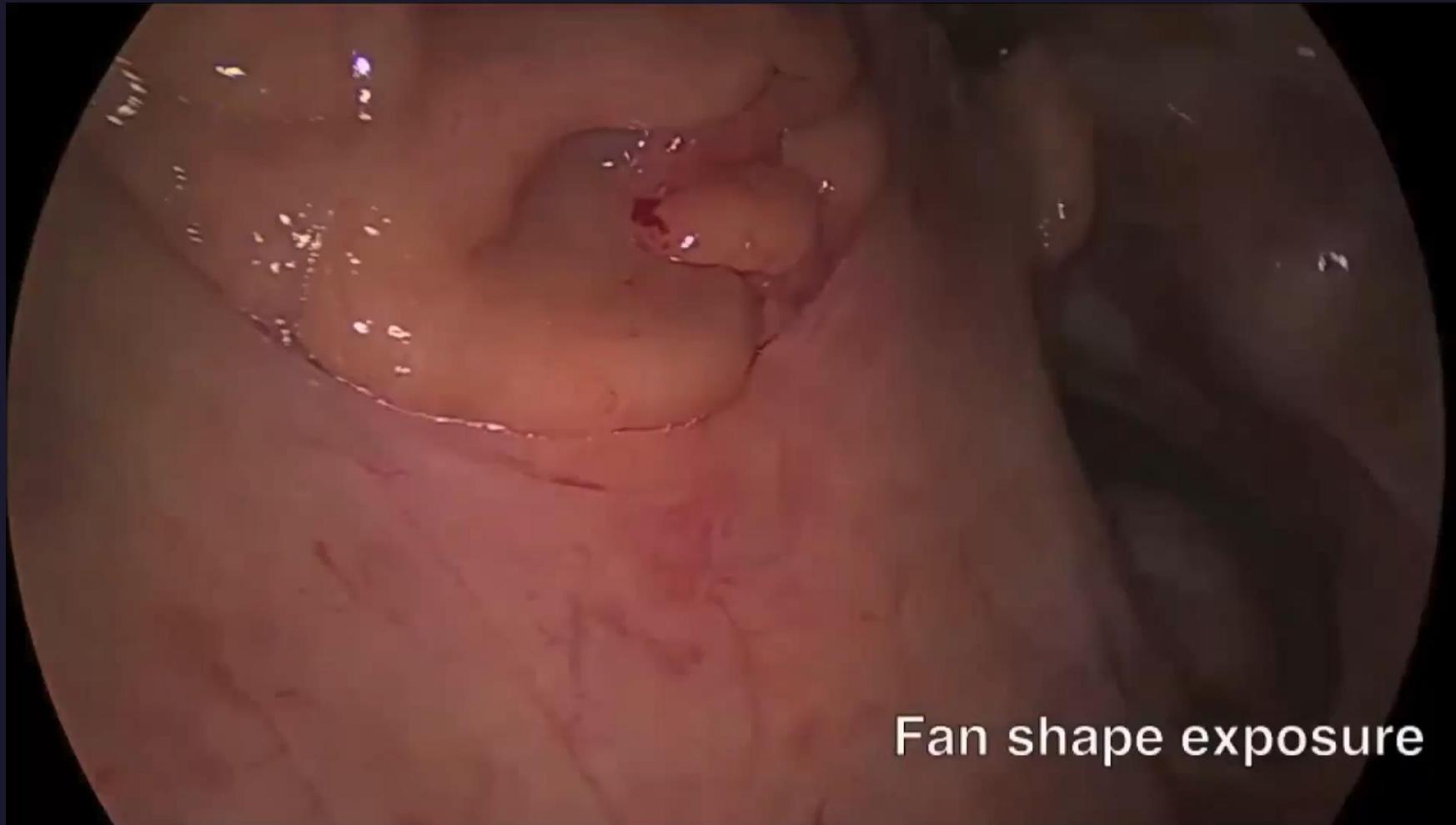
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Distal Ureter

- The distal ureter traverses from the inferior portion of the SI joint to the UVJ. Injuries in this location account for the vast majority (up to 91%) of all iatrogenic ureteral injuries
- The treatment of choice for these injuries is direct reimplantation of the ureter into the bladder

Autonomic nerve injuries

Avoid Autonomic nerve injury



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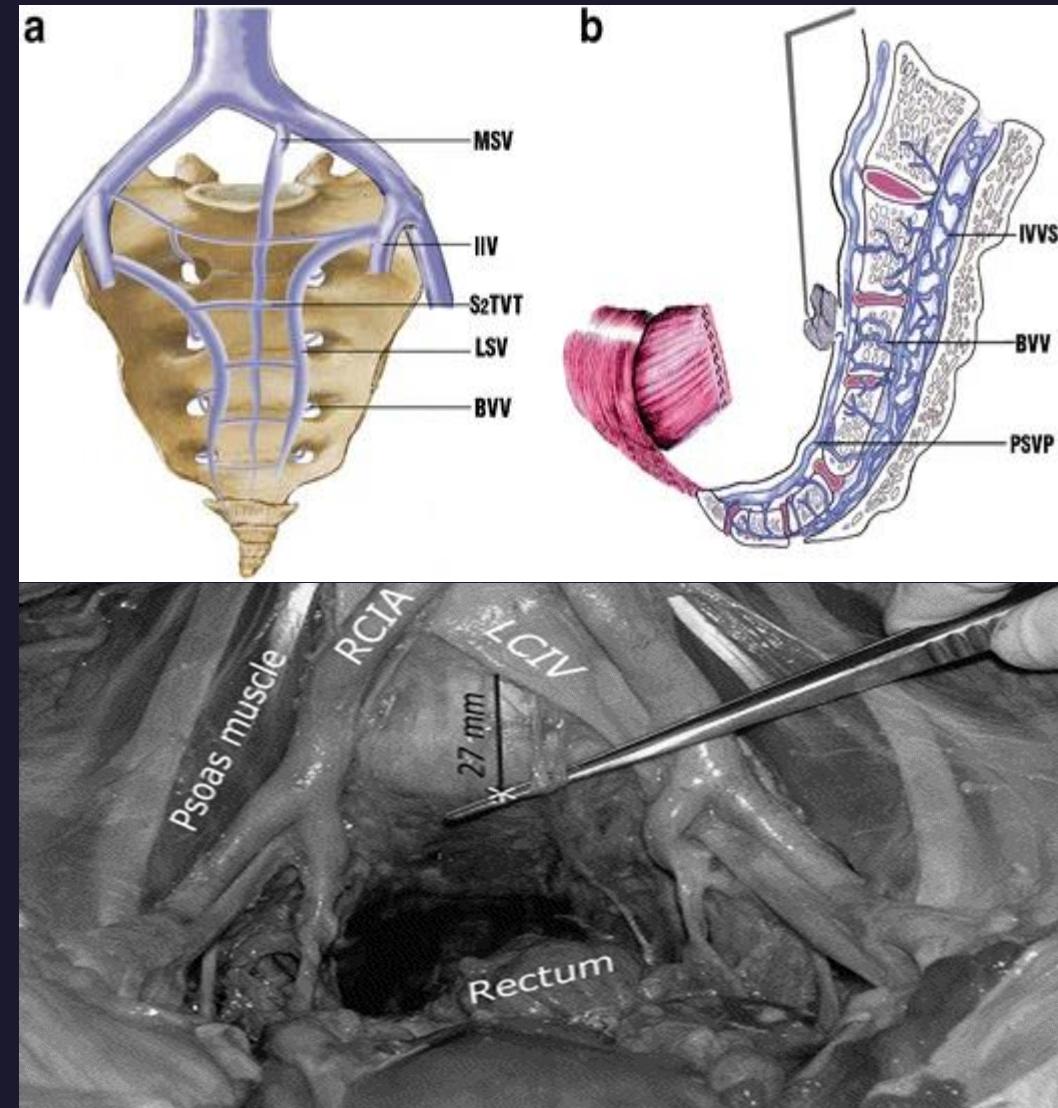
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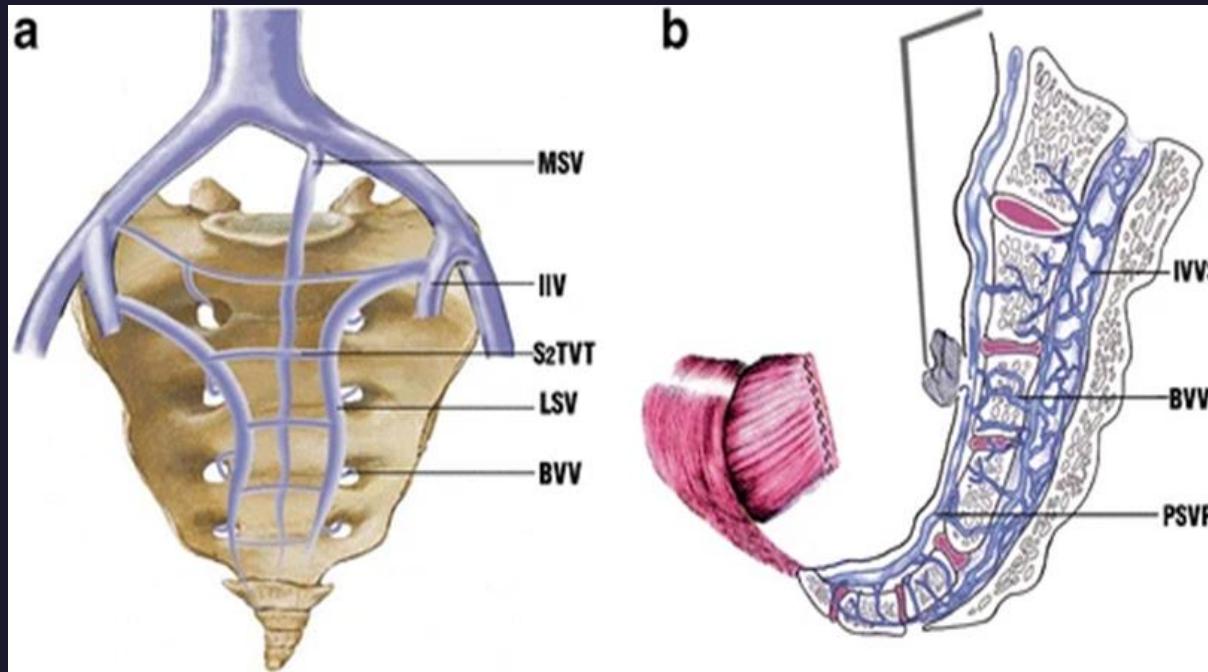
Presacral Bleeding

- Catastrophic complication during pelvic surgery
- The vasculature of the presacral space may deviate considerably from expected locations, making careful navigation of this space imperative



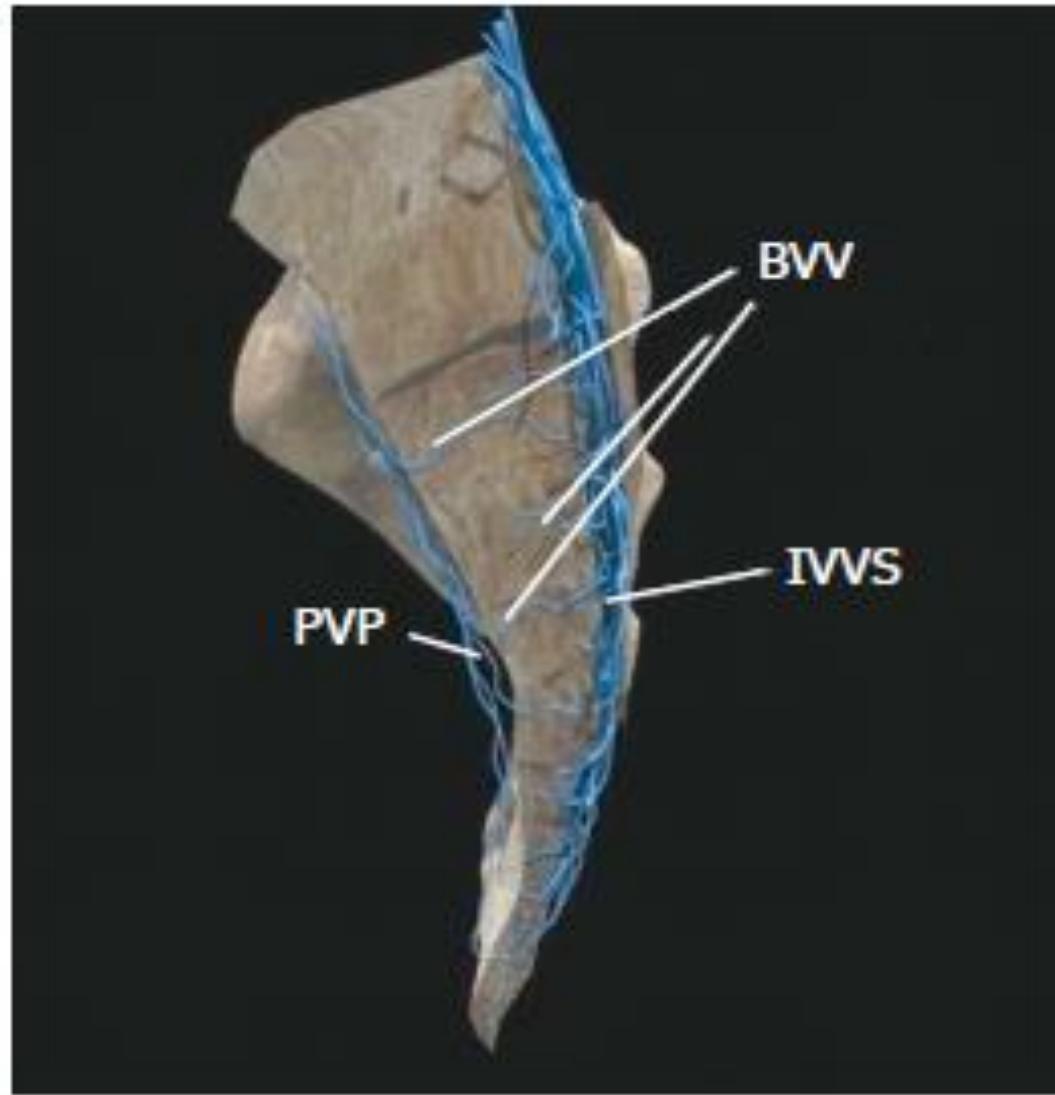
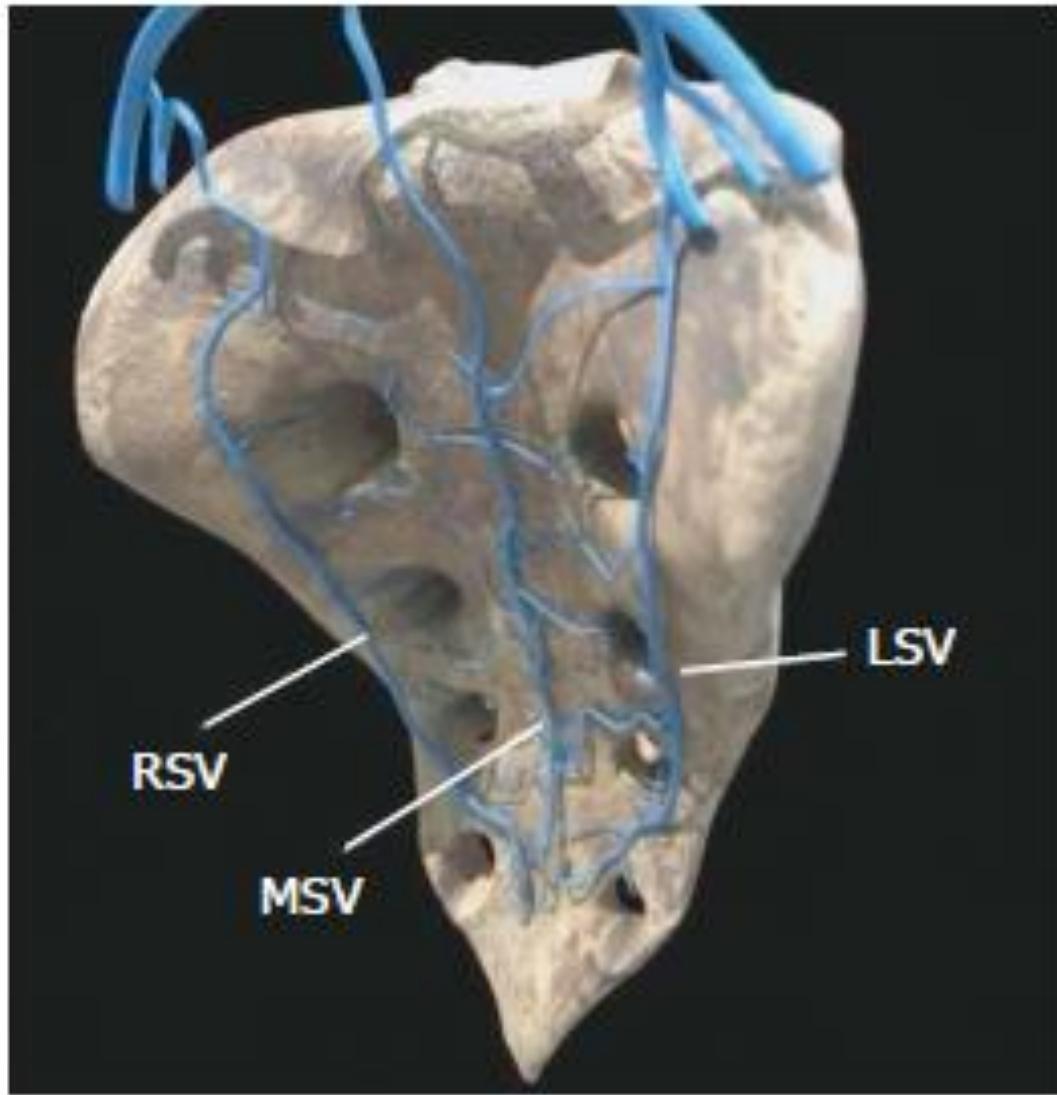
Bleeding

Anatomical considerations



- Network of veins primarily formed by the anastomosis between the medial and lateral sacral veins.
- The medial sacral vein usually drains into the left common iliac vein, whereas the lateral veins drain into the internal iliac vein
- The SVP receives contributions from the lumbar veins of the posterior abdominal wall and the basivertebral veins that pass through the sacral foramen



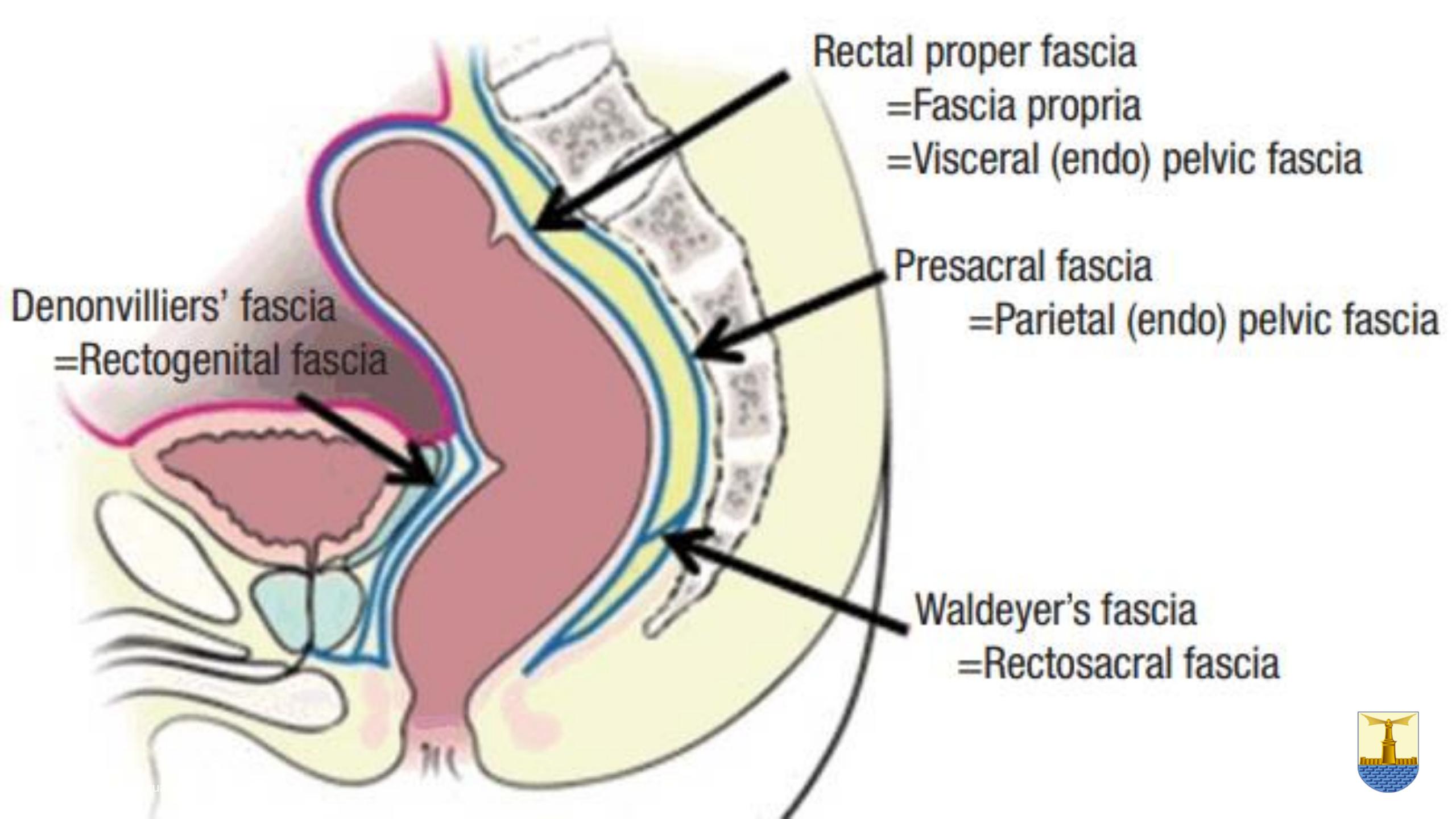


Anatomical considerations



- The vascular anastomoses between the medial sacral vein and the lateral veins are at the level of the 3rd and 4th sacral foramen in 70% of cases
- Waldeyer's fascia, is a sheet of connective tissue that extends from the periosteum of the sacrum to the posterior wall of the rectum 3-4 cm above the anorectal junction.





Causes of injury

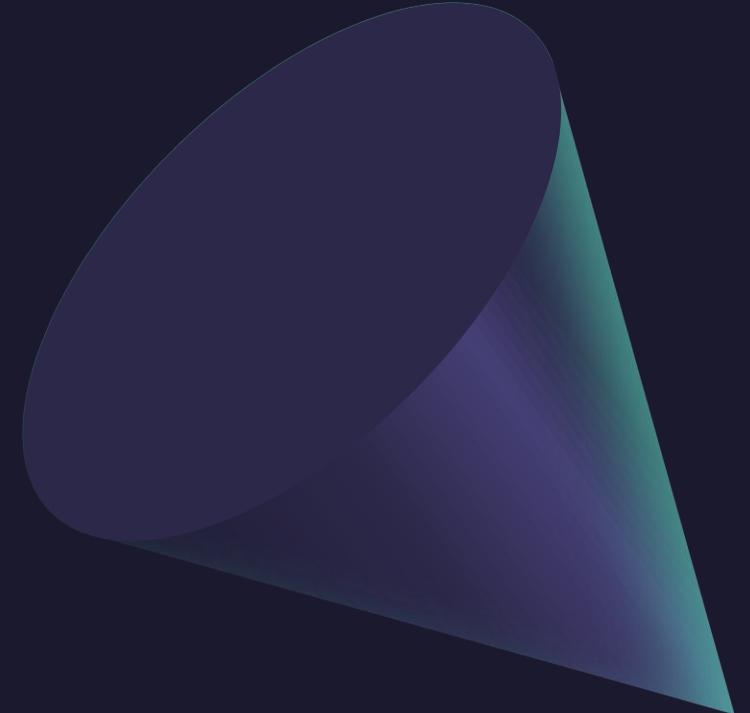
- Risk factors that influence the incidence of presacral bleeding
 - Height of the tumor in the rectum,
 - Infiltration of the presacral fascia by the tumor
 - Use of adjuvant radiotherapy
 - Prior rectal surgery
 - Poor visualization of the surgical field
 - Anatomical relationship of the anorectal fascia
 - Presacral veins, can be lacerated by the surgeon due to inadequate dissection of the posterior wall of the rectum in the sacral concavity

- 3 types of venous injury
 - Injury to the presacral veins (type I)
 - Injury to the presacral veins and/or basivertebral veins of diameter < 2 mm (type II)
 - Injury to the presacral veins and/or basivertebral veins of diameter > 2 mm (type III)

Wang et al Arch Surg. 1985



Surgical management



Rules

- Calm down
- Inform anesthesiologist
- Apply compression for minutes and take a deep breath until everything is ready
- Have packed RBCs ready for possible transfusion
- Have good suction irrigation handy
- **Ligation of the internal iliac artery is not effective and can cause gluteal and vesical necrosis, and ligation of the internal iliac vein makes venous drainage of its tributaries difficult, increases pressure on the sacral plexus, and exacerbates bleeding**



Rules



- There is limited evidence in the literature evaluating the effectiveness of different techniques, and it is typically expert opinion and experience
- Surgeons should familiarize themselves with the products available at their institutions in the event that presacral bleeding is encountered
- The techniques can be used in no particular order
- No need to convert to open surgery except if you can't apply the techniques laparoscopically



Pelvic packing

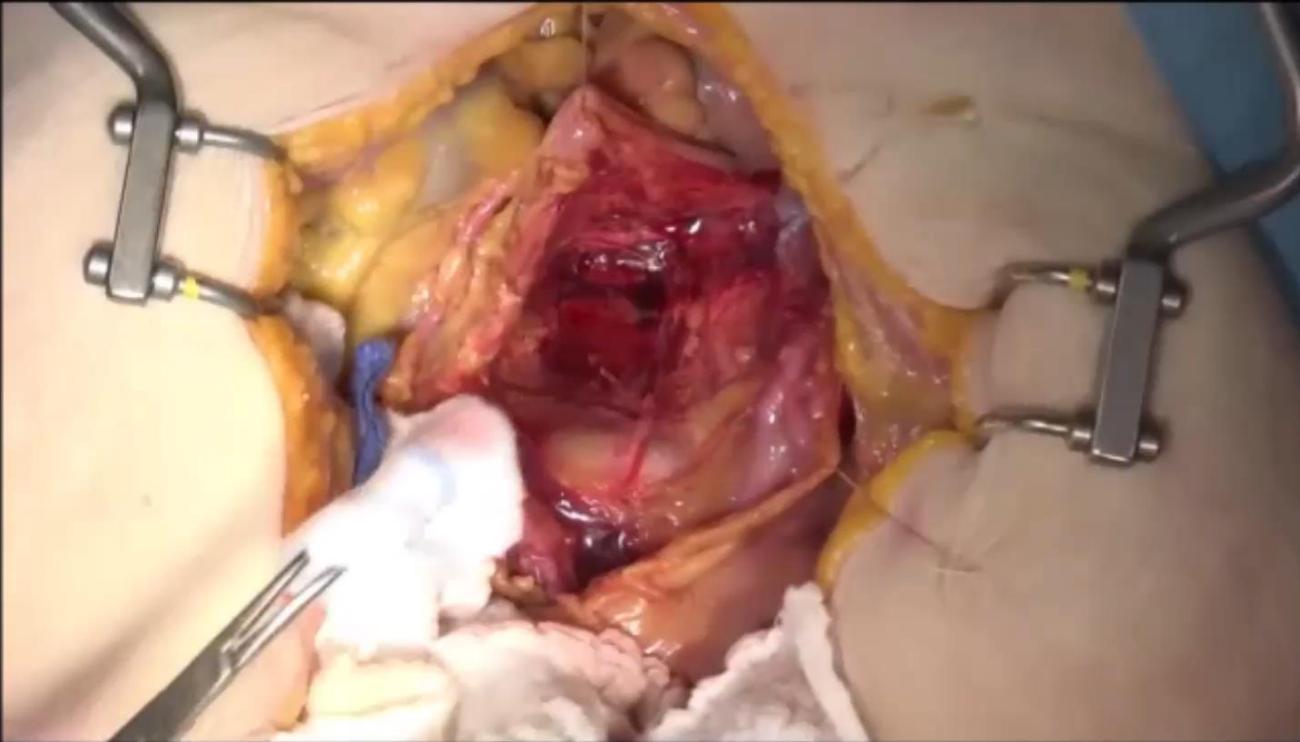
Traditional with compresses

Compartmental hemostatic balloon

Plugging with Bonewax®

Plugging with bone cement

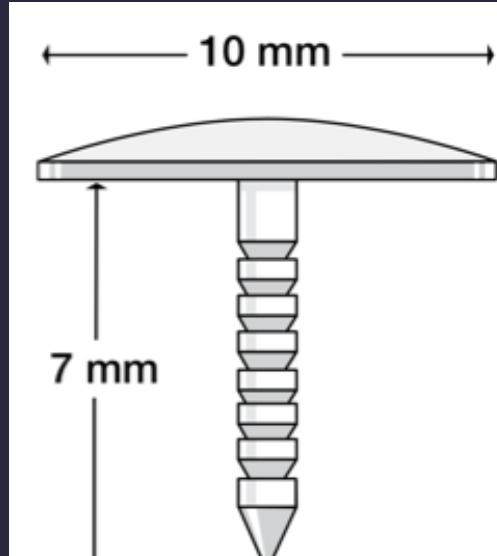
Compression and Packing



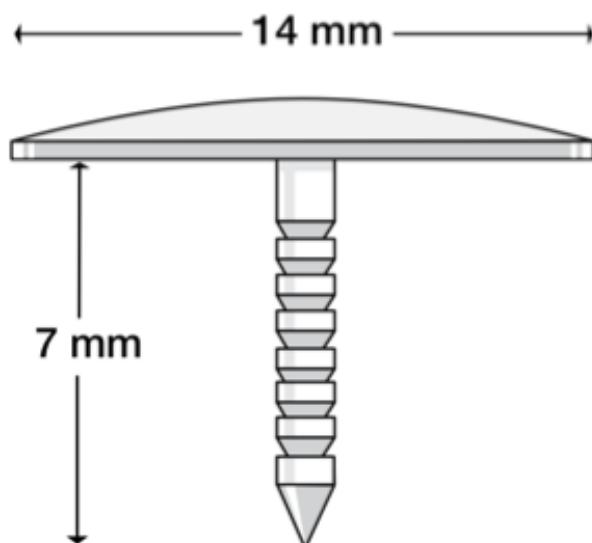
Hokenstad ED, Occhino JA. Int Urogynecol J. 2020 Jan

Metal implants	
	Thumb Tacks
	Helical titanium pins + Surgicel®
	Staples + cancellous bone + Surgicel®
	Ligaclips®
Topical hemostatic agents	
	Cyanoacrylate + Surgicel®
	Floseal® + Surgicel®

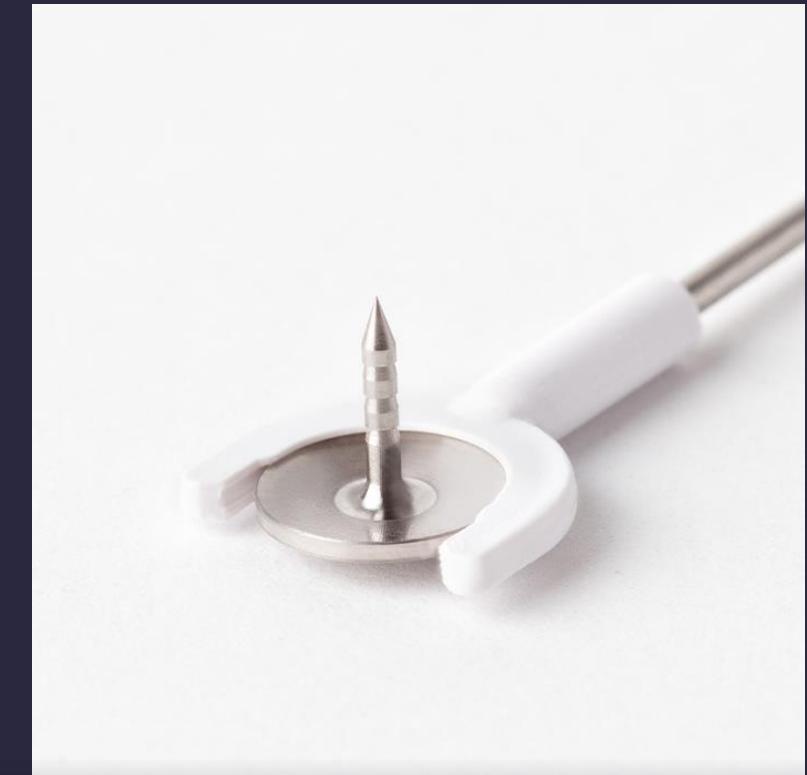
Thumb Tack



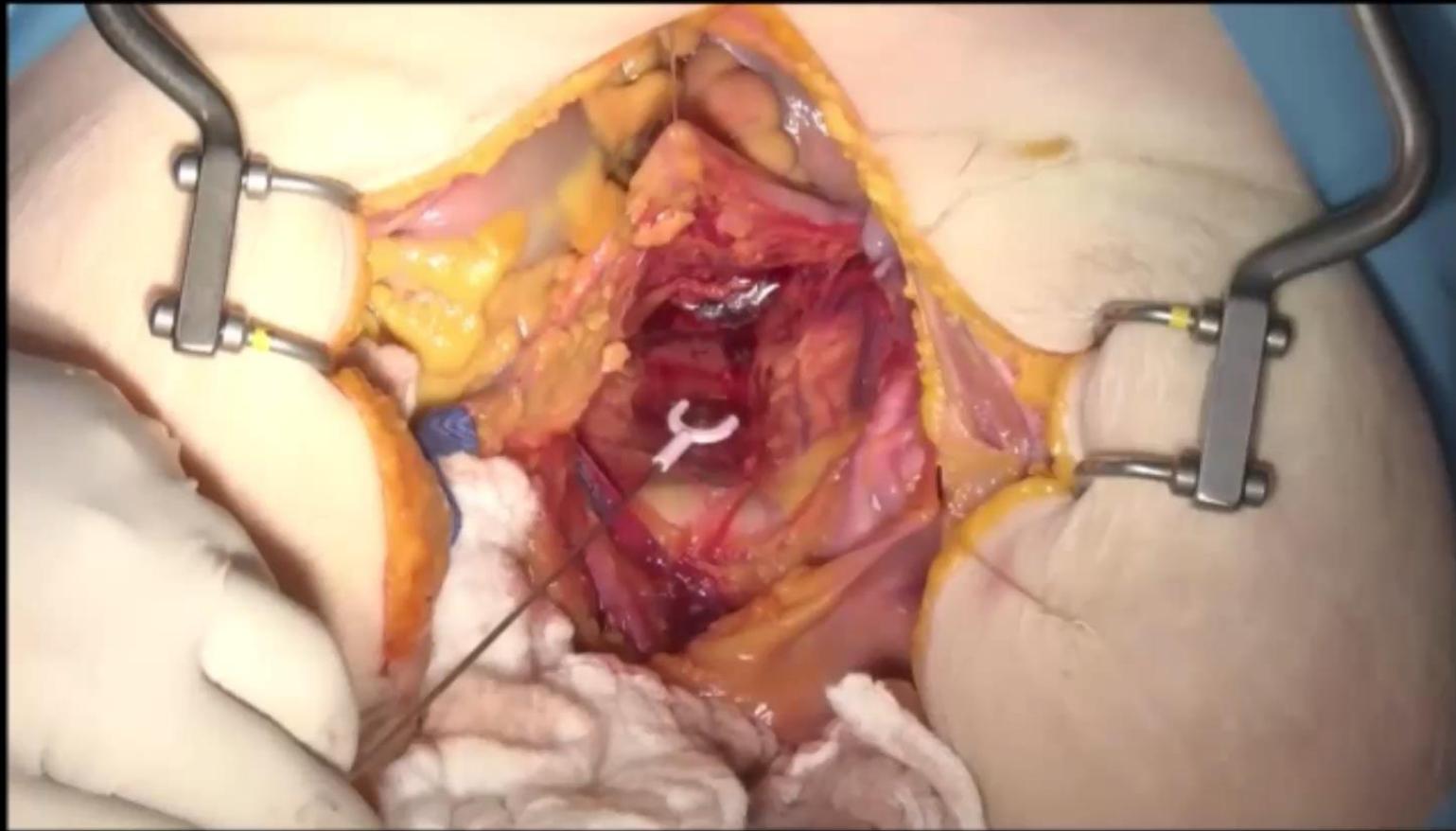
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Thumb Tack

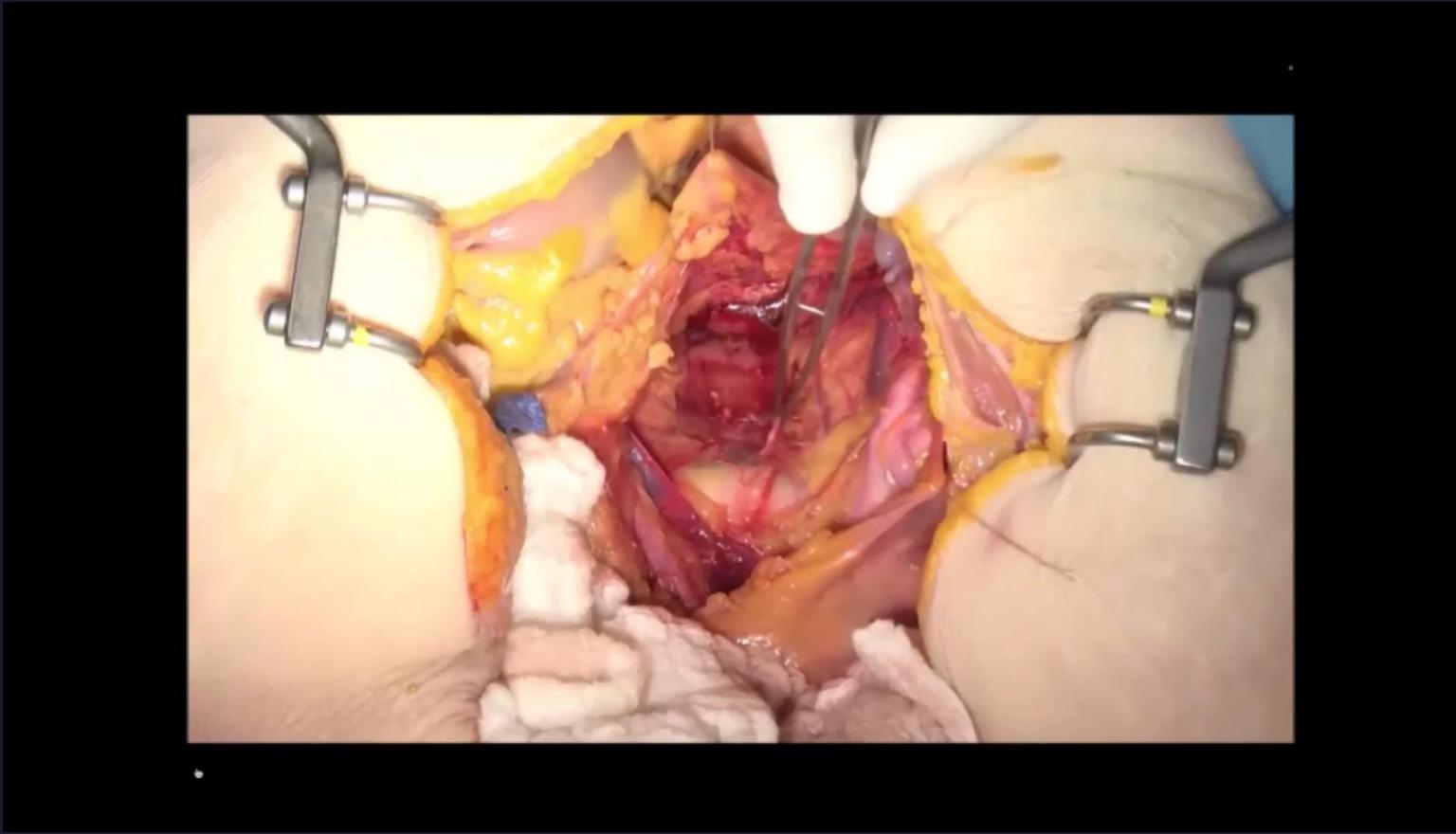


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Contraindications

1. Severe instability of the patient as measured by severe hemorrhage or hypertension
2. Bleeding further than 2 cm from the midline.
3. Bleeding originating from a sacral neural foramina or structure such as a ureter, rectum, or vagina
4. Diffuse hemorrhage related to a systemic coagulation disorder

Surgical Clips, Sutures



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Direct/indirect
electrocoagulation

Spray electrocautery

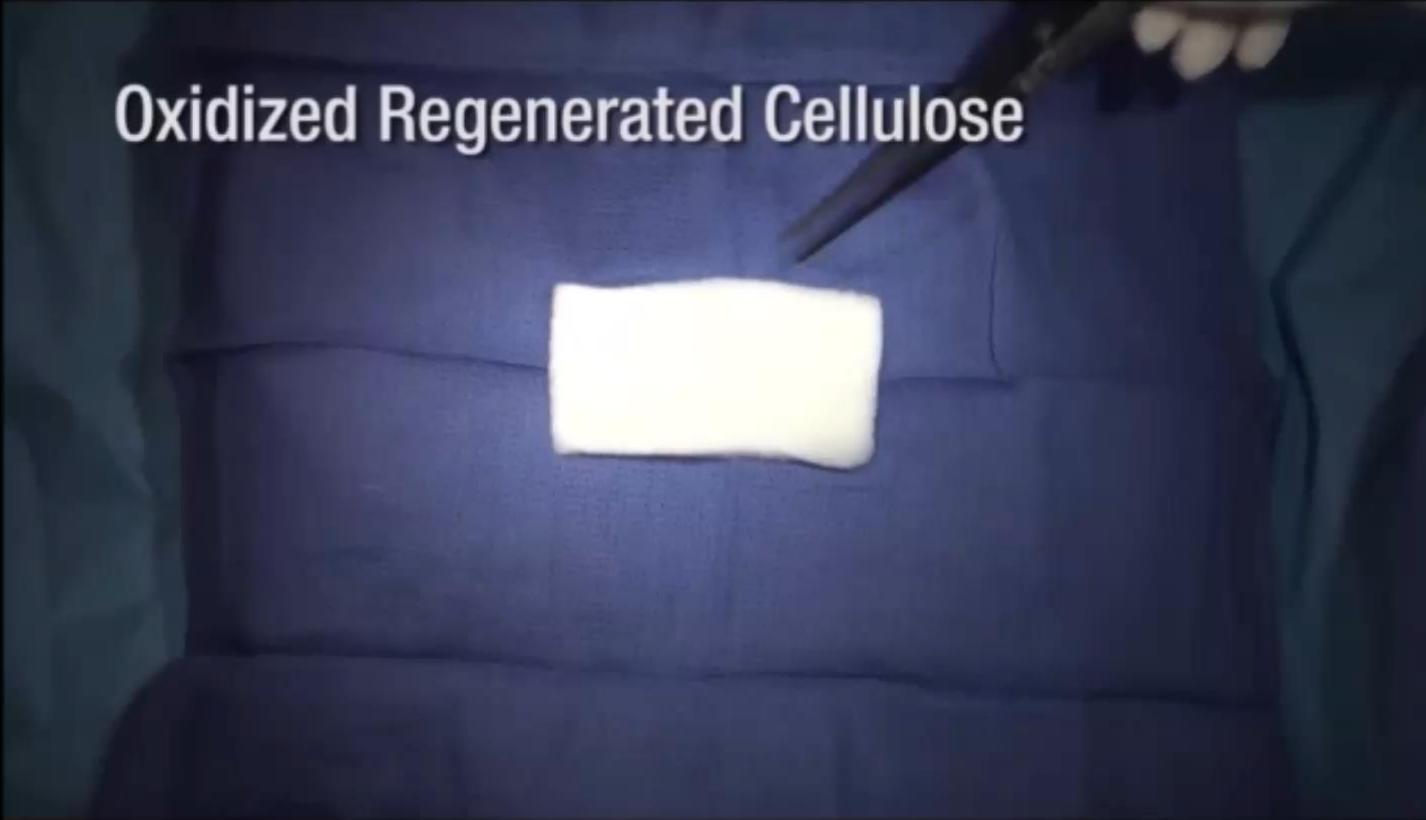
Bipolar coagulation

Argon coagulation

Electrocoagulation on a piece of epiploic appendix/muscle fragment

ROC & Electrocautery

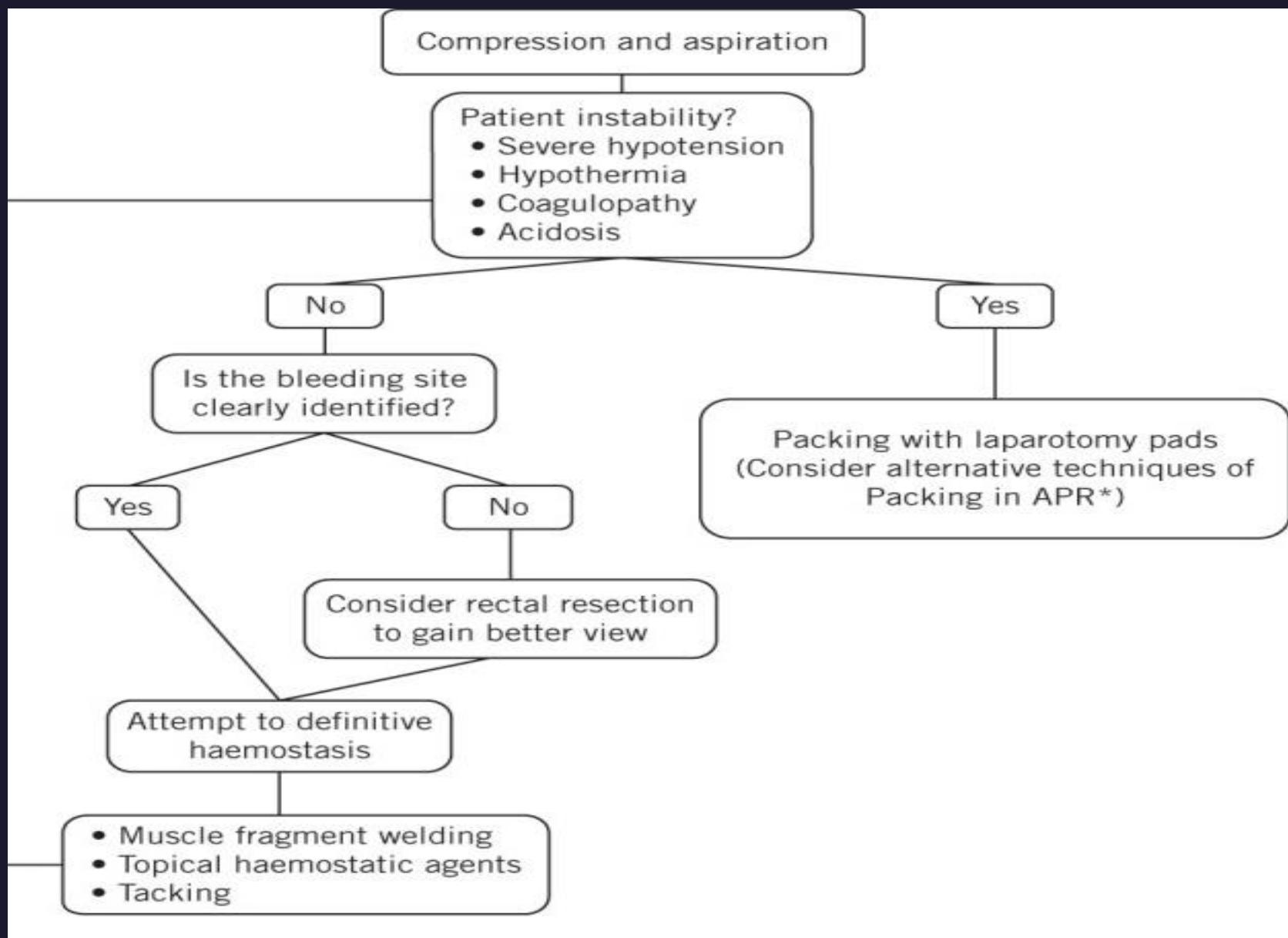
Oxidized Regenerated Cellulose



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Muscle and fat fragments





Conclusions

- First hold pressure with a laparotomy sponge
- During this time we call for any product we may need to achieve hemostasis, such as gelatin matrix with thrombin, or begin harvesting rectus muscle for welding
- Anesthetists are made aware in the event and blood products need to be ordered
- The sponge is slowly withdrawn and the bleeding can be evaluated to decide which technique to use, apply the gelatin matrix with thrombin, suture a bleeding vessel, perform muscle fragment welding, etc.
- Presacral bleeding encountered during pelvic surgery has the potential to be catastrophic and familiarity with a variety of techniques and locally available products will aid in the management

Thank you

