



TME and autonomic nerve preservation techniques: based on Video and Cadaveric anatomy

**19TH ANNUAL CONFERENCE
OF THE EGYPTIAN GROUP
OF COLON AND RECTAL SURGEONS**



13 - 15 SEPTEMBER 2017

JW Marriott Hotel - Cairo

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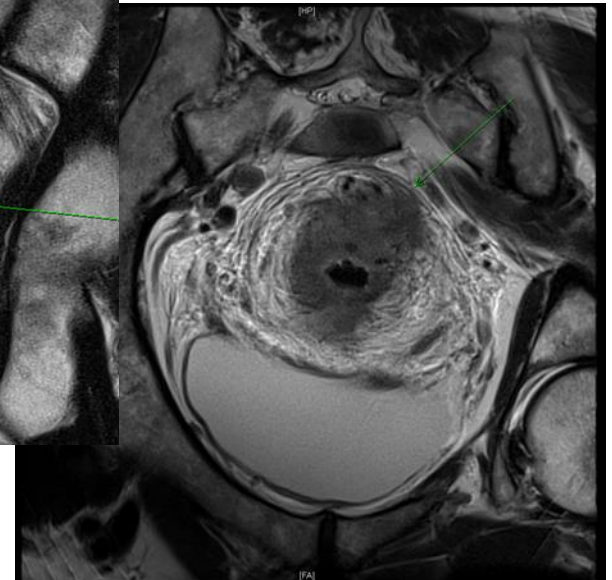
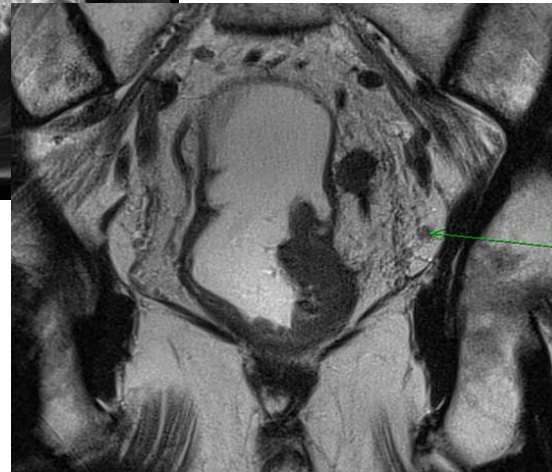


Goals of Surgery for Rectal Cancer

- **Optimal Curative Surgery**
 - **Curative resection**
 - Low rate of recurrence
 - Long term survival
 - **Safety**
 - **Good quality of life**
 - **Anal sphincter preservation**
 - **Appropriate rectal reservoir**
 - **Preservation of sexual and urinary function**



Why TME ?



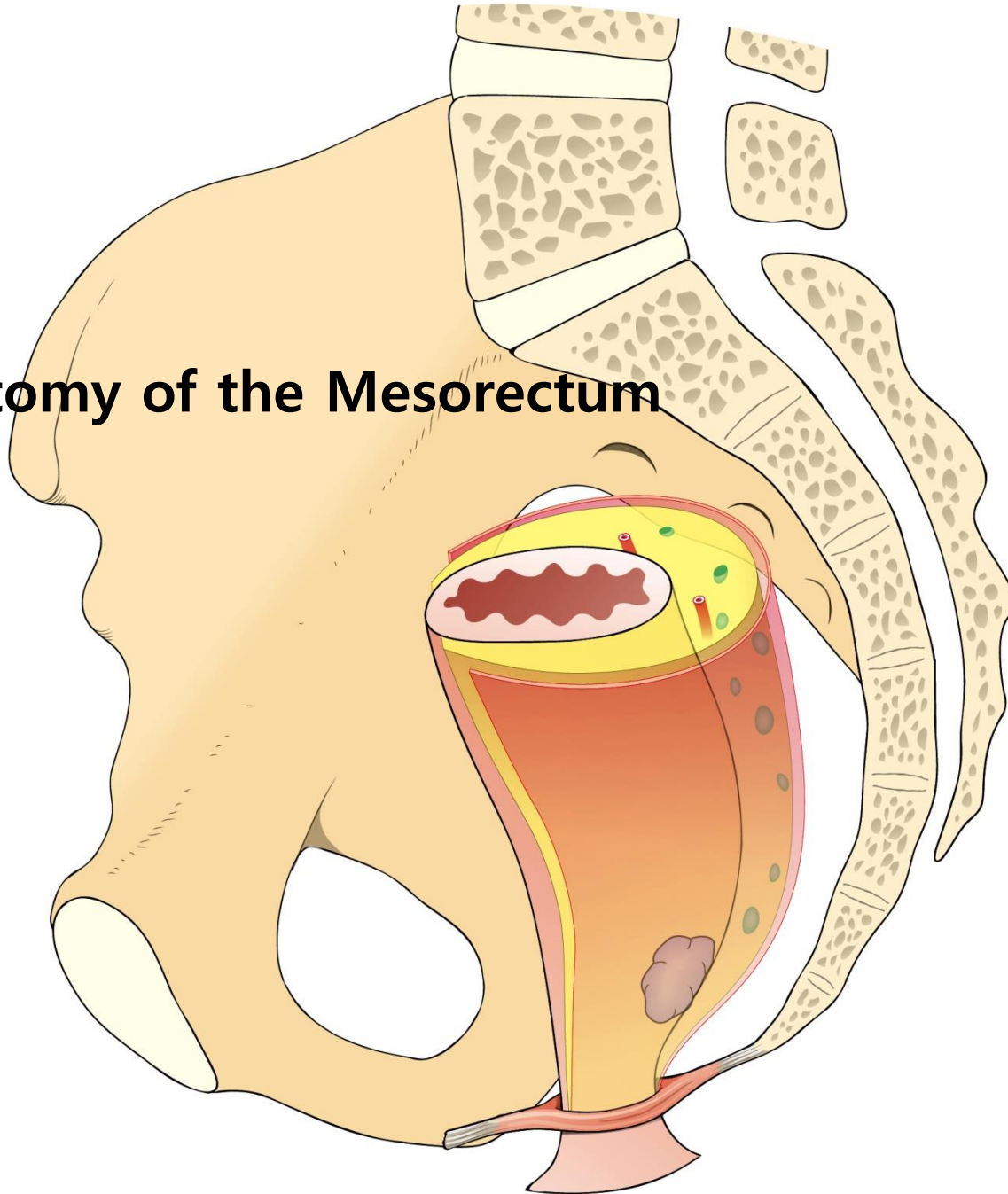
Excellent knowledge of the complex pelvic anatomy is a prerequisite to optimize the oncological and functional outcome of rectal cancer



- **The anatomy of Mesorectum and the pelvic floor**
- **The fascia anatomy of the rectum**
- **Neurovascular structures surrounding the rectum**
- **Technical tips when perform lower pelvic dissection.**
- **Sequential step by step procedures for optimal pelvic dissection**

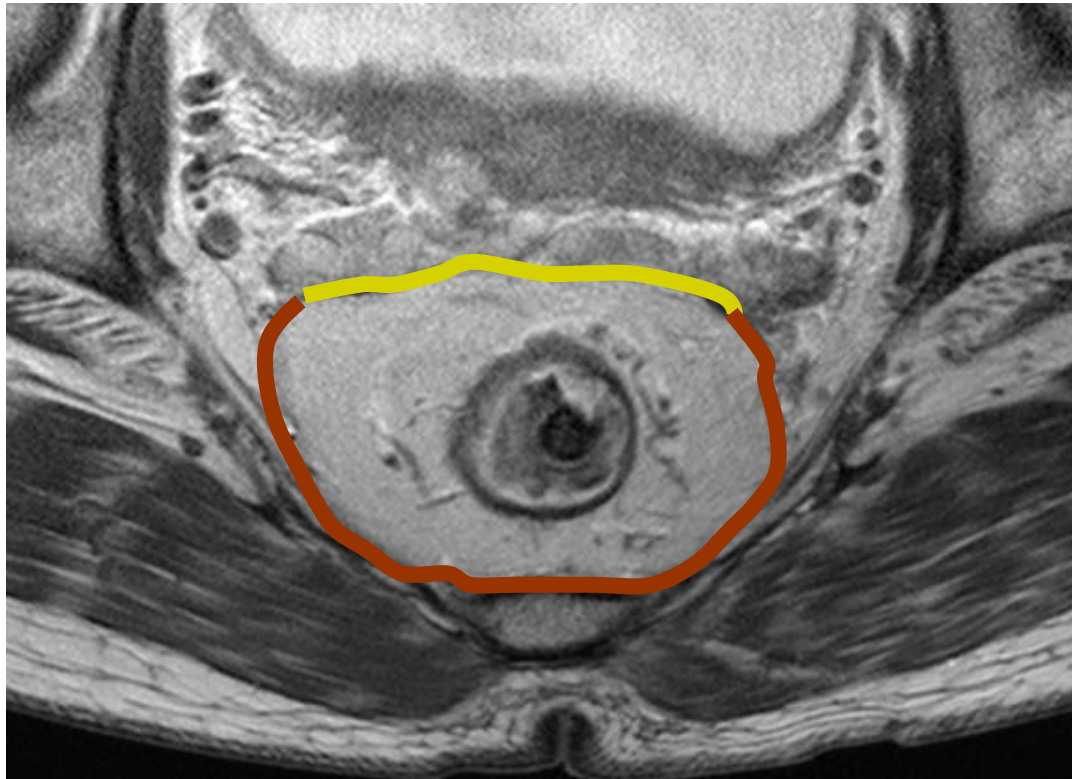


The Anatomy of the Mesorectum





Mesorectal fascia on MRI : Crucial for CRM involvement

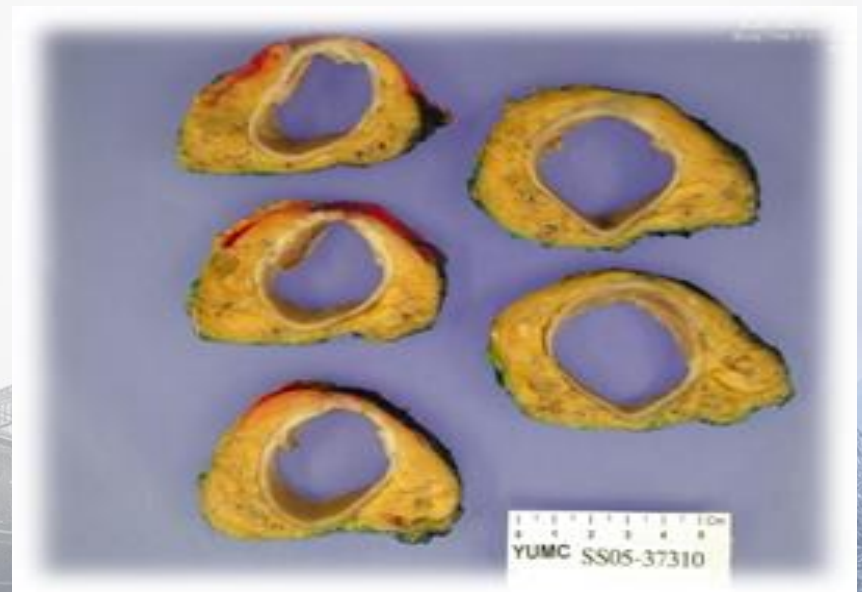
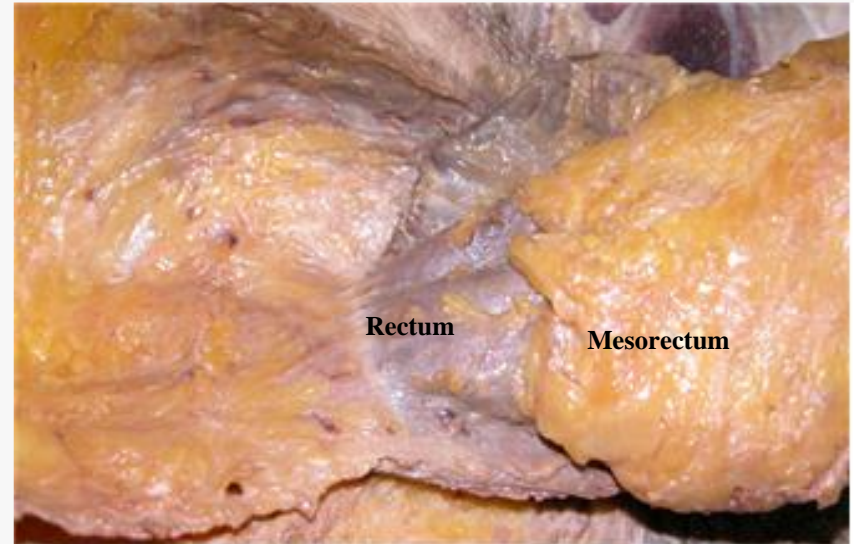
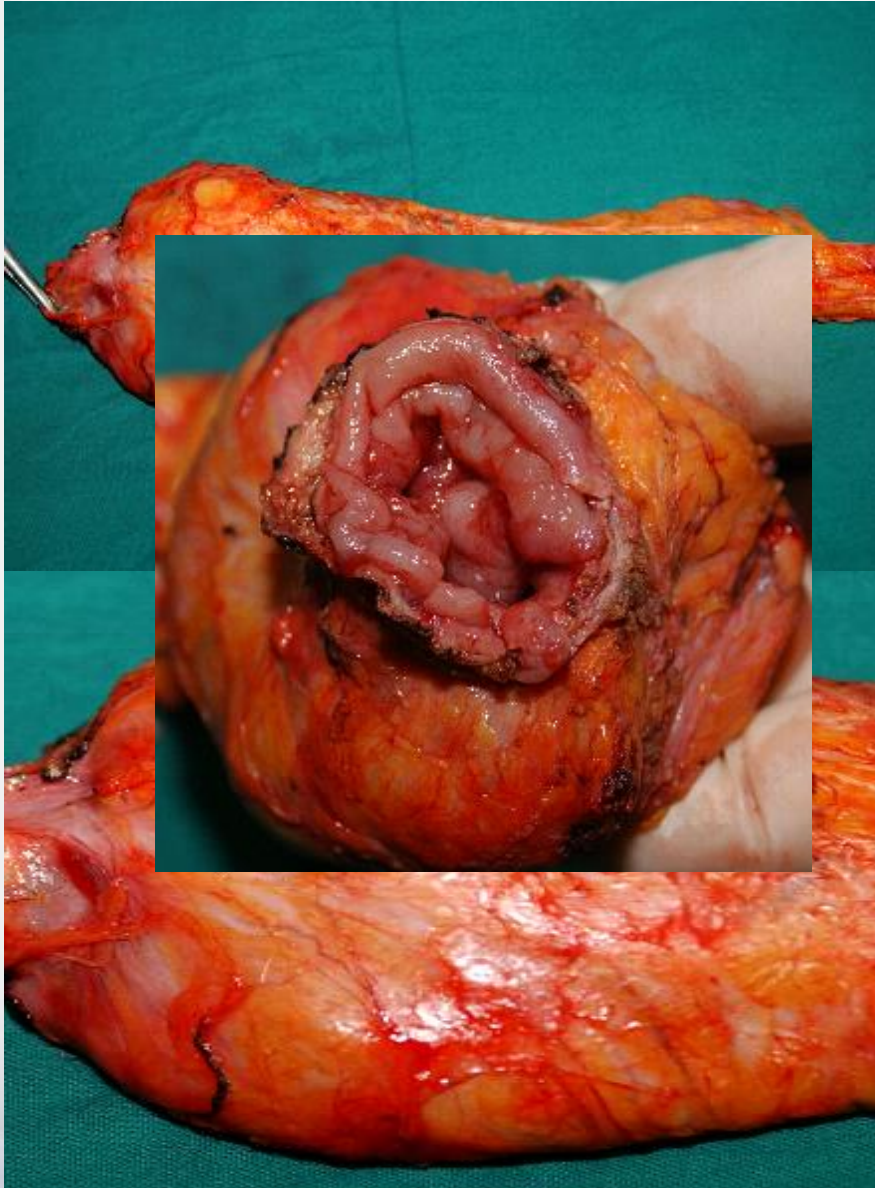


Mesorectal fascia



Falu lasarett, 2006

Total mesorectal excision



The Pelvic Floor and the shape of the mesorectum

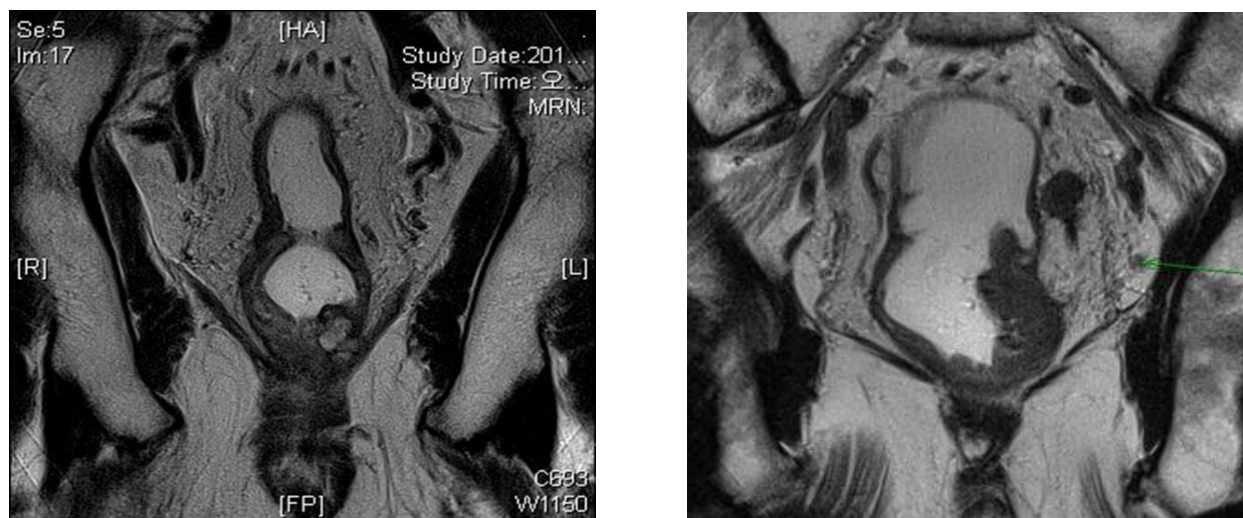
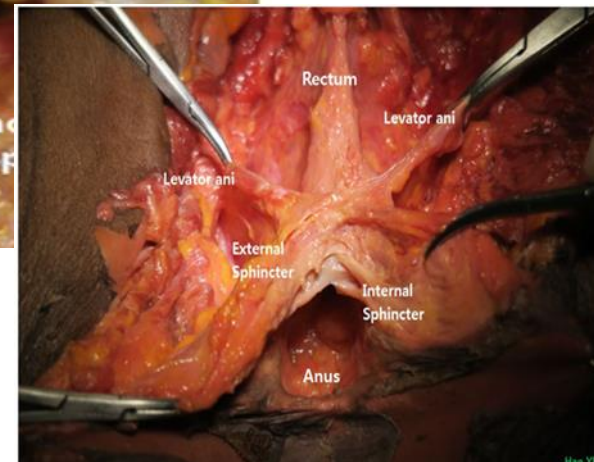
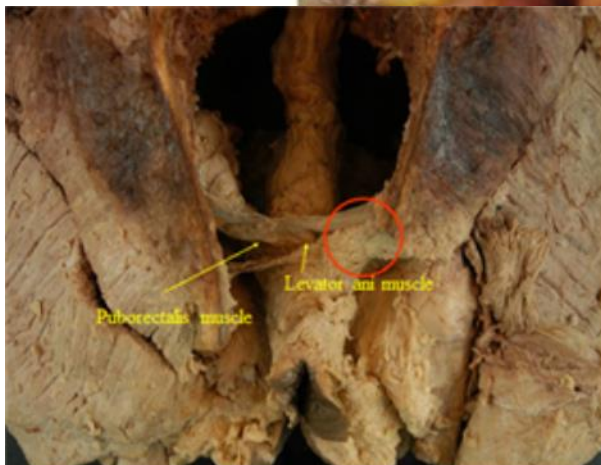
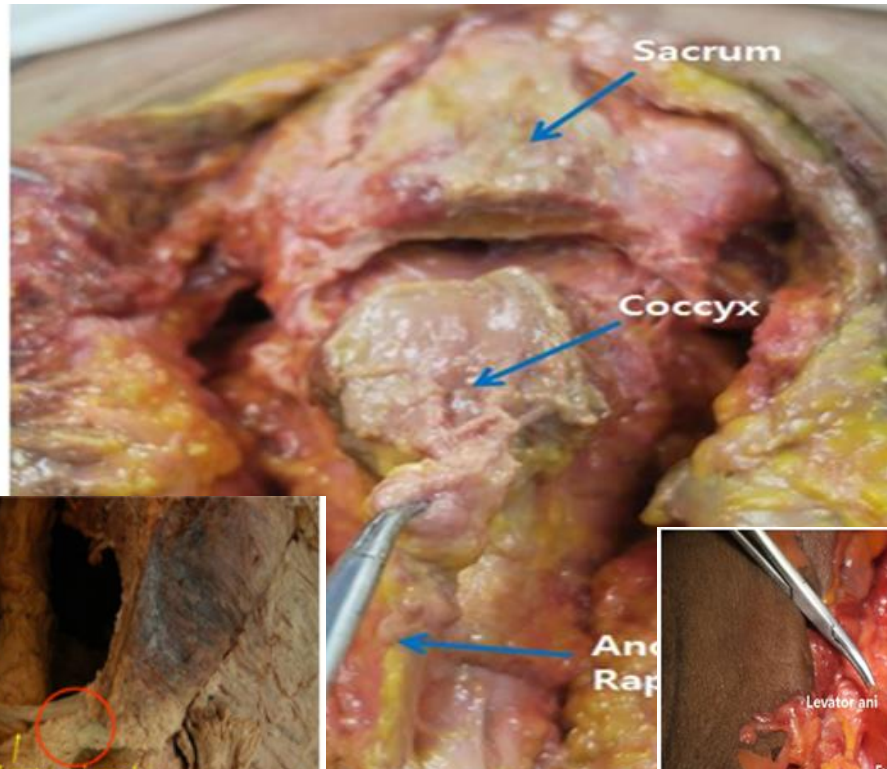


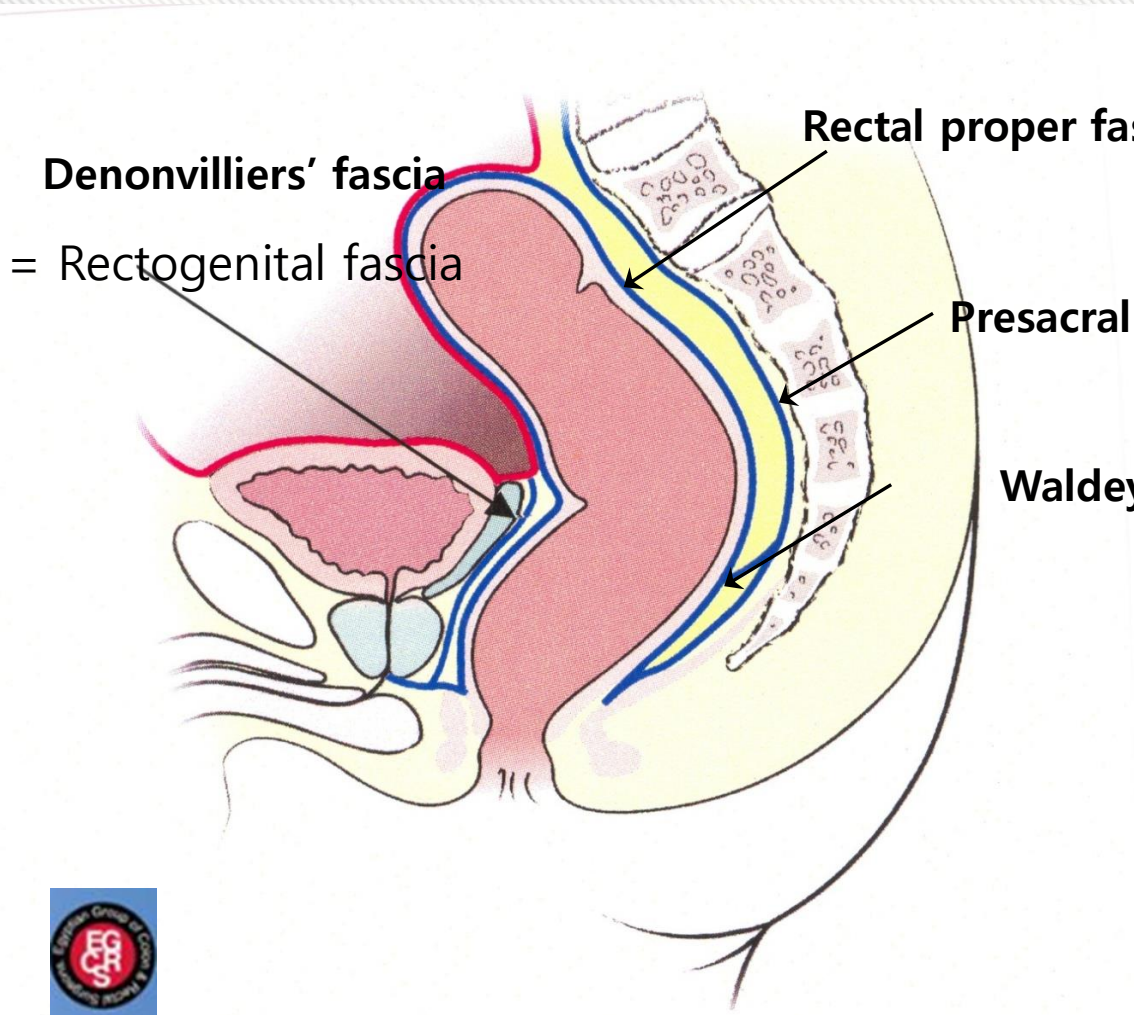
Figure 5. Pelvic floor images on MRI coronal axial view A. steep coning down of pelvic floor with narrow angle, B. Gradual coning down of pelvic floor with wide angle



The pelvic floor



TME Dissection plane





Rectal proper fascia

The histology of the perirectal fascia and the pelvic autonomic nerves

Kraima AC et al EJSO 41(2015) 1621-1629

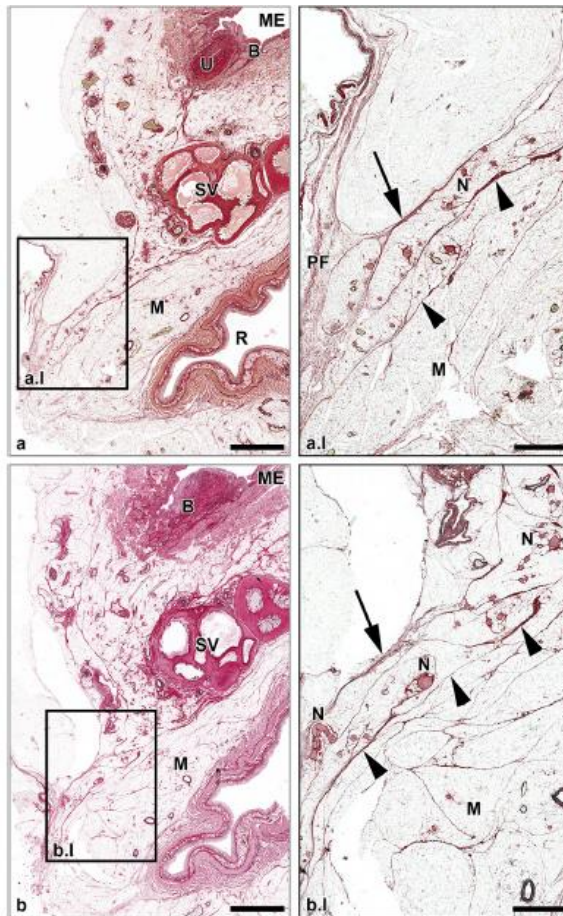


Figure 3. This figure shows fasciae surrounding the lower rectum (R) at successive inferior levels in a male cadaveric specimen. This figure shows fasciae surrounding the lower rectum (R) at successive inferior levels in a male cadaveric specimen. This figure shows fasciae surrounding the lower rectum (R) at successive inferior levels in a male cadaveric specimen. This figure shows fasciae surrounding the lower rectum (R) at successive inferior levels in a male cadaveric specimen.

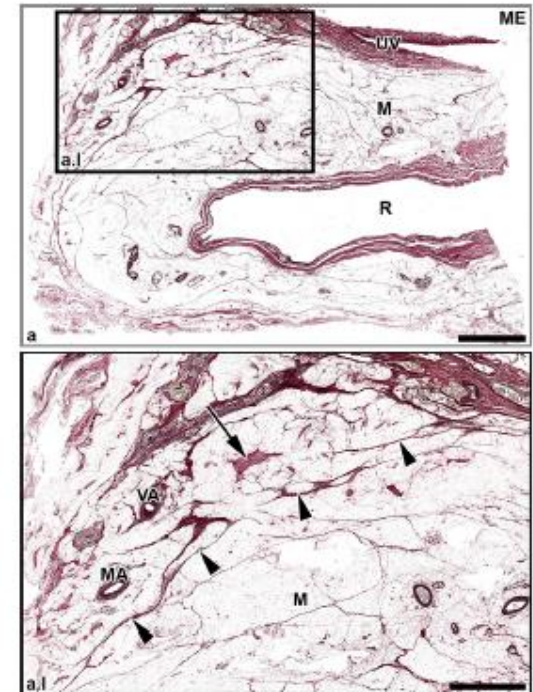
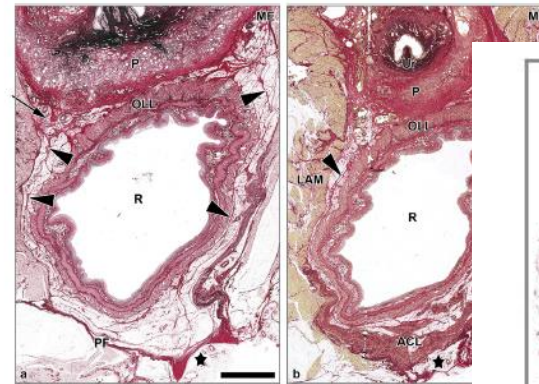
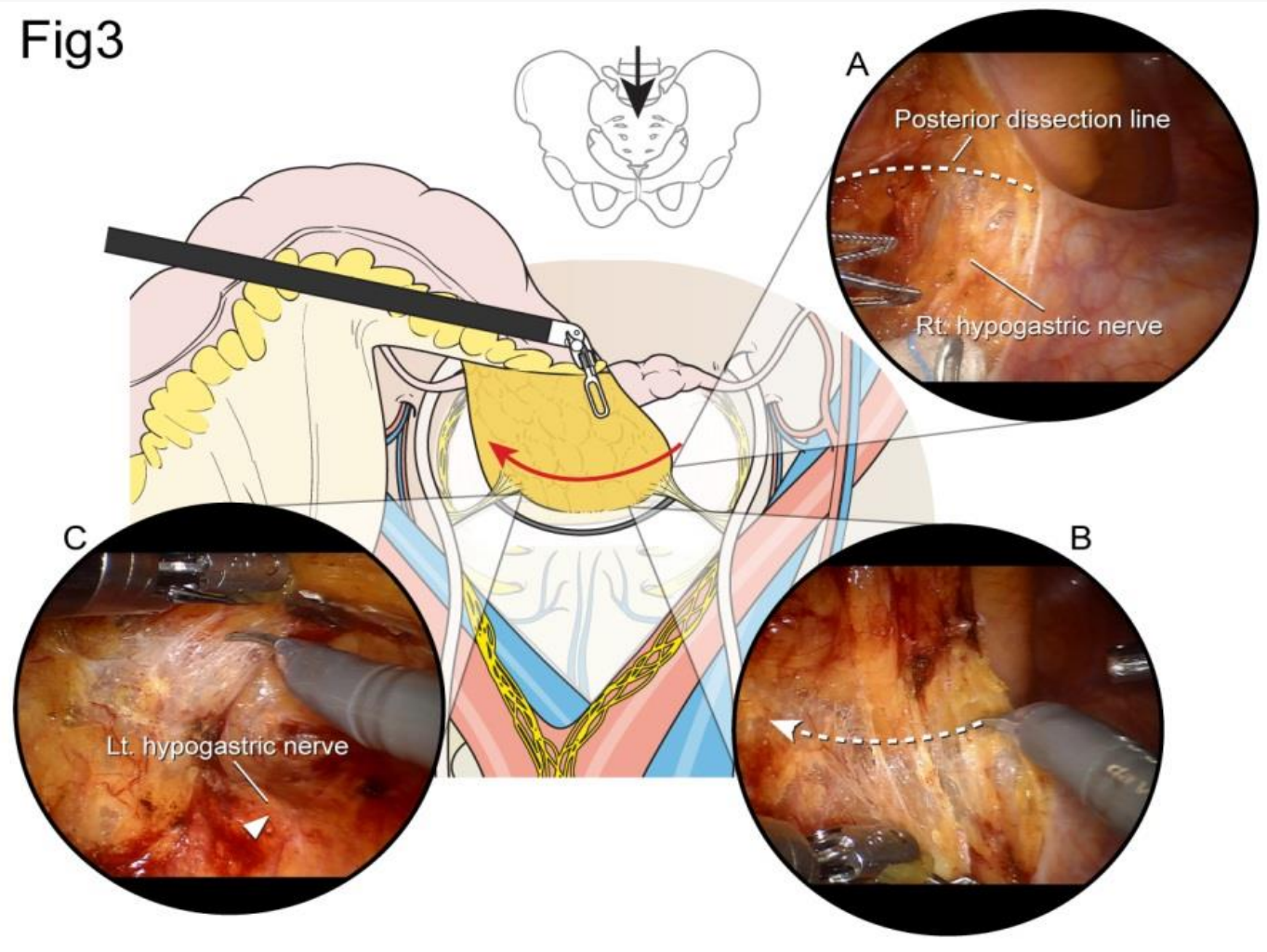


Figure 5. This reveals the variable aspect of the mesorectal fascia (arrowheads) at the anterolateral lower mesorectum (M) in a female cadaveric specimen. Note that between the second and third arrowhead from left to right, a part of the mesorectal fascia is lacking. The arrow indicates a ganglionated nerve. Between the third and fourth arrowhead, the mesorectal fascia is interrupted and much thinner. UV: upper vagina; R: rectum; VA: vaginal artery; MA: middle rectal artery; ME: Miller's elastin. Scale bar in windows a: 6 mm, window a.i: 2 mm.

The mesorectal fascia allows nerve preservation in TME, but it varies in thickness and shows gap. Most prominently at the anterolateral lower rectum., the this site have a high risk of incomplete TME

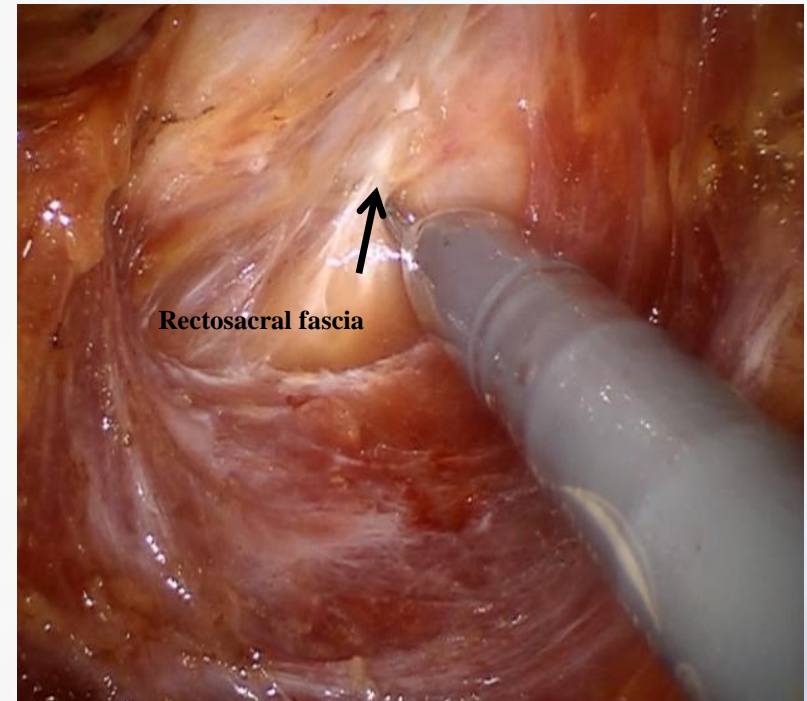
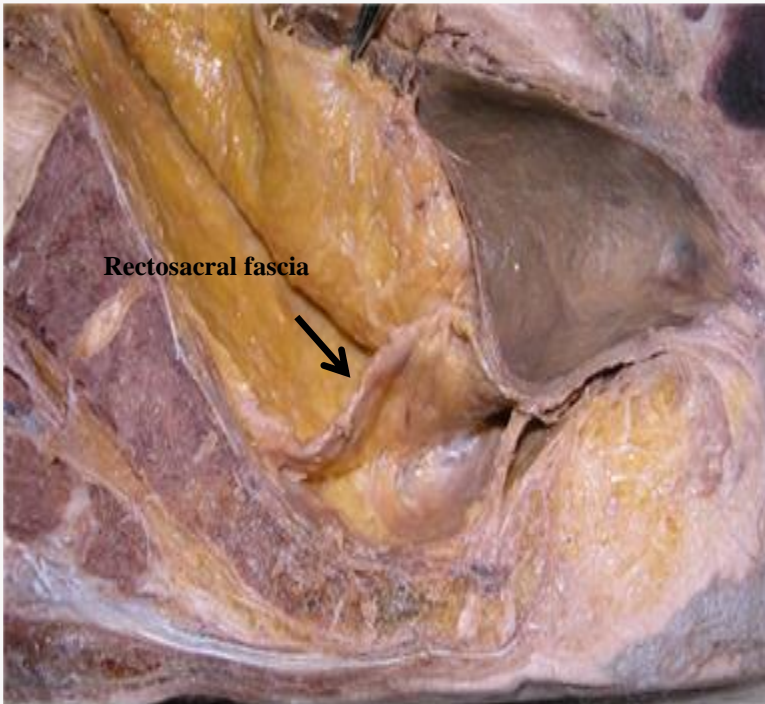
Posterior pelvic dissection

Fig3



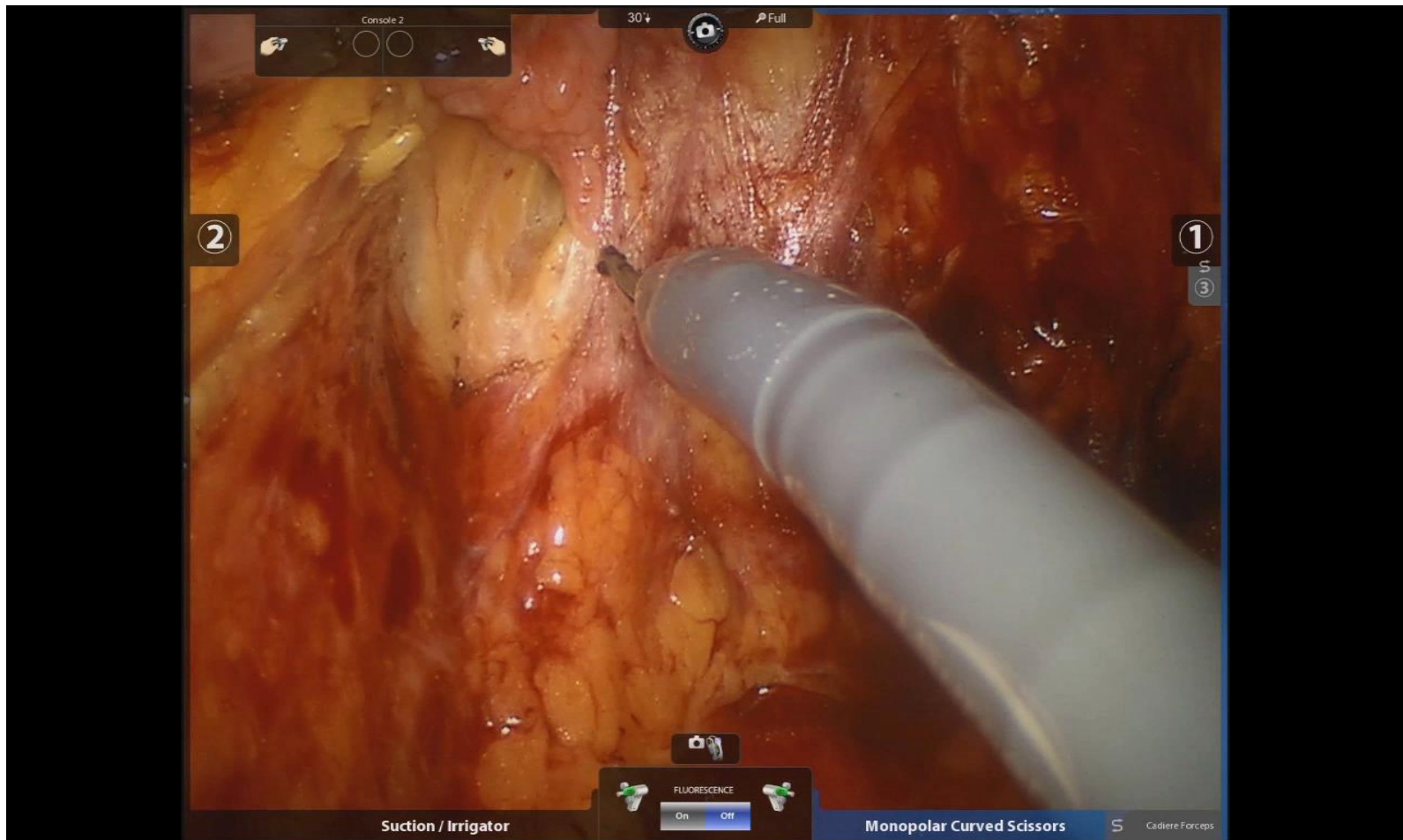


Deep posterior pelvic dissection

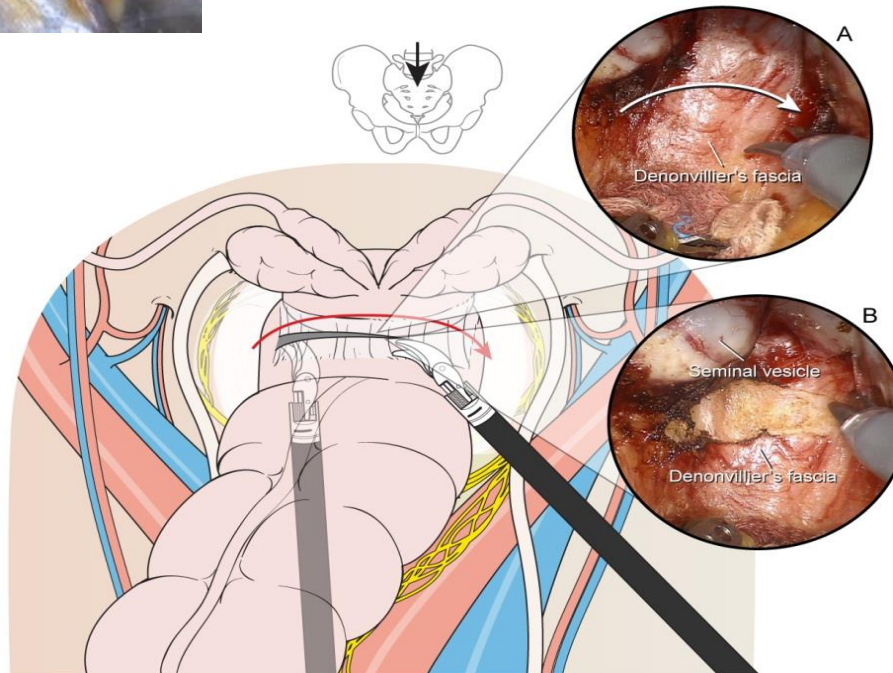
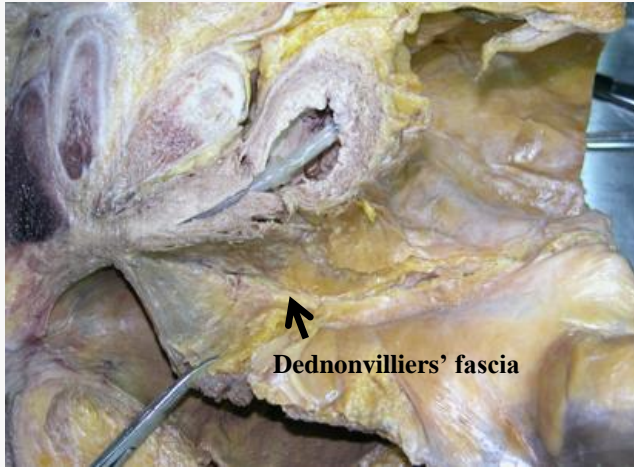




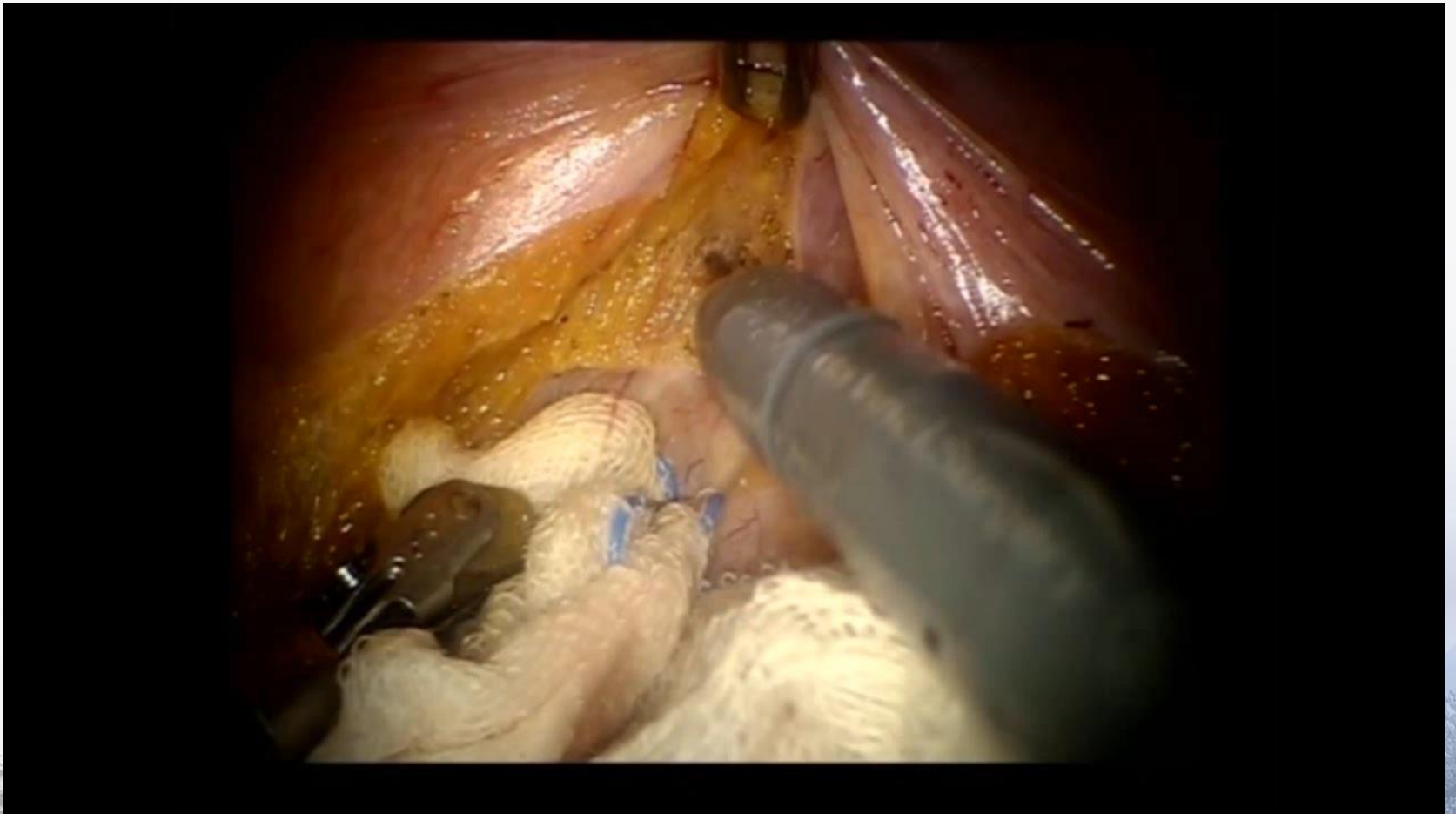
Deep posterior dissection



Anterior pelvic dissection



Anterior Dissection, DVF



Denonvilliers' fascia is one entity and adherent to the mesorectal fascia: implication for the anterior plane in TME?

Kraima AC et al. EJSO 41(2015) 738-745

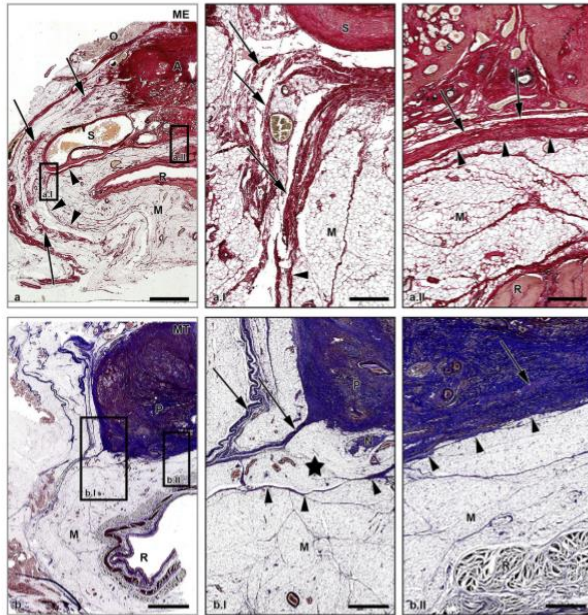


Figure 1. This figure shows the relationship of DVF to the seminal vesicles (SV) and prostate (P). The inferior hypogastric plexus (arrow) located laterally to the mesorectal fascia (arrowheads in window a). The arrows in detail window a.I show the lateral edges of DVF at : lowest arrow points out the part that fuses with the mesorectal fascia (arrowhead). The arrows in detail window a.II show that DVF is ad orectal fascia (arrowheads). At inferior levels, nerves (N) are located in the intervening space (star in detail window b.I) which is located be fascia (lower arrow) and mesorectal fascia (arrowheads). The prostatic fascia fuses with the endopelvic fascia (upper arrow). The rightmos that DVF and the mesorectal fascia are continuous. The arrow in window b.II shows that DVF cannot be distinguished separately from the (arrowheads). ME: Millers' elastin, MT: Masson's trichrome, O: obturator internus muscle, A: apex of prostate, R: rectum, M: mesorec windows a and b: 8 mm, windows a.I and a.II: 800 μ m, window b.I: 2 mm and window b.II: 1 mm.

Whole mount microscopic section of adult pelvis

- multilayered condensation of collagen and smooth muscle fibers
- The lateral edge, autonomous nerve
- The neurovascular bundle is at risk during the dissection of the anterolateral mesorectum
- Sharp dissection on the mesorectal fascia is needed.
- Small nerves between the prostate or vagina and DVF
- Surgical plane anterior to DVF will OK for preserving ANP

A.C. Kraima et al./EJSO 41 (2015) 738–745

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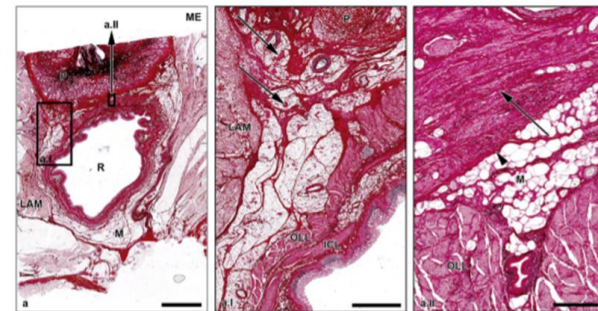
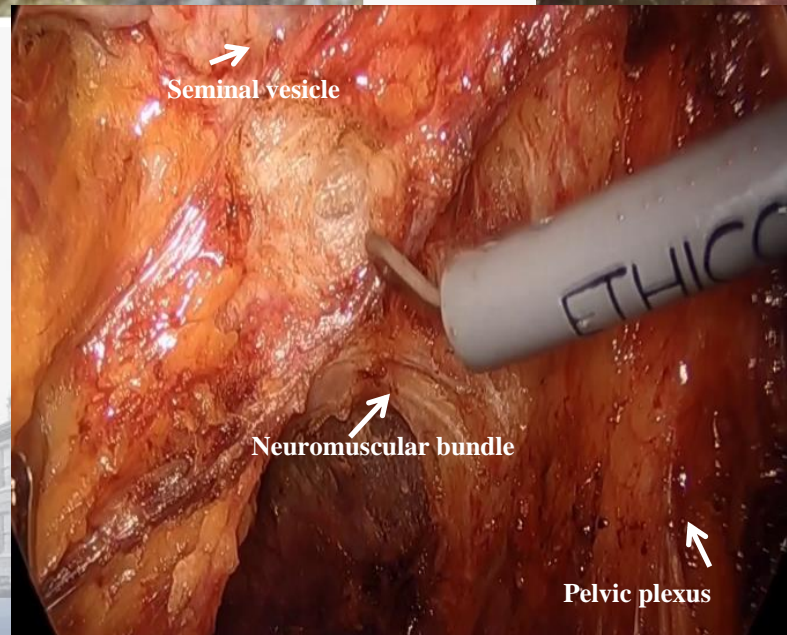
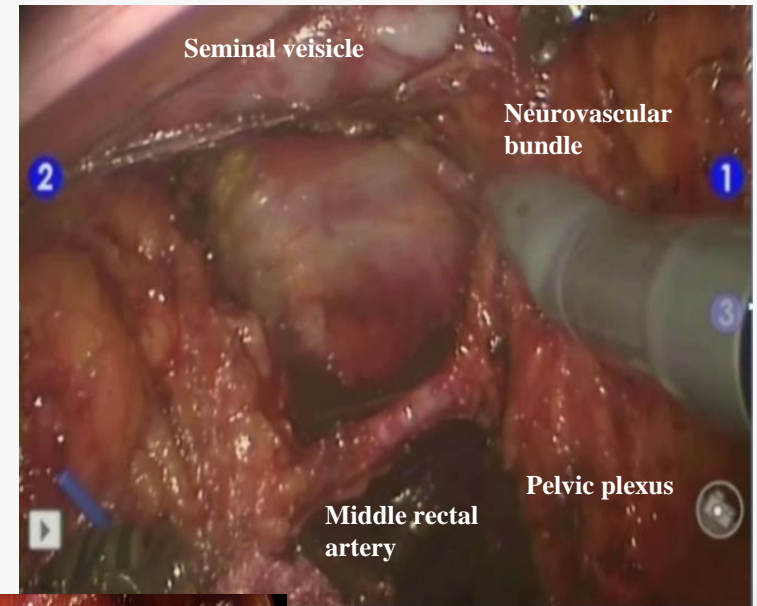
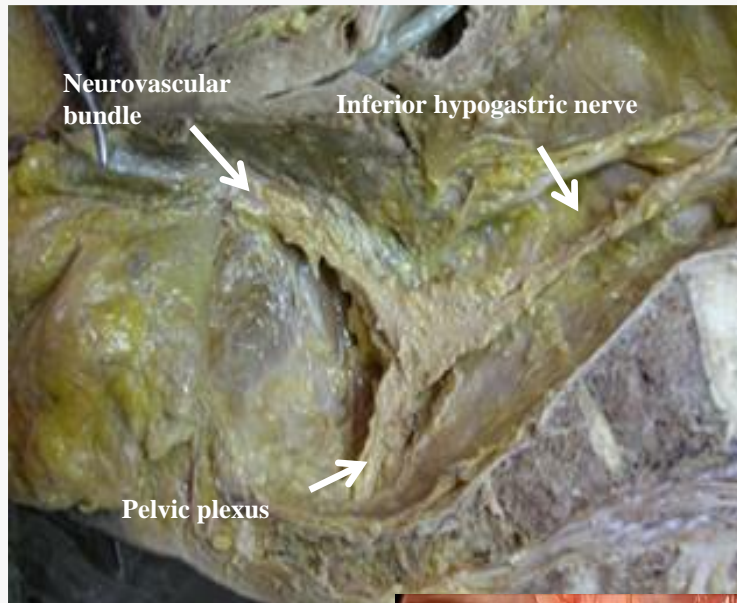


Figure 2. This figure illustrates the lateral edges of DVF at the prostatic base (P). Detail window a.I shows the multi-layered lateral edges. Between these layers, small nerve fibres can be detected (arrows). Note the close relation of DVF with the outer longitudinal layer of the rectal wall (OLL). The arrow in detail window a.II shows that at high magnification DVF is as closely related to the prostatic fascia (arrowhead). ME: Millers' elastin, LAM: levator ani muscle, R: rectum, M: mesorectum, ICL: inner circular layer of the rectal wall. Scale bars in window a: 8 mm, window a.I: 2 mm, window a.II: 300 μ m.



Posterolateral & anterolateral pelvic dissection



1885 Chejungwon



Lateral edges of Denonvilliers' fascia

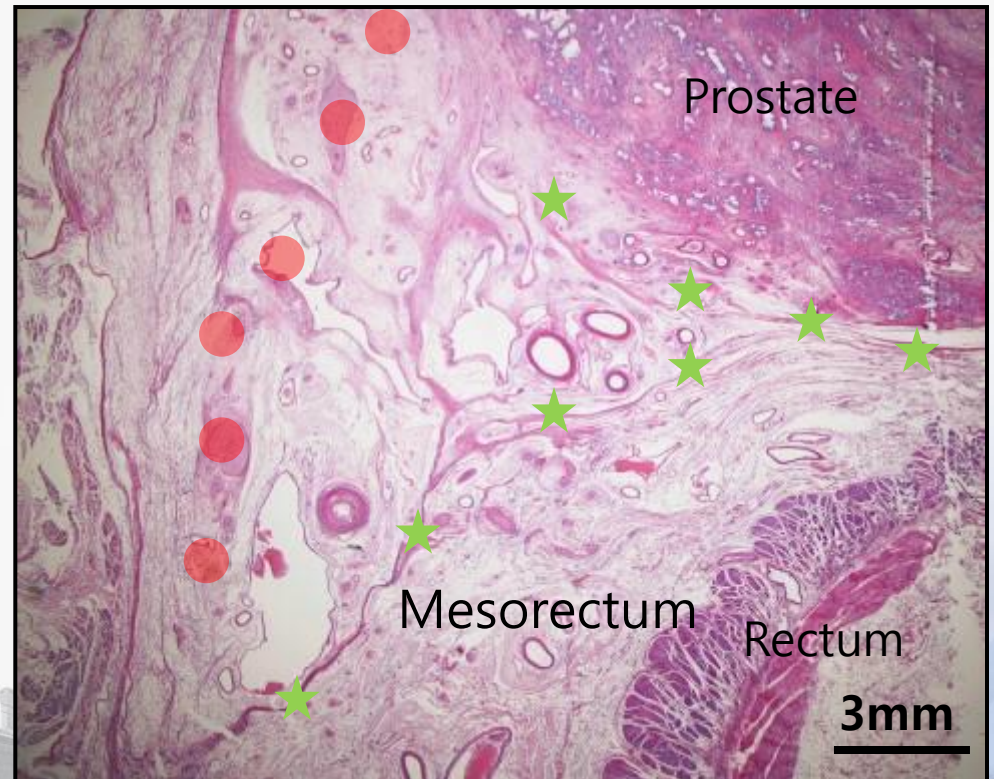
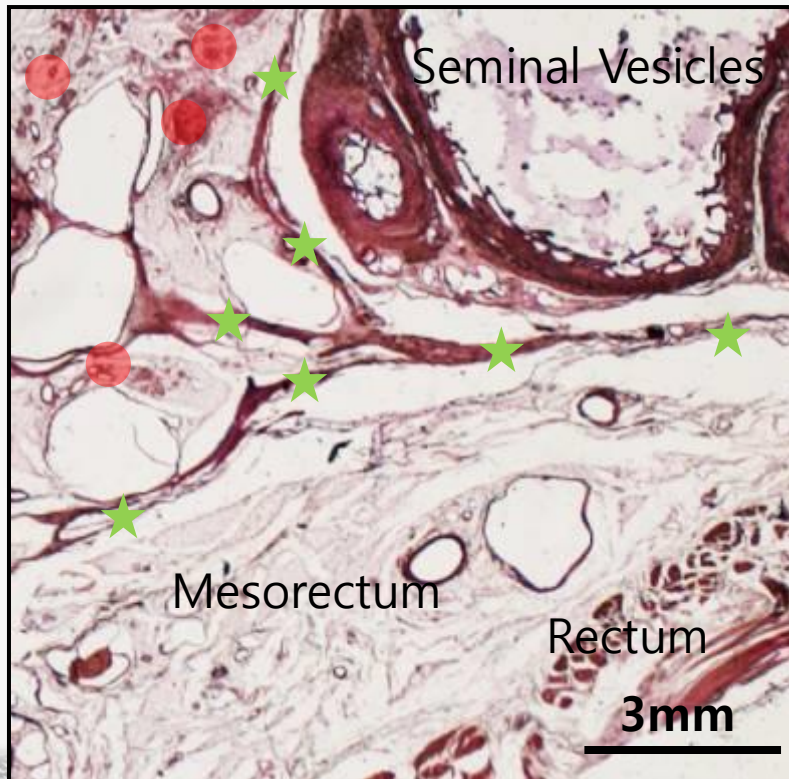
lateral



Transverse section



medial

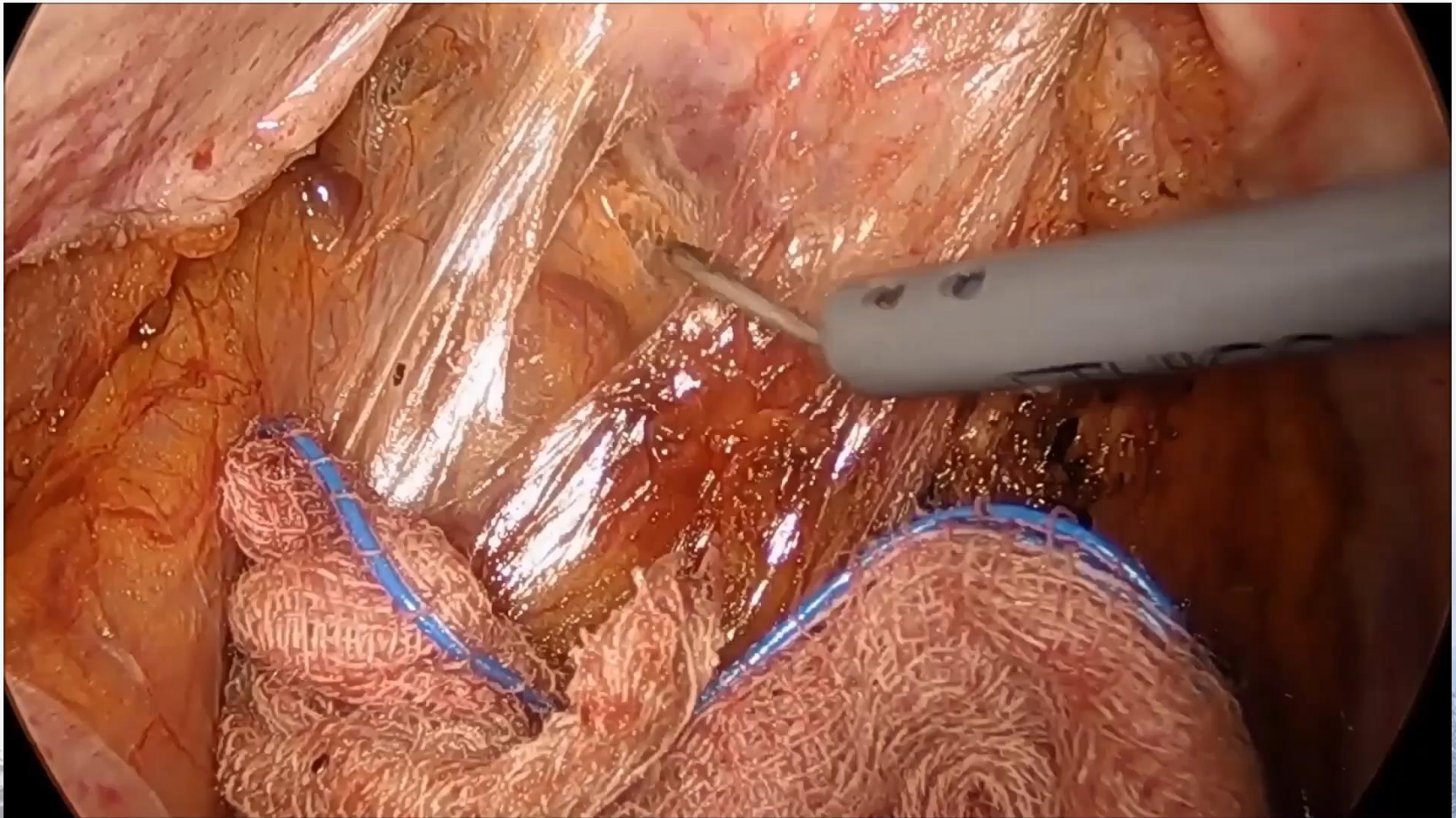


● nerve

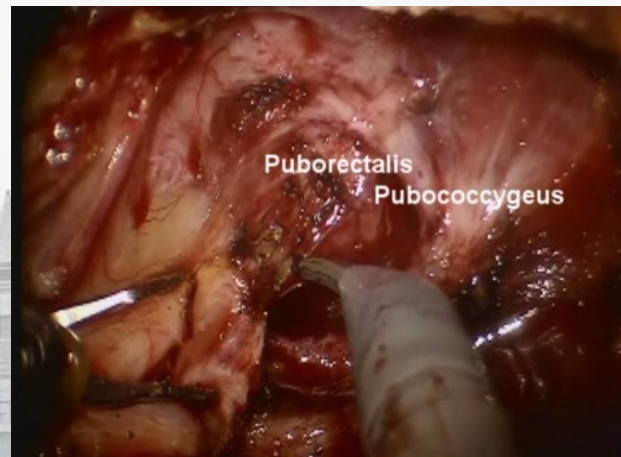
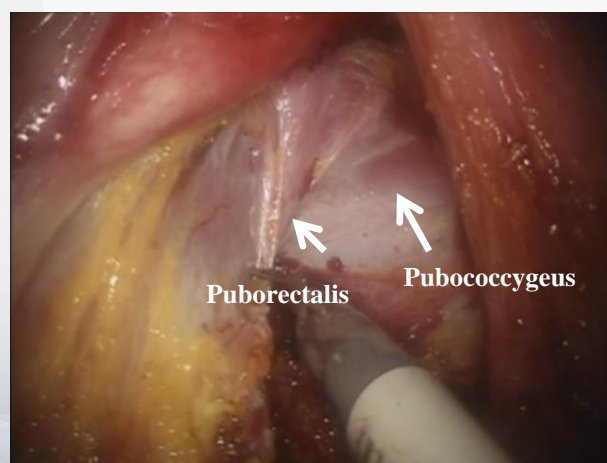
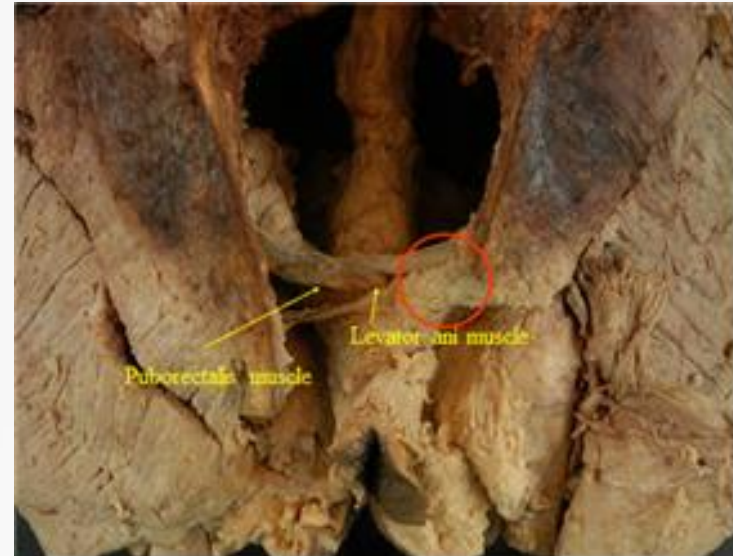
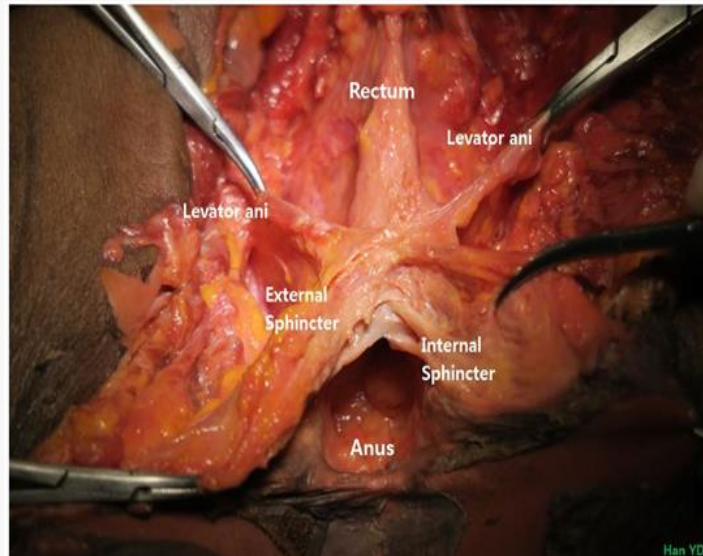
★ Denonvilliers' fascia

Dr. Sheungwon

Anterolateral pelvic dissection toward the pelvic floor



Final deeper pelvic dissection toward the pelvic floor



Three dimensional reconstruction of the pelvic autonomic network.

Kraima AC, Int J Gynec Cancer 2016;26;959-966

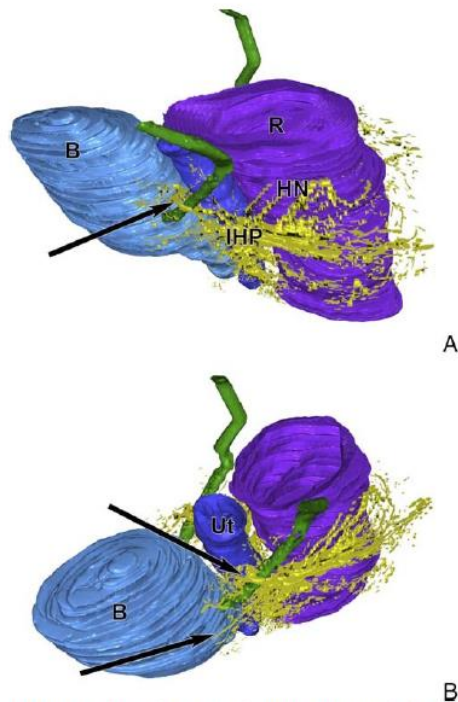


FIGURE 4. Three-dimensional reconstruction of the pelvic autonomic network. Three-dimensional reconstruction of the pelvic autonomic network of the fetus aged 14 weeks. The bladder is depicted in light blue, the uterus in dark blue, the rectum in purple, the ureter in green, and the autonomic nerves in yellow. A, Posterolateral view, in which the arrow indicates the nerve fibers from the middle part of the IHP surrounding the distal ureter. B, Anterolateral view, in which the distribution of nerve fibers in relation to the distal ureter can be explored. The upper arrow shows the plexus located on top of the ureter in the superficial layer of the VUL, whereas the lower arrow points out nerve fibers running in the deep layer of the VUL.

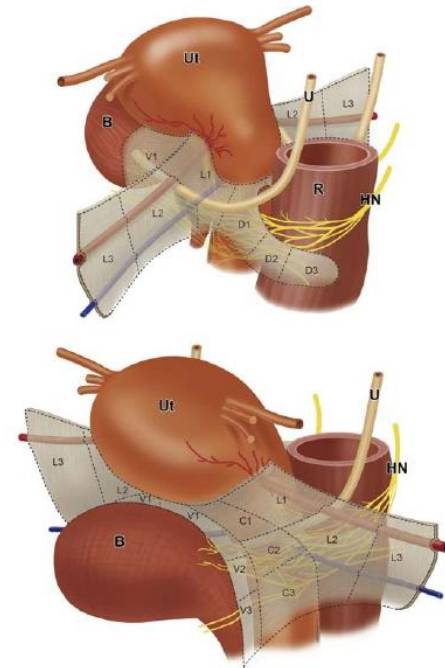


FIGURE 5. Pelvic autonomic network in relation to the different extensions of the parametrium. The parametrium can be divided into 4 surgical extensions based on the Leiden TNM classification system. Ventral (V) 1, superficial layer of the VUL; V2, medial part of the deep layer of the VUL; V3, lateral part of the deep layer of the VUL. Lateral (L) 1, medial to the ureter; L2, between the ureter and pelvic side wall; L3, until the pelvic side wall. Caudal (C) 1, above the ureter; C2, above the deep uterine vein; C3, below the deep uterine vein. Dorsal (D) 1, between the uterus and rectum; D2, at the anterior rectal border; D3, halfway of the rectal circumference. Note that the ureter passes through the lateral, ventral, and upper caudal parametria. The IHP is located in the dorsal, lateral, and upper caudal parametria, caudal to the ureter. The vesical plexus is located in the ventral parametrium in V1 and V2 superiorly and inferiorly to the distal ureter.

Superior hypogastric nerve plexus

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A.C. Kraima et al. / Autonomic Neuroscience: Basic and Clinical 189 (2015) 60–67

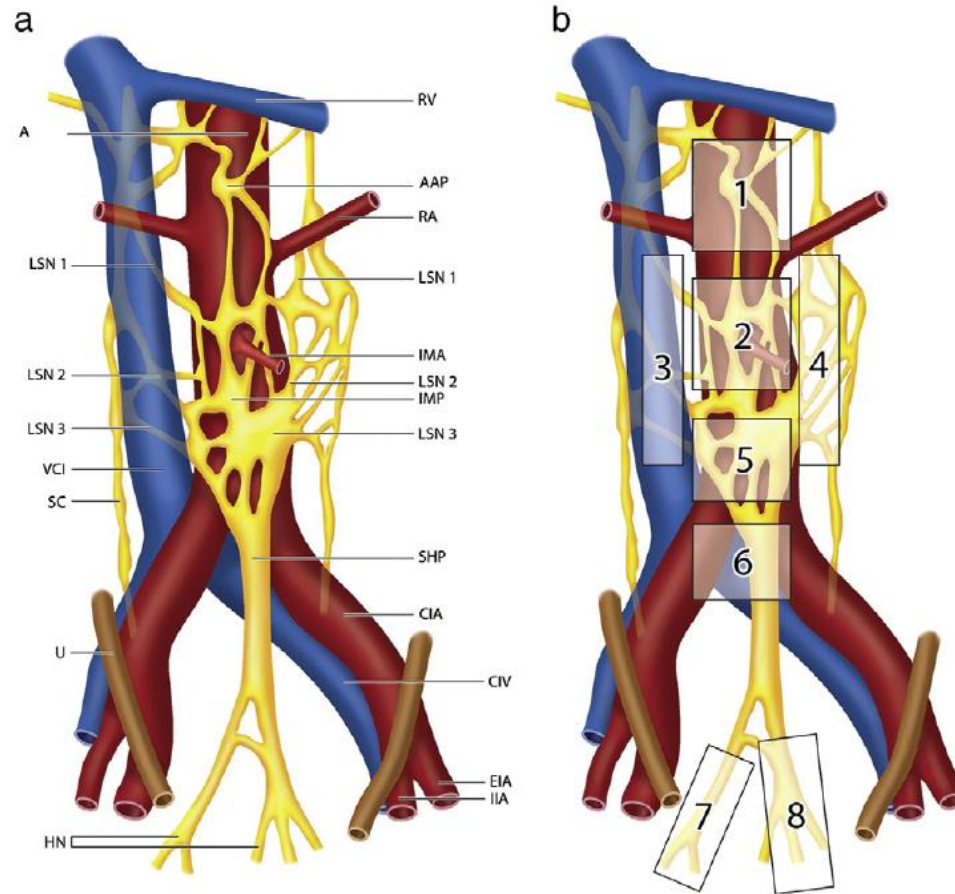
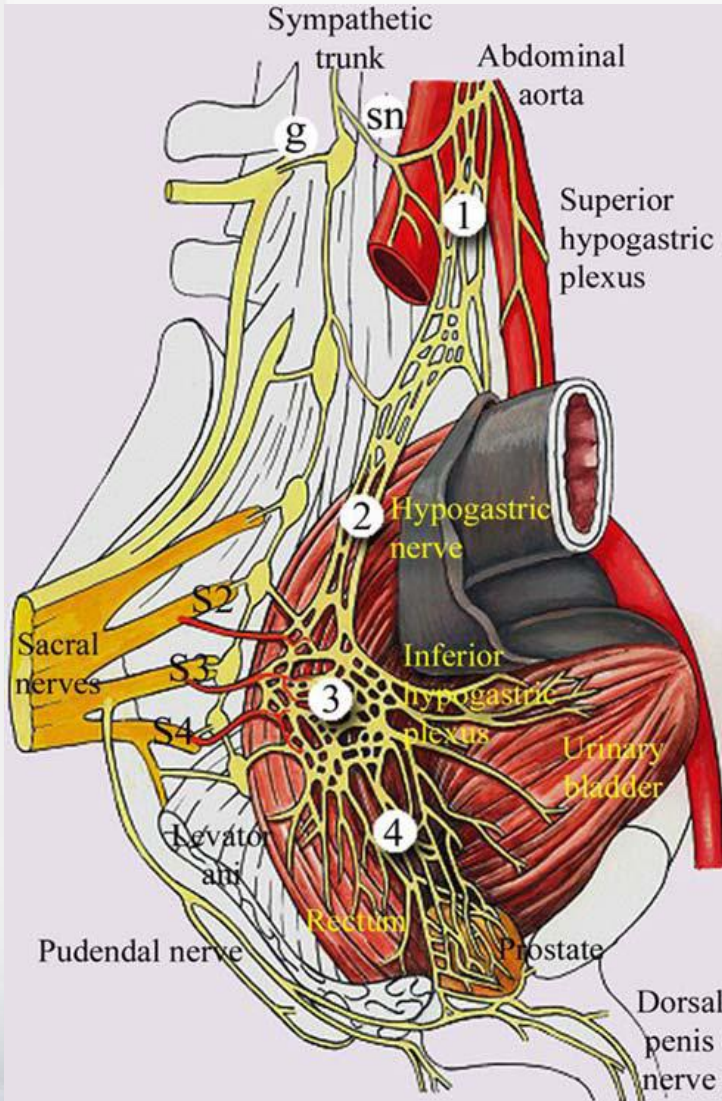


Fig. 2. Schematic representation of the superior hypogastric plexus and its neural in- and outflow structures. A: abdominal aorta, RV: renal vein, AAP: abdominal aortic plexus, RA: renal artery, LSN: lumbar splanchnic nerve, IMA: inferior mesenteric artery, IMP: inferior mesenteric plexus, VCI: vena cava inferior, SC: sympathetic chain, SHP: superior hypogastric plexus, CIA: common iliac artery, CIV: common iliac vein, U: ureter, HN: hypogastric nerves, EIA: external iliac artery, IIA: internal iliac artery. b) shows the multiple segments taking out during autopsies. Segment 1 represents the AAP; 2 represents the IMP; 3 and 4 represent the LSN 1, 2 and 3; 5 and 6 represent the superior and inferior part of the SHP; 7 and 8 represent the HN.

Autonomic nerve preservation



1. Superior hypogastric plexus

→ High or low ligation of IMA

2. Hypogastric nerve

→ Posterolateral pelvic dissection

3. Pelvic plexus

→ Division of lateral ligament

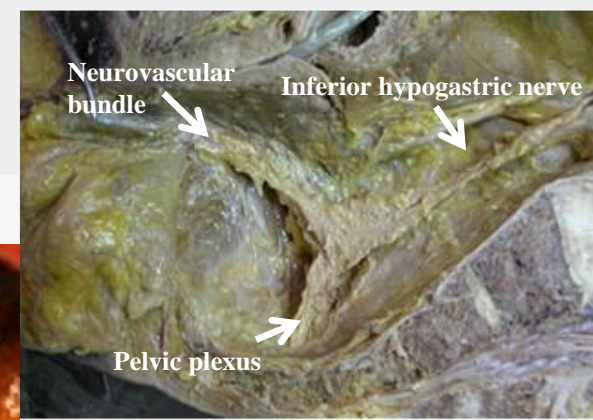
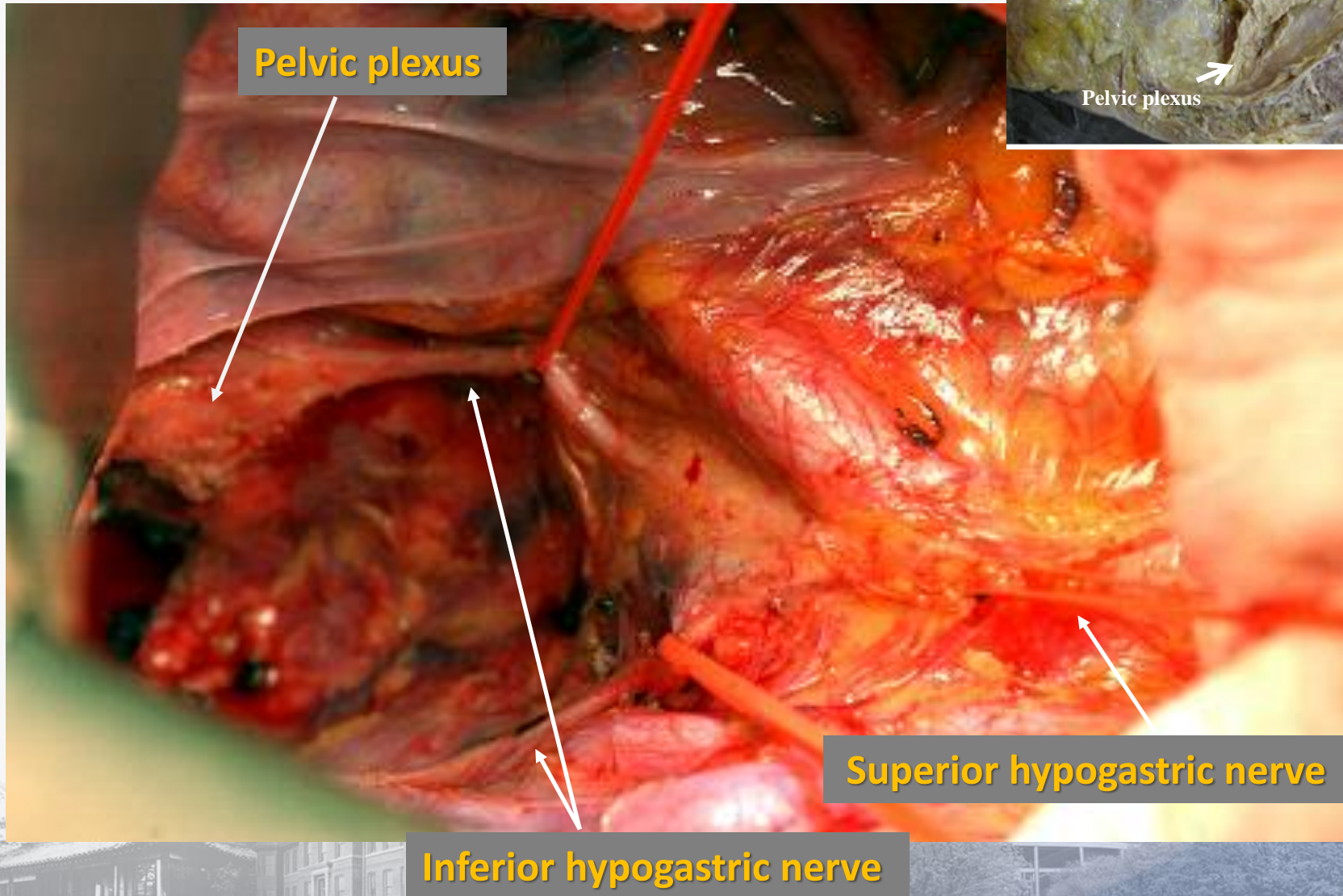
4. Neurovascular bundle

→ Dissection of Denovillier's fascia

ANP

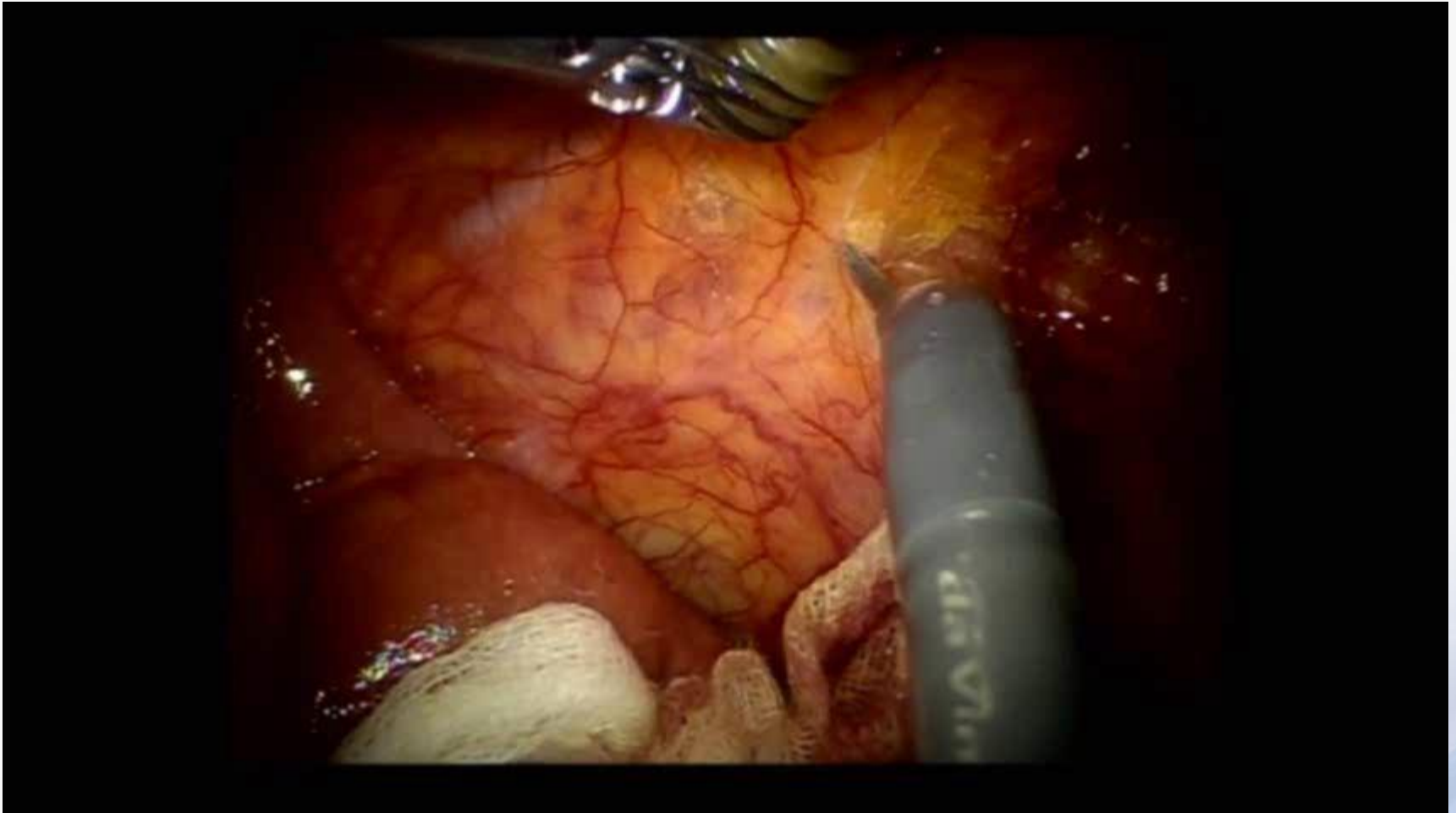


Autonomic nerve preservation





Autonomic nerve preservation





Summary and Conclusion

- Sharp pelvic dissection along the anatomical embryological plane combined pelvic AN preservation
 - Named anatomical landmark should be identified
 - The cylindrical shape of the distal mesorectum kept in mind to avoid + CRM
 - 3 dimensional concept and approach for optimal pelvic dissection
 - Neuroanatomy for autonomous pelvic nervous system should be understood.
 - Pelvic diaphragm and its shape



Thank you for your kind attention



Robotic & Laparoscopic Animal Workshop





Summary of optimal TME for maximal oncologic and functional outcomes

- **Posterior approach**
 - Inferior hypogastric nerve and the mesorectal fascia
- **Anterior approach**
 - Division of peritoneum and D. fascia, mesorectum and rectovaginal septum
- **Anterolateral approach**
 - NVB spared and into the pelvic floor
- **Deep posterior approach**
 - Division of rectosacral fascia and into the coccyx level
- **More deep anterior approach**
 - More mobilize rectum from the adj. organ and pelvic plexus
- **Dissection to the level of pelvic floor**
 - Anococcygeal lig. PR and Levator ani muscle and fascia





2015 Tumor Specific Mesorectal Excision for Rectal Cancer Workshop

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Update and Debate on Standard Colorectal Surgery

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