Groin Pain Diagnosis and Treatment (Simplified)

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LICHTENSTEIN AMID
HERNIA CLINIC

Every surgeon wants to provide the best possible care to each patient

Inguinal Hernia

- Annual repairs: 20M worldwide,

  ~ 800,000 in US
- Recurrence in 2 %
- Significant pain in 6 - 8%

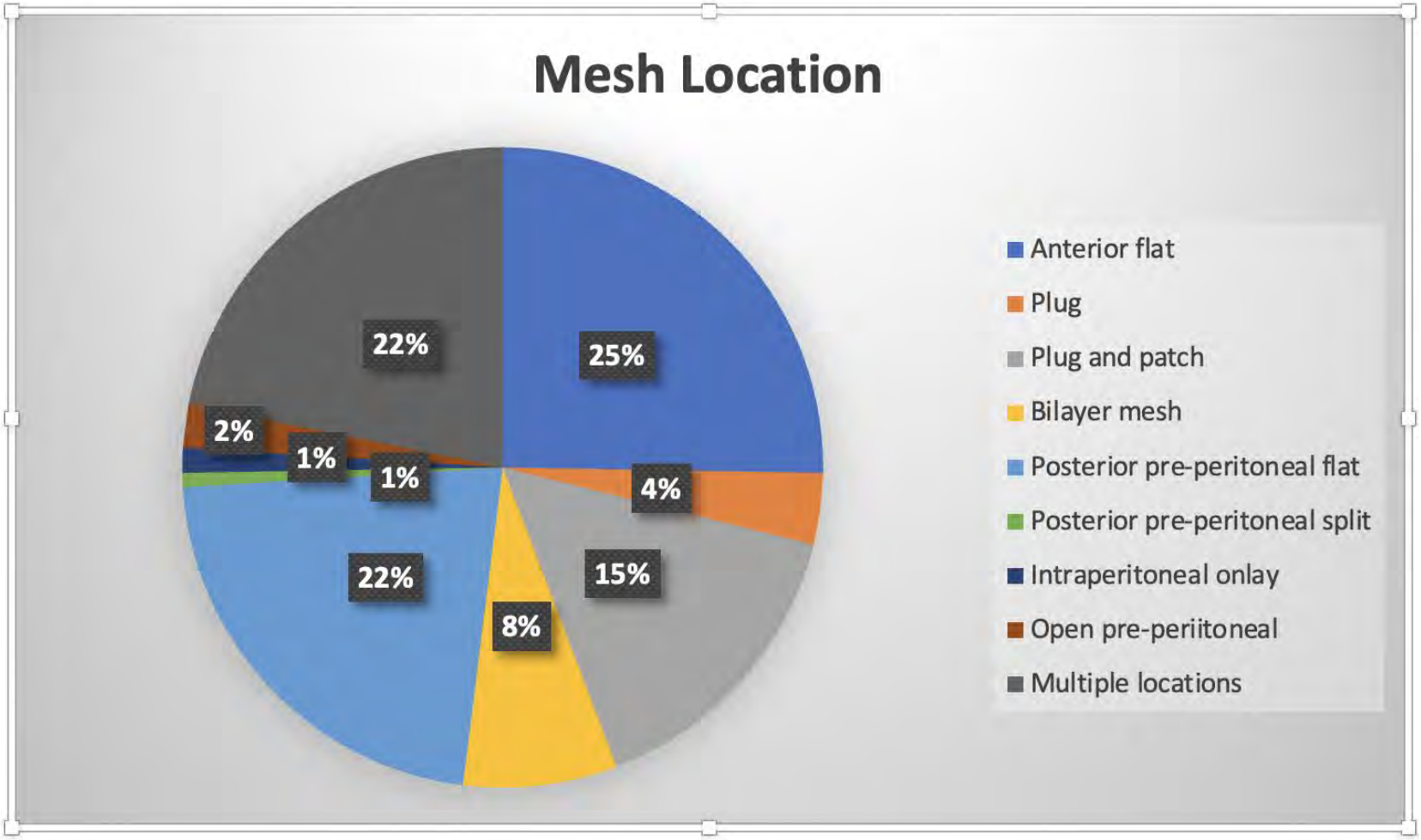
Goal of modern inguinal hernia repair

Reduction of the rate of recurrence and chronic pain to less than 0.5%

All Repairs Can Cause Pain

- Anterior techniques have more direct exposure to nerves
- Lap techniques have indirect exposure to nerves
- The problem preceded mesh and tissue repairs may cause pain
- All techniques can be optimized to minimize pain
- Function of the denominator: more usage = more patients with pain

Figure 1. Description of prior mesh location in patients with chronic post-operative inguinal pain.

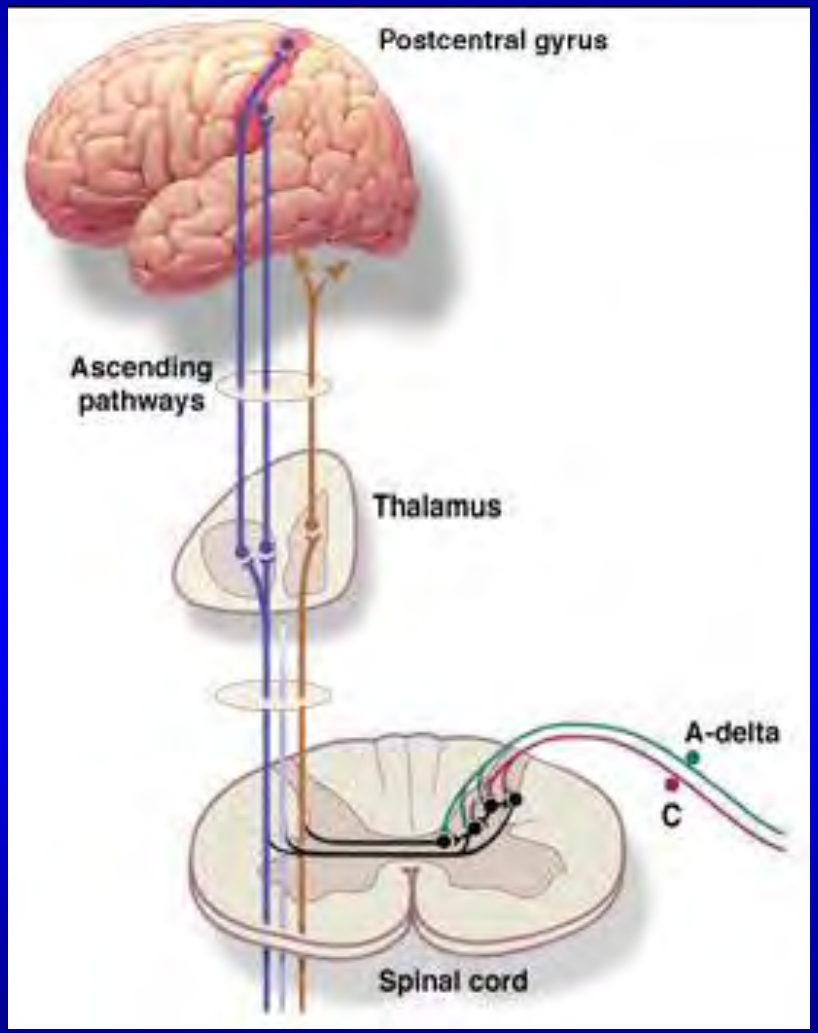


Causes of Chronic Pain

- Nociceptive: inflammation, meshoma
- Neuropathic: nerve injury, scarring
- Somatic/ Visceral
- Overlap of symptoms / signs
- Psychological, social, genetic factors

Nociceptive pain

- Activation of nociceptors by nociceptive material produced by Tissue Injury/Inflammation
- Mediated by A-delta and C-fibers and perceived as aching, squeezing, stabbing or throbbing pain



PK Amid. Mastery of Surgery. 2011

COMMENTARY

Radiologic Images of Meshoma

A New Phenomenon Causing Chronic Pain After Prosthetic Repair of Abdominal Wall Hernias

HERNIA SURGERY HAS been fundamentally altered by the use of prosthetic meshes, which have dramatically lowered the rate of recurrence after hernia repair. This revolutionary development, however, may lead to certain complications. Depending on the chosen procedure and the approach, the mesh is implanted in front of or behind the transversalis fascia; in the latter case, this is done through an open or laparoscopic approach. Furthermore, depending on the surgeon's choice, the mesh is implanted without fixation or is fixed by sutures, metallic staples and tacks, or a variety of tissue glues. Nonfixation, insufficient fixation, or insufficient dissection to make adequate room for the prosthesis, however, can lead to folding and wrinkling of the mesh, a process that continues until the mesh is wadded up into a ball, which elsewhere I have referred to as "meshoma." **Figures 1**, **2**, **3**, and **4** show computed tomographic and magnetic resonance images of this phenomenon and the corresponding explanted surgical specimens.

The mechanical pressure of these hard and abrasive meshomas on the adjacent tissues (Figures 1 and 2), including nerve fibers (Figure 3) and vas deferens (Figure 4), or complete encasement of these structures (Figures 3 and 4) can lead to chronic postherniorrhaphy pain, which recently has been a primary focus of hernia surgeons. Many of these patients undergo extensive pain management, including intrathecal opiate infusion pump and radiofrequency ablation, with no improvement. Furthermore, the pain is frequently associated with other problems, such as mood swing, depression, long-term drug dependency, and an inability to return to work, requiring prolonged and

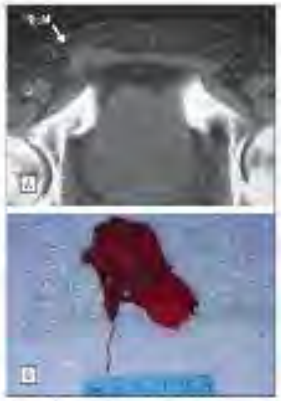


Figure 1. A wrinkled mesh (open arrow) and hernia repair following an appendectomy. A, A computed tomographic image of the wrinkled mesh. B, The explanted wrinkled mesh.

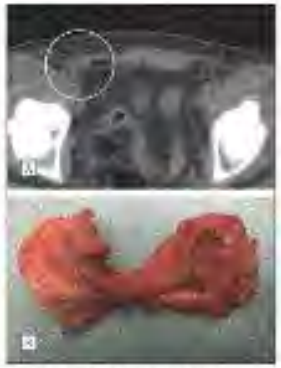


Figure 2. A wrinkled mesh (meshoma) adjacent to a preperitoneal inguinal hernia repair. A, A computed tomographic image of the wrinkled mesh (meshoma). B, The explanted surgical specimen.

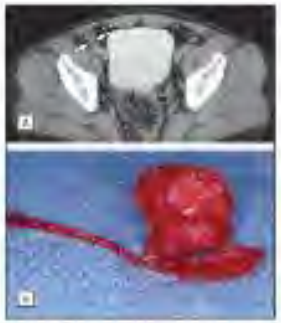


Figure 3. A meshoma and compression and encasement of the iliohypogastric nerve. A, A computed tomographic image of the meshoma. B, The explanted specimen showing the resected iliohypogastric nerve completely encased within the base of a mesh plug.

Figure 4. A meshoma (mesh plug) with compression and encasement of the vas deferens resulting in epididymal obstruction of the vas. A, A magnetic resonance image of the meshoma. B, The explanted plug (arrow points to the site of encasement of the vas).

Amid PK. Arch Surg 2004

Problem of Mesh/Approach?
Pain: Function of Denominator

Cause and Prevention of Postherniorrhaphy Neuralgia: A Proposed Protocol for Treatment

Irving L. Lichtenstein, MD, FACS, Alex G. Shulman, MD, FACS, Parviz K. Amid, MD, FACS, and **Michele M. Montllor, MD, FACS,** Los Angeles, California

Painful symptoms are rarely caused by the scars that result from common surgical procedures. They are a significant problem in no more than 1 to 2 percent of cases. When they do occur, they represent substantial diagnostic and therapeutic problems. Fortunately, the pain is usually temporary and becomes minimal or disappears within 4 to 6 months. However, the long-term painful groin after inguinal herniorrhaphy may persist for years and be extremely incapacitating. Successful treatment to date has been elusive. The cause, however, is not so arcane and can be traced to ligation or crushing of the sensory nerves to the area [1].

Anatomic Characteristics

To expose the inguinal canal, the external oblique aponeurosis is split in the direction of its fibers. The iliohypogastric and ilioinguinal nerves are usually easily discernible at this point.

The plexus roots from the first and second lumbar nerves divide into upper and lower branches. The iliohypogastric nerve originates from the first lumbar root which joins a lower branch from the twelfth thoracic nerve root. It is analogous to the intercostal nerve and splits into a second branch, the lateral cutaneous branch. This supplies the skin on the outside of the pelvis, the hip, and the trochanter region. The main branch emerges from the internal oblique muscle medial to the anterior superior iliac spine and extends almost horizontally under the aponeurosis of the external oblique muscle to the superficial inguinal ring. Its distribution covers the skin of the hypogastric region.

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The ilioinguinal nerve originates in the lumbar plexus from the first lumbar root. It continues beneath the aponeurosis of the external oblique muscle in the direction of the pubic region. The nerve generally lies within the cremaster fibers on the anterior aspect of the cord or round ligament. It then emerges through the superficial abdominal ring, where it leaves the inguinal canal. Its sensory distribution ranges from the inguinal region up to the iliac crest, the symphysis pubis, the root of the penis, the inner aspect of the scrotum, and a small adjacent area on the inside of the thigh.

The genitofemoral (genitocrural) nerve first described by Magee [2] as a cause of postoperative neuralgia is often ignored in articles on this subject [3]. The nerve arises from the first and second lumbar roots and consists mainly of sensory fibers. The nerve bifurcates into the external spermatic (genital branch) and lumboinguinal (femoral branch) nerves. In male subjects, the genital branch passes through the internal ring behind the spermatic cord and exits through the external ring. It supplies the motor fibers to the cremaster muscle and sensory fibers to a part of the scrotal skin and the medial adjacent thigh. Accompanying the nerve in the inguinal canal are the inconsequential external spermatic artery and veins supplying the cremaster covering and arising from the deep epigastric vessels lying medial to the internal ring (Figure 1). Since the genital branch to the genitofemoral nerve hugs the floor of Hesselbach's triangle just medial to the shelving edge of Poupart's ligament, it may be divided along with the external spermatic vessels when the spermatic cord and its cremaster envelope are elevated by means of a Penrose drain in order to completely expose the canal floor.

TABLE I Clinical Differentiation of Genitofemoral and Ilioinguinal Neuralgia*

	Genitofemoral Entrapment	Ilioinguinal Entrapment
Site	Posterior abdominal wall, inguinal or femoral region	Medial to anteroposterior iliac spine
Pain	Groin, scrotum, upper thigh	Groin, scrotum, back
Sensory change	Hyperalgesia in distribution of nerve	Hypoesthesia or hypalgesia in inguinal region
Point of tenderness	± Internal inguinal ring	Medial to anteroposterior iliac spine
Hip joint movement	Hyperextension or rotation of hip increases pain	Limitation of internal rotation, extension of hip
Treatment	Excision of portion of main trunk of genitofemoral nerve	Nerve block, neurolysis, neurectomy

* This clinical differentiation can be difficult, inaccurate, and misleading [8].

Volume 155, June 1988

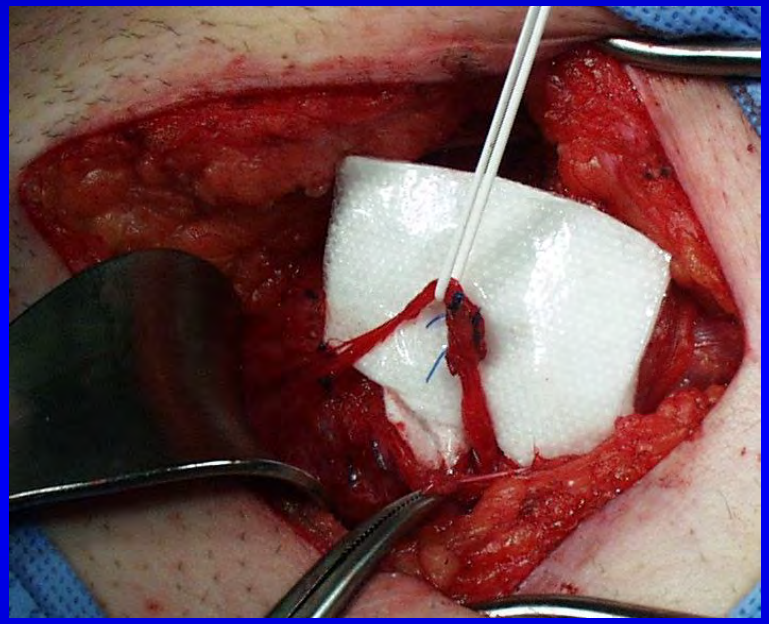
Neuropathic pain

- Caused by Direct Nerve Injury
- Characterized by:
  - Inguinodynia: Groin Pain
  - Radiation to the scrotum/femoral triangle
  - Paresthesia
  - Allodynia
  - Hyperpathia
  - Hyperalgesia
  - Hyperesthesia
  - Hypoesthesia
  - Positive Tinel's sign

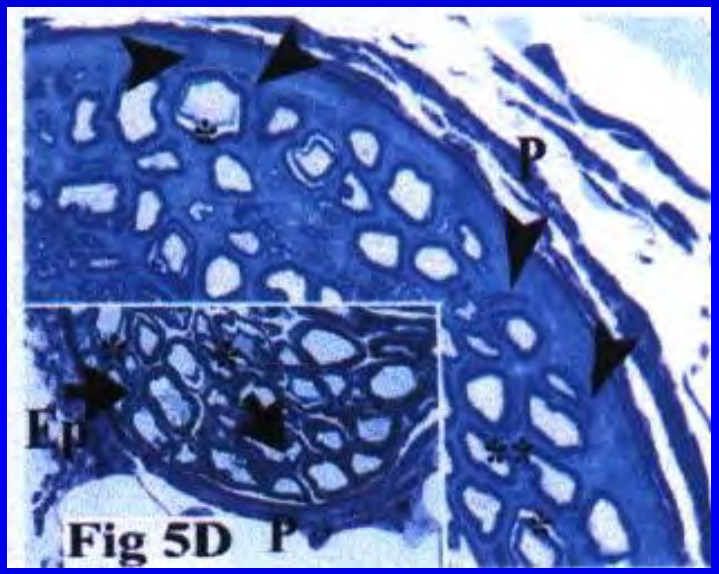
International Association for the Study of Pain (IASP)

Pathophysiology of Neuropathic Pain

Mechanical

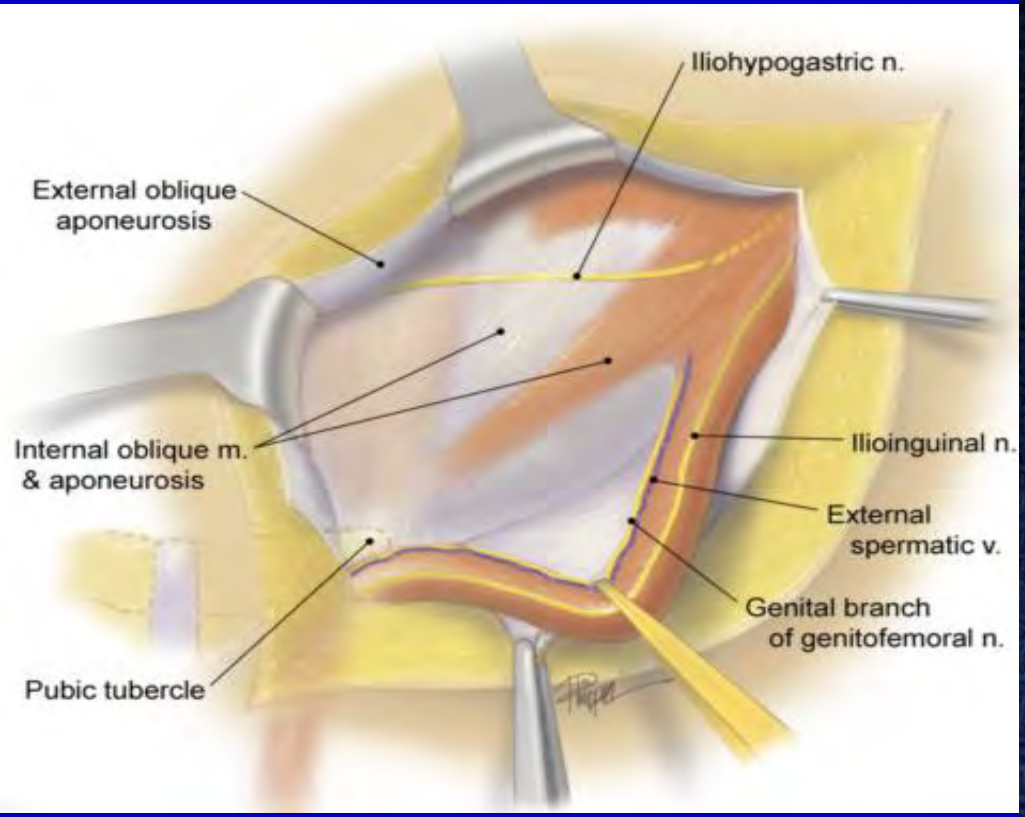


Structural

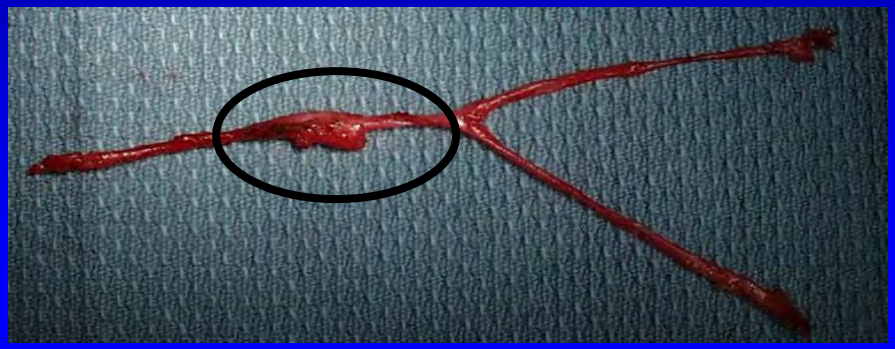


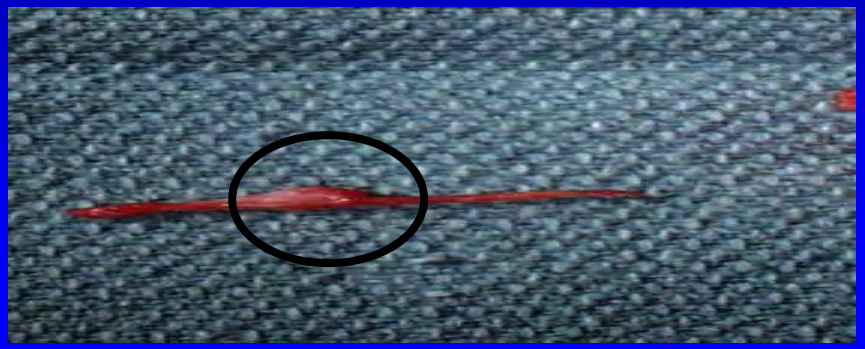
Pictures from PK Amid, DC Chen

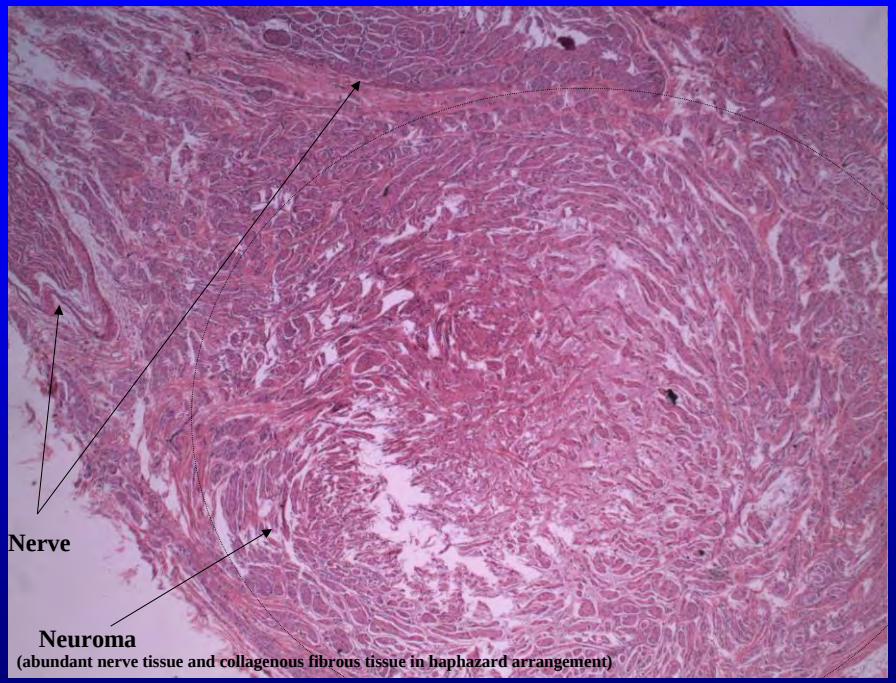
Anterior Nerves: Inguinal Canal



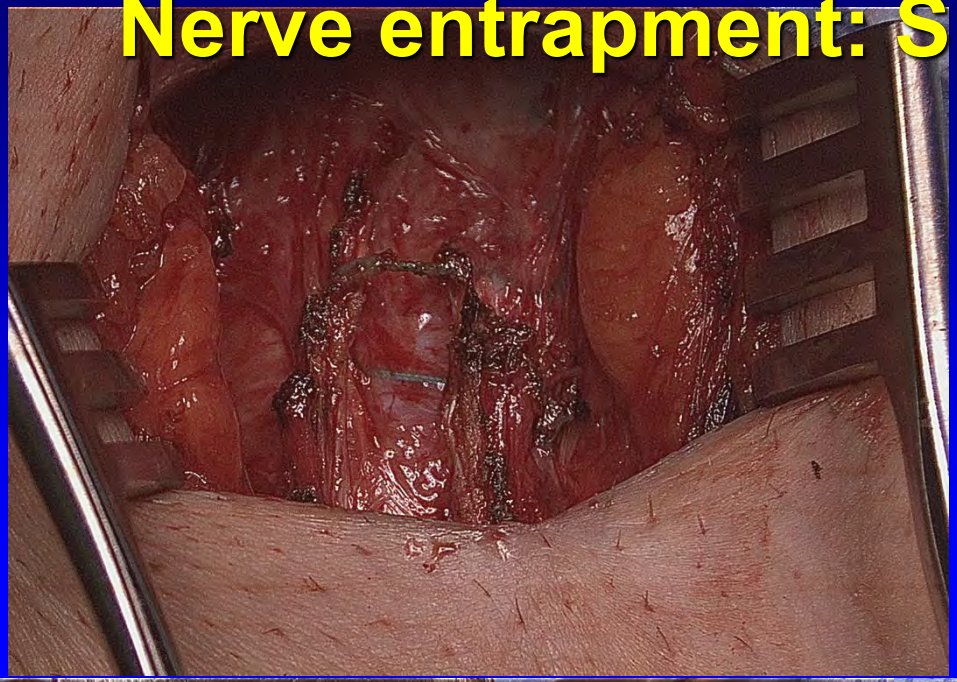
Traumatic neuroma after anterior repair

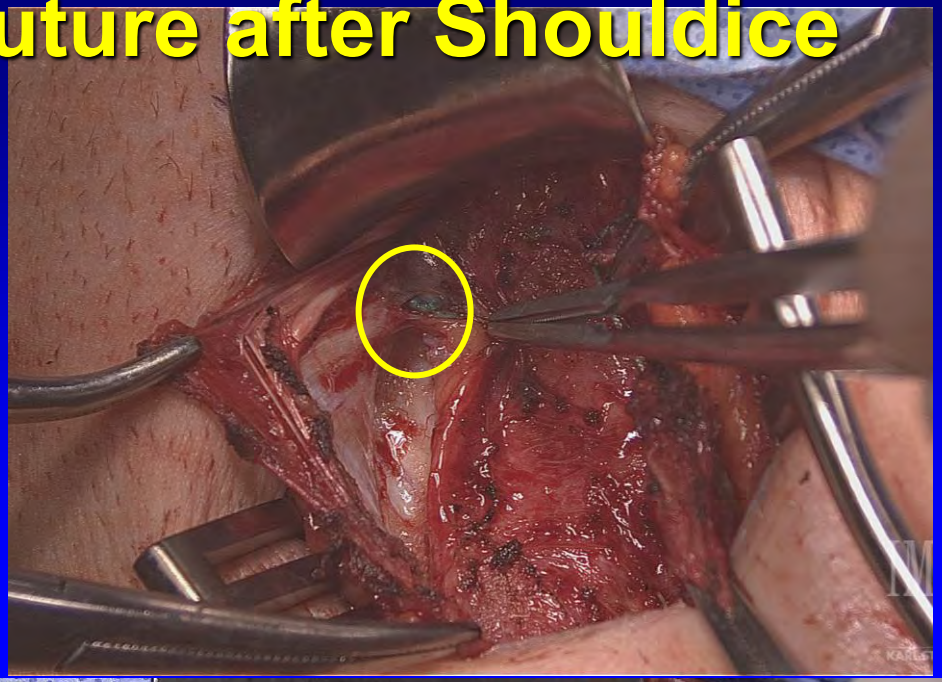


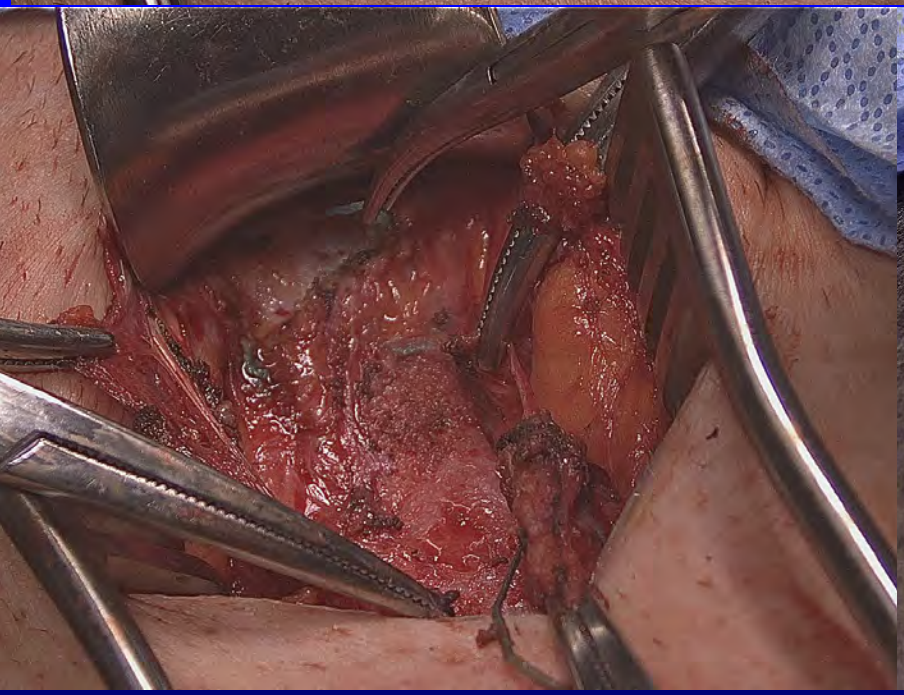


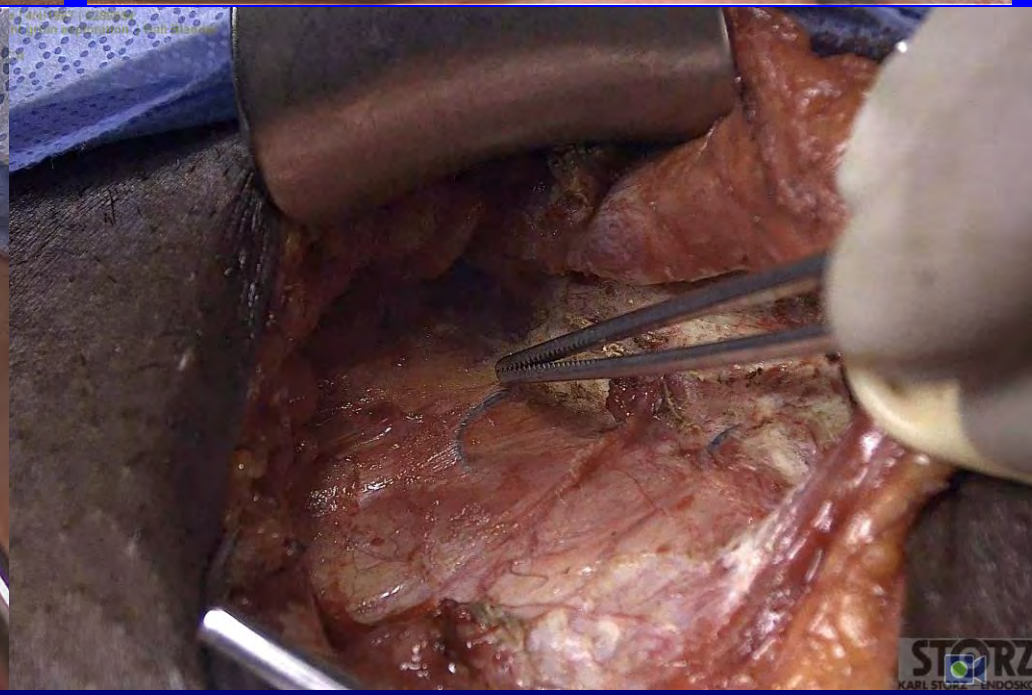


Nerve entrapment: Suture after Shouldice

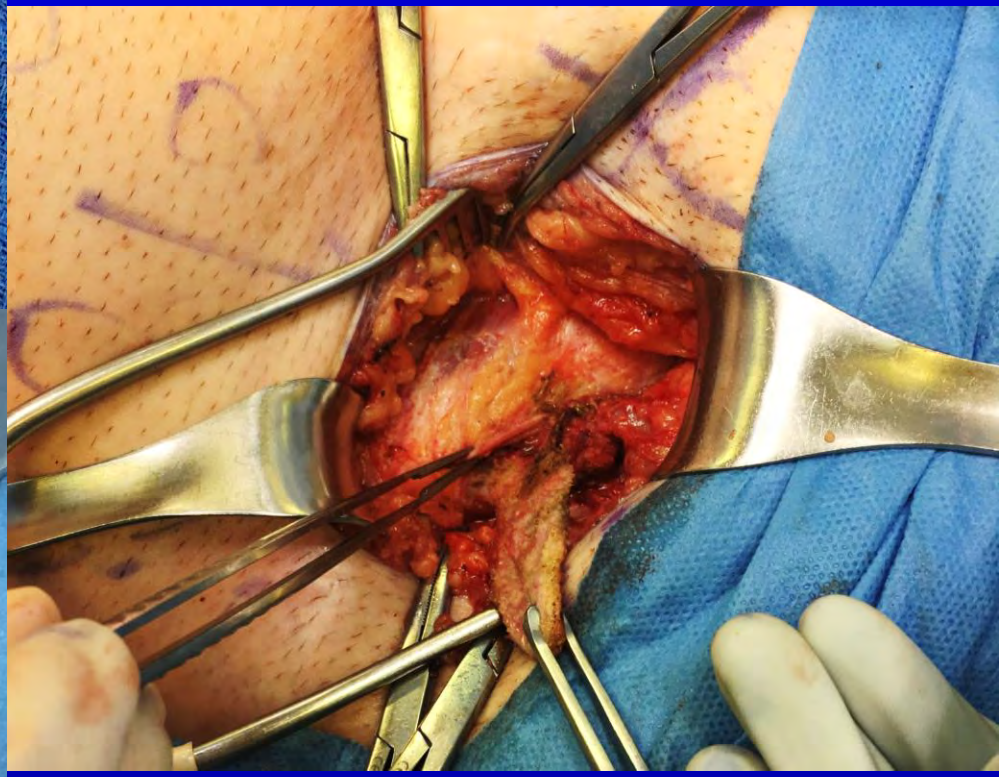




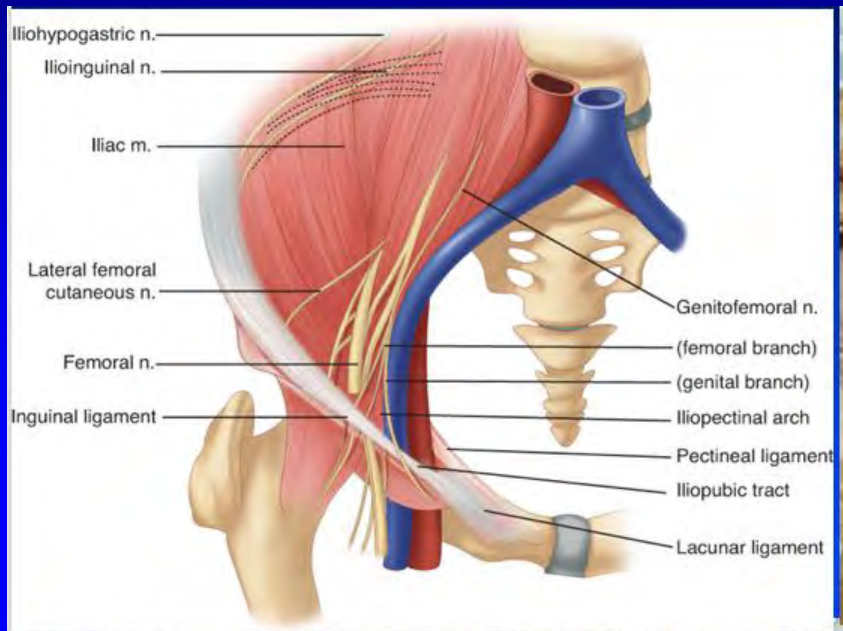


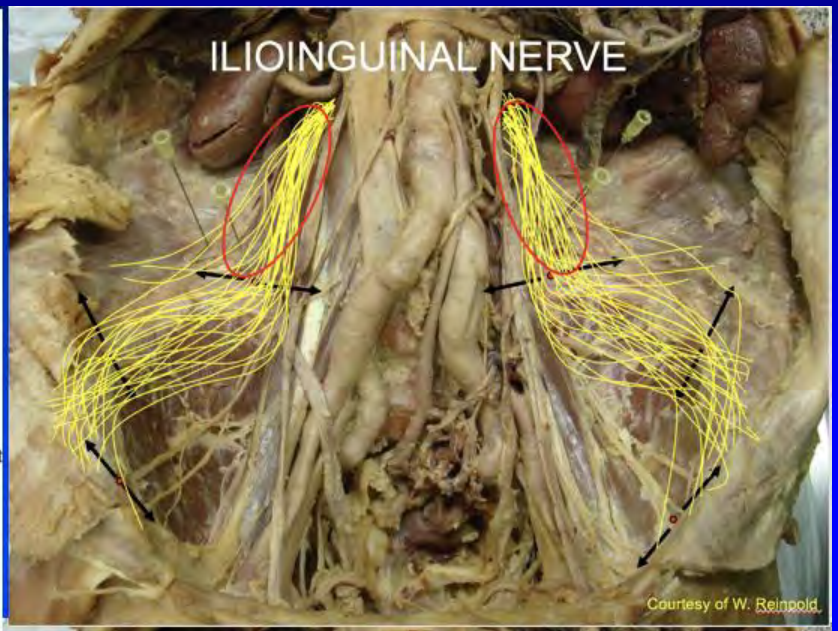


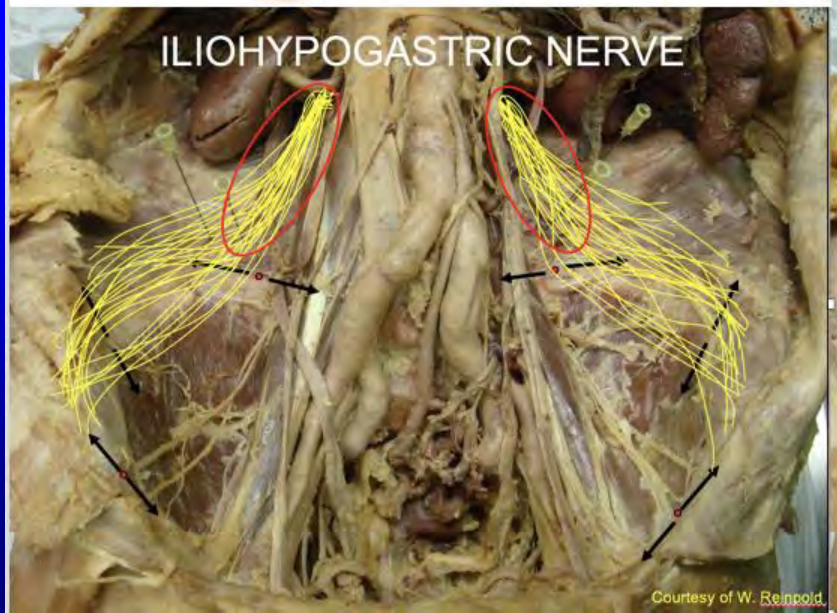
Nerve entrapment: Anterior Mesh Repair

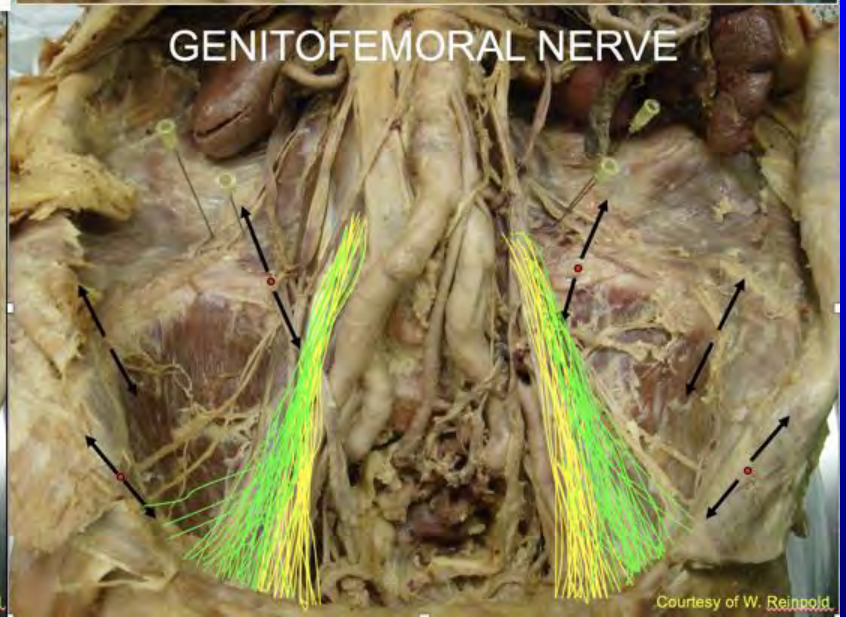


Posterior Nerves: Inguinal



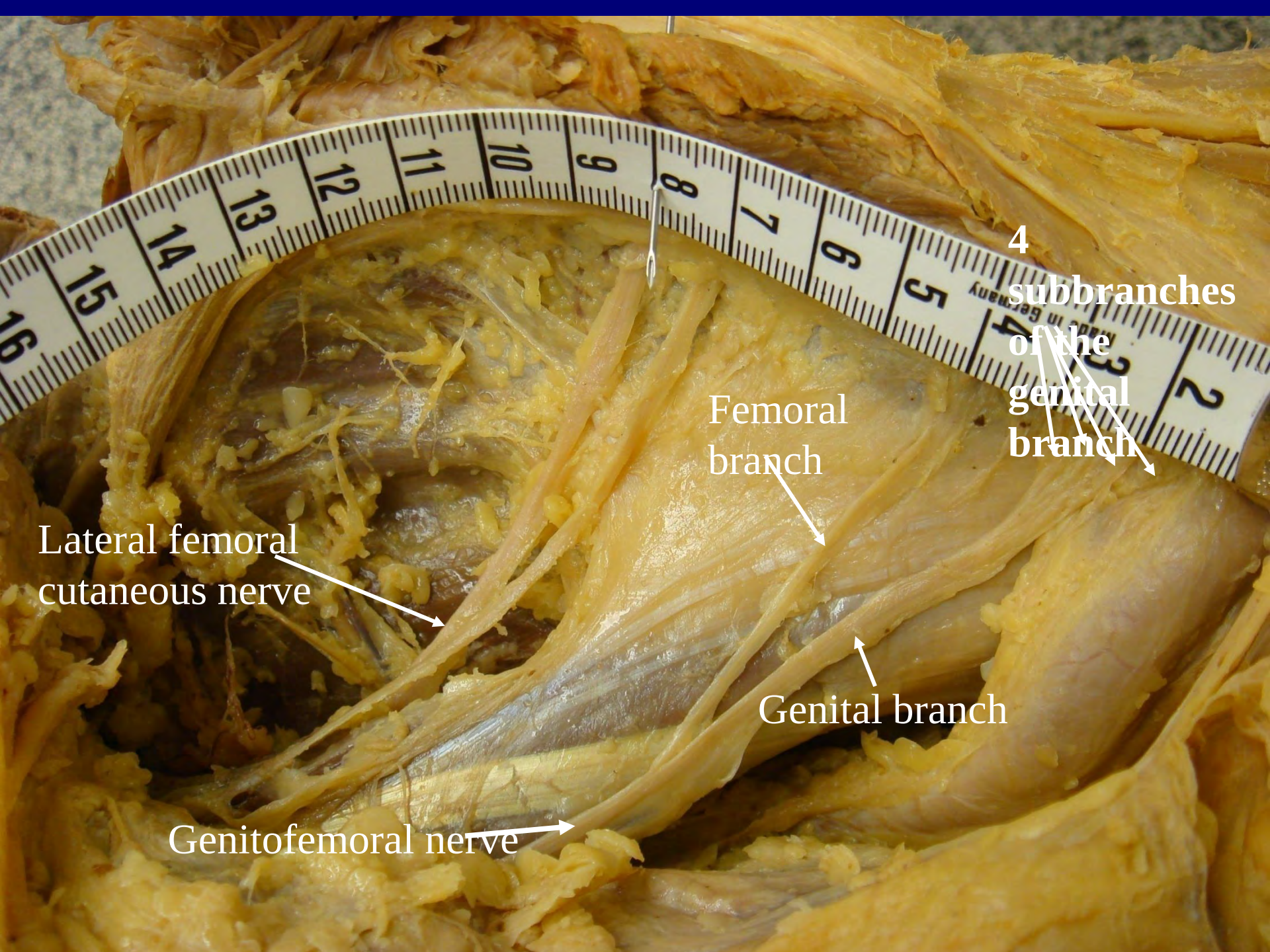






Nerves at Risk in MIS Inguinal Hernia Repair: No Fixation

- Genital Branch of Genitofemoral Nerve
- Femoral Branch of Genitofemoral Nerve
- Lateral Femoral Cutaneous Nerve


4 subbranches of the genital branch
Femoral branch
Lateral femoral cutaneous nerve
Genital branch
Genitofemoral nerve

Two Compartments of the Preperitoneal Space

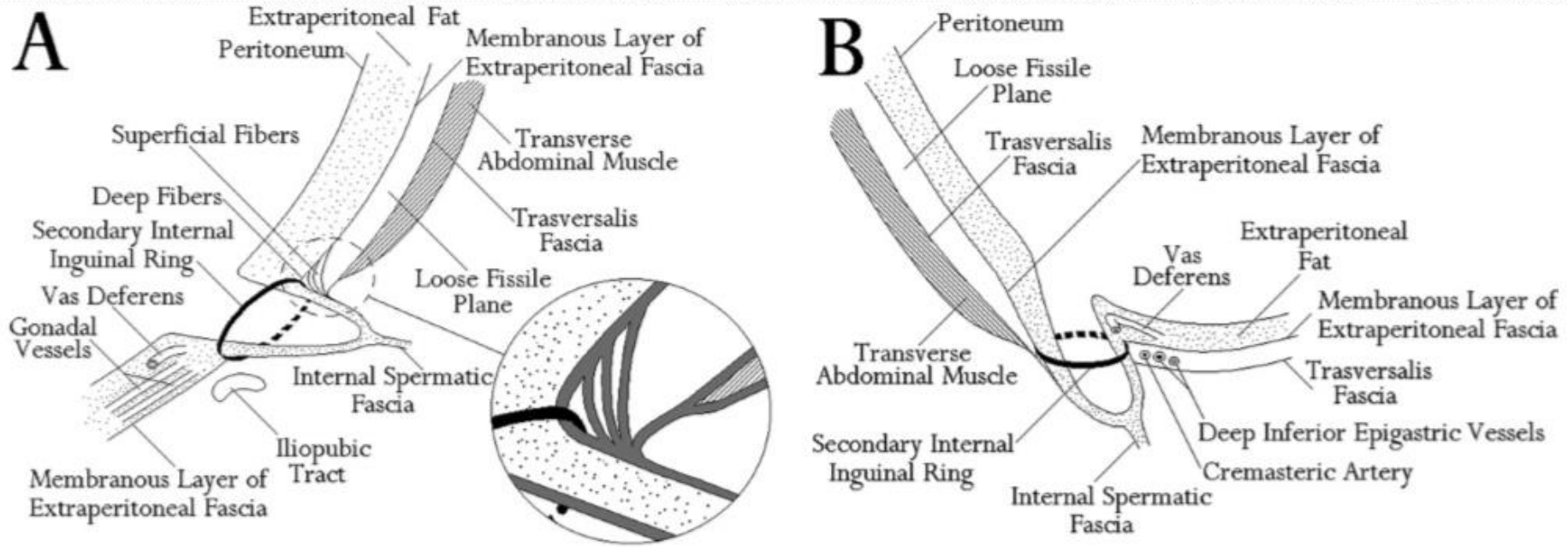
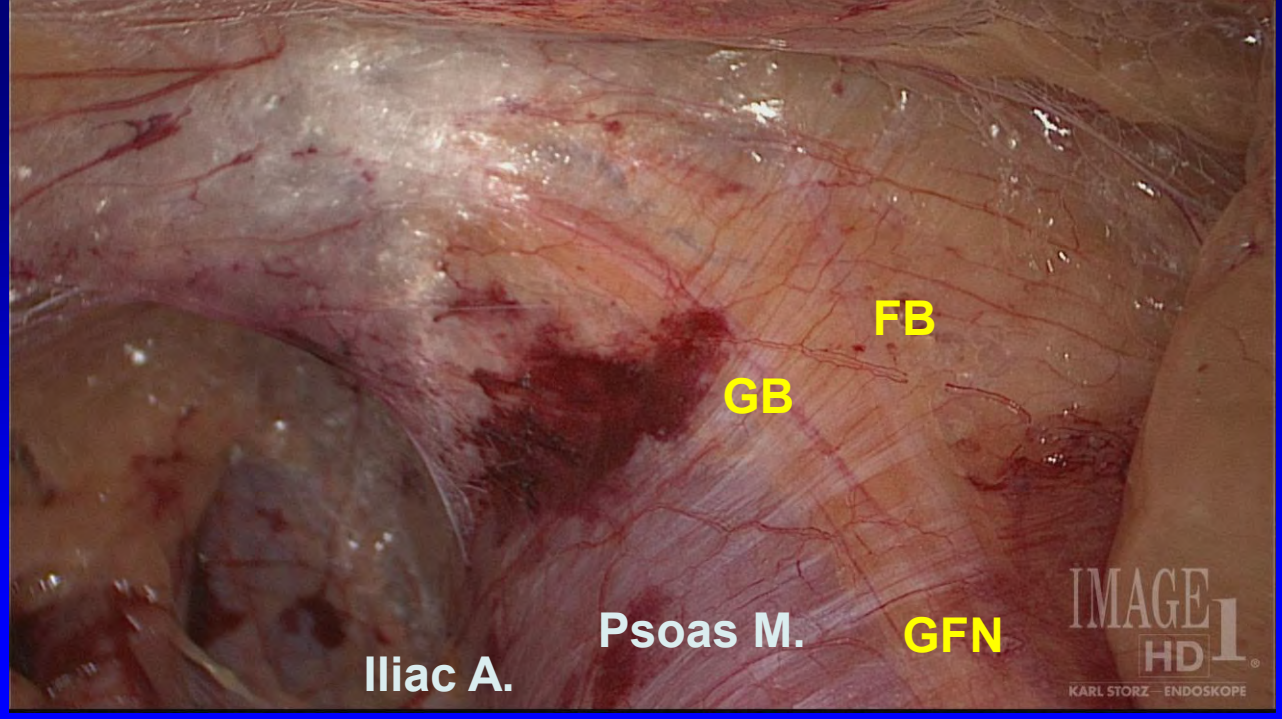
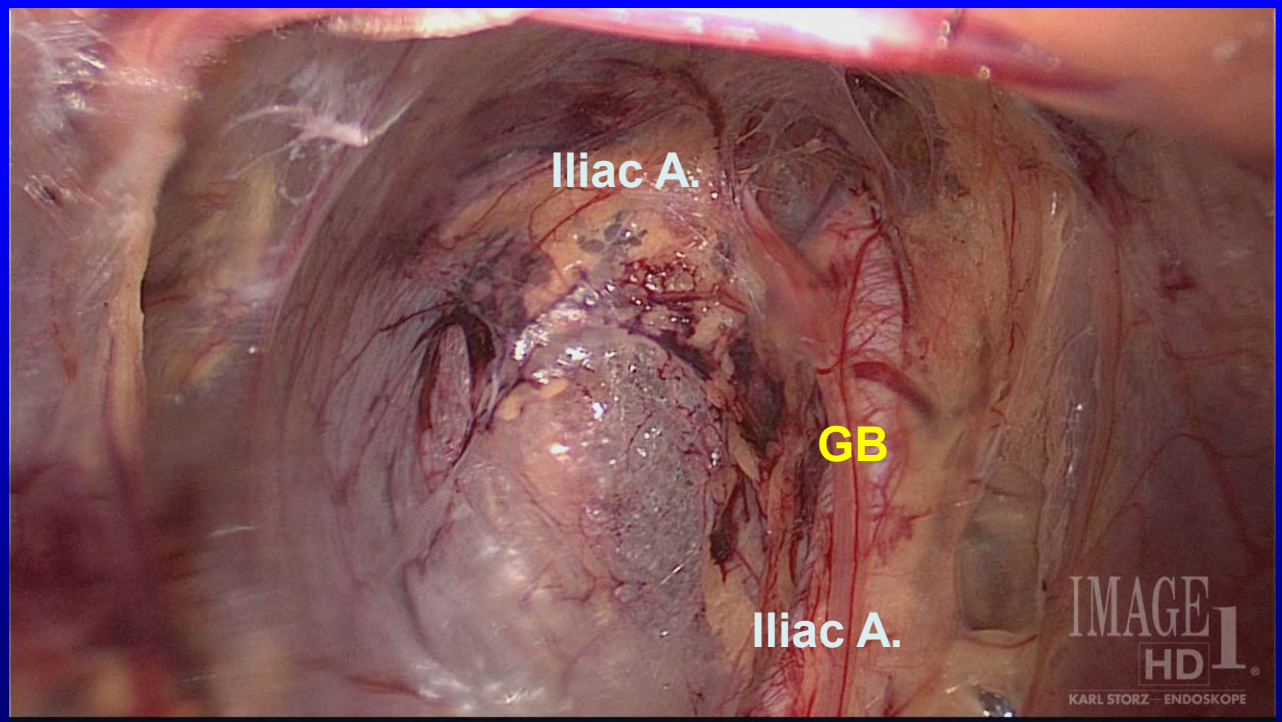


Figure 3. Diagrammatic representation of a parasagittal (A) and horizontal (B) section of the anterior abdominal wall through the area of the secondary internal inguinal ring. The term *loose fissile plane* belongs to Fowler and stands for areolar extraperitoneal tissue. (Redrawn from: Fowler R. The applied surgical anatomy of the peritoneal fascia of the groin and the "secondary" internal inguinal ring. Aust N Z J Surg 1975;45:8–14, with permission.)


FB
GB
Psoas M.
GFN
Iliac A.
IMAGE 1 HD
KARL STORZ – ENDOSKOPE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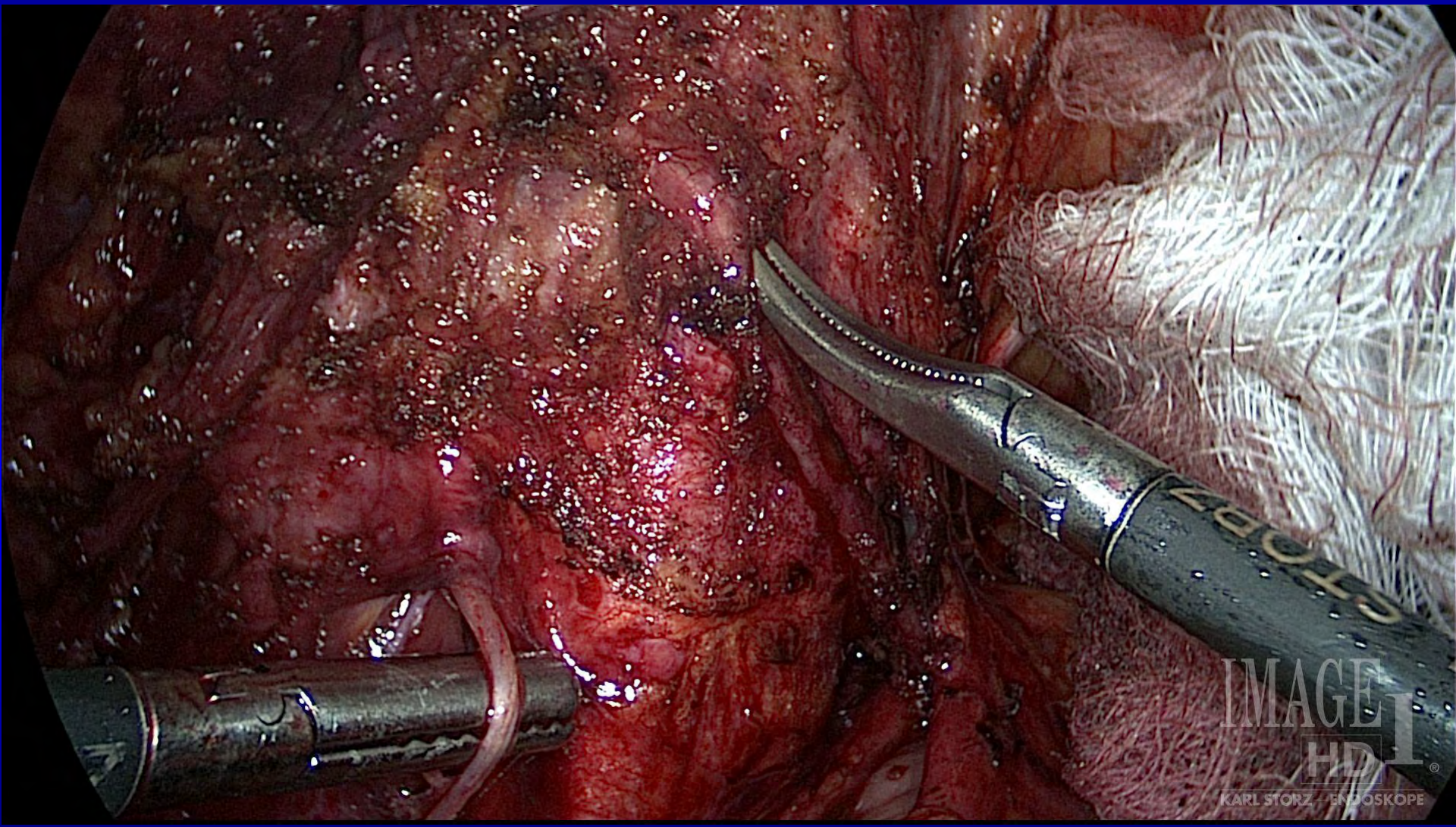
KARL STORZ – ENDOSKOPE

Neuropathy from overdissection or mesh contact

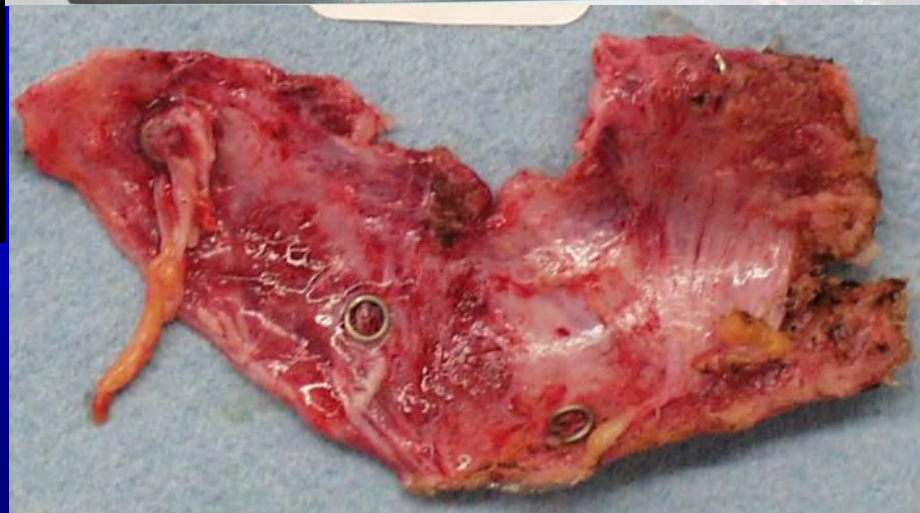


Nerves at Risk in Laparoscopic Inguinal Hernia Repair: Fixation

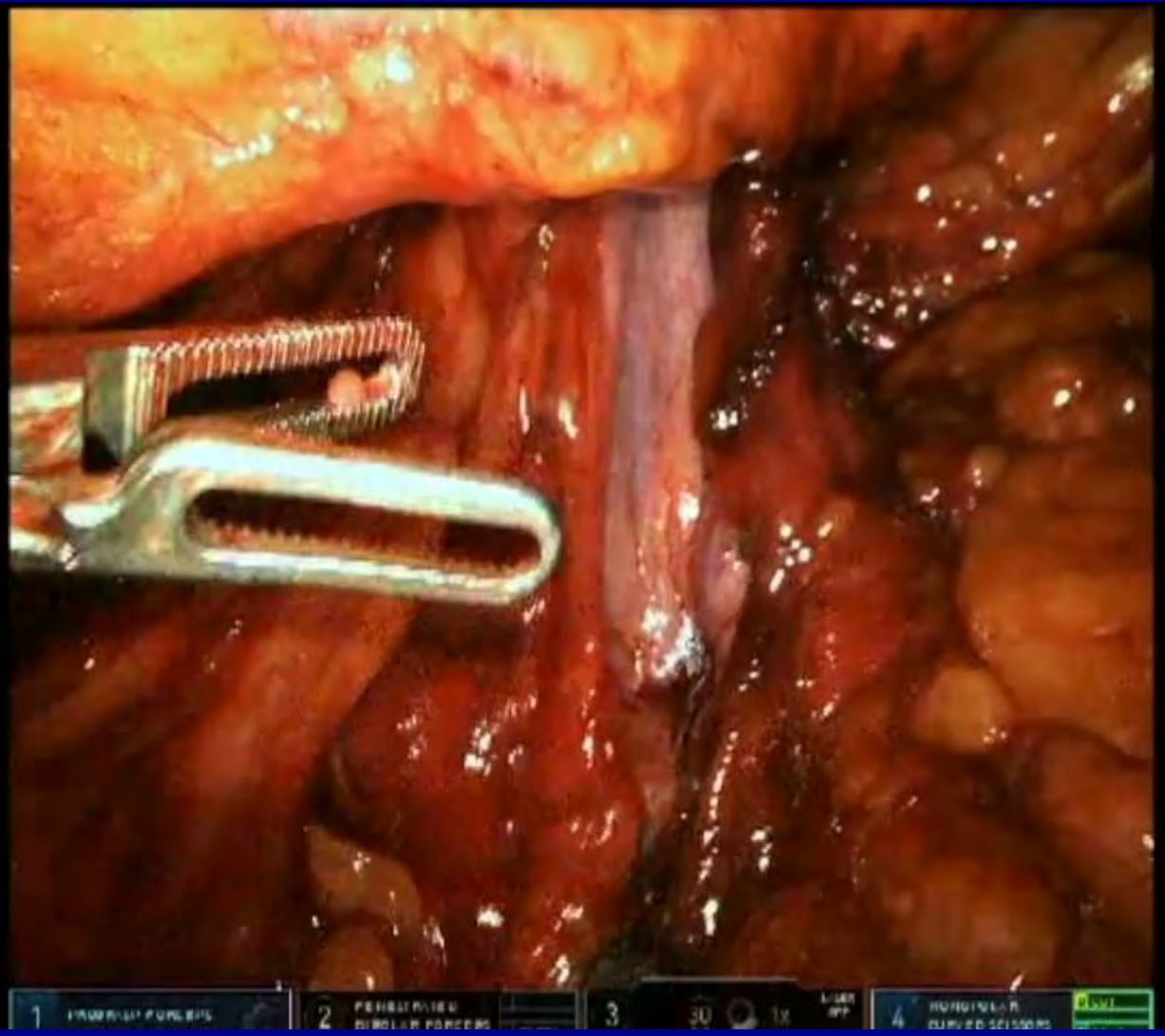
- Genital Branch of Genitofemoral Nerve
- Femoral Branch of Genitofemoral Nerve
- Lateral Femoral Cutaneous Nerve
- Iliohypogastric Nerve
- Ilioinguinal Nerve


BATTLESHIP
CENTER
5 HITS TO SINK CARRIER
4 HITS TO SINK BATTLESHIP
3 HITS TO SINK CRUISER
3 HITS TO SINK SUBMARINE
2 HITS TO SINK DESTROYER


OR Products & Safety Solutions

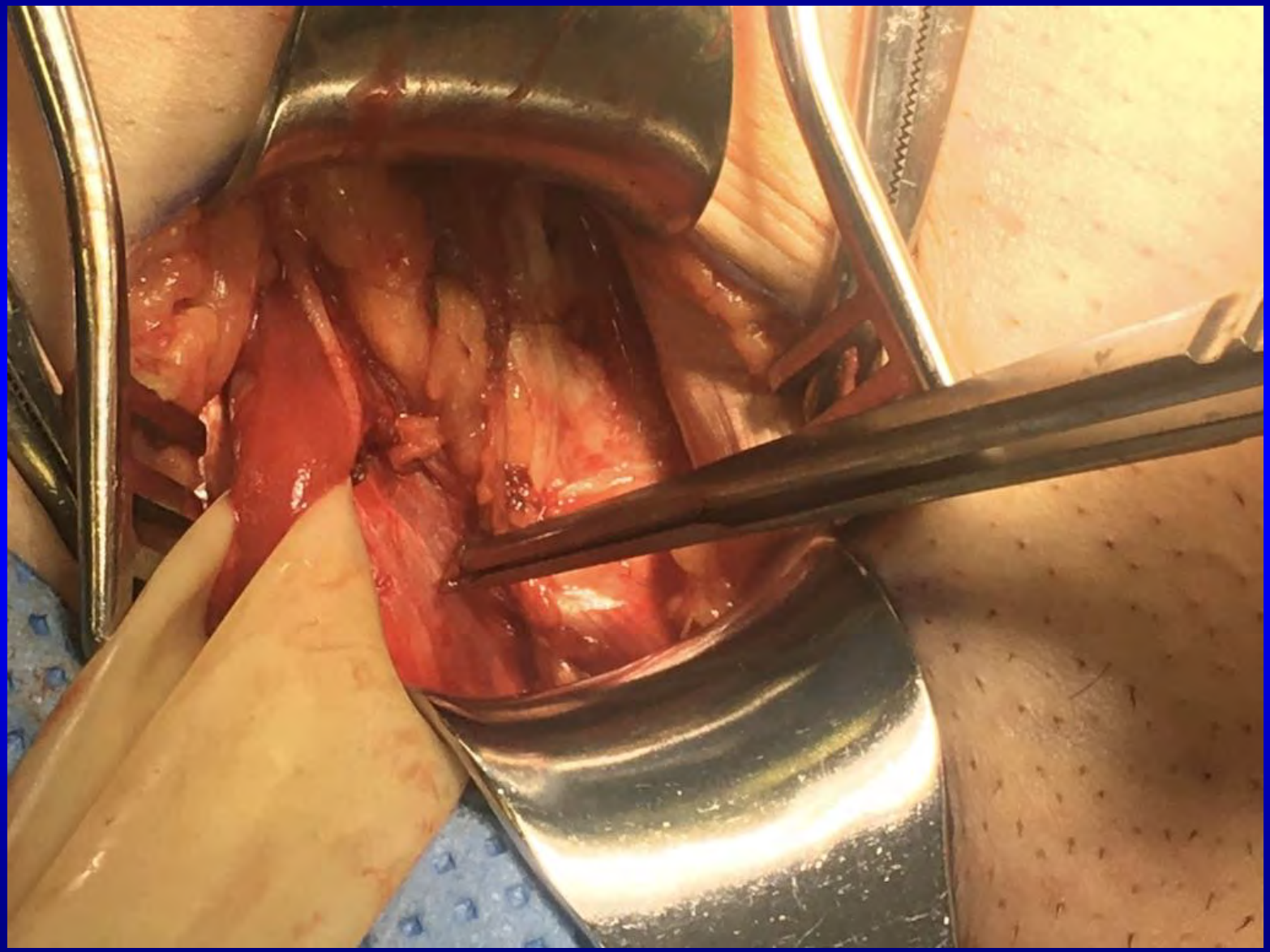


Neuropathy from closure of defects



Courtesy of Eduardo Parra

Robotic Entrapment Neuropathy



Decision Making: Mechanism

Treatment Requires:

- Understanding of the Causes of Pain
- Understanding of Groin Neuroanatomy
- Understanding of the Technical Aspects of the Initial Operation
- Tailored Approach: Open, Endo, Robot

Types of Inguinal Hernia Repair

Tissue repairs : Bassini…McVay…Shouldice…Desarda

Mesh repairs:

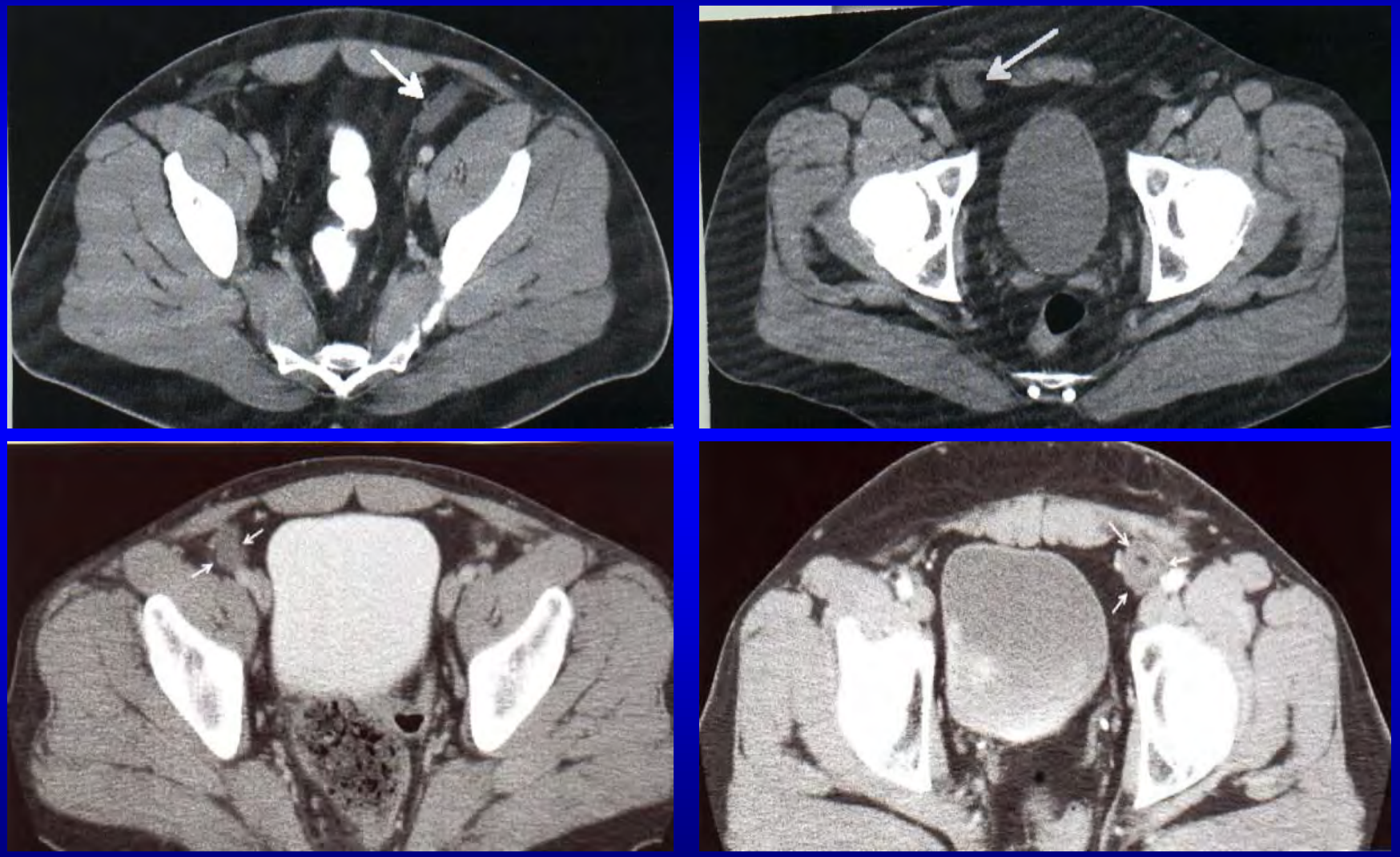
- Mesh in front of transversalis fascia: Lichtenstein
- Mesh in preperitoneal space:
  - Open
  - MIS Lap/ Robo
- Mesh in both places: Plug/PHS/UHS/TIPP

Diagnostic Evaluation

- Review All Operative Reports
- Ultrasound: recurrence, lipoma, abscess, mass, seroma, hematoma, ischemia
- CT/MRI to rule out meshoma, alternate pathologies
- MR-neurography (has false negatives)
- Interventional Injections, Blocks, Ablation
- Recent: Pre/Post-op Quantitative Testing
- Dermatomal Mapping

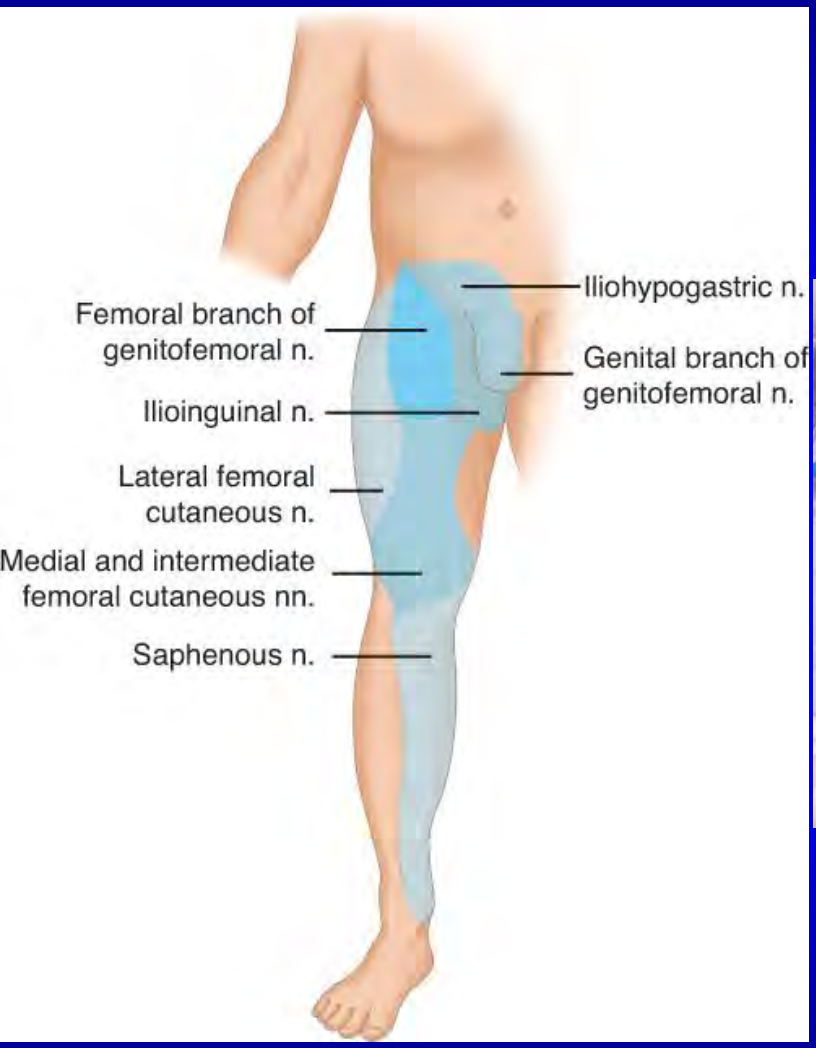

ARL M / 49Y

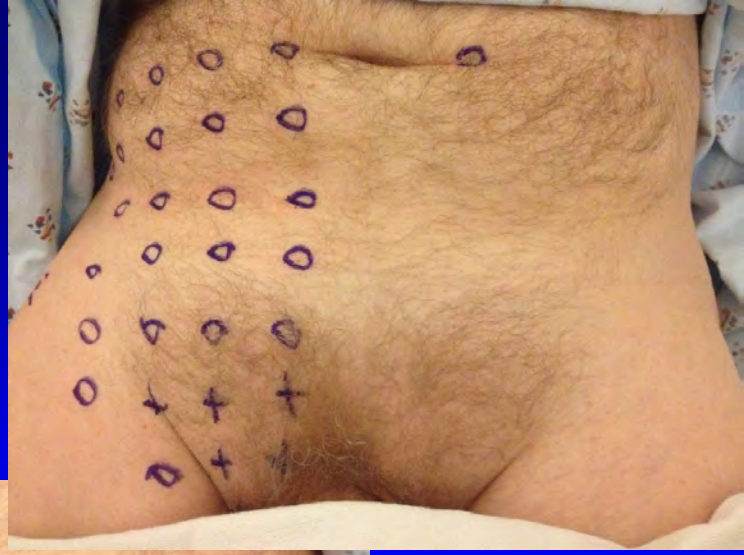
Cross-Sectional Imaging: Meshoma

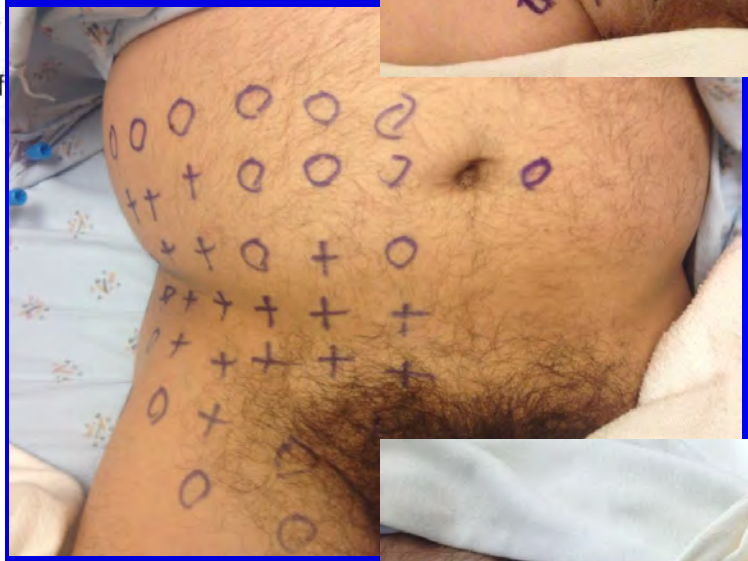


Decision Making: Mapping

- Determine Likely Nerves Involved
- Distinguish Dermatomal Neuropathic Distribution from Localized Nociceptive Pain: Nerves/Mesh/Both
- Tailored Approach: Selective versus Triple, Open versus Endoscopic
- Assess Patient Reliability


Iliohypogastric n.
Femoral branch of genitofemoral n.
Genital branch of genitofemoral n.
Ilioinguinal n.
Lateral femoral cutaneous n.
Medial and intermediate femoral cutaneous nn.
Saphenous n.





4:18

Conrad's Post

Conrad Ballecer ▶ International Hernia Collaboration

Oct 2, 2017 · Peoria, AZ ·

Get this. 40 ish y/o female sp c section incisional hernia repair by her OB physician 2 months ago with no mesh, presents to the office with post op chronic pain. She c/o burning and tearing sensation in L groin. Attached is her mapping. VAS 2-3. + is pain - is numbness and 0 is no pain. CT scan done 4 days after surgery secondary to L groin pain just showed postop changes. Pain experts #WWYD

Like Comment

Write a comment...

4:21

Carter Smith ▶ International Hernia Collaboration

Apr 25, 2018 ·

to have pain in the right groin since then. CT scan 2 months out showed some inflammation at the superior aspect of the mesh. Repeat Imaging one month later shows persistent inflammation with question of an inflammatory mass. Prior midline from sigmoid resection years ago. He's on our local financial assistance so I haven't had any success with referrals. Thanks for any advice.

Write a comment...

4:22

Leopoldo's Post

Leopoldo Castañeda ▶ International Hernia Collaboration

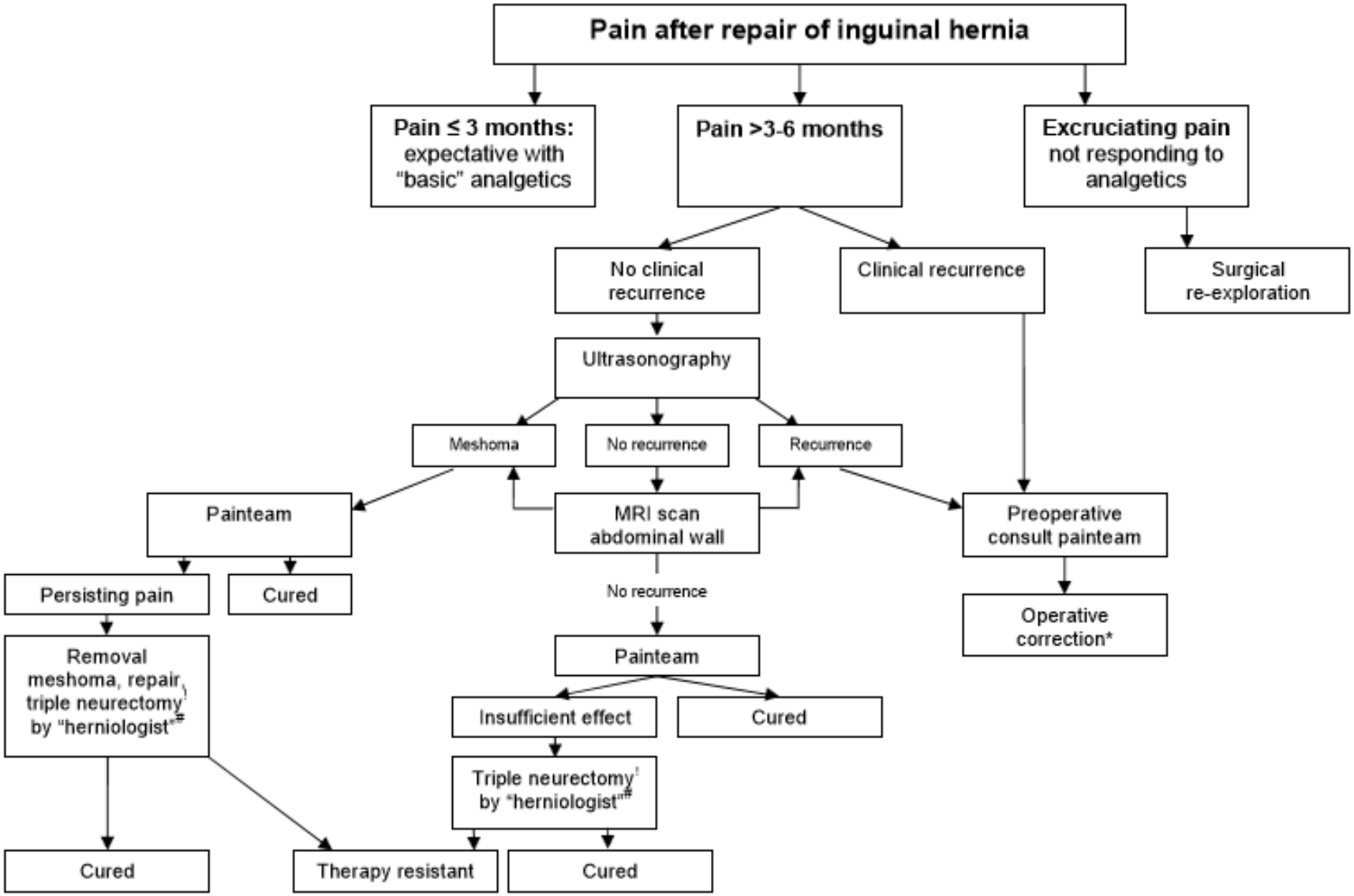
Jan 16 ·

I need advice from the group.
51 Yo female. Postop laparoscopic left inguinal hernia repair 6 m/a by another surgeon. Aparently he used progrip and told the patient he didn't use tackers.
She started with inguinodinia and was treated with NSAID and pregabalin with partial improvement.
CT scan with this images that supose to be clips for the round ligament.
There would be an option to take out those clips? lap or open?
David Chen
Rigo Alvarez
Conrad Ballecer
Yuri Novitsky

Write a comment...

Treatment of Chronic Pain

- Standardized algorithm
- Multidisciplinary
- Expectant management in most pts.
- Pharmacologic, behavioral therapies
- Interventional: Nerve blocks, ablation
- Operative: neuropathic pain, meshoma



! Including proximal genitofemoral nerve-neurectomy in case of chronic pain after open or laparoscopic preperitoneal mesh technique

\# Open or endoscopic procedure

* In case of neuropathic pain anterior correction in combination with triple neurectomy is optional

New York Algorithm, Lange et al. Hernia. 2014

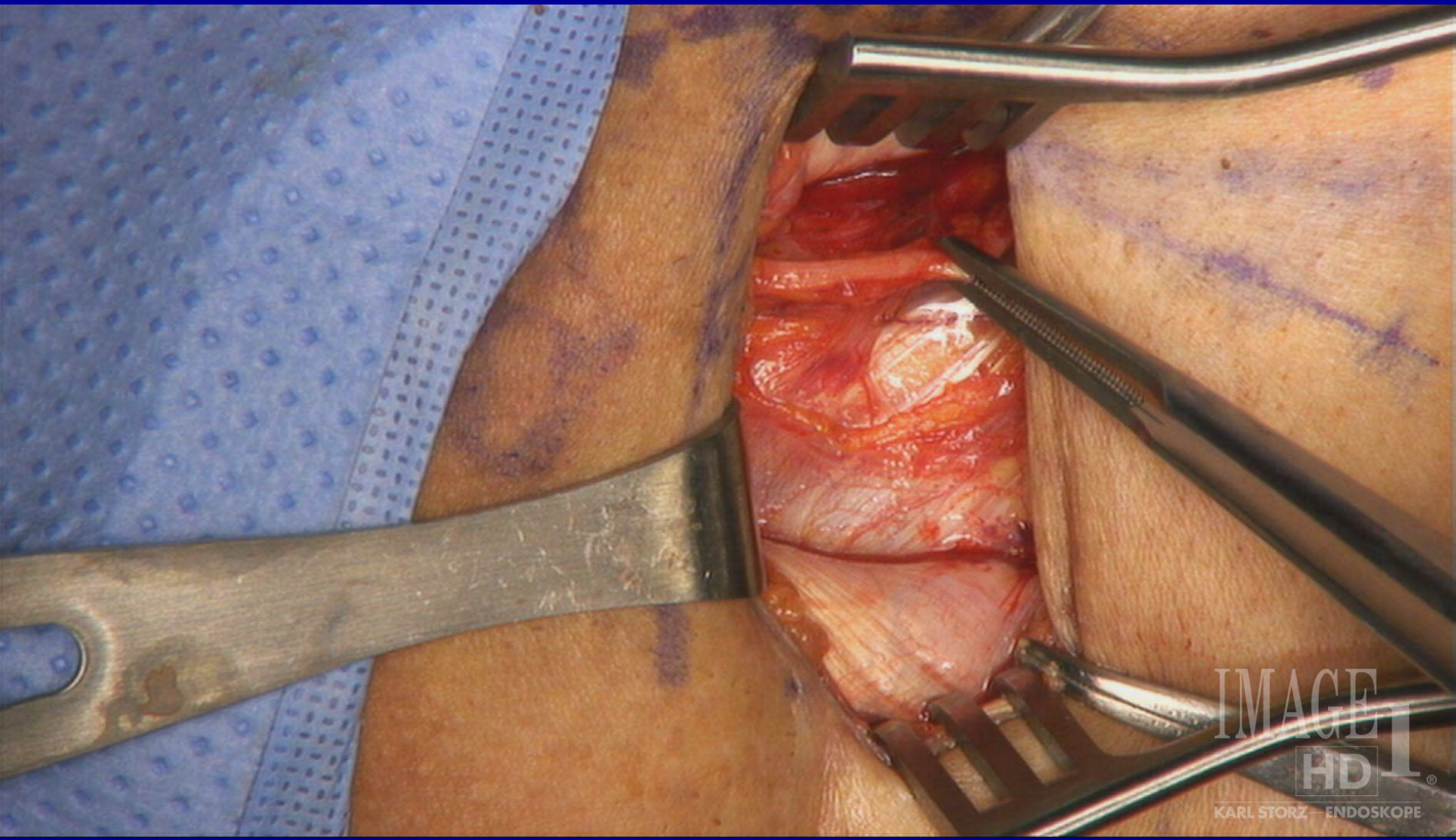
First Line Treatment Options

- Analgesics
- Limited Narcotics
- +/- Lidocaine Patches
- Neuropathic Meds: Gabapentin, Pregabalin, Atypical Antidepressants
- Physical Therapy
- Nerve Blocks: Local anesthetic/ steroid

Surgically Correctable Problems

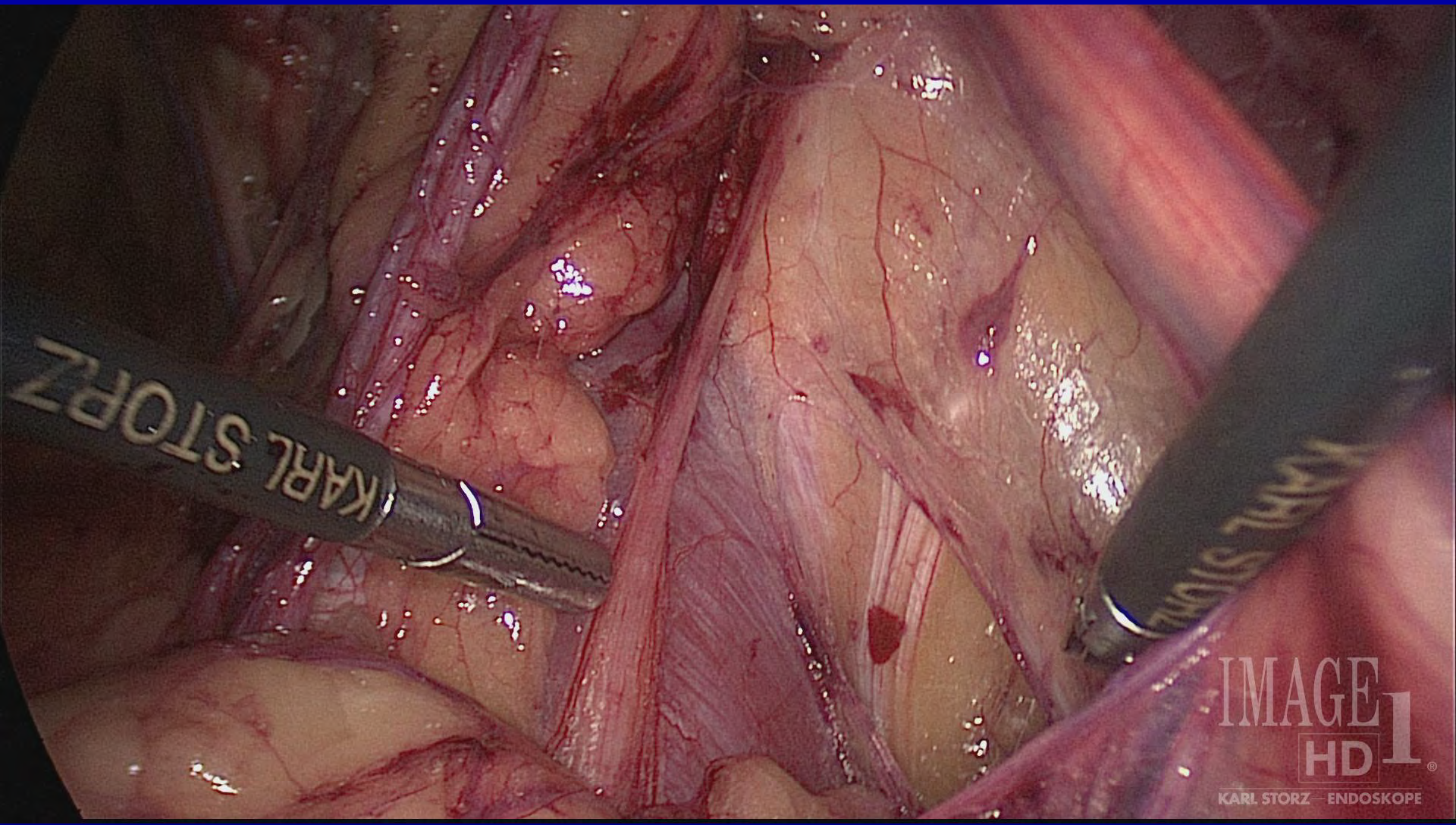
- Recurrence
- Neuropathic:
  - Selective versus Triple Neurectomy
  - Open/ Open Extended versus Lap
- Meshoma: Open, Lap/ Robotic, Both
- Orchialgia:
  - Open versus Lap/Robotic
  - Neurectomy versus orchiectomy

Selective Neurectomy: Open



Picture from PK Amid, DC Chen

Selective Neurectomy: MIS



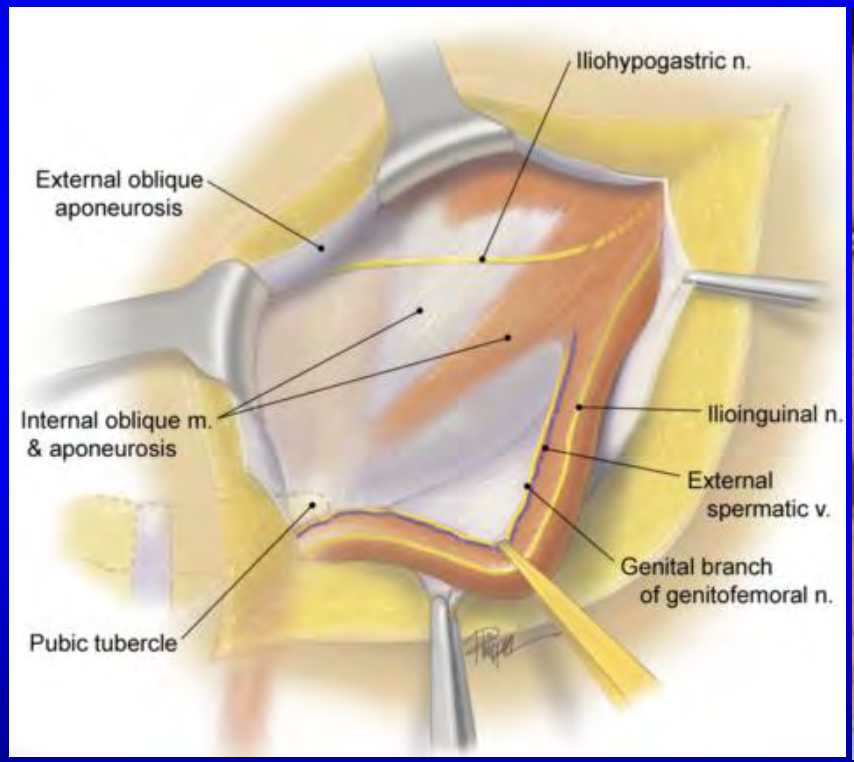
Picture from PK Amid, DC Chen

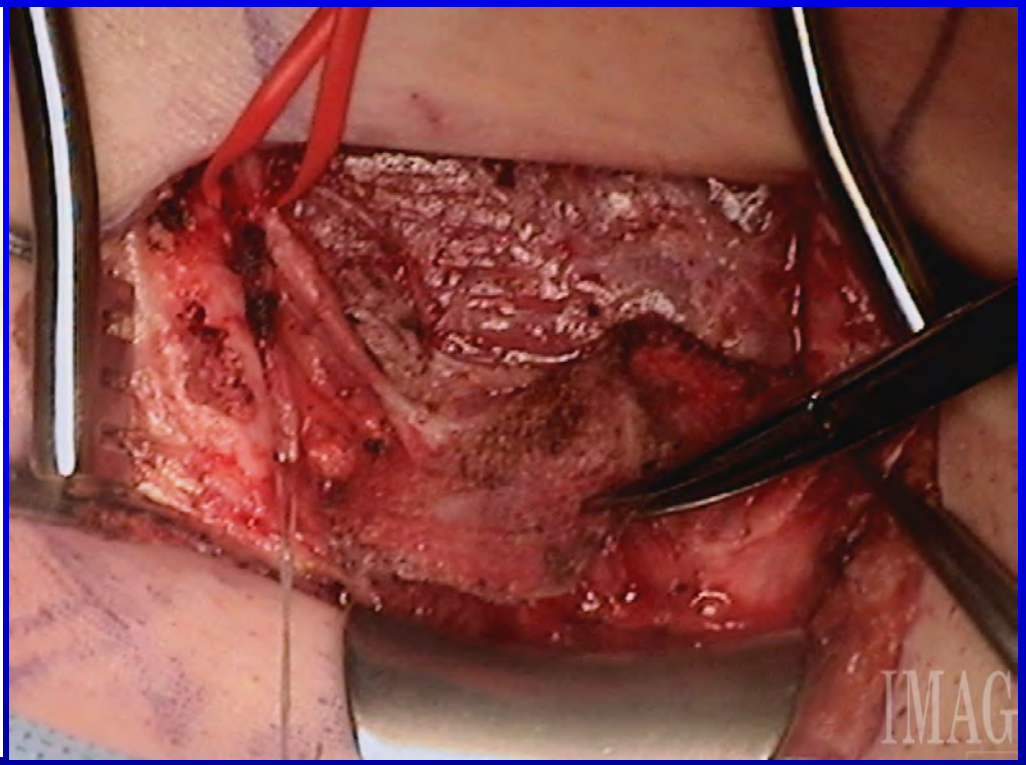
Operative Neurectomy Series

	Yr	n	Efficacy	Operation
Starling	1994	340	95%	2-stage Triple N
Amid	2004	225	95%	1-stage Triple N
Madura	2004	100	97%	1-stage Triple N
Giger	2009	39	69%	Lap Selective N
Loos	2010	54	76%	Selective N
Zacest	2010	26	67%	Selective N

Chen et al. JAMA Surgery 2013

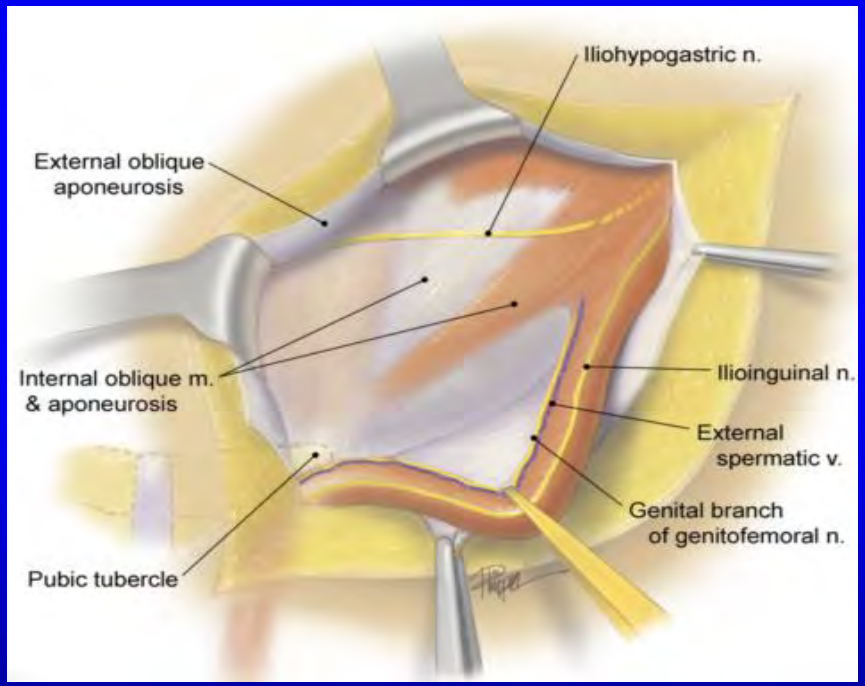
Technique of Triple Neurectomy: Ilioinguinal Nerve

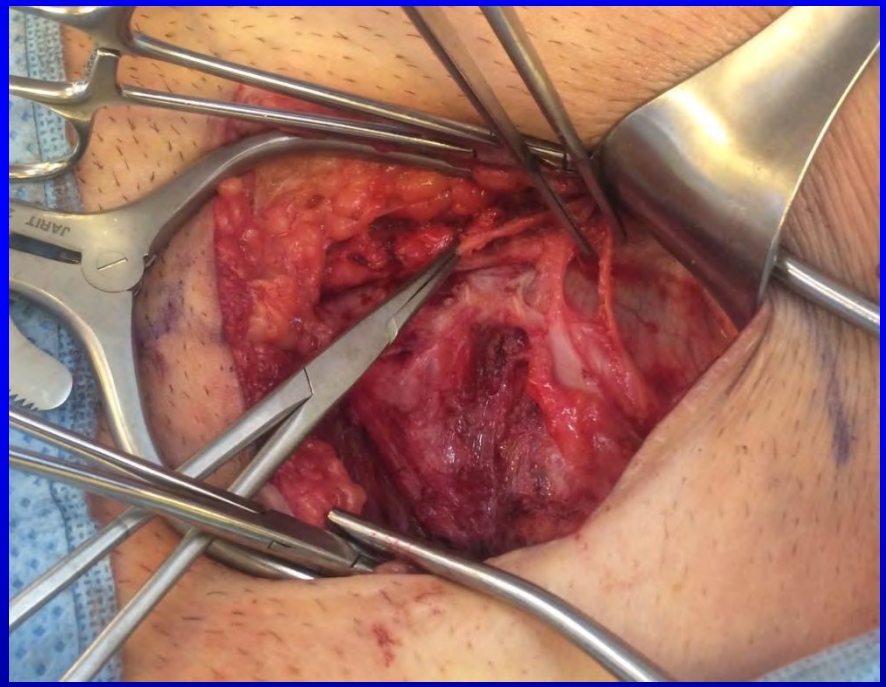




Pictures from PK Amid, DC Chen

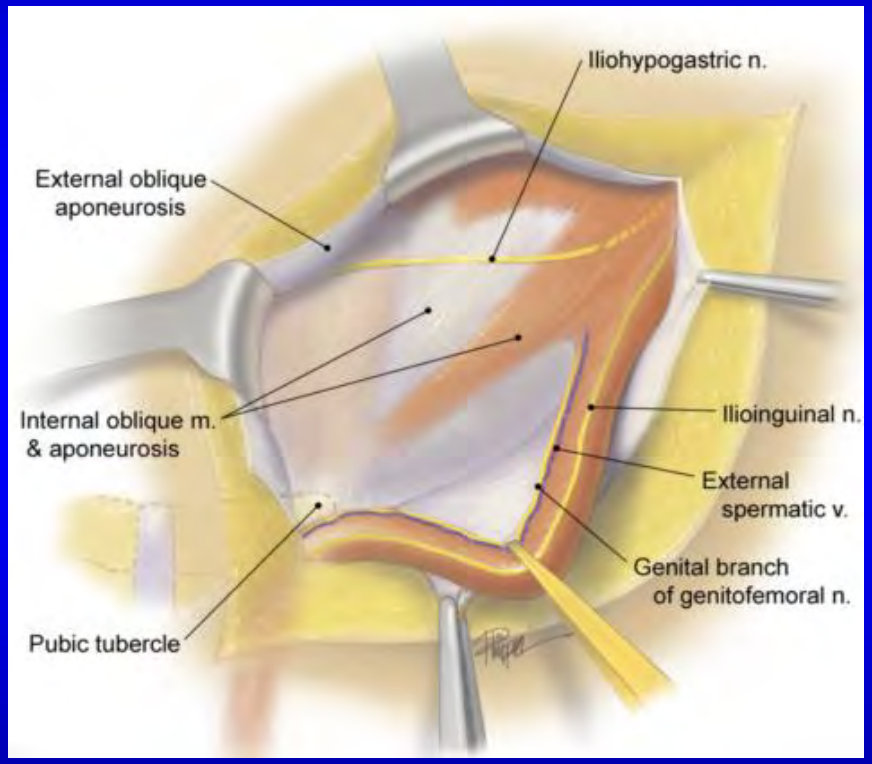
Technique of Triple Neurectomy: Iliohypogastric Nerve

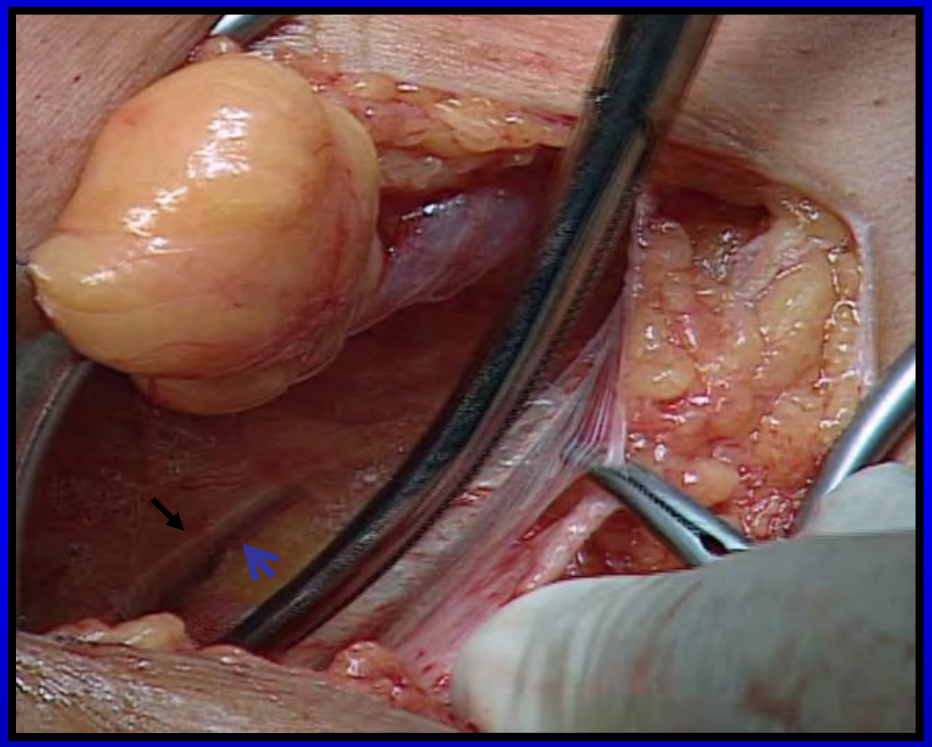




Pictures from PK Amid, DC Chen

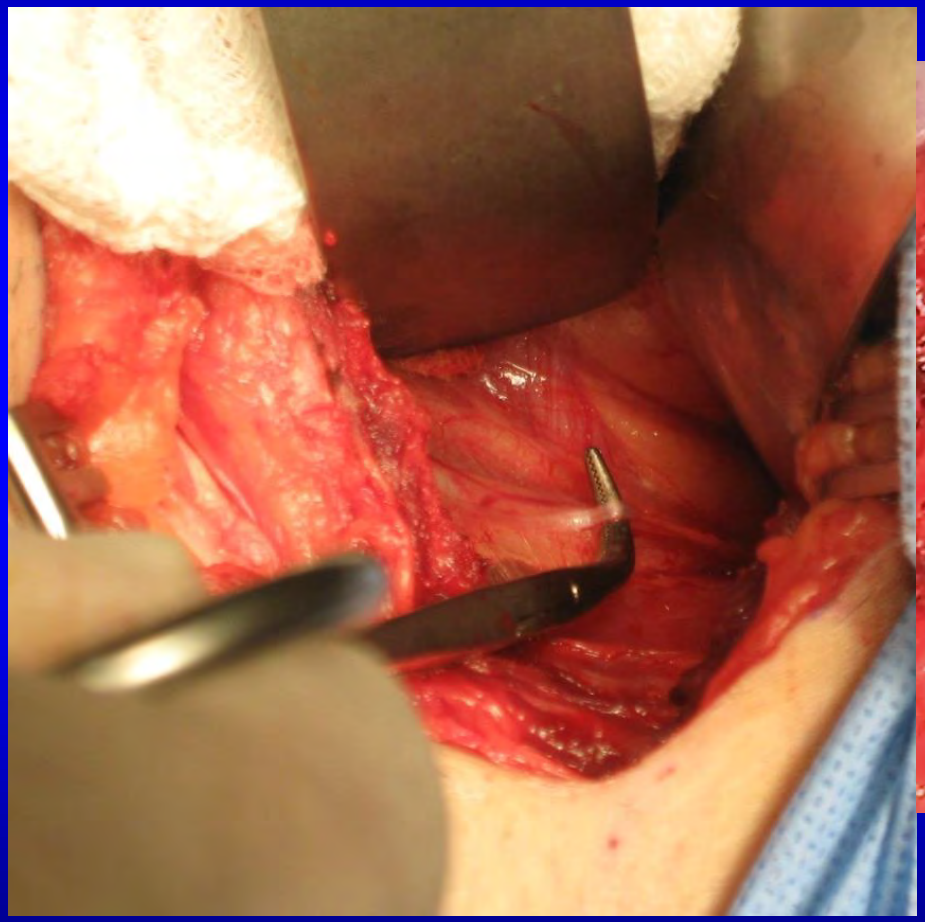
Technique of Triple Neurectomy: Genital Nerve

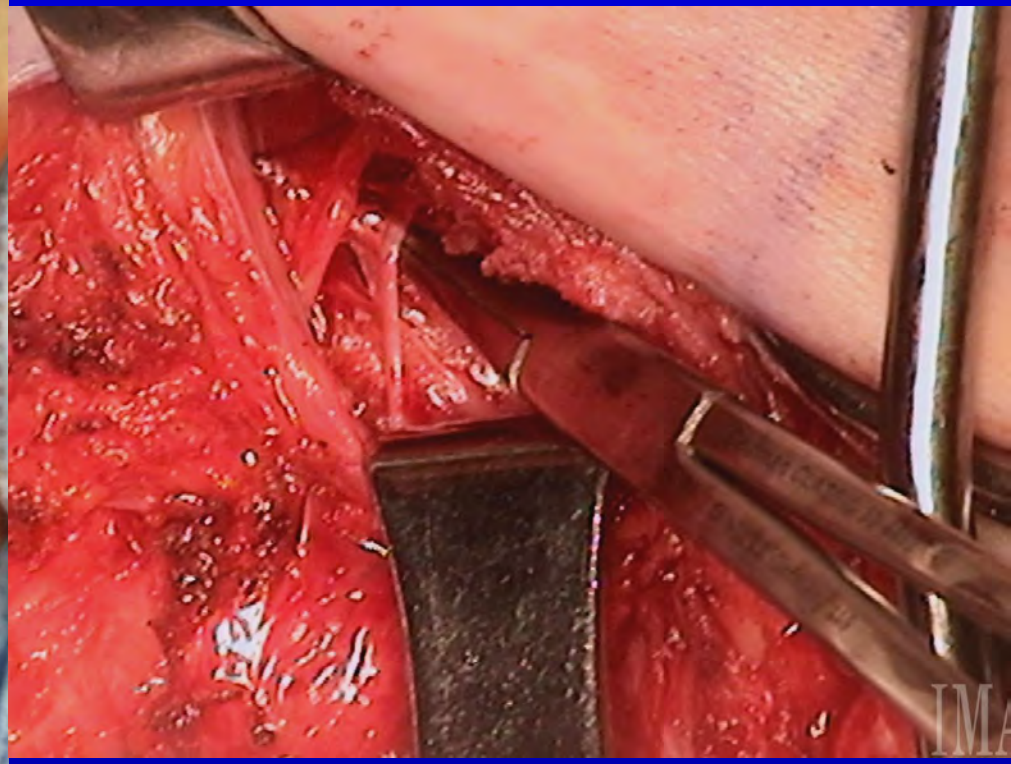




Pictures from PK Amid, DC Chen

Extended Open: Preperitoneal GFN





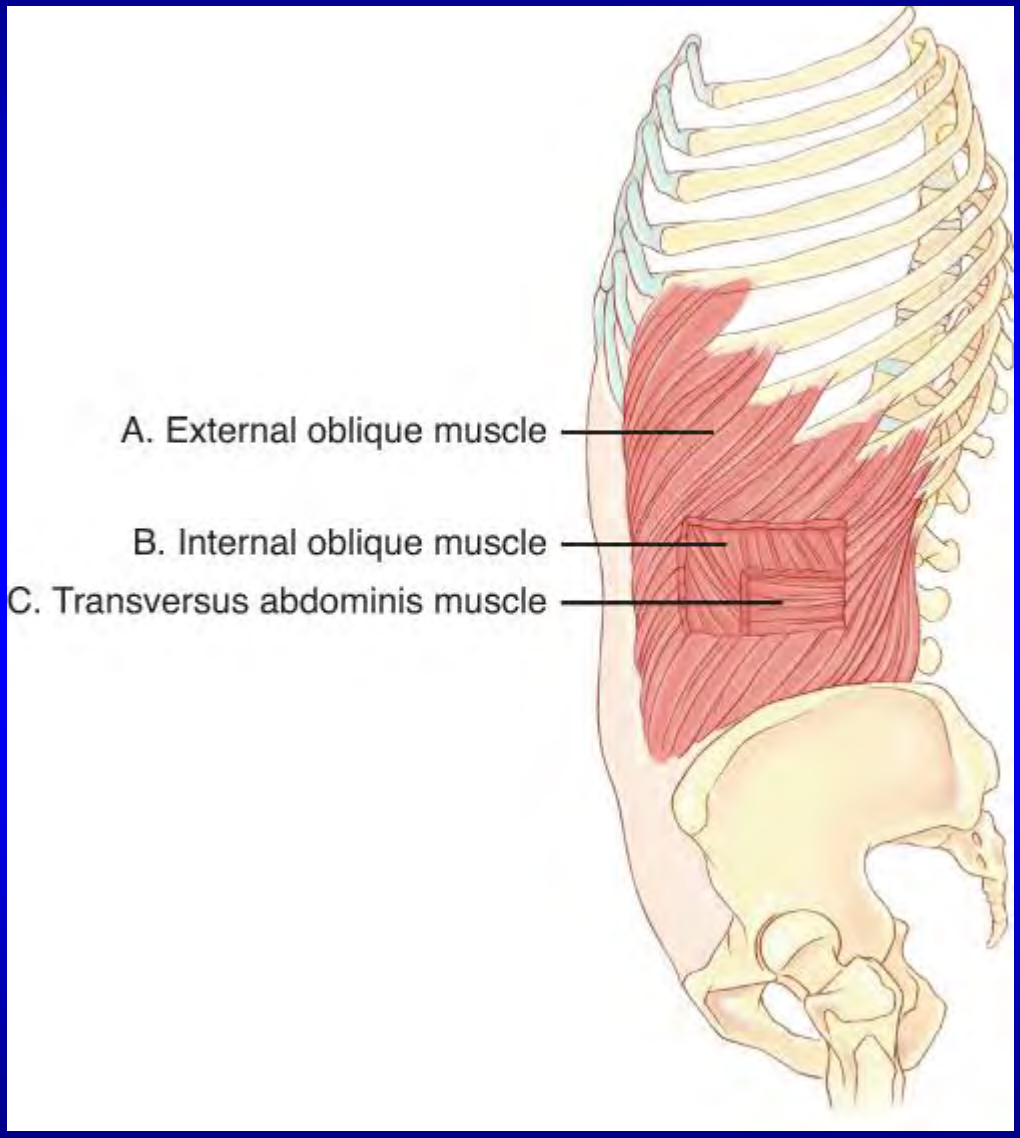
Amid, JACS 2011

Triple Neurectomy Approaches

- Open anterior
  - Scarred field
  - Difficult nerve identification / access
  - Potential to disrupt repair, create new injury

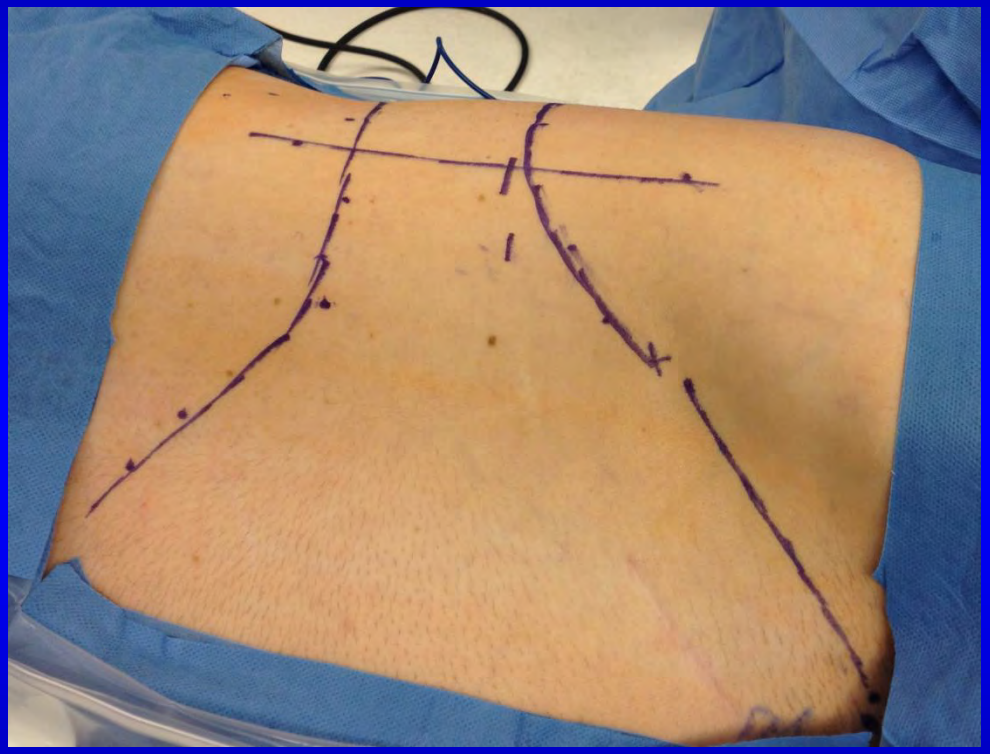
Triple Neurectomy Approaches

- Open anterior
  - Scarred field
  - Difficult nerve identification / access
  - Potential to disrupt repair, create new injury
- **MIS Laparoscopic/Robotic:**
  - **Retroperitoneal**
  - **Proximal to scarred field**
  - **Immediate result**

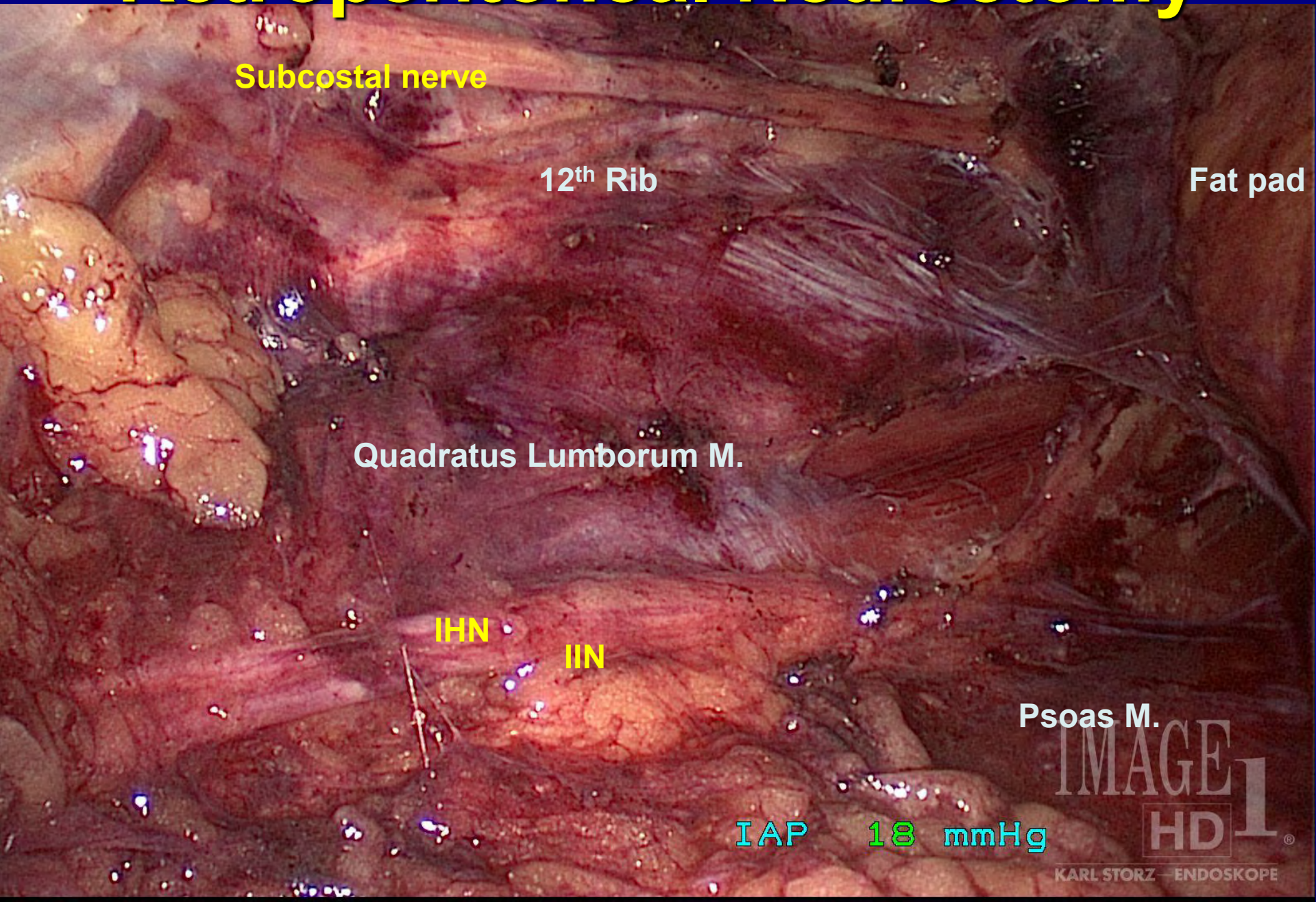


Schwartz 2013

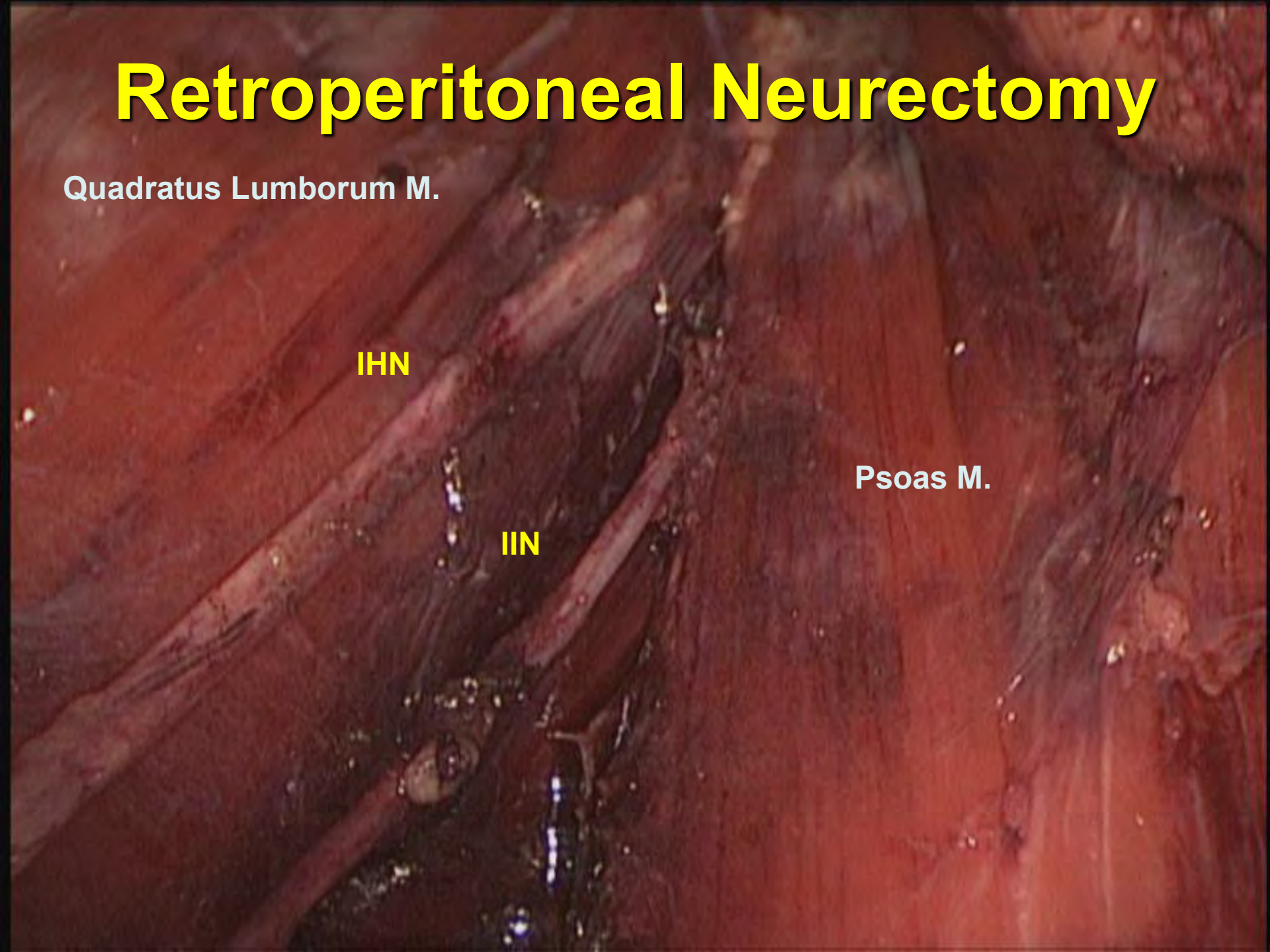
Retroperitoneal Neurectomy



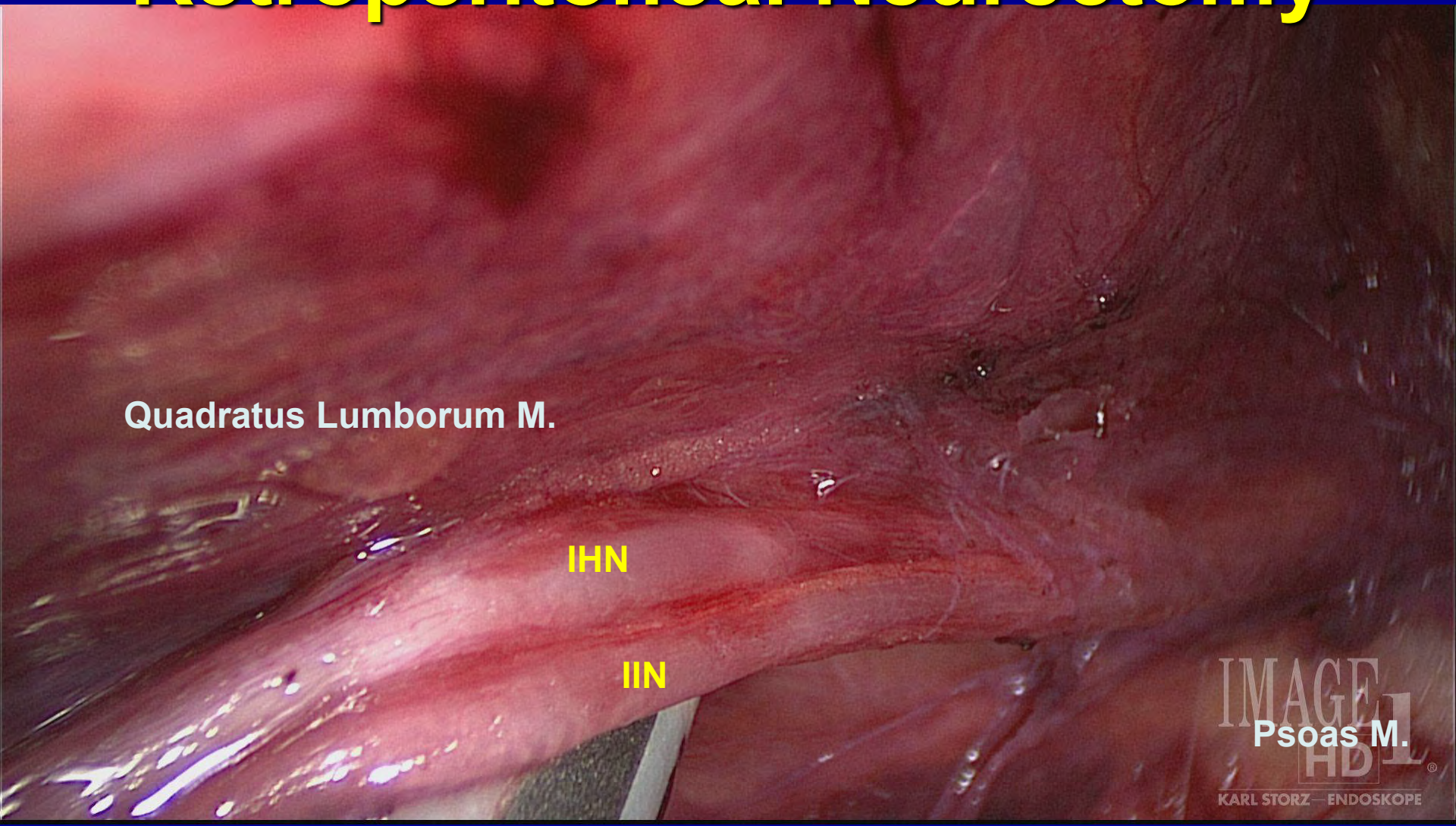
Retroperitoneal Neurectomy



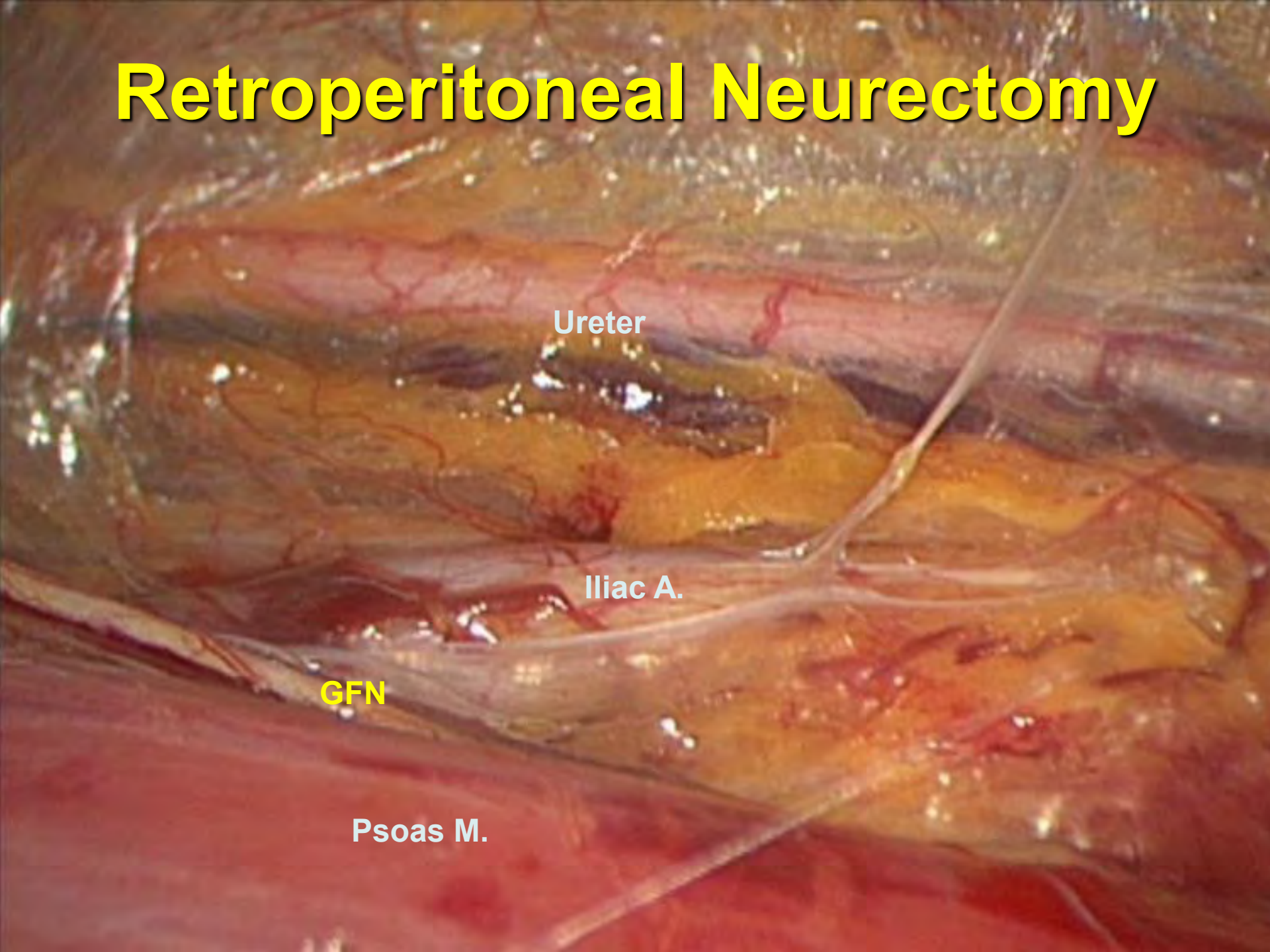
Retroperitoneal Neurectomy



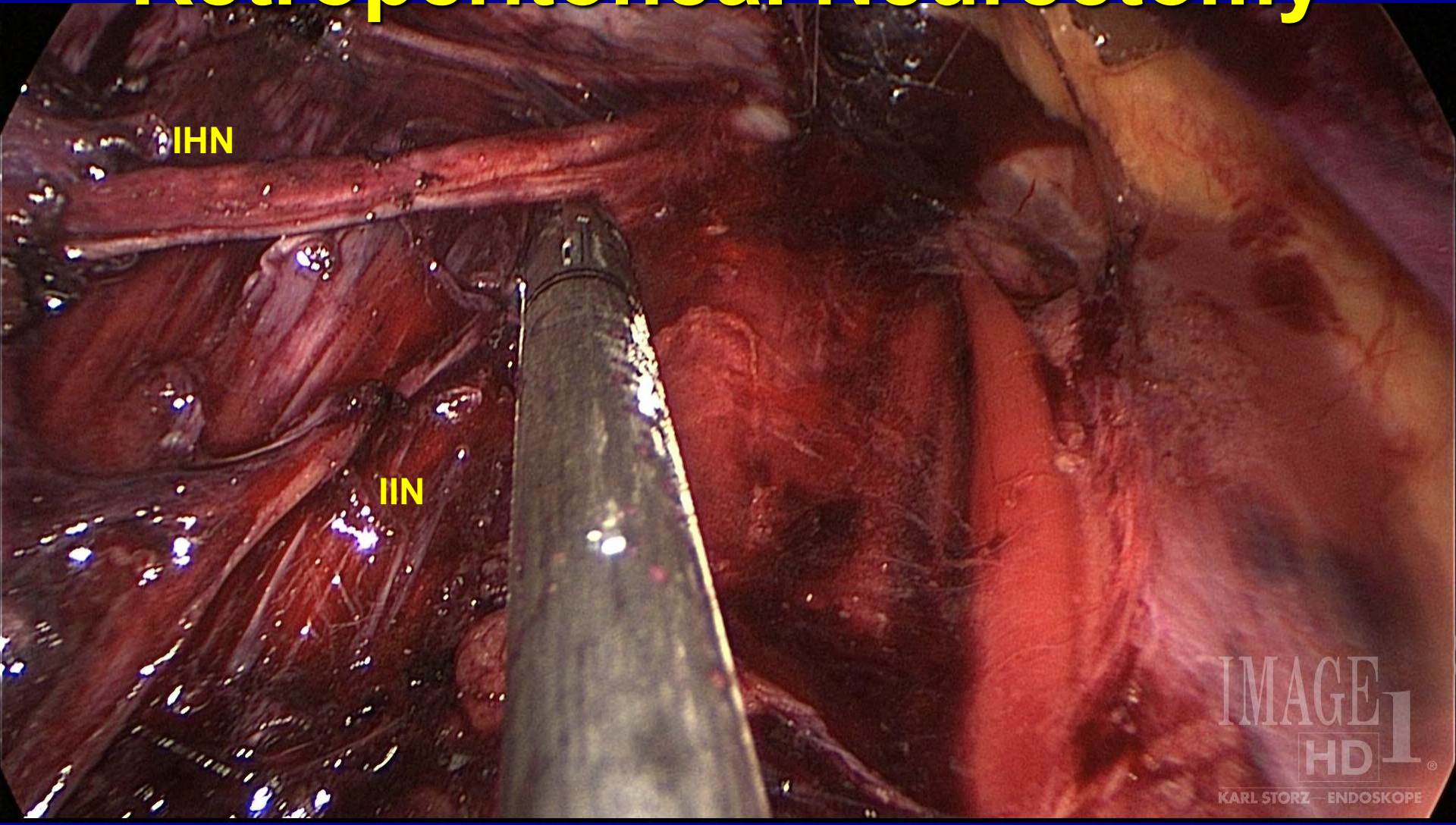
Retroperitoneal Neurectomy



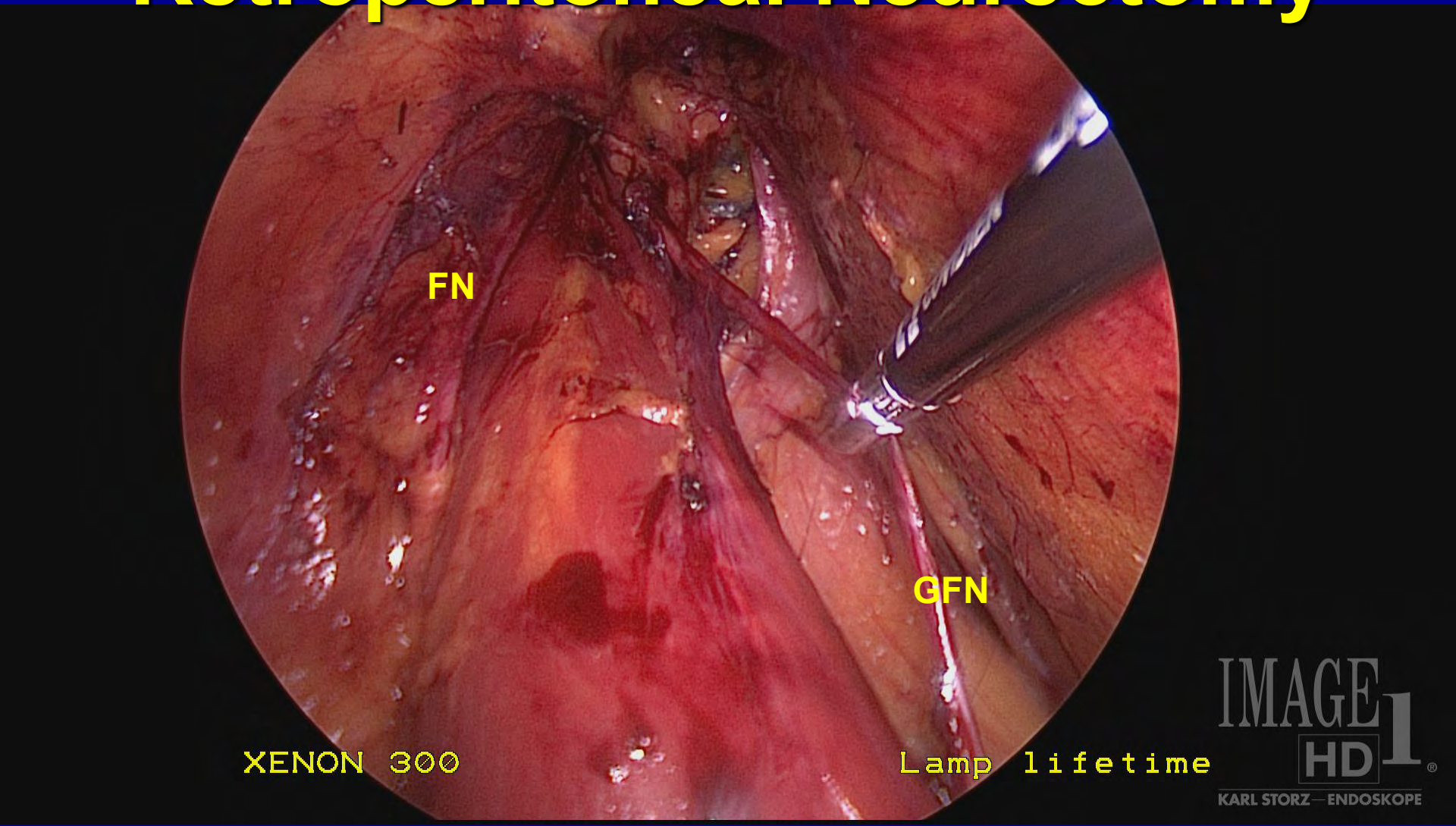
Retroperitoneal Neurectomy



Retroperitoneal Neurectomy

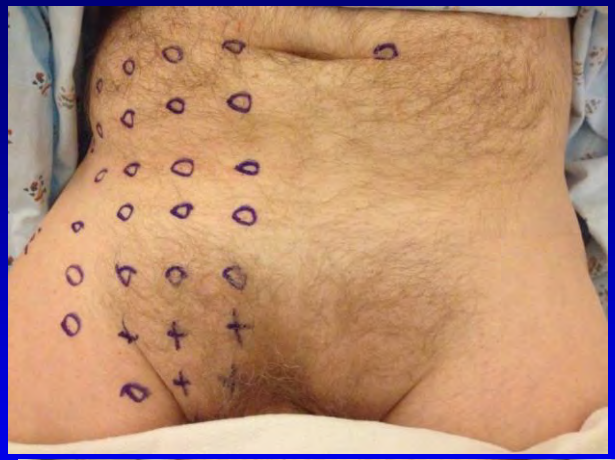


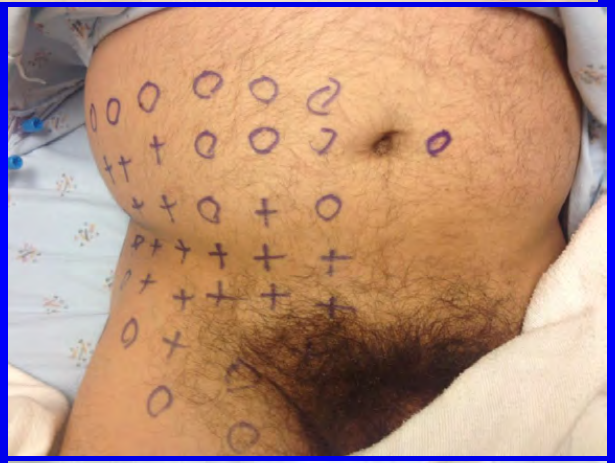
Retroperitoneal Neurectomy



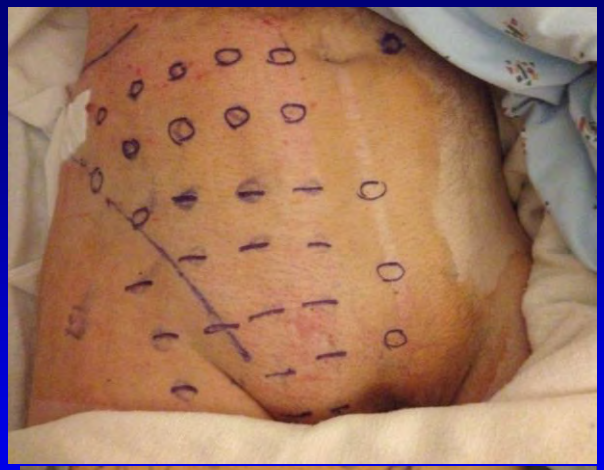
Robotic Neurolysis

Preop



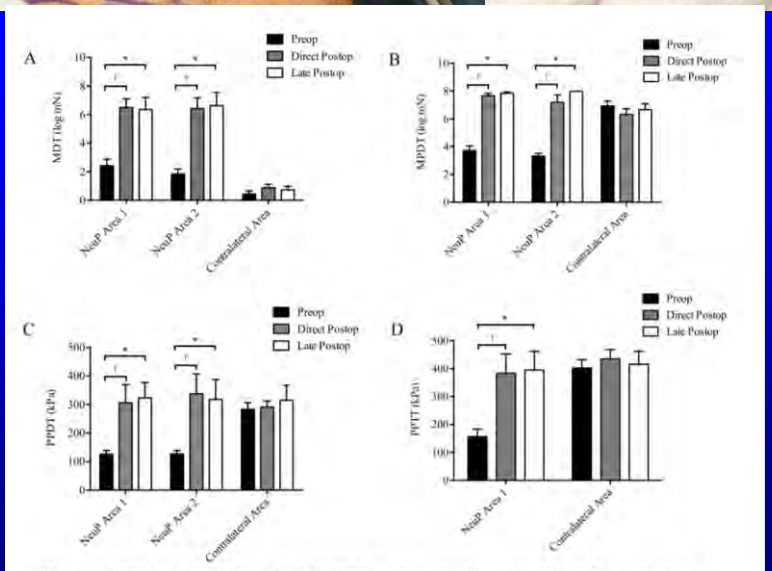


Recovery

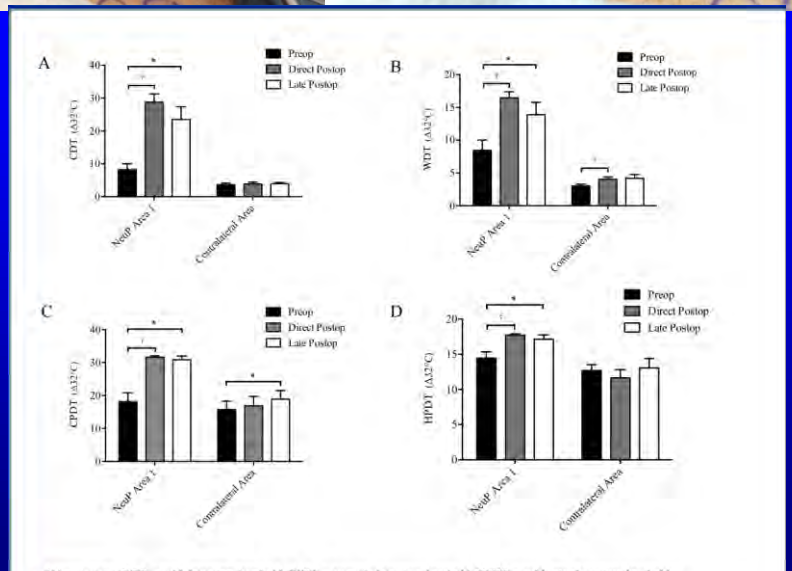


Quantitative validation of sensory mapping in persistent postherniorrhaphy inguinal pain patients undergoing triple neurectomy

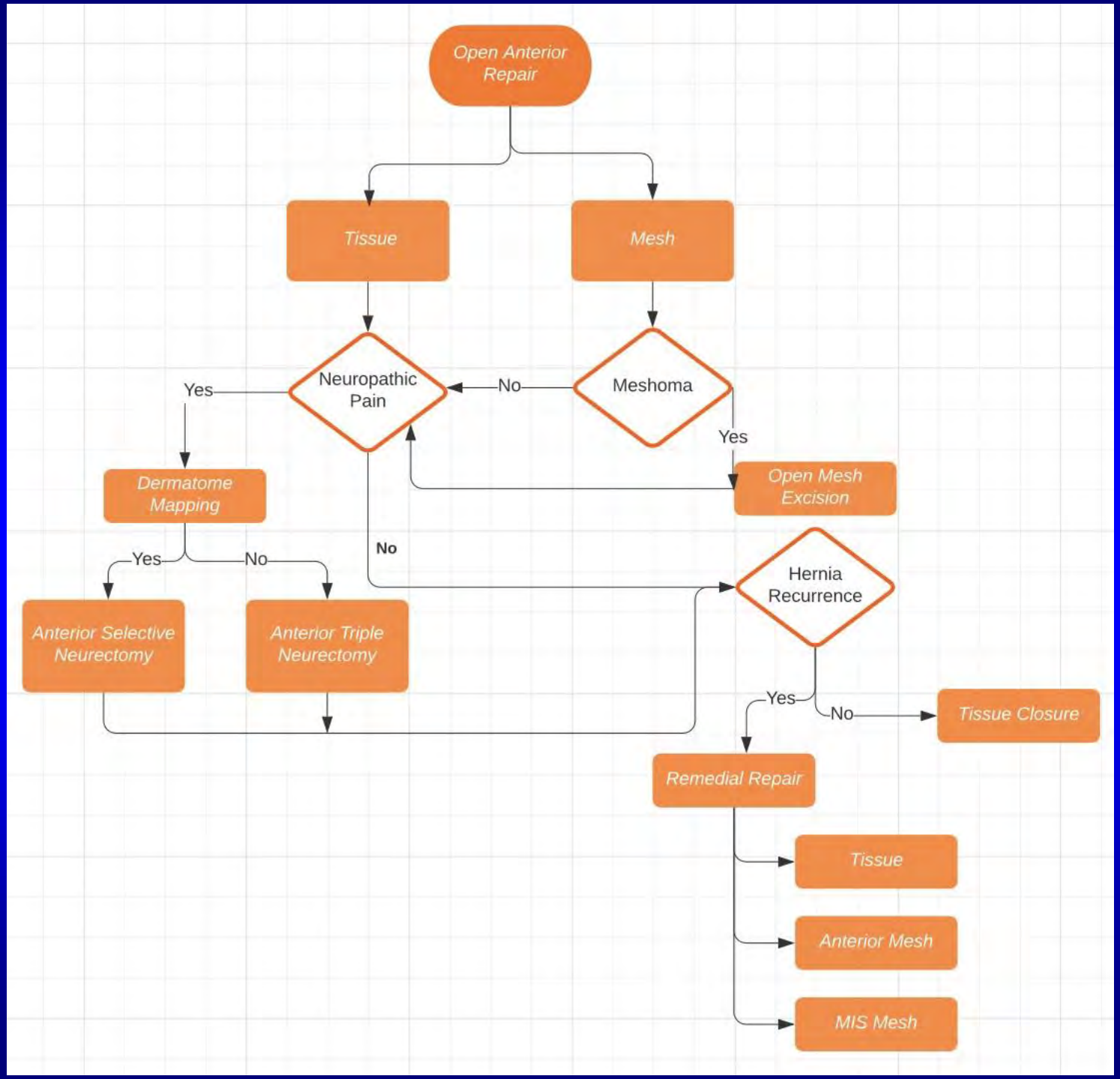
M. F. Bjurström[1,2] · R. Álvarez[3] · A. L. Nicol[4] · R. Olmstead[2] · P. K. Amid[5] · D. C. Chen[5]



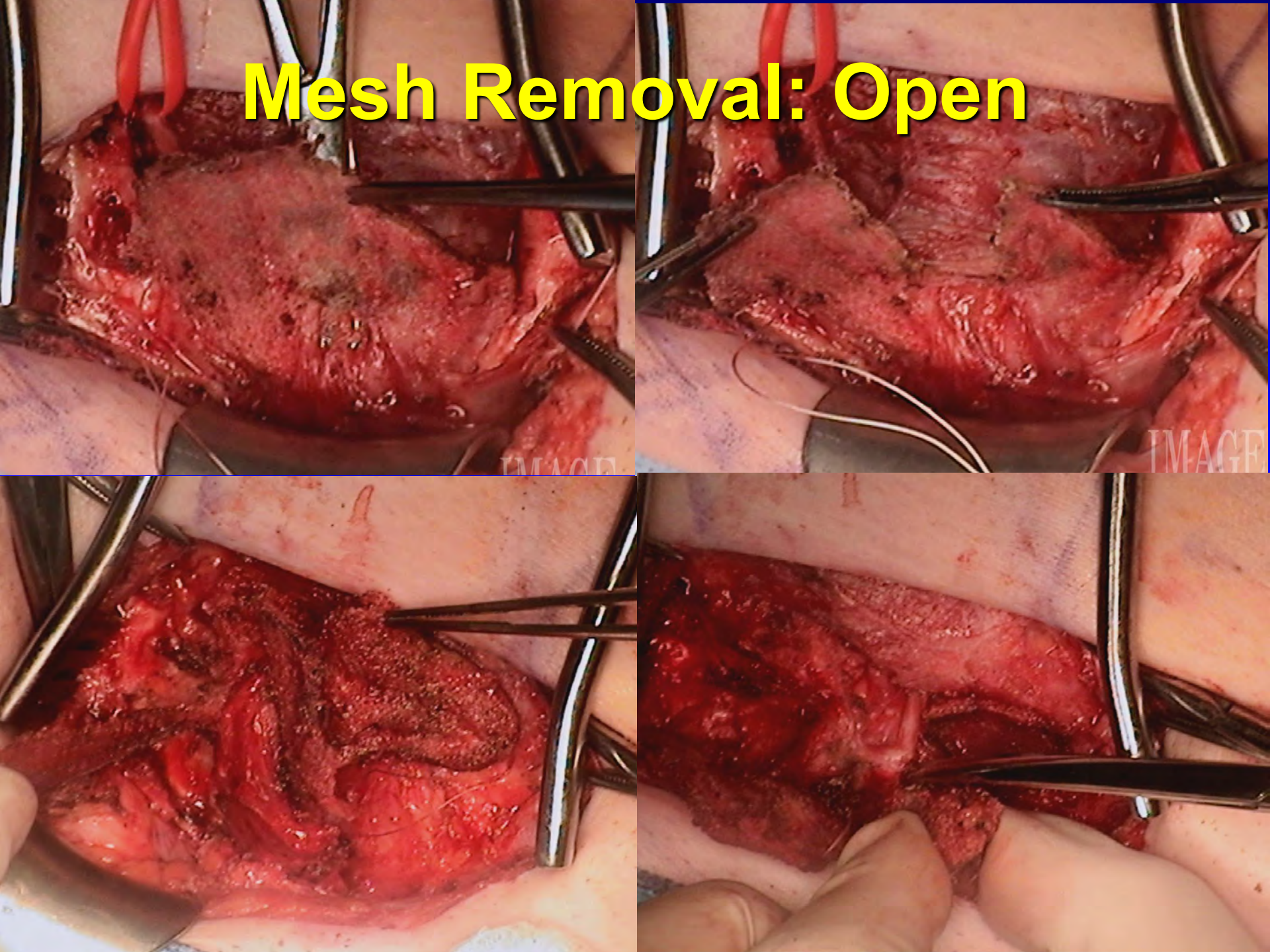
Abbreviations: MDT = mechanical detection threshold, MPDT = mechanical pain detection threshold, PPDT = pressure pain detection threshold, PPTT = pressure pain tolerance threshold; *p<.05; †p<.01

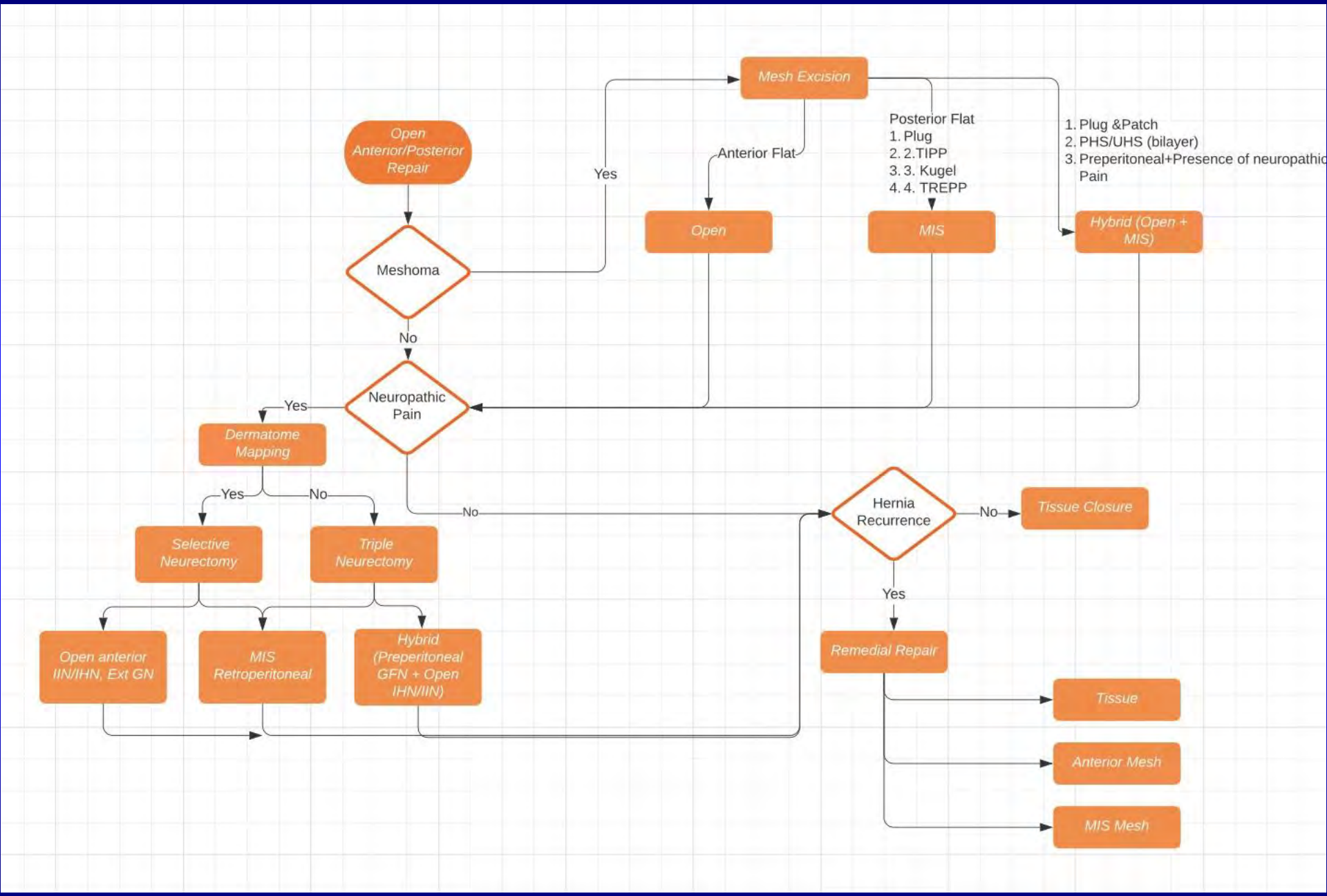


Abbreviations: CDT = cold detection threshold, WDT = warmth detection threshold, CPDT = cold pain detection threshold, HPDT = heat pain detection threshold; *p<.05; †p<.01

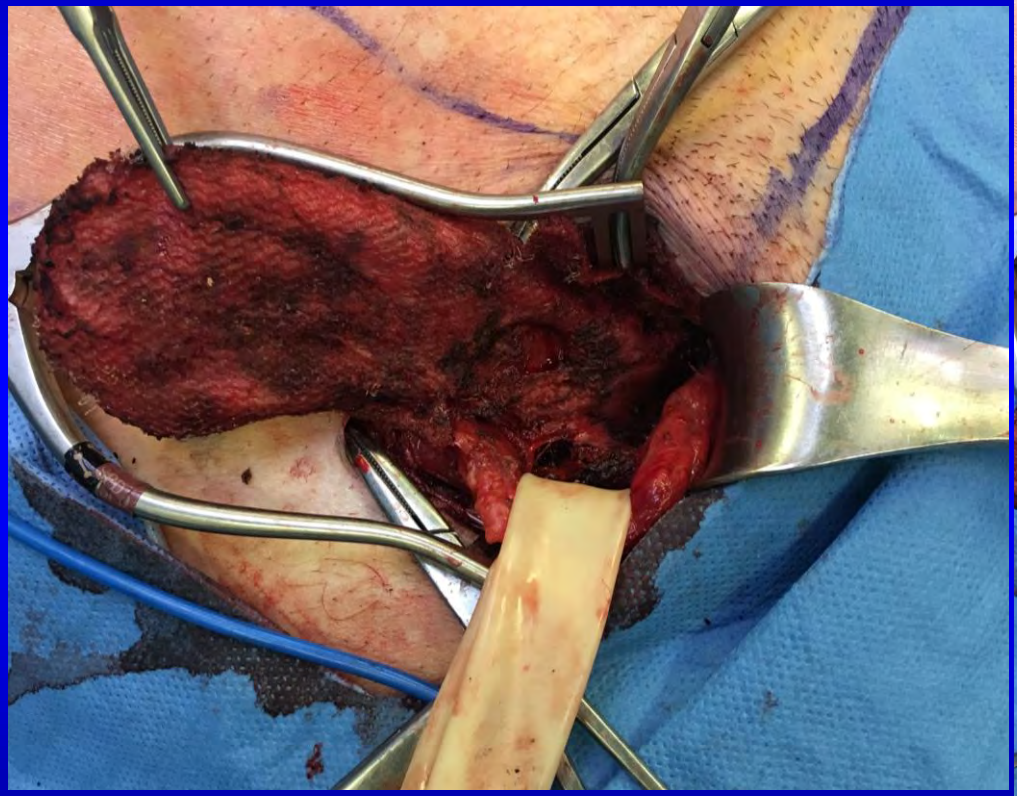

Open Anterior Repair
Tissue
Mesh
Neuropathic Pain
No
Meshoma
Yes
Yes
Dermatome Mapping
Open Mesh Excision
Yes
No
No
Hernia Recurrence
Anterior Selective Neurectomy
Anterior Triple Neurectomy
Yes
No
Tissue Closure
Remedial Repair
Tissue
Anterior Mesh
MIS Mesh

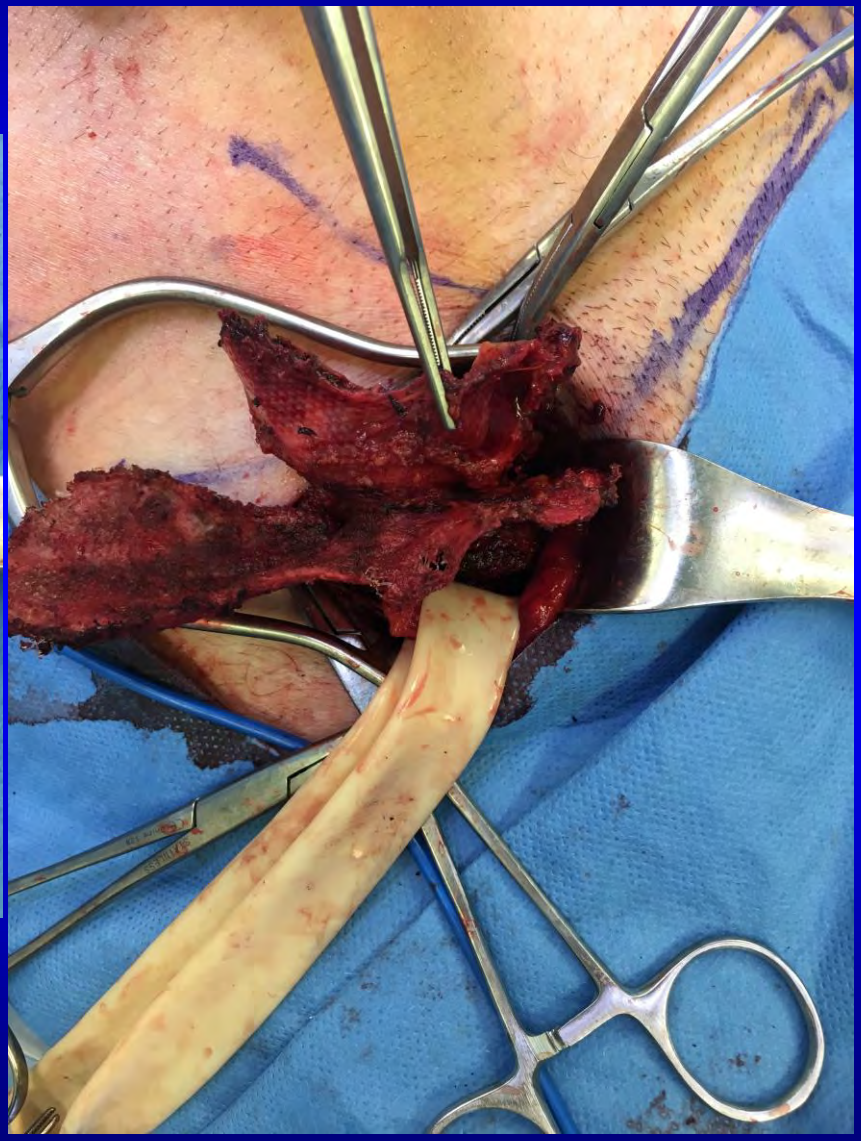
Mesh Removal: Open

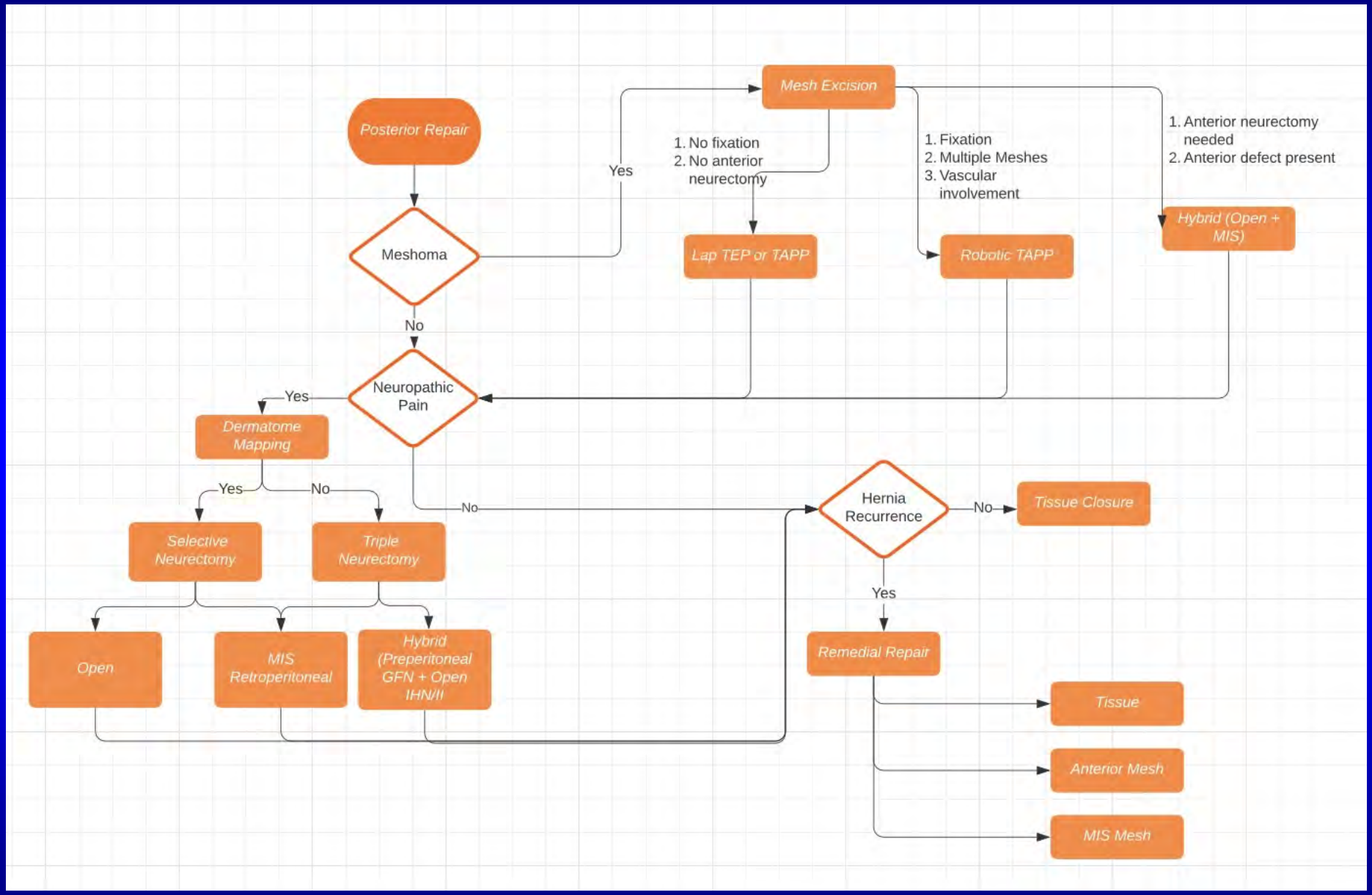



Mesh Excision
Open Anterior/Posterior Repair
Yes
Anterior Flat
Posterior Flat
1. Plug
2. 2.TIPP
3. 3. Kugel
4. 4. TREPP
1. Plug &Patch
2. PHS/UHS (bilayer)
3. Preperitoneal+Presence of neuropathic Pain
Open
MIS
Hybrid (Open + MIS)
Meshoma
No
Neuropathic Pain
Yes
Dermatome Mapping
Yes
No
No
Hernia Recurrence
No
Tissue Closure
Selective Neurectomy
Triple Neurectomy
Yes
Open anterior IIN/IHN, Ext GN
MIS Retroperitoneal
Hybrid (Preperitoneal GFN + Open IHN/IIN)
Remedial Repair
Tissue
Anterior Mesh
MIS Mesh

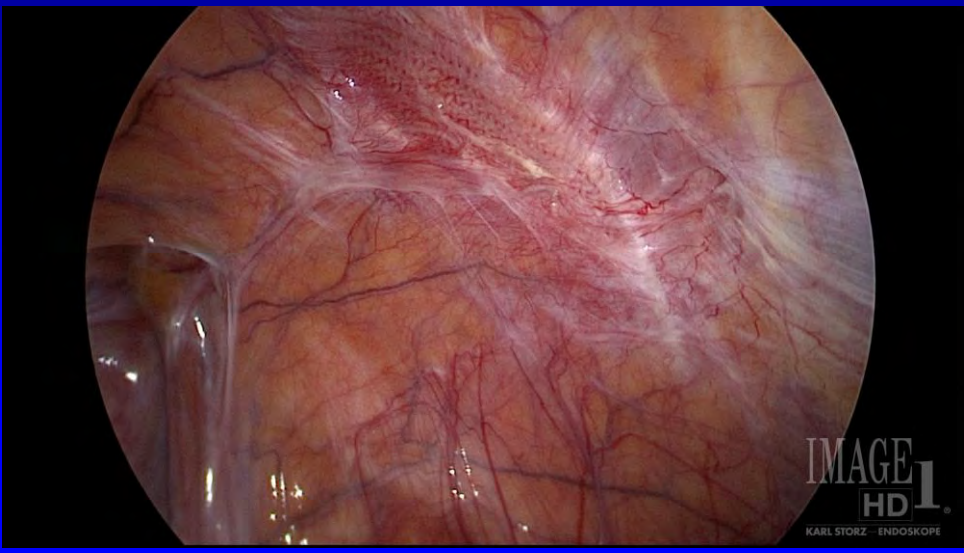
Mesh Removal: Open

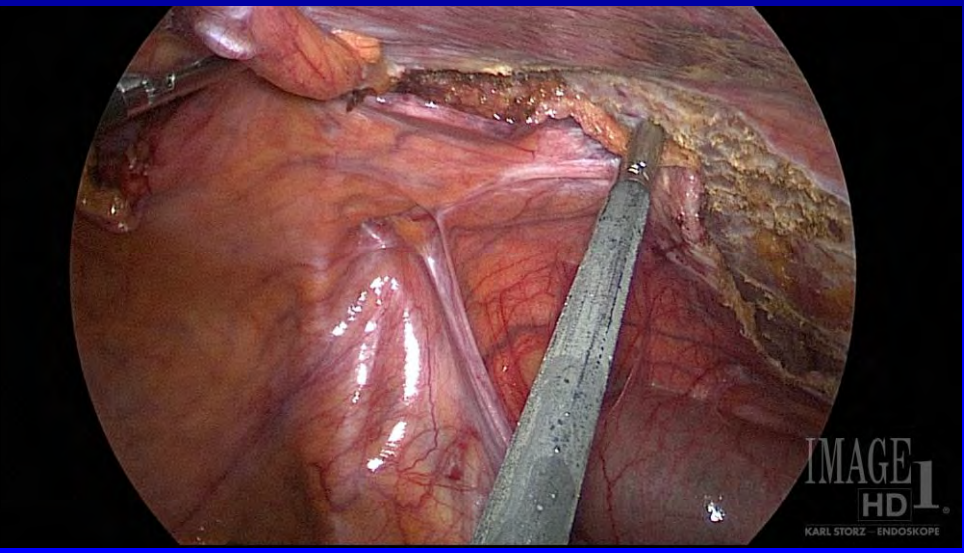


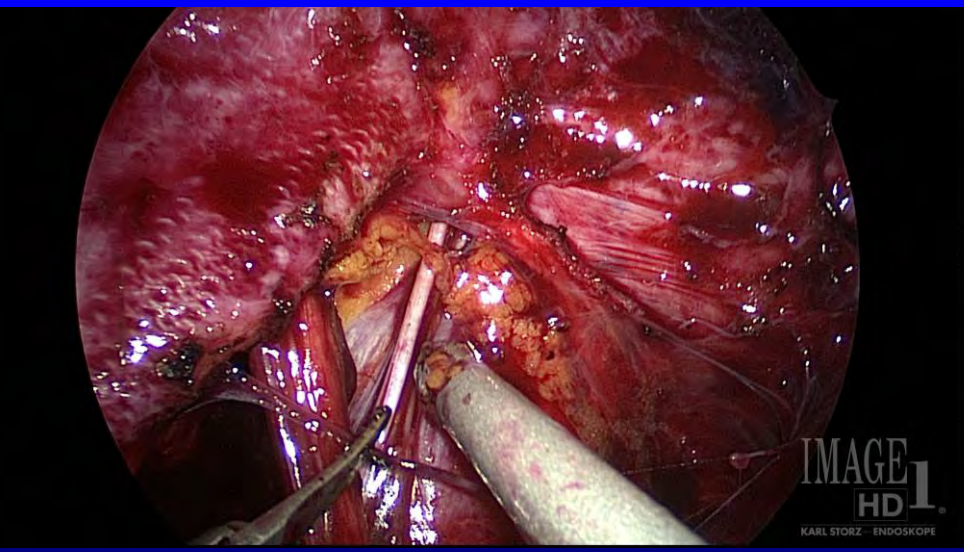


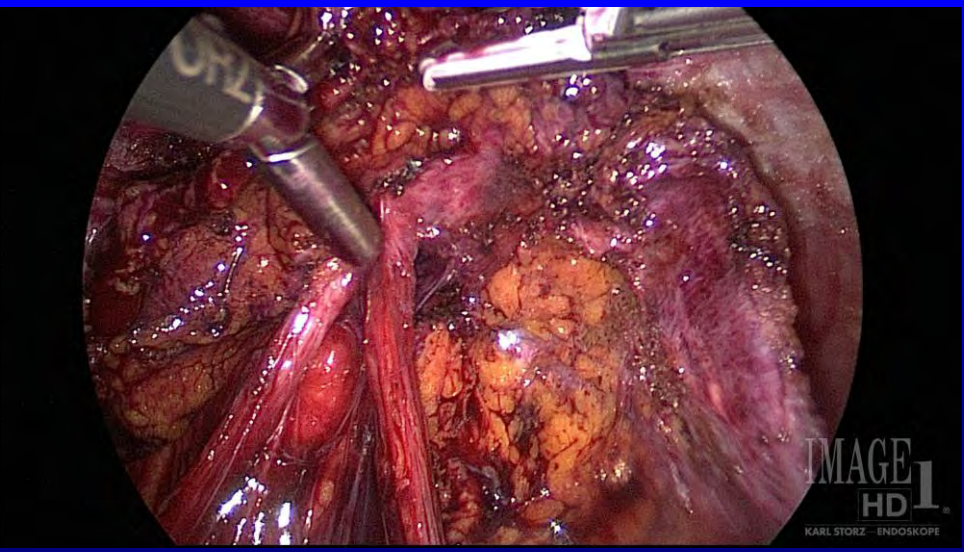

Posterior Repair
Meshoma
Yes
Mesh Excision
1. No fixation
2. No anterior neurectomy
Lap TEP or TAPP
1. Fixation
2. Multiple Meshes
3. Vascular involvement
Robotic TAPP
1. Anterior neurectomy needed
2. Anterior defect present
Hybrid (Open + MIS)
No
Neuropathic Pain
Yes
Dermatome Mapping
Yes
No
Selective Neurectomy
Triple Neurectomy
Open
MIS Retroperitoneal
Hybrid (Preperitoneal GFN + Open IHN/II
No
Hernia Recurrence
No
Tissue Closure
Yes
Remedial Repair
Tissue
Anterior Mesh
MIS Mesh

Mesh Removal: Lap

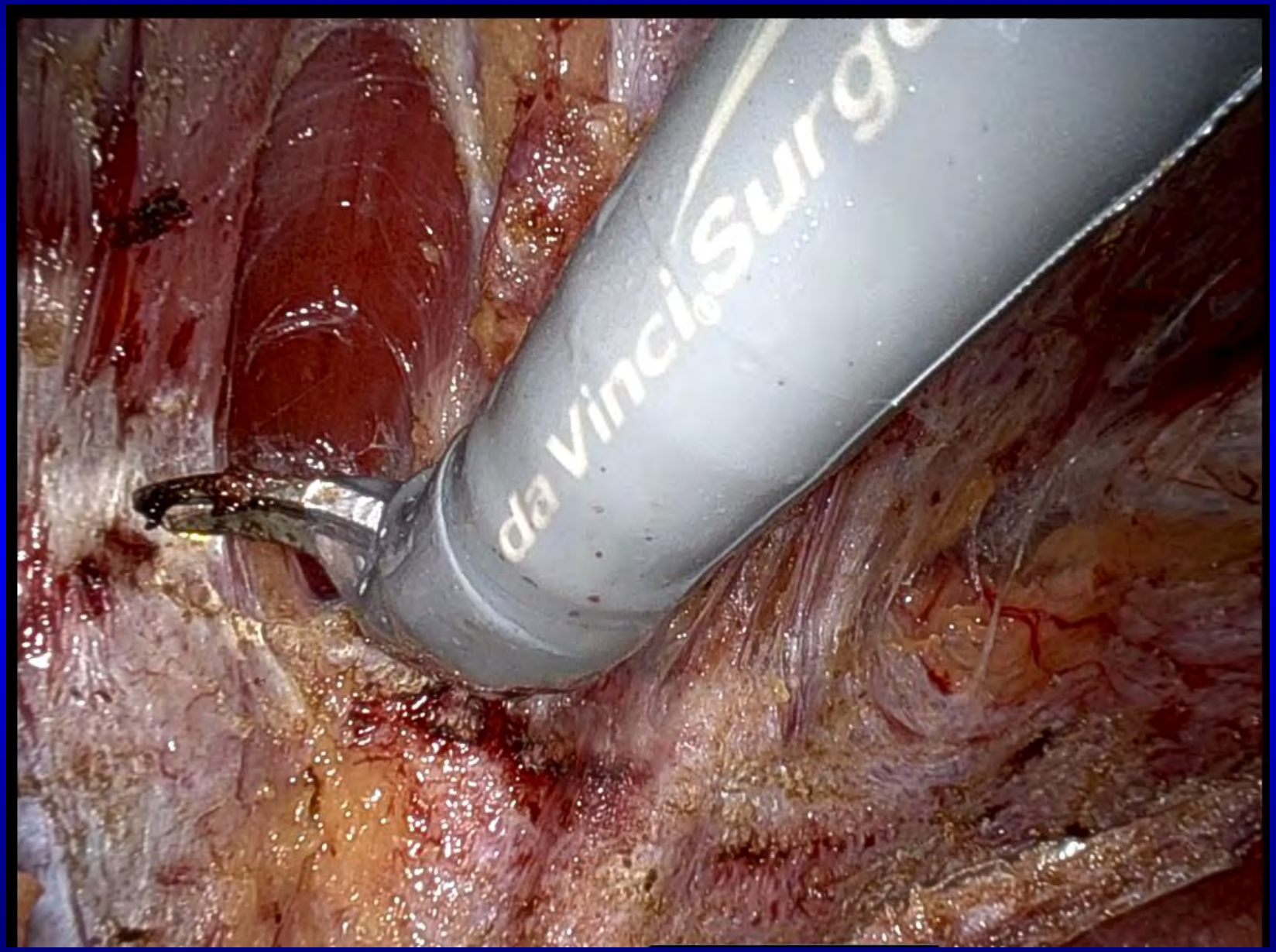








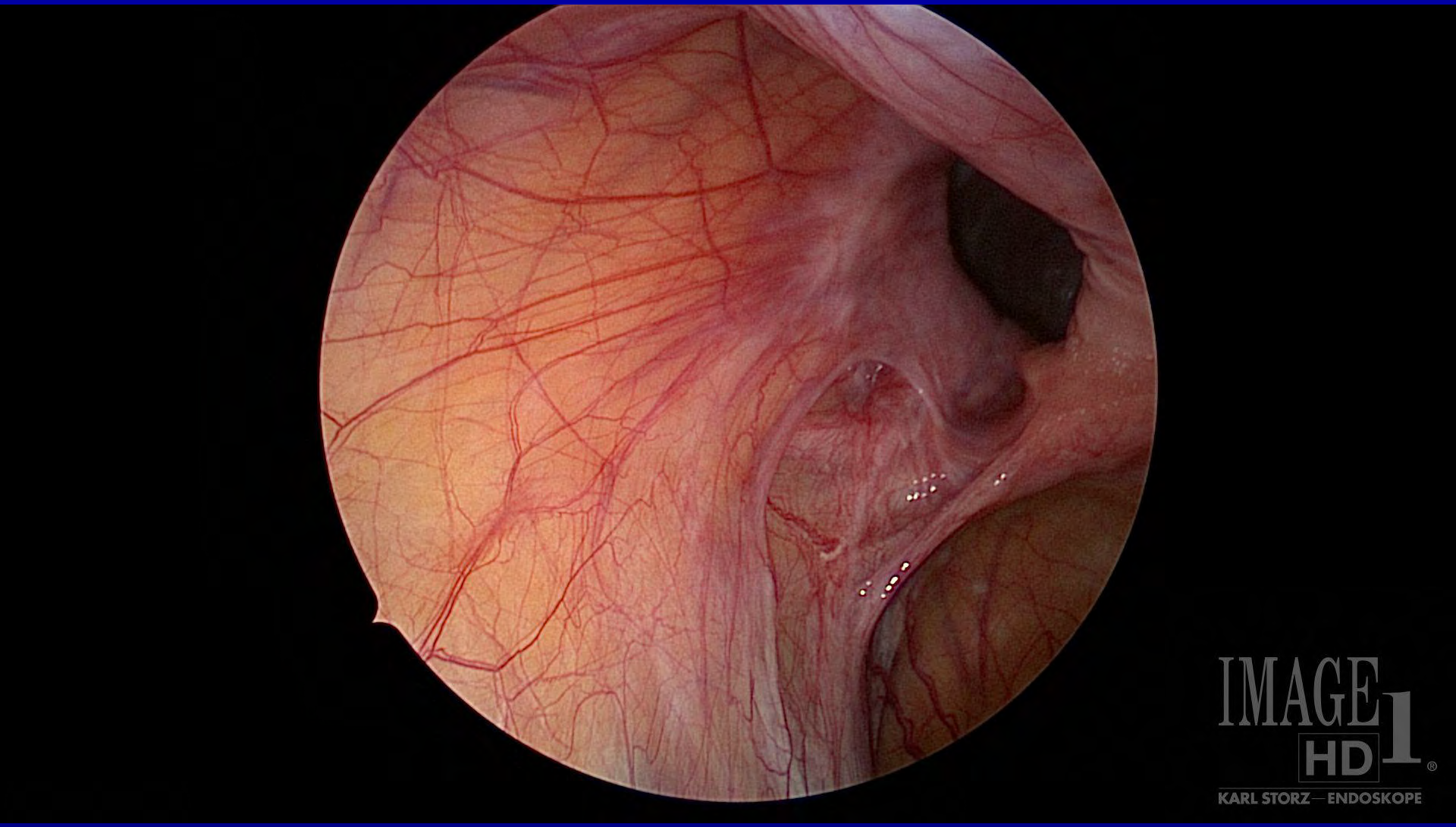
Mesh Removal: Robotic



Hybrid Approach: MIS and Open Mesh Removal +/- Neurectomy

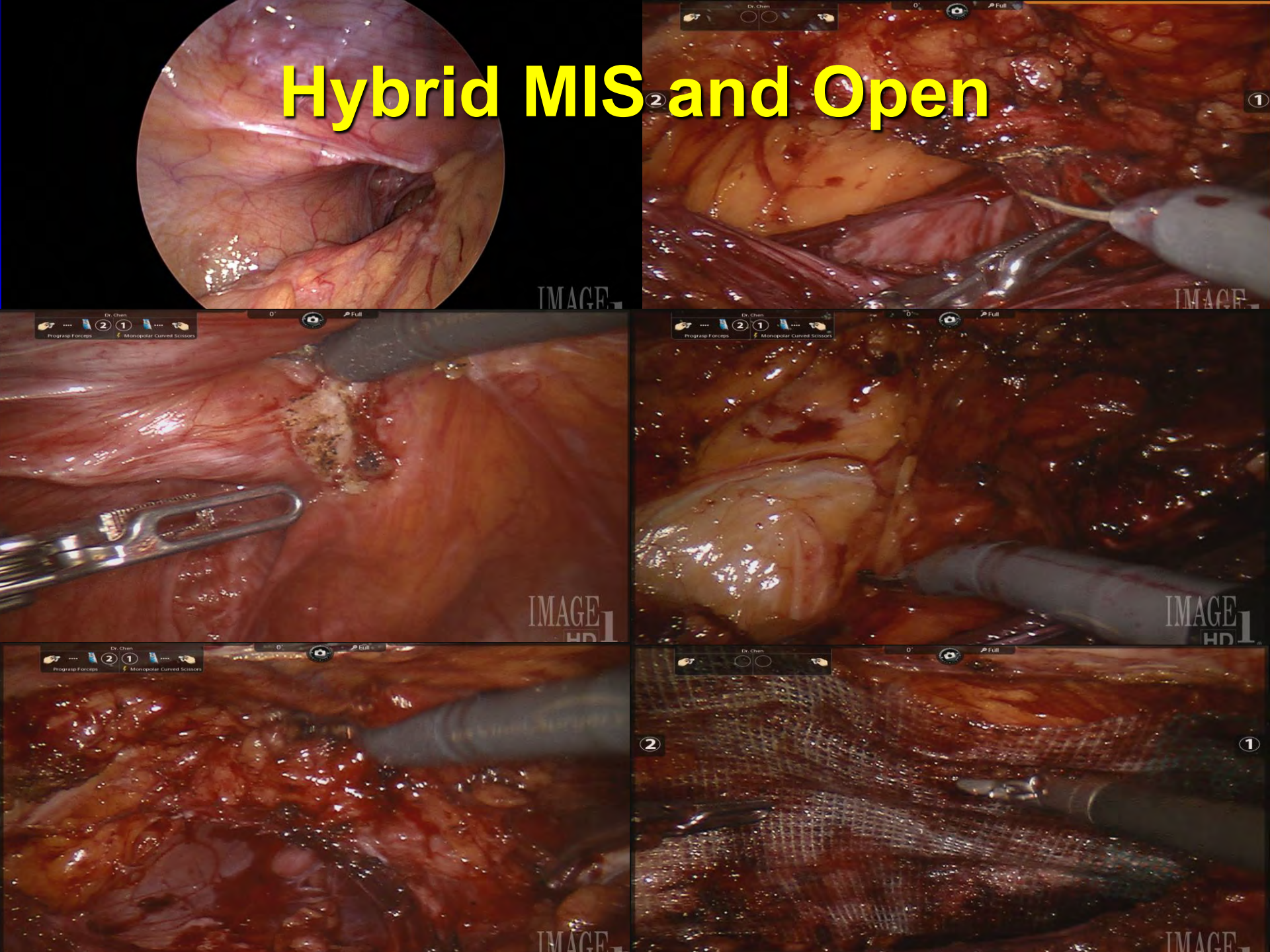
- Approach as TEP or TAPP
- Stay directly on mesh
- Separate epigastrics to iliacs
- Isolate Vas and Spermatic vessels
- Find genitofemoral and lateral femoral cutaneous nerves
- Leave rim of mesh if needed
- Approach IIN/IHN open anterior
- Fix recurrence anterior or posterior

Hybrid MIS and Open

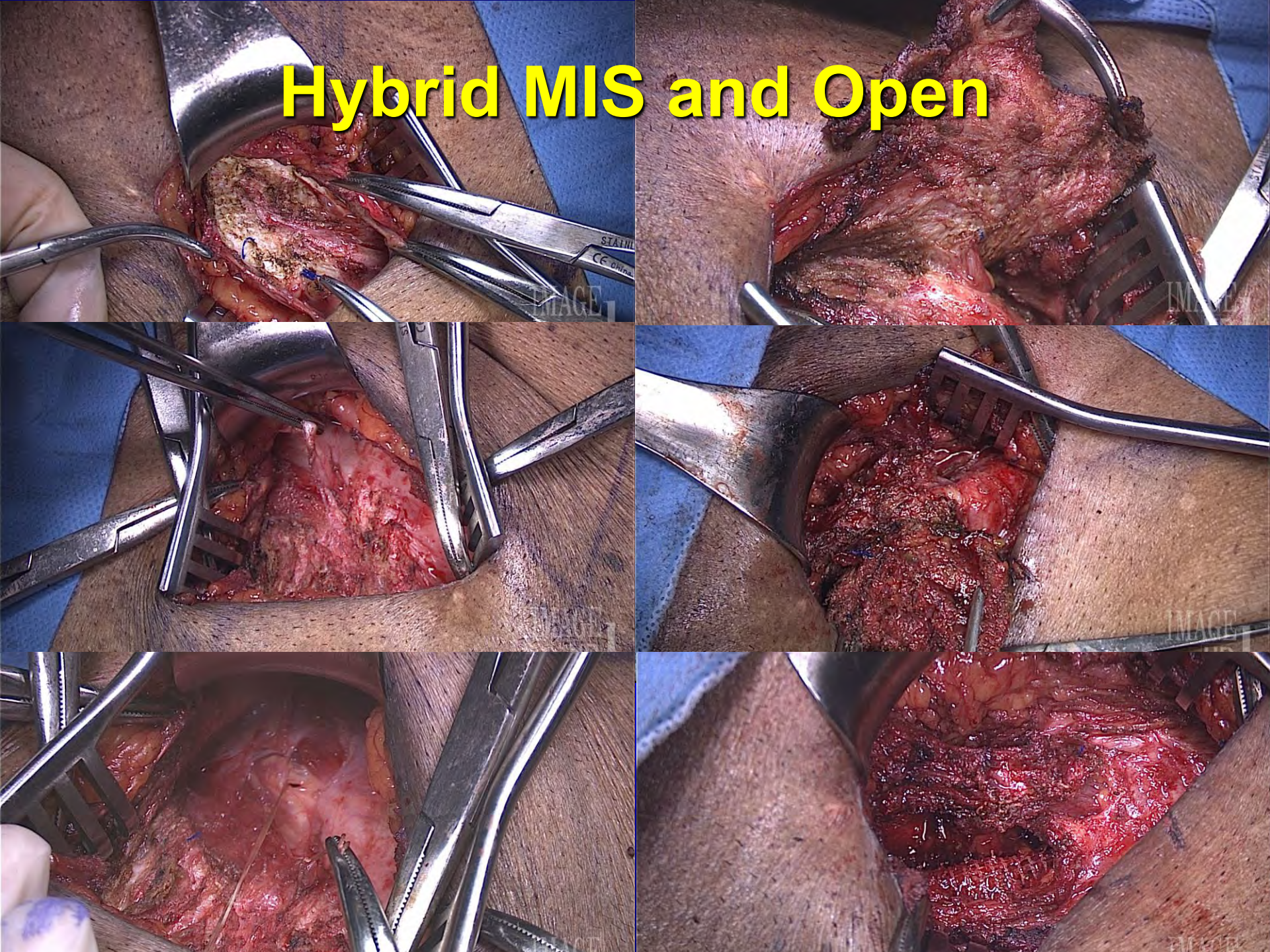


Picture from PK Amid, DC Chen

Hybrid MIS and Open



Hybrid MIS and Open

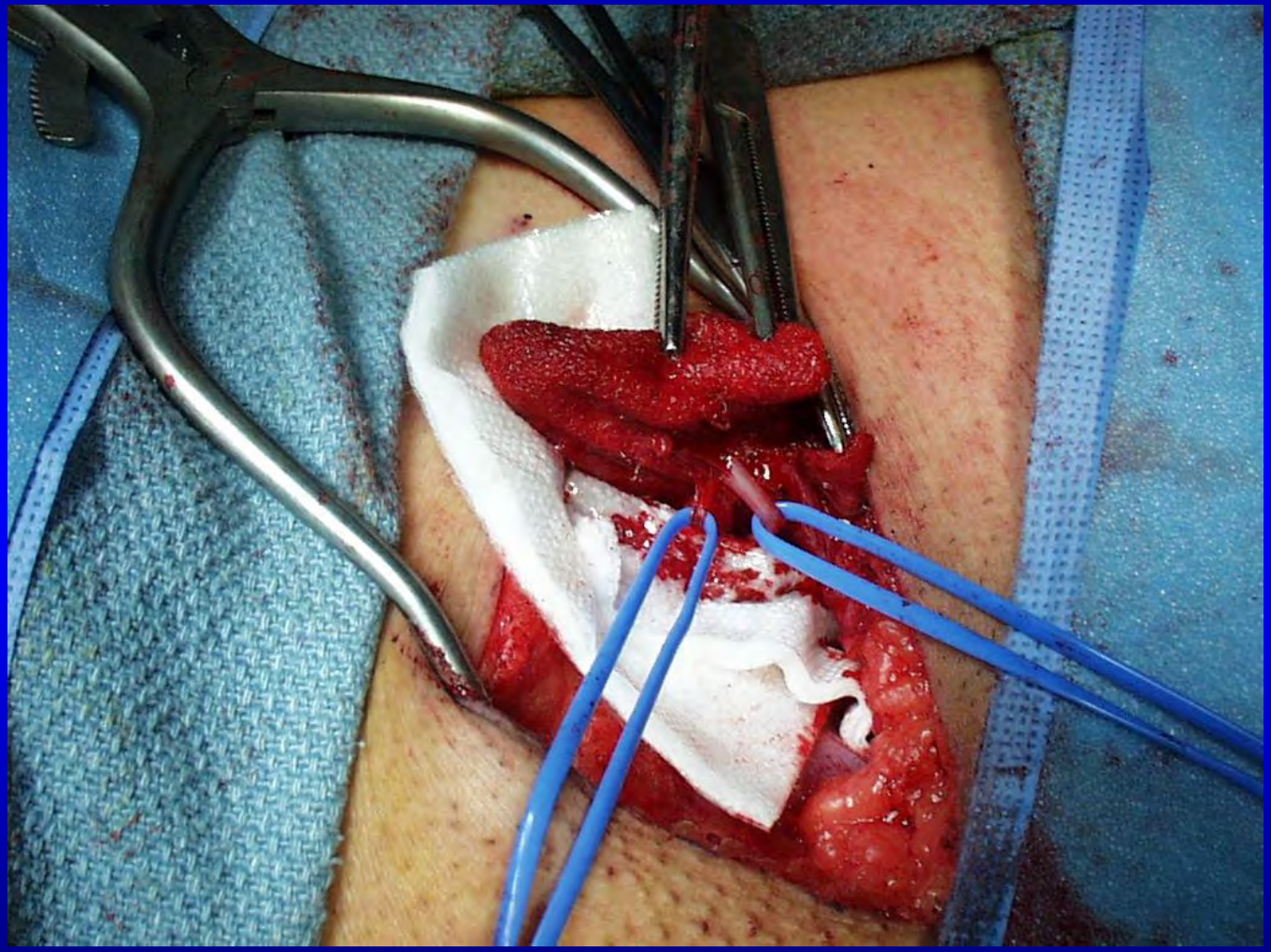


Operative Management: Post Herniorrhaphy Orchialgia

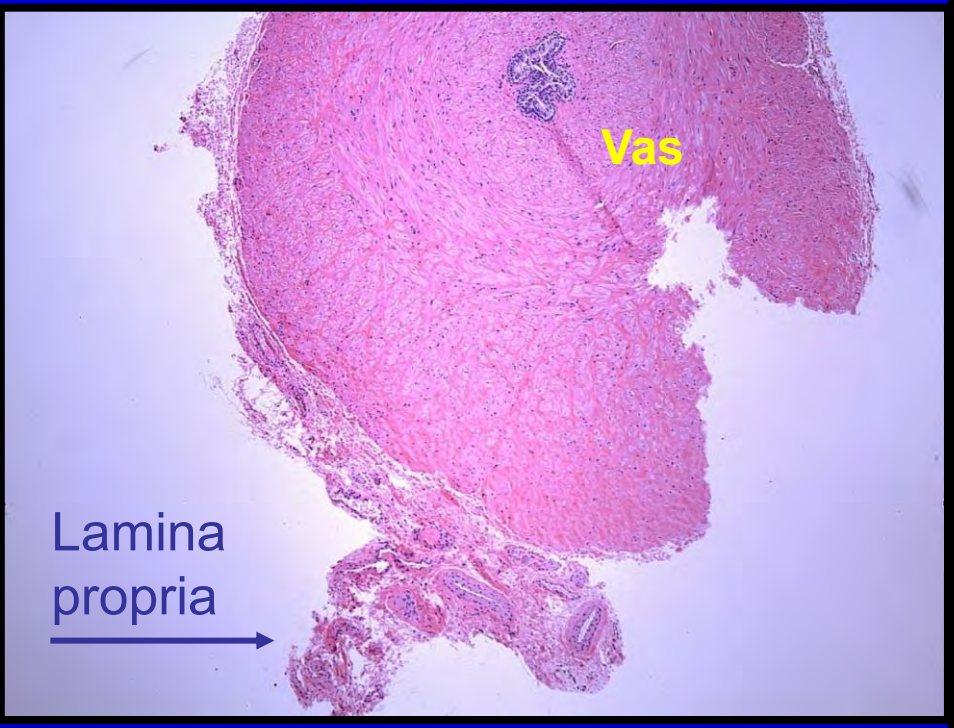
- 2-3% of the time together with groin pain there is coexisting testicular pain
- Sensory nerve of testis is not genital nerve but autonomic and paravasal nerves within the lamina propria of the vas from the deep pelvic plexus
- Nociceptive Pain from Testicular Parenchyma

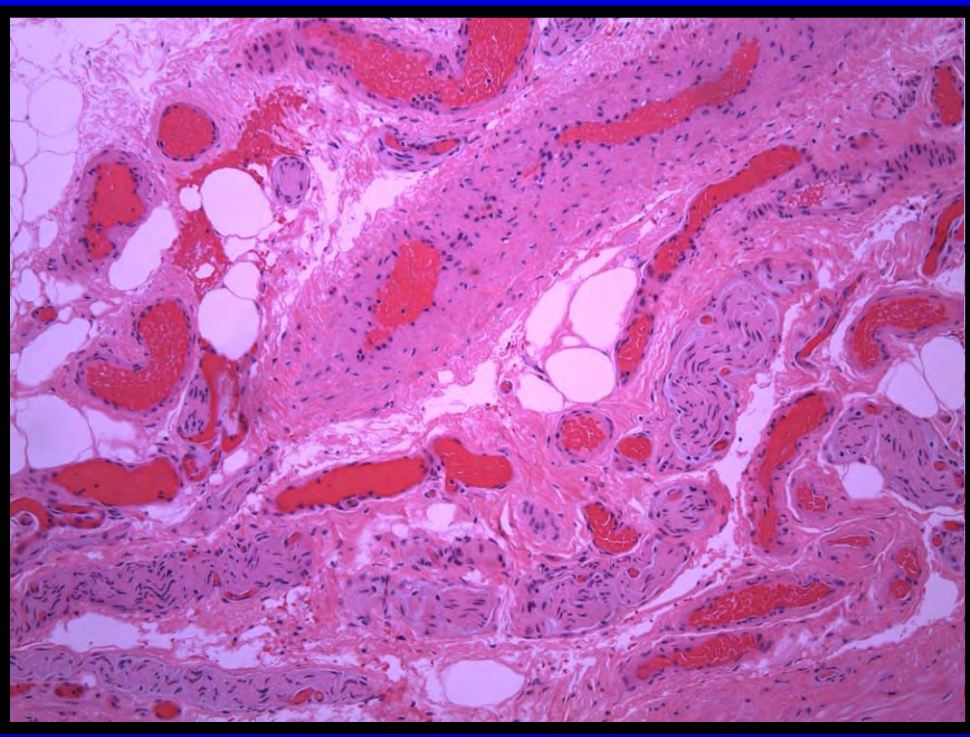
DC Chen, PK Amid, JACS 2011

Paravasal Neurectomy: Open



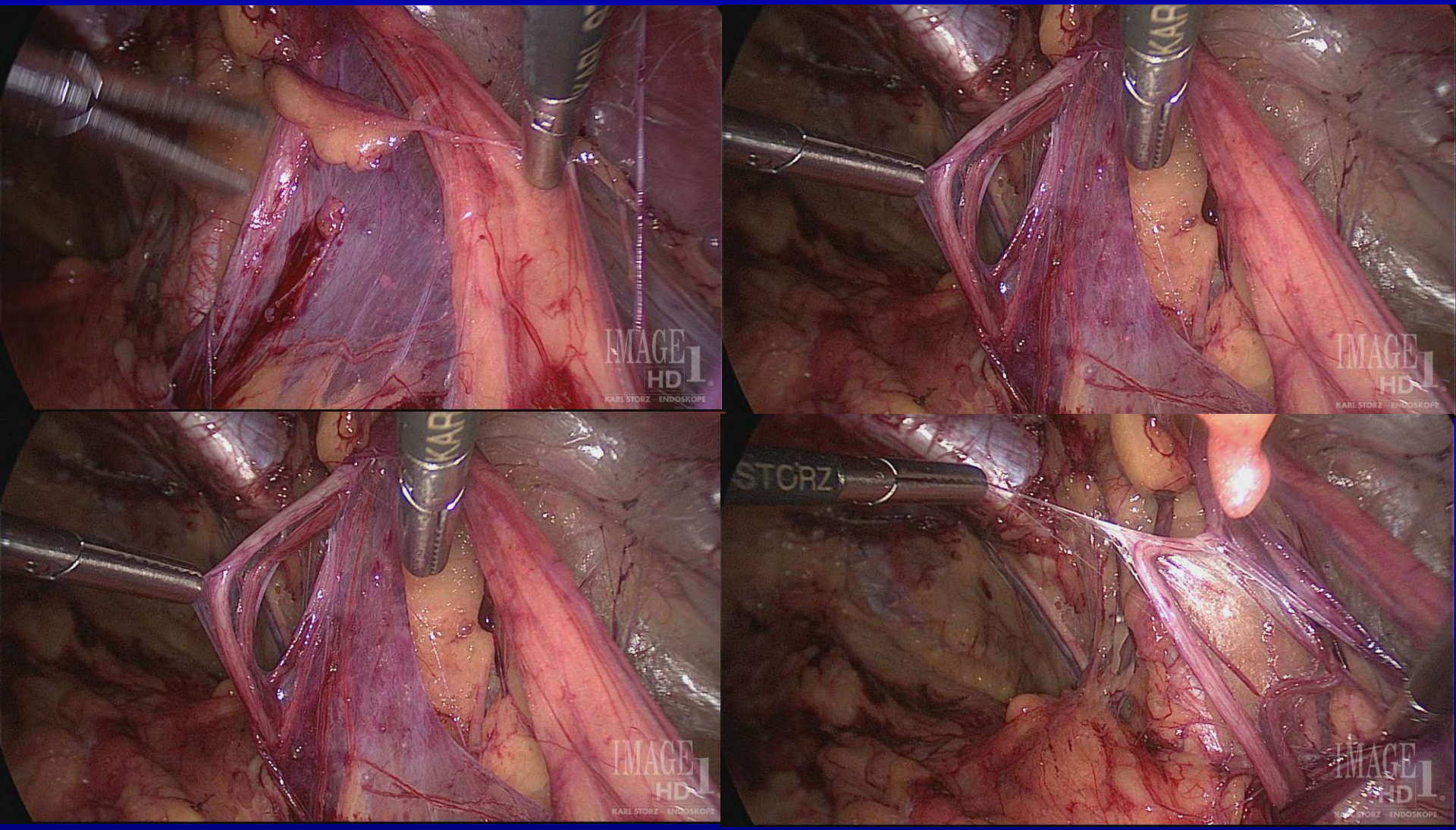
Testicular innervation of vas within lamina propria





Picture from PK Amid, DC Chen

Proximal Vas Neurolysis: Lap

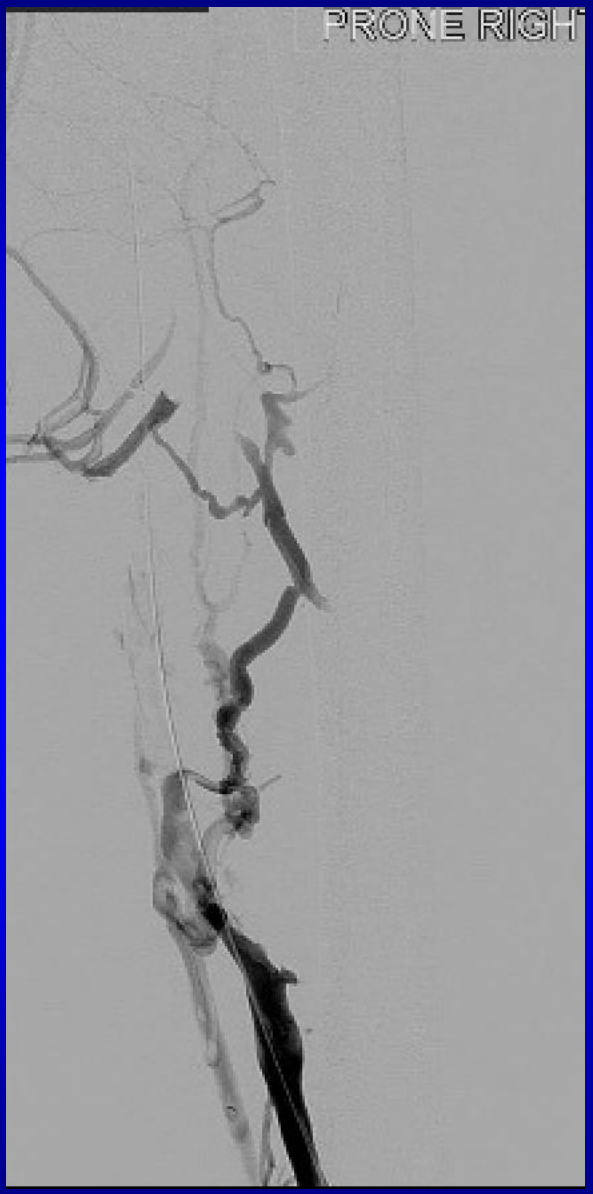


Picture from PK Amid, DC Chen

PRIMUM NON NOCERE

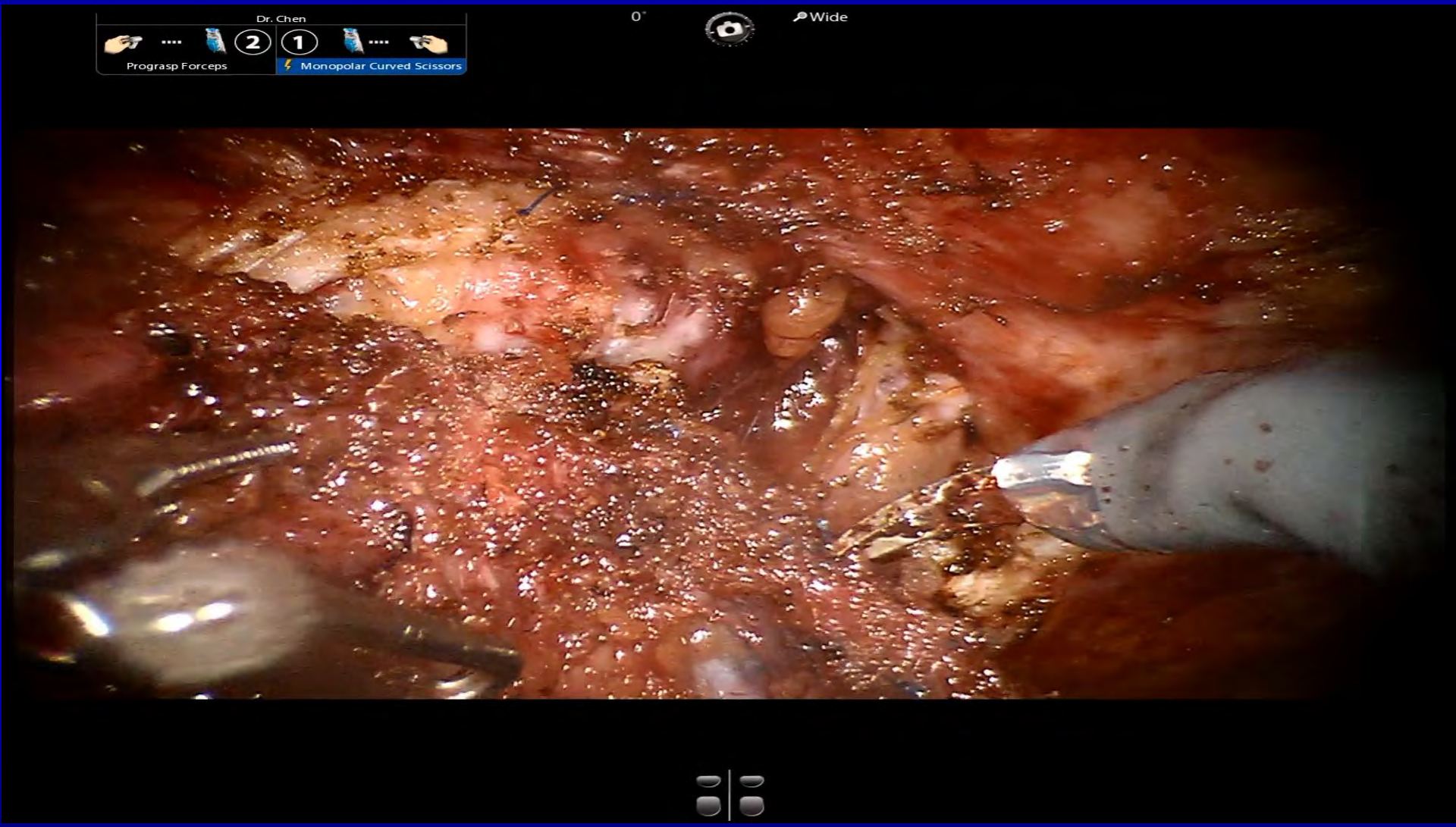
Informed Consent: Risks

- Ongoing Chronic Pain
- Hernia Recurrence
- Testicular Loss
- Vascular Injury
- Delayed Complications: Thrombosis, Testicular Dysfunction/ Atrophy
- Numbness, Deafferentation

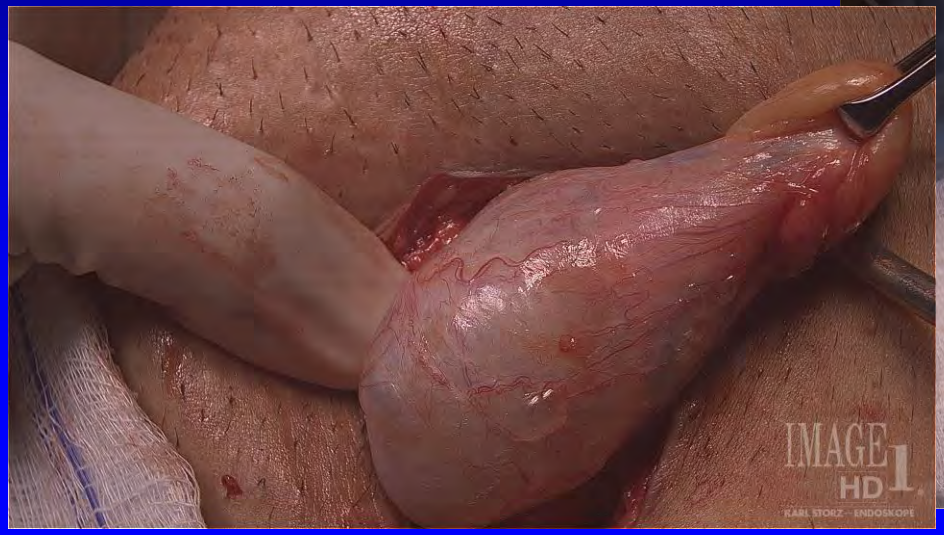

PRONE RIGHT


PRONE RIGHT

Robotic Iliac Artery Repair



Orchiectomy



Denervation

Conclusions

- CPIP: common and debilitating problem occurring regardless of repair technique
- Dermatomal Mapping Is Essential
- Trial Multi-modal non-operative therapy
- Operative Tailoring based on symptoms and mechanism (prior operations)
- Mesh excision, neurectomy, concurrent hernia repair can be safe and effective
- Orchialgia: Paravasal Neurectomy
- Manage patient expectations
- Prevention is most effective intervention