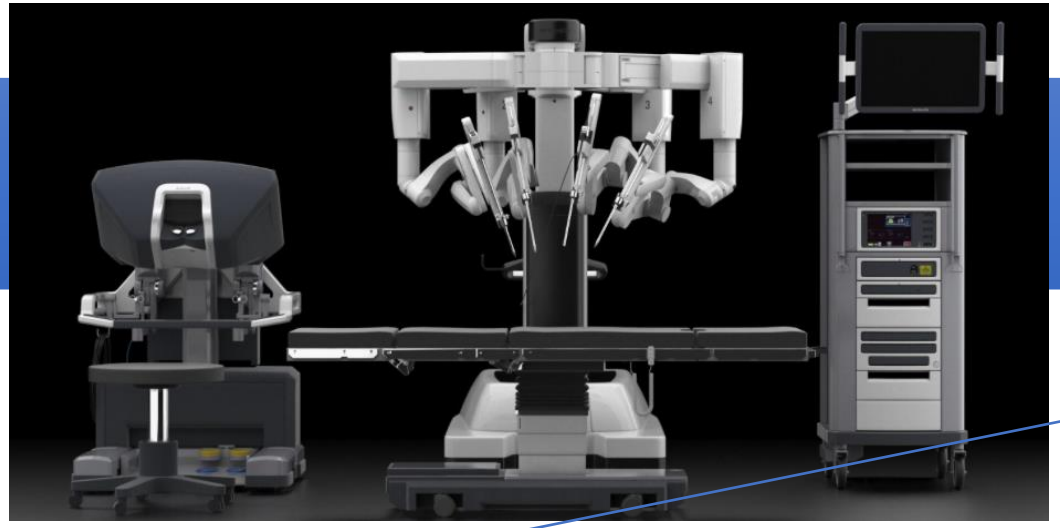
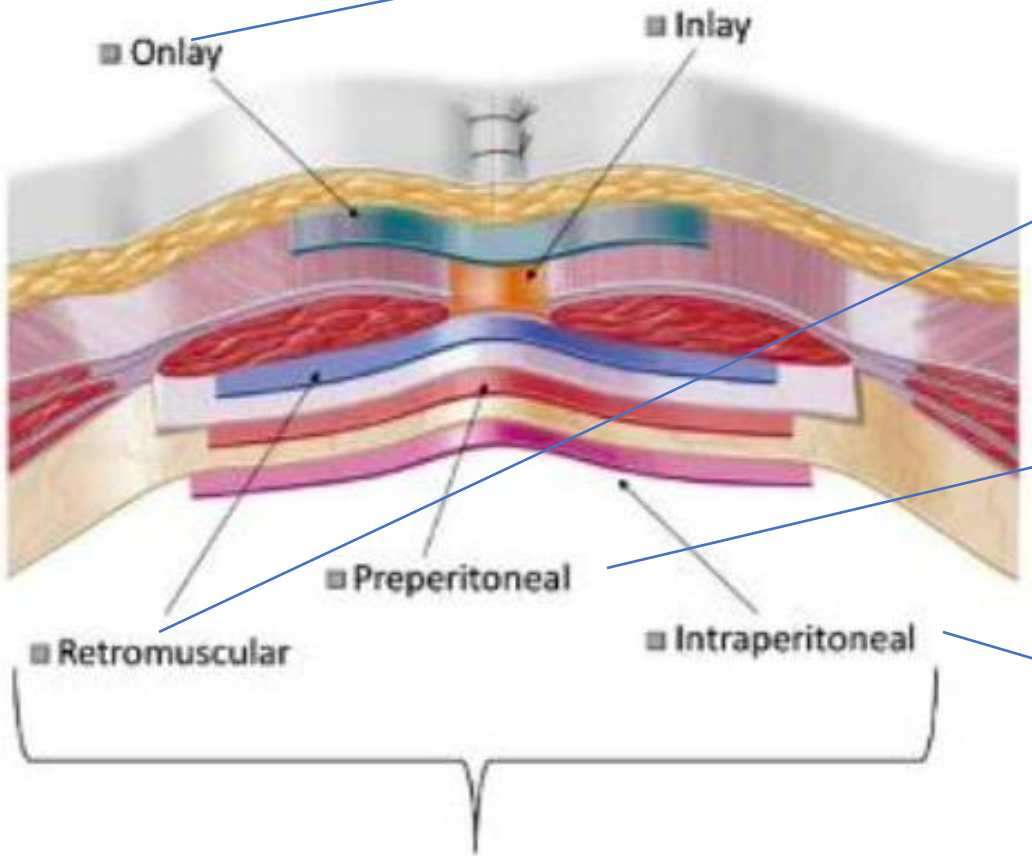
Does the Plane We Place Mesh Really Matter?

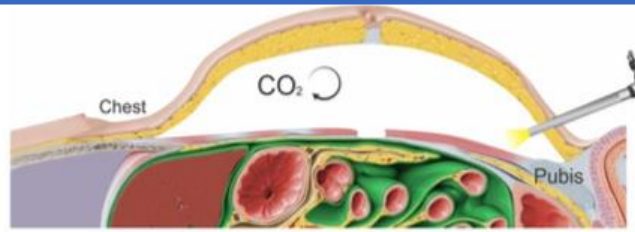
Clayton Petro, MD
Assistant Professor of Surgery
Lerner College of Medicine
Department of General Surgery

SMALL TO MEDIUM <7 cm WIDE

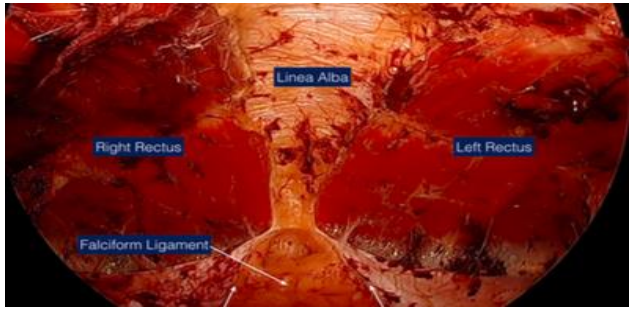




SCOLA



eTEP/TAR

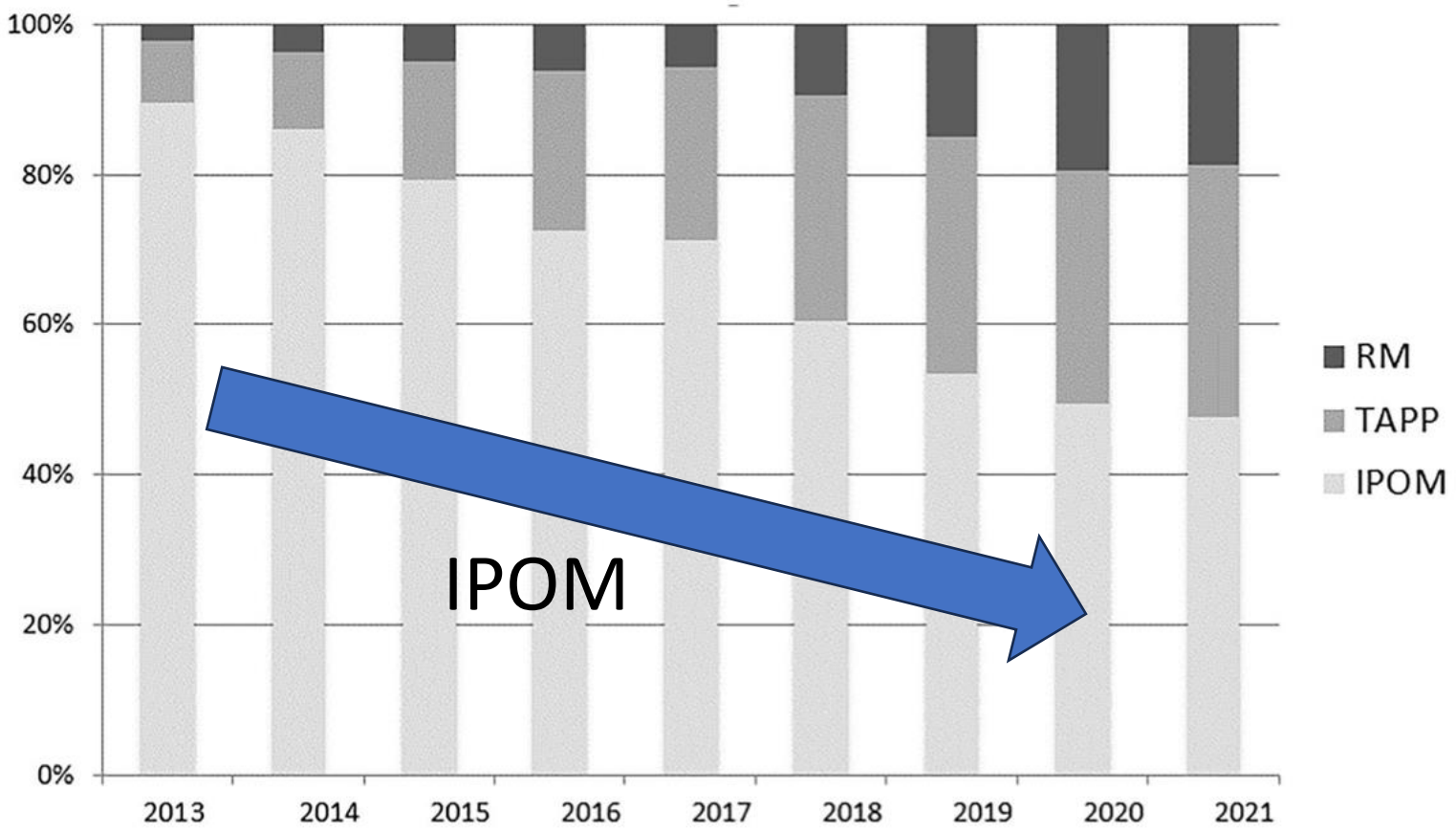


rTAPP

IPOM

S041—Trends and short-term outcomes of three approaches to minimally invasive repair of small ventral hernias. An ACHQC analysis

Melanie Vargas[1] · Molly A. Olson[2] · Thomas E. Read[3] · Mazen R. Al-Mansour[3]



RM/TAPP

Ventral Hernia Management

Expert Consensus Guided by Systematic Review

Mike K. Liang, MD, Julie L. Holihan, MD,* Kamal Itani, MD,† Zeinab M. Alawadi, MD, MS,* Juan R. Flores Gonzalez, MD,* Erik P. Askenasy, MD,‡ Conrad Ballecer, MD,§ Hui Sen Chong, MD,¶ Matthew I. Goldblatt, MD,|| Jacob A. Greenberg, MD,** John A. Harvin, MD,* Jerrod N. Keith, MD,¶ Robert G. Martindale, MD, PhD,†† Sean Orenstein, MD,†† Bryan Richmond, MD,‡‡ John Scott Roth , MD,§§ Paul Szotek, MD,¶¶ Shirin Towfigh, MD,|||| Shawn Tsuda, MD,*** Khashayar Vaziri, MD,††† and David H. Berger, MD‡*

Mesh Location

Consensus

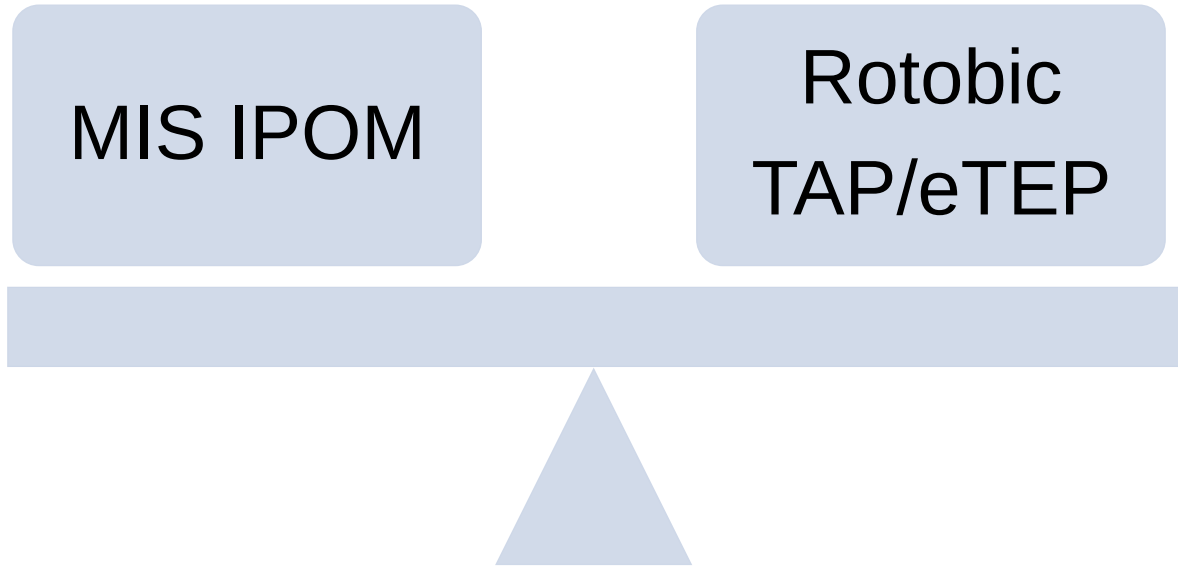
- Sublay is the optimal mesh location in open, elective VHR, but there is a role for other positions of mesh placement. Grade C

Midline incisional hernia guidelines: the European Hernia Society

David L. Sanders[1,2], Maciej M. Pawlak[1,2], Maarten P. Simons[3], Theo Aufenacker[4], Andrea Balla[5], Cigdem Berger[6], Frederik Berrevoet[7], Andrew C. de Beaux[8], Barbora East[9], Nadia A. Henriksen[10], Miloslav Klugar[11], Alena Langaufová[12], Marc Miserez[13], Salvador Morales-Conde[14], Agneta Montgomery[15,16], Patrik K. Pettersson[15,16], Wolfgang Reinpold[6], Yohann Renard[17], Simona Slezáková[11], Thomas Whitehead-Clarke[18] and Cesare Stabilini[19,20]

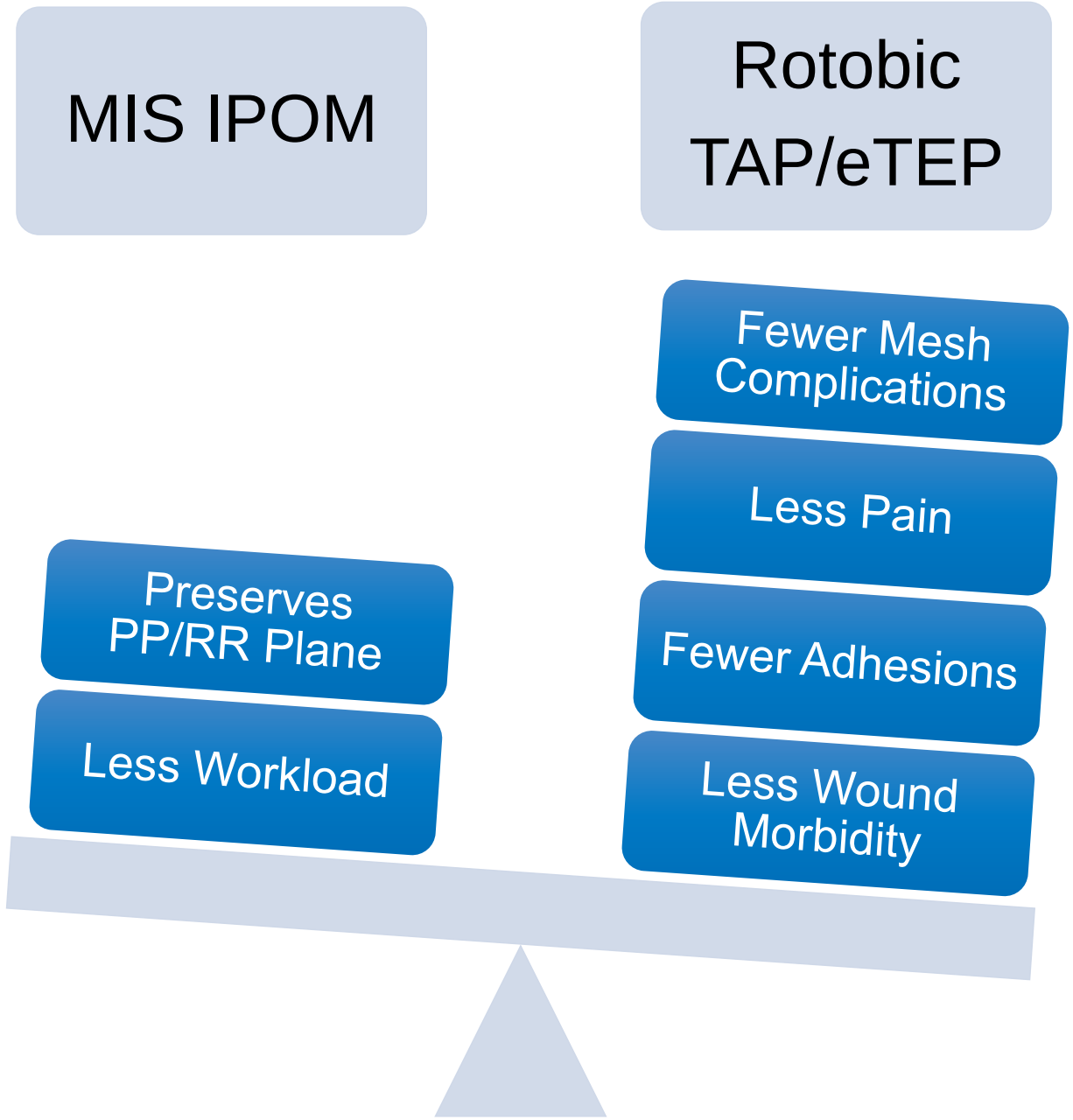
Due to the risk of intraperitoneal adhesions, and with the growing popularity of alternative minimally invasive methods for retromuscular repair such as MILOS and extended Totally ExtraPeritoneal (eTEP), which are showing promising results, it is suggested to keep the mesh out of the peritoneal cavity where possible to limit contact with the viscera.

Small/Medium 2-7cm Ventral Hernias



- Wound Morbidity?
- Pain?
- Workload?
- Preserves planes?
- Mesh Complications?
- Adhesions?

Small/Medium 2-7cm Ventral Hernias



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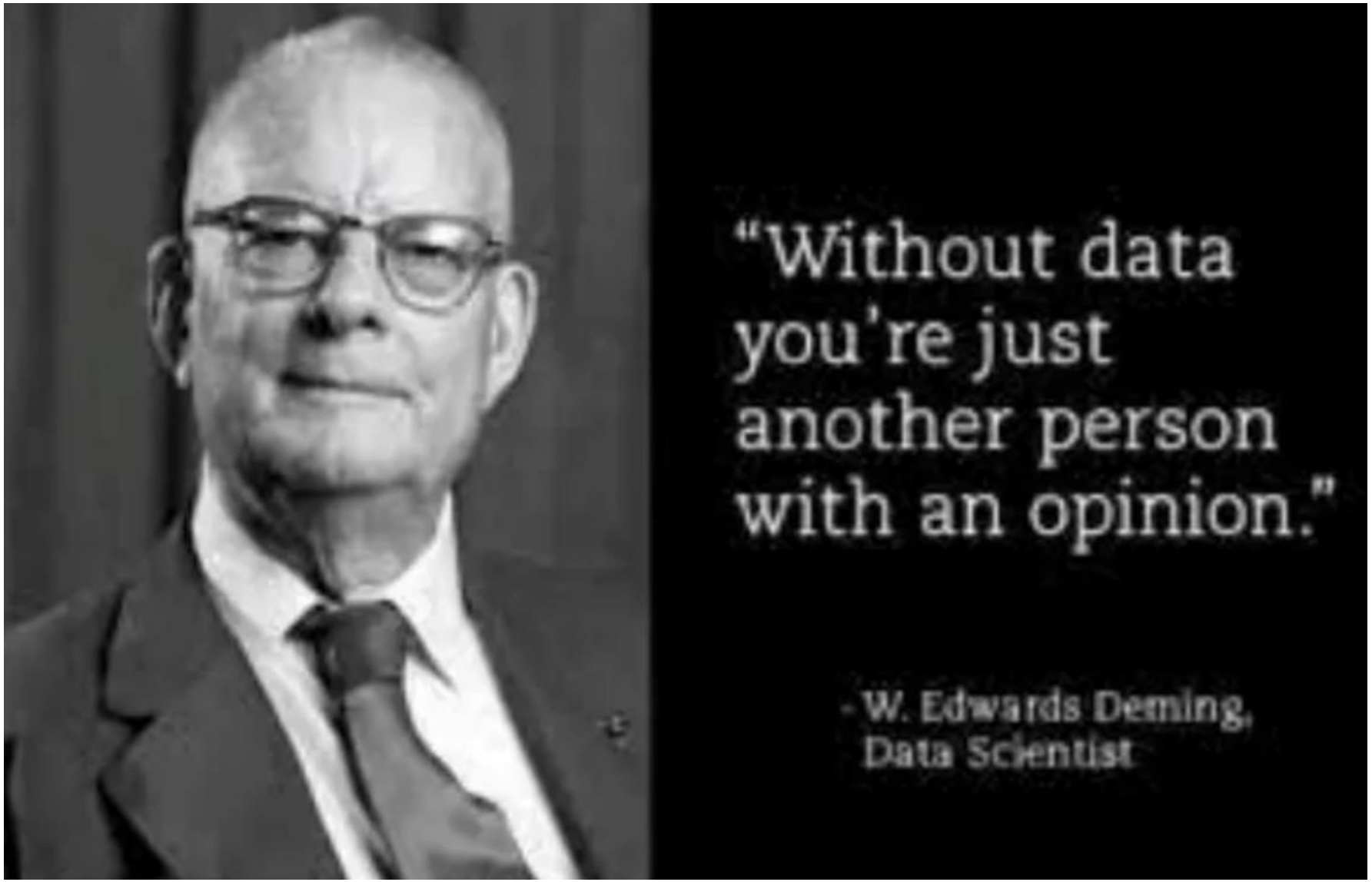
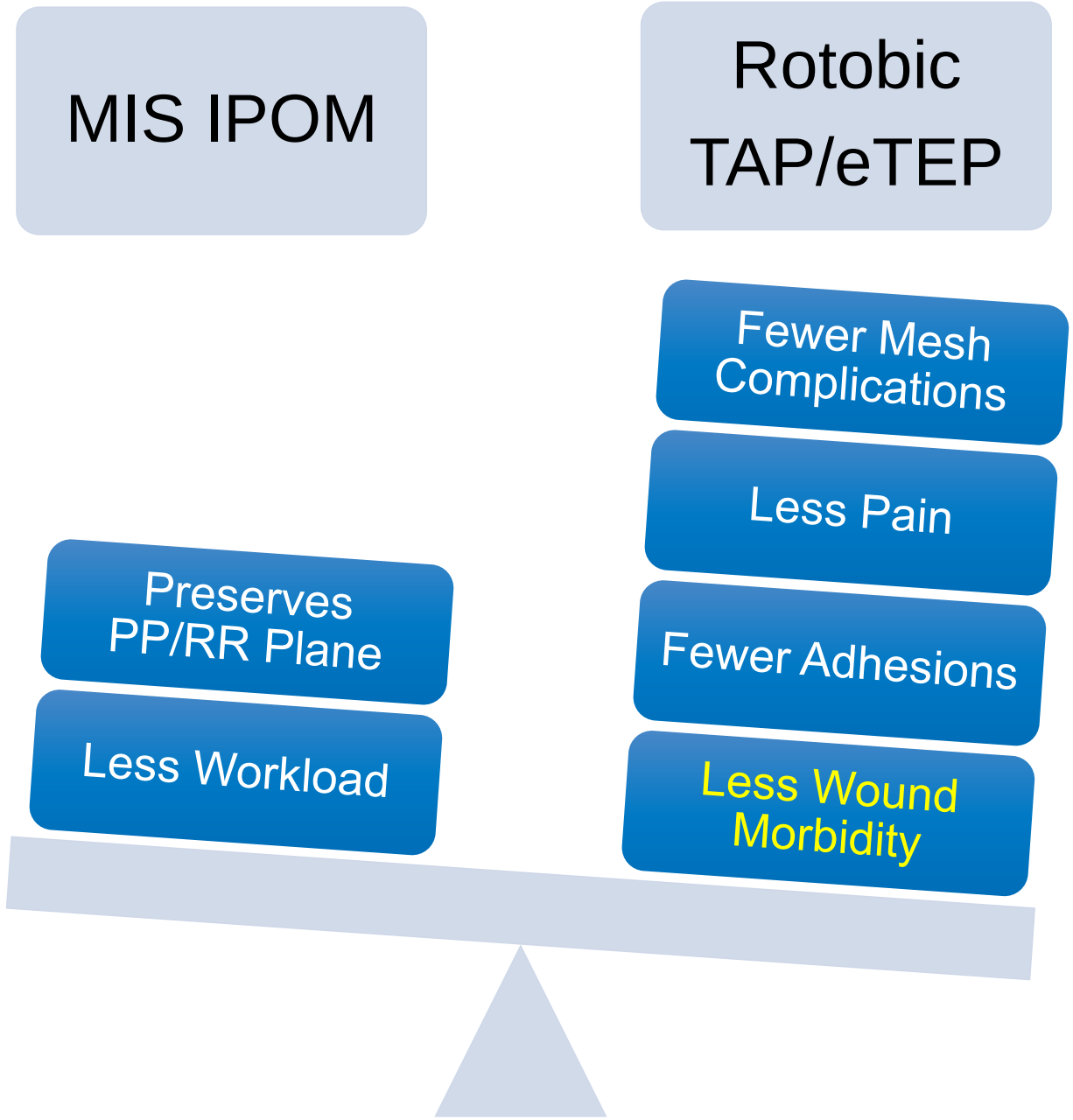

"Without data you're just another person with an opinion."
- W. Edwards Deming, Data Scientist

Small/Medium 2-7cm Ventral Hernias

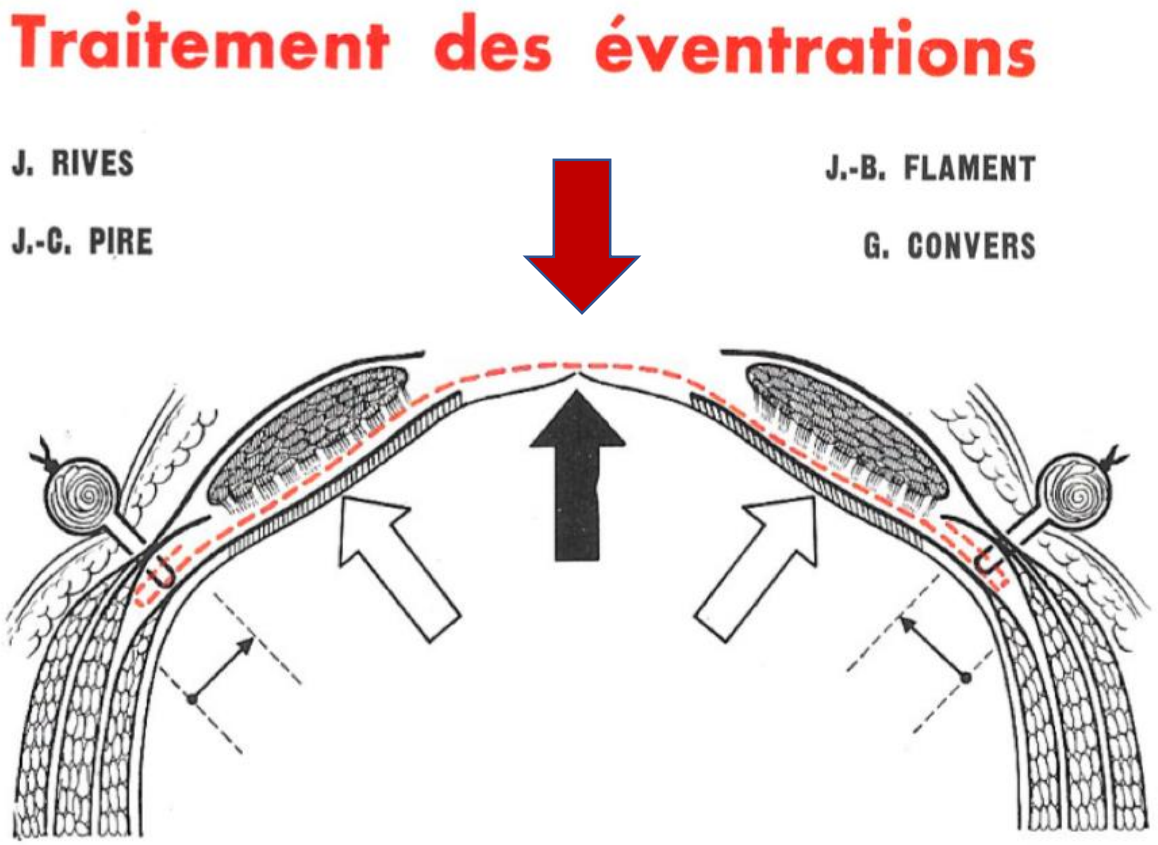


Cleveland Clinic

1977

Jean Rives

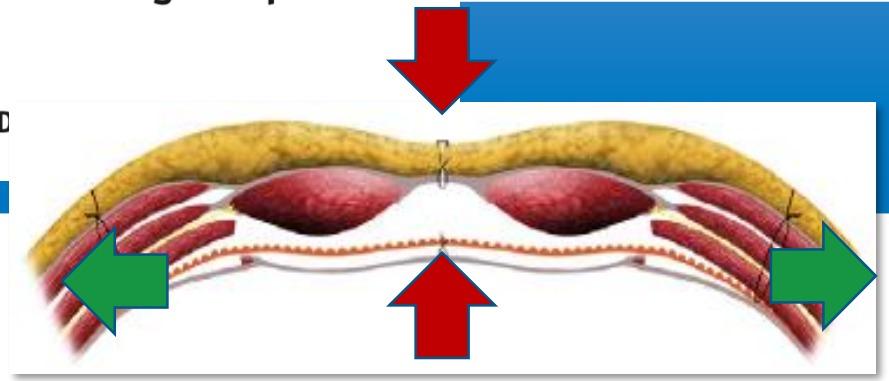
Rene Stoppa



Transversus abdominis muscle release: a novel approach to posterior component separation during complex abdominal wall reconstruction

Yuri W. Novitsky, M.D.[a,b,*], Heidi L. Elliott, M.D
Michael J. Rosen, M.D.[b]

2012



- No anatomic limitations to retromuscular repair
  - Wide mesh overlap in every direction
- Well vascularized plane for ingrowth
  - Separate from viscera and superficial wound morbidity
  - No skin flaps
- Synthetic mesh now has the optimal location

…OPTIMAL **OPEN** REPAIR

World J Surg (2014) 38:2233–2240
DOI 10.1007/s00268-014-2578-z

World Journal of Surgery

Laparoscopic Versus Open Incisional and Ventral Hernia Repair: A Systematic Review and Meta-analysis

Yanyan Zhang · Haiyang Zhou · Yunsheng Chai · Can Cao · Kaizhou Jin · Zhiqian Hu

WOUND INFECTION

- Lap – 2.8%
- Open – 16.2%

Cochrane Library

Cochrane Database of Systematic Reviews

Laparoscopic versus open surgical techniques for ventral or incisional hernia repair (Review)

Sauerland S, Walgenbach M, Habermalz B, Seiler CM, Miserez M

"the most clear and consistent result was that laparoscopic surgery reduced the risk of wound infection"

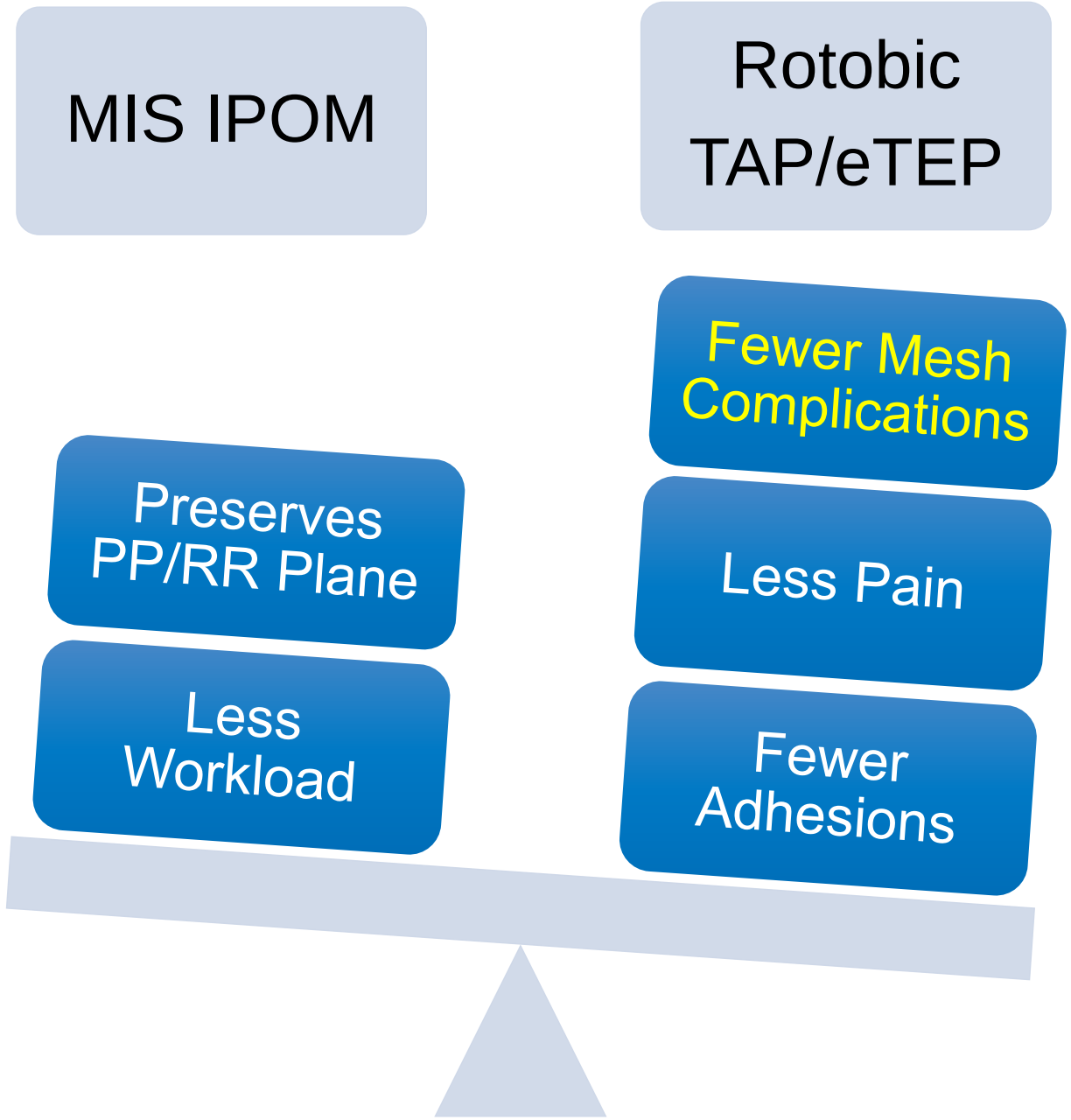
RR = 0.26 95% CI [0.15-0.46]

QC Data

			MIS SSI	OPEN SSI
2024	Gaskins et. al	Robotic vs Open RMS Propensity Match	1%	4%
2023	Pereira et. al	Robotic vs Open Lateral Hernias – Propensity Match	1%	3%
2023	Petro et. al	eTEP vs IPOM RCT	0	
2023	Vargas et. al	MIS Small Hernia Trends N = 7261. 2012-2021	0.5-0.7%	
TBD	Warren et. al	Open vs Robot TAR	4%	7%

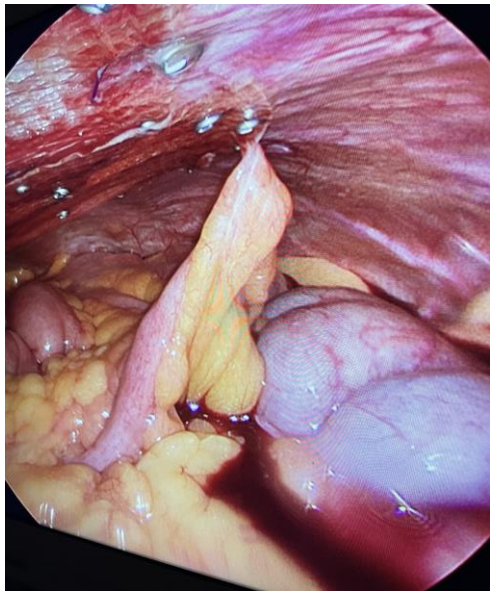
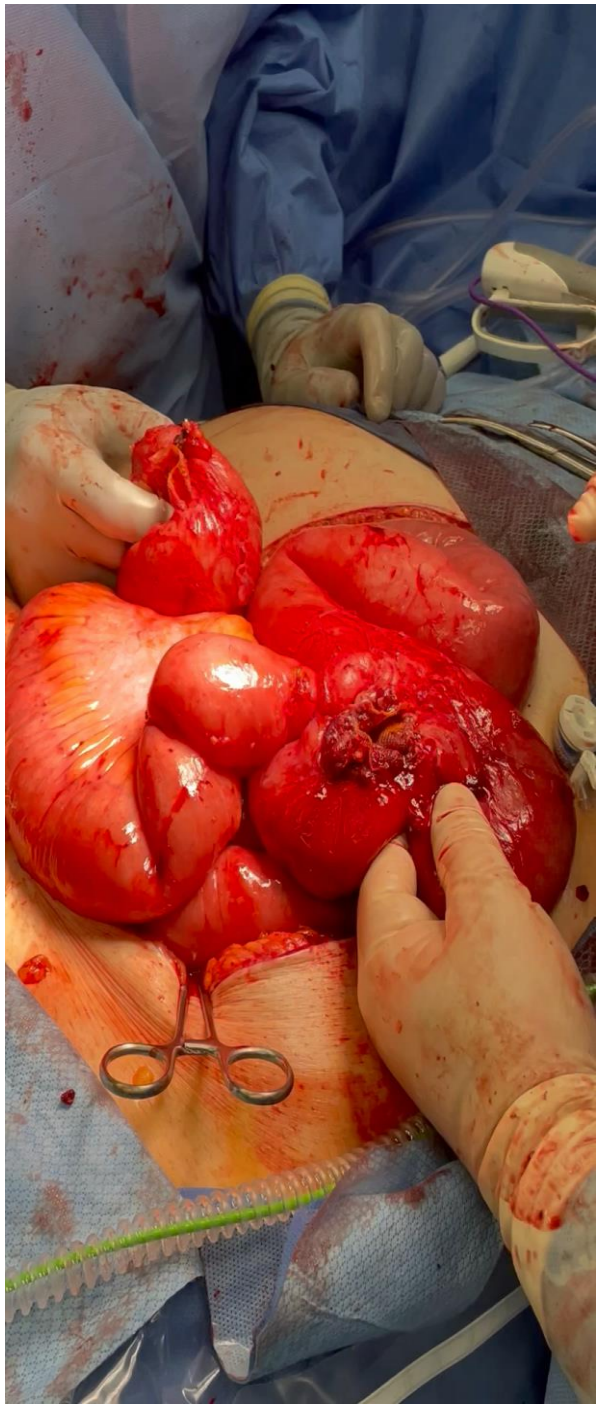
Small/Medium 2-7cm Ventral Hernias

~~Less Wound Morbidity~~



Cleveland Clinic




$$\frac{\text{Anecdotal Mesh Complications}}{\text{\# Mesh Implants}} = ?\%$$

f (x) mesh location?

JAMA | Original Investigation

Long-term Recurrence and Complications Associated With Elective Incisional Hernia Repair

Dunja Kokotovic, MB; Thue Bisgaard, MD, DMSc; Frederik Helgstrand, MD, DMSc

N ~ 3000

Mesh Repairs

Danish Hernia Database
National Patient Reg
Manual Chart Review

Re-OP Any Indication

30%

Re-OP Mesh Complication

4.5%

Median F/U 5 Years

Open

5.6%

11 mo

Lap

3.7%

24 mo

Uncoated PP
Larger Pieces

NOT Mesh Position

Larger Mesh

Mesh Removed

1.6%

2/3 INFECTION
1/5 PAIN
9% OBSTRUCTION
3% ADHESION

1 Bowel Perf

Long-term mesh-related complications from minimally invasive intraperitoneal onlay mesh for small to medium-sized ventral hernias

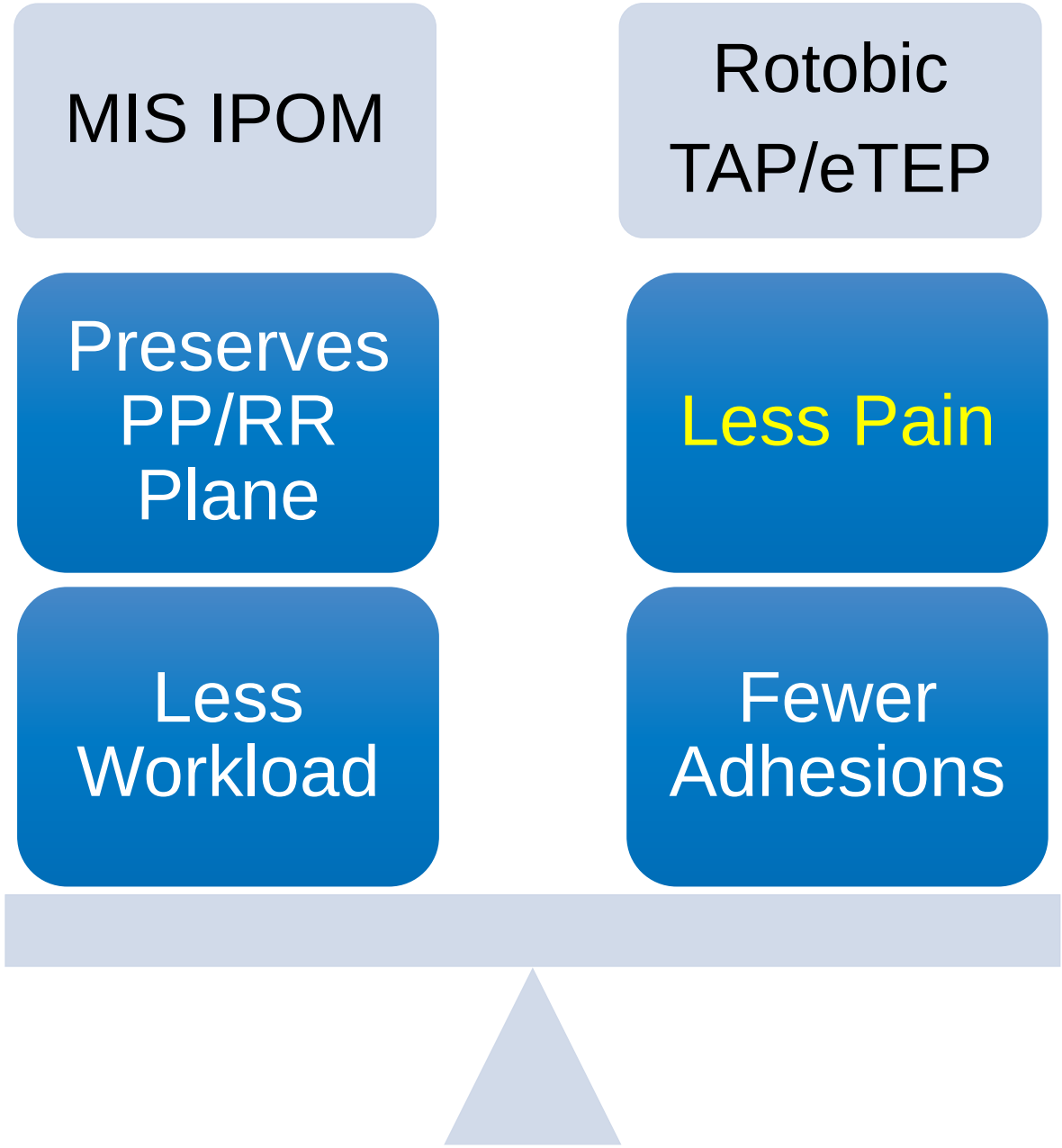
Sara M. Maskal[1] · Ryan C. Ellis[1] · Ouen Mali[1] · Braden Lau[1] · Nir Messer[1] · Xinyan Zheng[2] · Benjamin T. Miller[1] · Clayton C. Petro[1] · Ajita S. Prabhu[1] · Michael J. Rosen[1] · Lucas R. A. Beffa[1]

- Mesh related complications EXCEEDINGLY rare

Small/Medium 2-7cm Ventral Hernias

~~Less Wound Morbidity~~

~~Fewer Mesh Complications~~



Cleveland Clinic

Robotic eTEP versus IPOM evaluation: the REVEAL multicenter randomized clinical trial

Clayton C. Petro[1] · Katherine C. Montelione[1] · Samuel J. Zolin[1] · David B. Renton[2] · Jonathan P. Yunis[3] · Michael P. Meara[2] · Adele Costanzo[1] · Kayla Diaz[2] · Kristen McKenzie[3] · Melanie Wilber[3] · Tamela Fonseca[3] · Chao Tu[4] · Molly A. Olson[5] · David M. Krpata[1] · Lucas R. Beffa[1] · Ben K. Poulose[2] · Michael J. Rosen[1] · Ajita S. Prabhu[1]

2022

STUDY POPULATION

Adults with midline ventral hernias ≤ 7cm

HYPOTHESIS

Robotic eTEP offer less early postoperative pain compared to robotic IPOM

RANDOMIZATION

Robotic eTEP

n = 51

Robotic IPOM

n = 49

EVALUATION

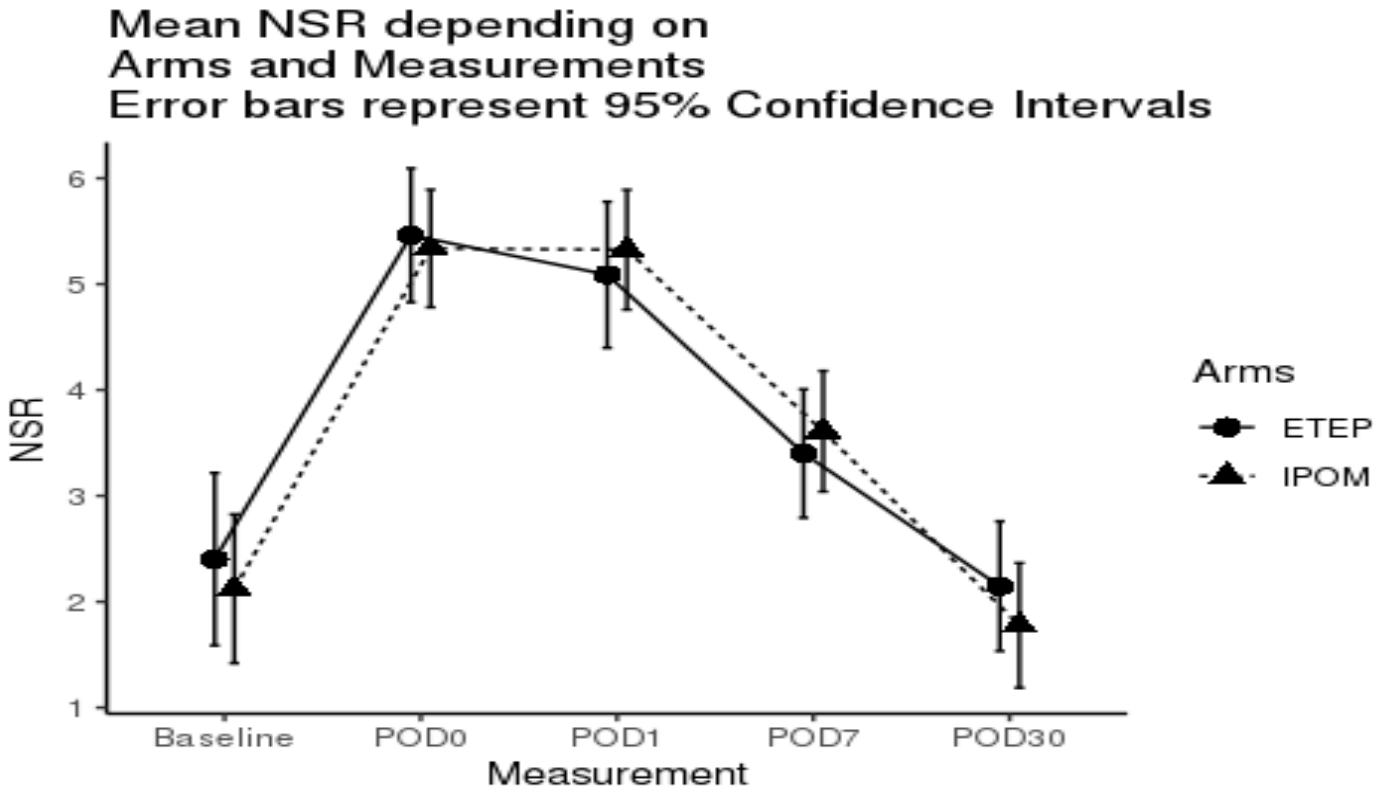
PRIMARY OUTCOME

eTEP does not cause less pain on POD#1 (p=0.66)

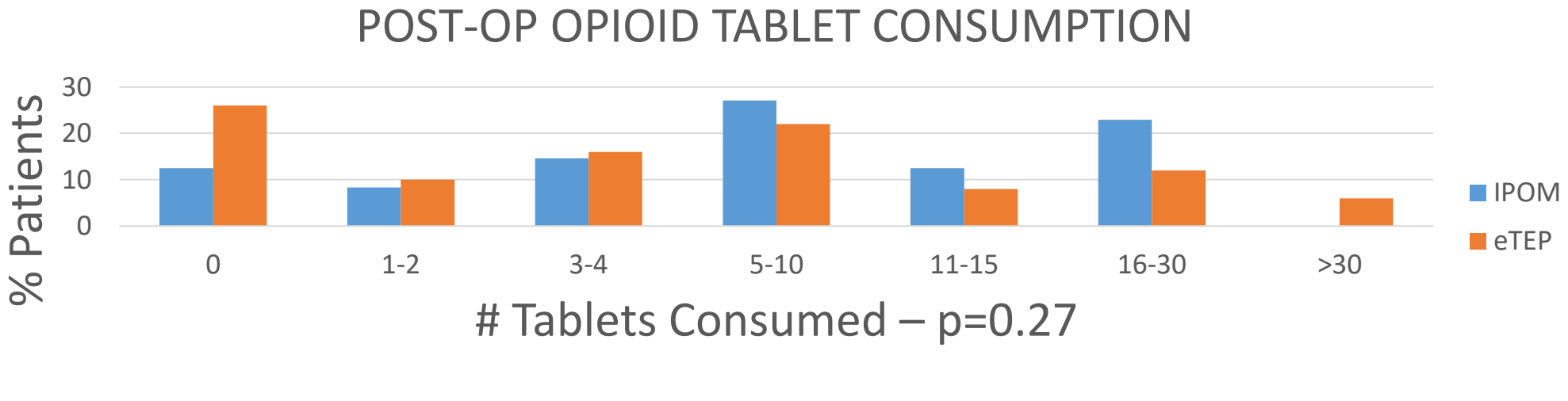
SECONDARY OUTCOMES

No difference in pain on POD #7 or #30, same-day discharge, LOS, opioid consumption, QoL, cost

Less surgeon workload and OR time with robotic IPOM



	Robotic IPOM	Robotic eTEP
Chronic Opioid Use	6% (1/31)	6% (2/34)
Other Chronic Substance Abuse	6% (2/31)	6% (2/34)



HerQLes

Higher Number = Better QoL

92/100

	rIPOM	eTEP	p
Baseline	57 [34 to 76]	49 [31 to 80]	0.69
1-year	92 [81 to 95]	82 [52 to 92]	0.02
Delta	35	33	

OR 0.31 [95% CI 0.15-0.67] p=0.003

HerQLes

REVEAL

	rIPOM	eTEP	p
Baseline	57 [34 to 76]	49 [31 to 80]	0.69
1-year	92 [81 to 95]	82 [52 to 92]	0.02
Delta	35	33	

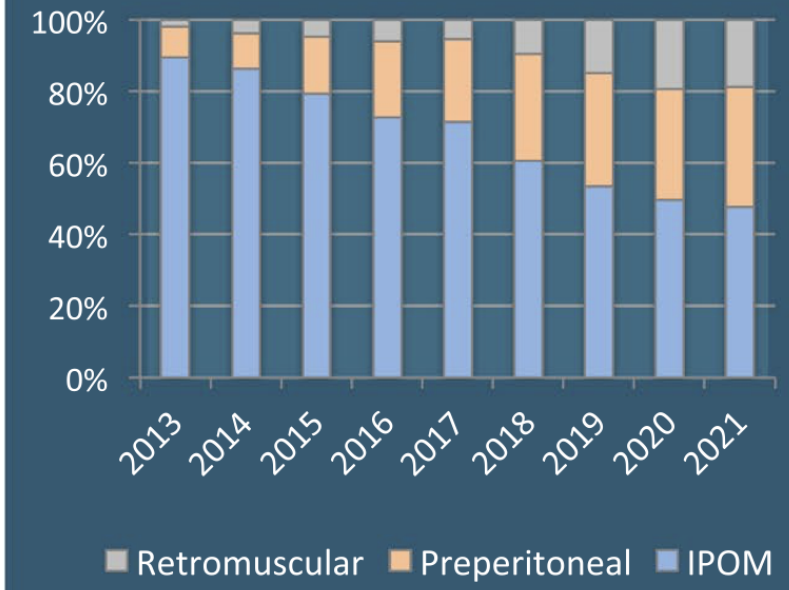
PROVE-IT

	rIPOM	Lap IPOM	p
Baseline	55 [35 to 73]	51 [36 to 76]	0.69
1-year	92 [82 to 100]	77 [49 to 93]	0.04
Delta	35	18	

S041—Trends and short-term outcomes of three approaches to minimally invasive repair of small ventral hernias. An ACHQC analysis

Melanie Vargas[1] · Molly A. Olson[2] · Thomas E. Read[3] · Mazen R. Al-Mansour[3]

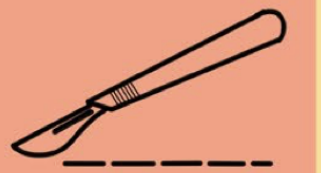
Ventral hernia ≤ 6 cm (N= 7261)



Robotic approach

Retromuscular	89%
Preperitoneal	86%
IPOM	47%

Transversus abdominis release performed in 14% of retromuscular



Short-term outcomes

Retromuscular vs. Preperitoneal

- ↑ 30-day reoperation (OR=5.3)
- ↑ 30-day readmission (OR=2.6)

Retromuscular vs. IPOM

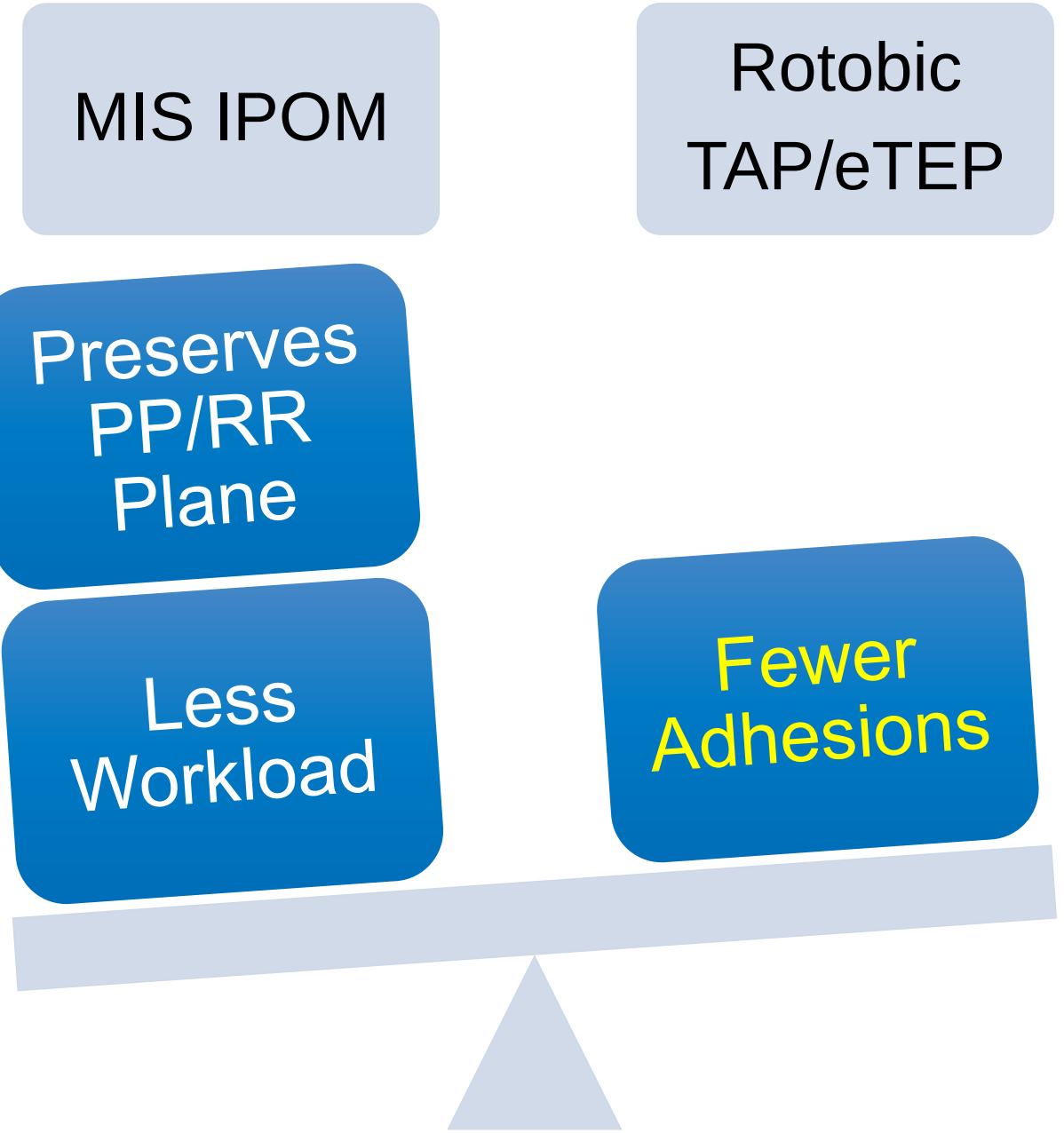
- ↑ 30-day reoperation (OR=3.5)

Preperitoneal vs. IPOM

No significant differences

Small/Medium 2-7cm Ventral Hernias

- ~~Less Wound Morbidity~~
- ~~Fewer Mesh Complications~~
- ~~Less Pain~~



ORIGINAL ARTICLE

Risk of Complications From Enterotomy or Unplanned Bowel Resection During Elective Hernia Repair

Stephen H. Gray, MD; Catherine C. Vick, MS; Laura A. Graham, MPH; Kelly R. Finan, MD, MSPH; Leigh A. Neumayer, MD, MS; Mary T. Hawn, MD, MPH

- 4x increase in enterotomy
- 4x increase in re-operation
- More fistulas
- UNCOATED MESH

ORIGINAL ARTICLE

Long-term outcomes of 1326 laparoscopic incisional and ventral hernia repair with the routine suturing concept: a single institution experience

E. Chelala[1] · H. Baraké[1] · J. Estievenart[1] · M. Dessily[1] · F. Charara[1] · J. L. Allé[1]

- 1326 IPOM repairs
- 126 Reoperations
  - 90% adhesion-free or with loose adhesions

Small/Medium 2-7cm Ventral Hernias

- ~~Less Wound Morbidity~~
- ~~Fewer Mesh Complications~~
- ~~Less Pain~~
- ~~Fewer Adhesions~~

MIS IPOM

Rotobic TAP/eTEP

Preserves PP/RR Plane

Less Workload

Cleveland Clinic

Small/Medium 2-7cm Ventral Hernias

~~Less Wound Morbidity~~

~~Fewer Mesh Complications~~

~~Less Pain~~

~~Fewer Adhesions~~

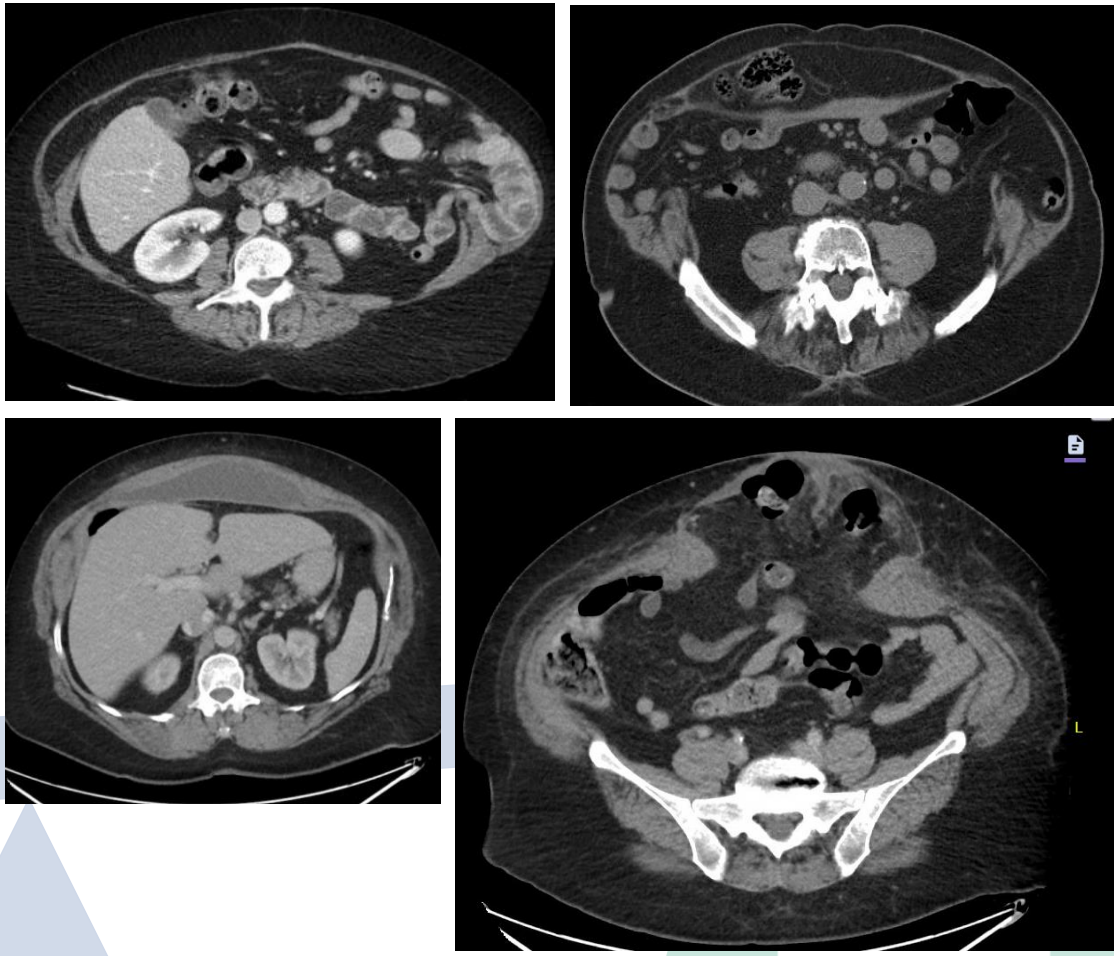
MIS IPOM

Fewer procedural complications

Preserves PP/RR Plane

Less Workload

Rotobic TAP/eTEP



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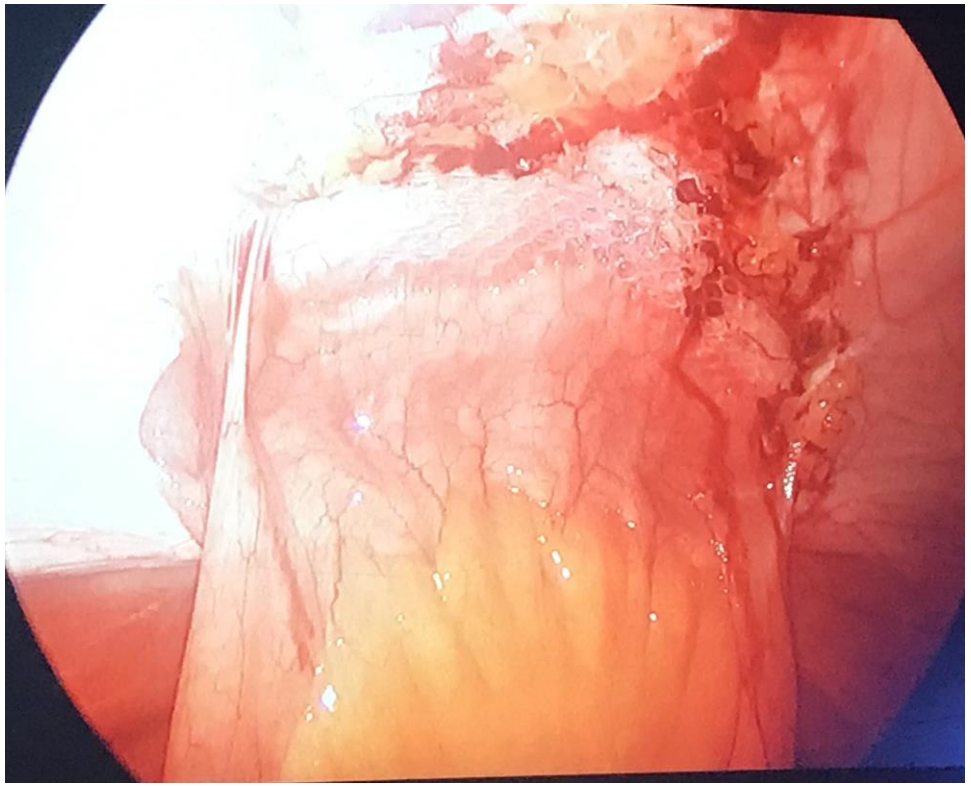
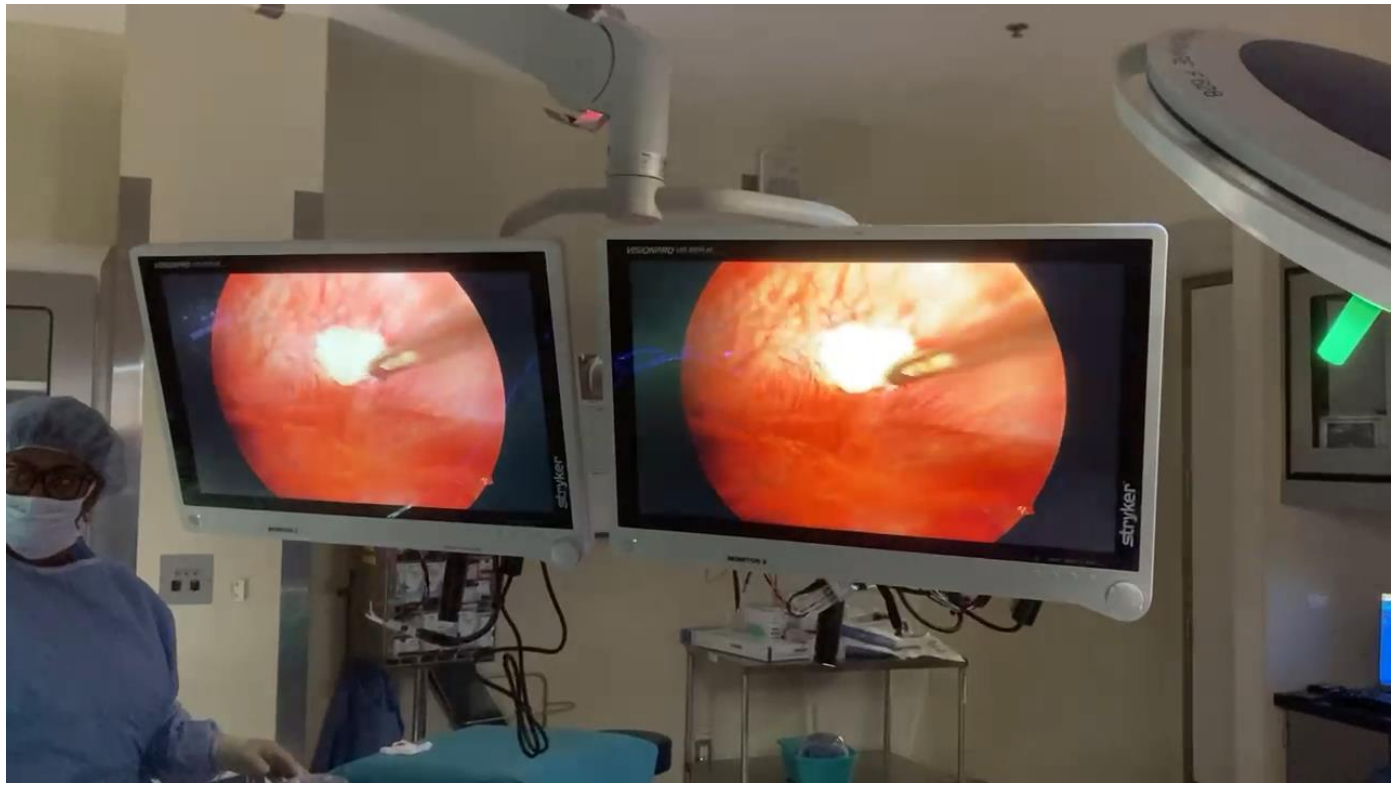
Extraperitoneal mesh gone wrong…





Small/Medium 2-7cm Ventral Hernias

- ~~Less Wound Morbidity~~
- ~~Fewer Mesh Complications~~
- ~~Less Pain~~
- ~~Fewer Adhesions~~
- ~~Fewer procedural complications~~

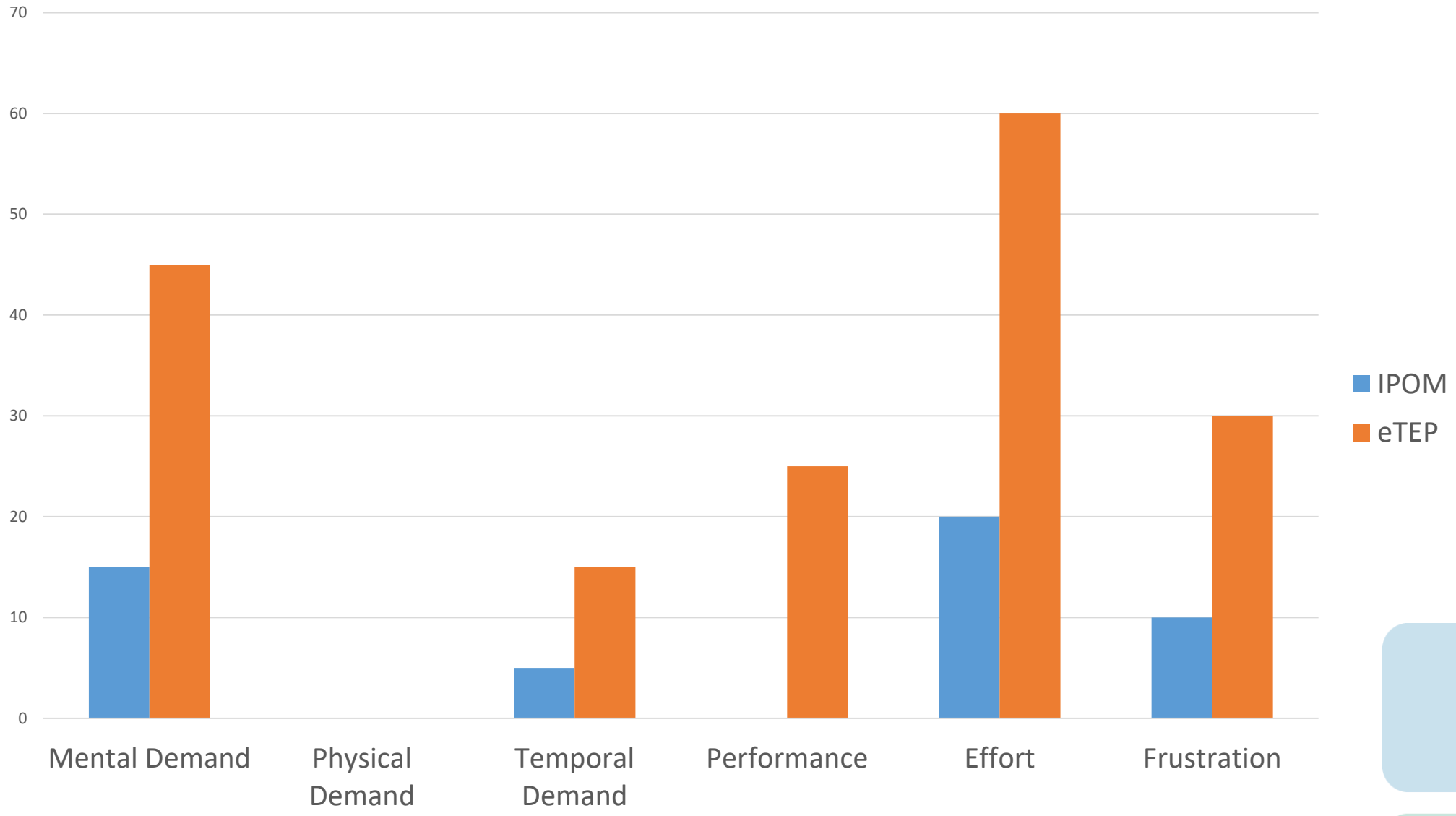
MIS IPOM

Rotobic TAP/eTEP

Preserves PP/RR Plane

Less Workload

NASA-TLX SUBSCALES



p =	**<0.001**	**0.087**	**<0.001**	**0.019**	**0.009**	**<0.001**

Small/Medium 2-7cm Ventral Hernias

- ~~Less Wound Morbidity~~
- ~~Fewer Mesh Complications~~
- ~~Less Pain~~
- ~~Fewer Adhesions~~
- ~~Fewer procedural complications~~

MIS IPOM

Rotobic TAP/eTEP

Preserves PP/RR Plane

Less Workload

Small/Medium 2-7cm Ventral Hernias

- ~~Less Wound Morbidity~~
- ~~Fewer Mesh Complications~~
- ~~Less Pain~~
- ~~Fewer Adhesions~~
- ~~Fewer procedural complications~~

MIS IPOM

Rotobic TAP/eTEP

Preserves PP/RR Plane

Less Skill

Small/Medium 2-7cm Ventral Hernias

~~Fewer Mesh Complications~~

~~Less Wound Morbidity~~

~~Less Pain~~

~~Fewer procedural complications~~

MIS IPOM

Rotobic TAP/eTEP

Preserves PP/RR Plane

More Skill!

Selective Use of eTEP/TAPP

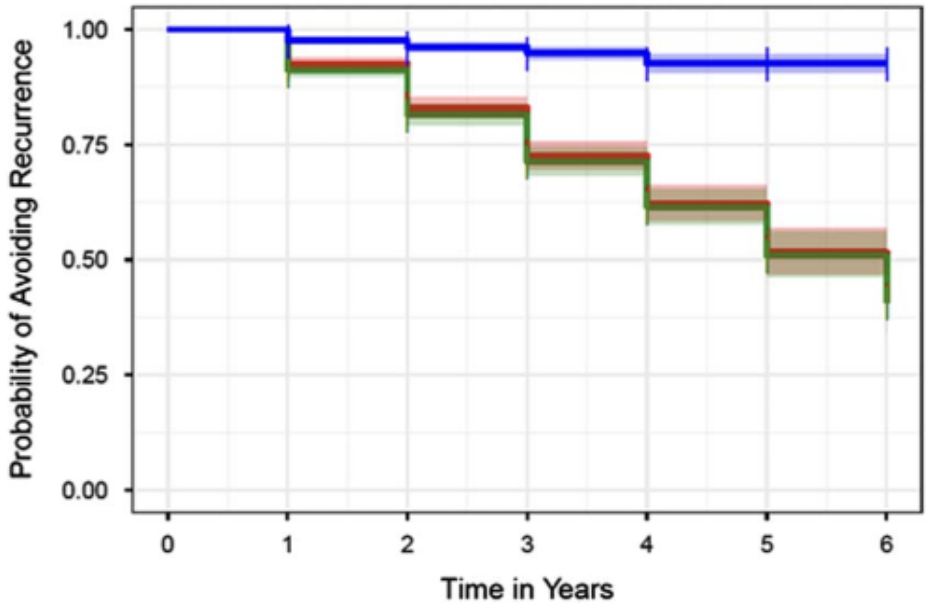
- Particularly Useful:
  - Recurrences after IPOM
  - Suprapubic and sub-xyphoid defects
  - Crohn’s patients
  - Multiple spaced-out small midline hernias
  - Concomitant inguinal/ventral

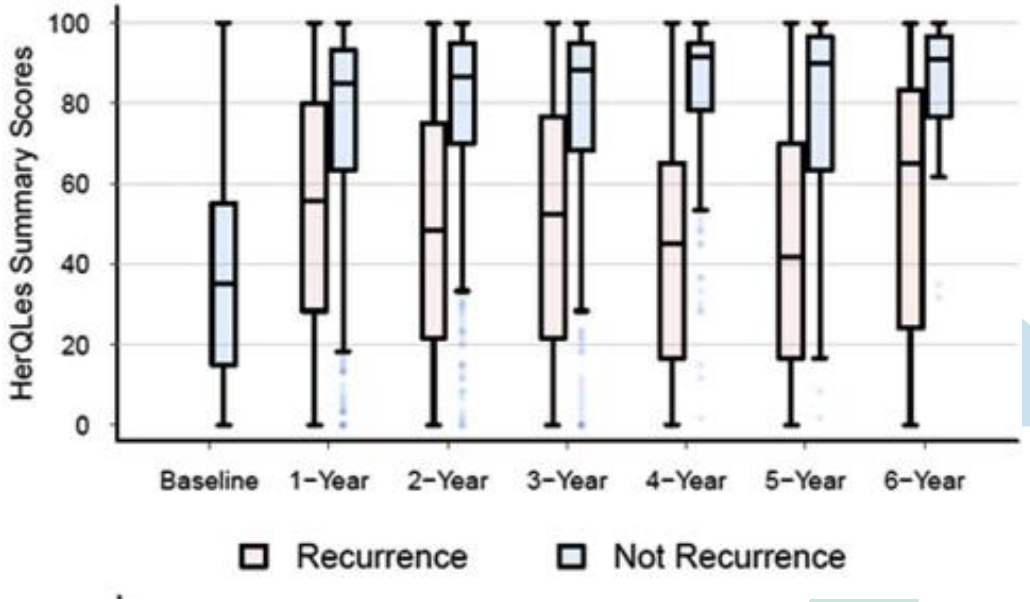
Does the Plane We Put Mesh Really Matter?

- For 2-7cm hernias… probably not.

Long-term Clinical and Patient-Reported Outcomes After Transversus Abdominis Release With Permanent Synthetic Mesh: A Single Center Analysis of 1203 Patients

Samuel J. Zolin, MD,✉ David M. Krpata, MD,* Clayton C. Petro, MD,* Ajita S. Prabhu, MD,* Steven Rosenblatt, MD,* Samantha Rosen, BA,* Reid Thompson, BS,* Aldo Fafaj, MD,* Jonah D. Thomas, MD, MS,† Li-Ching Huang, PhD,‡ and Michael J. Rosen, MD**





Conclusions

- Surgeons are over-applying the benefits of extraperitoneal mesh that were underscored for large OPEN hernia repairs.

- Surgeons are willing to embrace the fear of intraperitoneal mesh, but NOT the problems with achieving extraperitoneal mesh.