Robots to 2020: Hernia & AWR

34TH ANNUAL
CONTROVERSIES, PROBLEMS & TECHNIQUES IN SURGERY

Montefiore EINSTEIN

FLAVIO MALCHER
CRM 52 64384

Disclosures

- Bard/Davol – advisory board
- KCI/Acelity - research grant

SEX MACHINE

Poll Finds 1 in 5 People Would Have Sex With a Robot

Would you have sex with a robot? If you answered yes, you're not alone.

CHARLOTTE LYTTON 05.07.14 9:45 AM ET

2014

Forget raging against the machine: Some people would rather get nasty with it instead. A new survey has found that one in five U.K.-dwellers would be willing to have sex with robots, marking something of a leap in the realm of digitized romance.

Over 2,000 people were quizzed on their attitudes toward androids—with less than favorable results. Forty-six percent of participants said they felt that technology was progressing too quickly, while a third expressed fears that automatons posed a serious threat to humanity. The same number also believed that robots may soon replace key jobs, including those of soldiers, cops and teachers.

Middlesex University's Professor Martin Smith, who oversaw the study, said, "While many of us worry about the role of technology and machines in modern society, robots are increasingly being developed for important roles

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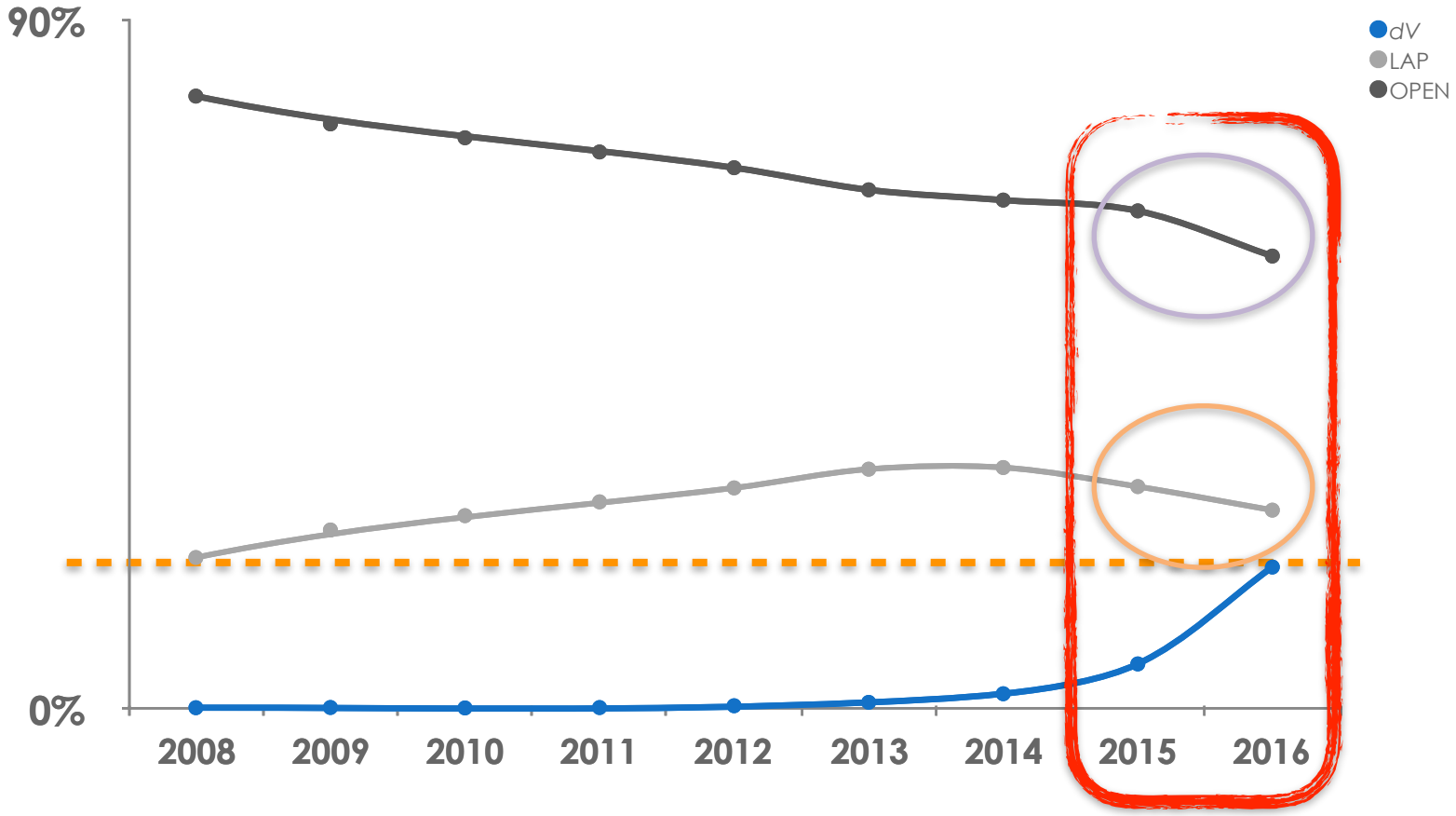
2017

Enabling MIS with *da Vinci*® Surgery for Hernia Repair

National Trends in Hernia Repair by Surgical Approach*



*Based on Q1 2008 through Q3 2015 Premier data listing ventral or inguinal hernia repair as the primary procedure. The data are not collected under formalized study. The data have not been peer-reviewed and have not been published.

† Open and laparoscopic surgery 2016 market penetration projections based on ISI internal estimates. *da Vinci* Surgery 2016 market penetration projection based on Goldman Sachs financial model on 02/06/16

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- Artic ted and precise instruments
- No caling of movements
- St vision
- Remote
- Ergonomics
- Training tools
- Shorter learning curve

EASIER

FDA Investigates Robotic Surgery System After Adverse Event Spike

Robert Lowes | Apr 30, 2013

Medscape from WebMD

A spike in the number of adverse event reports (AERs) associated with the *da Vinci Surgical System* (Intuitive Surgical) last year has prompted the US Food and Drug Administration (FDA) to survey surgeons about their experience with this technology for robot-assisted surgery.

Some of the AERs on file with the FDA pertain to equipment malfunctions that resulted in no harm to patients during operations that ranged from hysterectomies to coronary artery bypass graft surgery. Other reports describe injuries and deaths, although they are not necessarily blamed on an equipment problem. In some cases, surgeons who operated robotic arms and the various tools attached to them punctured bladders, severed nerves and blood vessels, and otherwise appeared responsible for the mishaps.

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AW robotic surgery

Open Surgeons:

Enables MIS -> easier learning curve and adoption

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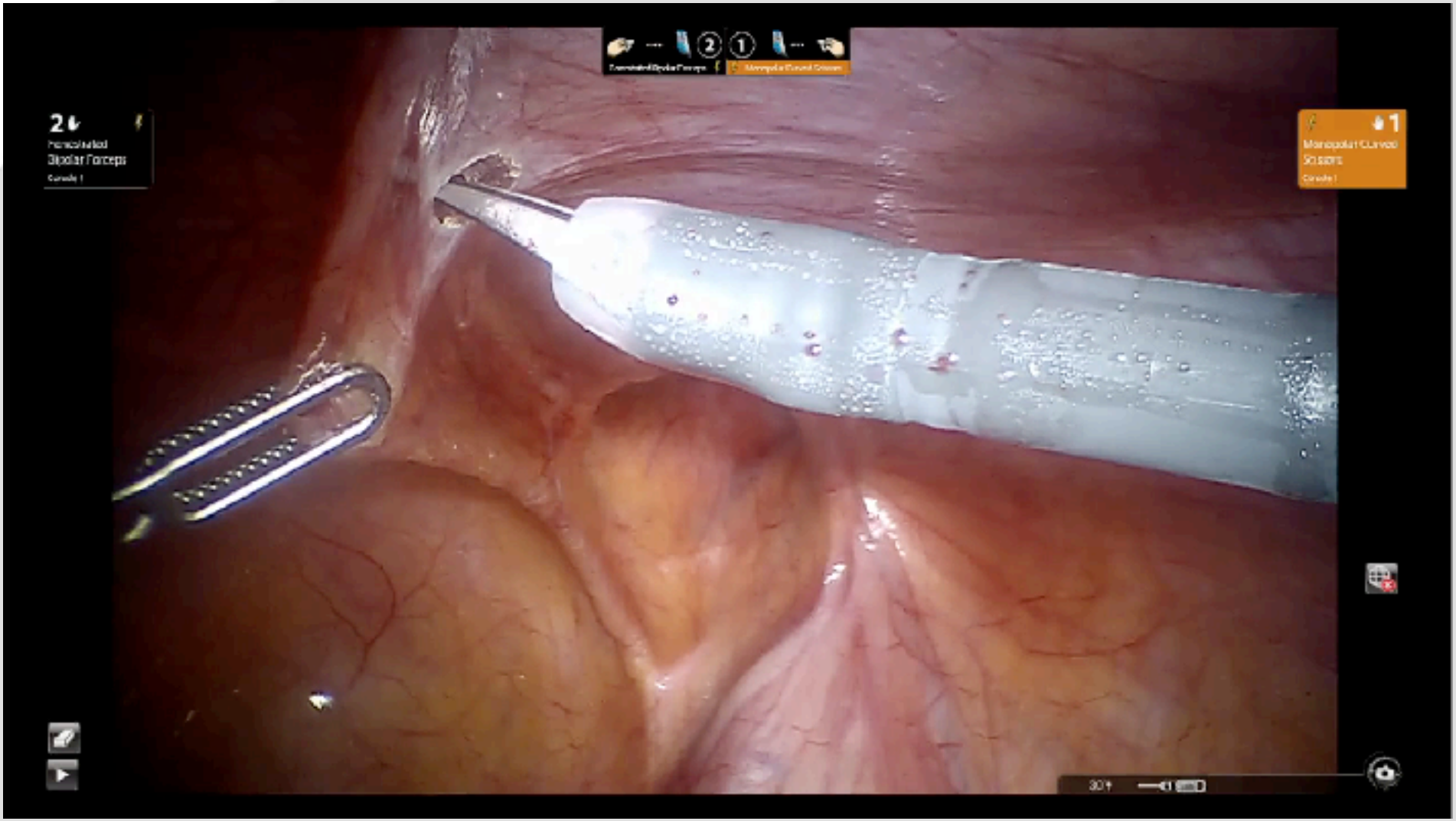
R-TAPP



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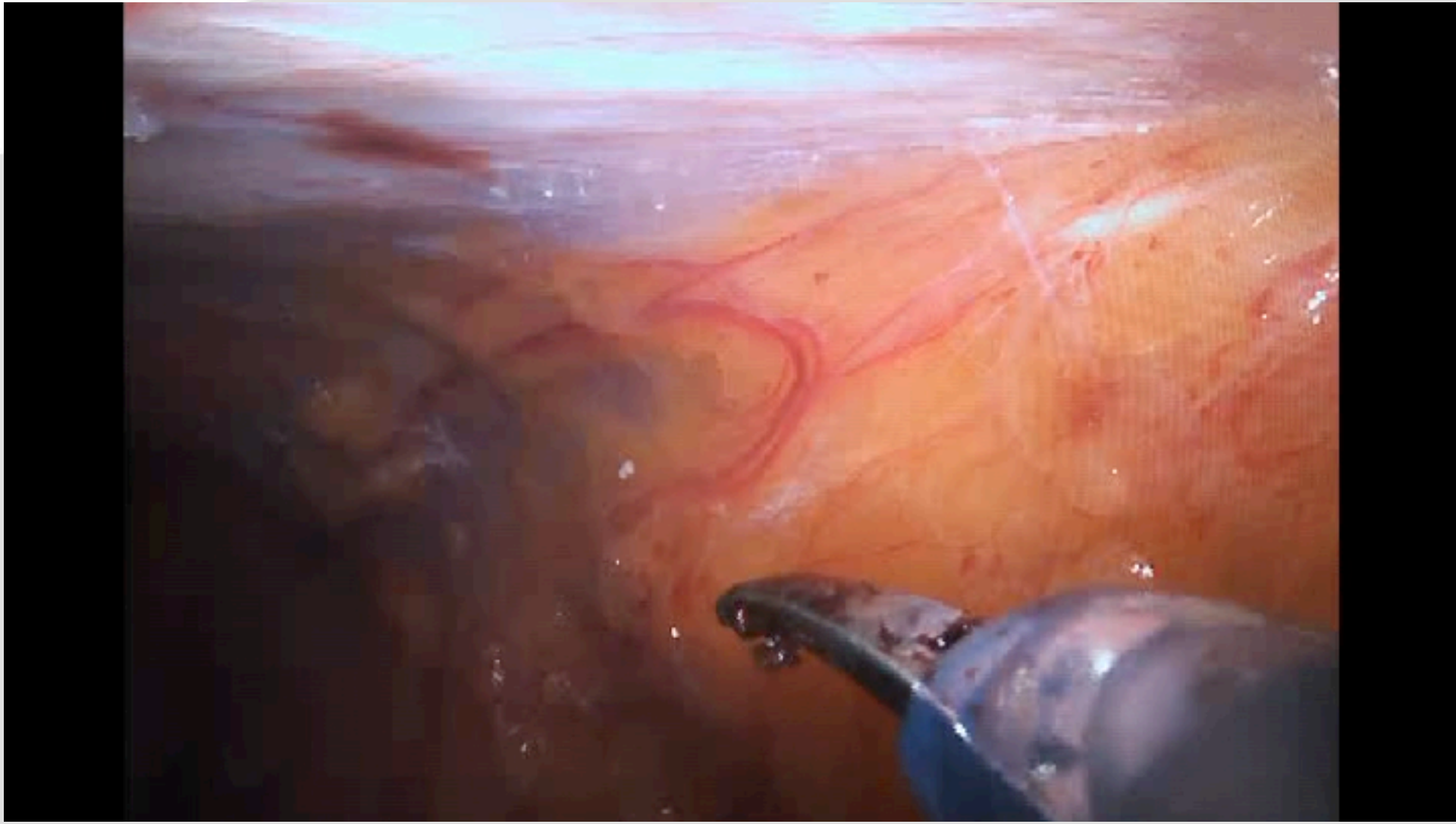
R-IPOM
Adhesiolysis



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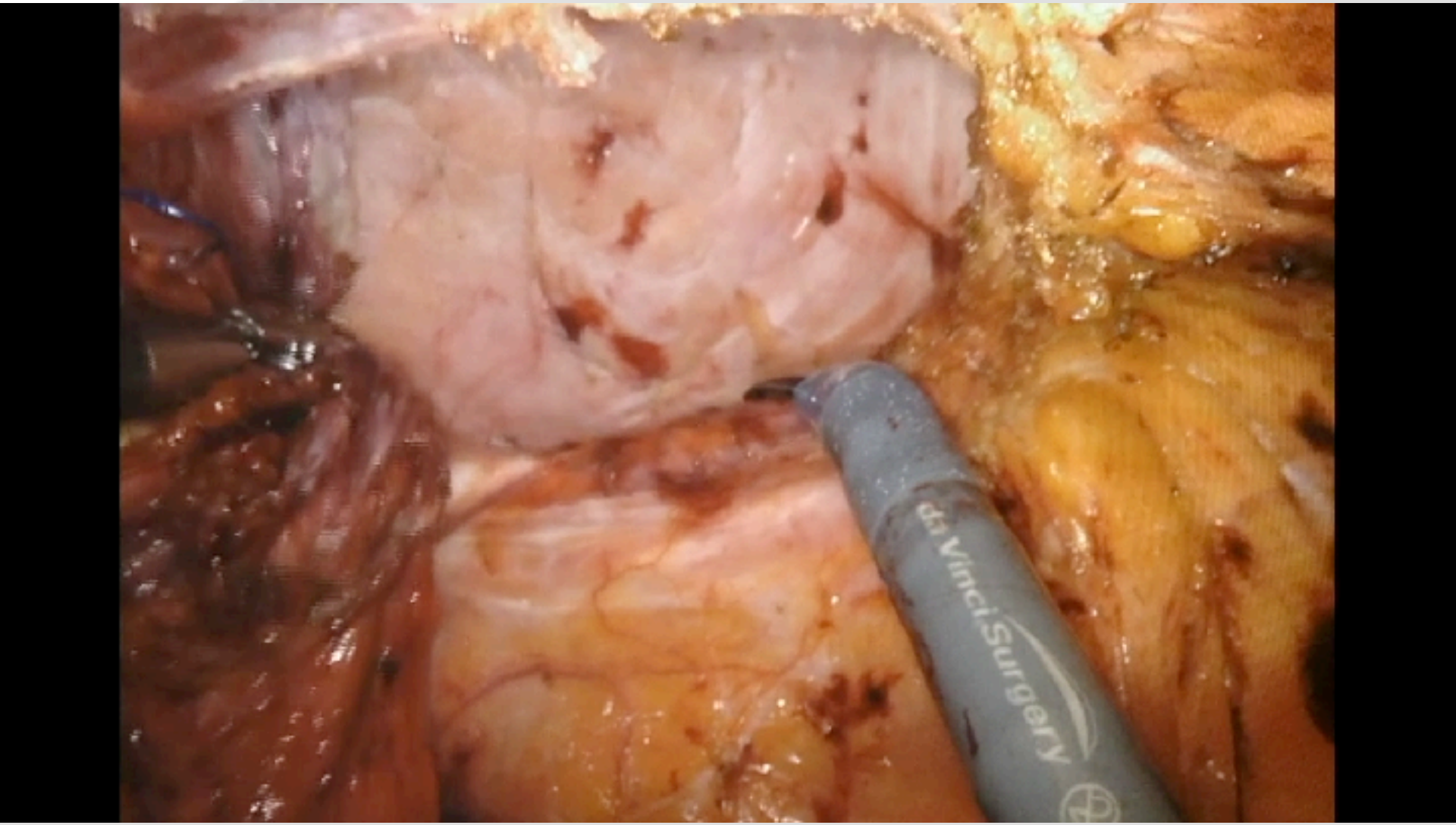
Hernia sac dissection / removal



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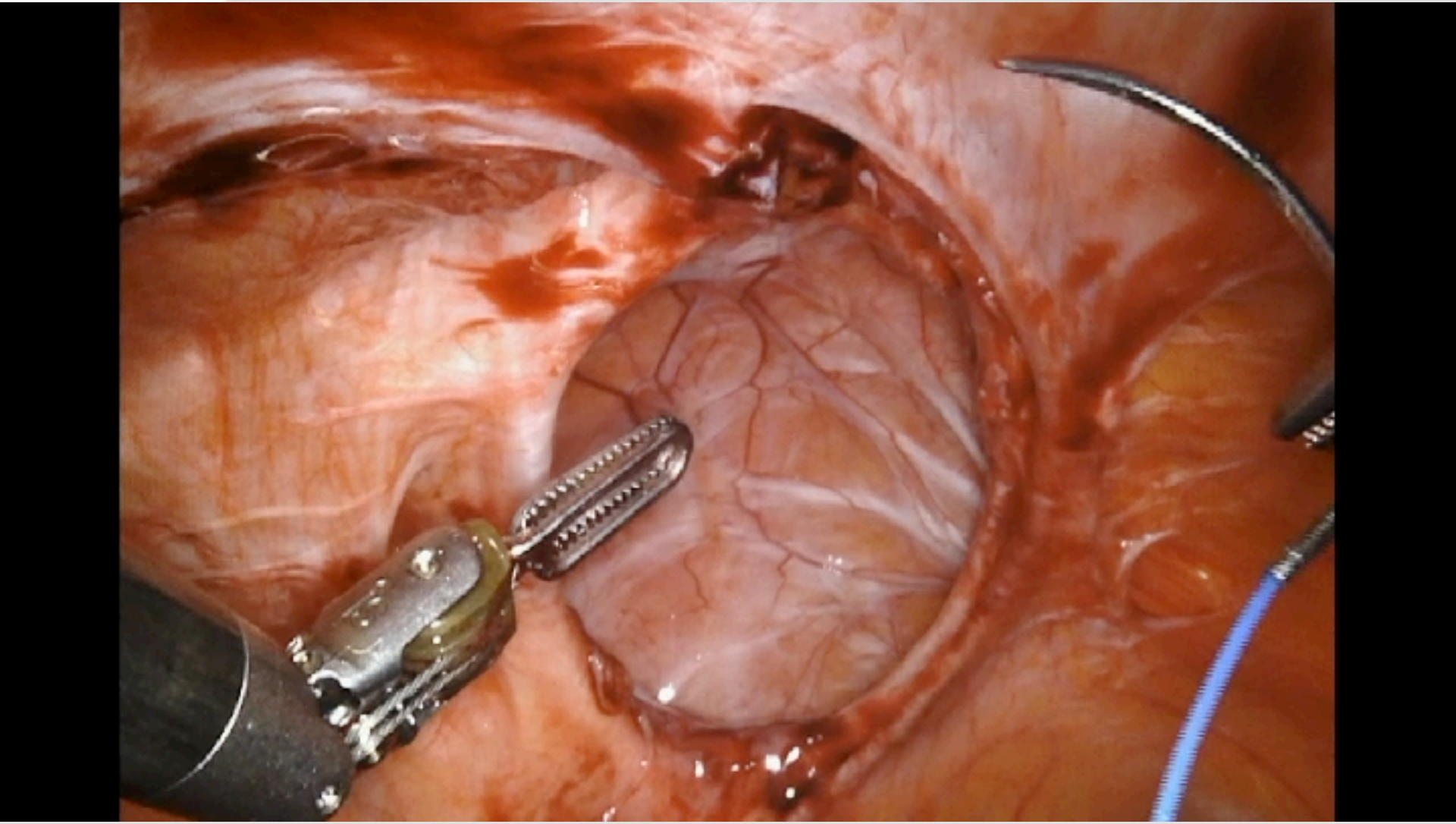
Defect closure



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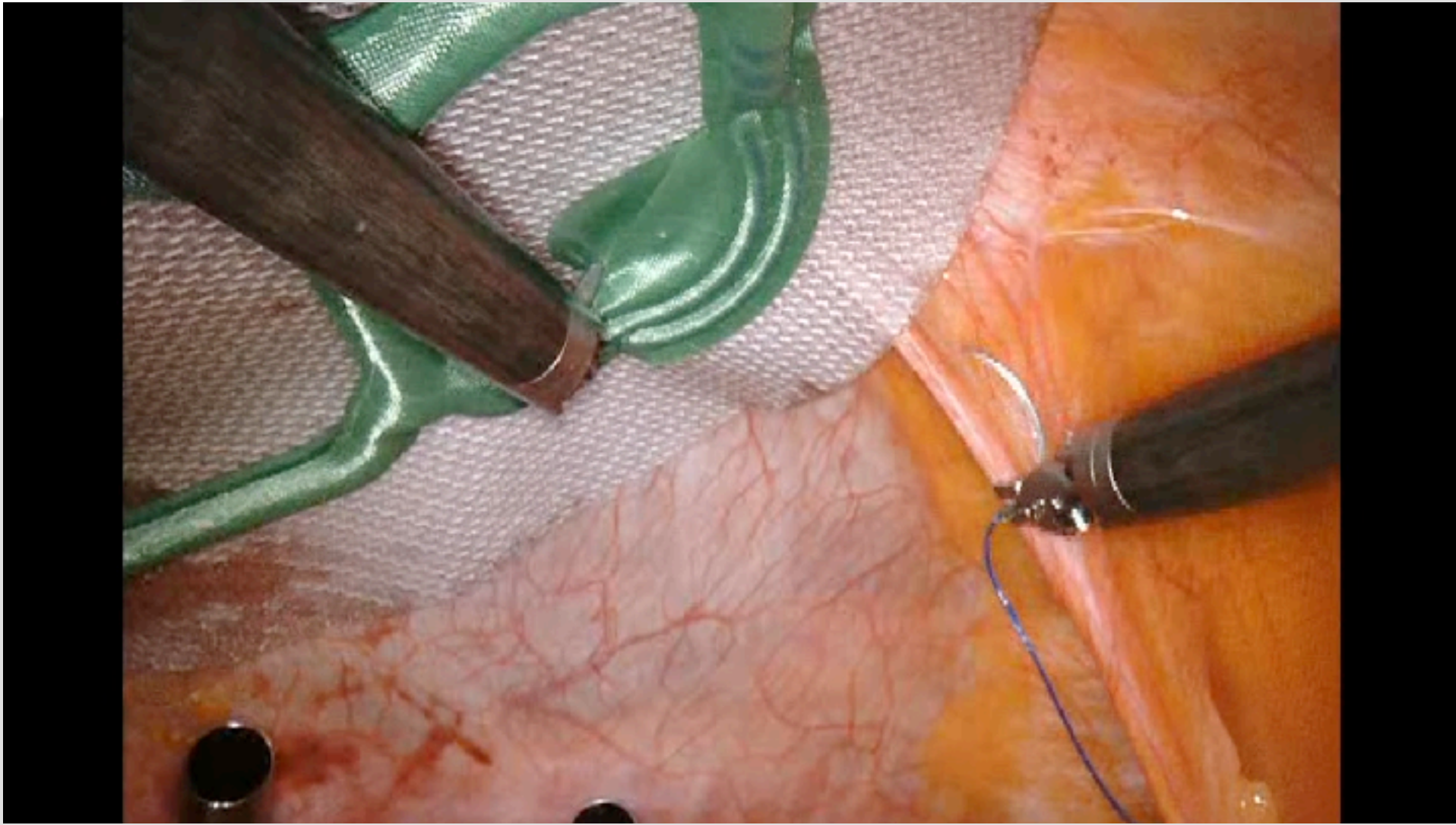

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AW robotic surgery

Lap Surgeons:

Do what you do: better, easier and more comfortably & in challenging cases

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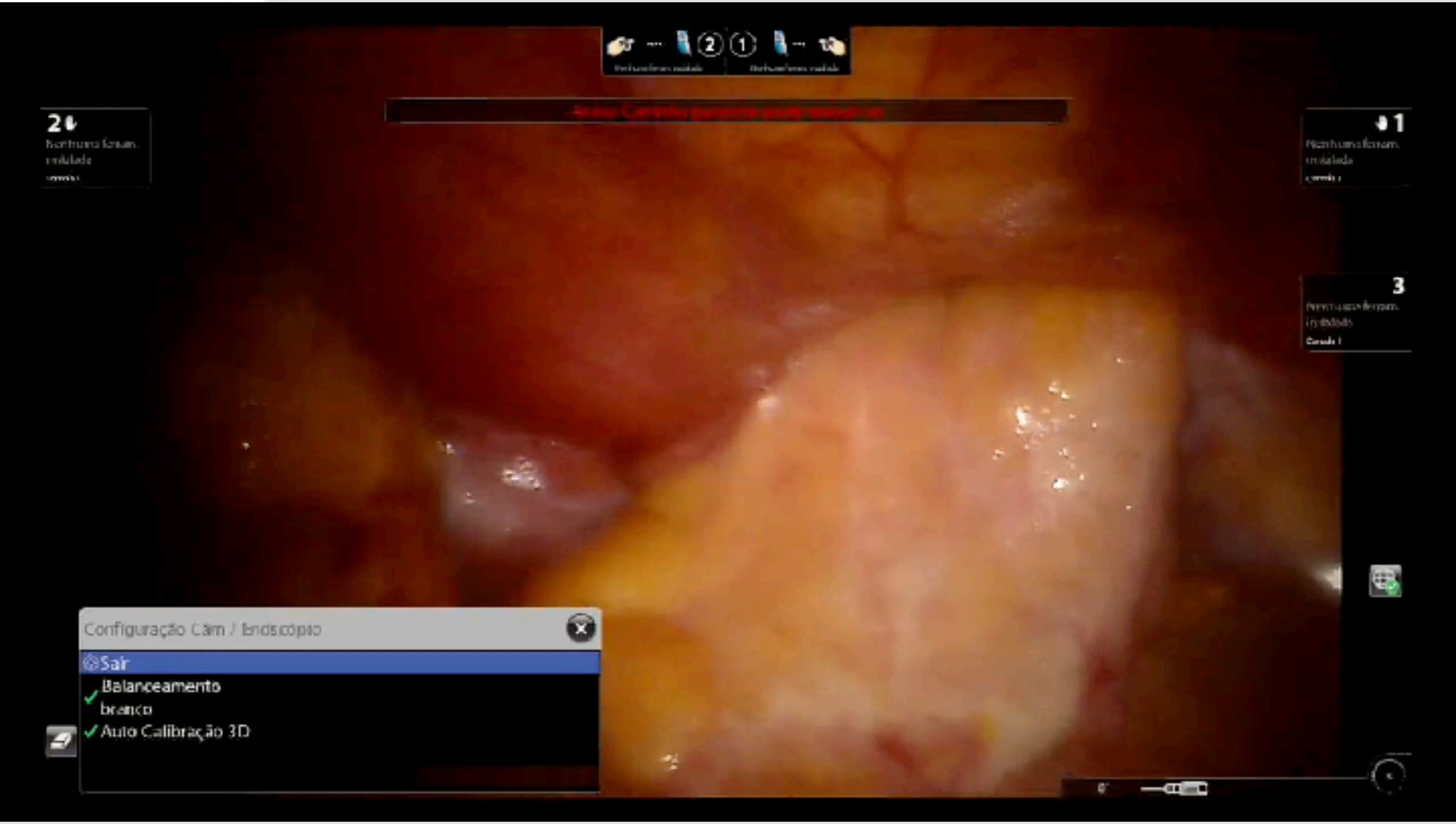
R-Stoppa



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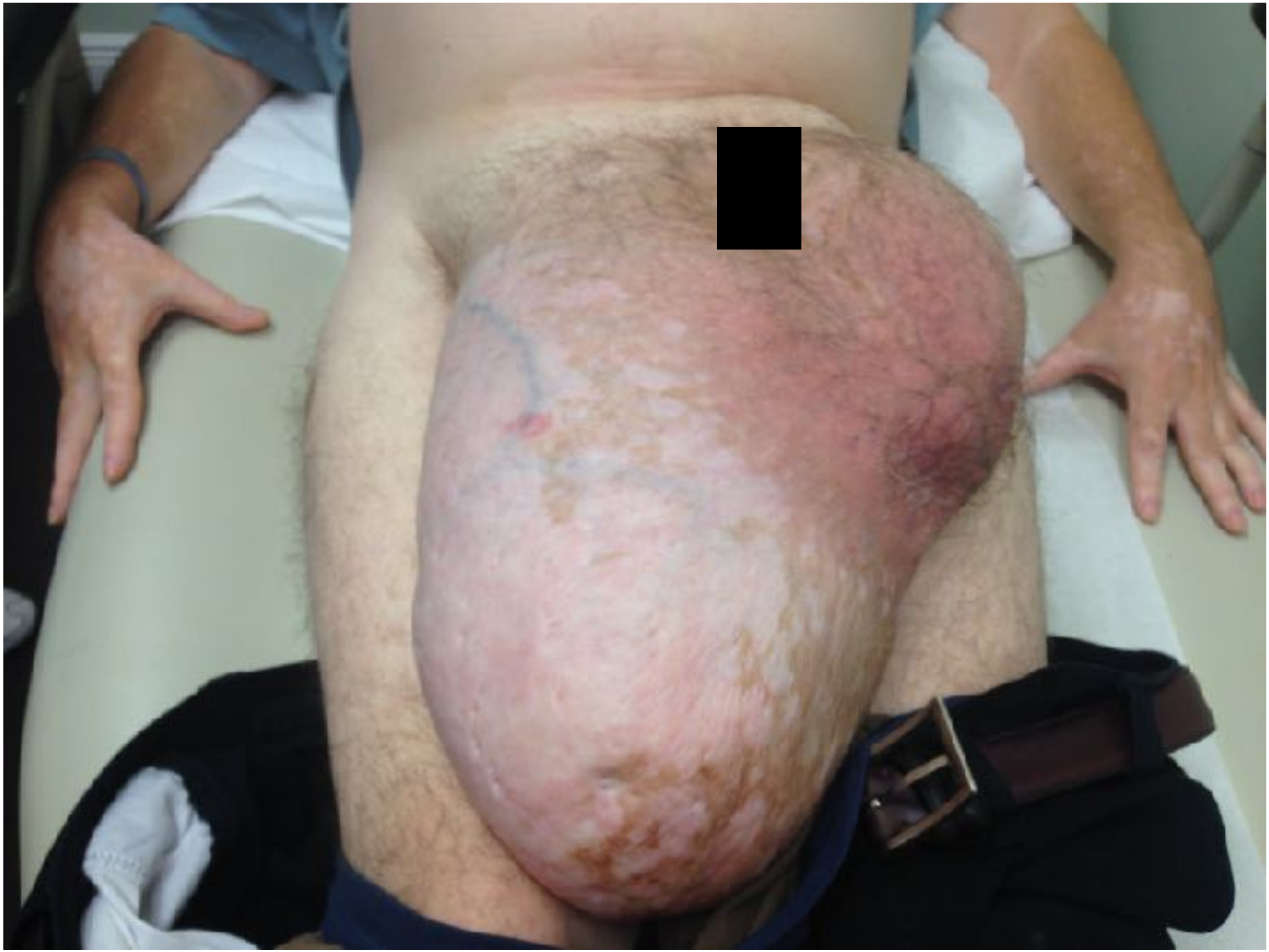
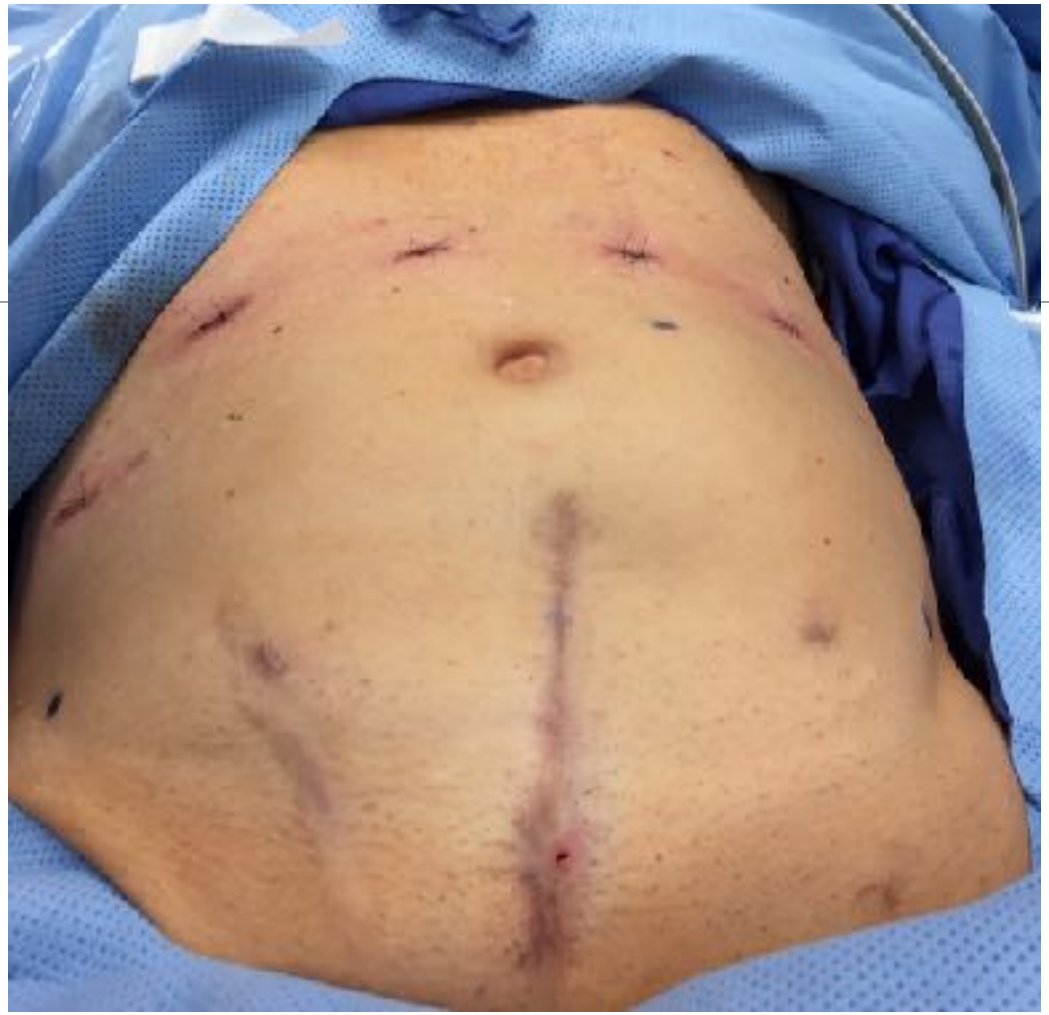


Anterior technique recurrence: Plug and patch removal

Posterior Technique Recurrence: Previous TAPP

Recurrent bilateral inguinal hernia open and hx of open prostatectomy



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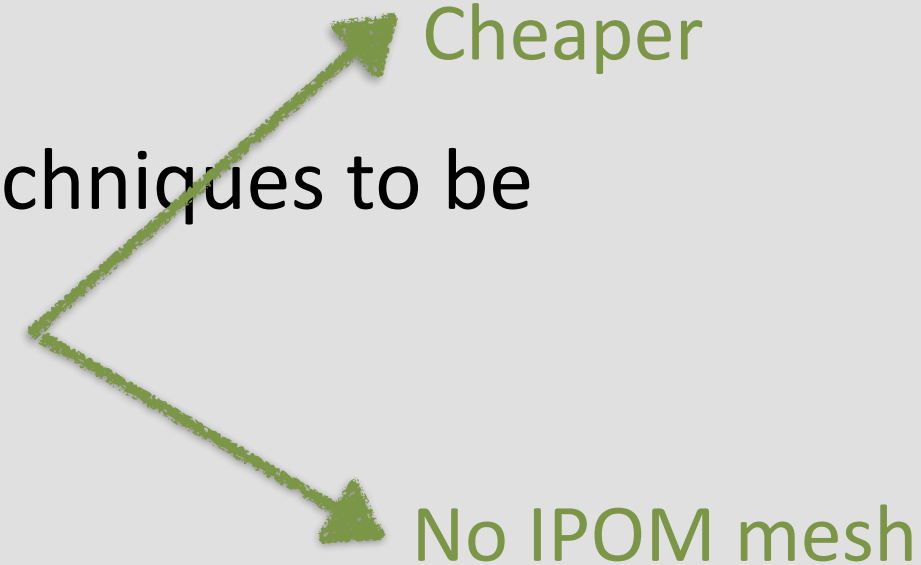
AW robotic surgery

Both:

Allows classic “open" techniques to be performed by MIS:

- Ventral TAPP
- Rives-Stoppa
- Onlay repair
- Component Separation (anterior& posterior)



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Costs in Ventral Repair

	Lap (US$)	Robot (US$)
System (capital cost)	200 k	2 M
Contract (yearly)	?	100 k
Instruments	?	800
Mesh	1 k	100
Fixation	1 k	40
	Total/case	Total/case
	2 k + ??	1 k + ??

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Nationwide Prospective Study of Outcomes after Elective Incisional Hernia Repair

Frederik Helgstrand, MD, Jacob Rosenberg, DMSC, FACS, Henrik Kehlet, PhD, FACS (HON), Lars N Jorgensen, DMSC, Thue Bisgaard, DMSC

J. Am Coll Surg, 2013. 216(2), 217–228

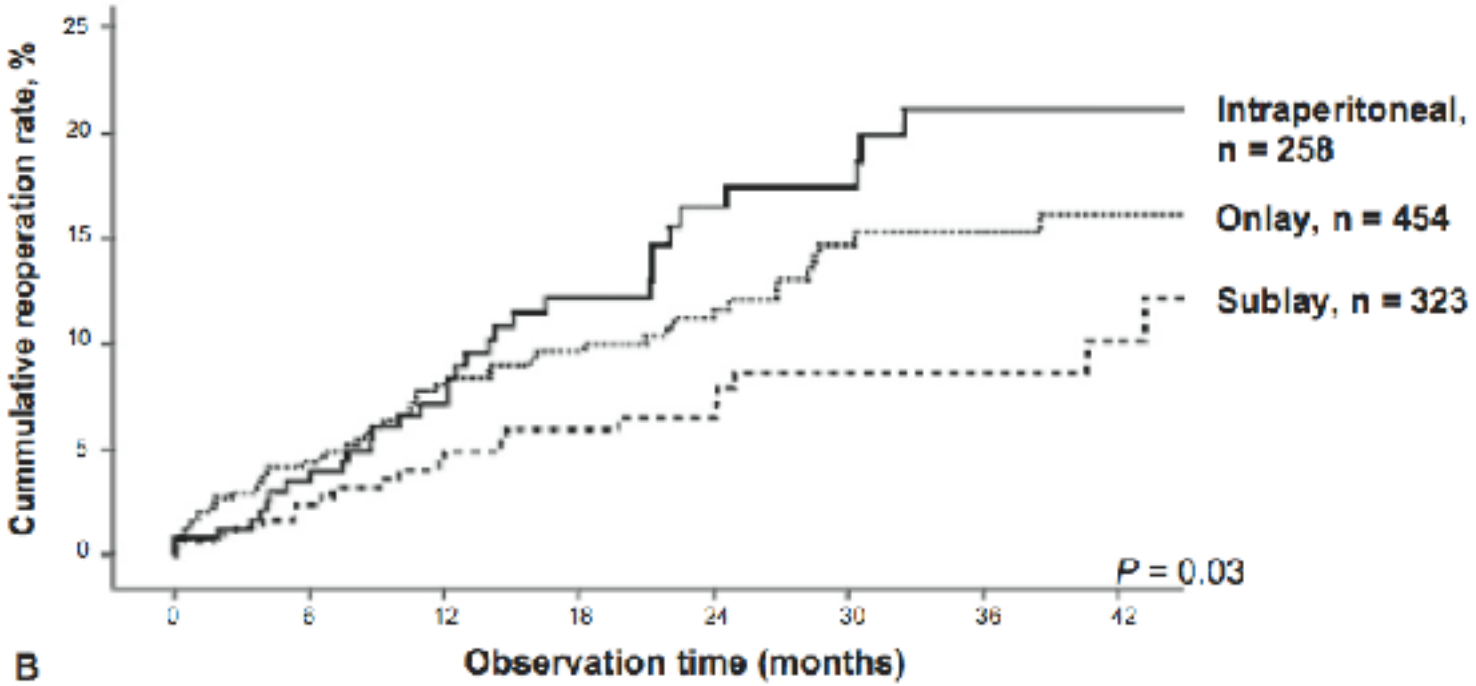

Figure 2. Cumulated reoperation rate for recurrence after open incisional hernia repair. (A) Reoperation for recurrence after sutured vs mesh repair; (B) reoperation for recurrence according to mesh position (onlay, sublay, and intraperitoneal). n, number of repairs.

Surg Endosc (2017) 31:823–828
DOI 10.1007/s00464-016-5038-z

Risks of subsequent abdominal operations after laparoscopic ventral hernia repair

Puraj P. Patel[1] · Michael W. Love[1] · Joseph A. Ewing[1] · Jeremy A. Warren[1] · William S. Cobb[1] · Alfredo M. Carbonell[1]

- 733 laparoscopic incisional hernia repairs
- 17% reoperation rate

Table 3 Indications for reoperation

Characteristic	Value
Recurrent hernia	33 (26.4)
Bowel obstruction	18 (14.4)
HPB	17 (13.6)
Infected mesh removal	15 (12.0)
Gynecology	10 (8.0)
Colorectal	8 (6.4)
Bariatric	4 (3.2)
Trauma	1 (0.8)
Other	19 (15.2)

- 4% enterotomy or unplanned bowel resection

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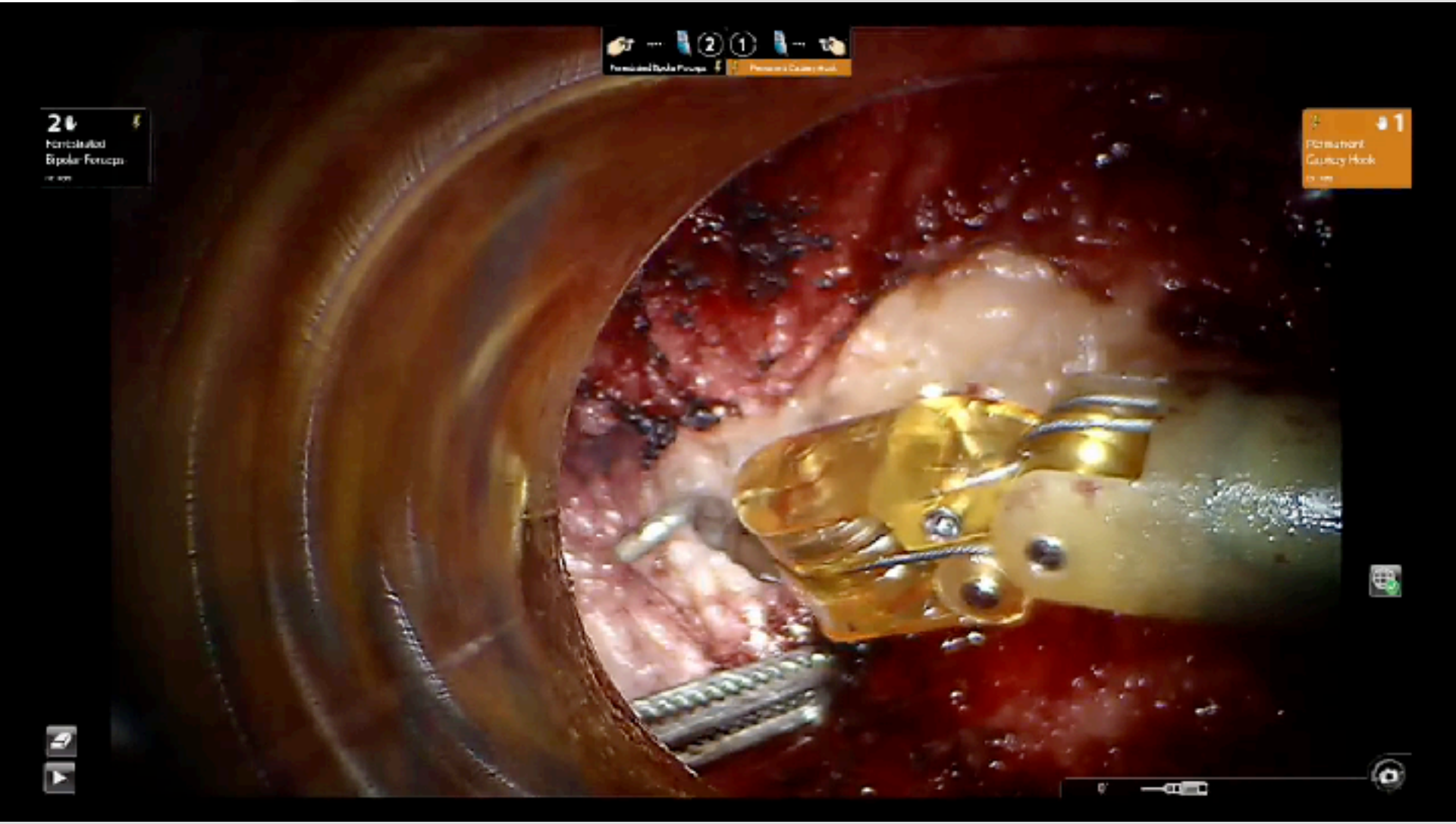
R-Onlay



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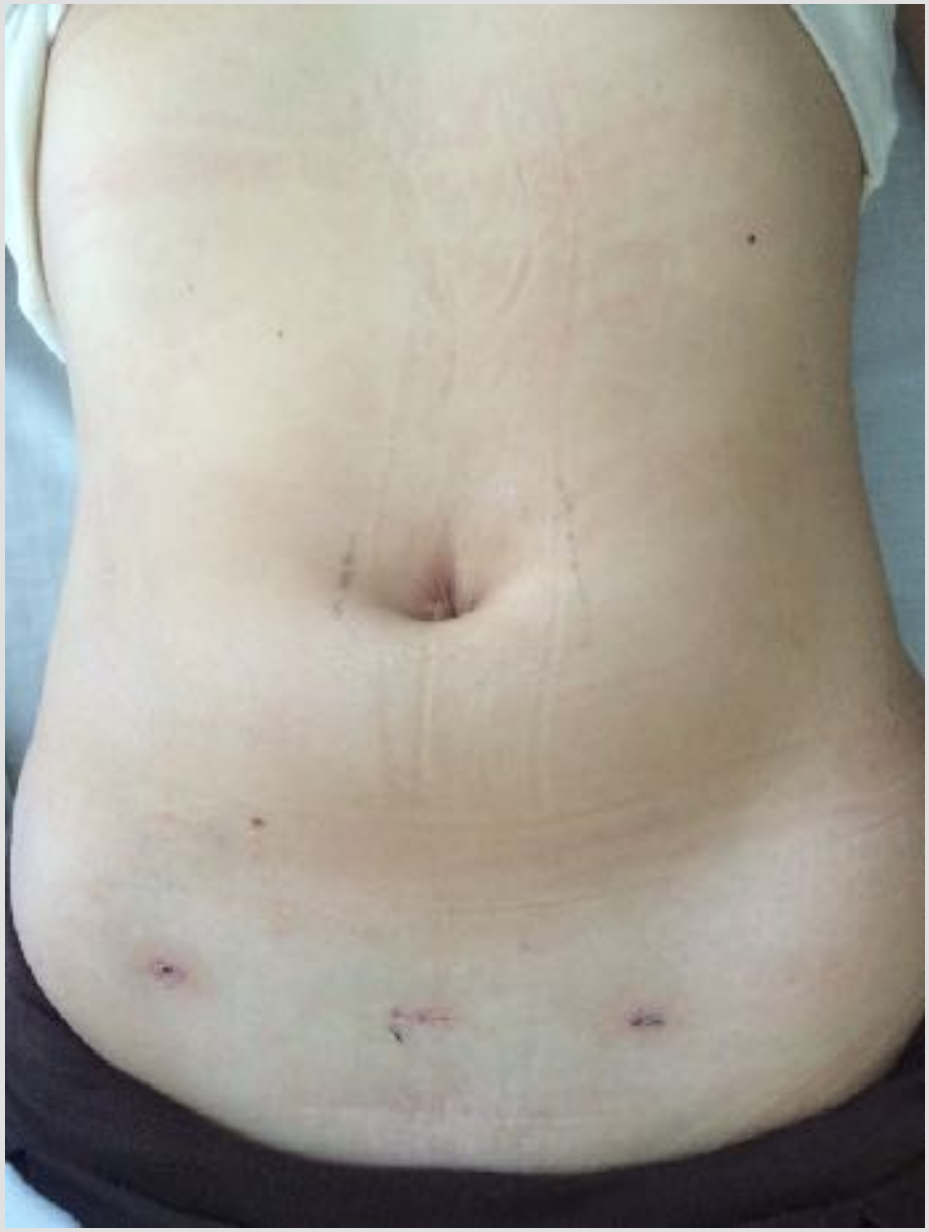
- 30 day FU

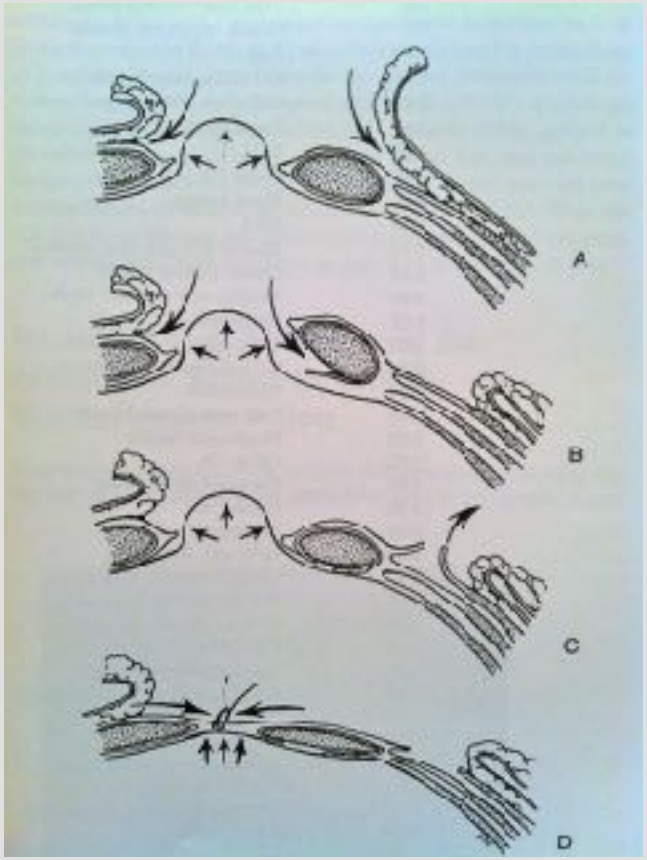


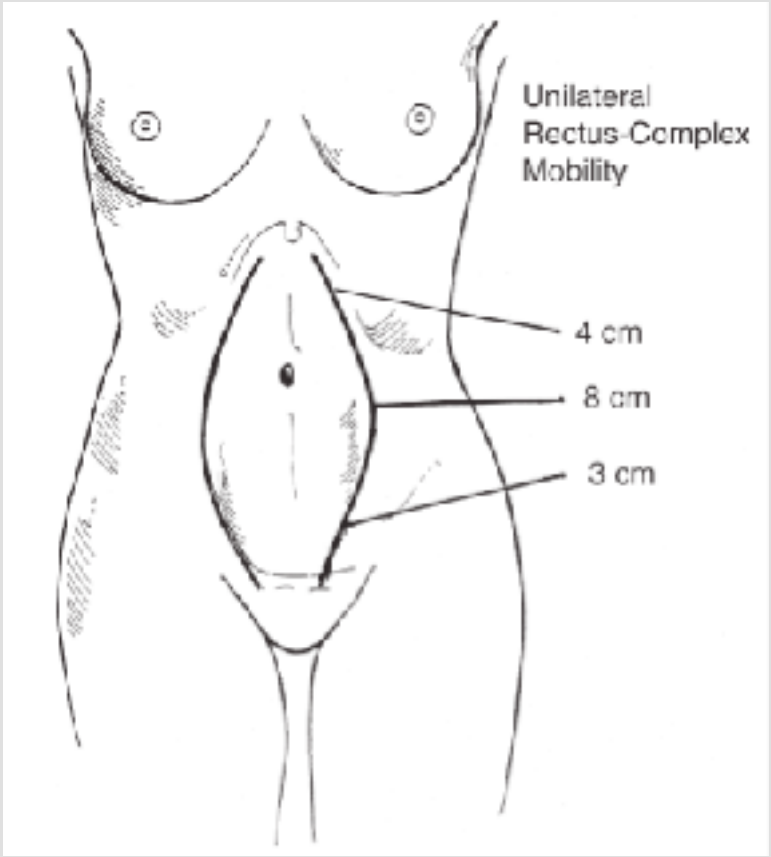
"Components Separation" Method for Closure of Abdominal-Wall Defects: An Anatomic and Clinical Study

Oscar M. Ramirez, M.D., Ernesto Ruas, M.D., and A. Lee Dellon, M.D.

Baltimore, Md.

Plast Reconstr Surg. 1990 Sep;86(3):519-26





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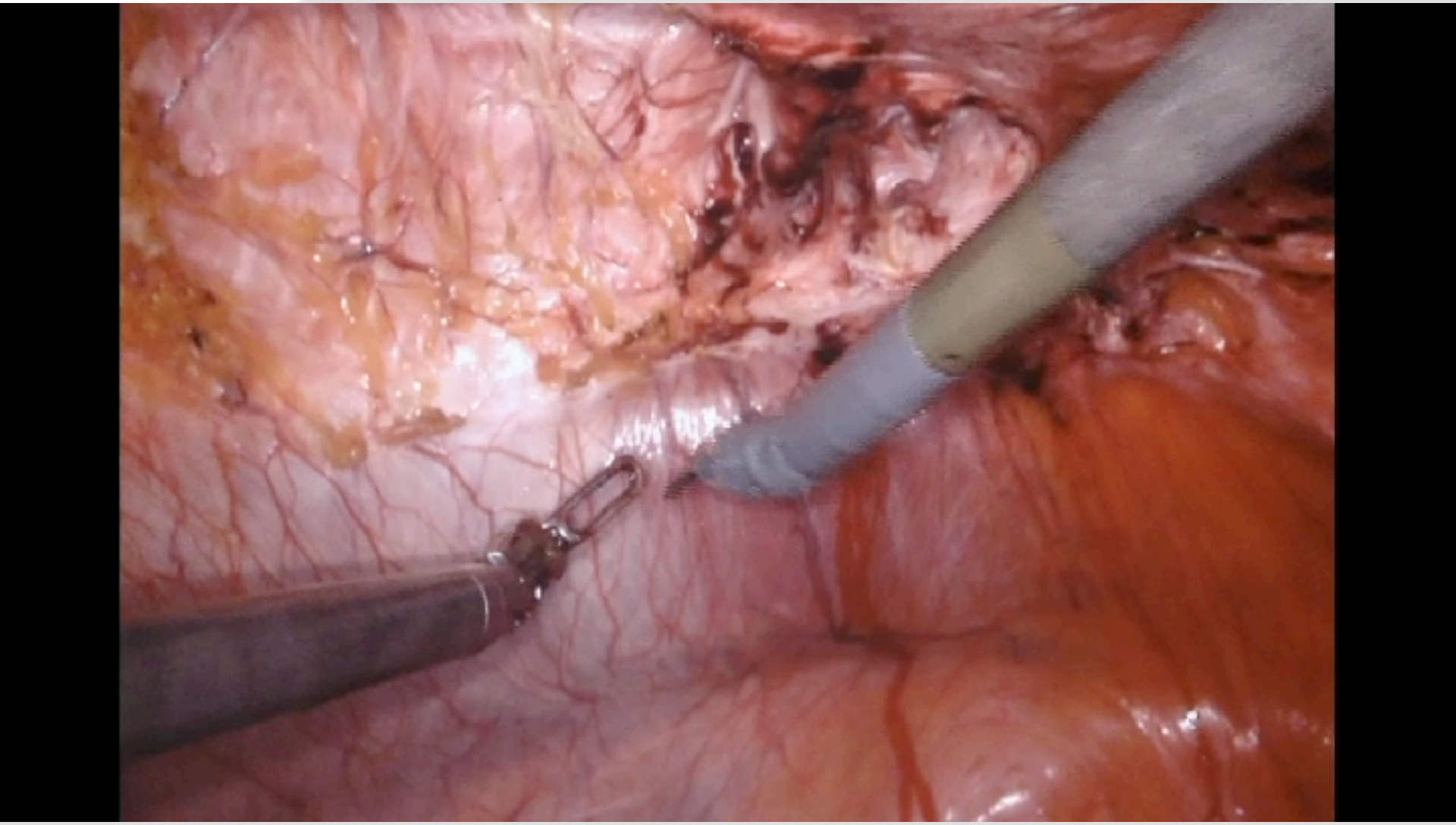
Robotic Anterior CS



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Ventral TAPP

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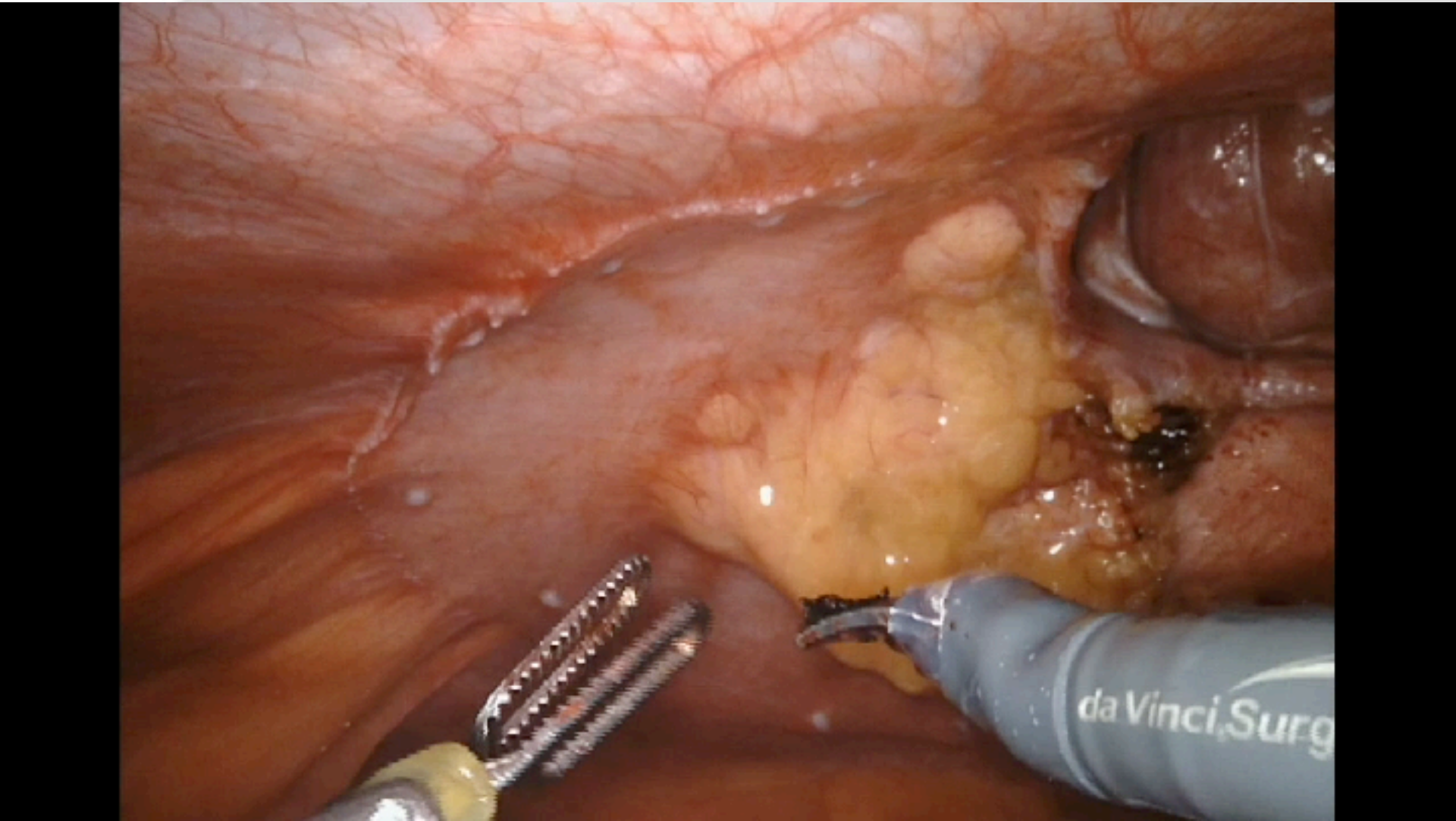
R-Rives

Single-docking



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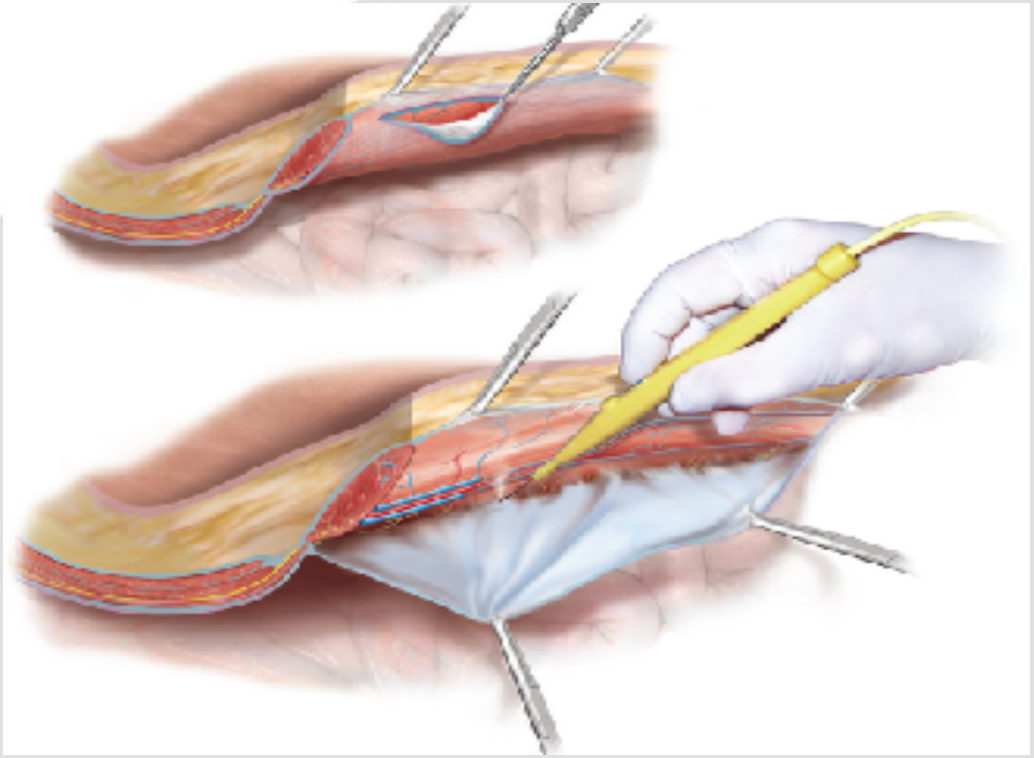
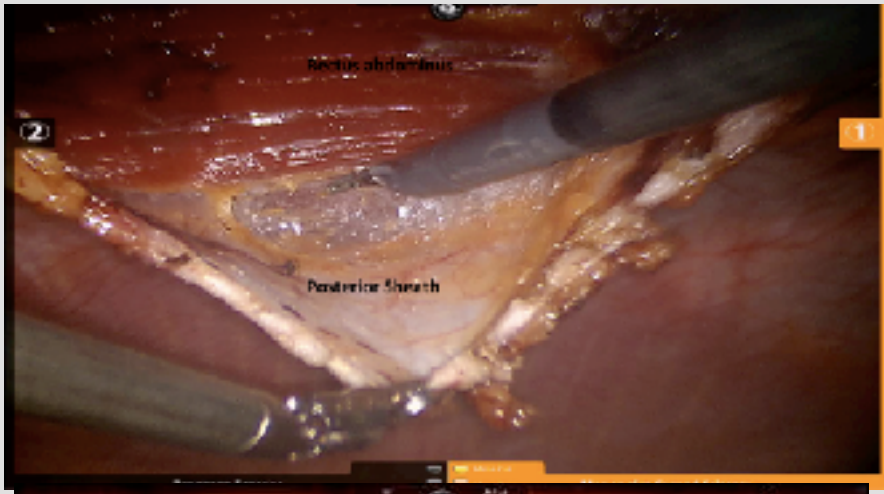
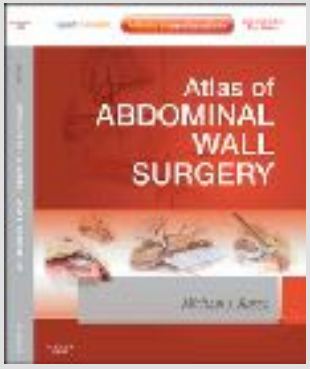
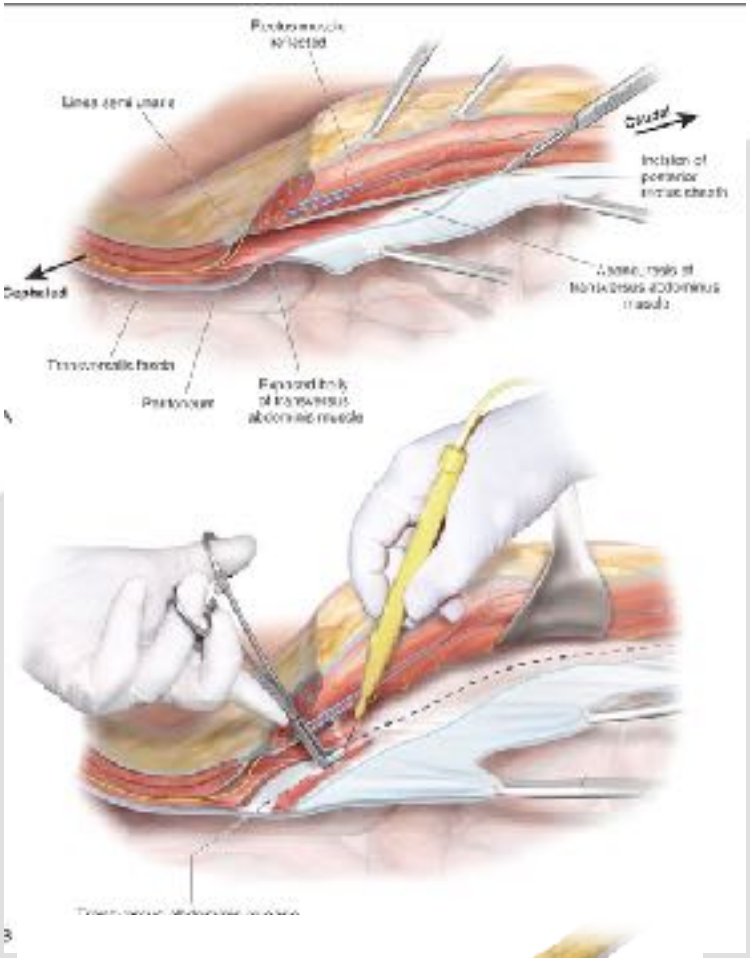
r-TAR

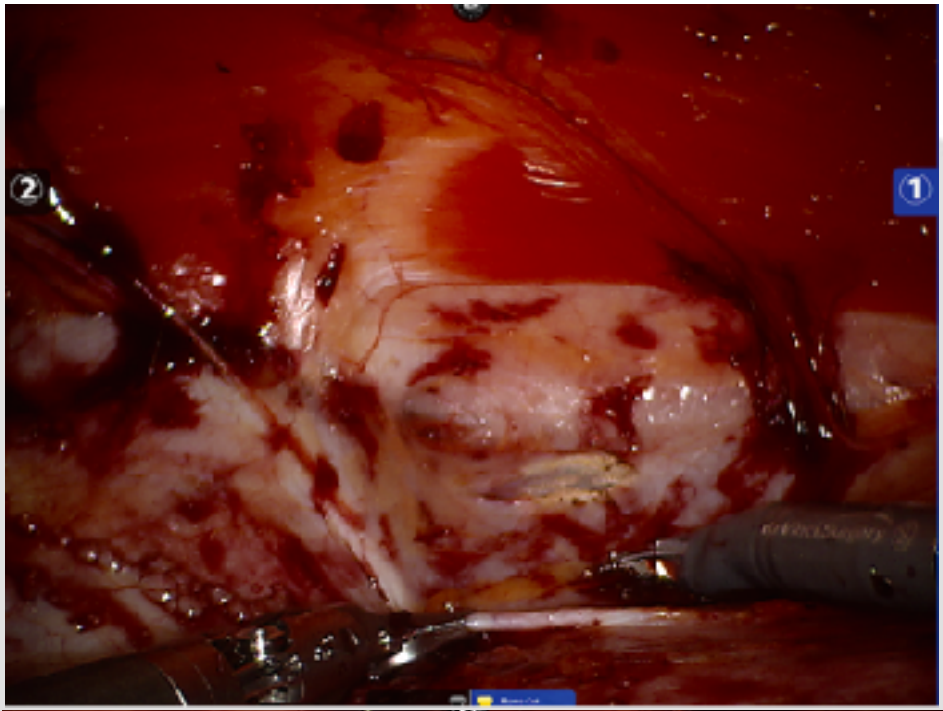
Transversus Abdominis Release

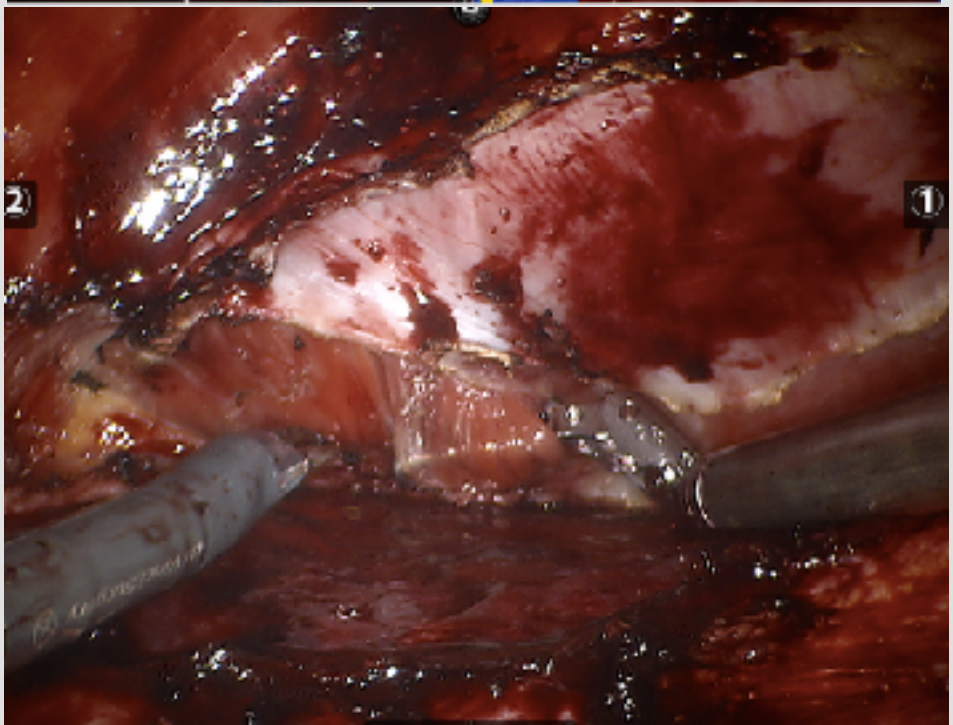


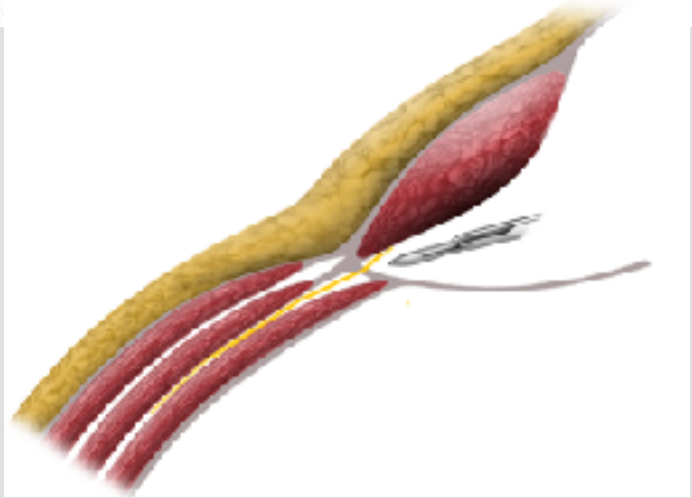


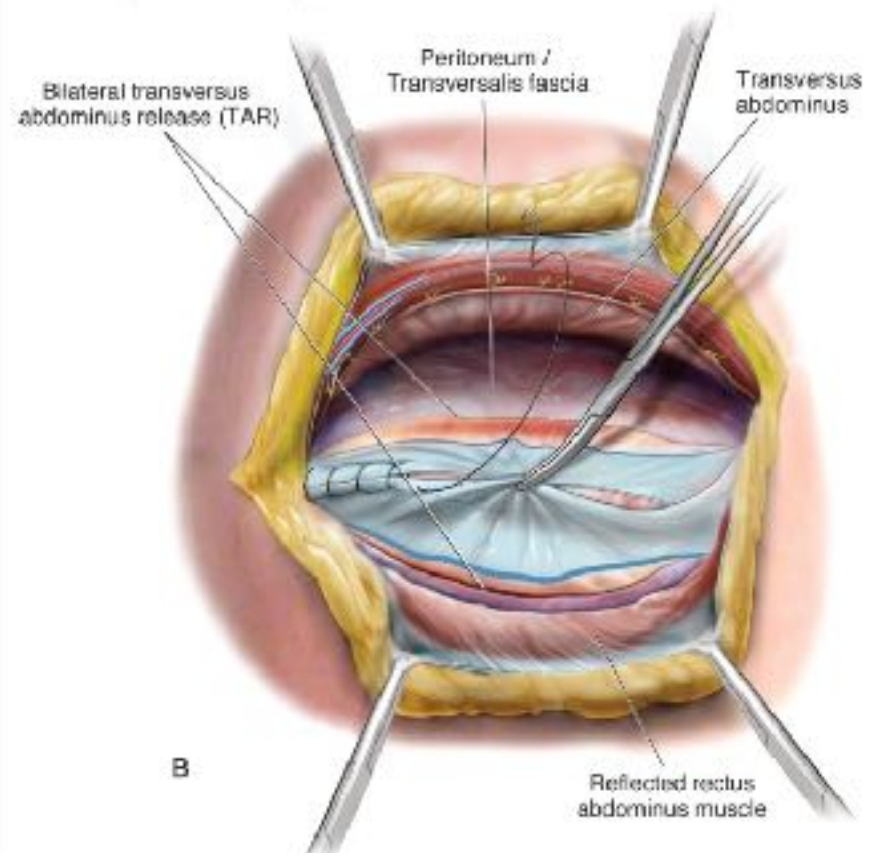


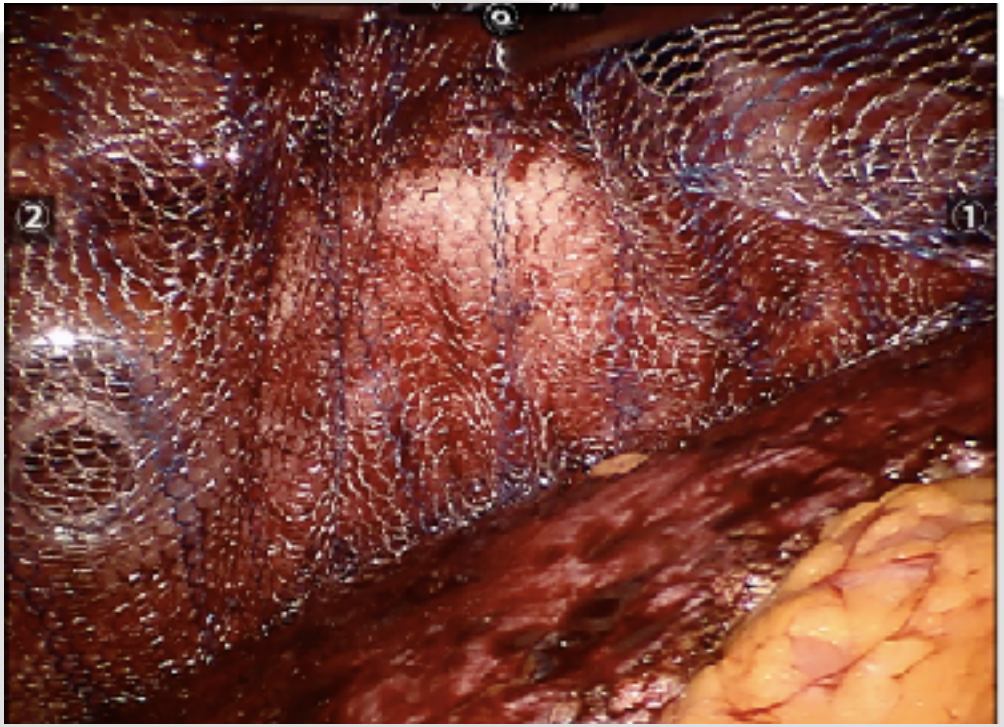

Caudal
Cephalad








Bilateral transversus abdominus release (TAR)
Peritoneum / Transversalis fascia
Transversus abdominus
B
Reflected rectus abdominus muscle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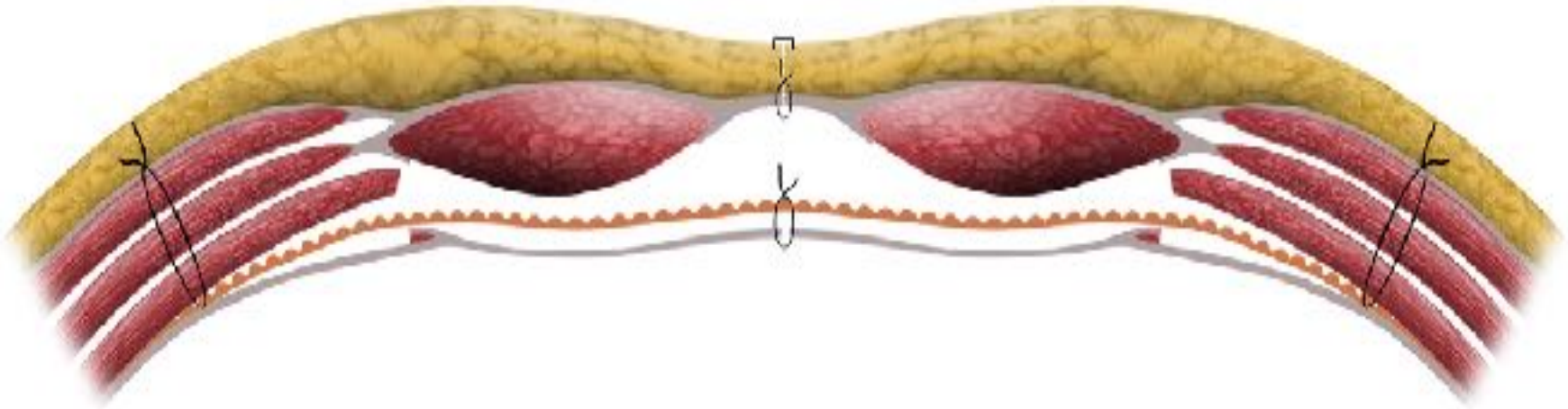

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EBM
2017

A nationwide evaluation of robotic ventral hernia surgery☆

Kathleen M. Coakley [a], Stephanie M. Sims [a], Tanushree Prasad [a], Amy E. Lincourt [a], Vedra A. Augenstein [d], Ronald F. Sing [b], B. Todd Heniford [d], Paul D. Colavita [d,*]

The American Journal of Surgery 214 (2017) 1158–1163

Results: From 2008-2013, 149,622 ventral hernia surgeries were identified; 117,028 open, 32,243 laparoscopic, and 351 robotic. Open repairs were excluded. RVHR rose annually with 2013 containing 47.9% of all RVHRs. RVHR patients were more likely to be older and have more chronic conditions. There was no difference between length of stay. Pneumonia rates were higher with RVHR; however, after controlling for confounding variables, there was no difference in pneumonia rates. Mortality and other major complications were similar. Total charges were increased for RVHR in univariate and multivariate analysis. RVHR was more common in teaching hospitals and wealthier zip codes.

Conclusion: RVHR demonstrates comparable safety to the laparoscopic technique, with increased charges and increased volume in urban teaching hospitals and patients from areas of higher median income.

Laparoscopic vs Robotic Intraperitoneal Mesh Repair for Incisional Hernia: An Americas Hernia Society Quality Collaborative Analysis

Ajita S Prabhu, MD, FACS, Eugene O Dickens, MD, FACS, Chad M Copper, MD, FACS, John W Mann, MD, FACS, Jonathan P Yunis, MD, FACS, Sharon Phillips, MSPH, Li-Ching Huang, PhD, Benjamin K Poulose, MD, MPH, FACS, Michael J Rosen, MD, FACS

J Am Coll Surg 2017;225:285–293

CONCLUSIONS: Despite longer operative times using the rIPOM approach, patients undergoing rIPOM had a significantly shorter LOS than LapIPOM, without additional risk of wound morbidity requiring intervention.

Standard laparoscopic versus robotic retromuscular ventral hernia repair

Surg Endosc (2017) 31:324–332
DOI 10.1007/s00464-016-4975-x

Jeremy A. Warren[1] · William S. Cobb[1] · Joseph A. Ewing[2] · Alfredo M. Carbonell[1]

Conclusion RRVHR enables true AWR, with myofascial release to offset tension for midline fascial closure, and obviates the need for intraperitoneal mesh. Perioperative morbidity of RRVHR is comparable to LVHR, with shorter length of stay despite a longer operative time and extensive tissue dissection.

Reducing Length of Stay Using a Robotic-assisted Approach for Retromuscular Ventral Hernia Repair

A Comparative Analysis From the Americas Hernia Society Quality Collaborative

Alfredo M. Carbonell, DO, Jeremy A. Warren, MD,* Ajita S. Prabhu, MD,† Conrad D. Ballecer, MD,‡ Randy J. Janczyk, MD,§ Javier Herrera, MD,¶ Li-Ching Huang, PhD,|| Sharon Phillips, MSPH,|| Michael J. Rosen, MD,† and Benjamin K. Poulose, MD, MPH***

Annals of Surgery • Volume XX, Number XX, Month 2017 DOI: 10.1097/SLA.0000000000002244

Conclusions: Using real-world evidence, a robotic-assisted approach to RVHR offers the clinical benefit of reduced postoperative LOS. Ongoing monitoring of this technique should be employed through continuous quality improvement to determine the long-term effect on hernia recurrence, complications, patient satisfaction, and overall cost.

Comparative analysis of open and robotic transversus abdominis release for ventral hernia repair

Surg Endosc
DOI 10.1007/s00464-017-5729-0

James G. Bittner IV[1,2] · Sameer Alrefai[2] · Michelle Vy[2] · Micah Mabe[2] · Paul A. R. Del Prado[3] · Natasha L. Clingempeel[2]

Robotic Transversus Abdominis Release (TAR): is it possible to offer minimally invasive surgery for abdominal wall complex defects?

Transversus Abdominis Release (TAR) Robótico: é possível oferecer cirurgia minimamente invasiva para os defeitos complexos da parede abdominal?

Rev. Col. Bras. Cir. 2017; 44(2): 216-219

Maria Vitória França do Amaral[1]; José Ricardo Guimarães[1]; Paula Volpe, TCBC-SP[2]; Flávio Malcher Martins de Oliveira, TCBC-RJ[3]; Carlos Eduardo Domene, TCBC-SP[2]; Sérgio Roll, TCBC-SP[4]; Leandro Totti Cavazzola, TCBC-RS[1].

Comparative analysis of perioperative outcomes of robotic versus open transversus abdominis release

Surg Endosc
DOI 10.1007/s00464-017-5752-1

Luis A. Martin-del-Campo[1] · Adam S. Weltz[2] · Igor Belyansky[2] · Yuri W. Novitsky[1]

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2020

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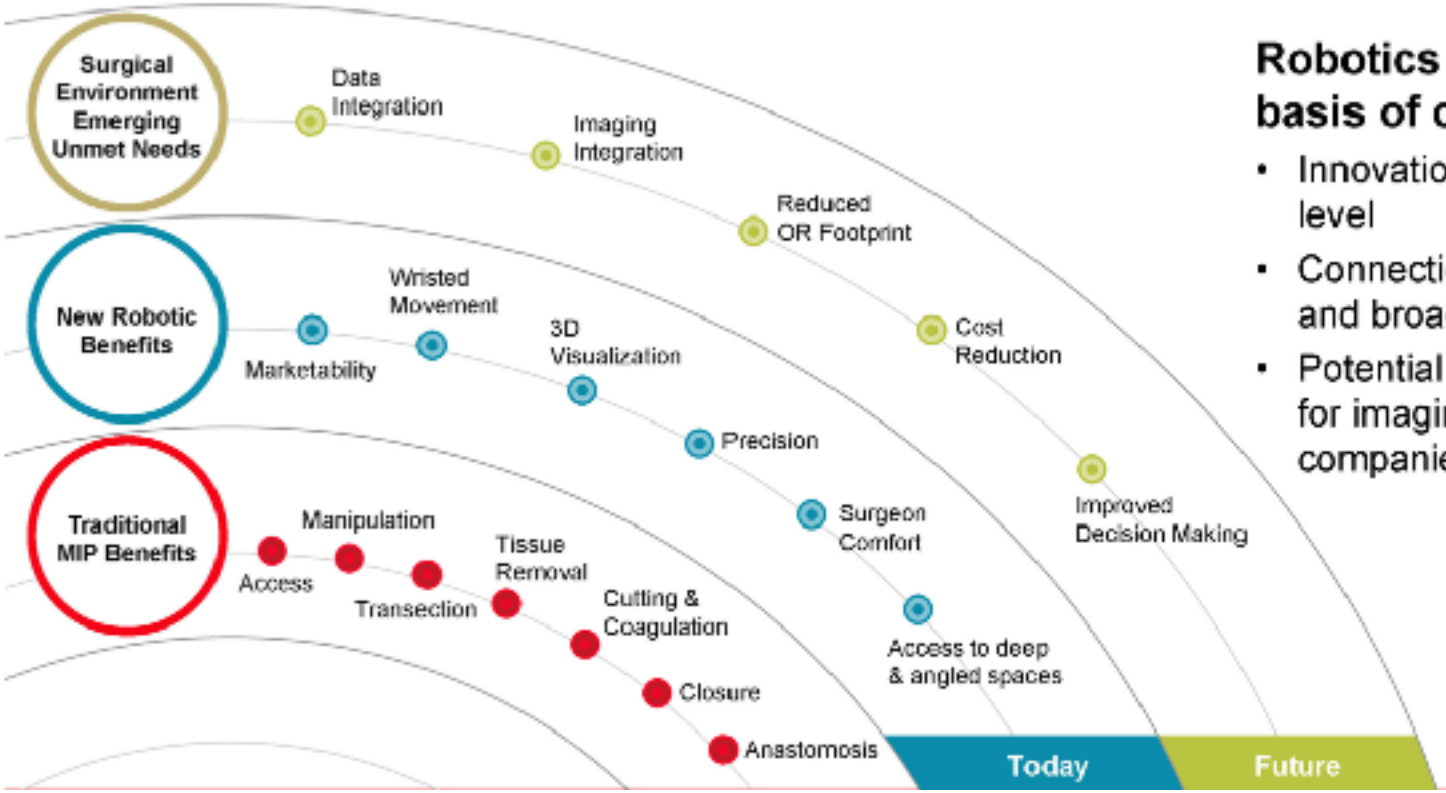
Robotics Opportunities: Today and Future



Robotics is shifting the basis of competition

- Innovation at the system level
- Connection between OR and broader environment
- Potential bridge to the OR for imaging & diagnostic companies

Future

An Information-Rich Surgical Environment

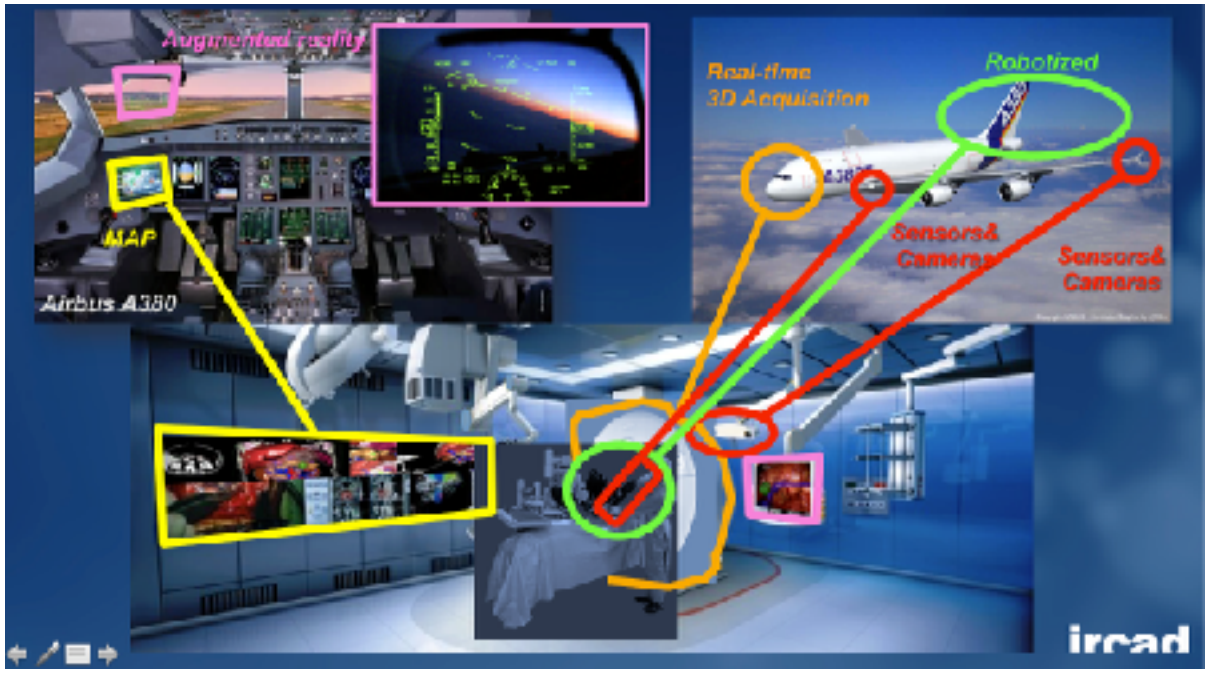
Integration, registration, and utilization of preoperative and real-time information:

Fully integrated robotic platforms

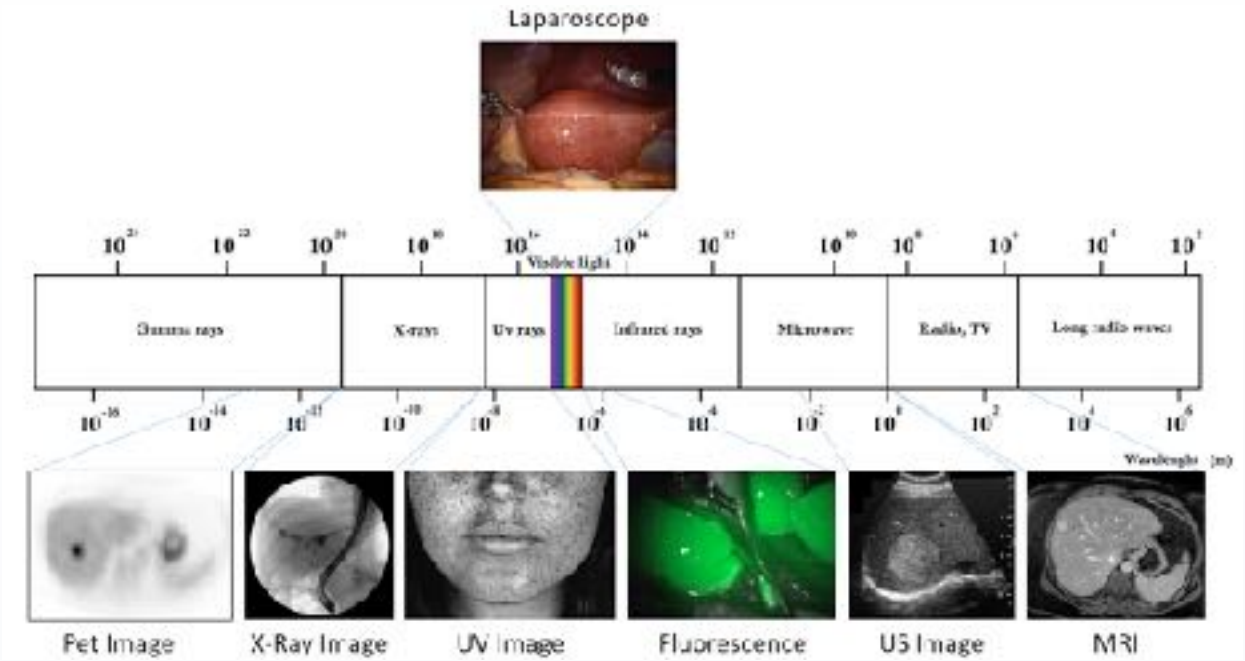
Higher resolution stereo displays

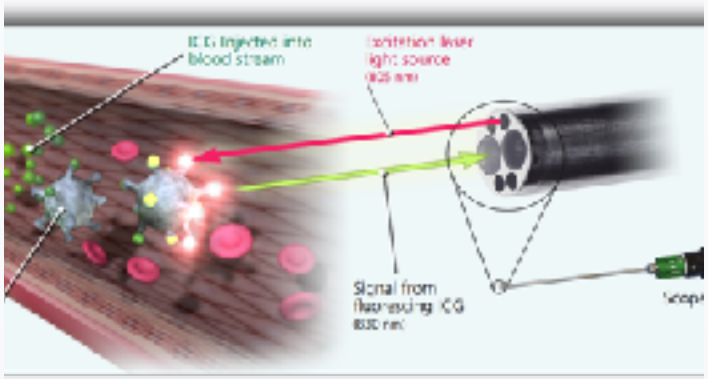
Advanced software

Augmented reality



Vision: overcoming human limits





Future

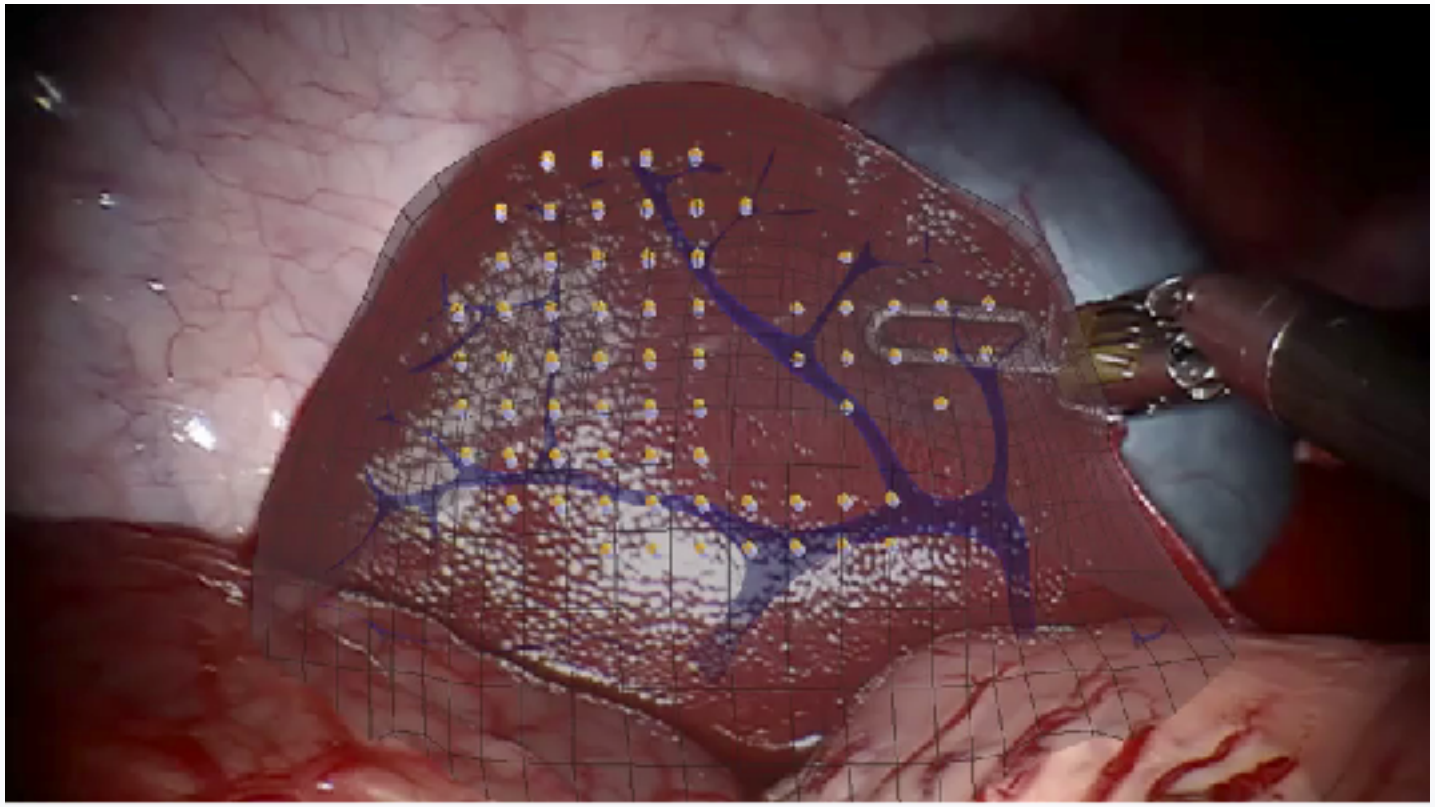
FUSION

3D virtual Image + Video Image

Augmented Reality

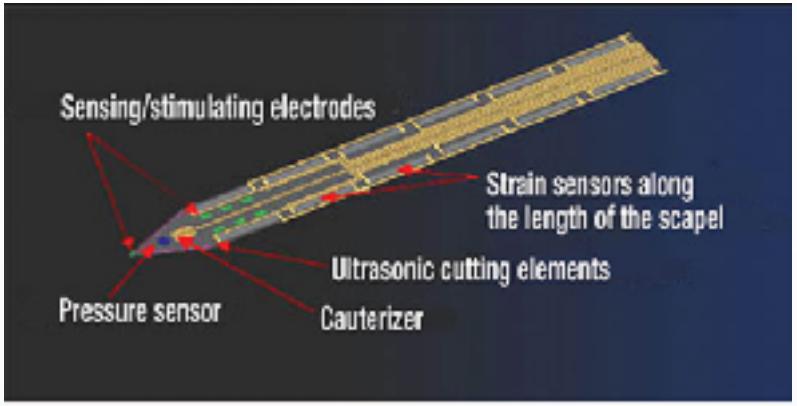
Future

Augmented Reality with Deformable Model

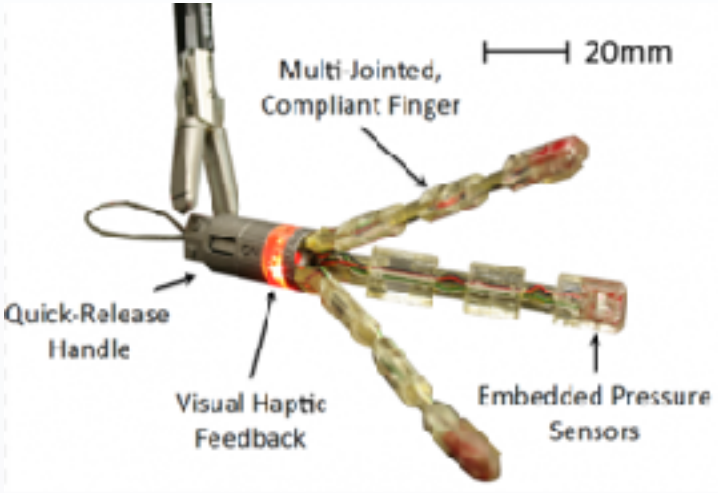


ircad
América Latina

Future



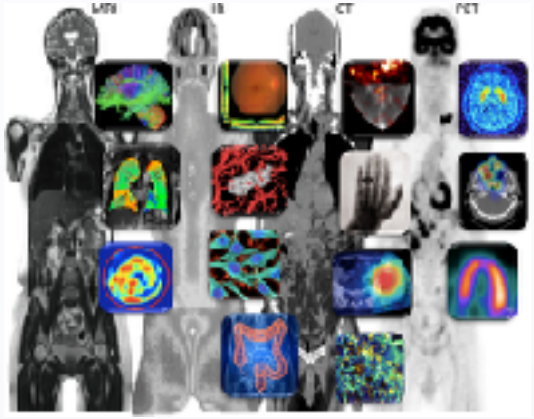
3. The surgical knife of the future will be known as the "data" knife. Under development at Verimetra [www.verimetra.com], this smart scalpel helps surgeons navigate through delicate surgical procedures.



Towards ”BRAIN-assisted” surgery

IBM Watson

Alphabet



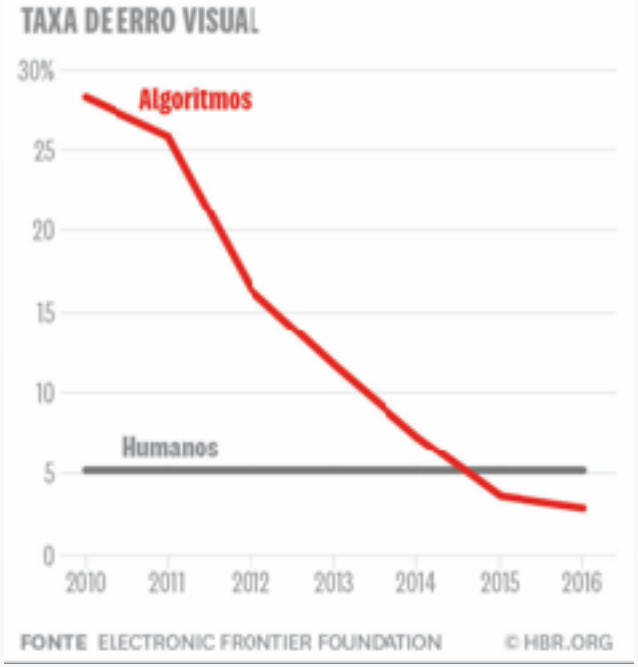
Future

EndoNet: A Deep Architecture for Recognition Tasks on Laparoscopic Videos

Andru P. Twinanda, Sherif Shehata, Didier Mutter,
Jacques Marescaux, Michel de Mathelin, and Nicolas Padoy

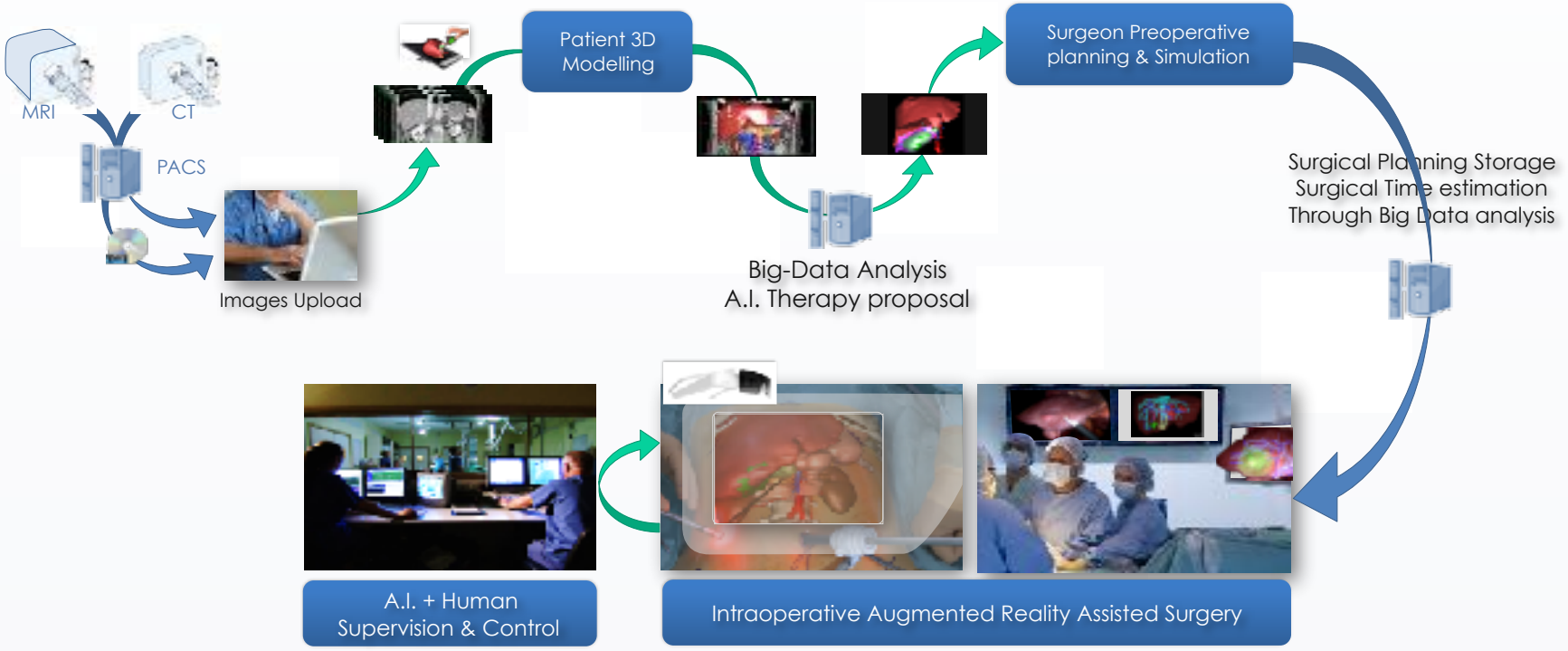
Research Group CAMMA: Computational Analysis and Modeling of Medical Activities

KAREN ZACK/@TEENYBISCUIT



A.I. & OP room

Condor Project



“My God, Jim, we can’t leave him in the hands of 20th century medicine. Those butchers will use needles and knives and cut open his belly and chest. It is still the dark ages. You have no idea what those barbarians will do ! ”

Dr. Leonard McCoy
Medical Officer
Starship Enterprise
Star Date 2394.3

Star Trek IV:
The Voyage Home

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