Robotic surgery for rectal cancer: Marginal gains worth the pains?

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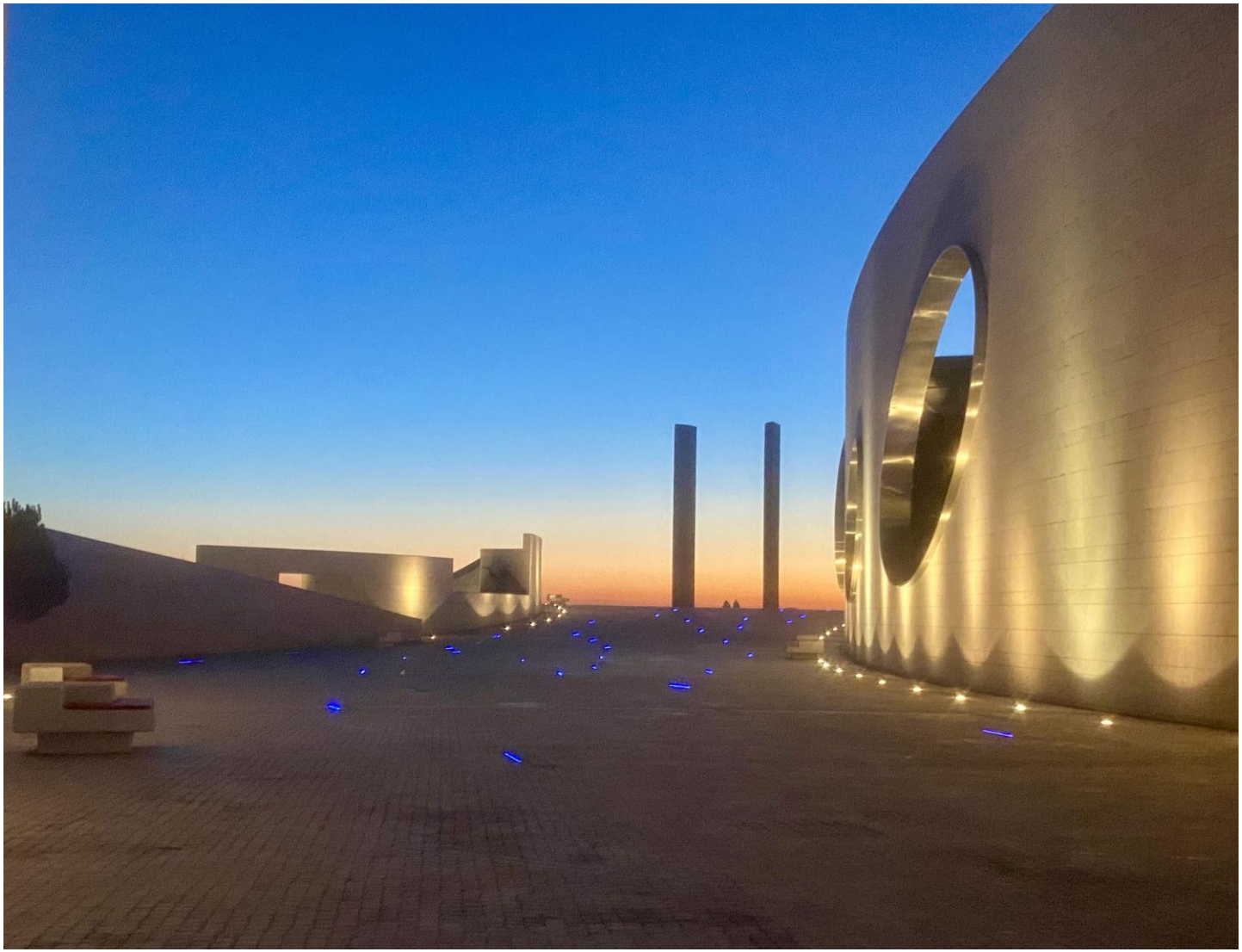
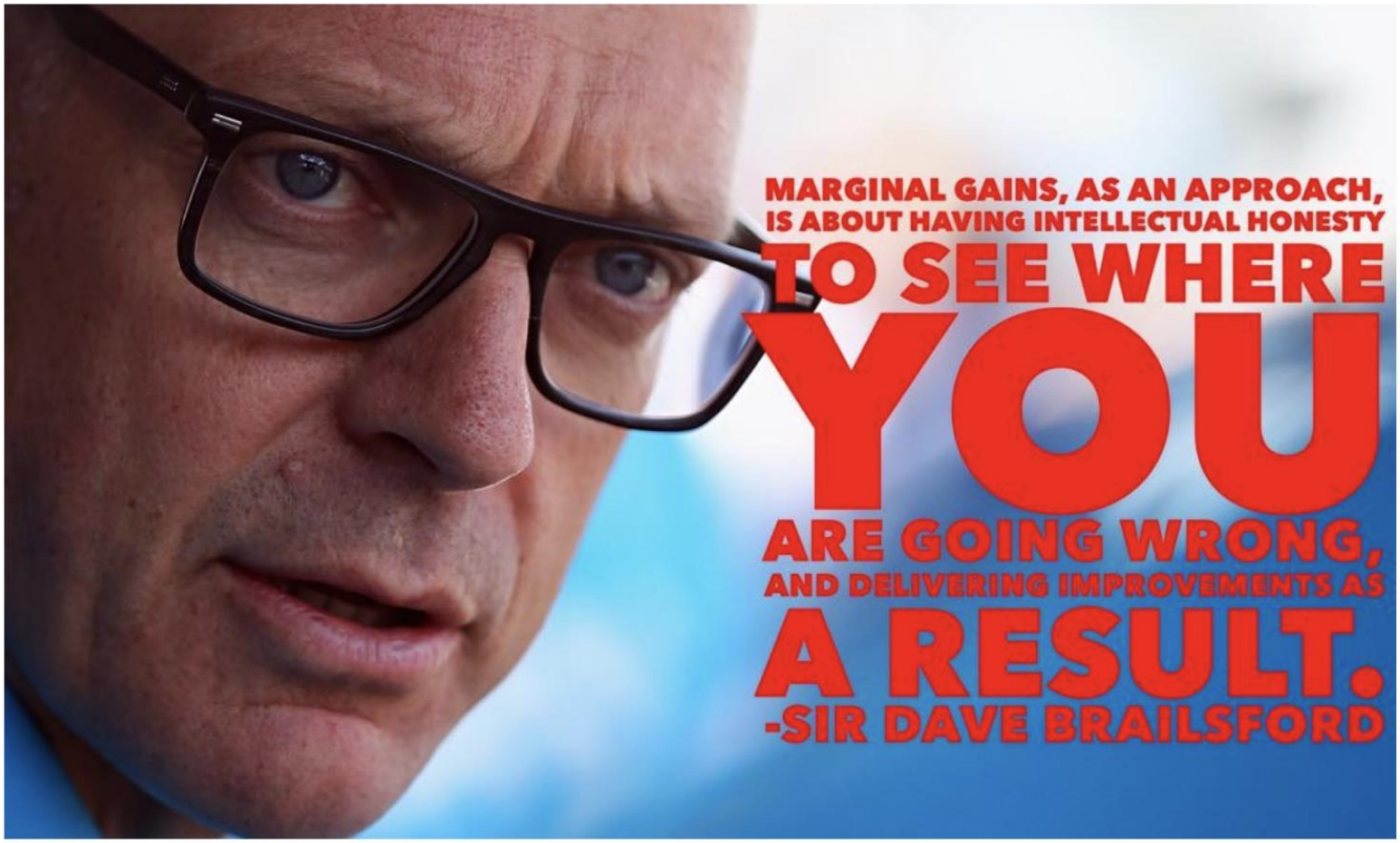
Centre for Unknown…



How rectal surgery has evolved ?

- TME concept reduced the local recurrence
- Introduction of Staplers increase sphincter preservation rates
- Extra levator APR reduce specimen quality
- Minimal Invasive approach improves short term outcomes and equivalent oncology
- Robotic surgery offer marginal gains

Marginal Gains Theory

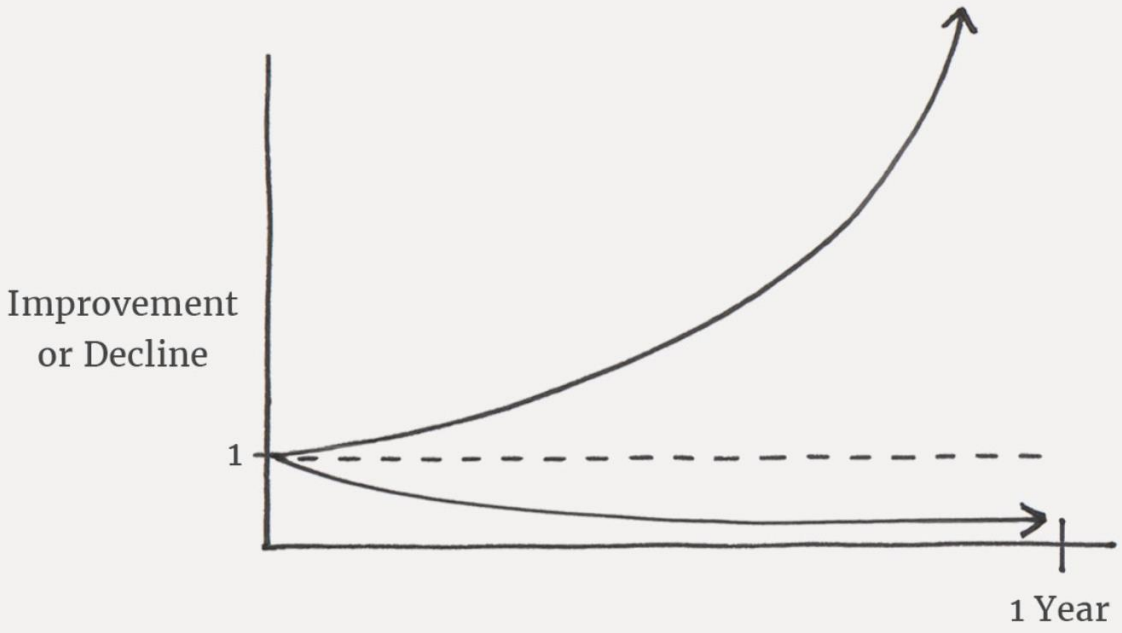


Marginal gains theory is the theory that **improving and optimising your performance by a small amount across a number of different areas will lead to much more significant, noticeable improvements overall**.

The Power of Tiny Gains

1% better every day $1.01^{365} = 37.78$

1% worse every day $0.99^{365} = 0.03$



MIS in rectal cancer Tool or religion?

Can Robotic approach improve outcomes

- Marginal gains:
- - Conversion rates
- -Better nerve preservation
- - Better complication rates /Better oncological ?
- -Better sphincter preservation
- -Better in High risk Patients
- (Obese,Lower tumour, Males, Post chemo RT, Advanced stage)

- Anatomy still holds the key

- Skill acquisition through structured and standardised training

Robotic versus laparoscopic surgery for middle and low rectal cancer (REAL): short-term outcomes of a multicentre randomised controlled trial

Qingyang Feng, Weitang Yuan*, Taiyuan Li*, Bo Tang*, Baoqing Jia*, Yanbing Zhou*, Wei Zhang, Ren Zhao, Cheng Zhang, Longwei Cheng, Xiaoqiao Zhang, Fei Liang, Guodong He, Ye Wei, Jianmin Xu, for the REAL Study Group*[†]

Findings Between July 17, 2016, and Dec 21, 2020, 1742 patients were assessed for eligibility. 502 patients were excluded, and 1240 patients were enrolled and randomly assigned to receive either robotic surgery (620 patients) or laparoscopic surgery (620 patients). 69 patients were excluded (34 in the robotic surgery group and 35 in the laparoscopic surgery group). 1171 patients were included in the modified intention-to-treat analysis (586 in the robotic group and 585 in the laparoscopic group). Six patients in the robotic surgery group received laparoscopic surgery and seven patients in the laparoscopic surgery group received robotic surgery. 22 (4·0%) of 547 patients in the robotic group had a positive circumferential resection margin as did 39 (7·2%) of 543 patients in the laparoscopic group (difference –3·2 percentage points [95% CI –6·0 to –0·4]; p=0·023). 95 (16·2%) of patients in the robotic group had at least one postoperative complication (Clavien-D… after surgery, as did 135 (23·1%) of 585 patients in the laparos… 3]; p=0·003). More patients in the robotic group ha… [95·4%] of 586 patients *vs* 537 [91·8%] of … otic group had better postoperative … 0 to 11·0] *vs* 8·0 days [7·0 to 12… (99 [16·9%] of 586 patients … conversions to open surgery … [–4·3 to –0·4]; p=0·021), less … difference –10·0 [–20·0 to –10… *vs* 51 [8·7%] of 585 patients; differen… topic group.

Robotic Group:

-Less conversion
-less post operative complication
-Better sphincter preservation
-less blood loss
-Better specimen quality

Interpretation Secondary short-term outcomes suggest that for middle and low rectal cancer, robotic surgery resulted in better oncological quality of resection than conventional laparoscopic surgery, with less surgical trauma, and better postoperative recovery.

Robotic rectal Surgery

ORIGINAL CONTRIBUTION

Robotic Resection is a Good Prognostic Factor in Rectal Cancer Compared with Laparoscopic Resection: Long-term Survival Analysis Using Propensity Score Matching

Jin Kim, M.D., Ph.D.[1] • Se-Jin Baek, M.D., Ph.D.[1] • Dong-Woo Kang, M.D.[1]
Young-Eun Roh, Ph.D.[2] • Jae Won Lee, Ph.D.[2] • Han-Deok Kwak, M.D., Ph.D.[1]
Jung Myun Kwak, M.D., Ph.D.[1] • Seon-Hahn Kim, M.D., Ph.D.[1]

1Department of Surgery, Korea University College of Medicine, Seoul, Korea
2Department of Statistics, Korea University College of Political Science and Economics, Seoul, Korea

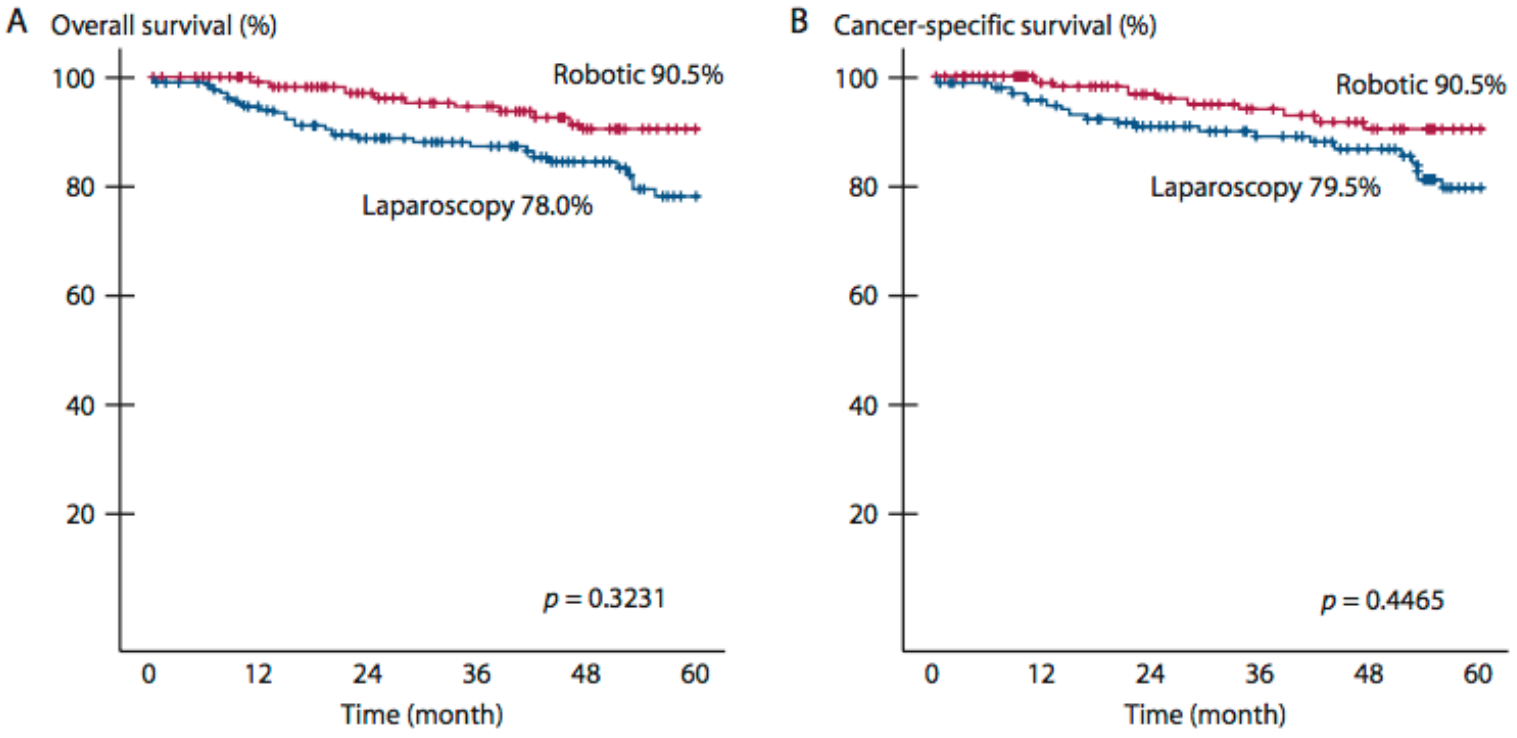
TABLE 4. Five-year survival rates and comparison between robotic and laparoscopic groups in matched patients excluding stage IV

	Overall survival			*Cancer-specific survival*			*Disease-free survival*		
	Robotic TME (n = 272)	*Laparoscopic TME (n = 460)*	*p*	*Robotic TME (n = 272)*	*Laparoscopic TME (n = 460)*	*p*	*Robotic TME (n = 272)*	*Laparoscopic TME (n = 460)*	*p*
All stages (I–III), %	90.5	78.0	0.3231	90.5	79.5	0.4465	72.6	68.0	0.6409
Stage I, %	98.2	86.2	0.3751	98.2	88.7	0.6002	74.0	75.8	0.8917
Stage II, %	91.2	87.0	0.8956	93.6	91.5	0.7842	70.9	79.5	0.9685
Stage III, %	83.1	64.2	0.5258	81.0	62.2	0.9432	72.0	51.4	0.3887

TME= total mesorectal excision.

5 Years survival lap vs Robotic Surgery

ASES OF THE COLON & RECTUM VOLUME 60: 3 (2017)



Robotic rectal surgery offers advantages with the Pretext.

Totally robotic rectal resection: an experience of the first 100 consecutive cases

J. Ahmed, M. Nasir, K. Flashman, J. Khan & A. Parvaiz

International Journal of Colorectal Disease
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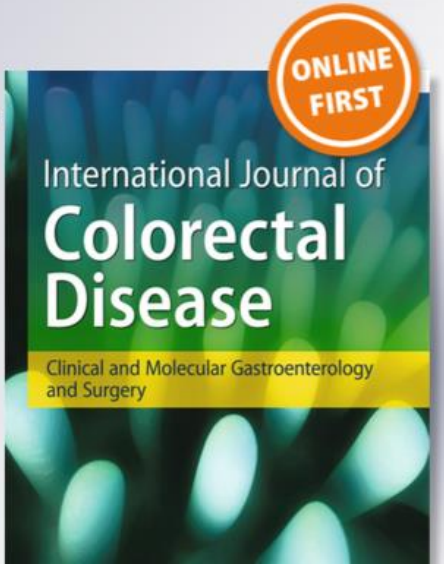
Int J Colorectal Dis
DOI 10.1007/s00384-016-2503-z



Int J Colorectal Dis
DOI 10.1007/s00384-016-2503-z

ORIGINAL ARTICLE

Totally robotic rectal resection: an experience of the first 100 consecutive cases

J. Ahmed[1] · M. Nasir[1] · K. Flashman[1] · J. Khan[1] · A. Parvaiz[1,2]

Accepted: 12 January 2016

Abstract
Introduction Robotic surgery provides an alternative option for a minimal access approach. It provides a stable platform with high definition three-dimensional views and improved access, which enhances the capabilities for precise dissection in a narrow surgical field. These distinctive features have made it an attractive option for colorectal surgeons.
Aim The aim of this study was to present a standardised technique for single-docking robotic rectal resection and to analyse clinical outcomes of the first 100 robotic rectal procedures performed in a single centre between May 2013 and April 2015.
Method Prospectively collected data related to 100 consecutive patients who underwent single-docking robotic rectal surgery was analysed for surgical and oncological outcomes.
Results Sixty-six patients were male, the median age was 67 years (range-24–92). Eighteen patients had neo-adjuvant chemoradiotherapy whilst 23 patients had BMI >30. Procedures performed included anterior resection ($n=74$), abdominoperineal resection ($n=10$), completion proctectomy ($n=9$), restorative proctectomy with ileal pouch–anal anastomosis (IPAA) ($n=5$) and Hartmann's procedure ($n=2$). The median operating time was 240 min (range-135–456), and median blood loss was 10 ml (range 0–200). There was no conversion or intra-operative complication. Median length of stay was 7 days (range, 3–48) and readmission rate was 12 %. Thirty-day mortality was zero. Postoperatively, two patients had an anastomotic leak whilst two had small bowel obstruction. The median lymph node harvest was 18 (range, 6–43).
Conclusion The single-docking robotic technique should be considered as an alternative option for rectal surgery. This approach is safe and feasible and in our study it has demonstrated favourable clinical outcomes.

Keywords Colorectal · Minimally invasive surgery · Robotic

Colorectal Disease

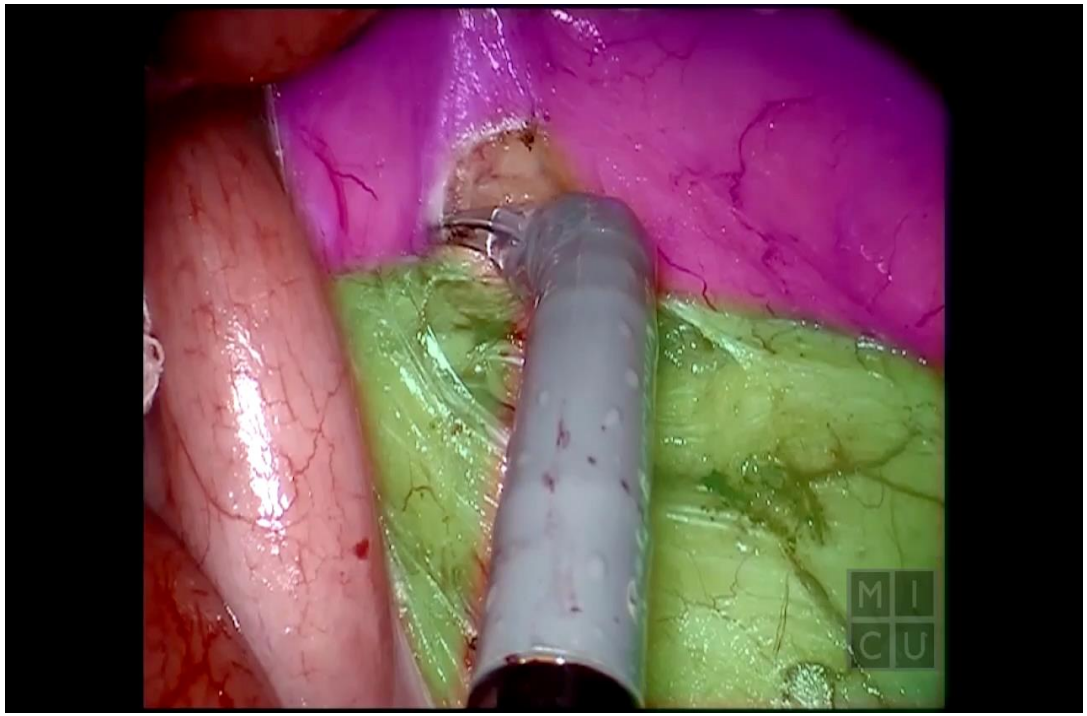
Technical Note

Three-step standardized approach for complete mobilization of the splenic flexure during robotic rectal cancer surgery

J. Ahmed, M. A. Kuzu, N. Figueiredo, J. Khan, A. Parvaiz ✉

First published: 27 February 2016 | https://doi.org/10.1111/codi.13313 | Citations: 12

The video was also presented in the annual meeting of the Clinical Robotic Surgery Association (CRSA) 2015, Chicago, Illinois, USA.



International Journal of Colorectal Disease
Clinical and Molecular Gastroenterology and Surgery

Int J Colorectal Dis. 2017 Feb;32(2):241-248. doi: 10.1007/s00384-016-2682-7. Epub 2016 Oct 21.

Urogenital function in robotic vs laparoscopic rectal cancer surgery: a comparative study.

Panteleimonitis S[1,2], Ahmed J[3], Ramachandra M[3], Farooq M[3], Harper M[4], Parvaiz A[3,4,5].

⊕ Author information

Abstract

PURPOSE: Urological and sexual dysfunction are recognised risks of rectal cancer surgery; however, there is limited evidence regarding urogenital function comparing robotic to laparoscopic techniques. The aim of this study was to assess the urogenital functional outcomes of patients undergoing laparoscopic and robotic rectal cancer surgery.

METHODS: Urological and sexual functions were assessed using gender-specific validated standardised questionnaires. Questionnaires were sent a minimum of 6 months after surgery, and patients were asked to report their urogenital function pre- and post-operatively, allowing changes in urogenital function to be identified. Questionnaires were sent to 158 patients (89 laparoscopy, 69 robotic) of whom 126 (80 %) responded. Seventy-eight (49 male, 29 female) of the responders underwent laparoscopic and 48 (35 male, 13 female) robotic surgery.

RESULTS: Male patients in the robotic group deteriorated less across all components of sexual function and in five components of urological function. Composite male urological and sexual function score changes from baseline were better in the robotic cohort ($p < 0.001$). In females, there was no difference between the two groups in any of the components of urological or sexual function. However, composite female urological function score change from baseline was better in the robotic group ($p = 0.003$).

CONCLUSION: Robotic rectal cancer surgery might offer better post-operative urological and sexual outcomes compared to laparoscopic surgery in male patients and better urological outcomes in females. Larger scale, prospective randomised control studies including urodynamic assessment of urogenital function are required to validate these results.

› Int J Colorectal Dis. 2018 Aug;33(8):1079-1086. doi: 10.1007/s00384-018-3030-x.
Epub 2018 Mar 25.

Robotic Rectal Cancer Surgery in Obese Patients May Lead to Better Short-Term Outcomes When Compared to Laparoscopy: A Comparative Propensity Scored Match Study

Sofoklis Panteleimonitis [1] [2], Oliver Pickering [3], Hassan Abbas [3], Mick Harper [4], Ngianga Kandala [4], Nuno Figueiredo [5], Tahseen Qureshi [3] [6], Amjad Parvaiz [3] [4] [5]

Affiliations + expand

PMID: 29577170 PMCID: PMC6060802 DOI: 10.1007/s00384-018-3030-x

High Risk Patients ?

Colorectal Dis. 2017 Jun 23. doi: 10.1111/codi.13783. [Epub ahead of print]

Robotic versus laparoscopic rectal surgery in high-risk patients.

Ahmed J[1,2], Cao H[1], Panteleimonitis S[1,2], Khan J[2], Parvaiz A[1,2,3].

⊕ Author information

Abstract

AIM: Laparoscopic rectal surgery is associated with a steep learning curve and high conversion rate despite progress in equipment design and consistent practice. The robotic system has shown the advantage over laparoscopic approach due to stable three-dimensional views, improved dexterity and better ergonomics. These factors make the robotic approach more favourable for rectal surgery. The aim of this study was to compare the perioperative outcomes of laparoscopic and robotic rectal cancer surgery in high-risk patients.

METHOD: A prospectively collected dataset for high-risk patients who underwent rectal cancer surgery between May 2013 and November 2015 was analysed. Patients with any one of the following characteristics were defined as high risk: BMI of ≥ 30, male gender, preoperative chemo-radiotherapy, tumour < 8 cm from the anal verge and previous abdominal surgery.

RESULTS: 184 high-risk patients were identified: robotic (n = 99) and laparoscopic (n = 85) groups. Robotic surgery was associated with a significantly higher sphincter preservation rate (86% vs 74%, P = 0.045), shorter operative time (240 vs 270 minutes, P = 0.013) and hospital stay (7 vs 9 days, P = 0.001), less blood loss (10 vs 100 mls, P < 0.001) and conversion rate to open surgery (0% vs 5%, P = 0.043) when compared with laparoscopic technique. Re-operation, anastomotic leak rate, 30-day mortality and oncological outcomes were comparable between the two techniques.

CONCLUSION: Robotic surgery in high-risk patients is associated with higher sphincter preservation, reduced blood loss, conversion rates, operating time, and hospital stay. However, further studies are required to evaluate this notion. This article is protected by copyright. All rights reserved.

High-risk group

- Patients with BMI of 30 or over
- Male gender mid to low rectal cancer
- Preoperative chemo-radiotherapy
- Tumour <8cm from anal verge
- Previous abdo. surgery

Results

- 184 patients (99 robotic vs 85 laparoscopic)

Rectal cancer surgery for high risk patients	Laparoscopic		Robotic			
	n	%	n	%		p value
total	**85**		**99**			
age median	68 (45 - 89)		69 (35 - 92)			0.633
male	58	68.2	71	71.7		0.607
BMI median	27 (16 - 43)		27 (21 - 46)			0.588
T4	5	5.9	4	4.0		0.735
preop RT	19	22.4	27	27.3		0.442
tumour <8 cm	45	52.9	51	51.5		0.847
previous abdo surgery	22	25.9	34	34.3		0.214
ASA 3 or 4	17	20.0	13	13.1		0.209

Conclusion

- Robotic surgery in high-risk patients is associated with:
  - higher sphincter preservation
  - reduced blood loss
  - better conversion rates
  - shorter operating time
  - shorter length of stay

cancers

MDPI

Article

Textbook Oncological Outcomes for Robotic Colorectal Cancer Resections: An Observational Study of Five Robotic Colorectal Units

José Moreira Azevedo [1,2,*], Sofoklis Panteleimonitis [1,3,4], Danilo Mišković [4], Ignacio Herrando [1], Mahmood Al-Dhaheri [5], Mukhtar Ahmad [6], Tahseen Qureshi [6], Laura Melina Fernandez [1], Mick Harper [3] and Amjad Parvaiz [1,3]

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Table 1. Individual and cumulative parameter percentages for TOO.

	Individual (n, %)	**Cumulative (n, %)**
Total population	501	
no conversion	497 (99.2%)	497 (99.2%)
No mortality	500 (99.8%)	496 (99.0%)
No CD $\geq$ 3 complication	455 (90.8%)	451 (90.0%)
LOS $\leq$ 14 days	446 (89.0%)	420 (83.8%)
No readmission	471 (94.0%)	403 (80.4%)
R0	480 (95.8%)	388 (77.4%)
TOO	388 (77.4%)	

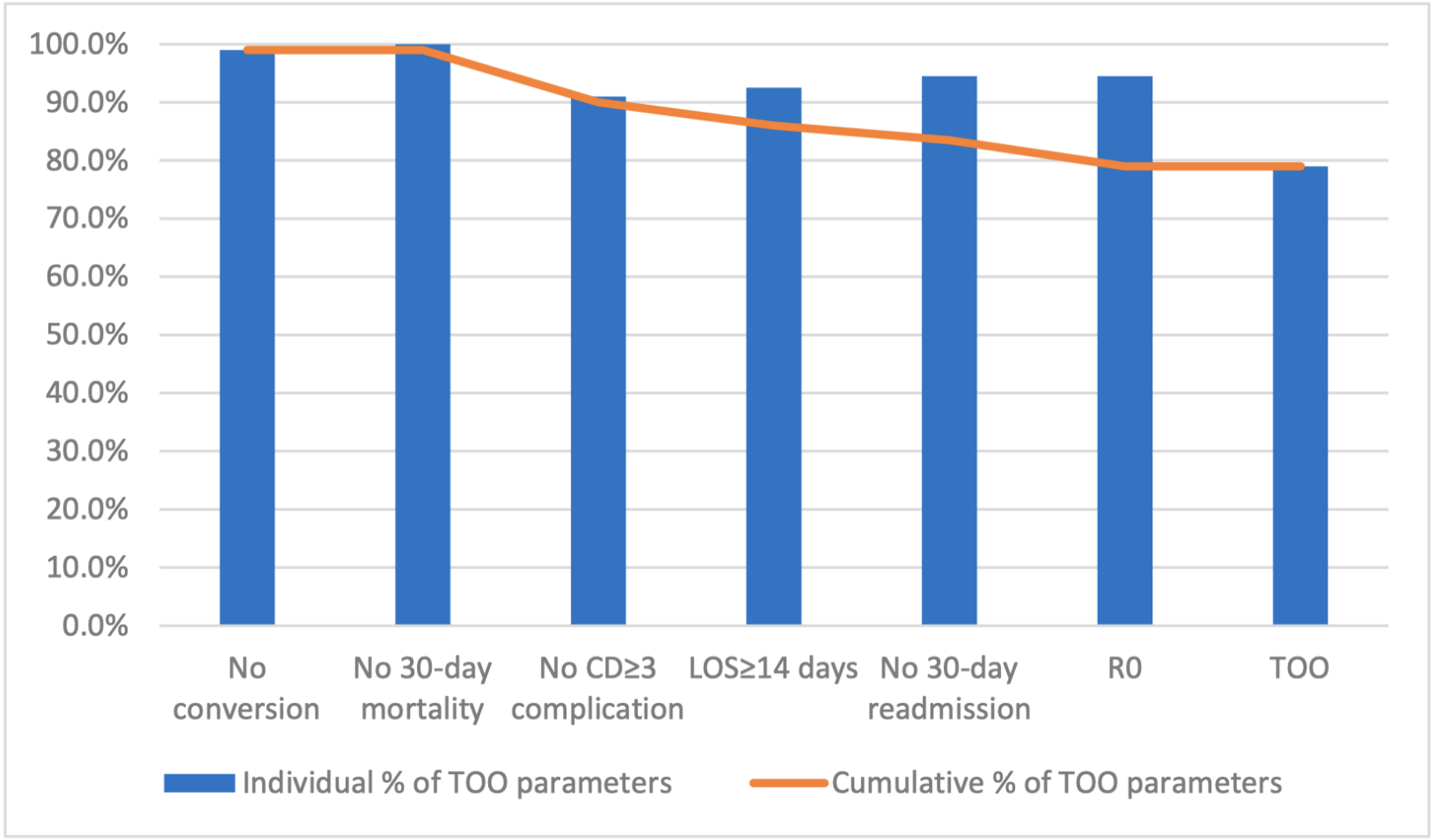

Figure 1. The rates of the individual TOO parameters (bars) and cumulative percentage (line) of TOO after each parameter.

Colonic vs rectal surgery ?

Table 3. TOO parameters for colon and rectal resections. c—χ^2 test, m—Mann–Whitney U test, f—Fisher exact test.

	Colon (=104)	**Rectum (n = 397)**	***p* Value**
Conversion	3 (2.9%)	1 (0.3%)	0.030 f
30-day mortality	1 (1%)	0	0.208 f
CD $\geq$ 3 complication	9 (7.8%)	37 (9.3%)	0.834 c
LOS > 14 days	8 (7.7%)	47 (11.8%)	0.229 c
LOS in days	5 (4–7)	5 (4–8)	0.215 m
30-day readmission	4 (3.8%)	26 (6.5%)	0.362 f
R0	102 (98.1%)	378 (95.2%)	0.274 f
TOO	84 (80.8%)	93 (76.6%)	0.362 c

> Ann Surg. 2021 Dec 1;274(6):e1218-e1222. doi: 10.1097/SLA.0000000000003805.

Robotic Surgery for Rectal Cancer Provides Advantageous Outcomes Over Laparoscopic Approach: Results From a Large Retrospective Cohort

Jacopo Crippa [1], Fabian Grass [1], Eric J Dozois [1], Kellie L Mathis [1], Amit Merchea [2], Dorin T Colibaseanu [2], Scott R Kelley [1], David W Larson [1]

Affiliations – collapse

Affiliations

1 Division of Colon & Rectal Surgery, Mayo Clinic, Rochester, Minnesota.
2 Division of Colon & Rectal Surgery, Mayo Clinic, Jacksonville, Florida.

PMID: 32068552 DOI: 10.1097/SLA.0000000000003805

Methods: We performed a retrospective review of consecutive patients operated on for rectal cancer with a mini-invasive approach at Mayo Clinic from 2005 to 2018. The primary aim of this study was to investigate the difference in postoperative morbidity between the laparoscopic and robotic approach. Multivariable models for odds to complications and prolonged (≥6 days) length of stay were built.

Results: A total of 600 patients were included in the analysis. The number of patients undergoing robotic surgery was 317 (52.8%). The 2 groups were similar in respect to age, sex, and body mass index. Laparoscopic surgery was correlated to shorter operative time (214 vs 324 minutes; P < 0.001). Patients undergoing robotic surgery had a lower overall complications rate (37.2% vs 51.2%; P < 0.001). Robotic surgery was found to be the most protective factor [odds ratio (OR) 0.485; P = 0.006] for odds to complications. The event of a complication (OR 9.33; P < 0.001) and conversion to open surgery (OR 3.095; P = 0.002) were identified as risk factors for prolonged length of stay whereas robotic surgery (OR 0.62; P = 0.027) was the only independent protective factor.

Conclusions: Robotic rectal cancer surgery is strongly associated with better short-term outcomes over laparoscopic surgery.

Role in Teaching & Training

› Colorectal Dis. 2019 Mar;21(3):270-276. doi: 10.1111/codi.14502. Epub 2019 Jan 24.

European Consensus on the Standardization of Robotic Total Mesorectal Excision for Rectal Cancer

D Miskovic [1], J Ahmed [2], R Bissett-Amess [2], M Gómez Ruiz [3], F Luca [4], D Jayne [5], N Figueiredo [2], R J Heald [2], G Spinoglio [6], A Parvaiz [7] [8] [9], European Academy for Robotic Colorectal Surgery (EARCS)

Affiliations + expand

PMID: 30489676 DOI: 10.1111/codi.14502

Surgical Endoscopy
https://doi.org/10.1007/s00464-020-08184-1

Check for updates

Short-term clinical outcomes of a European training programme for robotic colorectal surgery

Sofoklis Panteleimonitis[1] · Danilo Miskovic[2] · Rachelle Bissett-Amess[3] · Nuno Figueiredo[3] · Matthias Turina[4] · Giuseppe Spinoglio[5] · Richard J. Heald[3,6] · Amjad Parvaiz[1,3,7] · On behalf of the EARCS Collaborative

Received: 28 April 2020 / Accepted: 17 November 2020

- 26 European colorectal units
- 2014-2018
- 1130 robotic colorectal resections (826 rectums)
  - 323 training
  - 626 graduates
  - 181 proctors

Table 1 Baseline characteristics of robotic colorectal procedures

	Training ($n=323$)	Graduate ($n=626$)	Proctor ($n=181$)	p value
Age (years)	65 (56–75)	67 (57–74)	66 (59–74)	0.485
BMI (kg/m^2)	26 (24–29)	26 (23–29)	26 (24–28)	0.497
Gender				
Male	189 (58.5%)	376 (60.1%)	112 (61.9%)	
Female	134 (41.5%)	250 (39.9%)	69 (38.1%)	0.756
ASA grade				
1	46 (14.3%)	75 (12.1%)	25 (14.1%)	0.147
2	202 (62.7%)	408 (65.8%)	127 (71.8%)	
3	74 (23%)	134 (21.6%)	25 (14.1%)	
4	0	3 (0.5%)	0	
Malignant	289 (89.5%)	561 (89.6%)	179 (98.9%)	*<0.001*
Neoadjuvant Tx	43 (26.9%)	118 (29.3%)	58 (34.1%)	0.330
T stage				
0	23 (8.6%)	55 (10.6%)	11 (6.3%)	0.555
1	34 (12.6%)	60 (11.6%)	25 (14.4%)	
2	67 (24.9%)	141 (27.3%)	50 (28.7%)	
3	122 (45.4%)	232 (44.9%)	78 (44.8%)	
4	23 (8.6%)	29 (5.6%)	10 (5.7%)	
N stage				
0	157 (66%)	283 (66.4%)	116 (67.1%)	0.647
1	58 (24.4%)	97 (22.8%)	45 (26%)	
2	23 (9.7%)	46 (10.8%)	12 (6.9%)	
Operations				
Anterior resection	191 (59.1%)	367 (58.6%)	139 (76.8%)	*0.018*
APER	26 (8%)	68 (10.9%)	10 (5.5%)	
Hartman's	3 (0.9%)	2 (0.3%)	3 (1.7%)	
Right hemicolectomy	47 (14.6%)	83 (13.3%)	10 (5.5%)	
Left hemicolectomy	19 (5.9%)	28 (4.5%)	7 (3.9%)	
Sigmoid resection	24 (7.4%)	48 (7.7%)	9 (5.0%)	
Completion proctectomy	3 (0.9%)	4 (0.6%)	0	
Panprocto- or proctocolectomy	2 (0.6%)	4 (0.6%)	1 (0.6%)	
Rectopexy	7 (2.2%)	15 (2.4%)	1 (0.6%)	
Subtotal colectomy	1 (0.3%)	3 (0.5%)	1 (0.6%)	
Other	0	4 (0.6%)	0	
Rectal resections	225 (69.7%)	448 (71.6%)	153 (84.5%)	*0.001*

Statistically significant values are given in italics

BMI body mass index, *ASA* American Society of Anaesthesiologists, *APER* abdominoperineal excision

Table 2 Short-term outcomes of robotic colorectal procedures

	Training ($n=323$)	Graduate ($n=626$)	Proctor ($n=181$)	p value
Conversion	7 (2.2%)	21 (3.4%)	5 (2.8%)	0.583
Operation time (min)	302 (230–390)	265 (200–353)	255 (202–342)	*<0.001*
EBL (ml)	50 (20–100)	50 (20–100)	30 (10–100)	*<0.001*
LOS (days)	7 (5–10)	6 (4–9)	6 (3–8)	*0.003*
30-day reoperation	21 (6.5%)	39 (6.2%)	10 (5.5%)	0.908
30-day readmission	23 (7.1%)	51 (8.1%)	15 (8.3%)	0.835
30-day mortality	1 (0.3%)	2 (0.3%)	0	0.750
Anastomotic leak	9/286 (3.1%)	17/538 (3.2%)	6/166 (3.3%)	0.954
Complications (Clavien–Dindo)				
I or II	40 (12.4%)	89 (14.2%)	20 (11%)	0.714
III to V	33 (10.2%)	53 (8.5%)	17 (9.4%)	
R1 resection	3/203 (1.5%)	6/355 (1.7%)	3/133 (2.3%)	0.863
Lymph node yield	18 (13–25)	18 (13–25)	18 (13–24)	0.778

Statistically significant values are given in italics

EBL estimated blood loss, *LOS* length of stay

Training conclusion

- Structured training pathway in robotic colorectal surgery →
    1. overcome learning process without compromising clinical outcomes
    2. surgeons can achieve similar clinical outcomes to their trainers

EARCS
European Academy of Robotic Colorectal Surgery

Essentials for training..

› Langenbecks Arch Surg. 2018 Sep;403(6):749-760. doi: 10.1007/s00423-018-1690-1. Epub 2018 Jun 20.

Implementation of robotic rectal surgery training programme: importance of standardisation and structured training

Sofoklis Panteleimonitis [1 2], Sotirios Popeskou [3], Mohamed Aradaib [4], Mick Harper [4], Jamil Ahmed [3], Mukhtar Ahmad [3], Tahseen Qureshi [3 5], Nuno Figueiredo [6], Amjad Parvaiz [3 4 6]

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PMID: 29926187 PMCID: PMC6153605 DOI: 10.1007/s00423-018-1690-1

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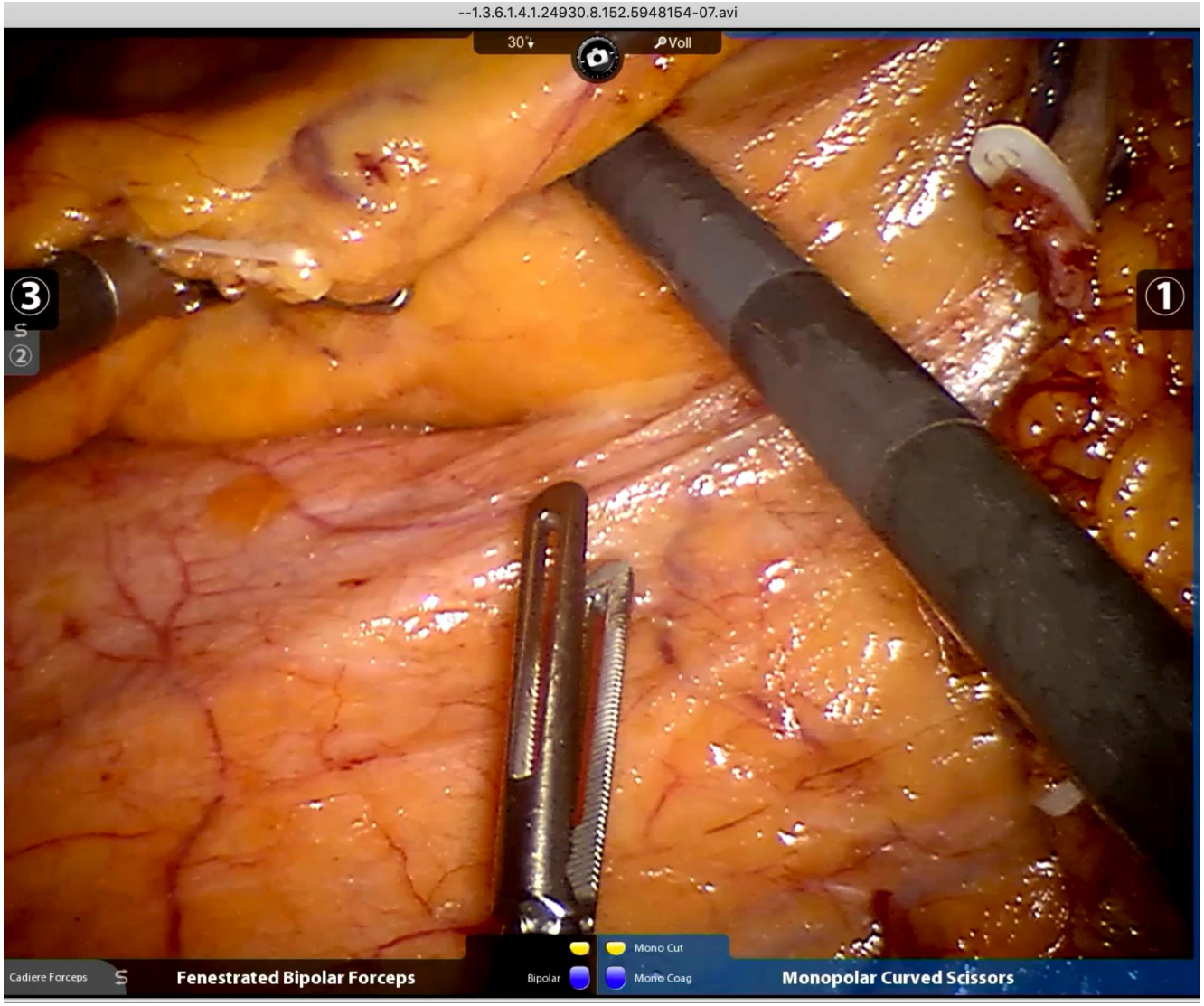
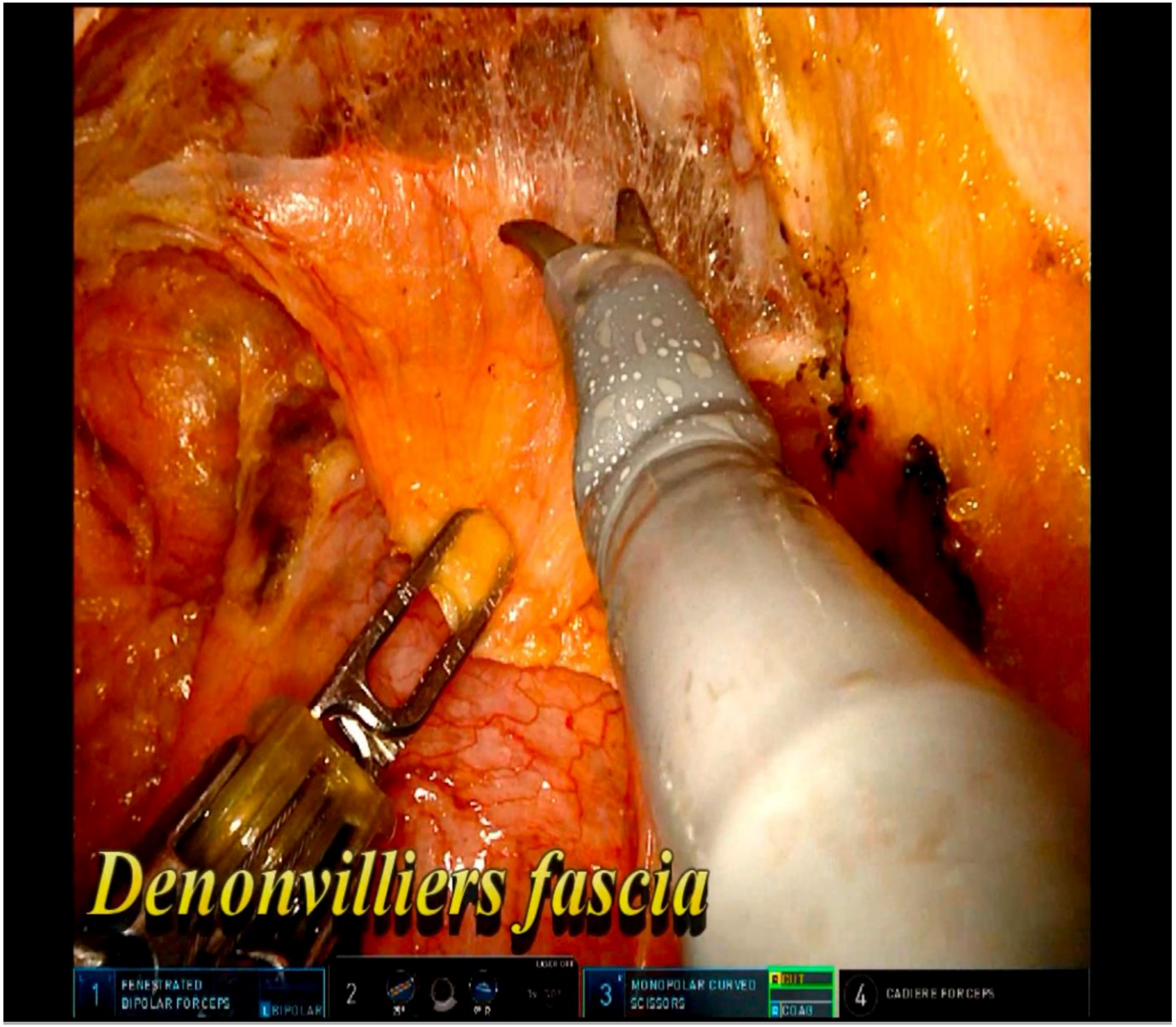
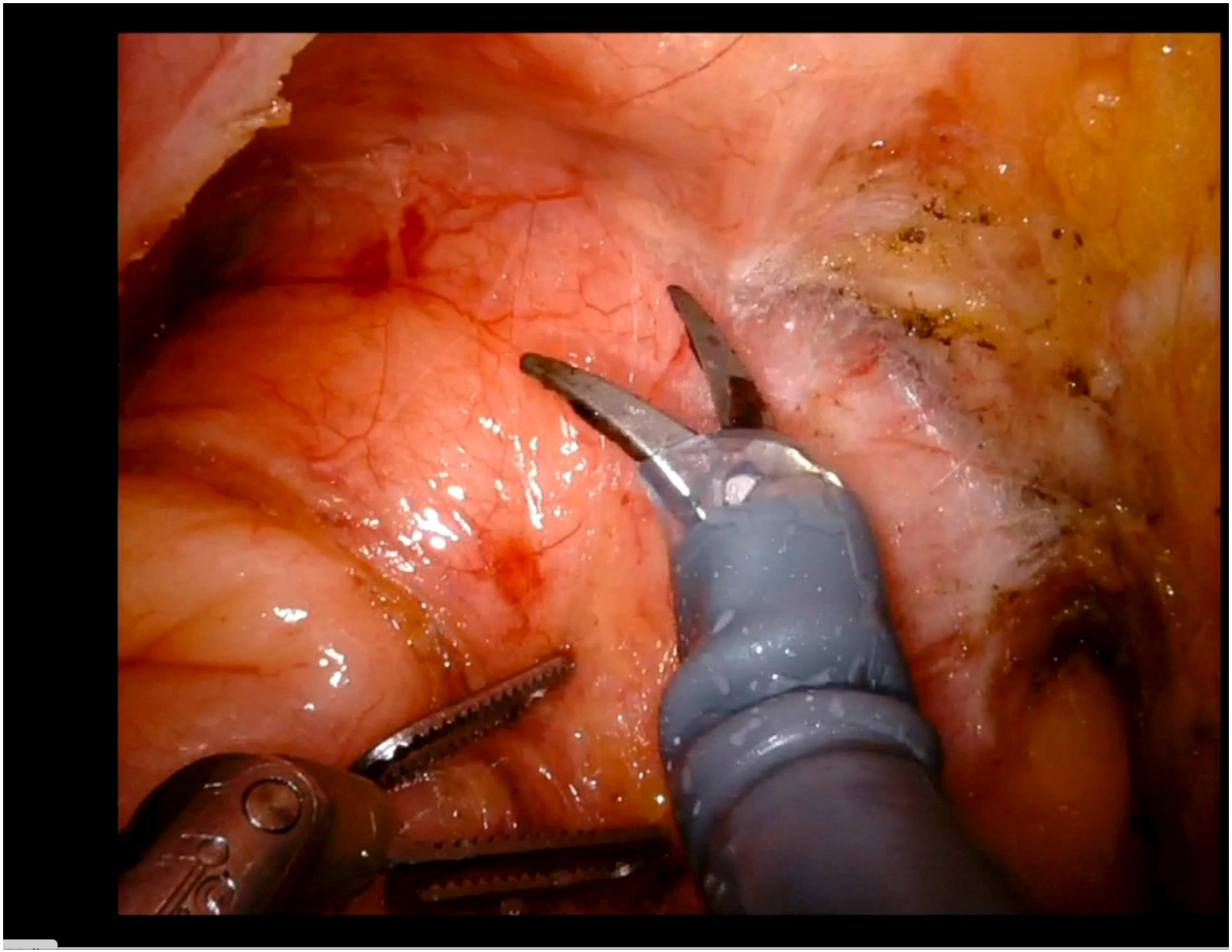
Robotics = anatomical surgery

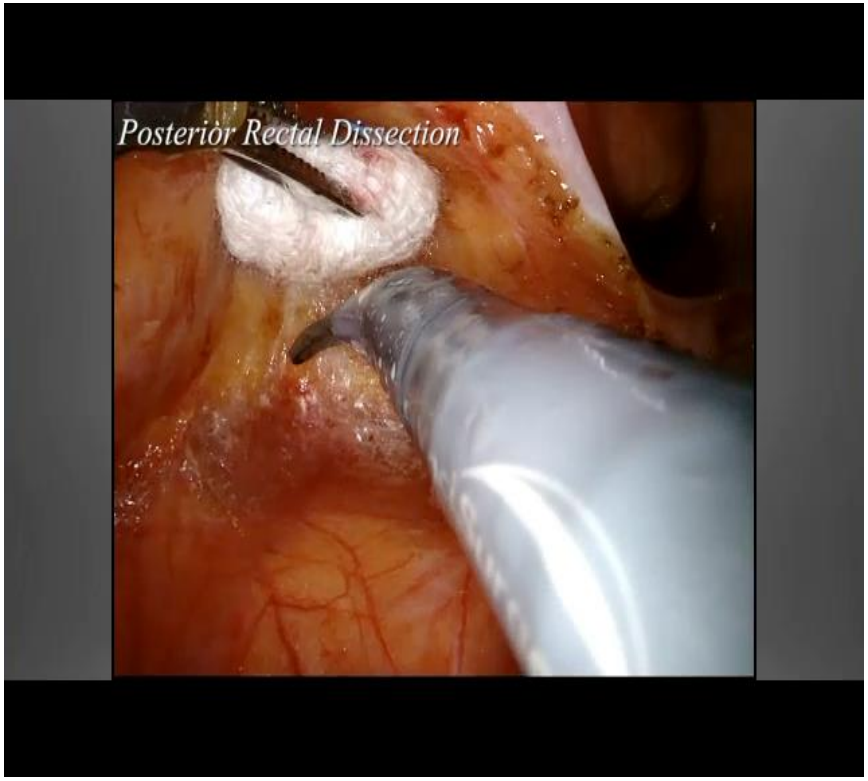


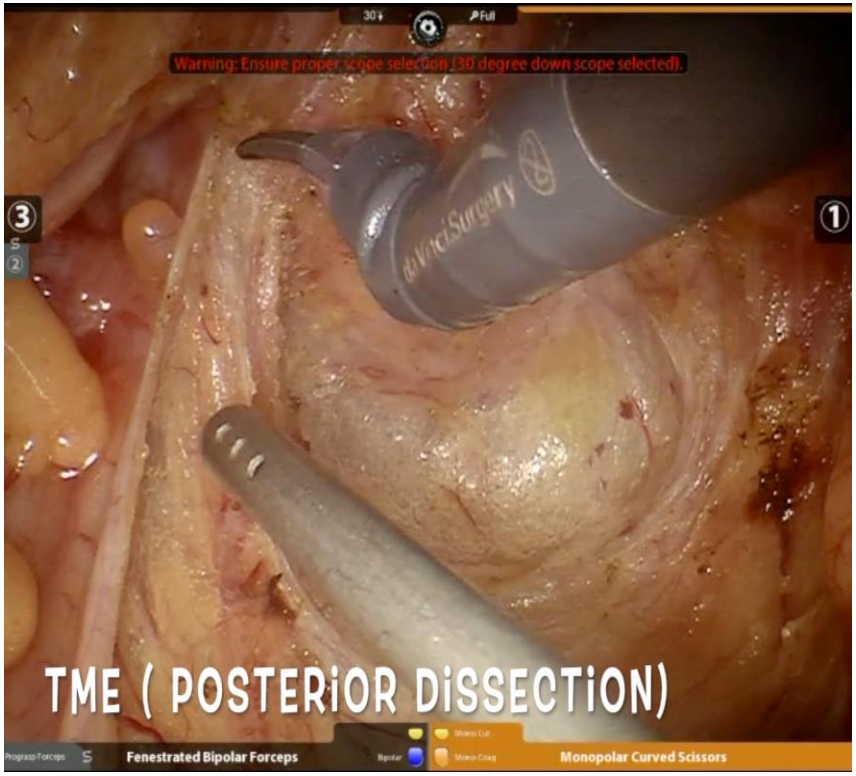
Anatomical Precision..



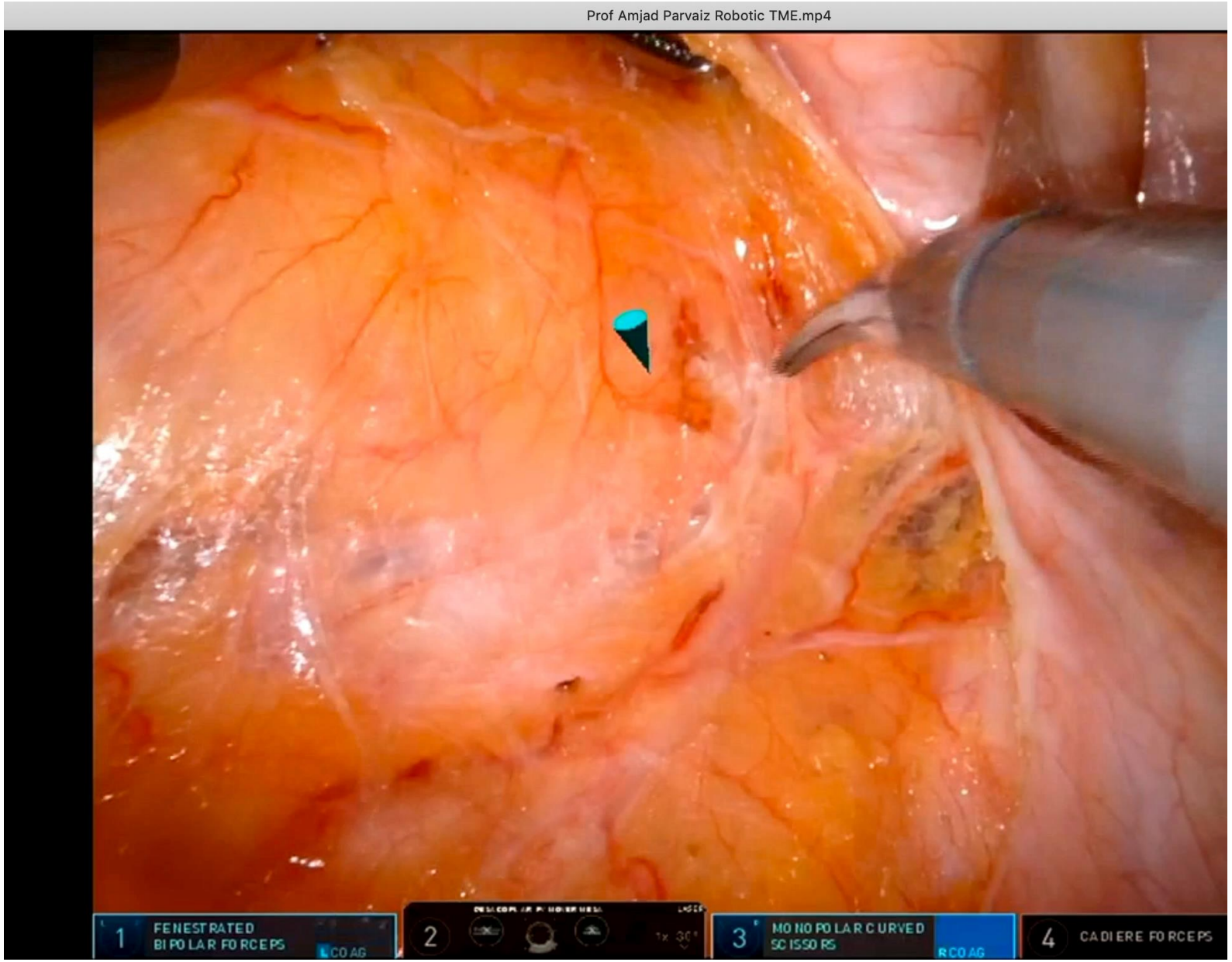
Anterior Dissection Male post chemo-RT



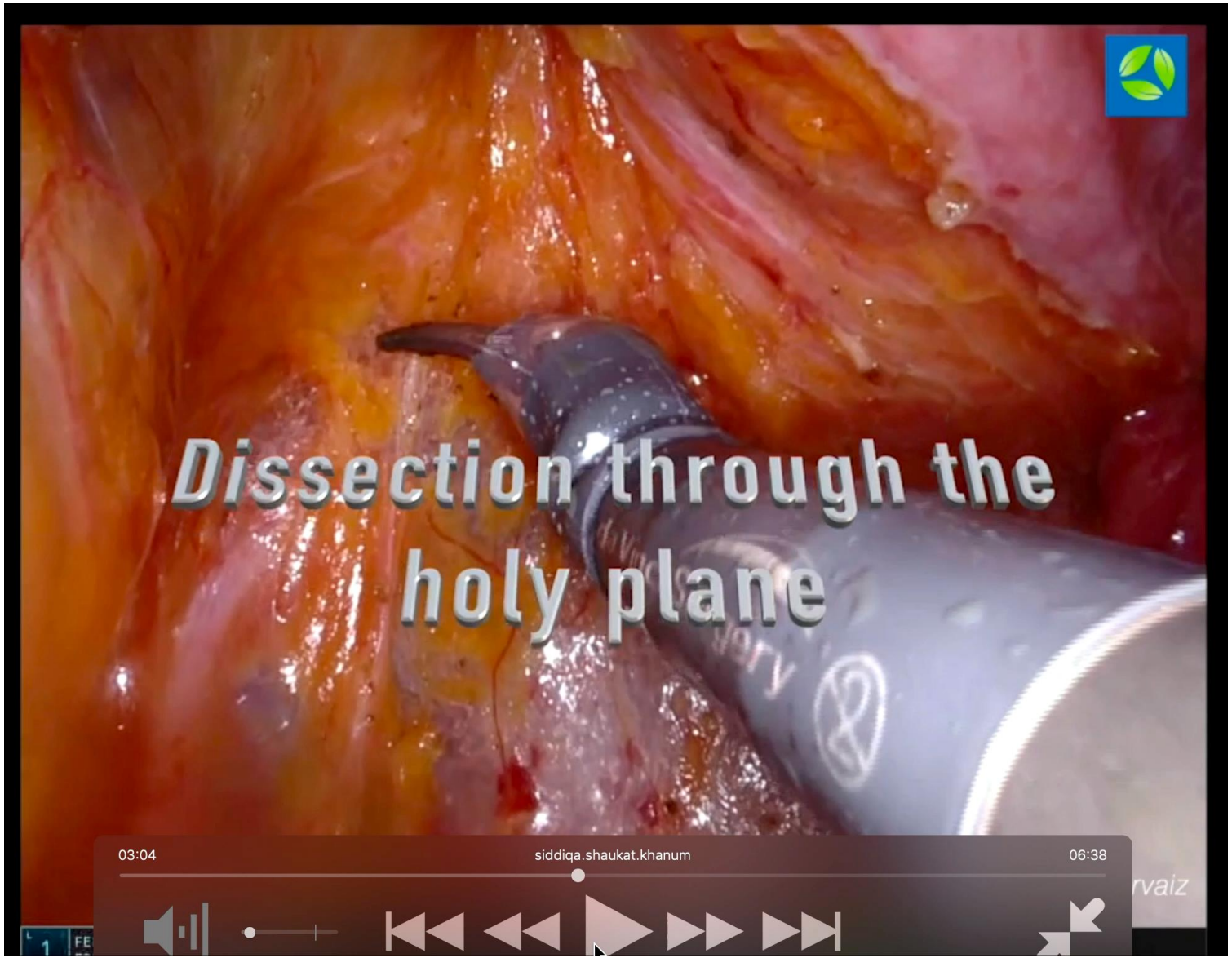

Posterior Rectal Dissection


Warning: Ensure proper scope selection (30 degree down scope selected).
TME (POSTERIOR DISSECTION)
Fenestrated Bipolar Forceps
Monopolar Curved Scissors

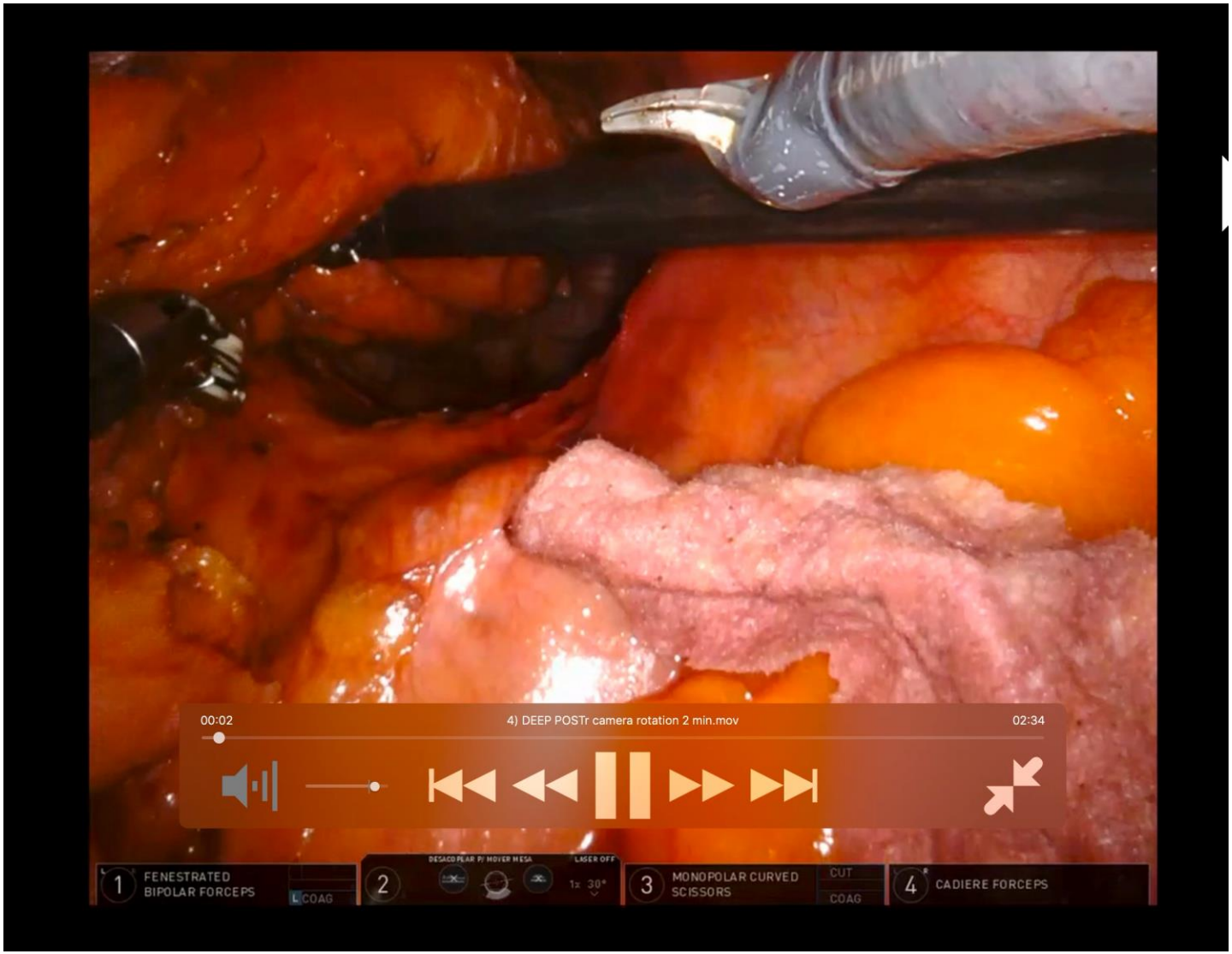
Nerve preservation



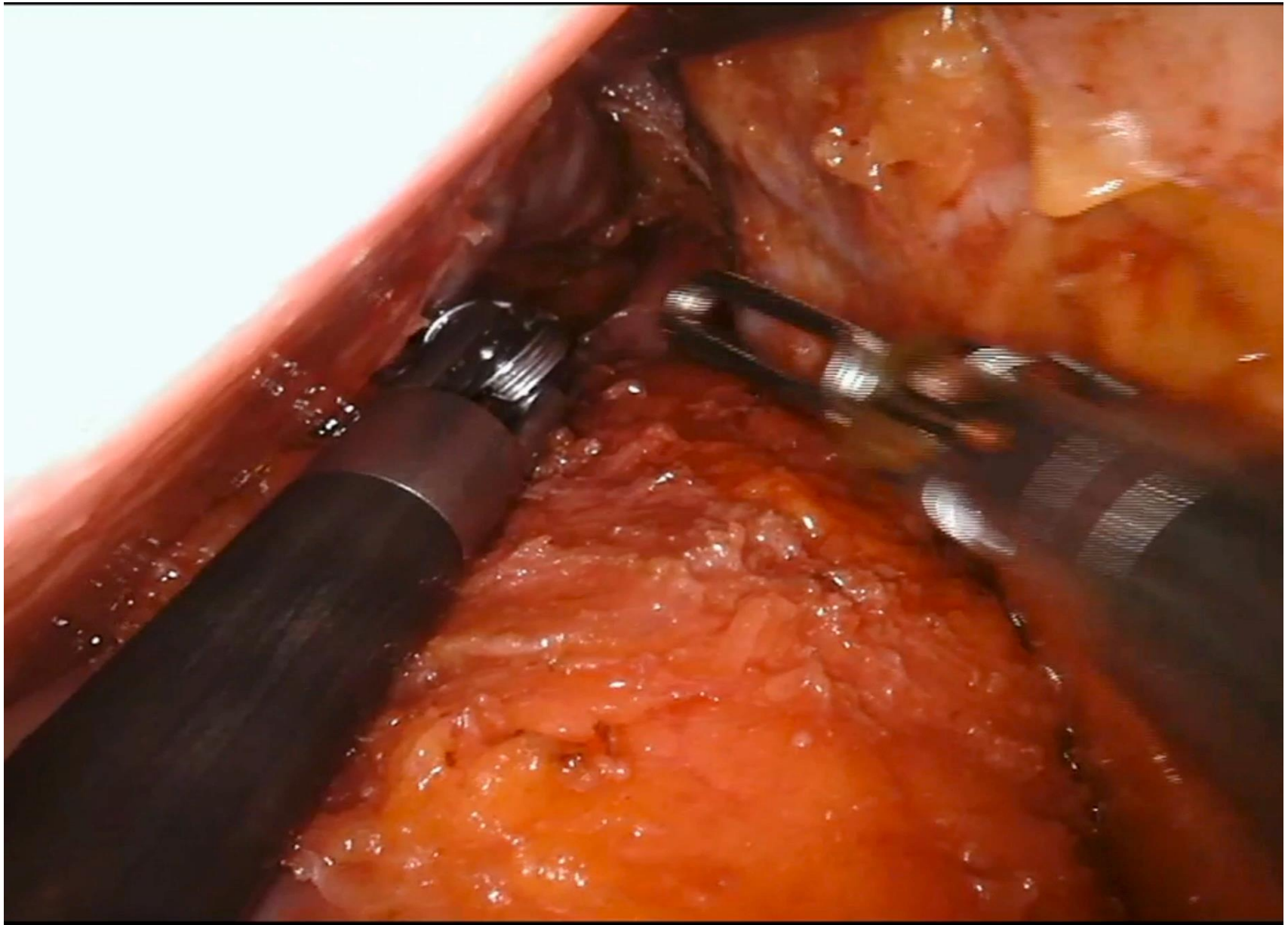
Robotic TME in T4 cancer

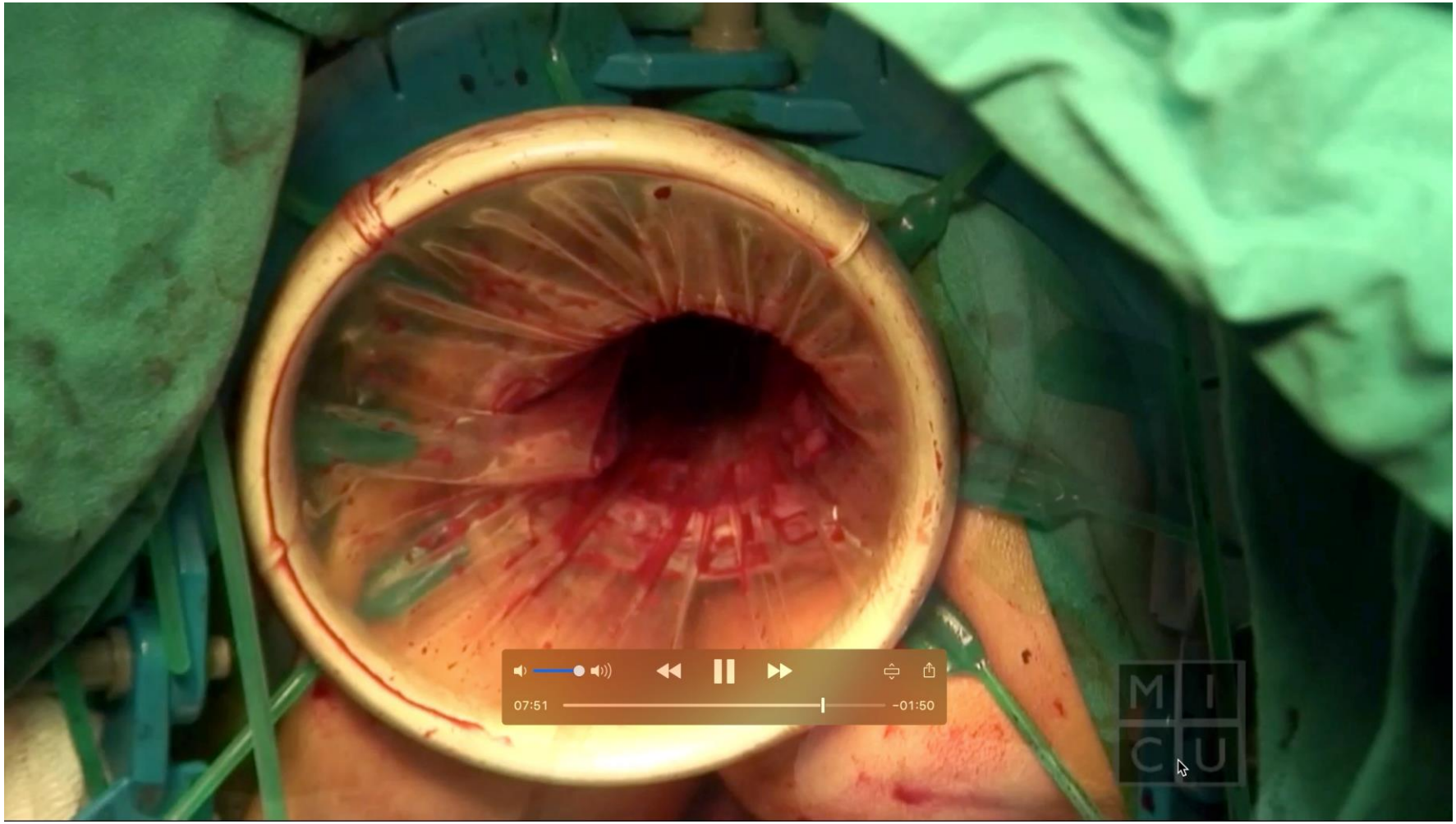


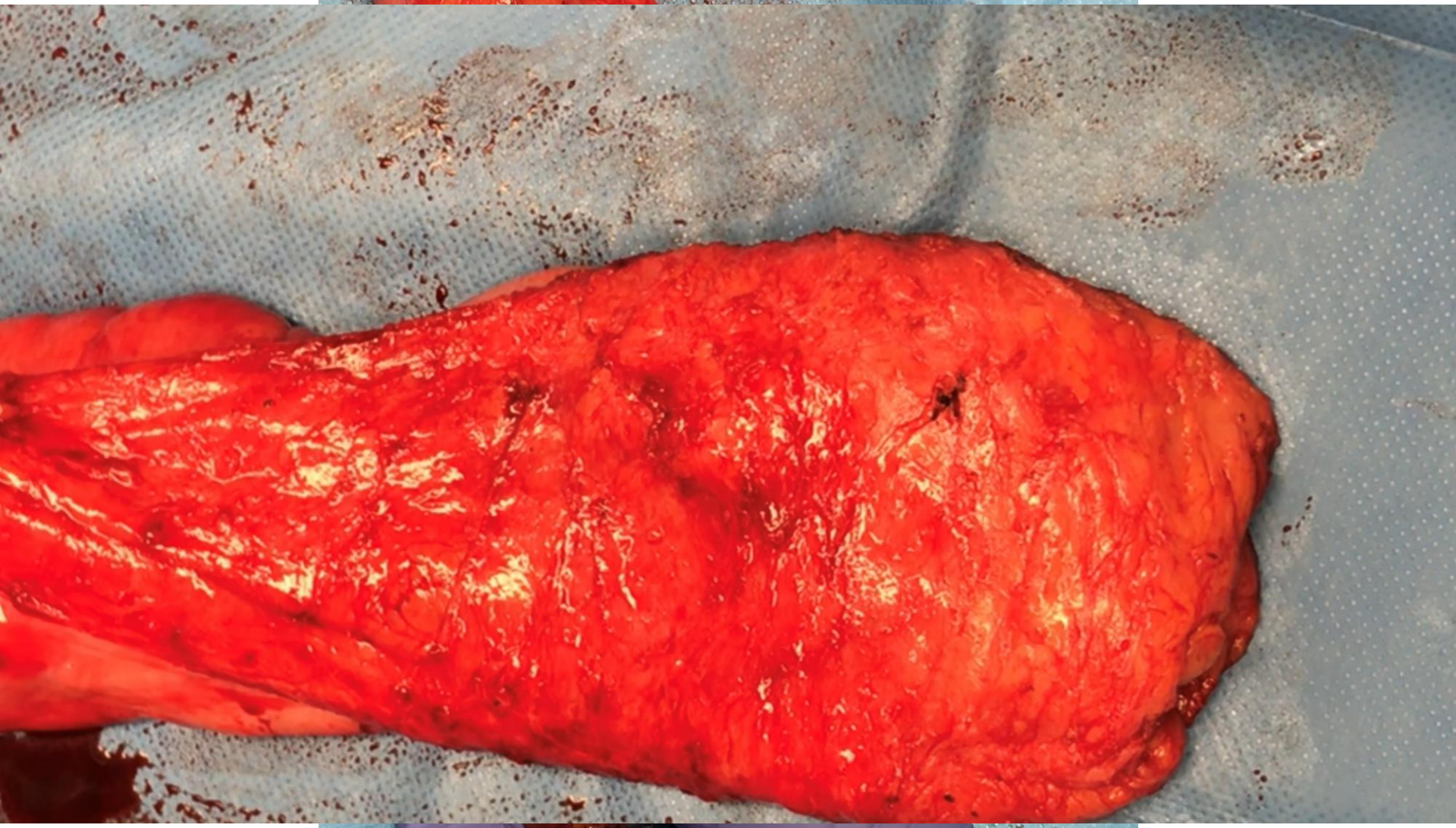
Lower rectum difficult exposure ?

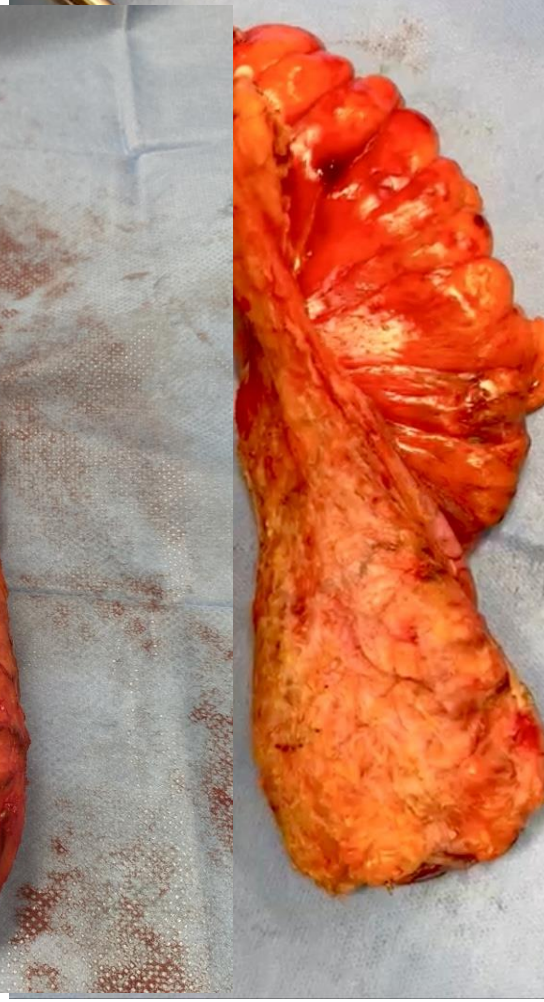


Difficult to know the distal edge?




07:51
-01:50
M I
C U



Key to Success !

- Seeking anatomical Precision should be the goal
- Standardization of Operative technique
- Attention to details
- Reproducibility of operative technique
- Marginal Gains with practice (purposeful practice !)

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