Clarunis
Universitäres Bauchzentrum Basel
St. Claraspital und Universitätsspital Basel

Laparoscopic, transanal, robotic or even open rectal resection: an agony of choice?

Prof. Markus von Flüe

19th century: Survive the surgery!

Image 2. Approach for Kraske's posterior proctectomy: Left wing of sacral bone hollowed with chisel and removed [4].

„Limited“ resection by mostly posterior approach

Analysis of 1500 cases before 1900
from Kocher, Billroth, Kraske, Czerny

Operative mortality 21%
Local recurrence 80%

AS Galler, Surg Oncol 2011

20th century: Survive the cancer!

Image 3. Sir William Ernest Miles [9].

Miles 1908: Report of 12 cases wit **APR**

Mortality 42% (5)

Overall survival 1 year 58% (7)

Claude Dixon 1948 **Anterior resection**

6-20 cm from dentate line

Two stage procedure

Mortality 2.6%

5yrs-survival 64%

Sir Alan Parks 1970

Low anterior resection

Clarunis

AS Galler, Surg Oncol 2011

20th century: Survive the cancer!

Bill Heald 1980: TME

Prior: blunt dissection with 25% lateral positive margins, 85% LRR

After: TME, CRM + 3.6%, **5 yrs LRR 4%**, **5 yrs OS 80%**

21th century: Preserve the function!

- 1951 Goligher, Dukes, and Bussey: **distal margin 5 cm**
  - 1500 specimens, 2% spread distally >2cm
- 1953 Pollett and Nichols: **distal margin 2 cm**
  - 23 recurrences in 334 patients. No difference for distal margin <2cm, 2-5cm and >5cm
- 2003 Harvey Moore: **distal margin 1 cm or less**
  - After **neoadjuvant treatment** no difference <1cm and >1 cm

21th century: Minimize surgical trauma!

Laparoscopic rectal cancer surgery
ACS-NSQIP 2005-2016, USA
N=31’795

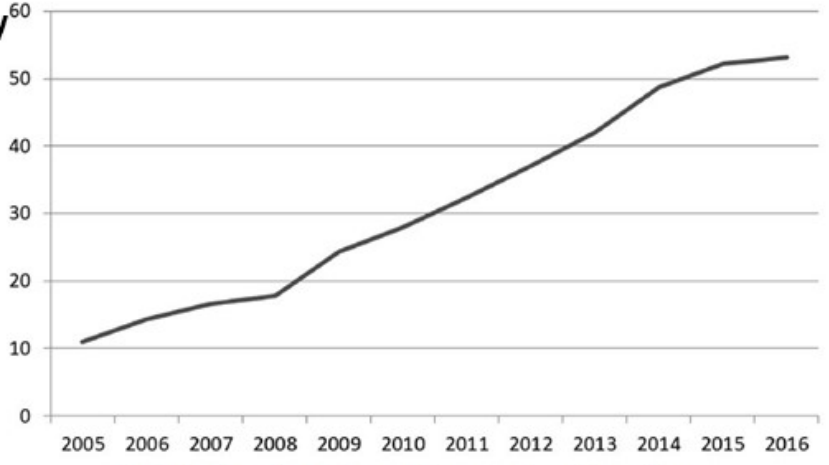


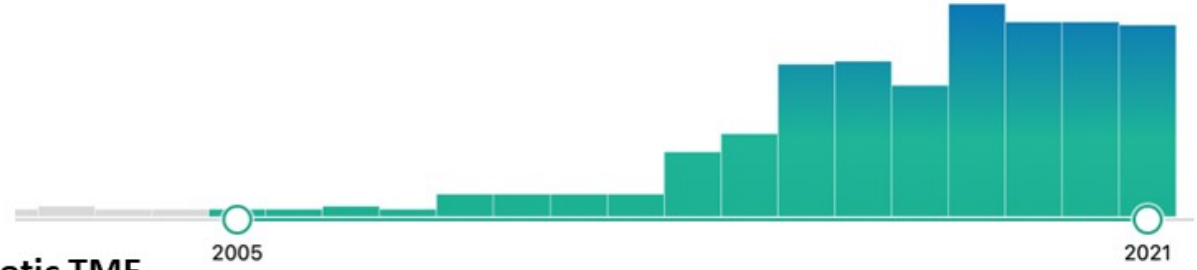
Fig. 1. Overall prevalence of laparoscopic resection for rectal cancer by year.

Davis CH, Gaglani T, Cusick MV, Int J Surg 2019

21th century: Minimize surgical trauma!

Publications on **taTME**

385 results



Publications on **Robotic TME**

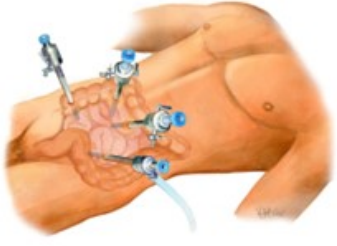
RESULTS BY YEAR

210 results

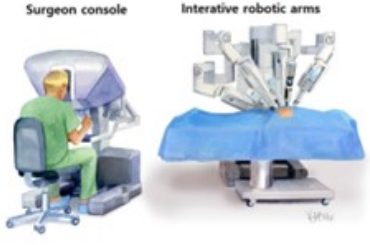
Agony of choices

open

laparoscopic



robotic



ta-TME

Advantages of Laparoscopy

Laparoscopy vs open (CLASSIC trial)	
↘local complications	OR 0.51
↘wound infections	OR 0.47
↘time to gas	-33%
↘pain at rest, day 3	-62.5%
↘opioid use (first 48h)	-36.9%
↘hospital stay	-20.6%

Guillou PJ, MRC CLASSIC, Lancet 2005

Oncologic equivalent?

Colorectal cancer (lap. vs. open)

UK MRC CLASSIC (n=794)

- ✓ 3yrs disease free survival 66.3% vs 67.7%
- ✓ 3yrs local recurrence rate 8.6% vs 7.9%

COLOR (n=1248)

- ✓ 3yrs disease free survival 74.2% vs 76.2%

COST (n=872)

- ✓ 5yrs disease free survival 69.2% vs 68.4%

ALCCaS (n=601)

- ✓ 5yrs disease free survival 77.7% vs 76%

Guillou PJ, Lancet 2005; Veldkamp R, Lancet Oncol 2005; Jayne DG, Surg Oncol 2007, 25; Bonjer HJ, Lancet Oncol 2009; Fleshman J, Ann Surg 2007; Bagshaw PF, Ann Surg 2012; Abraham NS, Br J Surg 2004

…and for rectal cancer?

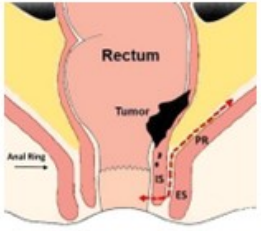
Subgroup rectal cancer		
CRM +	12% vs 6%	p=0.19
3yrs local recurrence	7.8% vs 7.0%	p=0.70

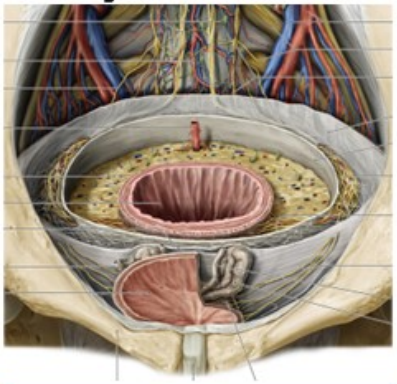
- COLOR II
- COREAN
- ALaCaRT
- ACOSOG Z6051

Guillou PJ, Lancet 2005; Veldkamp R, Lancet Oncol 2005; Jayne DG, Surg Oncol 2007, 25; Bonjer HJ, Lancet Oncol 2009; Fleshman J, Ann Surg 2007; Bagshaw PF, Ann Surg 2012; Abraham NS, Br J Surg 2004

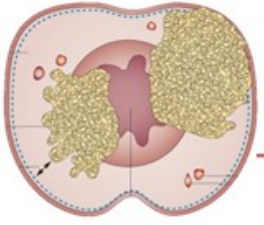
Oncologic Quality of Rectal Cancer Surgery

Distal margin





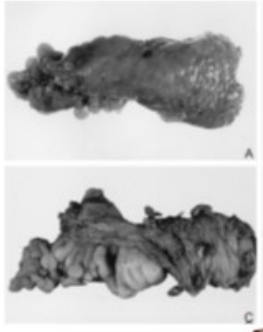
Circumferential margin (CRM)



Survival
Local Recurrence

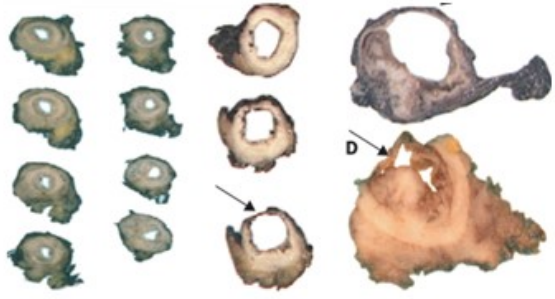
	Local recurrence	Distant metastases	Survival (2 y)	No.
≤0.10 cm	16.4%	37.6%	69.7%	120
0.11–0.20 cm	14.9%	21.0%	84.8%	53
0.21–0.50 cm	10.3%	17.2%	87.0%	139
0.51–1.00 cm	6.0%	8.2%	91.2%	155
>1.00 cm	2.4%	10.9%	92.8%	189
	p = 0.0007	p <0.0001	p <0.0001	

Quality of specimen



2-yrs recurrence:

good/nearly tot	14.9%
poor	28.6%
	p=0.03



Quirke P, Lancet 2003; Nagtegaal ID, J Clin Oncol 2002; Heald RJ, Arch Surg 1998; Nagtegaal ID, Am J Surg Pathol 2002

ALaCaRT and ACOSOG Z6051

	✖ non-inferiority	✖ non-inferiority
Lap. vs. open	**ALaCaRT (n=475)**	**ACOSOG Z6051 (n=486)**
Non inferiority boundary	8%	6%
centers	24	35
surgeons	Video-Assessment ≥ 30 lap. Rektum / ≥ 100 lap. Kolon	Video-Assessment ≥ 20 lap. Rektum
Tumour stages	I-III	II-III (T3 N0-2)
Neoadjuvant chemoradiation	49.5%	Alle
conversions	9%	11.3%
Combined endpoint, % (95%CI): - **Negative CRM (≥ 1mm)** - **Distal margin (≥ 1mm)** - **Specimen good/nearly total**	**82 vs. 89 (-12.4 to ∞)** Post-hoc test for superiority 95%CI -13.8;-0.6, p=0.03	**81.7 vs. 86.9 (-10.8 to ∞)**
Specimen good/nearly tot, % (95%CI)	97 vs. 99 (-10.9 to 0.2)	92.1 vs. 95 (-7.4 to 1.5)
CRM free (>1mm), % (95%CI)	93.3 vs. 97 (-7.6 to 0.1)	87.9 vs. 92.3 (-9.8 to 0.98)
Distal margin (>1mm), % (95%CI)	99 vs. 99 (-1.8 to 1.0)	98.3 vs. 92.2 (-2.3 to 2.5)

Stevenson ARL, JAMA Surgery 2015; Fleshman J, JAMA Surgery 2015

Meta-Analysis

lap. vs open	Including	Endpoint	Result
✘ Martinez-Perez 2017	14 RCT n=4034	CRM+	7.9% vs 6.1%, p=0.26
		Specimen good	86.8% vs 89.6% p=0.02
✓ Creavin 2017	4 RCT n=2319	CRM+	7.5% vs 6.1% p=0.31
		Speciment good/near tot	95.9% vs 96.5% p=0.26

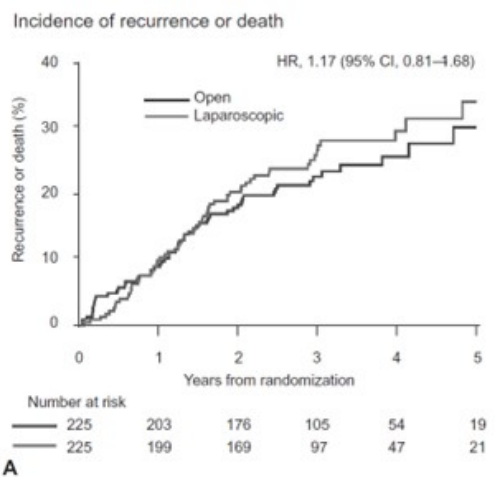
Nienhüser H, JOGS 2018; Martinez-Perez A, JAMA Surg 2017; Creavin B, Br J Surg 2017

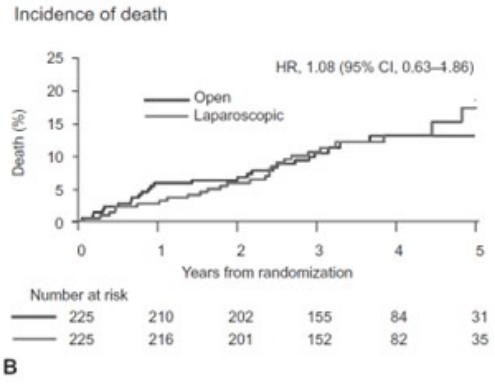
ALaCaRT

Lap. vs. open	ALaCaRT (n=450)
Non inferiority boundary	8%
centers	24
surgeons	Video-Assessment ≥ 30 lap. Rectum / ≥ 100 lap. colon
Tumour stages	I-III
Neoadjuvant chemoradiation	49.5%
conversions	9%
2-yrs LRR, % (Δ; 95%CI)	5.4 vs. 2.3 (2.3; -1.5 to 6.1)
2-yrs DFS, % (Δ; 95%CI)	80 vs. 82 (-2; -9.5 to 5.4)

✓no significant difference

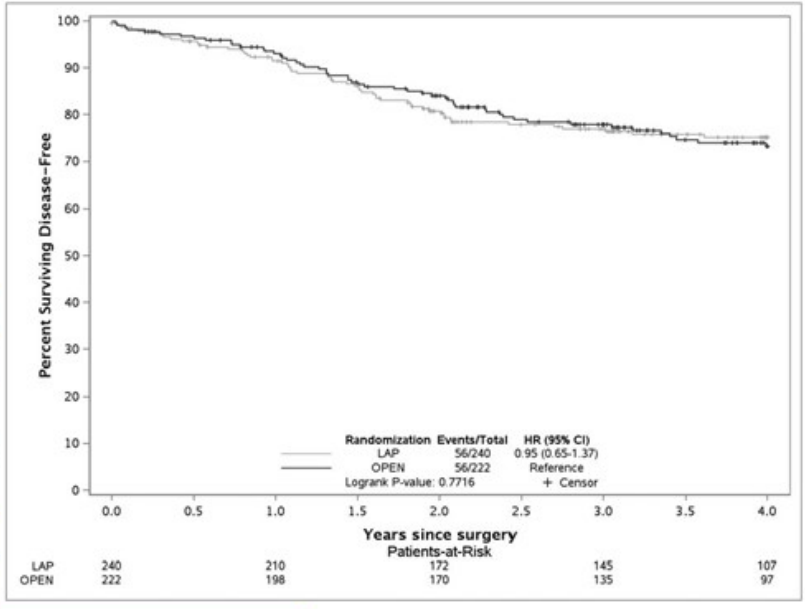
Stevenson ARL, Ann Surg 2019





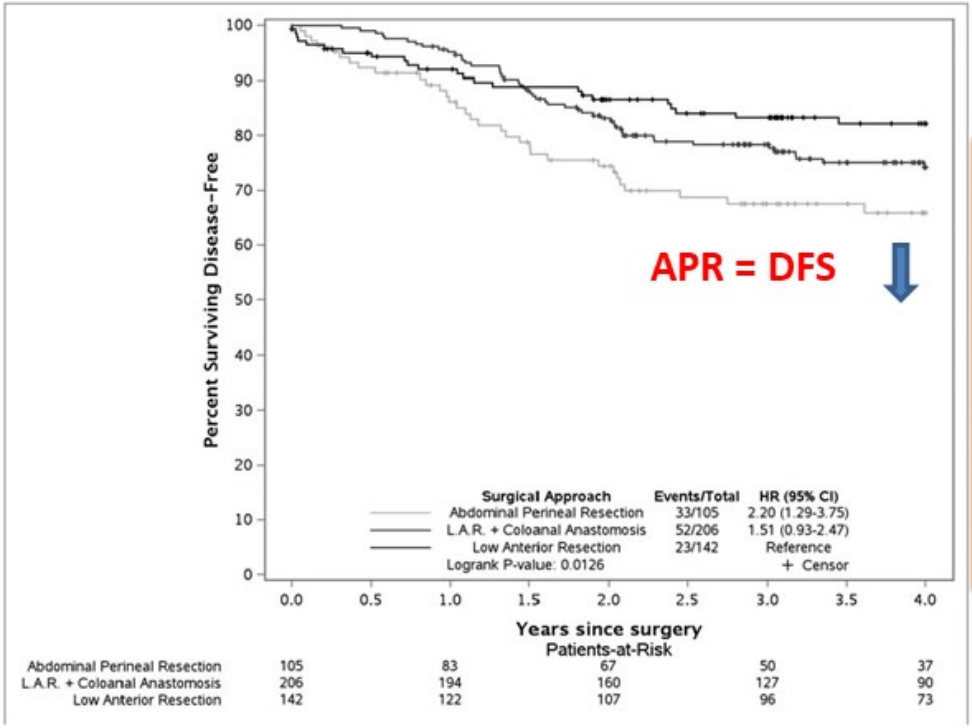
ACOSOG Z6051

Lap. vs. open	ACOSOG (n=486)
Non inferiority boundary	6%
centers	35
surgeons	Video-Assessment ≥ 20 lap. Rectum
Tumour stages	II-III (T3 N0-2)
Neoadjuvant chemoradiation	Alle
conversions	11.3%
2-yrs DFS, % (95%CI)	79.5 (74.4-84.9) vs. 83.2 (78.3-88.3)



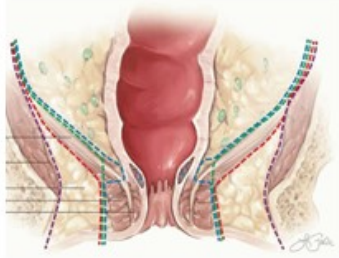
Fleshman J, Ann Surg 2019

✓no significant difference



Rectal perforations (specimen):

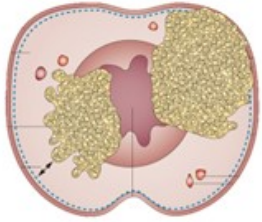
laparoscopic	15.4%
open	9.5%
p	0.054
APR	36%
LAR	4%
LAR + CAA	6%
p	<0.0001



Fleshman J, Ann Surg 2019

Laparoscopic vs open

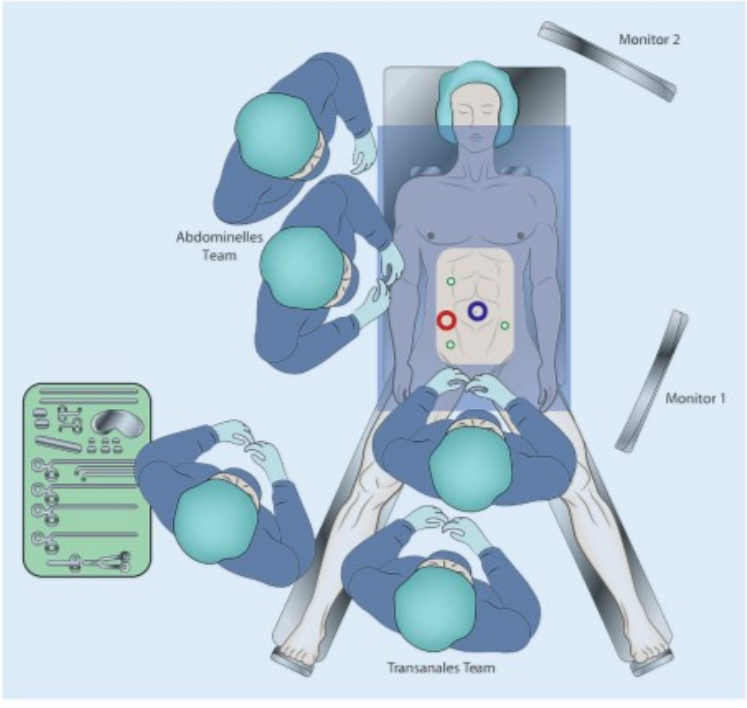
- **Lower morbidity** for laparoscopy
- Data seems to demonstrate **oncologic equivalence**
- **CRM+** as most imporant predictor for local recurrence

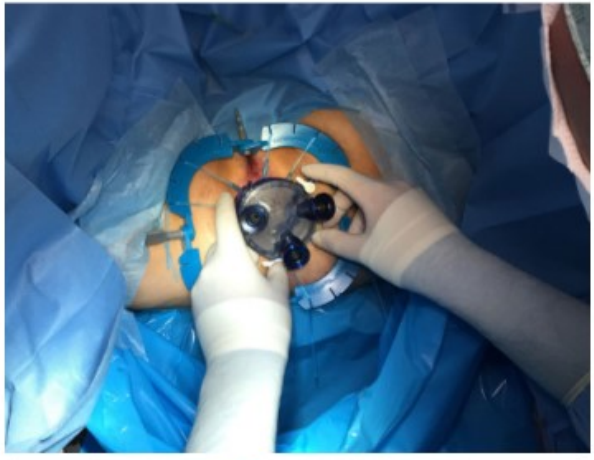


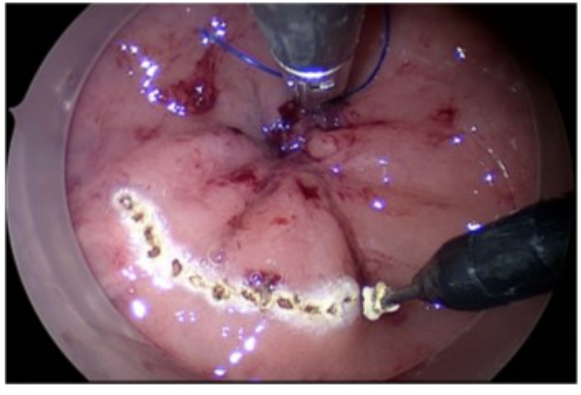
Laparoscopy

- **Caution in case of advanced tumours:** risk of inadvertent tumour perforation (APR) or compromised CRM
- Reduction of CRM+ in **TaTME or robotic TME?**

taTME







taTME

Anticipated advantage	Risks
Better exposure of distal rectum	Increased local recurrence?
Safe distal margin	Long flat learning curve
No coning	New complications: Urethral injury (0.8%), CO2-emboly
No double-stapling	

Aigner F. Chirurg 2020 · 91:860–869

Table 1. Characteristics of Patients Included in the Study

Characteristic	Data
Age, y, mean ± SD	65.5 ± 12.7
Sex, n (%)	
Male	89 (63.6)
Female	51 (36.4)
BMI, kg/m^2, mean ± SD	25.2 ± 3.9
American Society of Anesthesiologists score, n (%)	
I	8 (5.7)
II	117 (83.6)
III/IV	15 (10.7)
Previous abdominal open surgery, n (%)	35 (25.0)
Tumor location, n (%)	
Upper rectum	29 (20.7)
Middle rectum	70 (50.0)
Lower rectum	41 (29.3)
Distance from anal verge by MRI, cm, mean ± SD	7.6 ± 3.6
Upper rectum	12.6 ± 1.9
Middle rectum	7.7 ± 1.9
Lower rectum	3.6 ± 1.2
Preoperative T stage, n (%)	
mrT1	2 (1.4)
mrT2	27 (19.3)
mrT3	90 (64.3)
mrT4	11 (7.9)
Not assessed*	10 (7.1)
Preoperative N stage, n (%)	
mrN−	71 (50.7)
mrN+	59 (42.1)
Not assessed*	10 (7.1)
Preoperative M stage, n (%)	
M0	131 (93.6)
M1†	9 (6.4)
Neoadjuvant therapy, n (%)	
Chemoradiation	90 (64.3)†
Chemotherapy	3 (2.1)
Radiotherapy	1 (0.7)

taTME

- Barcelona, n=140, 2011-2014
- Anastomotic leakage 8.6%
- Quality:
  - Complete 91.1%
  - Nearly complete 2.1%
  - Incomplete 0.7%
  - CRM <1mm 6.4%
- Follow-up **15 months**
  - **LRR 2.3%**
  - Disease free 90.8%

Lacy AM, Wexner SD, Heald RJ. Surg Endosc 2015

taTME vs lap. TME

Characteristic	taTME	laTME	*P* value
Gender, *n* (%)			0.724
Male	83 (64.8%)	89 (66.9%)	
Female	45 (35.2%)	44 (33.1%)	
Age in years, mean ± SD (range)	56.1 ± 11.2 (26.0–78.0)	56.1 ± 10.9 (26.0–75.0)	0.270
BMI in kg/m^2, mean ± SD (range)	22.5 ± 3.1 (17.0–33.2)	22.2 ± 2.9 (14.2–31.6)	0.536
Historical of abdominal surgery, *n* (%)			0.160
Yes	10 (7.8%)	5 (3.8%)	
No	118 (92.2%)	128 (96.2%)	
Distance between tumor and anus in cm, mean ± SD (range)	5.0 ± 1.7 (1.5–10)	5.1 ± 1.5 (2.8–9.3)	0.509
Tumor large size in cm, mean ± SD (range)	3.2 ± 1.3 (1.1–7.4)	3.0 ± 1.3 (0.6–8.0)	0.150
Neoadjuvant chemoradiation, *n* (%)			0.100
Yes	59 (46.1%)	48 (36.1%)	
No	69 (53.9%)	85 (63.9%)	
Both of radiotherapy and chemotherapy	21 (16.4%)	15 (11.3%)	
Only chemotherapy	38 (29.7%)	33 (24.8%)	
Preoperative T stage, *n* (%)			0.560
T0	2 (1.6%)	3 (2.3%)	
T1	3 (2.3%)	2 (1.5%)	
T2	19 (14.8%)	25 (18.8%)	
T3	100 (78.1%)	102 (76.7%)	
T4	1 (0.8%)	1 (0.8%)	
TX	3 (2.3%)	0 (0%)	
Preoperative N stage, *n* (%)			0.241
N0	76 (59.4%)	85 (63.9%)	
N1	43 (33.6%)	37 (27.8%)	
N2	6 (4.7%)	11 (8.3%)	
NX	3 (2.3%)	0 (0%)	

Data	taTME	laTME	*P* value
Mesorectal resection quality, *n* (%)			0.173
Complete	121 (94.5%)	119 (89.5%)	
Nearly complete	7 (5.5%)	14 (10.5%)	
Incomplete	0 (0%)	0 (0%)	
Length of resected intestine in centimeter (cm), mean ± SD (range)	11.9 ± 4.6 (6–36)	11.7 ± 4.2 (2.4–39)	0.841
Length between tumor and distal resection margin in cm, mean ± SD (range)	1.4 ± 1.1 (0.1–8.0)	1.3 ± 0.9 (0–6.0)	0.745
Evaluated lymph nodes, median (range)	15 (2–35)	16 (0–66)	0.069
Distal resection margin status			0.498
Positive	0 (0%)	2 (1.5%)	
Negative	128 (100%)	131 (98.5%)	
CRM status			0.674
Positive	2 (1.6%)	2 (1.5%)	
Negative	126 (98.4%)	131 (98.5%)	

NCT02966483, estimated enrollment 1114 patients

Preliminary results of RCT (**128 vs 133 patients**).

No difference in pathological outcome.

Zheng Z. Surg Endosc 2020

Bordeaux RCT

- 50 taTME vs 50 lap TME
- Distance from anal verge 4 (2-6) cm
- Follow-up 60 months

	taTME	lapTME	p
Positive distal margin	2%	8%	0.362
CRM +	4%	18%	0.025
Quality incomplete/nearly/complete, %	12/18/70	12/26/62	0.616
5-yr LRR	2.6%	4.8%	0.300
5-yr DFS	73.9%	71.9%	0.351

Denost Q. Surg Endosc 2018

Norwegian Moratorium

- Norwegian Colorectal Cancer Registry: **3.4% LRR after TME**
- 110 taTME between 2015-2017 (20 Hospitals)
- **10 Local Recurrences (9%), median onset 11 months**
- **Rapid, multifocal growth in pelvic cavity and sidewalls (unusual pattern).**
- Neoadjuvant treatment in 30% (CRM at risk) in Norway, but 58% in taTME series
- No adjuvant Chemotherapy in stage I-III in Norway

Larsen SG, BJS 2019: 1120-21

Netherlands

- **First 10 taTME** of 20 hospitals (n=120)
- CRM+ 5%, Anastomotic leakage 17%, **LRR 10% after 15 months**
- Prolonged cohort (266 patients): **LRR 4%**

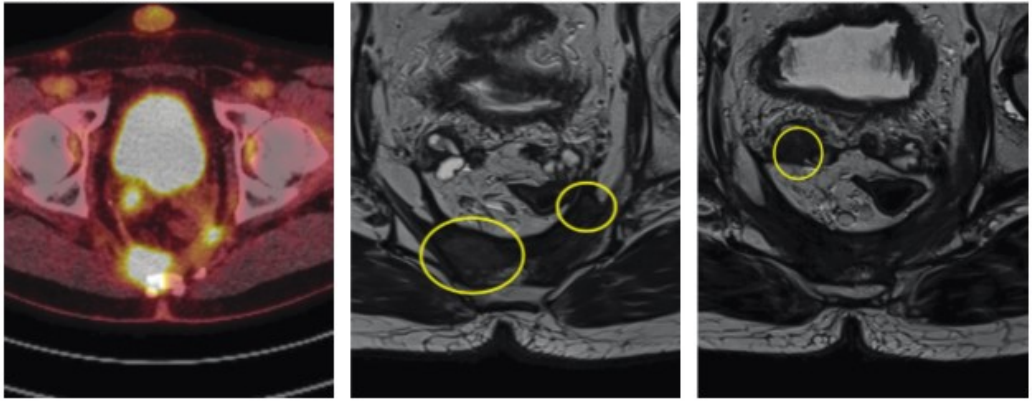


Table 6 Local recurrence according to number of transanal total mesorectal excision procedures at each centre in prolonged cohort

	Local recurrence rate			
	Procedures 1–10	Procedures 11–40	Procedures ≥41	Total
Centre A	2 of 10	2 of 30	0 of 31	4 of 71 (6)
Centre B	1 of 10	2 of 30	3 of 28	6 of 68 (9)
Centre C	2 of 10	0 of 30	1 of 7	3 of 47 (6)
Centre D	1 of 10	1 of 30	0 of 40	2 of 80 (3)
Overall	6 of 40 (15)	5 of 120 (4·2)	4 of 106 (3·8)	15 of 266 (5·6)

Values in parentheses are percentages.

Van Oostendorp SE. BJS 2020

COLOR III

COLOR III: a multicentre randomised clinical trial comparing transanal TME versus laparoscopic TME for mid and low rectal cancer

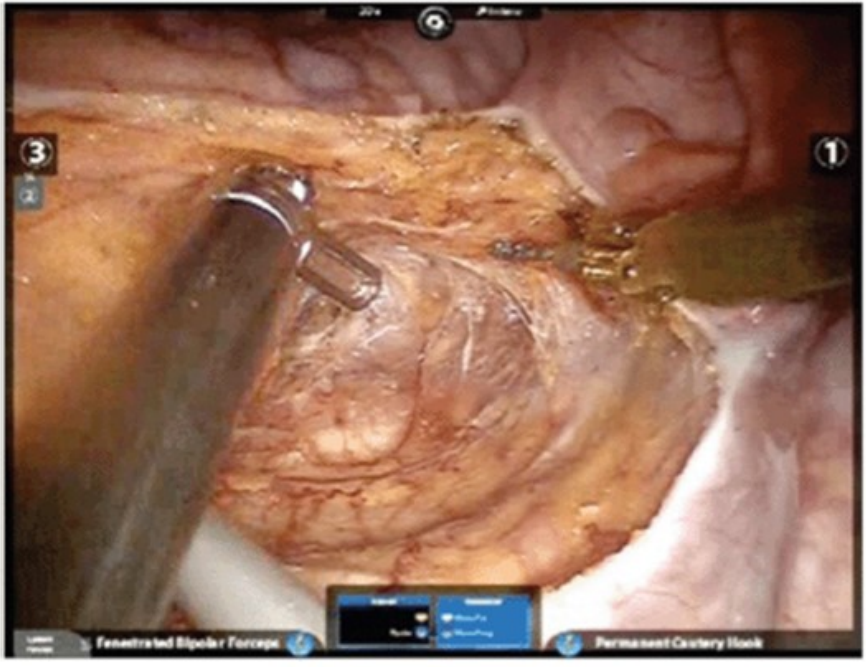
Charlotte L. Deijen[1] · Simone Velthuis[2] · Alice Tsai[3] · Stella Mavroveli[3] · Elly S. M. de Lange-de Klerk[1] · Colin Sietses[2] · Jurriaan B. Tuynman[1] · Antonio M. Lacy[4] · George B. Hanna[3] · H. Jaap Bonjer[1]

Received: 3 April 2015 / Accepted: 15 September 2015 / Published online: 4 November 2015

- 1100 Patients (669 taTME, 335 laparoscopic)
- Primary endpoint: **Involved CRM**
- **Superiority** trial (estimated CRM+ 7% in lap TME vs 3% in taTME

Deijen CL. Surg Endosc 2016

Robotic TME



Advantages:

- 3D View
- Articulated instruments
- Advantage in narrow spaces

Robotic TME vs lap. TME

- RCT, 163 patients, 2 surgeons
- cT1-3NxM0, mid and low rectum
- stratified per sex and administration of preoperative chemoradiotherapy
- primary outcome was the **quality of total mesorectal excision** (TME) specimen

Kim MJ Ann Surg 2018

Robotic TME vs lap. TME

TABLE 1. Demographic and Clinical Characteristics of Randomly Assigned Patients (n = 139)

	RG (n = 66)	LG (n = 73)	*P*
Age, yrs, mean (SD)	60.4 (9.7)	59.7 (11.7)	0.693
Sex, n (%)			0.417
Male	51 (77.3)	52 (71.2)	
Female	15 (22.7)	21 (28.8)	
BMI, mean (SD)	24.1 (3.3)	23.6 (3.0)	0.327
ASA grade, n (%)			0.185
I	20 (30.3)	30 (41.1)	
II	46 (69.7)	43 (58.9)	
History of surgery, n (%)			0.105
Yes	16 (24.2)	27 (37.0)	
No	50 (75.8)	46 (63.0)	
Family history of cancer, n (%)			0.630
Colon cancer	6 (9.1)	8 (10.9)	
Other than colon cancer	24 (36.4)	31 (42.5)	
Unknown cancer	1 (1.5)	0 (0)	
None	35 (53.0)	34 (46.6)	
Tumor location from anal verge, cm, n (%)			0.809
≤5	33 (50.0)	35 (48.0)	
>5	33 (50.0)	38 (52.0)	
Preoperative CEA level, ng/mL, n (%)			0.259
≤5	44 (66.7)	55 (75.3)	
>5	22 (33.3)	18 (24.7)	
Preoperative CRT, n (%)			0.755
Yes	51 (77.3)	58 (79.5)	
No	15 (22.7)	15 (20.5)	

ASA indicates American Society of Anesthesiologists; BMI, body mass index; CEA, carcinoembryonic antigen; CRT, chemoradiotherapy; LG, laparoscopic group; RG, robotic group; SD, standard deviation.

TABLE 2. Operative Data (n = 139)

	RG (n = 66)	LG (n = 73)	*P*
Procedures, n (%)			0.592
Low anterior resection (DS)	40 (60.6)	48 (65.8)	
Low anterior resection (HS)	25 (37.9)	22 (30.1)	
Abdominoperineal resection	1 (1.5)	2 (2.7)	
Hartmann operation	0 (0)	1 (1.4)	
Diverting ileostomy, n (%)			0.621
Yes	65 (98.5)	70 (95.9)	
No	1 (1.5)	3 (4.1)	
Splenic flexure mobilization, n (%)			0.455
Yes	9 (13.6)	7 (9.6)	
No	57 (86.4)	66 (90.4)	
Operation time, min, mean (SD)	339.2 (80.1)	227.8 (65.6)	<0.0001
Estimated blood loss, mL, median (range)	100 (0–1000)	50 (0–300)	<0.0001
Conversion to open surgery, n (%)			0.475
Yes	1 (1.5)	0 (0)	
No	65 (98.5)	73 (100.0)	
Intraoperative adverse event, n (%)			0.647
None	61 (92.4)	70 (95.9)	
Bleeding	3 (4.6)	1 (1.4)	
Perforation of the rectum	2 (3.0)	2 (2.7)	

DS indicates double-stapling anastomosis; HS, hand-sewn anastomosis; LG, laparoscopic group; RG, robotic group; SD, standard deviation.

Kim MJ Ann Surg 2018

Robotic TME vs lap. TME

- No difference in
  - Quality of TME
  - CRM
  - morbidity

	Robotic	Laparoscopic	
Distal resection margin, cm, median (range)	1.5 (0.04–6.7)	0.7 (0–2.5)	0.11
Radial resection margin, cm, median (range)	0.7 (0–2.5)	0.7 (0–1.8)	0.531
Circumferential resection margin, n (%)†			0.999
Positive (≤1 mm)	4 (6.1)	4 (5.5)	
Negative (>1 mm)	61 (92.4)	68 (93.2)	
Quality of TME as rated by pathologist, n (%)			0.599
Complete	53 (80.3)	57 (78.1)	
Nearly complete	12 (18.2)	16 (21.9)	
Incomplete	1 (1.5)	0 (0)	

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ROLARR

- N=471, Primary endpoint: **conversion to open surgery**
- Konversionen: **Rob 9.1% vs Lap 12.2%, p=0.16**
- No difference for:
  - Morbidity
  - CRM +
  - Bladder and sexual function
- Costs $1132 higher in Rob
- Limitations:
  - Fewer than 5 recruited patients per center
  - Experience in robotic surgery < laparoscopy
  - Inclusion of high and low rectal cancer, with and w/o neoadj. therapy

Jayne D. JAMA 2017

ROLARR: Subgroup males

eTable 4. Treatment x Sex Interaction Effects

Effect	Laparoscopic surgery (No. conversions/ No. patients (%))	Robotic surgery (No. conversions/ No. patients (%))	Risk difference and 95% CI (unadjusted)	Odds ratio and 95% CI (adjusted)*	p-value	
Treatment in males: robotic surgery (vs. laparoscopic)	25/156 (16.0)	14/161 (8.7)	7.3 (0.1, 14.6)	0.455 (0.209, 0.987)	0.0429	0.0939**
Treatment in females: robotic surgery (vs. laparoscopic)	3/74 (4.1)	5/75 (6.7)	-2.6 (-9.8, 4.6)	2.022 (0.425, 9.621)	0.3757	

*adjusted for BMI class, preoperative radiotherapy, intended procedure and operating surgeon.
**p-value for the treatment effect is referring to a test of heterogeneity of treatment effect between the subgroups.
Odds ratios derived from the Treatment term and Treatment-by-Sex interaction term.

Jayne D. JAMA 2017n Suppl Informations

QoL: Propensity score analysis

	Robot (n = 130)	Laparoscopy (n = 130)	P-value
Age (years)*	60.5 (10.1)	60.0 (9.3)	0.703
Sex, n (%)			
Male	95 (73.1)	95 (73.1)	1.000
Female	35 (26.9)	35 (26.9)	
BMI (kg/m^2)*	23.7 (3.2)	23.3 (2.9)	0.287
Preoperative CCRT, n (%)	63 (48.5)	61 (46.9)	0.901
Tumour location (cm)*	5.9 (2.7)	6.3 (2.6)	0.196
Type of operation, n (%)			
Low anterior resection	90 (69.2)	91 (70.0)	0.991
Coloanal anastomosis	38 (29.2)	37 (28.5)	
Abdominoperineal excision	2 (1.5)	2 (1.5)	
Protective ileostomy, n (%)	43 (33.1)	37 (28.5)	0.502
Postoperative hospital stay (days)*	9.0 (6.6)	10.7 (14.2)	0.228
Complications, n (%)	23 (17.7)	26 (20.0)	0.751
Anastomotic leakage	12 (9.2)	9 (6.9)	

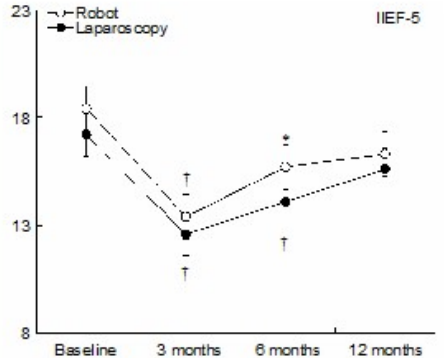
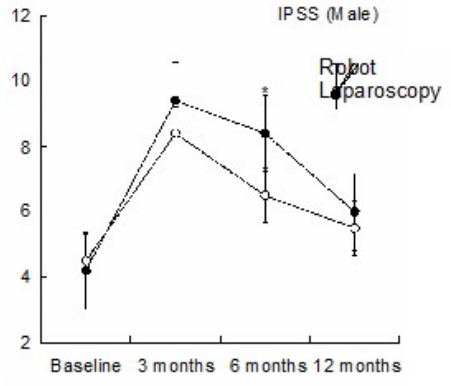


Figure 5 International Index of Erectile Function-5 (IIEF-5) scores. *P < 0.05 for difference in mean scores between groups. †P < 0.05 for difference in mean scores between baseline and each time point.



- International prostatic symptom score **less impaired in Robotic after 6 months**
- **Erectile function better in Robotic (6 months).**

Kim HJ. Colorect Dis 2018

Feng et al, Lancet September 7, 2022

1742 Patients / 11 hospitals/ 8 provinces
Age: 18 – 80 y
Middle (5-10cm) and low (<5cm) rectum
cT 1-3/ No-1/ no distant metastasis
3 - year locoregional recurrence rate
CRM +
30 day postop complications (Clavien-Dindo II and higher)

Feng et al, Lancet September 7, 2022

	Rob-G	Lap-G	p =
	n = 586	n = 585	
CRM + (%)	**4**	**7.2**	0.023
Conversions to open procedure; n (%)	1.7	3.9	0.021
Intraop. Complications (%)	5.5	8.2	0.030
Complications CD II+ (%)	16.2	23.1	0.003
Anastomotic leakage (%)	5.1	8.2	0.057
Complete resection (%)	**95.4**	**91.8**	0.042
Hospital stay (days)	7	8	0.0001
Preventive stoma (%)	26.5	26.1	0.866

Feng et al, Lancet September 7, 2022

Robotic surgery for middle and low rectal cancer by experienced surgeons could improve surgical quality compared with conventional laparoscopic surgery

Eigene Daten

	Rob TME (n=68)	Lap TME (n=154)	p
Age; median years (IQR)	69 (57 – 81)	66 (56 – 74)	0.425
Female gender	17 (25)	47 (31)	0.297
Body mass index: median (IQR)	25 (22.32 – 27.37)	25 (23,6 – 28)	0.344
Tumor distance from dental line: mean cm ± SD	8.7 ± 2.43	8.63 ± 1.81	0.982
Neoadjuvant Chemoradiation	100%	100%	1.0

	Rob-G	Lap-G	p =
	n = 68	n = 154	
Operation time; median minutes (IQR)	**360 (300 – 427)**	**305 (265 – 380)**	**0.0001**
Conversions to open procedure (%)	**1.5**	**16.2**	**0.0082**
Stoma formation primary (%)	**50**	**89**	**0.0001**
Minor morbidity	25	29	0.824
Major morbidity (Clavien >3a)	15	10	0.301
Anastomotic leakage	11.8	9.1	0.421
Hospital stay; median days (IQR)	13 (11-22)	11.5 (10-16)	0.221

Eigene Daten

	Rob TME N = 68	Lap TME N = 154	P
TME complete (%)	88	89	0.828
TME nearly complete (%)	12	11	0.614
TME incomplete (%)	0	0	
CRM; mean mm ± SD	19.6 ± 10.5	19.5 ± 11.5	0.958
CRM+ (%)	1.5	1.3	> 0.999

Fazit

	Open	Laparo-scopic	taTME	Robotic
Oncological safe	☑	☑	• Large RCT pending • Learning curve	(☑)
Advantage			• Better exposure	• Better exposure • Less conversions in male (high BMI)
Risks			• Novel complications • LR in low volume	• Costs
Evidence	☑ good	☑ good	✗ weak	✗ weak
Subgroups	• T4 • Threatend CRM	„Standard“	• Low tumours	• obese • male