

27TH ANNUAL CONFERENCE OF
THE EGYPTIAN SOCIETY OF

COLON & SURGEONS RECTAL



State of the art;
Rectal cancer surgery;
Open, Laparoscopic,
Transanal or Robotic.
Let the data speak

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1

ONCOLOGIC COMPARISON



2

OPERATIVE COMPARISON



3

POST OPERATIVE COMPARISON



4

LEARNING CURVE



5

COST COMPARISON



COMPARISON OF 4 APPROACHES FOR TME



OPEN

LAP

ROBOTIC

TaTME

Total Mesorectal Excision
for Rectal Cancer

Revolution of Rectal Cancer Surgery

1908 — Miles **The Open Era**: The operation becomes anatomical

1980s — Bill Heald and **The birth of TME**

1990s–2000s — The **Laparoscopic Revolution**

2000s–2010s — **Robotic TME**

2009–2010s — “Why not approach the difficult pelvis from below?” **TaTME**

2019 **TTSS** Spinelli and colleagues, Transanal Transection and Single-Stapled Anastomosis Single anastomosis

TABLE 2. KEY PUBLICATIONS: STUDY TYPE, CONCLUSIONS & CRITICISMS

STUDY (First Author)	YEAR	TYPE OF RESEARCH & COMPARISON	PRINCIPAL CONCLUSION	MAIN CRITICISM / LIMITATION
1 COLOR II – initial [van der Pas]	2013	RCT – Laparoscopic vs Open	Laparoscopy: better short-term recovery, similar early oncologic quality.	Heterogeneous tumors (incl. upper rectal); expert centers; limited generalizability.
2 COLOR II – 3-year follow-up [Bonjer]	2015	Long-term follow-up RCT	3-year LR, DFS, OS similar; supports oncologic safety of laparoscopy.	3-year follow-up only; T4 cases under-represented.
3 COREAN – initial [Kang]	2010	RCT after CRT – Lap vs Open (mid/low rectal)	Laparoscopy: short-term recovery benefits without compromising quality.	Highly experienced centers; may not reflect early learning curve settings.
4 COREAN – 10-year follow-up [Park]	2021	10-year follow-up RCT	10-year OS, DFS, LR similar; strong evidence for long-term equivalence.	Not powered for small differences; older era treatment; expert Korean centers.
5 ACOSOG Z6051 – pathology [Fleshman]	2015	RCT (Stage II–III) – Lap vs Open	Laparoscopy failed noninferiority for composite success: 81.7% vs 86.9%.	Composite endpoint; failure ≠ proof of inferiority; heterogeneous experience.
6 ACOSOG Z6051 – follow-up [Fleshman]	2019	Follow-up RCT	2-year DFS & LR similar between groups.	Short follow-up; CIs wide; not powered for survival equivalence.
7 ALaCaRT – pathology [Stevenson]	2015	RCT – Lap vs Open	Laparoscopy failed noninferiority for composite pathological endpoint.	Composite endpoint; not proof of inferiority; operative heterogeneity.
8 ALaCaRT – follow-up [Stevenson]	2019	Follow-up RCT	2-year LR 5.4% vs 3.1%; DFS 80% vs 82%; OS 94% vs 93% (no sig. difference).	CIs include clinically meaningful differences; small event numbers.
9 ALaCaRT – functional [Keane]	2022	Secondary functional analysis	High LARS in both; no significant functional difference.	Subset analysis; selection bias; not powered for functional superiority.
10 ROLARR [Jayne]	2017	RCT – Robotic vs Laparoscopic	No significant conversion reduction (8.1% vs 12.2%); similar CRM+, complications and functional outcomes.	Robotic learning curve; variable experience; power and effect size issues.
11 REAL – short-term [Feng]	2022	RCT (China) – Robotic vs Lap	Robotic: lower CRM+ (4.0% vs 7.2%); fewer complications; faster recovery.	Open-label; selected centers; partial TME in some, short-term outcomes.
12 REAL – 3-year outcomes [Feng]	2025	Long-term RCT	Robotic: lower LR (1.6% vs 4.0%) and higher DFS (87.2% vs 83.4%); OS similar.	Small number of recurrence events (9 vs 23); Chinese centers; needs external validation.
13 Liu et al. – Meta-analysis	2025	Meta-analysis (20 non-RCT studies)	5-year OS & DFS similar: robotic vs lap after CRT.	All non-RCT; selection bias; confounding; different eras.
14 Morarasu et al. – Meta-analysis	2026	Meta-analysis	Robotic: higher complete TME and lower distal margin+; CRM+ similar.	Low certainty; retrospective studies; heterogeneity; publication bias.
15 Madarász et al. – 3-way review	2025	Systematic review (Open vs Lap vs Robotic)	Robotic: better conversion, LOS, some complications; longest operative time; 5-year OS/DFS similar across approaches.	Mostly retrospective; heterogeneity; no direct 3-arm RCTs.

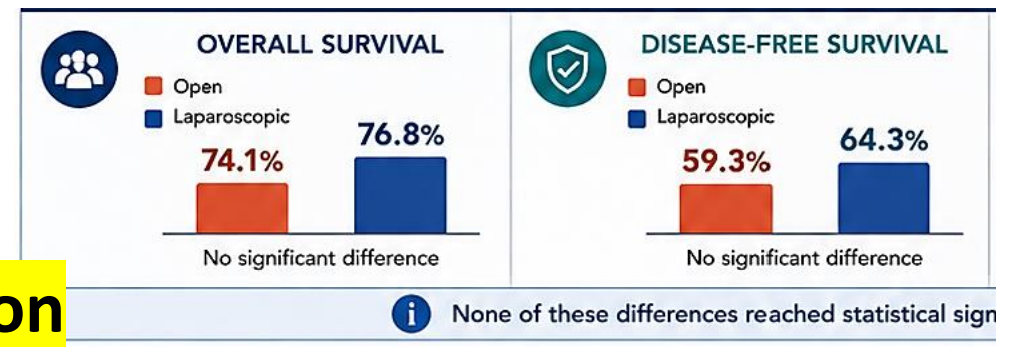
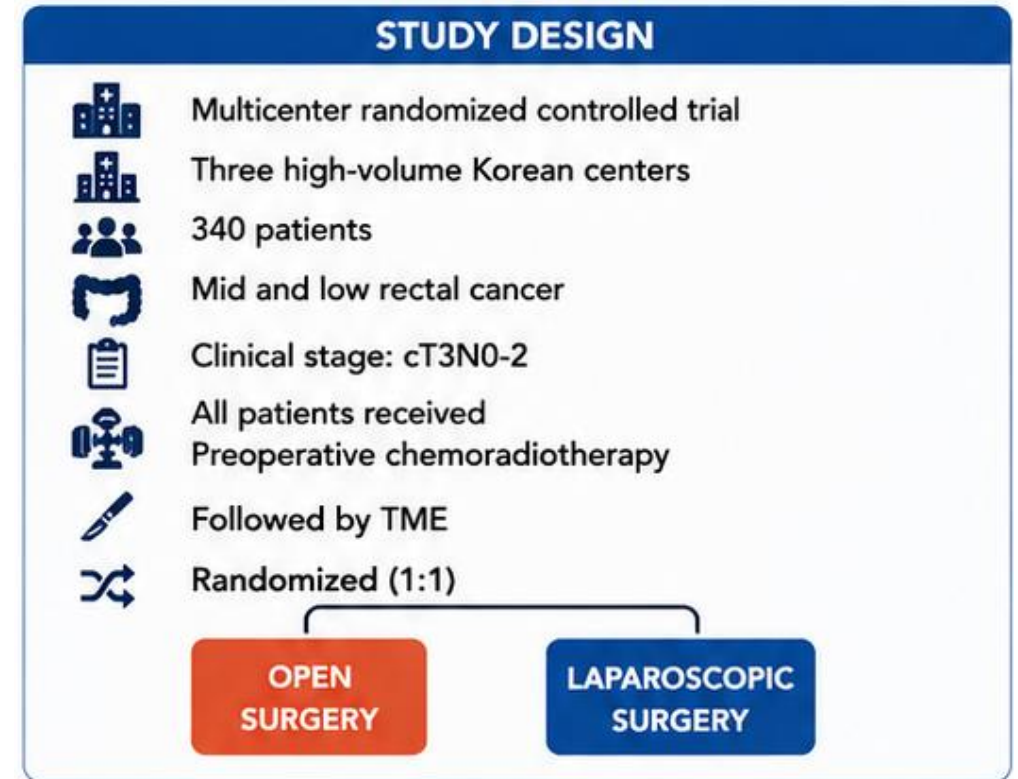
LEGEND (Level of Evidence):

I Randomized Controlled Trial (RCT)
 II Long-term Follow-up of RCT
 III Systematic Review / Meta-analysis
 III–IV Non-RCT / Observational

2010 — COREAN

- Laparoscopy produced: less blood loss, less pain, faster recovery, shorter hospitalization, without an obvious compromise in pathological quality.
- Long-term follow-up (10 years)No significant difference in overall survival or disease-free survival.
- The message was becoming clear:

TME did not necessarily require a large incision

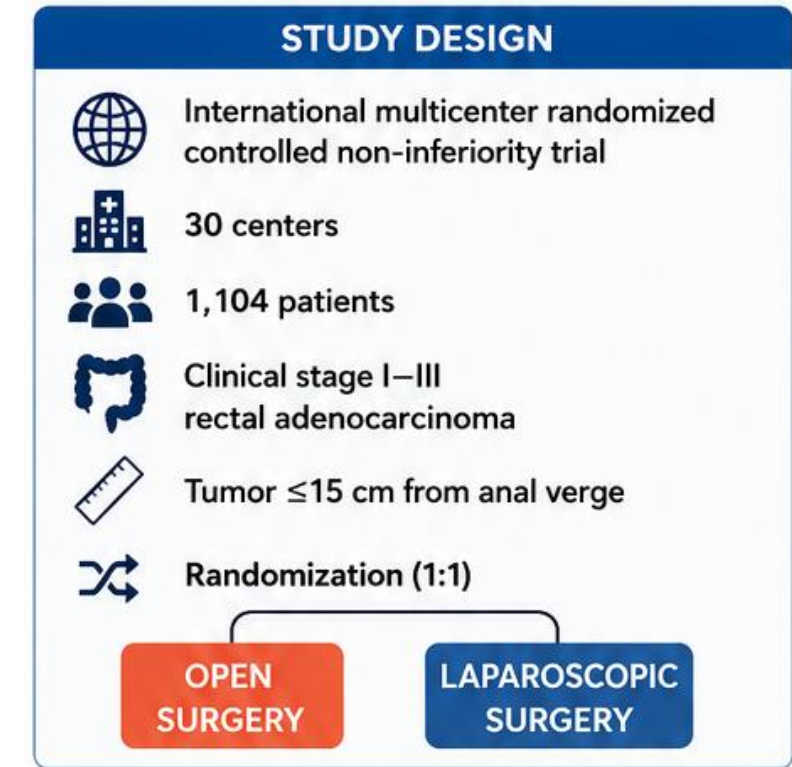


2013–2015 — COLOR II

The laparoscopic approach again demonstrated **better perioperative recovery.**

Disease-free survival and overall survival were comparable.

Laparoscopy appeared capable of reproducing open oncological surgery.



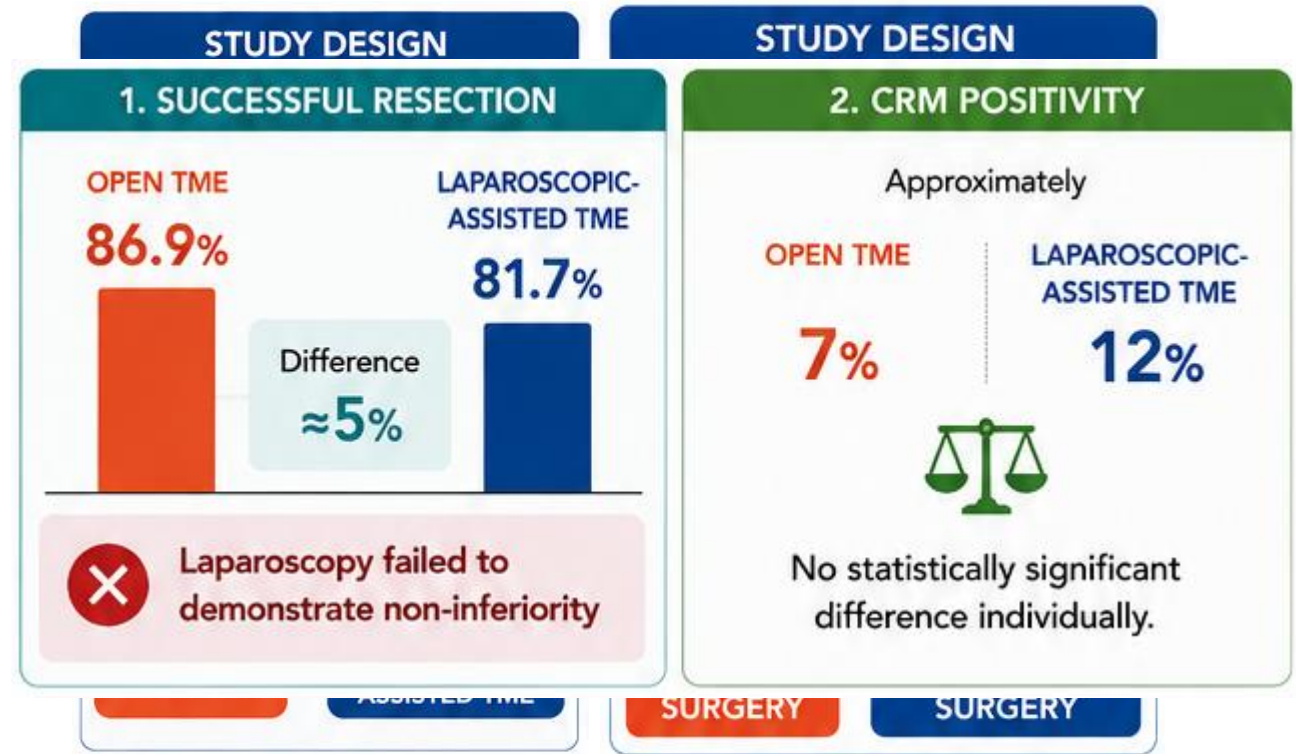
2. PATHOLOGICAL OUTCOMES		3. THREE-YEAR ONCOLOGIC OUTCOMES	
CRM POSITIVITY		LOCAL RECURRENCE (AT 3 YEARS)	
LAPAROSCOPIC	OPEN	LAPAROSCOPIC	OPEN
10%	9%	5.0%	5.1%
No significant difference		No significant difference	
 COMPLETE TME Similar in both groups		 DISEASE-FREE SURVIVAL (DFS) Equivalent	
 LYMPH NODE HARVEST Equivalent		 OVERALL SURVIVAL (OS) Equivalent	

2015, ACOSOG Z6051 and ALaCaRT

Important warning

Is the actual surgical specimen oncologically perfect?" with strict composite pathological endpoint.

Both trials **failed to demonstrate statistical non-inferiority of laparoscopy.**



The lesson was: "Laparoscopic TME is technically demanding, and surgical expertise matters."

The Mechanical Limits of Laparoscopy

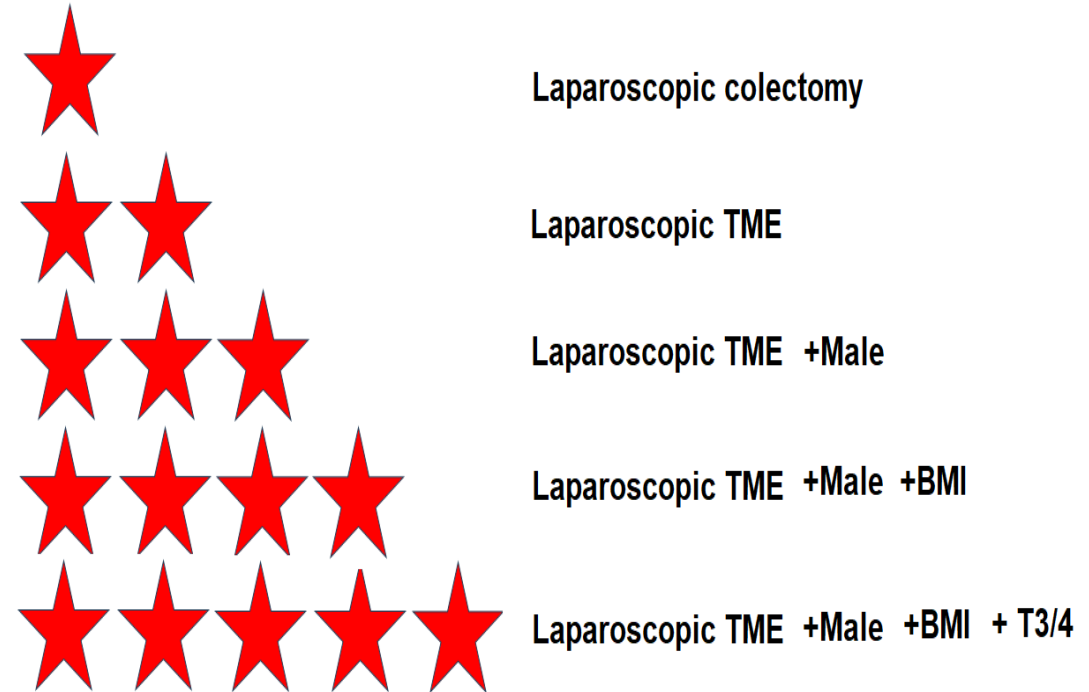
The surgeon encounters:

1. Rigid instruments
2. Restricted triangulation
3. Fulcrum effects
4. Unstable camera assistance
5. difficult distal retraction
6. challenging stapler positioning.

-The question naturally became:

What if the instruments could articulate like the human wrist?

-That question introduced the robotic era.



2017 — ROLARR

The primary endpoint was conversion to open surgery.

The trial failed its primary superiority endpoint.

ROLARR's message became:

Robotic TME is safe—but superiority over laparoscopy was not proven.

Many participating surgeons were highly experienced laparoscopic surgeons but considerably earlier in their **robotic learning curves**.

SUBGROUP ANALYSIS

Although the primary endpoint was negative, certain subgroups appeared to benefit from robotics:

- ✓ Male patients
- ✓ Obese patients
- ✓ Low rectal tumors
- ✓ Narrow pelvis

However, these analyses were exploratory and not powered for definitive conclusions.

TME

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2022–2025 — The REAL trial changes the discussion

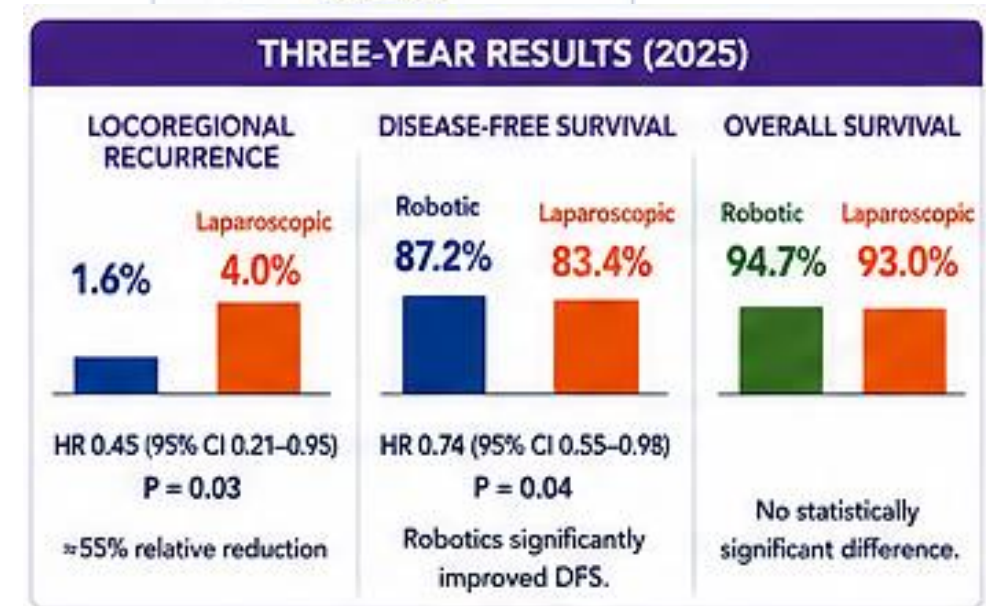
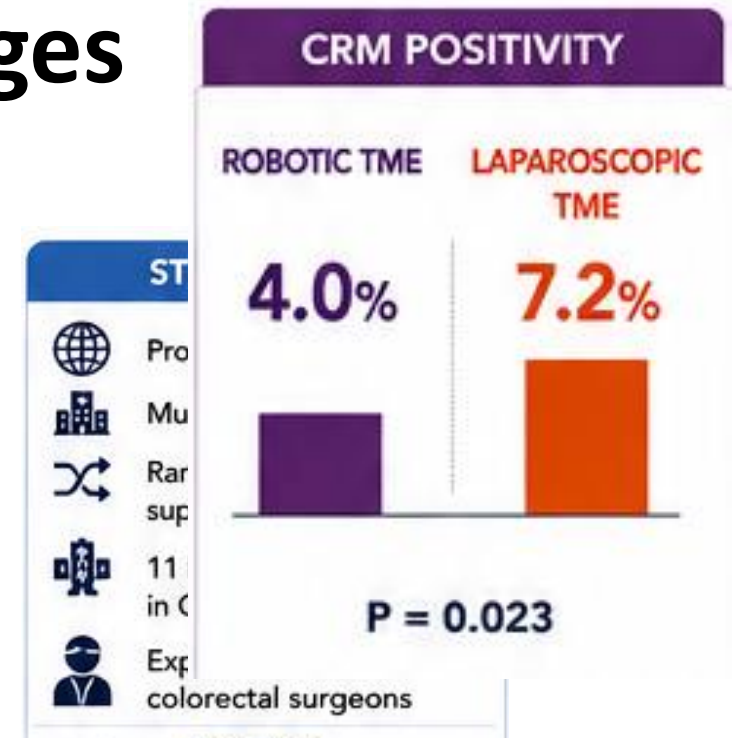
Primary end point was CRM positivity which was:

For the first time, a large randomized trial demonstrated a significant **pathological advantage favoring robotics.**

Then came the three-year results in **2025.**

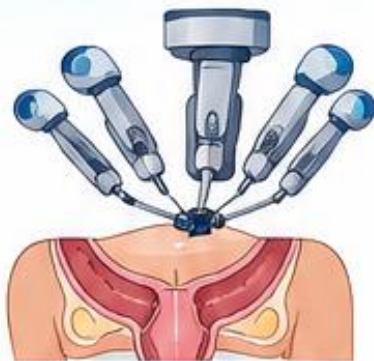
Locoregional recurrence Robotic: 1.6%
Laparoscopic: 4.0%

Overall survival was not significantly different.





Why REAL Was Positive?



- ✓ Improved pelvic visualization
- ✓ Wristed robotic instruments
- ✓ Greater dexterity
- ✓ Better nerve preservation

→ Facilitated more precise mesorectal excision and better oncologic quality.



Why ROLARR Was Negative?



Trial Design

Designed to prove superiority (reduced conversion)



Conversion Rate

Lower than expected (12.2% vs. 8.1%)



Learning Curve

Many surgeons early in robotic experience



Heterogeneous Population

Different tumor heights, treatments, and techniques



Clinical Take-home Message

- ✓ **ROLARR:** Robotic TME is **safe but not superior** to laparoscopy in conversion or oncologic outcomes.
- ✓ **REAL:** Robotic TME may offer **oncologic advantages** (lower CRM positivity, lower local recurrence, higher disease-free survival) in experienced high-volume centers.
- ✓ **Together:** Robotics is a **safe and effective alternative**, with emerging evidence of superior oncologic quality once the learning curve is overcome.

TaTME The strongest mature oncologic evidence

1. TaLaR Trial (3-year Results, 2025)

TaTME vs Laparoscopic TME

PRIMARY ENDPOINT: 3-YEAR DISEASE-FREE SURVIVAL (non-inferiority)



✓ NON-INFERIORITY DEMONSTRATED

✓ 3-year overall survival: Comparable



Exploratory subgroups (men, BMI >25) showed potential benefit, but CIs cross unity – hypothesis generating, not proof of superiority.

2. COLOR III Trial (Short-term Results, 2026)

TaTME vs Laparoscopic TME

	90-day morbidity	Similar (non-inferior)
	Complete resection (R0)	Similar (non-inferior)
	Conversion to open	Significantly reduced with TaTME



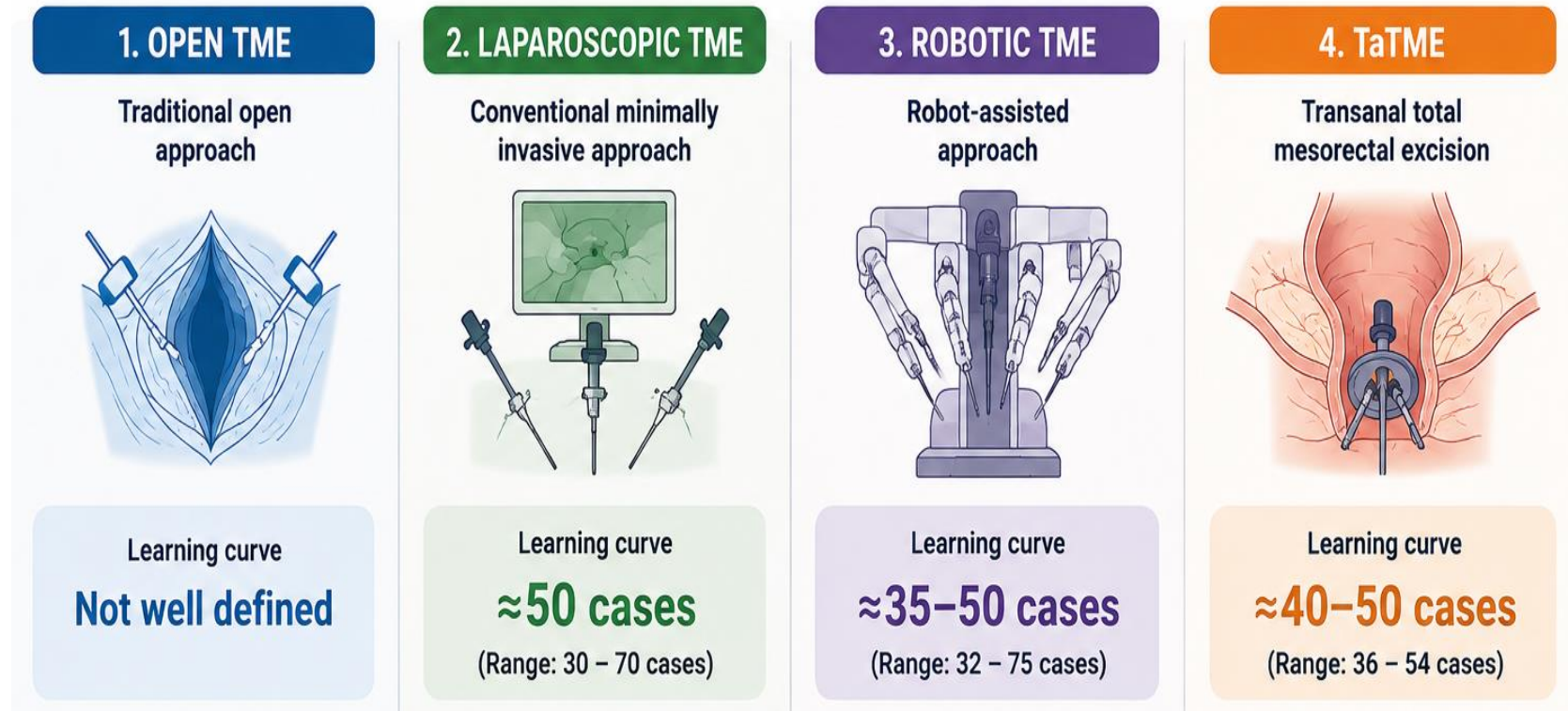
PRIMARY ONCOLOGIC ENDPOINT NOT YET REPORTED
Trial designed for 3-year local recurrence
(non-inferiority). Follow-up ongoing.

The Norwegian experience in TaTME

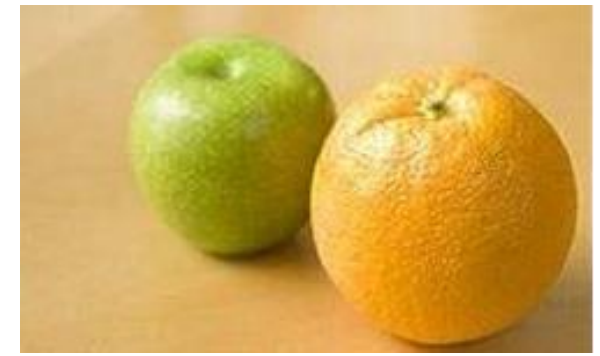
- The **Norwegian experience** remains essential to interpreting TaTME, early reports of unexpected local recurrence patterns and serious complications during implementation.
- Mastering the technique requires: **structured training → cadaveric/proctored experience → careful case selection → sufficient institutional volume → prospective audit of morbidity and oncologic outcomes.**

Learning Curve

- **TaTME** → hardest anatomical learning
- **Laparoscopy** → hardest psychomotor learning
- **Robotics** → predominantly platform/workflow learning



Learning Curve



- **Laparoscopic TME** — “Psychomotor learning”
50–70 cases. The challenge is combining correct TME anatomy with rigid instruments, the fulcrum effect, restricted pelvic triangulation and difficult distal rectal transection
- **Robotic TME** — “Platform learning”
35–50 cases. The surgeon must learn docking, arm positioning, retraction strategy, and console technique.
- **TaTME** — “Anatomical reorientation”
40–50 cases. TaTME introduces unfamiliar bottom-up pelvic anatomy and technique-specific hazards.

TRUE PROFICIENCY SHOULD MEAN STABILIZATION OF:

OPERATIVE
EFFICIENCY



COMPLICATIONS



CONVERSION



TME
COMPLETENESS



CRM
STATUS



ANASTOMOTIC
OUTCOMES



WHAT THIS MEANS



OPERATIVE
EFFICIENCY

Stable operative time, blood loss and intraoperative performance.



COMPLICATIONS

Acceptably low and consistent rates of intraoperative and postoperative complications.



CONVERSION

Low and stable conversion rate without patient or oncologic compromise.



TME
COMPLETENESS

Achieving complete mesorectal excision with intact mesorectal fascia.



CRM
STATUS

Consistently negative circumferential resection margin (CRM).



ANASTOMOTIC
OUTCOMES

Low and stable rates of anastomotic leak, stricture and other related issues.



**TRUE PROFICIENCY = CONSISTENT QUALITY AND SAFETY,
NOT JUST OPERATIVE TIME.**

Average COST per Patient



Average Cost per Patient (USD) – 2024 Estimates from Published Studies

	1. OPEN TME Traditional Open Surgery	2. LAPAROSCOPIC TME Minimally Invasive Laparoscopic Surgery	3. ROBOTIC TME Robot-assisted Surgery	4. TaTME Transanal Total Mesorectal Excision
				
 TOTAL AVERAGE COST (30-day episode)	\$5,070 (\$3,400 – \$7,400)	\$7,750 (\$5,250 – \$11,450)	\$12,250 (\$8,750 – \$17,600)	\$9,920 (\$6,950 – \$13,800)

Operating costs
(OR time, equipment,
disposables)

Hospital stay

Complications
& readmissions

Follow-up care



Oncologic outcomes
(local recurrence,
survival)

Functional outcomes
(continence, urinary,
sexual function)

Quality of life

Patient satisfaction

Cost vs Value

- Value is achieved when better outcome or QOL justify additional cost.
- A procedure costing € XX more is not necessarily economically inferior if it prevents a **Conversion, Positive CRM, Major complication, Lengthy hospital stay, Permanent stoma, or Recurrence.**

WHY FUNCTIONAL OUTCOMES MATTER: QUALITY OF SURVIVAL, NOT JUST LENGTH

OPERATION A



Patient survives but develops:

- Permanent stoma
- Urinary dysfunction
- Sexual dysfunction
- Severe LARS



OVERALL
SURVIVAL (OS)
EQUAL

OPERATION B



Same survival but:

- Good continence
- No permanent stoma
- Preserved urinary/sexual function



LOOKING ONLY AT OS, THE OPERATIONS APPEAR EQUIVALENT.

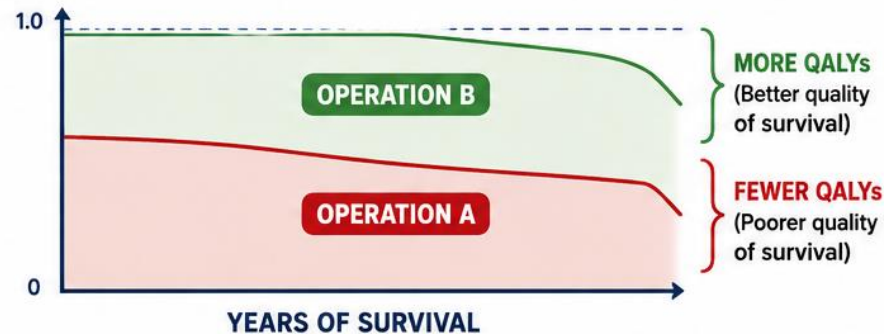
LOOKING AT QALYs (QUALITY-ADJUSTED LIFE YEARS)

Operation B could be superior because the years of survival are lived at a higher health utility.



QALYs combine length of life with quality of life (utility).
1 year in perfect health = 1.0 QALY
1 year in poor health = < 1.0 QALY

HEALTH
UTILITY
(QUALITY
OF LIFE)



Years of survival are not equal if the quality of those years is different.



THIS IS WHY FUNCTIONAL OUTCOMES MATTER
ECONOMICALLY AS WELL AS CLINICALLY.

QALY

QALY (Qu
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Conclusion

- **Quality of TME** is more important than access platform.
- Laparoscopy remains evidence-based standard.
- Robotics shows promising oncologic and functional advantages in selected patients.
- TaTME does not appear to sacrifice oncologic outcome compared with laparoscopic when performed within an appropriately controlled setting.
- Patient selection and surgeon experience remain paramount
- Structured training and audited practice are essential.

