# Total mesorectal excision and management of rectal cancer

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**Treatment of rectal cancer over the last two decades has evolved with changes in techniques of surgery and radiation based on national and international trials. Preoperative adjuvant radiation is now preferred over postoperative adjuvant radiation, and total mesorectal excision with preservation of pelvic nerves is the gold standard for surgical treatment of rectal cancer. Preservation of the anal sphincter without compromising oncological outcome is an additional benefit for patients with carcinoma in the distal rectum. Further progress in imaging and a multidisciplinary team approach will facilitate individualization of treatment strategy with more focus on quality of life.**

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CONTENTS



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## Evolution of rectal cancer surgery: abdominoperineal & low anterior resections

The first combined abdominal and perineal operation for rectal cancer was performed by Czerny in 1884. Removal of the rectum using Czerny's method had high mortality and inevitably resulted in local recurrence. In 1908, Ernest Miles described the abdominoperineal resection (APR) in his own series of 57 patients [1]. He reported an operative time of between 1 h 15 min and 1 h 30 min. Although the patient suffered "no more shock than after ordinary perineal excision", the mortality rate was 41.6%. By the 1920s, Miles had reduced the recurrence rate from almost 100% to approximately 30%, establishing his technique as the gold standard for the treatment of rectal cancer. Despite this extreme surgery, considerable local failure rate and potential to cause urinary and sexual dysfunction with unavoidable permanent colostomy, Miles' APR was the treatment choice and remained the gold standard for treatment of middle and distal rectal cancer until the late 1970s. Of note, in the late 1930s, Dixon introduced the technique of resection and anastomosis for rectosigmoid and rectal cancers. However, according to his description it was suitable only for tumors located above 8 cm [2].

Progress in the technology of surgical staplers in the late 1970s with the introduction of circular stapling devices enabled low anastomoses to the distal rectum. However, concerns arose regarding the performance of low rectal anastomoses due to increased local recurrence, and debate arose regarding oncologic effectiveness of sphincter-preserving operations. Although, Heald's initial introduction of total mesorectal excision (TME) in 1980 was primarily as a surgical technique to obtain a clean muscle tube at the anorectal junction that was suitable for stapling [3], it became apparent in his 1982 report that TME resulted in an unprecedented 0% 2-year local recurrence rate without benefit of adjuvant radiotherapy [4]. In 1986, Heald reported a 5-year local recurrence of 2.7% and survival of 87% using TME [5]. In 1990, McAnena and Heald reported a 3.5% local recurrence rate and 81% 5-year survival [6]. In 1993, MacFarlane, an external reviewer of Heald's patients, reported a 4% local recurrence rate after curative TME [7]. This low local recurrence without adjuvant radiation was discussed in the context of the NIH standard of postoperative chemoradiation that resulted in a recurrence rate of 12% [8]. With regard to the achievement of this low local recurrence rate, it is noteworthy that these rectal cancers were deemed as curative (i.e., mobile, non-fixed and not invading the anal sphincters or adjacent structures) and the data do not include locally advanced tumors. By this time, others were adopting TME as the


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preferred surgical technique for excision of rectal cancer. In 1995, Enker reported a 7.3% local recurrence rate in 246 patients using TME [9].

### Further rationale for standardizing TME as the surgical technique for rectal cancer excision

As an alternative to long-course postoperative radiation (45–54 Gy in 25 fractions) and 5-fluorouracil-based chemotherapy as advocated by the NIH, the Swedish Rectal Cancer Trials began investigating short-course preoperative radiation (25Gy in 5 fractions) in Stockholm in the late 1980s. These studies culminated in a randomized trial published in 1997 that reported local recurrence of 11% using preoperative radiation compared with 27% for surgery alone [10]. The high local recurrence rates in these initial Swedish Rectal Cancer trials illustrates that the nonstandardized and non-TME surgical technique used was similar to other published reports of variable local recurrence rates of up to 40% in previous surgical studies of rectal cancer management. Furthermore, whether preoperative short-course radiation would improve the already low rate of local recurrence resulting from TME surgery was not answered by the initial Swedish Rectal Cancer Trials that did not use TME.

Following these initial Swedish trials, a main objective of the Dutch ColoRectal Cancer Group was to standardize the surgical technique of rectal cancer excision to TME [11]. The group investigated the effect of preoperative short-course radiation on a baseline of TME, with surgical quality monitored by pathology assessment of the quality grade of the TME specimens. In a randomized trial published in 2001, local recurrence was 2.4% for preoperative radiation plus TME versus 8.2% for TME alone [12]. These results and results of the successful introduction of TME on a national level in Norway support the concept that TME is a surgical technique that can be taught to general surgeons with reproducible low recurrence rates for mobile rectal cancers outside of the hands of "technically-gifted masters of surgery" in specialized centers [13,14]. TABLE 1 summarizes trials and local recurrence rates after curative surgery over the last 20 years.

### Importance of completeness of TME and the circumferential resection margin

In as early as 1982, Heald described minute foci of adenocarcinoma in the mesorectum several centimeters distal to the apparent lower edge of a rectal cancer with no other evidence of lymphatic spread of the tumor [4]. On the basis of this observation, one hypothesis is that these foci might lead to staple-line or pelvic recurrence in conventional anterior resections when much of this tissue remains in the pelvis. The locoregional recurrence of rectal carcinoma (presumably on the basis of incomplete mesorectal excision) is the main rationale for TME. Intuitively (and as is proposed by advocates of TME), the keystone of curative resection is complete *en bloc* clearance of the rectal mesentery, including its blood supply and lymphatic drainage, along embryological developed fascial planes that protect against tumor dissemination until advanced stages.

Further to the locoregional pattern of recurrent rectal cancer, Quirke reported that defects in the mesorectal fascia of the surgical specimen were associated with pelvic recurrence [15]. This result supports the hypothesis that pelvic recurrence is a consequence of inadequate mesorectal excision that leaves residual regional disease in the pelvis. Currently, TME (defined as the complete excision of visceral mesorectal tissue to the level of the levators with pelvic nerve preservation) is the gold standard for treatment of middle and lower third rectal cancers [7].

Another important cause of locoregional recurrence is a positive circumferential or radial margin. In a prospective study of 141 patients undergoing curative surgery for rectal cancer, Adam reported that 25% of patients had positive circumferential margins with overall recurrence rate of 25% [16]. Where margins were positive for tumor, 78% of patients had recurrence in contrast to 10% in those in whom margins were negative. Results from Norwegian national population-based studies demonstrated that with decreasing circumferential margin there was an exponential increase in the rates of local recurrence, metastasis and death [17,18]. The group of patients with TME surgery alone had a local recurrence rate of 22% among patients with a positive resection margin and only 5% in those with a margin greater than 1 mm. Of patients with a positive margin, 40% developed distant metastasis, compared with only 12% of those who had negative margins [18]. Focusing on patients with T3 tumors, Erikson *et al.* have found that the local recurrence rate for T3N0 ranged from 11 to 19% with decreasing clinical resection margin (CRM) from more than 3 mm to less than 1 mm [17].

### Preservation of anal sphincter & urogenital function with TME

With TME training in Sweden, there has been a significant reduction in abdominoperineal resection and requirement of permanent colostomy from 60% to 27% [19]. The rate of sphincter preservation has become a further indicator of surgical quality [20]. The explanation for such growing utilization of this sphincter preservation technique after TME is that TME dissection results in increased ability to achieve clear margins at the level of the pelvic floor and so the anorectal junction can be used as a bared muscular rectal tube satisfactory for a low rectal anastomosis.

Urogenital dysfunction is a well-recognized complication of rectal cancer surgery. Urinary complications after conventional surgery were observed in 42–73% of patients, and neurogenic bladder dysfunction was encountered in 16% [21]. Sexual dysfunction was observed in 40–66% of male patients, and 44–59% became impotent [22–24]. Sexual dysfunction in females has not been well documented to date. Damage to the hypogastric nerves or pelvic nerve plexuses during surgery is thought to be the major cause of the dysfunction. Because most rectal cancers do not spread outside the mesorectum at the time of operation, nerve-preserving techniques as part of TME improves the functional outcome [25,26]. Enker reported results from a questionnaire demonstrating that sexual function could be maintained in more than 80% of patients, regardless of sex [25]. However, age and abdominoperineal resection were factors associated with postoperative sexual dysfunction. In a series of

Table 1. Local recurrence rates after curative surgery.

| Study | Year | Recurrence (%) | | | | Ref. |
|---|---|---|---|---|---|---|
| | | *Non-TME* | *TME* | *Non-TME plus RT* | *TME plus RT* | |
| *Series of non-TME surgery* | | | | | | |
| Adam *et al.* | 1994 | 22.7 | | | | [16] |
| Damhuis *et al.* | 1997 | 18 | | | | [63] |
| Mollen *et al.* | 1997 | 18.1 | | | | [64] |
| Kapiteijn *et al.* | 1998 | 22.5* | | | | [31] |
| Phang *et al.* | 2002 | 16 | | | | [65] |
| *Trials of non-TME alone versus non-TME with RT* | | | | | | |
| Stockholm 1 | 1990 | 28.2 | | 15 | | [66] |
| Stockholm 2 | 2001 | 25 | | 12 | | [67] |
| MRC II | 1996 | 46.4 | | 36 | | [68] |
| SRCT | 1997 | 23 | | 9 | | [10] |
| MRC III | 1996 | 33.6 | | 20.5 | | [69] |
| *Series of TME* | | | | | | |
| Heald *et al.* | 1986 | | 2.7 | | | [5] |
| McAnena *et al.* | 1990 | | 3.5 (5 years) | | | [6] |
| MacFarlane *et al.* | 1993 | | 4 | | | [7] |
| Enker *et al.* | 1995 | | 7.3 | | | [9] |
| Wibe *et al.* | 2002 | 12 | 6 | | | [13] |
| *Trials of TME alone vs with RT* | | | | | | |
| Martling *et al.* | 2000 | 15.2 | 9 | | 6 (preoperative) | [19] |
| Kapiteijn *et al.* | 2001 | | 8.2 | | 2.4 (preoperative) | [12] |

*Range between hospitals was 9–36%.
TME: Total mesorectal excision; RT: Radiotherapy.



20 patients undergoing TME (including coloanal and ileoanal anastomoses), Pocard provided urodynamic profiles that demonstrated no change in urinary function following nerve-sparing TME [27]. As such, TME with nerve preservation is the standard approach to rectal cancer excision.

#### Anatomic basis & technical tips for TME

Detailed knowledge of the embryology and anatomy of the rectum is fundamental to successful surgical resection of rectal cancer and dissection of the cadaver pelvis is helpful in understanding this anatomy [28]. The mesorectum, as a part of the mesentery functioning like the mesentery of other parts of intestine, surrounds the rectum and is covered by a layer of visceral fascia. The endopelvic parietal fascia covers presacral vessels, internal iliac blood vessels and lymphatics, posterolateral endopelvic muscles (piriformis, coccygeus), and the levators (iliococcygeus, pubococcygeus and puborectalis). A potential space exists between the visceral fascia covering the mesorectum and the parietal fascia of the pelvis (the endopelvic fascia). This potential space is a relatively bloodless plane of TME dissection, the so-called 'holy plane' of Heald. The posterior mesorectal fascia abuts the parietal presacral fascia. At the level of S4, there is condensation of the interfascial areolar tissues into the rectosacral ligament, which must be divided to reach the pelvic floor. During dissection of the posterior mesorectum, the conventional method of the manual extraction technique can cause breaks in the mesorectal fascia, resulting in incomplete excision of the tumor and mesorectum. Forceful tearing of the presacral fascia can cause heavy bleeding from the presacral venous plexus, which is difficult to control. Waldeyer's fascia is the parietal fascia covering the pelvic floor muscles (puborectalis, pubococcygeus and iliococcygeus). Waldeyer's fascia reflects from covering the pelvic floor muscles on the distal mesorectum and must be incised to expose the bared rectal muscular tube at the anorectal junction distal to the mesorectum. Branches of the middle hemorrhoidal vessels cross

from the pelvic floor to the mesorectum at the level of Waldeyer's fascia covering the anorectal junction, and can bleed from incision of Waldeyer's fascia during dissection at the pelvic floor.

Anteriorly above the *cul-de-sac* peritoneal reflection, the rectal muscularis is covered by serosa and there is no mesorectum at this level of the rectum. Below the *cul-de-sac*, the anterior mesorectal fascial covering is known as Denonvillier's fascia. It is bilayered in that Denonvillier's fascia is also the fascia that covers the posterior surfaces of the seminal vesicles and upper and midprostate in the male and the posterior vaginal wall in the female. On the posterior surface of the distal prostate at the level of the urogenital diaphragm of the pelvic floor, Denonvillier's fascia is absent, there is no anterior mesorectum and the bared rectal muscular tube lies within the upper anal sphincter. Thickness of the mesorectum is minimal in the anterior location, creating minimal barrier to anteriorly located cancer. TME for cancer located anteriorly below the *cul-de-sac* in the mid- and distal rectum is problematic because of the thinness of the anterior mesorectum and minimal potential for achieving adequate radial margin distance anteriorly.

Identification and preservation of pelvic autonomic nerves is one of the main features of TME dissection. The sympathetic splanchnic nerves pass fibers distally via preaortic nerve branches; preaortic nerves then run in fat at the bifurcation of the aorta near the sacral promontory to form the superior hypogastric plexus. The superior hypogastric plexus gives rise to the right and left hypogastric nerves, which are found along the posterolateral pelvic brim just below the course of the ureters. The hypogastric nerves lie in the areolar tissue plane between the visceral mesorectal and endopelvic parietal fasciae. The plane between visceral and endopelvic fasciae is very thin at the level of the pelvic brim, such that the hypogastric nerves seem adherent to the visceral mesorectal fascia.

The parasympathetic nervi erigentes are anterior branches of the S2–4 nerve roots; the nervi erigentes meet the hypogastric nerves in the right and left inferior hypogastric plexuses behind the endopelvic parietal fascia. Rectal branches of the inferior hypogastric plexus and small branches of the middle hemorrhoidal vessels traverse the plane between the endopelvic parietal and the visceral mesorectal fasciae as the lateral stalks of the rectum. At this location, again, there is minimal areolar tissue between visceral and parietal pelvic fascia, making dissection of an intact mesorectal fascial envelope laterally and anteriorly in the mid- and distal pelvis difficult. Genitourinary branches of the inferior hypogastric plexus (nerve bundles of Walsh) pass beneath the anterolateral endopelvic parietal fascia and behind Denonvillier's bilayer fascia to the bladder and either the prostate and seminal vesicles or the vagina and uterus. The genitourinary nerves are again at risk during TME dissection anteriorly below the *cul-de-sac*.

The 'holy plane' of perimesorectal dissection ends in the intersphincteric plane between the internal (smooth muscle) and external (skeletal muscle) sphincters. It is this smooth muscular rectal tube bared distal to the mesorectum at the pelvic floor and anorectal junction that is used for a stapled anastomosis of colon to distal rectum or upper anus [29].

TME surgery is a specimen-oriented dissection with the main objective of maintaining intact the mesorectal fascia circumferentially throughout the entire length of the entire mesorectal specimen in order to achieve completeness of mesorectal excision. Pelvic autonomic nerves are identified and preserved. The anorectal junction at the pelvic floor marks the distal extent of dissection and provides a bared muscular tube suitable for low anastomosis.

### TME training & achievement of good outcomes

Factors likely to affect outcomes include a specimen-oriented technique, good lighting and equipment, good assistance, and allowing for additional time.

TME training on a national basis has been reported to significantly decrease national local recurrence rates after rectal cancer excision. A prospective study in Norway investigated the impact of adopting TME into surgical practice on a national level and identified several issues relating to the learning curve [30]. The authors reported that with sufficient instruction in TME procedures, good oncologic and technical efficacy could be reached in a relatively short time. The Swedish experience in 2000 demonstrated the feasibility and benefits of a live operating training program and a structured workshop in training multiple surgeons [19]. Although this was a nonrandomized study, the TME group compared favorably against the published Stockholm I and II radiotherapy trials that served as controls. The 2-year local recurrence rates were 6% with preoperative radiation and 9% without adjuvant radiation after TME training, compared with 15 and 14% in the Stockholm I and II trials using preoperative radiation, respectively ($p < 0.001$). Similarly, the Dutch have reported decrease in national local recurrence rates from 36% before to less than 9% after their national TME trial [31,32]. After introduction of TME on a national level in Norway, local recurrence decreased to 7% overall [18].

Individual surgeon outcomes are likely related to higher volume of surgery in addition to adequate training. The Swedes reported the effects of TME training on rectal cancer outcomes in Stockholm [19]. In that study, higher volumes of rectal cancer surgery were associated with lower local recurrence rates. In a Canadian study, Porter reported that colorectal subspecialization and higher rectal cancer surgery volumes were associated with lower pelvic recurrence rates [33].

The TME principle of specimen-oriented surgery must be accompanied by specimen-oriented histopathology, which is essential for appropriate staging and audit. Since macroscopic evaluation by the operating surgeon is not reliable [16], the pathologist must verify radial margin clearance. Heald recommends a Quirke-based detailed histopathological approach as an audit method [15]. Not only does this assessment provide objective data that can be used for quality control of a surgery program for rectal cancer, the pathology assessment of TME quality provides immediate feedback to the surgeon on the quality of their personal technique.

### TME complications

TME is the oncologic procedure of choice for excision of rectal cancer, but potential complications can result from the extensive dissection. TME is associated with increased risk of anastomotic dehiscence and problematic anorectal dysfunction.

Construction of lower anastomoses to the bared rectal tube at the anorectal junction after TME dissection is associated with increased anastomotic leak. Leak rates following TME are reported in the range of 15–20% compared with a 5% or less leak rate for colonic and intraperitoneal rectal anastomoses. There is some evidence that a proportion of anastomotic leaks are associated with an individual surgeon's learning curve [30] and are reduced by appropriate instruction [19]. Risk factors for leakage of a low anastomosis have been identified to include male sex and preoperative radiation [34–36]. In consideration of the high leak rate associated with low anastomoses and potential devastating sepsis or even death from anastomotic leakage, it seems sensible to consider diversion in all cases where the anastomosis is lower than 6 cm [37].

Continence, urgency and ability to defer defecation, and incomplete rectal evacuation and clustering of bowel movements are a consequence of low rectal anastomoses (known as the anterior resection syndrome) and are problematic for patients after TME. Factors predicting poor function after sphincter preservation in these ultra-low anterior resections with TME have been difficult to identify [6]. Loss of the rectal reservoir and destruction of anorectal physiology are responsible for diminished anorectal function. Fecal incontinence after TME can result from loss of rectal reservoir function in the presence of poor preoperative anal sphincter function or diarrhea. Preoperative evaluation of anal sphincter function by history and digital assessment of anal tone are necessary to predict postoperative incontinence. In equivocal situations of possible incontinence, anal manometry along with pudendal nerve testing can aid decision-making regarding sphincter preservation. In addition, preoperative radiotherapy is detrimental to sphincter function. The Swedish Rectal Cancer Trial demonstrated that short-course preoperative radiation had a negative effect on anal function [38]. Radiation therapy can directly injure the anal sphincter and pudendal nerves, resulting in worsening incontinence. Direct injury of the sphincter and pudendal nerves may be lessened by excluding the sphincter in targeting during adjuvant radiation for middle and upper third rectal cancer. Again, preoperative history of fecal incontinence and poor anal sphincter tone are relative contraindications to coloanal reconstruction after TME. In situations of poor preoperative anal function, a colostomy will provide better functional outcome after TME.

In cases of adequate preoperative anal function, use of an end-to-side anastomosis, colon pouch or coloplasty should be considered to minimize postoperative anorectal dysfunction. Compared with a straight coloanal anastomosis, which tends to produce three to nine stools a day, an end-to-side anastomosis decreases urgency and frequency, and a colon pouch averages two to four movements per day [39,40]. Prospective randomized data demonstrate that incomplete rectal evacuation is associated with length of colon pouch greater than 6 cm [41–44]. However, to date, there are minimal data to support the hypothesis that reservoir construction is associated with improved functional outcomes and quality of life after low anterior resection [44].

Subtotal TME with reconstruction to the distal rectum will provide less anorectal dysfunction than reconstruction to the anus. TME is likely not necessary for upper rectal cancer, considering what is known of the biology of the distal spread of rectal cancer. Pathologic examination of mesorectal specimens of upper rectal cancer has not shown metastases to lymph nodes or tumor deposits in the mesorectum more than 5 cm below the lower mural tumor margin [4,45–47]. Therefore, a subtotal mesorectal excision with a distal 5 cm margin is likely sufficient to remove all pararectal lymph nodes potentially containing metastases. In performing a subtotal mesorectal excision, it is imperative to resect the distal mesorectal margin at a right angle to the long axis of the rectum, avoiding coning into the distal mesorectal resection margin.

While outcomes of treatment of rectal cancer have been improved since introduction of the TME technique, outcomes for treatment of distal rectal cancer are less favorable than for mid and upper rectal cancer. Marr reported that local recurrence is higher (36.5 vs 22.3%) and survival is lower (52.3 vs 65.8%) in patients undergoing abdominoperineal resection compared with anterior resection in a study of 608 patients [48]. This was due to a higher rate of incomplete excision at the circumferential margin (41 vs 12%) with less tissue removed around the area of the tumor in abdominoperineal resection than anterior resection. Since the mesorectum surrounding the rectal muscular tube is absent at the anorectal junction, it is difficult to achieve radial margin clearance at this location. Less favorable outcomes for distal third rectal cancer requiring abdominoperineal resection have also been reported in a Norway national cohort study [49] and in the Dutch trial [50]. The Dutch trial confirmed a higher rate of CRM involvement (30.4 vs 10.7%), higher perforation rate (13.7 vs 2.5%), higher local recurrence rate, and poorer survival for distal third compared with mid and upper third rectal cancer locations [50]. One approach to improve outcomes for distal third rectal cancers is further surgical training in the perineal approach to reduce CRM involvement [51].

### Controversies of TME & future considerations

Adjuvant radiation is superior when given preoperatively compared with when given postoperatively [52–56]. As such, it is necessary to investigate preoperatively whether unfavorable factors are present that require preoperative adjuvant radiation. Presence of local extension of the tumor through the bowel wall and perirectal lymph nodes can be assessed using endorectal ultrasound, CT scan and MRI. Endorectal ultrasound is good at assessing T-stage and is helpful in selecting patients for local excision. However, endorectal ultrasound is unable to visualize the mesorectal fascia and therefore cannot be used to predict circumferential resection margins at surgery. MR imaging provides accurate local assessment of radial margin clearance with 97% accuracy to predict involved, threatened and clear margins [57–59]. In addition, MRI can identify poor prognostic features including extramural spread greater than 5 mm, extramural venous cancer invasion, nodal

involvement and peritoneal infiltration. FIGURE 1 shows a transverse MR image of a rectal cancer that approaches and perhaps penetrates the mesorectal fascia with possible invasion of the right seminal vesicle and right piriformis muscle. Accordingly, portions of the right seminal vesicle and piriformis muscle have been resected *en bloc* with the TME to achieve a clear gross radial margin. Newer CT technology may approach MR accuracy for rectal cancer assessment. On the basis of excellent preoperative assessment of risk factors using MR, a selective approach for use of preoperative adjuvant radiation and chemotherapy to achieve tumor shrinkage and improve radial margin clearance while sparing anorectal dysfunction from radiation seems warranted. Although good prospective evidence supporting this selective approach to preoperative radiation is currently unavailable, one estimate is that over 50% of patients can be treated successfully with primary surgery alone [59]. To date, there is no consensus or evidence on which to base the use of preoperative radiation using specific criteria from preoperative CRM clearance identified by MR. However, based on results from the Norwegian national cohort study, indications for preoperative chemoradiation include patients in whom the distance from the tumor to the mesorectal fascia, measured on a good-quality MR scan, is 3 mm or less and when lymph node metastases are identified; conversely, no preoperative chemoradiation is recommended when the MR radial margin is greater than 3 mm and when no lymph nodes are identified [17].

### TME & laparoscopy

While TME is established as the preferred technique of rectal cancer excision, it is not clear whether the minimally invasive surgical approach is advantageous over the open technique. Because definitive long-term results are not yet available, the oncological safety of laparoscopic surgery for treatment of rectal cancer remains unproven. Breukink's review claimed no significant differences between laparoscopic and open TME with regards to resection margins, recovered lymph nodes, local recurrence and disease-free survival, or to anastomotic leakage, morbidity and mortality [60]. Although initial surgical outcomes from the UK CLASSIC trial showed increased radial margin positivity in the laparoscopic arm (12 vs 6% open), this outcome did not translate to increased local recurrence [61,62]. Laparoscopic TME was associated with less blood loss, pain, narcotic use and immune response, as well as quicker return to normal diet. Laparoscopic TME required longer operative time and higher operative instrumentation costs. Laparoscopy provides good exposure of the pelvis because of magnification and good illumination, and may facilitate pelvic dissection due to insufflation of dissection planes. As with colon cancer, laparoscopic resection for rectal cancer can provide short-term advantages in selected patients. However, laparoscopic TME is technically more difficult than laparoscopic colectomy, requires further training and experience, and should be approached with very careful selection of patients.

### Multidisciplinary approach to TME & quality of life

No longer should the individual surgeon be the sole determinant of an individual patient's outcome. The patient-oriented outcome depends on close collaboration of the surgeon with the radiologist, pathologist, radiation and medical oncologist, psychologist, social worker, stoma nurse, home-care nurse, and family physician. This multidisciplinary team approach with active professional input of every member of the group will

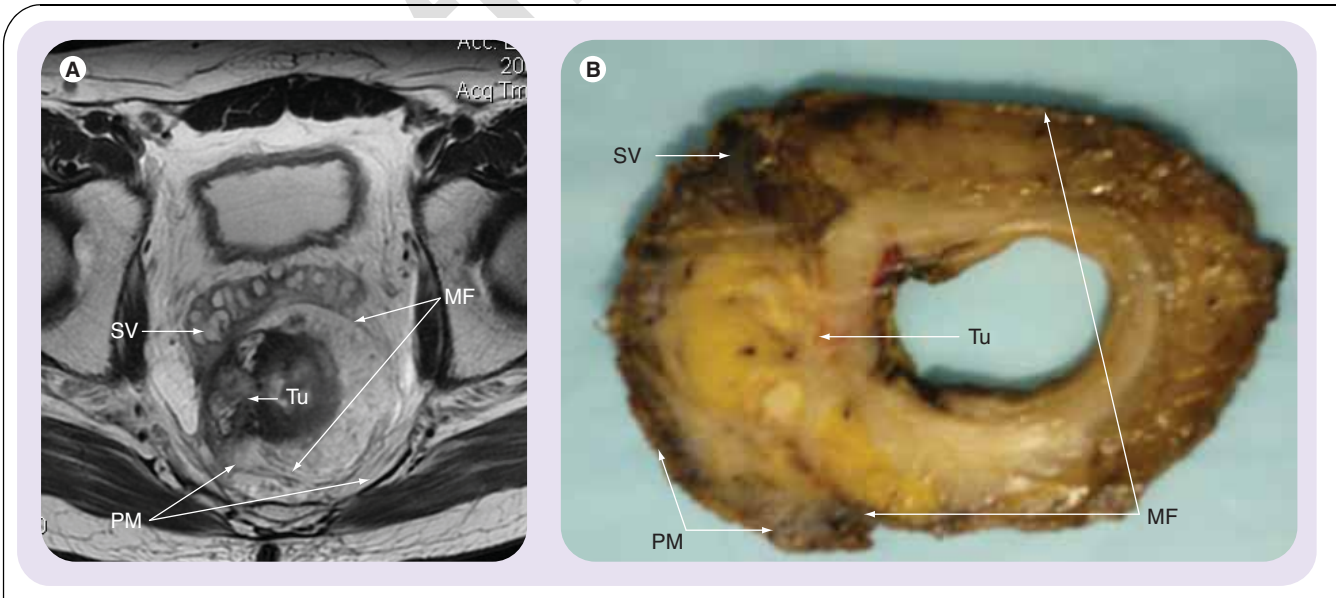


Figure 1. Preoperative pelvic MRI of patient received neoadjuvant chemoradiation (A) and the corresponding level in the TME specimen (B). (A) Tumor (Tu) invading through a mesorectal fascia (MF) into right seminal vesicles (SV) and right piriformis muscle (PM). (B) Ulcerating tumor approaching MF but with macroscopically clear margins.
Photograph (B) provided by Douglas Filipenko.

bring the current treatment of rectal cancer to a new level, adding anorectal function and quality of life to traditional oncologic outcomes.

### Five-year view

The concept of TME has been developed and its superior potential for better oncologic outcomes has been proved in large multicentral trials. Excellent results from leading TME centers have had remarkable influence on adoption of the technique by every surgeon who takes care of patients with rectal cancer. It has become increasingly clear that the surgeon himself is an important prognostic factor in controlling the local tumor as well as in maintenance of anorectal and genitourinary function, and he cannot base his management on the results of other surgeons. He can offer only his own technical experience and facilities of the institution he works at. Optimized surgery and quality control reporting are pivotal in providing the best possible care and the starting point for further improvement of an individual surgeon's own results. A decision to proceed with neoadjuvant therapy based on selective approach seems to be more appropriate when it is made in collaboration with medical specialists involved in treatment. However, the principal role within such a multidisciplinary team belongs to the surgeon.

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### Key issues

- There has been a significant improvement in local recurrence of rectal cancer after the introduction of preoperative radiotherapy.
- The total mesorectal excision (TME) technique offers better outcome than nonstandardized surgery with neoadjuvant radiotherapy.
- TME is currently the preferred surgical technique for rectal cancer excison.
- The success of TME is based on surgical training, experience and collaboration with the pathologist.
- Exact preoperative staging based on an ability of MRI to delineate the mesorectal fascia might prevent unnecessary preoperative radiation and will identify close radial resection margins that require preoperative radiation and additional consideration during surgical excision.
- Close collaboration as a multidisciplinary team of all specialties participating in the treatment of patients with rectal cancer defines new standards of treatment.
- The patient-oriented outcome measured by quality of life studies is becoming a new level of treatment.

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