Transanal endoscopic surgery: past, present and future

Transanal endoscopic surgery is a safe, established technique to remove lesions in the rectum via the anus. This article reviews its evolution, approaches, indications and evidence for its role in treating benign rectal polyps. The future of transanal endoscopic surgery in rectal cancer and inflammatory bowel disease is also explored.

Transanal endoscopic surgery is a minimally invasive, natural orifice surgery developed in the early 1980s by Professor Gerhard Buess to address the technical difficulties of removing tumours from the rectum without radical surgery (Buess et al, 1984). These lesions are often not amenable to endoscopic resection. Before transanal endoscopic surgery, a number of local excision techniques were available but they were associated with significant morbidity. The alternative would be an abdominal surgery in the form of either an anterior resection or an abdominal-perineal resection. Both of these surgeries, which carry significant morbidities and mortality, are radical, especially for benign tumours. Professor Buess collaborated with Richard Wolf Medical Instruments and eventually transanal endoscopic microsurgery was conceived. At the time, the term transanal endoscopic surgery was used synonymously with transanal endoscopic microsurgery as it was the only platform available.

Transanal endoscopic microsurgery is the name attributed to transanal endoscopic surgery using the Wolf platform and is unique within the market place in that it offers binocular vision. The relatively high initial set up cost has prompted other companies to develop alternative platforms such as Karl Storz, which produces the transanal endoscopic operation platform. Both these platforms are rigid reusable platforms while other companies offer flexible disposable platforms. This variety of platforms offers surgeons a method of performing transanal endoscopic surgery which can be tailored to financial limitations and cater for surgeons' laparoscopic and endoscopic training and experience.

Today, transanal endoscopic surgery is a generic term that encompasses all the local excision approaches. This article provides a broad overview of the evolution of the transanal endoscopic approaches, indications for their use, safety and morbidity profile, and discusses their future perspective.

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The past

A historical perspective

Before the transanal endoscopic microsurgery era, one method to resect rectal tumours was via a posterior approach. This included the York Mason trans-sphincteric approach which was mainly used for tumours in the mid rectum and the transcoccygeal Kraske approach for upper rectal lesions. These techniques have largely been abandoned now because of the high rates of complications such as chronic pain after coccygectomy, rectal-cutaneous fistulae, wound infection, anal stenosis and faecal incontinence (Hargrove et al, 1979; Thompson and Tucker, 1987).

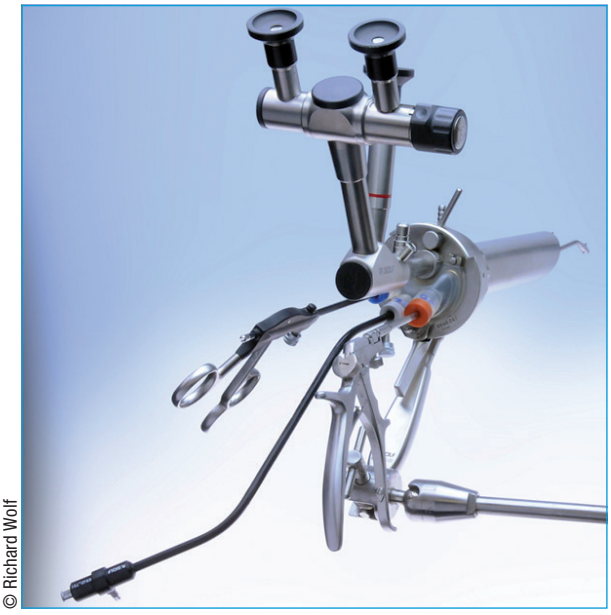
For completeness, a technical description of the posterior approach is provided below. The patient is placed in the prone jack-knife position. The Kraske approach involves making a midline incision over the sacrum and extending this inferiorly to the upper border of the anal sphincters and coccyx. The anococcygeal ligament is excised to improve exposure. The incision is deepened to expose the levator ani muscle, which is incised, exposing the posterior rectal wall. A rectotomy is made and after the lesion is excised, the muscles are closed in layers. For the York Mason approach, the sphincter complex is divided to gain entry into the rectum and the muscles are then closed in layers.

The present

Transanal endoscopic microsurgery

The transanal endoscopic microsurgery system consists of a bevelled rigid rectoscope about 4 cm in diameter and comes in two sizes – 12 cm and 20 cm long. The longer rectoscope is more suitable for lesions in the proximal rectum. The rectoscope is inserted into the anus to create an airtight

Figure 1. The transanal endoscopic microsurgery (TEMS) platform.



seal and fixed to the operating table using a multijointed clamp. A faceplate, which consists of multiple ports to allow placement of long working instruments for dissection, excision and suturing, and a stereoscopic angled telescope, is then attached onto the rectoscope. The telescope provides a three-dimensional visualization of the rectum and can also be connected to a standard laparoscopic video stack, which some surgeons prefer and which can be used for teaching purposes. The rectum is insufflated with carbon dioxide using a standard laparoscopic insufflator unit (*Figure 1*). Full-thickness excision of the lesion is possible, if malignancy is suspected, and the defect can be closed using sutures.

Transanal endoscopic operation

The transanal endoscopic operation platform is similar to that for transanal endoscopic microsurgery but is manufactured by Karl Storz. The rectoscope is also 4 cm in diameter and comes in 7.5, 15 and 20 cm lengths. Like the transanal endoscopic microsurgery platform, the rectoscope is held in position by a multijointed clamp and is placed inside the anus. The faceplate has three working ports for instruments. A 30° camera is used. The main differences are that the transanal endoscopic operation platform uses standard laparoscopic instruments and stack, thereby significantly reducing the cost, and it does not provide a binocular vision (*Figure 2*). Images are displayed on the laparoscopic monitor, just like any standard laparoscopic surgery. A number of studies have compared transanal endoscopic operation and transanal endoscopic microsurgery for benign and malignant lesions and have found similar satisfactory outcomes (Nieuwenhuis et al, 2009; Serra-Aracil et al, 2014).

Transanal minimally invasive surgery

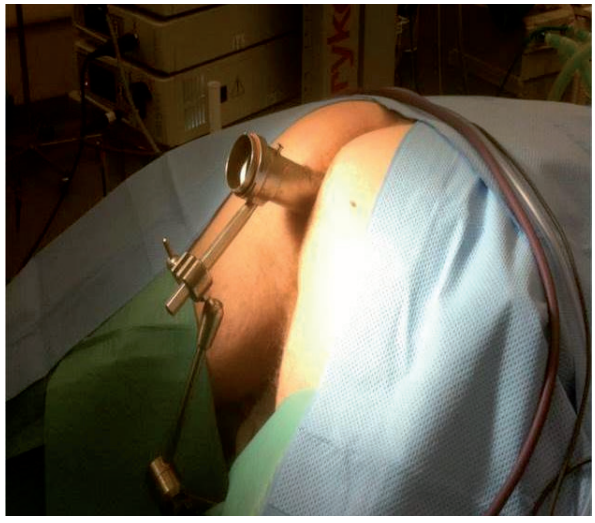
This latest transanal surgery innovation was conceived and coined by Dr Sam Atallah in 2010 (Atallah et al, 2010).

Figure 2. The transanal endoscopic operation (TEO) platform.

Figure 3. GelPOINT Path Transanal Access platform.

This technique was initially described using the SILS port (by Covidien, now called Medtronic), originally designed for use as a single port laparoscopic device. Applied Medical has developed their version of the device specifically for transanal use, called GelPOINT Path Transanal Access Platform (*Figure 3*). Both of these devices are collectively recognized as flexible platforms while transanal endoscopic microsurgery and transanal endoscopic operation are grouped as rigid platforms. The main difference between the Medtronic and Applied Medical devices is that the GelPOINT does not have pre-positioned access ports. The surgeon decides and places the access ports in the location of his/her choice on the platform, thereby tailoring the working ergonomics according to patient habitus or location of the lesion. Standard laparoscopic instruments are used for rectal insufflation, dissection and excision. The GelPOINT access channel (similar to a rectoscope) has only one size, measuring 4 cm in diameter but only 5.5 cm in length. Therefore, it may not be suitable for lesions in the upper rectum. Because it is not fixed in position with a clamp, like the rigid platforms, its movement within the rectum caused by insufflation pressure cycling (bellowing) can be a significant problem and requires an assistant to

Figure 4. Patient position for an anterior lesion.



hold the device in place to stabilize it, in addition to holding the camera. The use of newer volume type insufflators can prevent this but will incur additional investment. The main attractions of the flexible over the rigid platforms are the ease of setup and the cost.

Special considerations

Location and size

Preoperative assessment of the location of the rectal lesion is crucial, as this will determine how the patient is positioned on the operating table and the choice of rectoscope and instruments to use. The optimal position for the lesion is between the 3 and 7 o'clock position. Therefore, if the lesion is located anteriorly, the patient is ideally placed in the prone jack-knife position and in lithotomy if the lesion is posterior (*Figure 4*). Patients can also be placed in either the left or right lateral positions for lesions at the side or as a compromise where the prone position is deemed too high an anaesthetic risk.

There is no lower limit to resection sites and lesions encroaching the dentate line can be safely removed by this technique. The upper limit of resection is dependent upon surgeon experience and anatomical variance. As a rough guide the usual upper limit of dissection for full thickness excision is 15 cm for posterior lesions, 12 cm for lateral lesions and 10 cm for anterior lesions. These measurements correspond to the pelvic peritoneal reflection. Full thickness excision beyond these measurements risks entering the peritoneal cavity. This is not contraindicated but the operator must be competent to undertake an endoscopic closure of such defects. For benign lesions, where full thickness excision is not required, the physical limitation is determined by the rectoscope and the physical narrowing of the rectum. A 20 cm rectoscope will facilitate transanal excision of distal sigmoid lesions but is technically more difficult as the colon is mobile, whereas within the rectum the fixed nature of the mesorectum provides natural counter-traction for the surgeon.

Bowel preparation

There is no consensus as to whether the patient should receive preoperative full mechanical bowel preparation or phosphate enema. Some surgeons institute full bowel preparation with the view that it improves visualization and potentially reduces postoperative sepsis.

Postoperative antibiotics

It is common to develop a transient rise in temperature within the first 24 hours following transanal endoscopic surgery without other signs to suggest septicaemia. The cause of this is unknown but could be the result of a mild systemic inflammatory response. There is no evidence to guide the use of postoperative antibiotic but the authors prefer to administer oral metronidazole for 5 days postoperatively.

Closure of defect

Following full-thickness excision, the extraperitoneal tissue in the defect can either be left open or closed. In a randomized trial, no difference in outcome between these two practices was found (Ramirez et al, 2002) but the sample size was small and heterogenous for transanal endoscopic microsurgery and peranal excision. A further randomized trial specifically designed to assess the postoperative pain and complications between sutured and non-sutured closure of defect following transanal endoscopic microsurgery has finished recruiting and the results are awaited (Brown, 2011). The authors advocate closing full-thickness defects as it provides the surgeon with the experience of endoscopic suturing which is required if attempting resections above the peritoneal reflection and is a transferable skill if developing a practice in transanal total mesorectal excision resection (*Figure 5*).

Indications for transanal endoscopic surgery

Benign rectal polyps

Transanal endoscopic microsurgery was first developed to remove benign rectal polyps not amenable to endoscopic resection. At present, this remains the most common indication. With time, endoscopic techniques have improved and a significant proportion of rectal adenomas is now being removed via endoscopic mucosal resection. Transanal endoscopic microsurgery is complementary to endoscopic mucosal resection and is particularly useful for large and recurrent adenomas.

Several large series of rectal adenomas excised by transanal endoscopic microsurgery with long-term follow up have shown that transanal endoscopic microsurgery is safe with very low morbidity, has low recurrence rate (between 4.3% and 12.4%) and is more effective than other transanal excision techniques (Mörschel et al, 1998; Guerrieri et al, 2006; Moore et al, 2008). Risk factors for adenoma recurrence include size, previous piecemeal excision and positive resection margin (McCloud et al, 2006; Speake et al, 2008; Allaix et al, 2012). Large adenomas (>3 cm) have a median time of recurrence of 10 months, with over 75% recurring by 12 months (Barendse et al, 2013). A

recurrence rate of up to 29% in excised adenomas with a positive resection margin compared to 4% in those with clear margins has been reported (Mörschel et al, 1998; Whitehouse et al, 2006). There are no long-term data available yet for transanal minimally invasive surgery, although an early recurrence rate of 4% at 18 months has been reported (Albert et al, 2013).

Rectal cancers

The role of transanal endoscopic surgery in rectal cancers is three-fold: as a cure for low-risk early cancer, as part of an organ-preservation strategy in high-risk early rectal cancer and as a compromise for those unfit for radical surgery.

Transanal endoscopic surgery in isolation for early rectal cancer

Early rectal cancer is an invasive adenocarcinoma spreading into, but not beyond the submucosa, i.e. a T1 tumour in the tumour node metastasis (TNM) classification (Kudo, 1993; Sobin et al, 2009). Early rectal cancer has been relatively uncommon in the west but the bowel cancer screening programme has altered its incidence such that population-based screening studies in the UK reported that approximately 50% of screen-detected tumours are 'early' (pT1-2N0M0; stage I) (UK Colorectal Cancer Screening Pilot Group, 2004; Steele et al, 2009).

The gold standard curative treatment for rectal cancer is radical surgery in the form of total mesorectal excision, described by Professor Heald (Heald et al, 1982) over 30 years ago. Total mesorectal excision involves sharp dissection along the mesorectal plane, leading to the removal of the mesorectum envelope with the rectal tumour, mesorectal lymph nodes and vascular supply. While total mesorectal excision offers high rates of cure, it is not without its morbidity in terms of urgency, incomplete emptying and stool frequency (Temple et al, 2005; Wallner et al, 2008) and compromise in quality of life (Grumann et al, 2001; Engel et al, 2003; Wilson and Alexander, 2008). Permanent stoma rates of up to 37% for low anterior resection have been reported (Lindgren et al, 2011; Rutkowski et al, 2011). It is difficult to balance the level of surgical morbidity and mortality for all stages of resectable rectal cancer against a satisfactory oncological outcome. A tailored approach based on tumour staging and patient comorbidity is required to deliver the least invasive surgical approach while not significantly compromising oncological outcome.

A meta-analysis comparing transanal endoscopic microsurgery and radical surgery as a definitive treatment for 397 T1 rectal cancers found that transanal endoscopic microsurgery had lower morbidity (P=0.01) and no mortality compared to radical surgery (3.68%, P=0.01). However, transanal endoscopic microsurgery had an unacceptably higher rate of local recurrence (12% *vs* 0.5%, P=0.0004) but this did not translate to any difference in 5-year survival (Wu et al, 2011). The variation in local recurrence rates among early cancers suggests that further stratification is required to identify a subgroup which may have the least aggressive course, and therefore may be suitable for local excision alone. Bach et al (2009) developed a predictive model for local recurrence following local excision for rectal cancer. The model indicated that a subset of early rectal with favourable histopathological parameters, such as pT1, sm1, Ly0 and a diameter of <3 cm have a local recurrence rate of under 5%, similar to that achieved by total mesorectal excision (*Table 1*). For this group, transanal endoscopic surgery alone may be sufficient but as for the remaining early rectal cancers, the recurrence rate was unacceptably high if treated by local excision alone. Molecular studies to identify disease progression hold promise (Leong et al, 2011, 2014) and may provide a further level of stratification to aid clinicians in the accurate selection of patients for local excision.

In cases where poor prognostic histopathological features were found in the transanal endoscopic surgery specimen,

Figure 5. **a.** Rectal lesion **(b)** after full-thickness excision and **(c)** defect closed. **d.** Specimen pinned on a corkboard for histological analysis.

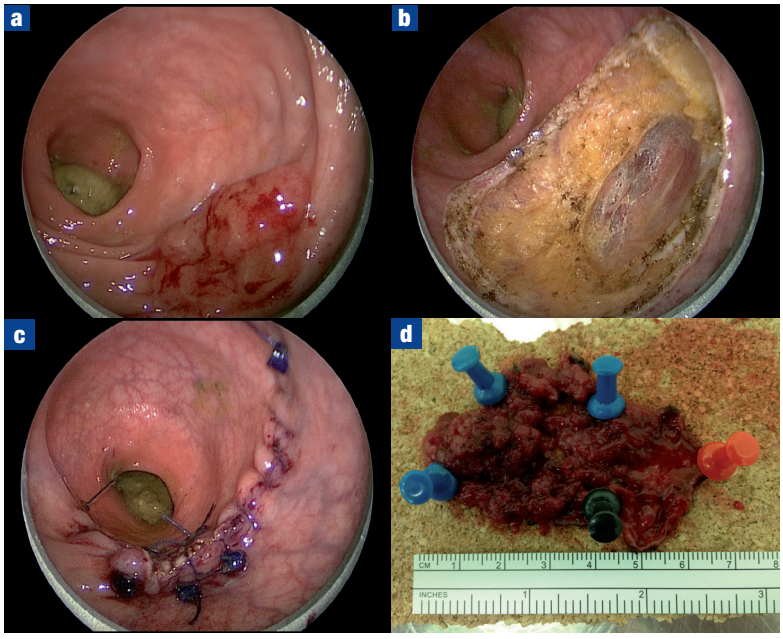


Table 1. Predicted local recurrence rates at 36 months following local excision of rectal cancers by transanal endscopic surgery

Depth of invasion	Lymphovascular invasion	Maximum tumour diameter (cm)					
		<1.1	1.1–2.0	2.1–3.0	3.1–4.0	4.1–5.0	>5.0
pT1 sm1	Negative	3	3.6	4.4	5.4	6.6	8.1
	Positive	5.2	6.4	7.7	9.4	11.4	13.7
pT1 sm2/3	Negative	10.5	12.7	15.3	18.5	22.1	26.4
	Positive	17.8	21.4	25.5	30.3	35.7	41.8
pT2	Negative	9.8	11.9	14.3	17.3	20.7	24.7
	Positive	16.7	20.0	23.9	28.5	33.7	39.5

Adapted from Bach et al (2009)

conversion to total mesorectal excision surgery would be required. 'Completion' surgery is safe and delivers the same oncological outcome to that of primary total mesorectal excision surgery for matched tumour groups (Borschitz et al, 2006). In a case-matched study, no difference in local recurrence and distant metastasis were found between those who underwent transanal endoscopic microsurgery followed by early total mesorectal excision and primary total mesorectal excision (Levic et al, 2013), although the study is flawed by its small sample size (n=25) and the short duration of follow up (median of 25 months). However, if local recurrence develops following transanal endoscopic surgery, the outcome of delayed or 'salvage' total mesorectal excision surgery in terms of survival is limited (Doornebosch et al, 2010) but is still superior to that of transanal re-excision (Stipa et al, 2012).

Transanal endoscopic surgery as part of a multimodal strategy for early rectal cancer

Incorporating preoperative chemoradiotherapy with transanal endoscopic surgery is appealing since chemoradiotherapy can downstage or induce complete pathological response in rectal cancer, thus reducing local recurrence and improve survival (Maas et al, 2010; Martin et al, 2012). A proof of principle randomized trial of neoadjuvant chemoradiotherapy followed by either transanal local resection or laparoscopic total mesorectal excision for T2 rectal cancer suggests that additional treatment to local excision can result in similar and acceptable recurrence rates to total mesorectal excision surgery (Lezoche et al, 2012). While the results are promising, the study does not represent real life clinical practice as patients with T2N0 rectal cancers are not routinely offered neoadjuvant therapy before total mesorectal excision surgery. Several pragmatic studies to assess the feasibility and efficacy of preoperative chemoradiotherapy and local resection as an organ-preserving treatment for early cancer have since been developed.

The CARTS study was a multicentre trial which assessed the feasibility of long course chemoradiotherapy followed by transanal endoscopic surgery 6–8 weeks later for T1-3N0 distal rectal cancer as a primary treatment. The results showed that complete pathological response was achieved in 55% of cases (30 out of 55) but at the expense of chemoradiotherapy-induced toxicity, with 46% of cases (23 out of 55) having grade 3 toxicity and two toxicity-related deaths (Verseveld et al, 2015). Local recurrence rate was significant at 8.5% after a median follow-up period of 17 months.

The ACOSOG Z6041 study was similar to the CARTS study. It assessed the oncological outcome of neoadjuvant treatment followed by transanal endoscopic surgery for T2N0 rectal cancers. Despite reducing the chemoradiotherapy regimen, significant toxicity was observed. For those treated by the 'organ-preserving' strategy, the 3-year survival was 88.2% in the intention-to-treat cohort and 86.9% in the per-protocol group, which were lower than anticipated (Garcia-Aguilar et al, 2015).

In the ongoing phase III GRECCAR 2 (NCT00427375) trial, T1-3N0 rectal cancers which have responded well to chemoradiotherapy are randomized to receive either local excision or total mesorectal excision surgery 6–8 weeks later. The phase II TREC trial (ISRCTN 14422743) has recently completed recruitment and the results are awaited. It differs from the other studies in that it offered short course preoperative radiotherapy rather than chemoradiotherapy. The trial explored clinicians' perceptions of trade-offs between oncological outcome against perioperative morbidity and mortality and quality of life between the two treatment arms of organ preservation strategy, incorporating preoperative short-course radiotherapy to transanal endoscopic microsurgery against total mesorectal excision surgery alone for early rectal cancer.

The Dutch CARTS and UK TREC investigators, in addition to oncologists and surgeons in Denmark, have designed the new STAR-TREC trial; a phase II randomized study comparing standard radical surgery and organ-saving strategy using either short course radiotherapy or chemoradiotherapy with selective use of transanal endoscopic surgery based upon a radiotherapy response assessment for T1-3N0 rectal cancer. This study is due to open for recruitment shortly. Results from this feasibility trial will lead to a phase III study, which will evaluate the efficacy of the three treatment modalities currently offered for 'early' rectal cancer (*Figure 6*).

The OPERA (NCT02505750) trial is a European phase III study comparing the rectal preservation rate after a boost of either contact X-ray brachytherapy (Papillon technique) or external beam radiotherapy following neoadjuvant chemoradiotherapy for T2-3N0 adenocarcinoma of the middle and distal rectum. If a complete clinical response is achieved, then a 'watch and wait' policy is adopted. Partial responders will undergo transanal endoscopic surgery while non-responders will be treated with radical surgery.

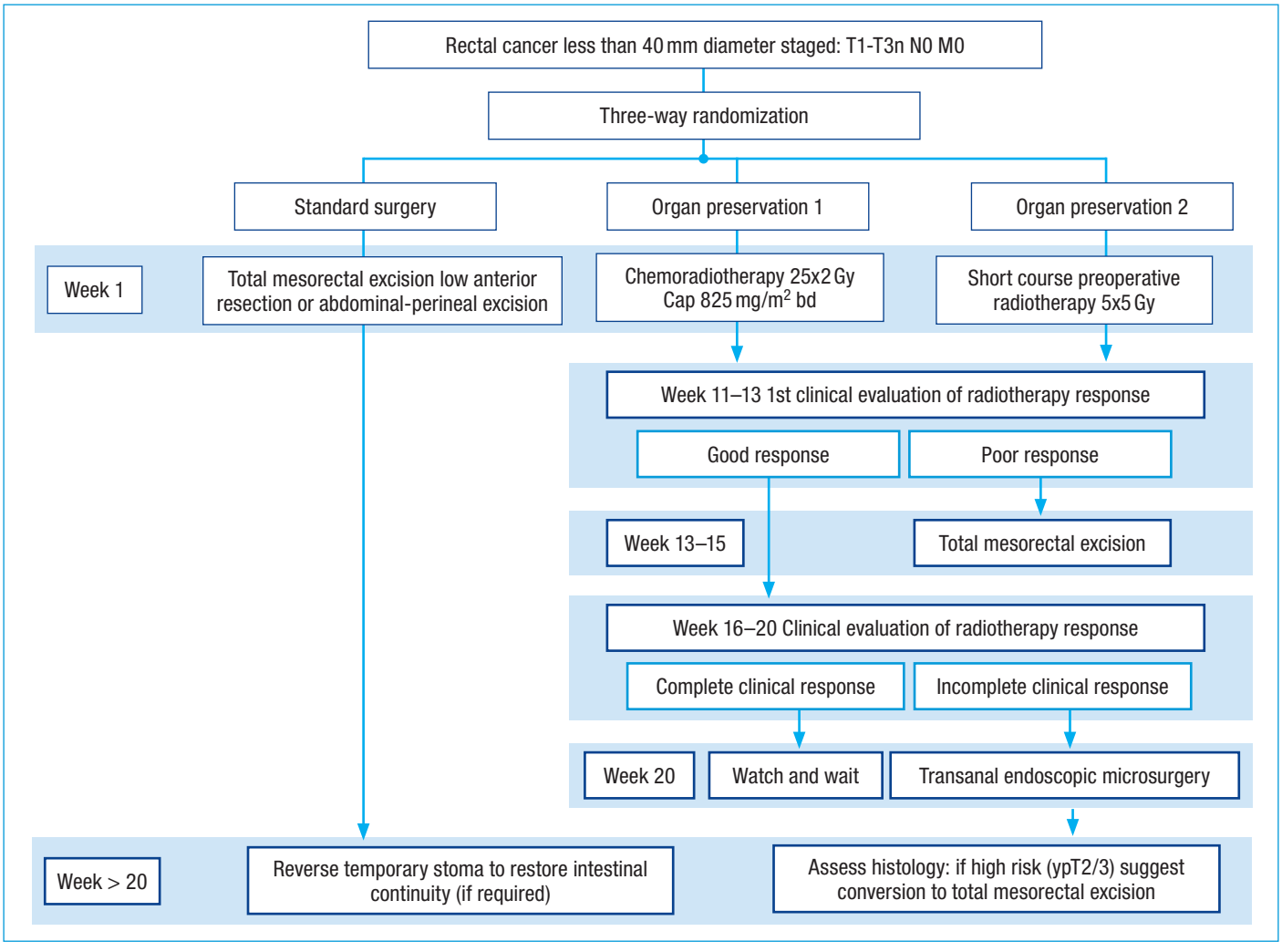
Transanal endoscopic surgery as a compromise for those unfit for surgery

Local excision can be considered for patients with early rectal cancer who refused or are too frail for radical surgery. Smart et al (2016) recently reported that, as part of the observation arm of the TREC trial, an organ preservation strategy of short course radiotherapy followed by local resection resulted in 97% (60 out of 62 cases) R0 resection with a third achieving complete pathological response following short course radiotherapy. Local recurrence was detected in four cases after a median follow up of 13 months.

Postoperative complications

The overall morbidity for transanal endoscopic surgery ranges between 7.7% and 21% (Allaix et al, 2009; Tsai et al, 2010; Albert et al, 2013; Schiphorst et al, 2014). The most common complications are bleeding, urinary retention and suture line dehiscence, which are commonly treated conservatively. Entry into the peritoneal cavity

Figure 6. Proposed STAR-TREC trial schema.



has been reported in 5.8% of cases and is associated with proximal anterior lesions. The majority of peritoneal breaches can be treated successfully by suturing the defect and administration of antibiotics and has no adverse implication on oncological outcome (Morino et al, 2013).

Functional outcomes

Although studies have shown that anal sphincter pressure is reduced following transanal endoscopic surgery, no long-term effect on continence has been observed (Banerjee et al, 1996; Hemingway et al, 1996; Kennedy et al, 2002). Cataldo et al (2005) showed that continence scores were similar before and after transanal endoscopic microsurgery. In another study, continence scores improved after transanal endoscopic microsurgery (Doornebosch et al, 2008), likely to be the result of excision of a mucus-producing lesion, thus improving quality of life. Even after repeat transanal endoscopic microsurgery, anorectal function is preserved (Zhang et al, 2012; Khoury et al, 2013). Similar good functional outcomes were also demonstrated with transanal minimally invasive surgery (Schiphorst et al, 2014; Karakayali et al, 2015).

Alternative options to transanal endoscopic surgery

Transanal excision

Transanal excision is a relatively simple method to excise lesions in the lower rectum and anal canal. It is generally safe with infrequent complications (Piccinini et al, 1995; Pigot et al, 2003). Similar to transanal endoscopic surgery, the patient's position on the operating table depends on the location of the tumour. To enhance exposure, a Lone Star and an Eissenhammer retractor can be used. The lesion is excised using electrocautery under direct vision. Full thickness excision down to mesorectal fat with 1 cm circumferential margin is recommended for malignant tumours. The main disadvantage is its surgical outcome. When compared to transanal endoscopic microsurgery, transanal excision is inferior in terms of clear margins (71% *vs* 90%), tumour fragmentation (65% *vs* 94%) and local recurrence (5% *vs* 27%), so it is reserved for small benign polyps located in the anal canal or lower rectum.

Endoscopic mucosal resection

Endoscopic mucosal resection, initially developed for use in the management of early gastric cancer, has now been

extended to colorectal polyps. The initial step involves submucosal injection of a colloidal-type fluid, methylene blue and adrenaline to lift the polyp off the muscularis propria. A snare is then placed over the polyp and electrocautery applied. For large polyps (>2 cm), piecemeal excision is required to reduce the risk of perforation in exchange for a higher recurrence rate. The main benefit of endoscopic mucosal resection over transanal endoscopic microsurgery is the cost and potentially reduced morbidity as endoscopic mucosal resection is routinely performed without general anaesthesia. A large retrospective study of 292 patients found that the early recurrence rate following resection of large adenomas was higher following endoscopic mucosal resection than transanal endoscopic microsurgery (31.0% *vs* 10.2%, $P<0.001$) but endoscopic mucosal resection had fewer postoperative complications (13% *vs* 24%, $P=0.038$) (Barendse et al, 2012). A multi-centre randomized trial assessing endoscopic mucosal resection and transanal endoscopic microsurgery for large adenomas (TREND study) is underway and should provide insight into the cost-effectiveness of both techniques (van den Broek et al, 2009).

Endoscopic submucosal dissection

Endoscopic submucosal dissection is a more advanced technique than endoscopic mucosal resection. Similar to endoscopic mucosal resection, using a flexible endoscope, fluid is injected into the submucosal layer, thus lifting the polyp off the muscularis propria. A variety of knives is available for mucosal incision and submucosal dissection. This allows precise dissection and higher en bloc resection rates than endoscopic mucosal resection. It is, however, technically demanding and the uptake in the west remains poor. A systematic review and meta-analysis of case series found that transanal endoscopic microsurgery achieved a greater R0 resection rate than endoscopic submucosal dissection and was associated with a lower overall need for further abdominal surgery as a result of complications or pathology indications (Arezzo et al, 2014).

Contact X-ray brachytherapy (Papillon technique)

In 2015 the National Institute for Health and Care Excellence approved the use of contact X-ray brachytherapy to treat early rectal cancer in patients who are fit but declined surgery or those considered unfit for surgery. The treatment involves the placement of an X-ray tube within an applicator in the rectum in contact with the cancer. The tube emits a low energy but high dose of radiation that penetrates a few millimetres directly on the cancer. This process minimizes the damage to surrounding tissues. Treatment is usually repeated every 2 weeks for three cycles. There are no studies directly comparing the efficacy of contact X-ray brachytherapy and local resection.

The future

Rectal cancer

The role of transanal endoscopic surgery as an extended surgical technique is increasingly being explored in patients with rectal cancer. Transanal total mesorectal excision is a new technique that removes the mesorectal envelope, using a hybrid approach of conventional total mesorectal excision dissection from the top (abdominal dissection) and a full thickness transanal incision into the total mesorectal excision plane from down below (perineal dissection) using the transanal endoscopic surgery platform, for mid and low rectal cancers. This technique has been developed in an attempt to overcome some of the challenges of operating deep in the narrow pelvis; the anatomical nature of the pelvis and suboptimal visualization make dissection of the total mesorectal excision plane down to the pelvic floor difficult. Some surgeons have developed and trialled a modified rectoscope to facilitate robotic-assisted transanal endoscopic surgery (Gomez Ruiz et al, 2014). A recent meta-analysis of case series showed that transanal total mesorectal excision is generally safe with comparable perioperative morbidity, anastomotic leaks and mortality to conventional total mesorectal excision surgery. However, it has unusual complications such as urethral injury, albeit very low incidence, not seen in open, laparoscopic or robotic total mesorectal excision surgery (Simillis et al, 2016).

Inflammatory bowel disease

The nature of transanal endoscopic surgery as a 'scarless' natural orifice surgery is also being exploited in surgery for inflammatory bowel disease. Several case series showed that completion proctectomy for ulcerative colitis using transanal endoscopic surgery is safe, feasible and avoids the need for abdominal surgery (Bremers et al, 2013; Liyanage et al, 2013). For ileo-anal pouch surgery, the transanal approach is attractive as it can obviate the need for double-stapling, which increases the risk of anastomotic leak. Several studies have explored this and found it to be feasible and safe but the long-term outcome is unknown (de Buck van Overstraeten et al, 2016; Leo et al, 2016).

A word of caution

Since its inception over 30 years ago, the technology of transanal endoscopic surgery has advanced significantly such that the ease of use and the affordability has allowed many surgeons to use transanal endoscopic surgery. While this is an encouraging notion, transanal endoscopic surgery, in particular as part of transanal total mesorectal excision, can be difficult and may compromise oncological dissection and lead to unusual complications because of the unfamiliarity of the anatomy. Attending recognized training courses, proctorship and two-consultant operation can enhance the training experience and address some of these challenges.

Conclusions

Transanal endoscopic surgery is now an established technique to treat benign polyps in the rectum. It has an excellent safety profile and good long-term data. Its outcome in treating early rectal cancer is encouraging and is appropriate as a stand-alone treatment in a subset of patients with early cancer. The challenge is to accurately

identify this group. For the rest, an organ-preserving strategy, incorporating transanal endoscopic surgery with neoadjuvant therapy, may be considered as part of a number of ongoing randomized controlled trials. Early outcome data suggest that this strategy is a safe alternative for patients deemed high risk or who refuse radical surgery. Its use to complement existing surgical techniques is being explored in patients with rectal cancers and inflammatory bowel disease and the initial results are encouraging. With appropriate training, transanal endoscopic surgery can be incorporated into a colorectal surgeon's armamentarium. **BJHM**

KEY POINTS

- Transanal endoscopic surgery is a safe and established technique to treat benign polyps in the rectum.
- It is an appropriate standalone treatment in a subset of early cancer but the challenge is to accurately identify this group.
- Several randomized controlled trials are exploring its use as part of a multimodal approach treatment for early rectal cancer.
- Its use to complement existing surgical techniques is being explored in rectal cancers and inflammatory bowel disease.
- Appropriate training and proctorship is recommended to enhance experience and reduce complications.

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Conflict of interest: Mr KJ Leong is an organizer for transanal endoscopic operation (Karl-Storz) courses; Mr P Lidder, Mr J Evans, Mr MM Davies and Mr A Scott are transanal endoscopic operation course organizers, users and trainers.

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