

# Current Challenges for Education and Training in Transanal Surgery

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## Abstract

Transanal endoscopic microsurgery (TEM) is a technique that was introduced in the 1980s for improved exposure to upper rectal polyps. This technique, though initially difficult to master due to new skill acquisition for surgeons, has spared many patients proctectomy. There are many benign indications for transanal endoscopic surgery which has led to in vivo operating room training with fewer undesirable effects to the patient. With the explosion of laparoscopic technology this transanal technique is no longer limited to intraluminal pathology, but is now being used to remove the entire rectum. In transanal total mesorectal excision (taTME), benign indications are less common, translating to potentially more severe oncologic patient consequences during the early phase of adoption. For this reason, strict training criteria consensus guidelines have been developed by the experts in taTME. The current consensus statements agree that training surgeons should have performed a minimum of 10 laparoscopic TME procedures and should have some experience with transanal surgery. Surgeons need to attend a formal training course and should start clinically on benign or early malignant pathology without threatened circumferential resection margins. Surgeons also need to have their first cases proctored until deemed proficient by the proctor and monitor their morbidity, oncologic, and functional outcomes prospectively.

## Keywords

- ▶ transanal endoscopic surgery (TES)
- ▶ education
- ▶ learning curve
- ▶ training
- ▶ transanal total mesorectal excision
- ▶ taTME

Advancing technology allows for surgeons to offer new minimally invasive options to patients. A downside of this new technology is the learning curve that is required to master these techniques, and the fact that the patient may suffer complications due to the learning curve. Arguably one of the most clinically valuable techniques is the adoption of transanal surgical platforms that allow better visualization and further reach into the rectum. This technological advancement has spared patients with upper rectal polyps or early rectal cancer the morbidity of a proctectomy and/or a stoma. In addition, rates of complete resection of polyps and recurrence are improved over traditional open transanal excision.<sup>1,2</sup> The initial technique described by Gerhard Buess coined transanal endoscopic microsurgery (TEM) was first

described in the 1980s.<sup>3,4</sup> This technique was developed prior to the widespread use of laparoscopy making it a vast learning curve from standard open transanal operative techniques. The initial system included fixed optics, instruments specifically designed for the straight nature of the proctoscope, as well as a carbon dioxide (CO<sub>2</sub>) insufflation for the rectum and a suction delivery system. Dr. Buess realized that using this complex system took additional training and described a 1-day course from dry to wet laboratory.<sup>5</sup> While this training is very helpful to allow the surgeon to become adept with the instrumentation, it may not translate to the prevention of complications for the patient.

Laparoscopy is commonly utilized in a colorectal surgeons practice and much of the equipment and techniques are

similar to that needed for transanal endoscopic surgery (TES). The explosion of technology around minimally invasive surgery has allowed surgeons to use less costly laparoscopic equipment to successfully complete transanal operations.<sup>4,5</sup> As surgeons become more facile and comfortable with minimally invasive techniques, the indications for transanal surgery have broadened. Sleeve resections, repair of fistulas, and resection of high rectal lesions have all been described successfully.<sup>6-8</sup>

As comfort with both laparoscopic and transanal techniques have improved, the newest role for transanal systems is minimally invasive perineal proctectomy. Transanal access for colectomy was first described in cadavers in 2007 by Whiteford et al.<sup>9</sup> This was quickly followed by animal model survival studies, as well as the first human case reported in 2010 by Sylla et al.<sup>10,11</sup> Transanal total mesorectal excision (taTME) has exploded and currently many surgeons are looking to utilize this technique to help with the most difficult aspect of the deep pelvis. Theoretical advantages include higher rates of complete specimens, better visualization of the distal margin, and decreased positive circumferential resection margins (CRMs). As the literature in this discipline proliferates, the reality of new complications specific to this technique has been realized. Urethral, pelvic side wall, and nerve injuries have all been described specifically related to taTME.<sup>12-14</sup> Training programs have been established to ensure the safe adoption of this new technique. The focus of these programs is somewhat on the technology, but more on identification of the correct planes and pitfalls specific to this operation.

### Transanal Endoscopic Surgery Education

When the TEM platform was developed in the 1980s, laparoscopic equipment was not a routine part of standard operating practice making the learning curve to this new technique much steeper. The first training courses describe a 1-day training session divided into four steps: becoming acquainted with the equipment, operating on cloth phantom through the proctoscope, training on opened bowel, and finally training on closed bovine bowel distended by gas insufflation.<sup>5</sup> This course was incredibly helpful in introducing the new equipment as well as maneuvering rigid instruments and suturing through a rigid proctoscope. There are many benign indications for TEM which allows the learning surgeon to improve without adverse oncologic consequences for the patient. Helewa et al report a leveling of the learning curve measured by the time of operation of 16 cases, with a second plateau at 35 cases.<sup>15</sup> Barendse et al showed a learning curve effect on conversion to laparoscopy, procedure length, and complication rate that all decreased with increasing experience.<sup>16</sup> Learning curve data on this technique is difficult to interpret as many surgeons will expand indications to include more proximal or larger lesions which in turn increases operating times. The overwhelming message is for new surgeons to audit their clinical outcomes and begin with low benign lesions.

The Colorectal Surgical Society of Australia and New Zealand require a formal TEM training certificate followed by assisting in five procedures, supervised performance of five procedures,

and maintenance of five cases per year with prospective auditing of outcomes.<sup>17</sup> The same mandates do not exist in the United States currently. Since the advancement of single incision laparoscopy, multiple transanal platforms are newly available with decreased startup costs which have increased the availability of TES to most colorectal centers. The equipment is similar to what surgeons are using laparoscopically for both the operating surgeon and operating room staff. Most surgeons leave their general surgery training with adequate laparoscopic training as well as laparoscopic suturing experience. When the surgeon is facile with the equipment and basic techniques required for a procedure, how much further training is required? The first report of learning curve for transanal minimally invasive surgery procedures reports a decreased operative time and improved R0 resection at 14 to 24 cases, which is similar to the TEM literature.<sup>18</sup> This shows that despite equipment that is familiar to the surgeon there is a learning curve specific to this technique that improves with experience. This further endorses that proper ex vivo training is helpful, but it is still up to the surgeon to start with more distal benign pathology to improve their outcomes and minimize any untoward outcomes to patients.

### Transanal Total Mesorectal Excision Training

Sylla et al reported the first case of a taTME in a live human in 2010.<sup>11</sup> Multiple case reports of small numbers of patients followed demonstrating feasibility with encouraging intact CRM rates ranging from 85 to 97%.<sup>12-14</sup> With larger case series and meta-analyses showing improved complete TME rates, decreased positive CRM rates, decreased operative times, and decreased conversion rates, this technique has become highly sought after.<sup>19</sup> The initial positive results are likely skewed by selection bias, and the results of the COLOR III trial will help to decipher the true benefits of this technique.<sup>20</sup> After these initial encouraging reports more concerning reports of complications specific to this technique were published. Reports of urethral injury, pelvic nerve and vessel injury resulting in hemorrhage, as well as reports of CO<sub>2</sub> embolus specific to insufflation of the perineum were published increasing awareness of some of the issues specific to this procedure.<sup>21-24</sup> Both the increase in complications not typically seen with traditional laparoscopic low anterior resection, as well as the variability in intact CRM rates, made it clear that structured training is required for widespread adoption of this technique.

With current technology it is easy to watch an expert perform an operation at any time with the numerous, often free, online resources that are available today. While these resources are invaluable, they show experts in the field performing surgeries that they execute routinely. The novice surgeon has to expect that finding the correct planes and avoiding complications will not be the same in their hands initially. Deijen et al show an increase in operative time and a higher conversion rate in low- versus high-volume centers which further pushes the case for training and experience with this new technique.<sup>25</sup> A study from the Florida Hospital group looked at how attendees performed in the cadaver

laboratory and followed their adoption of the technique.<sup>26</sup> They found 76% of trainees achieved a complete TME, 26% near-complete TME, and 3% incomplete TME. These numbers are far from the 90 + % complete TME results seen by the experts performing taTME routinely. Nine percent of trainees were noted to be out of plane, 4.5% injured the rectum or surrounding structures, and 20% mobilized the prostate. Fifty-two percent of surgeons leaving the course had completed taTME on their own, and of those 5 reported urethral injuries (20%), 15% experienced hemorrhage, 35% experienced issues with billowing of the pneumoperitoneum, and 25% reported operating in the wrong plane. These data confirm that there is a potentially great cost to the patient and complications are common despite structure training.

The second expert conference was held in Paris, France, in 2014 and described the appropriate indications for taTME as well as operative advice and some training recommendations for adopting surgeons.<sup>27</sup> These experts recommend using this technique for tumors < 12 cm from the anal verge, in T3 or less tumors, and starting on benign disease or in women with early tumors not threatening the CRM. Consensus was for trained laparoscopic rectal cancer surgeons to attend a formal training course, optimally with their operative team, and perform their first cases with a proctor. In addition, they recommend using an international registry monitoring comorbidities, and oncologic outcomes followed by long-term functional outcomes. Maykel et al published on the adoption of taTME at an academic medical center. They describe multiple surgeons taking a 2-day training course, performing the first 3 cases for benign indications, using a two-teamed approach with acceptable short-term patient outcomes and complete TME rate confirming that the first consensus guidelines can be successful in the right hands.<sup>28</sup>

The consensus on structured training for taTME published in 2017, sought the view of 148 surgeons performing taTME, many of these experts.<sup>29</sup> The learners group assigned clinical

proctoring and multidisciplinary team training as the two more important aspects that must be included in the taTME curriculum. The consensus group agreed that all genders with low or mid rectal cancers were indications for taTME performed in centers that perform more than 20 rectal cancer cases/year. The majority of experts agree that 2 surgeons per hospital should be trained in a structured taTME training curriculum which they describe, and have performed more than 5 transanal surgeries and more than 30 laparoscopic low anterior resections with demonstration of surgical outcomes. They also agreed that all surgeons should collect their own data on pathologic quality of the specimen as well as morbidity and oncologic outcomes.<sup>29</sup> The St. Gallen Colorectal Consensus Expert Group released a statement discussing the surgical indications, perioperative management, patient positioning and operating room set up, surgical technique, devices and instruments, pelvic anatomy, TaTME training, and outcomes analysis.<sup>30</sup> This document describes the operative technique in more detail than the prior recommendations, but also endorses a formal training curriculum prior to starting taTME (→ Fig. 1). They recommend an annual volume of at least 10 rectal cancers per year. The entire operating team to be trained and strongly encourages a two-teamed approach particularly in the beginning of the learning curve. They also suggest proctoring for the first 1 to 5 procedures based on the experience of the learning surgeon. No consensus could be met on a set number of procedures to reach proficiency, but all agreed that following clinical, oncologic, and functional outcomes was essential.

## Conclusion

All new technologies require a learning curve that can translate to suboptimal patient outcomes. It is every surgeon's prerogative to maximize their training outside of the operating room to minimize these untoward patient effects. Increased operative



**Fig. 1** Supervised dry-laboratory simulations for trainee surgeons during the annual transanal endoscopic surgery/transanal total mesorectal excision course at the IRCAD Latin America (Barretos, São Paulo, Brasil) – courtesy of L. Romagnolo, MD.

time and minor complications are unavoidable in the early stages of any newly adopted technique. When discussing new techniques for cancer, such as taTME, it is the surgeons' obligation to maximize outside training with experts, have appropriate proctoring, and to monitor their personal outcomes, to minimize the negative effects that the new technique has on the quality of the cancer resection.

#### Conflict of Interest

None declared.

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