Seminars in Colon and Rectal Surgery 26 (2015) 41–44

Contents lists available at ScienceDirect

Seminars in Colon and Rectal Surgery

journal homepage: www.elsevier.com/locate/yscrs

Functional outcomes following transanal rectal surgery

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A B S T R A C T

Transanal rectal surgery and particularly transanal endoscopic microsurgery are becoming increasingly utilized in a variety of settings. In well-selected cases, oncologic outcomes are comparable to more radical techniques, and operative complications are decreased with the less invasive procedures. Due to the necessity for anal dilation during transanal approaches however, concern over functional outcomes has developed. As the medical community focused on these functional results however, it became clear that compared to radical resection, transanal surgery compares favorably; disturbances due to pelvic nerve injury are notably less, and though incontinence often presents early post-operatively, it dissipates and has little effect upon patient quality of life. Both patient- and surgeon-related factors appear to influence functional outcomes, allowing for both improvements in surgical technique and clarity of patient expectations.

Introduction to local resection

Transanal endoscopic microsurgery (TES) is a relatively novel approach to rectal surgery; it was introduced almost 30 years ago as a less invasive alternative to radical rectal resection and a more precise technique than traditional transanal approaches. Local excision has become an accepted surgical option for colonoscopically unresectable rectal polyps and for select early-stage rectal cancers. With the increasing use of neoadjuvant chemoradiation therapy (CRT), endoscopic ultrasound (EUS), and MRI staging, TES's role is expanding. Shorter OR time and patient length of stay as well as decreased operative blood loss and complication rates compared to traditional total mesorectal excision (TME) makes this less invasive surgery seemingly ideal.[1,2]

In addition to the previously mentioned disadvantages of TME, radical resections often have worse functional results, despite similar oncologic outcomes.[3] The combination of extensive bowel resection and the possibility of pelvic nerve injury have led to fecal incontinence rates of up to 40–70%, urinary dysfunction (7–68%), and impotence (15–80%).[4] These functional changes lead to poor patient self-image and quality of life (QOL). In an age of medicine focused on treating the patient in addition to the disease, functional measurements like these are particularly important when assessing surgical techniques.

The minimally invasive nature of TES and the avoidance of nerve-injuring pelvic dissection make the technique attractive for rectal cancer resection. Upon initial introduction, TES promised good oncologic outcomes, decreased perioperative morbidity, and improved functional outcomes over more traditional rectal surgery due to decreased surgical trauma and enhanced sphincter preservation.[5] Early in its utilization, however, it became clear that the transanal approach is not without functional consequences. Though TES lacks pelvic dissection, its reliance upon anal dilation has made evaluation of functional outcomes important.

Post-operative function and dysfunction

Few studies evaluated functional outcomes of TES in the early years of its utilization. However, the use of a 12–20 cm long by 4 cm in diameter (or similar) proctoscope raised concerns regarding fecal continence.[6] Multiple studies agree that in the immediate post-TES period, anal dysfunction is a common finding, though few studies have evaluated the cause of dysfunction in the context of TES. Using barostat measurements, Herman et al.[7] identified physiological changes that lead to functional consequences. They found that proctoscope use causes a decrease in length and amplitude of the anal high-pressure zone at 3 weeks post-operatively (2.8–2.3 cm and 55.6–32.4 mmHg at rest, respectively). This change affects sphincter contraction, rectoanal inhibitory reflex, and regional pressure gradients. TES also appears to cause a decrease in rectal compliance and maximal tolerable rectal volume (9.8–6.2 ml/mmHg and 186.2–100.8 ml, respectively), though the direct cause is not entirely understood. Kennedy et al.[8] found, via manometry, that reduced anal pressure was

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http://dx.doi.org/10.1053/j.scrs.2014.10.010
1043-1489/

present in 100% of patients 6 weeks post-operatively. Similar quantitative decline has been recorded as late as 1 year after TES.[9] Conversely, several other studies found that sphincter pressure, though decreased at 3 months, returns to normal after 6–12 months.[7,10]

Regardless of the pressure measurements, many agree that clinically significant fecal incontinence is not as common as manometric data implies, and that it almost universally dissipates over months, similar to that described of sphincterotomy by Nyam and Pemberton.[11] Though initial post-operative incontinence has been documented, the rate is as low as $<1\%$ of patients, significantly lower than with TME. Additional studies suggest that anal function generally returns to normal 2–3 months after surgery. Cataldo et al.[12] found via 6-week post-operative surveys that patients denied any decrease in fecal continence, defecatory urgency, or change in number of daily bowel movements. For the few patients whose incontinence persists, physiotherapy and anal sphincter biofeedback have been shown effective in normalizing anal function.[4,13]

Though fecal incontinence may be the most common functional complication of rectal surgery, it is by no means the only form of dysfunction. Impotence, urinary/bladder dysfunction, and bowel obstruction are significant functional morbidities associated with TME and abdominoperineal resection.[2,14] Though the mechanism is not completely understood, urinary dysfunction does occur with TES as well; however, it occurs transiently and at lower rates. In a study by Doornebosch et al., urinary retention occurred in 4% ($n = 2$) of patients while other studies reported dysuria as occurring 0.7% of the time.[15] Impotence, a devastating possible complication of rectal surgery, is thought to at least in part be due to nerve injury during pelvic dissection.[16] It is understandable then that some degree of sexual dysfunction is often present after radical rectal surgery. Transanal endoscopic surgery is intraluminal and avoids pelvic nerve dissection; as expected, impotence is not a reported complication of this procedure. It should be noted, however, that as TES becomes utilized for more advanced rectal disease, some have combined the intraluminal approach with endoscopic posterior mesorectal resection (EPMR).[4] This latter addition, though minimally invasive, involves extraperitoneal pelvic exploration, which may in theory put pelvic nerves at risk of injury. At this point, however, few EPMR studies have addressed functional outcomes, none of which have focused on urinary or sexual function.

Lastly, the addition of chemoradiation often leads to functional consequences. Neoadjuvant chemoradiation prior to transanal local excision is expanding surgical indications, and though this combined treatment may offer improved disease outcomes, it may come at the cost of patient morbidity. In a study of neoadjuvant chemoradiation followed by local tumor excision, Garcia-Aguilar et al. found a high incidence of complications. Overall, 39% of patients developed complications during CRT, and within 60 days after surgery, 16% had further morbidities including pain, bleeding, incontinence, and urinary retention.[17] Though these complications may not be a direct consequence of TES, the procedure, in many cases, depends on neoadjuvant therapy necessitating an increase in awareness of the morbidity associated with chemoradiation.

Post-operative function's impact on quality of life

Despite its minimally invasive nature, TES does result in some functional changes. More important than the objective measure of dysfunction, however, is its effect on the patient's self-esteem, self-image, and quality of life (QOL). Quality-of-life and patient satisfaction data can be recorded through post-operative survey. Though subjective, these measures more completely demonstrate the life-impact of functional results by taking into account a patient's pre-operative functional baseline and post-operative expectations. Several studies have looked at post-TES functional outcomes using such quality-measures. Cataldo et al. surveyed patients 6 weeks after TES and found no significant fecal incontinence-related quality-of-life changes. Fecal Incontinence Severity Index (FISI), a patient-generated survey that measures extent of incontinence, found that pre-operative and post-operative mean scores were identical at 2.4; 4 of 49 patients reported worse post-operative FISI scores while the rest were either improved or unchanged. The Fecal Incontinence Quality of Life Survey (FIQLS), a measure of lifestyle, coping, depression, and embarrassment related to incontinence, similarly showed no significant change after TES.[12] At 6 months post-operatively, Doornebosch et al. performed a similar study and found that FISI scores had in fact improved from 10 to 6 (higher signifies more incontinence) in 24 of 47 patients. Interestingly, while previously demonstrating no significant QOL difference between TME and TES at 6 months post-TES, FIQLS suggested significantly improved lifestyle and embarrassment measures compared to pre-TES baselines. The authors suggest that tumor-related pre-operative urge, discharge, bleeding, and prolapse may be to blame for the low baseline quality of life.[6,18] Allaix et al.,[10] despite reporting the presence of incontinence beyond 1 year post-TES, noted a return to normal quality of life without any long-term effects of surgery. Planting et al.[19] demonstrated that TES patients suffered significantly more diarrhea after surgery (increase from 72 to 90 on a 100-point scale) but that quality-of-life scores did not decrease. Furthermore, measures of coping, embarrassment, and depression actually improved by post-operative FIQLS. These studies suggest that not only does transanal rectal surgery provide less functional disturbance than more traditional radical surgery, but that, with regards to fecal incontinence, what dysfunction exists does not disturb long-term quality of life (Table).

Risk factors for dysfunction

Though TES has demonstrated comparatively good functional outcomes without long-term degradation in quality of life, some individuals may be at increased risk for poor results. The identification of surgical risk factors, therefore, is essential. Several patient and operative factors have been significantly correlated with worse functional outcomes: tumor height above the anal verge, tumor size, and length of surgery. Surgery on tumors more than 8 cm above the anal verge has been associated with both perioperative and functional complications.[15] Conversely, operative distance closer to the anorectal junction is related to lower post-operative FISI scores and incontinence ($p = 0.01$).[6] Similarly, size of resection, an indirect assessment of tumor size, has been correlated with post-operative fecal incontinence. Several studies demonstrated that large resections (>2–4 cm diameter) increased incontinence by affecting urge to defecate, rectoinhibitory reflex, reflex sphincter contraction, rectal sensitivity threshold, and maximum rectal volume/compliance.[7,10,15] Lastly, multiple analyses have established that duration of TES operation is related to post-operative anal pressure and subsequent functional changes. A review by Zieren et al. suggests that this effect occurs with surgery greater than 2 hours. This is further supported by Dafinis et al.,[20] whose study showed that patients who suffered from post-TES incontinence had longer operative times (175 vs. 117 min, $p = 0.002$). However, Kreissler-Haag et al.[15] demonstrated that even operative times shorter than 120 min may have an impact; during the 8-year course of their study, OR times decreased from 86 min to 58 min with a simultaneous decrease in fecal incontinence from 6% to 3%.[21] Interestingly, several of these studies note that