47 Transanal Approaches to Rectal Cancer Surgery

John R.T. Monson and Veerabhadram Garimella

47.1 Introduction

Rectal cancer accounts for a third of colorectal cancer and has been managed by rectal excision for almost 100 years. Radical resection in the form of total mesorectal excision by anterior (AR) or abdominoperineal resection of rectum (APER) remains the standard of care for the overwhelming majority of patients. Despite radical surgery, 30–50 % of patients suffer either local, distant or combined tumor recurrence and of these 34 % die as a result of metastatic disease. Surgery is associated with a 5–8 % rate of mortality and significant complications like wound infection, anastomotic leak, urinary and sexual disturbance and functional disturbance of the bowel occur in upwards of 60 % of patients. In addition, APER results in a perineal wound and associated stoma and psychological complications with attendant increased financial costs.

Radical resection of the rectum came in to vogue in the era where intermediate to late stage cancers were commonest at the time of diagnosis. The fecal occult blood test (FOBT), flexible sigmoidoscopy [1] and colonoscopy based screening for colorectal cancer have resulted in increased diagnosis of early cancers. The first round of FOBT implemented in the United Kingdom has shown 77 % of cancers to be Dukes A and B and 29 % of these in the rectum [2]. Similarly, in the pilot single screening FS trial, 62 % of cancers identified were Dukes A [3]. There also have been improvements in neoadjuvant chemoradiotherapy regimes that help to significantly downstage more advanced rectal tumors that may then be considered for local surgical excision. The combination of these recent developments had resulted in an increased willingness to re-appraise the treatment paradigm for patients with rectal cancer.

47.2 Local Excision vs Tems

Local excision of rectal lesions has been used for many decades. For the most part, such operations were performed using traditional trans-anal surgery in patients with either benign lesions or the very earliest cancers, usually in elderly or infirm patients where radical surgical techniques were considered inappropriate. In more recent years the wider availability of trans-anal endoscopic microsurgery (TEMS) has increased the range of tumors being considered for local resection. TEMS was developed by Buess in 1983 to

J.R.T. Monson, MD, FRCS(Ire,Ed,Eng,Glas), FACS (✉)
Division of Colorectal Surgery, Department of Surgery, University of Rochester Medical Center, Rochester, NY, USA

Department of Colorectal Surgery, University of Rochester Medical Center, Rochester, NY, USA
e-mail: john_monson@urmc.rochester.edu

V. Garimella, MD, FRCS
Department of Colorectal Surgery, University Hospital of North Midlands, Staffordshire, UK

H.R.H. Patel et al. (eds.), *Pelvic Cancer Surgery: Modern Breakthroughs and Future Advances*,
DOI 10.1007/978-1-4471-4258-4_47, © Springer-Verlag London 2015

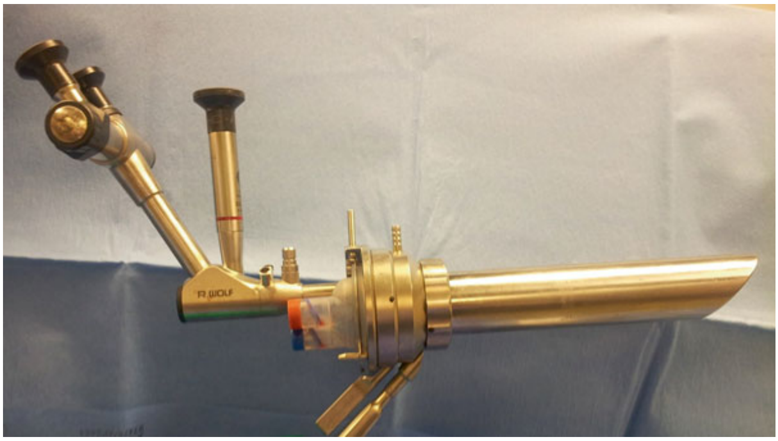

Fig 47.1 TEMS rectoscope with the binocular eye-piece and the instruments in the appropriate ports

overcome the limitations of transanal excision by providing clearer visualization of tumors, the ability to excise more proximal tumors as well as the ability to undertake full thickness excisions with repair of intra-peritoneal defects [4]. In reviews of literature by Maslekar et al. and Sengupta et al. the use of TEMS has been associated with lower local recurrence rates with TEMS. For example, the LR rates using TEMS were 0–6, 14 and 20 % compared to 9.7, 25 and 38 % after traditional trans anal excision for T1, T2 and T3 rectal cancers respectively [5, 6]. A recent meta-analysis of trials comparing local excision (n = 386), TEMS (n = 514) and radical resection has also shown that TEMS was more effective in obtaining clear margins than LE [7].

The instrumentation of TEMS allows true stereoscopic vision thus helping more precise dissection and thereby good circumferential margins (Fig. 47.1). In addition for the majority of patients the excision is full thickness thereby providing good quality tissue specimens for adequate pathological assessment of depth of invasion and on occasions some degree of lymph node sampling. There are now many studies in the literature that demonstrate excellent outcomes in terms of morbidity, mortality and rates of tumor recurrence following TEMS when performed after appropriate case selection based on tumor staging, age and physical fitness of patients, pathological variables of the tumor and technical considerations for TEMS [5, 8–11].

Procedure

The procedure is performed under general anesthetic with full muscle relaxation, as for abdominal surgery. Prior to the procedure, phosphate enemas may be employed to clear the rectum of feces. Full oral bowel preparation is also acceptable but it is essential that the rectum itself is meticulously cleansed so for many surgeons recommend two enemas. A single dose of broad-spectrum antibiotic (Ertapenam or Pipercilin/Tazobactam) is administered. Initially the patient is placed in Lloyd Davies position to assess the position of the tumor. It is essential that when performing TEMS the tumor is in the 6 o'clock position and therefore the patient has to be moved appropriately to achieve this orientation. So, for lateral tumors the patient will be in the decubitus position, reverse Lloyd-Davies for the anterior tumors and remain in the starting Lloyd-Davies position for tumors in a posterior location.

The TEMS rectoscope is inserted and firmly secured to the table using the Martin arm (Fig. 47.1). The tubes are connected for CO_2 insufflation, suction and electro-cautery. The CO_2 insufflation pressure is limited to 20–25 mm of H_2O and uses a specific immediate feedback system for continuous pressure monitoring to maintaining adequate rectal insufflation without excessive proximal colonic distension.

Numerous energy device options have been used for TEMS including Ligasure™, Harmonic

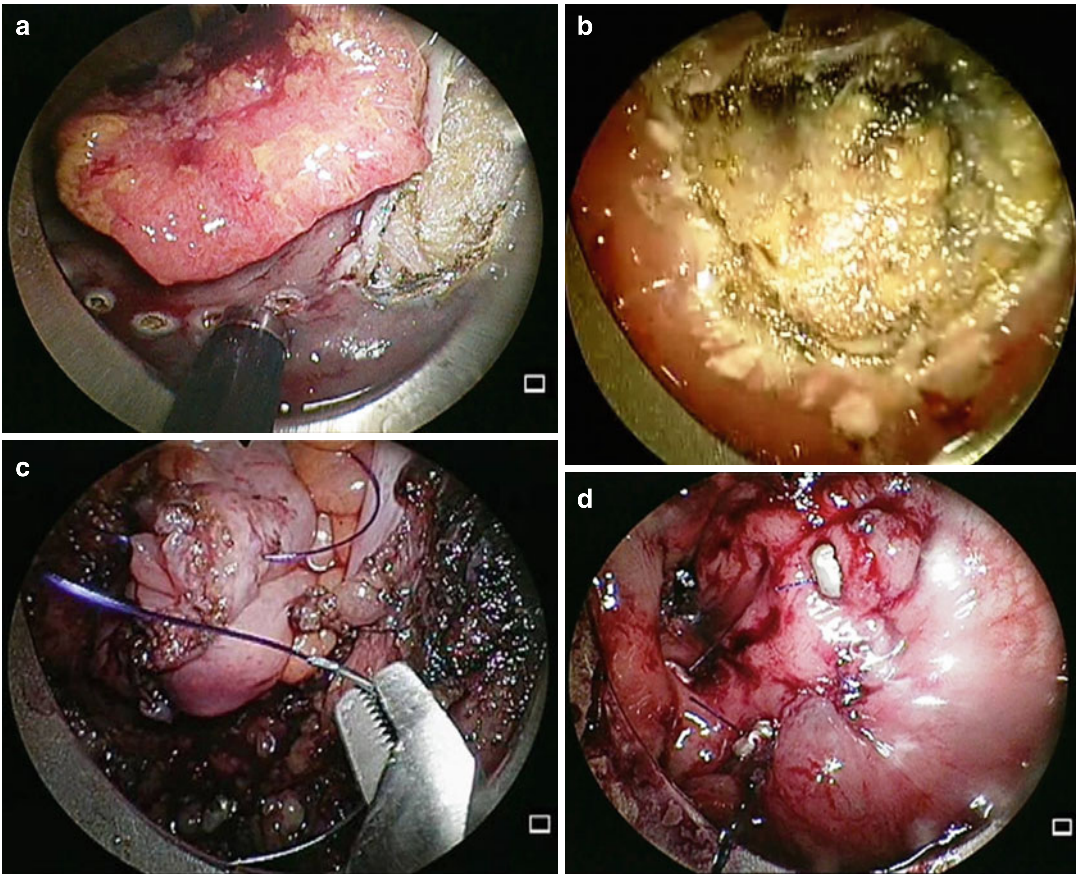

Fig 47.2 (**a**) TEMS Large polypoidal lesion being excised full thickness after marking excision margin with diathermy. (**b**) Mesorectal fat visible at the base after full thickness excision of polyp. (**c**) Suturing of the peritoneal defect after excision of polyp. (**d**) The final appearance of the area after suturing of the defects. The sutures are held in place with beads (seen)

Scalpel™, and water dissection but the commonest option remains traditional electro-cautery using either monopolar or bipolar current via a needle-point instrument. This approach should be used initially to mark out the margins of excision ensuring an adequate cuff of normal tissue (Fig. 47.2a). This step is crucial for adequate excision especially in larger lesions as it helps maintain the correct orientation during resection when the lesion becomes increasingly mobile. In other words it prevents the surgeon wandering off the correct pathway and runs the risk of a positive excision margin. The stereoscopic vision and magnification help in this respect to identify the margins of the tumor. Full thickness excision of the tumor is carried out with coagulation of any bleeding vessels (Fig. 47.2b). Meticulous hemostasis is essential throughout as hemoglobin will absorb the light and make dissection less precise. Identification of areolar tissue and mesorectal fat deep to the muscle layer help confirm the thickness of excision and the aim should be to ensure a vertical dissection through the layers of rectal wall to the depth required—coning of the excision is best avoided (Fig. 47.2b). Routine suturing of the resulting defect was recommended for all lesions in the early days of TEMS. However it is widely recognized as not being necessary assuming there have been no breaches into the peritoneal cavity when careful sutured closure is obviously required (Fig. 47.2c, d). On the other hand routine sutured closure of defects does help to maintain suturing skills for when they are required. Overall, this decision remains a matter of surgeon preference.

For low rectal tumors close to the anal verge maintaining an air seal can present a particular challenge but these lesions can still be excised by wedging the rectoscope up against the anal sphincter thereby permitting adequate rectal insufflation. In addition, when excising these lowest lesions particular care must be taken to avoid excising any significant portion of anal sphincter muscle. This can be challenging at times but is essential if the risks of postoperative incontinence are to be minimized.

Complications

Early post-operative complications are unusual and generally involve mild pain and fever in the first 24 h. Pain is commoner when excision has approached the dentate line and unusual following excision of higher lesions. Post-operative urinary retention is not uncommon in male patients but is rarely a long-term issue. Probably the commonest significant complication is that of a secondary hemorrhage which may occur 5–7 days after surgery. This occurs in less than 3 % of patients but is frightening for the patient because it occurs without warning when the patient is at home. It is therefore useful to at least warn the patient of such a possibility while providing reassurance that the bleeding almost always stops spontaneously and requires no intervention in the overwhelming majority of patients. More unusual complications that have been reported include pelvic sepsis, fistula to the vagina and perineum and intra-peritoneal sepsis. A systematic review of published studies by Middleton et al. showed an overall complication rate 10.3 % for benign adenoma excision and 20 % for carcinoma excision [12] although the majority of these complications are minor in severity.

A review of UK wide TEMS database by Bach et al. showed an overall complication rate of 14.9 % and mortality of 1.4 %. Bleeding was the most common complication (9 %), followed by post op medical complication in 1.9 %, pelvic abscess in 1.7 % and perforation in 0.2 % cases [13]. Perforation in to the peritoneal cavity can be treated either by primary suture (at time of surgery) or conservatively. Morino et al. studied short and long term outcomes of peritoneal perforation after TEMS (n = 28) [14]. This study showed that conversion to an abdominal procedure was needed in 10 % (3/28) of patients with a significant peritoneal breach. Long term follow up (48 months) did not show increased peritoneal or liver metastases.

Outcomes for T1 Rectal Cancer

Early rectal cancers with favorable histological features such as SM1 invasion, well to moderate differentiation (G1–2) and no lymphovascular invasion are most suitable for TEM excision. An early study by Blair et al. showed 0 % local recurrence and mortality after local excision in T1 tumors with favorable histological characteristics [15]. However, recurrence rates varying between 0 and 21 % have been reported in the published literature and confirm the importance of appropriate patient selection [13, 16–18]. Bach et al. reviewed 424 rectal cancers of which the majority (253) were T1, and were treated with TEMS [13]. The T1 tumors were further divided in to SM1–3 based on the extent of sub-mucosal invasion. In this the local recurrence rates were 3–4 % and lowest in the Sm1 group [19].

De Graaf et al. compared outcomes in 80 patients undergoing TEMS and 75 patients undergoing TME [20]. TEM was shown to be safer with less blood loss, fewer complications, shorter hospital stay and no mortality. Follow up of more than 5 years showed that overall and cancer specific survival was similar in the two groups although the local recurrence rate after TEMS was shown to be 24 %. The only randomized trial performed to date comparing TEMS alone to radical resection (TME) showed no difference in local recurrence (4 % vs 0 %) or 5 year survival [8]. Heintz et al. studied 103 patients who underwent TEM or TME for T1 rectal cancer [9]. These patients were further stratified into low risk (G1 and 2 with no lympho-vascular invasion) or high risk (G3 and lympho-vascular invasion). The local recurrence and 5 year disease free survival were comparable between TEMS and TME. However, local recurrence rates were higher after TEMS in the high-risk group (33 % vs 18 %). Stipa et al. reviewed 144 patients of whom 86 had T1 cancer. The overall 5 year survival was 83 and 92 % for T1 tumors [21]. Interestingly in this study, of the patients who developed local recurrence the survival was better in those who had radical surgery rather than TEMS excision.

T2–3 Rectal Cancer

Local excision alone for T2–3 rectal cancer leads to an unacceptably high local recurrence rates and the majority of these patients are best served by a radical resection. A review by Tjandra et al. of 22 studies has shown a recurrence of 25 % for T2 and 38 % for T3 rectal cancer [6]. Previous individual case series have shown improved outcomes when local excision/TEMS has been combined with adjuvant chemo-radiotherapy. A phase 2 multi institutional trial performed by CALGB showed 83 % estimated overall survival and 71 % disease free survival in T2 tumors treated with LE and adjuvant therapy [22]. Long term follow up data of the patients in this study group showed overall survival of 42 % and disease free survival of 58 % at 10 years [23]. Guerriri et al. studied 84 T2 and 61 T3 rectal cancers treated with TEMS. These patients were treated with high dose radiotherapy before tumor excision. The rectal cancer specific survival at 97 months in T2 was 90 and 73 % for T3 tumors [17]. In a prospective randomized study Lezoche et al. compared outcomes in patients undergoing TEMS and laparoscopic TME for T2 rectal cancer 6 cm from anal verge [24]. All patients had received neo-adjuvant chemo-radiotherapy. At a median follow up of 84 months the local recurrence was 5.7 % for TEM and 2.8 % for laparoscopic TME group. The survival probability for both the groups was 94 %.

In the last decade another potential role for TEMS has developed for patients thought to have a complete clinical response (CCR) after neo-adjuvant chemo-radiotherapy. The pioneering work by Habr-Gama exploring the possibilities of a watch and wait program following CR have resulted in increasing use of TEMS in selected patients to confirm the diagnosis of CR by way of an excisional biopsy. The future will determine the exact role for this approach and longer term follow-up is clearly required before this approach is refined [25, 26].

47.3 Functional Outcomes After TEMS

One of the advantages of TEMS over radical resection of rectum is the maintenance of functionality and preservation of the anal sphincter. However, there have been no direct comparison studies in this regard. TEMS involves dilating the anal canal with a large diameter rectoscope for extended periods of time intuitively raising the possibility of damage to continence and a number of individual studies have addressed these issues [27–31]. Not surprisingly these have shown reduced squeeze pressures and resting tones particularly in relation to the duration of surgery. In addition, the absence of recto anal inhibitory reflex (RAIR) has been reported after TEMS. Despite these findings the majority of case series continue to document no long term problems and have shown adequate function without a change in continence after the initial 6–8 weeks following TEMS.

47.4 Recent Advances in Transanal Surgery

Two recent advances in transanal surgery that look promising are the transanal minimally invasive surgery (TAMIS) and robotic assisted transanal surgery.

TAMIS

In TAMIS, single incision laparoscopic surgery (SILS) port and conventional laparoscopic instrumentation are used to perform transanal surgery [32]. Developed by Atallah et al. the perceived advantages are the readily available equipment and the shorter learning curve as the skills are similar to laparoscopic surgery [32]. The disadvantages as described by the same authors include extreme angles of the instruments that increase external torque resulting in port extrusion. Currently, there is information pertaining to the feasibility of the technique and adequate excision but limited follow up data in rectal cancer excision [33–35]. A variation in the TAMIS technique is the use of a glove port instead of SILS port [36].

Robotic Transanal Surgery

Robotic transanal surgery has been a direct progression to overcome the technical challenges identified in TAMIS. Direct 3D visualization and dexterity of the Da Vinci system could lead to better access to lesions. However, to date only cadaveric studies have been published using the robotic technique [37, 38].

47.5 Summary

There is mounting evidence for the role of local excision of early rectal cancer. TEMS has been shown to achieve better tumor free margins when compared to trans-anal excision. In properly selected cases of T1 rectal cancer, TEMS excision has shown to achieve results comparable to radical resection (TME) while achieving all the benefits of the less invasive approach. Early results of neoadjuvant chemo-radiotherapy to downsize T2/3 rectal cancers followed by TEMS excision look promising and it seems likely that this multi-modality approach to rectal cancer will become more common in the next decade.

Key Points

- Reassessment of surgical practice is required for management of rectal cancer in light of changing cancer trends
- Tumors up to 20 cm from the anal verge can be treated with TEMS
- The stereoscopic magnified view of the tumor along with specially designed instrumentation helps to precisely localize the tumor, achieve full thickness excision with clear margins
- TEMS excision results in better outcomes compared to transanal excision of tumors
- TEMS results shorter procedure time, reduced length of hospital stay and lower complications when compared to TME
- Functional results and continence are not affected by TEMS
- TEMS alone is sufficient for T1 cancer with favorable histological characteristics
- Where possible local recurrences after TEMS excision are best treated with radical resection
- Neo-adjuvant therapy along with TEMS can achieve oncological outcomes comparable to radical resection in T2/3 but with less morbidity, mortality and significantly better quality of life
- The initial results of newer platforms for transanal surgery like TAMIS look promising but comparative studies are required to confirm equipoise with TEMS

References

1. Dafnis G, et al. Transanal endoscopic microsurgery: clinical and functional results. Color Dis. 2004;6(5):336–42.
2. Logan RF, et al. Outcomes of the bowel cancer screening programme (BCSP) in England after the first 1 million tests. Gut. 2012;61(10):1439–46.

3. Atkin WS, et al. Single flexible sigmoidoscopy screening to prevent colorectal cancer: baseline findings of a UK multicentre randomised trial. Lancet. 2002;359(9314):1291–300.
4. Buess G, et al. Transanal endoscopic microsurgery. Leber Magen Darm. 1985;15(6):271–9.
5. Maslekar S, et al. Transanal endoscopic microsurgery: where are we now? Dig Surg. 2006;23(1–2):12–22.
6. Sengupta S, Tjandra JJ. Local excision of rectal cancer: what is the evidence? Dis Colon Rectum. 2001;44(9):1345–61.
7. Sgourakis G, et al. Transanal endoscopic microsurgery for T1 and T2 rectal cancers: a meta-analysis and meta-regression analysis of outcomes. Am Surg. 2011;77(6):761–72.
8. Winde G, et al. Surgical cure for early rectal carcinomas (T1). Transanal endoscopic microsurgery vs. anterior resection. Dis Colon Rectum. 1996;39(9):969–76.
9. Heintz A, Morschel M, Junginger T. Comparison of results after transanal endoscopic microsurgery and radical resection for T1 carcinoma of the rectum. Surg Endosc. 1998;12(9):1145–8.
10. Buess GF, Raestrup H. Transanal endoscopic microsurgery. Surg Oncol Clin N Am. 2001;10(3):709–31, xi.
11. Palma P, et al. Transanal endoscopic microsurgery: indications and results after 100 cases. Color Dis. 2004;6(5):350–5.
12. Middleton PF, Sutherland LM, Maddern GJ. Transanal endoscopic microsurgery: a systematic review. Dis Colon Rectum. 2005;48(2):270–84.
13. Bach SP, et al. A predictive model for local recurrence after transanal endoscopic microsurgery for rectal cancer. Br J Surg. 2009;96(3):280–90.
14. Morino M, et al. Does peritoneal perforation affect short- and long-term outcomes after transanal endoscopic microsurgery? Surg Endosc. 2013;27(1):181–8.
15. Blair S, Ellenhorn JD. Transanal excision for low rectal cancers is curative in early-stage disease with favorable histology. Am Surg. 2000;66(9):817–20.
16. Lezoche G, et al. Transanal endoscopic microsurgery for 135 patients with small nonadvanced low rectal cancer (iT1-iT2, iN0): short- and long-term results. Surg Endosc. 2011;25(4):1222–9.
17. Guerrieri M, et al. Transanal endoscopic microsurgery for the treatment of selected patients with distal rectal cancer: 15 years experience. Surg Endosc. 2008;22(9):2030–5.
18. Christoforidis D, et al. Transanal endoscopic microsurgery versus conventional transanal excision for patients with early rectal cancer. Ann Surg. 2009;249(5):776–82.
19. Kikuchi R, et al. Management of early invasive colorectal cancer. Risk of recurrence and clinical guidelines. Dis Colon Rectum. 1995;38(12):1286–95.
20. De Graaf EJ, et al. Transanal endoscopic microsurgery versus total mesorectal excision of T1 rectal adenocarcinomas with curative intention. Eur J Surg Oncol. 2009;35(12):1280–5.
21. Stipa F, Giaccaglia V, Burza A. Management and outcome of local recurrence following transanal endoscopic microsurgery for rectal cancer. Dis Colon Rectum. 2012;55(3):262–9.
22. Steele Jr GD, et al. Sphincter-sparing treatment for distal rectal adenocarcinoma. Ann Surg Oncol. 1999;6(5):433–41.
23. Wentworth S, et al. Long-term results of local excision with and without chemoradiation for adenocarcinoma of the rectum. Clin Colorectal Cancer. 2005;4(5):332–5.
24. Lezoche G, et al. A prospective randomized study with a 5-year minimum follow-up evaluation of transanal endoscopic microsurgery versus laparoscopic total mesorectal excision after neoadjuvant therapy. Surg Endosc. 2008;22(2):352–8.
25. Habr-Gama A, Perez RO. The surgical significance of residual mucosal abnormalities in rectal cancer following neoadjuvant chemoradiotherapy. Br J Surg. 2012;99:993–1001. Br J Surg, 2012. 99(11): p. 1601: author reply 1601–2.
26. Habr-Gama A, et al. Complete clinical response after neoadjuvant chemoradiation therapy for distal rectal cancer: characterization of clinical and endoscopic findings for standardization. Dis Colon Rectum. 2010;53(12):1692–8.
27. Cataldo PA, O'Brien S, Osler T. Transanal endoscopic microsurgery: a prospective evaluation of functional results. Dis Colon Rectum. 2005;48(7):1366–71.
28. Kreis ME, et al. Functional results after transanal endoscopic microsurgery. Dis Colon Rectum. 1996;39(10):1116–21.
29. Banerjee AK, et al. Prospective study of the proctographic and functional consequences of transanal endoscopic microsurgery. Br J Surg. 1996;83(2):211–3.
30. Kennedy ML, Lubowski DZ, King DW. Transanal endoscopic microsurgery excision: is anorectal function compromised? Dis Colon Rectum. 2002;45(5):601–4.
31. Herman RM, et al. Anorectal sphincter function and rectal barostat study in patients following transanal endoscopic microsurgery. Int J Color Dis. 2001;16(6):370–6.
32. Atallah S, Albert M, Larach S. Transanal minimally invasive surgery: a giant leap forward. Surg Endosc. 2010;24(9):2200–5.
33. Albert MR, et al. Transanal minimally invasive surgery (TAMIS) for local excision of benign neoplasms and early-stage rectal cancer: efficacy and outcomes in the first 50 patients. Dis Colon Rectum. 2013;56(3):301–7.
34. Slack T, Wong S, Muhlmann M. Transanal minimally invasive surgery: an initial experience. ANZ J Surg. 2014;84(3):177–80.
35. Lim SB, et al. Feasibility of transanal minimally invasive surgery for mid-rectal lesions. Surg Endosc. 2012;26(11):3127–32.
36. Hompes R, et al. Transanal glove port is a safe and cost-effective alternative for transanal endoscopic microsurgery. Br J Surg. 2012;99(10):1429–35.
37. Atallah SB, et al. Robotic TransAnal minimally invasive surgery in a cadaveric model. Tech Coloproctol. 2011;15(4):461–4.
38. Hompes R, et al. Preclinical cadaveric study of transanal endoscopic da Vinci(R) surgery. Br J Surg. 2012;99(8):1144–8.