Transanal Endoscopic Microsurgery

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INTRODUCTION

Transanal endoscopic microsurgery (TEM) was developed by Professor Gerhard Buess from Tübingen, Germany and it became available for widespread use in 1983 **(Fig. 1)**. A surgeon's ability to remove rectal lesions transanally is limited by access and exposure with conventional instruments usually restricting the surgeon to the distal 6–7 cm of rectum. When transanal excision is not possible, the traditional transabdominal approach, a major surgical procedure, is necessary. TEM, with its longer reach and enhanced visibility of the entire rectum, extends the boundaries of transanal surgery, giving appropriately selected patients a minimally invasive surgical option with a faster and virtually pain-free recovery.

Transanal endoscopic microsurgery allows for local excision of rectal neoplasm with greater exposure than transanal excision and less morbidity than transabdominal approaches. Supporters of the TEM technique praise the excellent exposure of the rectum and the minimal invasiveness as opposed to conventional surgical techniques. The arrival of TEM was associated with an increase in the number of operations for rectal cancer, however, the use of TEM remained constant relative to radical resections. Use of TEM resection alone is appropriate for all adenomas and cancers staged Tis and T1. Use of TEM alone is not an appropriate treatment for T2 cancers.

Fig. 1: Inventor of transanal endoscopic microsurgery (TEM) technology.

Local excision of rectal neoplasms is an accepted method of treating selected lesions and can be accomplished through either a transanal approach or a posterior proctotomy. The former is hindered by poor exposure and visibility of lesions in the middle and upper rectum. While the latter approach does give somewhat improved exposure of these more cephalad tumors, it may be complicated by fecal fistulae or sphincter impairment. TEM has emerged as a better technique for removing lesions in the middle and upper rectum and it obviates the need for a posterior proctotomy. Furthermore, the transanal rectoscope extends the boundaries of transanal surgery by providing access to lesions previously inaccessible with conventional means. The net result is an operative approach to rectal lesions that are not hindered by the poor exposure and limited reach associated with conventional retractors.

Virtually any adenoma of any size or degree of circumferential involvement can be removed with TEM. Adenomas are removed with a 5-mm margin of normal mucosa and dissection is undertaken in the submucosal plane. For large adenomas or those that have firm areas within them or previous histological evidence of atypia or dysplasia, the risk of harboring an occult cancer is increased; for such lesions, it is generally recommended that a full-thickness excision can be performed. Other benign indications for TEM include transrectal rectopexy for prolapse, for which there has been limited experience to date, and correction of anastomotic strictures by stricturoplasty.

INDICATIONS OF TRANSANAL ENDOSCOPIC MICROSURGERY

Benign

- Rectal polyps
- Carcinoid tumors
- Retrorectal masses
- Anastomotic strictures
- Extrasphincteric fistulae
- Pelvic abscesses.

Malignant

- Malignant rectal polyps
- T1-T2 rectal cancer
- Palliative excision of T3 cancer.

INSTRUMENTS

The basic TEM instrumentation includes the combined endosurgical unit, which regulates carbon dioxide insufflation, saline irrigation, and suction. The rectoscope is 40 mm in diameter and is available in lengths of 12 and 20 cm **(Fig. 2)**. Once the rectoscope is inserted to the desired location within the rectum, it is secured to the operating room table with a double ball-and-socket supporting arm **(Figs. 3A and B)**. During the dissection, the supporting arm is moved frequently to maintain direct visibility of the lesion. The end of the rectoscope is sealed with an airtight facepiece that has five entry ports. These ports, in turn, are sealed by rubber caps and sleeves, so that the various instruments necessary for the dissection can be inserted. One of the big advantages of TEM is binocular vision **(Figs. 4 and 5)**. The binocular stereoscopic eyepiece is inserted through one of the ports and it has an accessory scope for video hookup. The various instruments needed are suction catheter, a needle-tipped high-frequency electrical knife, tissue graspers that are oriented to the right or left, scissors, and a needle holder. The suction catheter, tissue graspers, and needle-tipped knife can all be connected to the cautery unit, which greatly facilitate control of hemorrhage and coagulation of bleeding vessels **(Figs. 6 to 8)**.

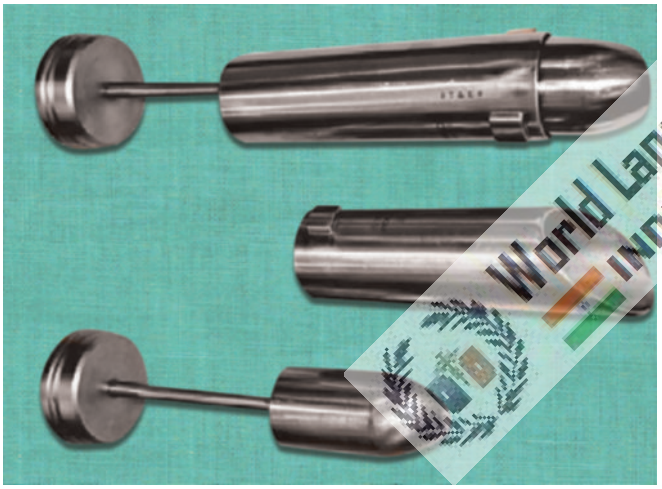


Fig. 2: 40 mm proctoscope.

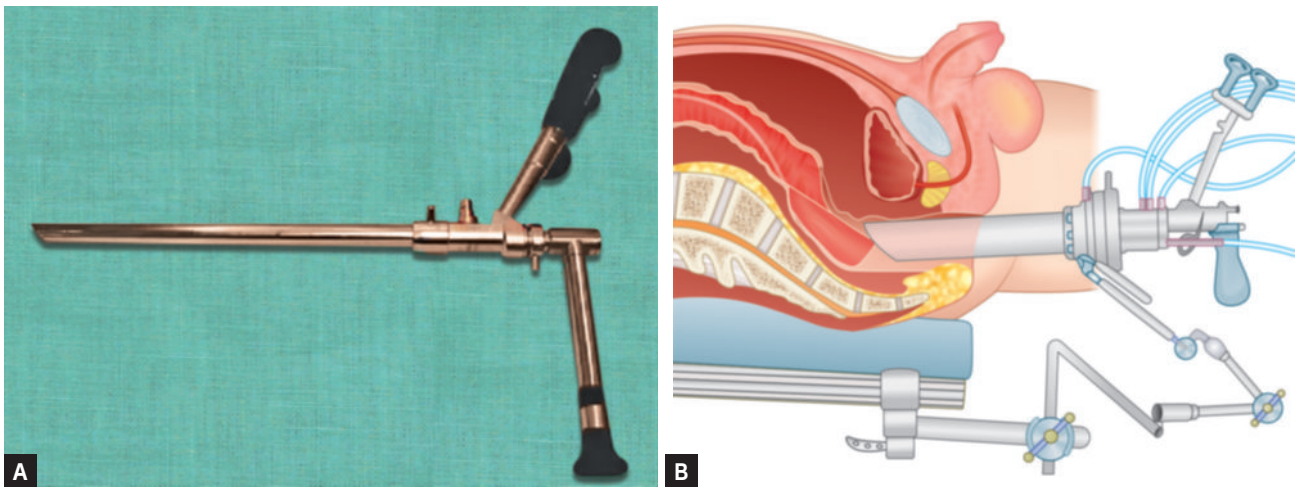
PATIENT POSITIONING IN TRANSANAL ENDOSCOPIC MICROSURGERY

Position of lesion determines positioning of patient on the operating room table **(Figs. 9A to D)**. The patient should be positioned in such a way that the lesion should be made to be in the 6 o'clock position for the operator **(Fig. 10)**.

Therefore, the position of the patient in the operating room is dependent on tumor location. Since the bevel of the rectoscope must face downward, patients with anterior lesions are placed in the prone position, whereas patients with posterior lesions are placed in the lithotomy position. Patients with lateral lesions are placed accordingly into the appropriate decubitus position.

TRANSANAL ENDOSCOPIC MICROSURGERY PROCEDURES (FIGS. 11 TO 15)

Properly selected rectal cancers can also be removed with TEM; for such lesions, a 1 cm margin of normal tissue surrounding the lesion should be obtained. A full-thickness excision is mandatory to accurately stage the depth of penetration and unpredictable in its location. TEM is a safe technique and having low number of complications; however, this procedure is not a license to disregard established criteria for local excision of cancers. The exceptions to this may be tumor size and location.



Figs. 3A and B: Stereoscope used in transanal endoscopic microsurgery (TEM).

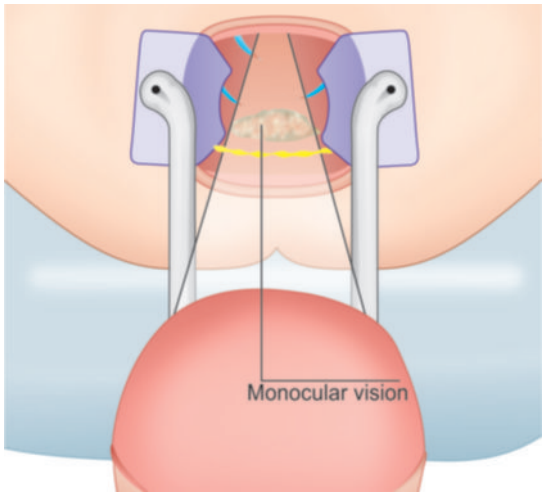


Fig. 4: Monocular vision in laparoscopy.

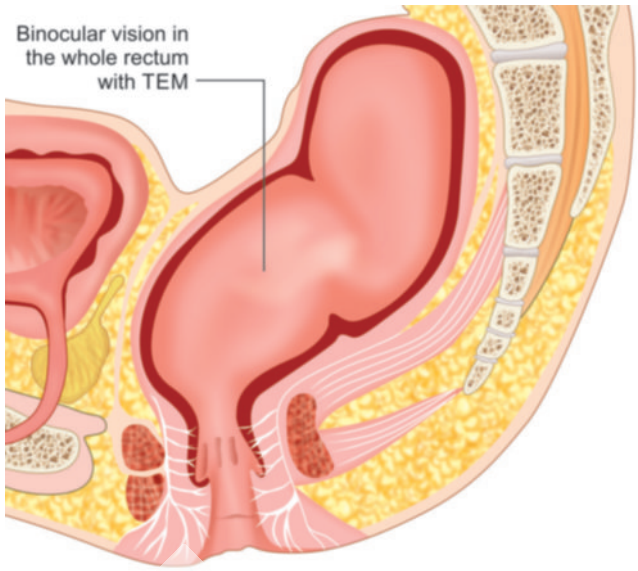


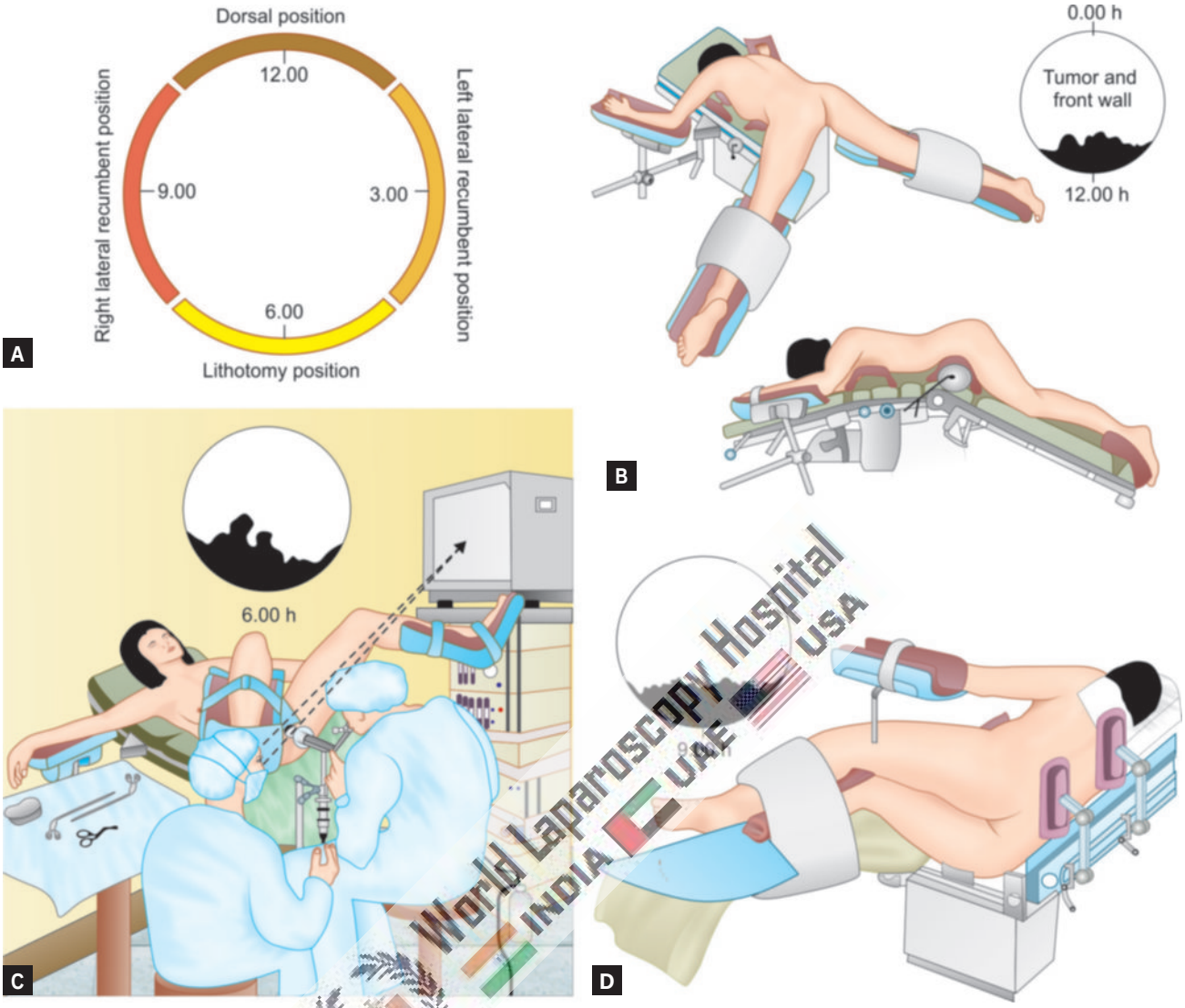
Fig. 5: Stereoscopic vision in transanal endoscopic microsurgery (TEM).

Fig. 6: Fine curve tipped instruments for transanal endoscopic microsurgery (TEM).

Fig. 7: Needle holders and electrosurgical instruments used in transanal endoscopic microsurgery (TEM).

Fig. 8: Insufflator used in transanal endoscopic microsurgery (TEM).

With its superior optics, constant rectal distention, and longer instrument casing, TEM is not limited to small, distally located lesions. Because of the magnification capabilities of the TEM equipment—about 30 times greater than normal—we are able to better visualize the lesion and get very good margins. This minimizes the chances of the patient needing a colostomy, which can sometimes result with open surgery, even with benign lesions. One may argue that cancers within the middle and upper rectum should all be treated with low anterior resection (LAR); however, if we accept the criteria for local excision as being appropriate for lesions in the distal rectum, we must embrace them as well for lesions in the middle and upper rectum. Currently, TEM has not had a significant impact on the treatment of rectal cancer. If, however, preoperative chemotherapy and radiation become the standard of care and have the effect of



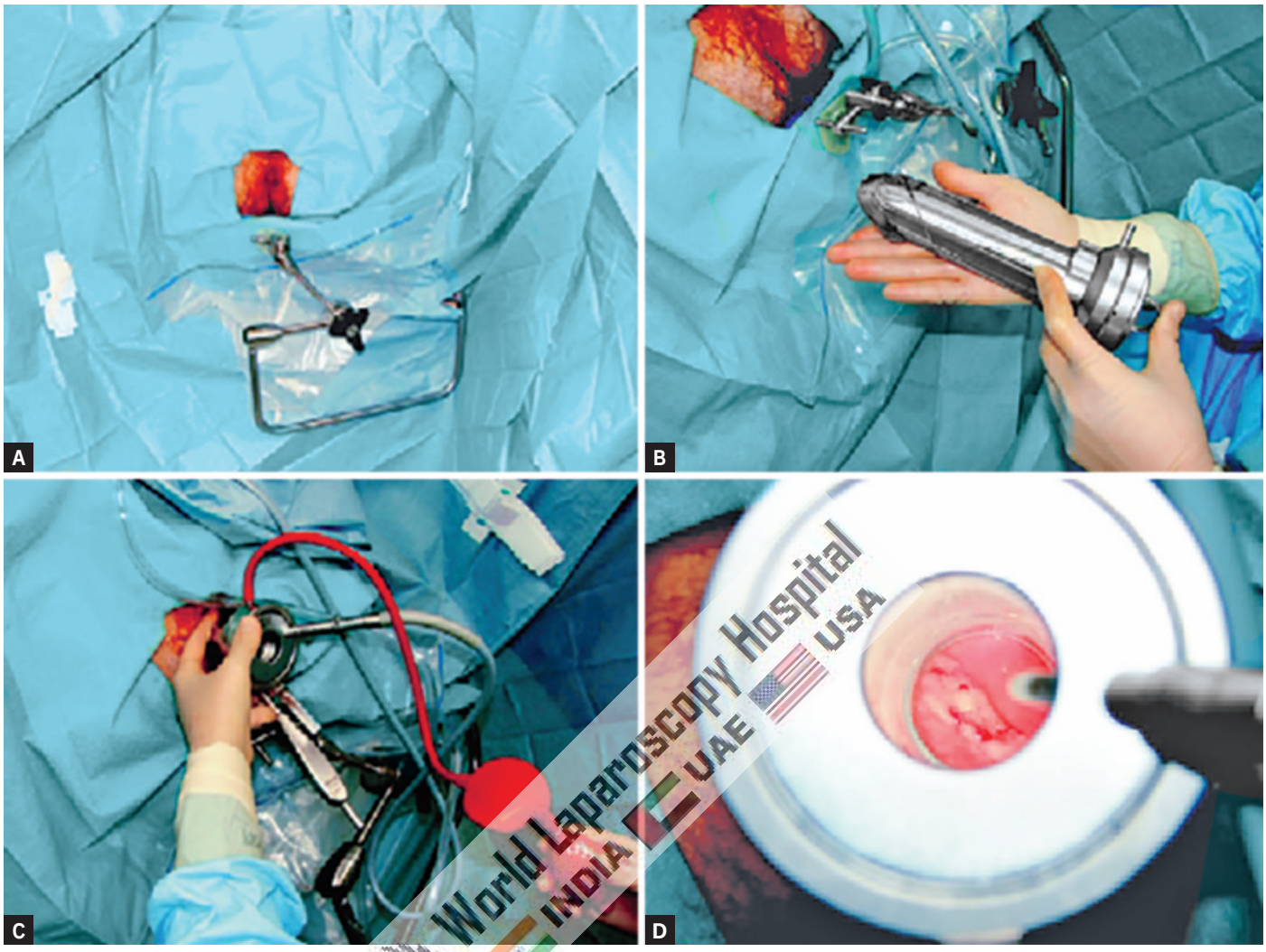
Figs. 9A to D: Positioning of patient for transanal endoscopic microsurgery (TEM).

Fig. 10: Patient position for lesion at right lateral position.

causing a downgrade of tumor stage, low shrinking tumors, and even inducing a complete remission, TEM may have an increased role. However, this remains to be seen and can only be answered with further studies.

Data presented at the annual meeting of the American Society of Colon and Rectal Surgeons last July also suggests that TEM offers certain advantages over the more standard procedure. In a retrospective study that compared transanal excision with TEM for both benign and malignant rectal masses, the TEM procedure was much more likely to result in a complete resection and yields negative margins compared with transanal excision (88% vs. 71%). This was true whether the lesion was benign or malignant. It was also more likely to produce an intact, nonfragmented specimen compared with transanal excision (94% vs. 63%) making it easier for pathological evaluation.

The rate of recurrence, both local and distant, was also lower in patients who had undergone TEM compared with transanal excision (5% vs. 25%). This was particularly true for rates of local recurrence, which were significantly lower for both benign and malignant lesions following TEM (4% vs. 20%). The rate of complications was similar between both groups.



Figs. 11A to D: Setting up instruments in transanal endoscopic microsurgery (TEM) to start procedure.

Fig. 12: Resected tissue through transanal endoscopic microsurgery (TEM).

Fig. 13: Marking of margin of tissue in transanal endoscopic microsurgery (TEM).

COMMON COMPLICATIONS

- Perforation of intraperitoneal rectal wall—unable to close using TEM in 3.9%
- Required LAR or diversion (one patient)
- Early mild incontinence/soiling in 2.6% resolved by 10 weeks.

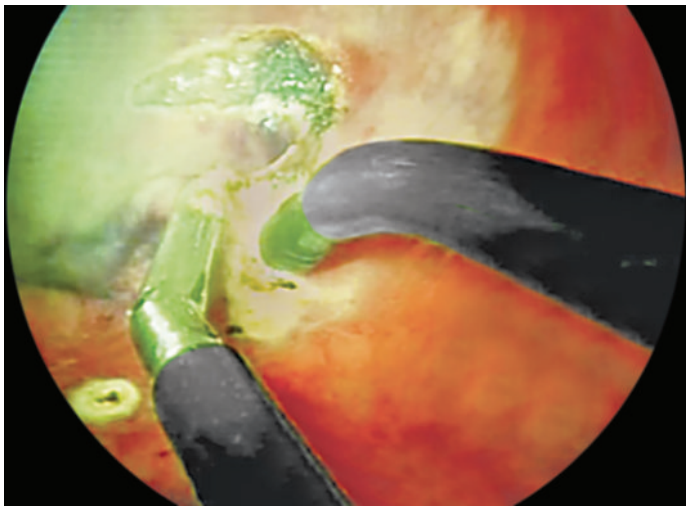


Fig. 14: Excision of malignant tissue in transanal endoscopic microsurgery (TEM).

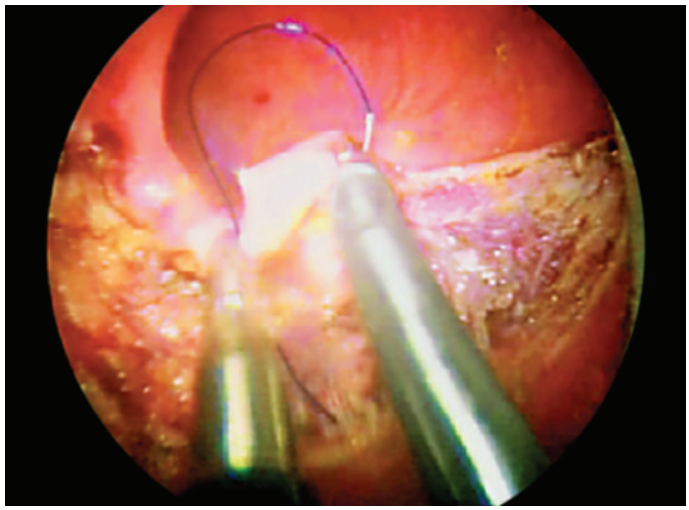


Fig. 15: Suturing in transanal endoscopic microsurgery (TEM).

CONCLUSION

The cost of the TEM equipment must be mentioned. The capital outlay of >$50,000 is considerable. That is why, you have to have the volume to justify this much expense. However, this is offset by several factors. There is no doubt that some surgeons will argue about how many patients have rectal lesions that are definitely reachable only with the TEM system. These patients are clearly saved a transabdominal rectal excision and realize a very significant cost saving. In addition, there are no disposable costs per case and the equipment is robust, requiring minimal maintenance (our own system is now 10-year-old). The imaging stack is compatible with the laparoscopic surgical system available in most operating suites. However, in view of the limited number of patients undergoing a TEM in a tertiary referral center, we believe that this is not a suitable approach for every colorectal unit and suggests that only larger centers would have enough patients to justify the costs. TEM is appropriate for a very specific patient population that includes patients with rectal benign or early cancer with no lymph node involvement. However, in this setting, the benefits are such that this technique has a rightful place as part of the colorectal surgeon's operative armamentarium.

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