

## To TEM or not to TEM: past, present and probable future perspectives of the transanal endoscopic microsurgery platform

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More than 30 years ago, Gerhard Buess introduced transanal endoscopic microsurgery (TEM) and revolutionized the technique and outcomes of transanal surgery. TEM was originally developed for the treatment of large villous adenomas for which indication is still considered the standard of treatment and later gained acceptance as local treatment for early rectal cancer [1]. Due to the low associated morbidity and the almost null mortality compared to transabdominal surgery for rectal diseases, several authors proposed to extend TEM indications to more advanced neoplastic lesions in selected patients unfit for radical surgery, in combination with neoadjuvant treatment. Nevertheless, the association with preoperative radiotherapy or chemoradiotherapy produced controversial results [2, 3] and is far from being accepted as a standard.

Although the diffusion of the technique was greatly delayed due to objective difficulty, the increase in confidence led little by little to an extension of indications to proximal rectal lesions and circumferential lesions [4], despite the increased risk of penetrating the peritoneal cavity. Even the opening of the peritoneum, which was considered in former times a good reason to perform only partial wall excision to avoid intraoperative complications, is now considered routine [5]. The TEM approach was given a boost by the introduction of the concept of Natural orifice transluminal endoscopic surgery (NOTES) over 10 years ago, when it was first realized that TEM is in fact a NOTES procedure, which also includes the concept of “solo-surgery” as a single operator is involved.

And in fact in the following years modified TEM instrumentation was proposed for transvaginal applications, and finally, a small series of transvaginal cholecystectomies was performed on humans by Gerhard Buess [6] and included in the EURONOTES Registry as the only transvaginal full-NOTES technique, non-hybrid as all the other techniques described, which entail the use of at least one additional transabdominal instrument. The TEM approach has also been useful in the minimally invasive treatment of surgical complications such as recto-vaginal fistulas [7] and anastomotic dehiscence, opening a new horizon for applications of TEM.

But the real acceleration in the diffusion of the transanal surgical techniques was observed with the introduction of TransAnal Minimally Invasive Surgery (TAMIS), which is feasible with standard laparoscopic instruments. If this technique struggled to prove real benefits compared to the original TEM technique, it soon became a potential platform for the transanal-total mesorectal excision (Ta-TME) technique, with the aim of extending indications of radical surgery in very low and bulky rectal tumors, thanks to a combined approach, so-called bottom-up, transanal and transabdominal for rectal resection. On the pages of this journal, Bill Heald, the putative father of TME affirmed “I predict that 2013 will be the year of endoscopic transanal approaches to radical low rectal dissection and anastomosis” [8] demonstrating great confidence in the technique. This is confirmed by the persisting interest for the technique after several years, and the success of the international Ta-TME clinical registry. At the same time, very recently a transperineal minimally invasive approach for extralevator abdominoperineal excision was reported in the literature [9], demonstrating an excellent magnification of the surgical field and a very precise bloodless dissection

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bottom-up even when abdominoperineal resection is indicated.

The use of TAMIS devices as well as the simplified transanal endoscopic microsurgery set offered by Karl Storz as TEO contributed to a significant cost reduction in the procedure, although renouncing some of the advantages of the original TEM instrumentation. Meanwhile, TEM was proposed and proved feasible under spinal anesthesia in unselected patients [10], which contributes and will contribute more in future, to the widening of indications, with both curative and palliative intent.

With the publication of the initial experience of the Oxford University group [11] of TEM for high rectal intussusception, a new frontier seems to be opening. Over the years, a number of interventions have been proposed for rectal prolapse both transanal and abdominal, with the former having fewer complications but requiring considerable experience, and paying the price of a higher recurrence rate. The opportunity to perform interventions such as EndoRectal ProctoPexy (ERPP), better known as “internal Delorme” or a full-thickness internal prolapse resection with the aid of a TEM platform, may represent a useful, minimally invasive tool to address this condition which is difficult to define and treat. A larger body of data is required to determine the benefits of this approach. The story of the TEM platform is therefore far from over, with intriguing new perspectives on the horizon.

#### Compliance with ethical standards

**Conflict of interest** The author declares that he has no conflict of interest.

**Ethical approval** The present paper was written according to a appropriate ethical standards.

**Informed consent** For this editorial informed consent is not required.

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