TRANSANAL ENDOSCOPIC OPERATIONS (TEO®)
Advanced Resection and Reconstructive Techniques

Xavier SERRA ARACIL, M.D.

Colorectal Surgery Unit
Coordinator of the Department of General and Gastrointestinal Surgery
Associate Professor of the Department of Surgery, Unitat Docent Parc Taulí

Autonomous University of Barcelona, University Medical Center
Parc Taulí University Hospital, Sabadell-Barcelona, Spain
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Correspondence address of the author:
Dr Xavier Serra Aracil
Hospital Universitario Parc Taulí
Parc Taulí s/n
08208 Sabadell (Barcelona), SPAIN
Phone: +34 937 23 10 10
Fax: +34 937 16 06 46
E-mail: JSerraA@tauli.cat

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P.O. Box, 78503 Tuttlingen, Germany
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Fax: +49 (0) 74 61/708-529
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1.0 Introduction

Transanal endoscopic surgery is a surgical technique developed in the 1980s by Buess in response to the technical difficulties of tumor resection in the rectal ampulla. Traditionally, the most frequently used procedure in the lower third of the rectum has been perineal resection, which was limited to a distance up to 7–8 cm from the anal verge. This technique is difficult in cases of large tumor size and a site higher up in the rectum, particularly when it comes to control of the dissection margins and to hemostasis.

In the middle third of the rectum, the most widely used local resection technique was the York-Mason trans-sphincteric approach. The technique is falling into disuse due to high morbidity and its associated fecal incontinence. The trans-sacral Kraske approach may be used for access to the upper third. The technique has also been abandoned due to its poor results with high morbidity and mortality.

In cases of large adenomatous tumors, the alternative to these techniques is anterior resection of the rectum or the Miles abdominoperineal resection. In rectal cancer, the first-line treatment modality is total mesorectal excision (TME). Even though these procedures are performed at specialized centers, the mortality rate ranges between 1–7% and morbidity rates are 30–40% when genitourinary dysfunction and a certain degree of fecal incontinence, at rates between 18% and 34%, are included; not to mention the disruption caused by the use of temporary or permanent ostomies.

In order to address the problems mentioned above, the concept of transanal endoscopic surgery was developed in the 1980s. This is an endoscopic procedure that allows for preservation of the sphincter. Using the excellent visualization properties of a rectoscope and the creation of a pneumorectum, access to rectal tumors up to 15–20 cm from the anal verge can be obtained. The technique allows for dissection, cutting, coagulation and suturing.

The advent of high-definition video cameras and use of high-definition flat TFT wide-view screens has significantly improved conditions for this type of surgery. The videoendoscopic technique is easier because visualization is provided via the monitor rather than through a binocular endoscope. The working position is similar to that used in conventional laparoscopic surgery.

The introduction of a systematic approach, the use of an ultrasonic scalpel for tumor dissection and improved hemostatic control, and the implementation of training courses has led to increasingly widespread use of the technique in recent years.
2.0 Preoperative Work-up and Basics of the TEO® Technique

2.1 Preoperative Work-up of Rectal Tumors

The selection of patients that are candidates for TEO® is based on proper preoperative staging of rectal tumors. Total colonoscopy with multifocal biopsy of the lesion should be performed in all patients. The work-up should address the following: tumor size, distance of its inferior and superior border from the anal verge, location by quadrants and the presence of any concomitant lesions in the rectum or colon.

Biopsy samples should allow to determine, if the lesion is an adenoma, its type (tubular, villous or tubulo-villous) and the degree of dysplasia, whether it is an infiltrating or intramucosal adenocarcinoma (in situ), and the level of differentiation.

Endorectal ultrasound (EUS) enables preoperative staging of the lesion according to the Hildebrandt criteria. Rigid proctoscopy usually allows to determine the following parameters: tumor size, distance from its inferior and superior margins to the anal verge, and location by quadrants (anterior, posterior, right or left lateral). It is important to confirm the site of the lesion as this will determine the patient’s position on the surgical table.

Pelvic magnetic resonance imaging (pelvic MRI) is an essential part of the work-up, that may be used as an adjunct to EUS. Even though accuracy of tumor staging (the T in staging) is no greater than with EUS, pelvic MRI is required to confirm the tumor stage. Apart from that, the modality is mandatory to corroborate the absence of possible metastatic lymphadenopathy in cases of rectal adenocarcinoma. Pelvic MRI also becomes imperative in cases of villous adenoma larger than 3 cm in diameter, due to an elevated rate of malignancy, that may be as high as 32%. Specifically, pelvic MRI permits to determine tumor stage, presence/absence of lymphadenopathy, and topography of the lesion.

Another very useful aspect of pelvic MRI is visualization of peritoneal reflection in patients scheduled to undergo TEO®. This allows to identify patients who are susceptible to a high risk of perforation into the peritoneal cavity (Fig. 1). Though it has been demonstrated that suture repair of a peritoneal perforation does not appear to pose a greater risk to the patient, and that it may be considered a safe procedure, we have observed that anterior lesions are not the only ones that might bear some risks. Lateral lesions in anterior dissection also carry an increased risk. We have also been able to find out that the height of the peritoneal reflection is highly variable, primarily in women.

Abdominal computed tomography is performed, and carcinoembryonic antigen (CEA) and carbohydrate antigen (CA) 19.9 levels are measured in cases of diagnosed or highly-suspected adenocarcinoma in order to rule out distant metastases. All patients undergo a Wexner anal sphincter function assessment. If there are any signs of incontinence, anorectal manometry should be performed in order to obtain baseline parameters. We have seen that TEO® leads to manometric changes but not to clinical changes in terms of continence.
2.2 Patient Selection for TEO® – Indication Groups

At present, resection of rectal lesions by use of TEO® is indicated for groups I and II as shown in Table 1.\textsuperscript{15}

Group I includes all benign rectal lesions that are staged by EUS and pelvic MRI as T\textsubscript{0}N\textsubscript{0}. Group II includes adenocarcinomas (well differentiated or moderately differentiated G1 or G2 tumors) staged as T\textsubscript{0-1}N\textsubscript{0}.

Group III is the most controversial. It consists of T\textsubscript{2}N\textsubscript{0} adenocarcinomas. Note, that T2 tumors can have an N1 status in 12–28\% of cases, which is why total excision of the mesorectum is considered the first-line treatment.\textsuperscript{14} TEO® is only indicated as an alternative treatment option in clinical trials (well differentiated or moderately differentiated G1 and G2 tumors with preoperative neoadjuvant chemotherapy and radiation therapy) or in patients who refuse radical surgery, a decision is made in consensus groups consisting of the patient and a multidisciplinary team (surgeon, oncologist, radiation oncologist).\textsuperscript{16}

Group IV includes all patients for whom palliative care is indicated, regardless of tumor stage.

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Curative Adenomas (benign tumors), T\textsubscript{0}N\textsubscript{0}</td>
</tr>
<tr>
<td>II</td>
<td>Curative Stage T\textsubscript{0-1}N\textsubscript{0} adenocarcinomas</td>
</tr>
<tr>
<td>III</td>
<td>Consensus Stage T\textsubscript{2}N\textsubscript{0} adenocarcinomas</td>
</tr>
<tr>
<td>IV</td>
<td>Palliative Carcinomas of any stage for palliative care</td>
</tr>
</tbody>
</table>

\textsuperscript{T} = Tumor stage by EUS and pelvic MRI
\textsuperscript{N} = Staging of the presence of lymphadenopathy by EUS and pelvic MRI

2.3 Limitations of the TEO® Technique

Cases in which the technique is not indicated either due to the height or size of the rectal tumor, as described below.

2.3.1 Topographical Aspects

Measurement of the distance between the lesion’s superior border (anatomically most proximal) and inferior border from the anal verge is of vital importance. Unlike endoanal resection, in which the distance between the lesion and the anal verge is limited to 7–8 cm, the inherent limits of TEO® are determined by the risk of perforation into the peritoneal cavity. Using this technique, it is possible to perform resection with a low risk of perforation up to 18–20 cm, when the tumor is located in the posterior quadrant, and up to 15 cm, when located anteriorly or laterally.
Since perforation into the peritoneal cavity is not an absolute contraindication to TEO®, considerations currently include:

- There are no other limits than those defined by the location of the lesion (anterior-posterior-lateral).
- The height limit is determined by the length of the rectoscope.
- The limits are determined by anatomical factors:
  - Narrow rectosigmoid junctions. A sigmoid colon of less than 4 cm in diameter, with a small rectal ampulla (less than 10 cm), will impede advancement of the rectoscope beyond 10 cm, even if the rectoscope is longer.
  - A previous history of abdominal surgeries that may account for adhesion formation at the rectosigmoid junction.
  - A wide (> 4 cm) mobile and displaceable sigmoid colon will occasionally allow lesions beyond the range of the rectoscope to be accessed by using the intestinal eversion maneuver (like a sock), allowing a lesion that is situated a few centimeters higher to be reached.

The limit for lower lesions is up to the anal verge.

### 2.3.2 Morphological Aspects

Lesions extending up to 3 quadrants of the circumference (up to 10–12 cm in diameter) can be resected. The four quadrants can be reached accurately given a small width and a size no greater than the permitted height.

The problems we found with large lesions are as follows:

- Suturing of the defect is indicated in the majority of cases due to the risk of stenosis.
- When the defect cannot be completely closed, it must be reduced to a minimum size. This is particularly important for the upper part due to the inherent risk of perforation.
- At times, fragmentation of the lesion is required, which involves that it is impossible to correctly identify the resection margins.

### 2.4 Preoperative Preparation of the Patient

Patients who are scheduled to undergo TEO® will be subjected to mechanical bowel preparation and thromboembolism prophylaxis, the day before surgery. Routine antibiotic prophylaxis for colorectal surgery is administered together with induction of anesthesia.
2.5 Basics of the Surgical Technique

2.5.1 Patient Positioning

2.5.1.1 Preoperative Rectoscopy

Adequate positioning of the patient on the surgical table is of vital importance. TEO® is designed to always be performed with the tumor situated on the inferior portion of the rectoscope, that is to say, patient positioning will depend on the quadrant the rectal tumor is located.

Despite preoperative localization of the lesion, we believe it is of vital importance to corroborate the location in the operating room (Figs. 2a–c). Accordingly, a rigid rectoscopy is performed, in the course of which we confirm:

- **Visualization**
- **Location**
- **Height**
- **Size**

2.5.1.2 Patient Positioning: Supine, Right Lateral, Left Lateral, Prone

As mentioned above, given the tumor is in a posterior location, the patient is placed in the lithotomy or supine decubitus position (Fig. 3). If the neoplasm is located anterior, the patient is placed in the prone position (Fig. 4), and if the tumor is lateral, the patient is placed in the corresponding lateral decubitus position (Figs. 5a, b), with legs split to facilitate maneuvering of the rectoscope.
2.5.2 Set-Up of the TEO® Operating Rectoscope (Fig. 6)

The TEO® rectoscope set comprises a rectoscope tube of 4 cm in diameter, that allows the use of three types of rectoscopes varying in length (7.5 cm, 15 cm, and 20 cm), the choice of which is governed by the distance to the tumor. Once the surgical field has been draped and prepared, the first device to be installed is the polyarticulated metal holding system. It is mounted to the operating table on the right side of the patient (optionally, on the left) such that the rectoscope is perfectly secured in position. First, a digital rectal examination and smooth digital anal dilation are performed. Subsequently, slow movements are used to introduce the rectoscope, which is finally affixed to the polyarticulated holder. In order to facilitate maneuvering of the rectoscope, the central locking (KSLOCK) of the holding system is preferably placed to the right side of the patient.

The working attachment is retracted together with its proximal lid. Proper fit of the silicone leaflet valves (Figs. 7a, b) must be checked to avoid air leakage. The working attachment accommodates three instrument channels (for instruments up to Ø 12 cm) and a separate one for the scope. The high-definition digital video camera head is coupled to the 30° scope, the light cable is connected to the light connector on the scope, afterwards the white balance can be made. Then the insufflation tube can be attached to the LUER-Lock connector marked with an arrow. Meanwhile the suction device can be coupled to the LUER-Lock connector at the rectoscope handle. Optionally a syringe for cleaning can be attached to the LUER-Lock connector marked with drops. On the floor of the OR, the pedal for the bipolar electrocautery is located at the surgeon's right foot. The high-definition screen is positioned in the surgeon's direct line of vision (Figs. 8a, b).
2.5.3 Essentials of the Surgical Procedure

2.5.3.1 Starting the Procedure by Delineating the Lesion

Surgery is performed under a pneumorectum at constant insufflation pressure (10–12 mmHg). Distending the rectum in this manner allows for proper exposure of the tumor and the rectal wall. The lesion will be located at the inferior part of the rectoscope. The first maneuver before starting the surgical procedure is to place the rectoscope above the lesion in a manner that allows to gain access to the entire perimeter of the tumor and to control its position in the rectal lumen.

We place the rectoscope approximately two centimeters from the lesion. Prior to initiating dissection, the area of the lesion is explored with graspers to make sure that the entire circumference of the lesion is accessible, at least up to 2/3 of the lesion. Mobility of the lesion is examined by touching the underlying mucosa (Fig. 9).

Dissection is started by circumferentially marking the margin using electrocautery at a distance of 10–15 mm from the tumor (Fig. 10a). Next, the mucosa is incised over the marked margin, and dissection of the lesion begins (Fig. 10b).

2.5.3.2 Full-Thickness Resection of the Rectal Wall Using an Ultrasonic Scalpel

The curved clamp-shaped design of the ultrasonic scalpel allows for lateral dissection in a procedure the main drawback of which is that one has to work in parallel. Maneuvering the instrument at a minimum pace makes sure that dissection is performed without bleeding. Advancing gradually facilitates visualization of the area being sectioned and helps to reduce operative time.

The healthy rectal mucosa is approached with a grasper, but never from above the lesion. Begin at the most distal tumor margin in a cephalocaudal direction, i.e., in the area closest to the rectoscope. The whole rectal wall thickness is resected in all cases. Continue laterally, posteriorly in depth and complete resection in the proximal area. This stage of the procedure tends to be more demanding because it is not feasible to lateralize the lesion, so you always have to work in parallel (Fig. 11).
Upon completion of resection, irrigate with povidone iodine solution diluted to 1% using physiological saline solution.

2.5.3.3 How to Prepare the TEO® Specimen for Histopathologic Processing?
With the help of the surgical nurse, the surgeon places the resected specimen on a cork or similar padding and pins the margins with needles to prevent retraction (Fig. 12a). In addition, it is very helpful to orient and mark the specimen such that the precise site of anatomical origin is comprehensible to the pathologist. Any additional pieces from the resection margins should be submitted to histopathologic examination, indicating the proper position with respect to the specimen, and they should also be pinned to a cardboard with needles (Fig. 12b).

2.5.3.4 Suture Repair of the Lesion
The lesion’s defect on the rectal wall should be sutured to prevent complications due to stenosis of the rectal lumen (in large defects) and postoperative bleeding on account of fecal erosions. A long-lasting 3–0 absorbable monofilament suture such as polydioxanone (PDS, MonoPlus) is used with a 20–22 gauge curved cylindrical atraumatic needle. A 10 cm length is cut to facilitate handling in the interior of the rectoscope (Fig. 13). A Vicryl (Ethicon) clip is placed at the ends, using an instrument known as Lapra-TY for placement, as an anchor and to avoid knot tying (Fig. 14).

A curved needle holder is used, which facilitates handling the suture (Fig. 15). The ergonomic design of the handle is particularly useful for opening and closing the jaws (Fig. 15). To introduce the suture thread with the needle holder in the rectoscope, the silicone leaflet valve of the working attachment should first be threaded onto the needle holder. Subsequently, the suture is grasped with the needle holder and introduced into the lumen of the rectoscope. Once the suture is in the rectoscope lumen, the needle should be positioned above the needle holder with the help of a grasping forceps.
The suture should always be made in a transverse direction to avoid compromising the rectal lumen and to avoid formation of stenosis. In small defects, start at one end and, using a continuous suture, finish at the other end by placing a new clip at the end of the suture. The stitches are placed as full-thickness continuous sutures that are passed through the rectal wall, as previously described. To perform these maneuvers, it is helpful to readjust the rectoscope to each of the required positions.

For large defects (Fig. 16a), it is useful to start the suture by placing one or two stitches in the center of the defect to approximate the central flap (Fig. 16b–d).
Then place two lateral sutures (Figs. 17a–d). Upon completion of suturing, irrigate once again with povidone iodine solution diluted to 1% with physiological saline solution.

2.6 Postoperative Monitoring

Our protocol involves removing the bladder catheter in the operating or recovery room. A gradual increase in food intake and mobilization begins on the first postoperative day, and the patient is discharged on postoperative days 2–4.

Regarding antibiotics, only the prophylactic dose is administered. Postoperative analgesia requirements are minimal, with only nonsteroidal anti-inflammatory drugs required. Antithrombotic prevention is maintained for one month as one does in colorectal neoplastic surgery.

2.7 Follow-up Protocol for Adenomas and Adenocarcinomas

2.7.1 Follow-up Protocol for Rectal Adenomas After TEO®

We perform rectosigmoidoscopy and biopsy at 4 months. One year after surgery a complete colonoscopy is performed. Afterwards, the protocol for colon polyps is performed.

2.7.2 Follow-Up Protocol for Rectal Adenocarcinomas After TEO®

- 1st and 2nd year: rectosigmoidoscopy-biopsy, endorectal ultrasound and CEA every 4 months.
- 3rd to 5th year: rectosigmoidoscopy-biopsy, endorectal ultrasound and CEA every 6 months.
- Complete colonoscopy, abdominal CT and pelvic MRI annually until the 5th year.
- Starting in the 5th year, follow-up protocol for colon polyps.
3.0 Advanced Resection and Reconstruction Techniques

3.1 Large Lesions (Figs. 18a–f)

As mentioned earlier, resection of large adenomatous lesions may be performed if endorectal ultrasound and MRI studies suggest that a lesion be staged as T0–1N0. In terms of size, lesions reaching up to 3 quadrants of the circumference (up to 10–12 cm in diameter) are amenable to excision (Fig. 18a).

Excision is started at the most distal portion of the lesion (close to the anus), marking the accessible zone with the electrocautery instrument (Fig. 18b). Adopting the same strategy as with any other lesion, resection is commenced using an ultrasonic scalpel. Begin at the most distal tumor margin and proceed in a cephalocaudal direction (Fig. 18c). Continue laterally, posteriorly in depth and complete excision in the proximal area. The difficulty lies in the proximal portion where tumor volume usually does not allow proper visualization of resection margins. At this point, lateralize from one side of the lesion to the other, ultimately even turning it over towards the intestinal lumen in order to complete resection (Fig. 18d). Occasionally, a large tumor size makes it necessary to divide the lesion prior to initiating resection. However, such practice should be used only as a last resort, because as a result, the pathologist will not be able to confirm the presence of clear margins.
3.2 Intraperitoneal Rupture After Full-Thickness Excision
(Figs. 19a–f)

The pelvic MRI of rectal lesions treated with TEO® allows us to identify those lesions that are at risk of intraperitoneal rupture after full-thickness excision (Figs. 19a, b). As mentioned earlier, such occurrence is not a contraindication for TEO®.

Once the site of perforation has been identified (Fig. 19c), full-thickness resection of the rectal wall should be completed. If the defect is very wide, loops of small intestine may be found to herniate into the rectal lumen. In that case, repositioning the patient in a slight Trendelenburg position has proven to facilitate retraction of the small intestine into the peritoneal cavity in order to begin the repair. Suturing of the defect should begin at the site where the perforation occurred, using wide full-thickness sutures (Fig. 19d). Once repair of the defect is complete, the remainder is reconstructed using the typical technique (Figs. 19e, f).

Suturing of the defect is indicated in the majority of cases due to the risk of stenosis (Fig. 18e). In those cases, in which the defect cannot be closed completely, reduce it to a minimum, particularly the upper part, that predisposes to the risk of iatrogenic perforation into the peritoneal cavity. Finish by irrigating with povidone iodine solution diluted to 1% using physiological saline solution (Fig. 18f).
3.3 Suturing Along the Entire Circumference. Resection of Full Circumference Lesions Requiring a Change in Position (Figs. 20a–f)

Lesions that involve all four quadrants can be reached accurately if the width is small (3–4 cm) and they are within the amenable height (Fig. 20a). Resection of the lesion is started in the same manner as with a large lesion. Whenever possible, it should be performed without dividing the specimen (Fig. 20b).
As a rule, under these circumstances, suturing is required to prevent formation of stenosis. Start suturing 2/3 of the inferior circumference (from the 2 o’clock to the 10 o’clock position) (Figs. 20c, d). Once this has been accomplished, it is helpful to change to the opposite side of the patient (although this can pose significant difficulties related to the operating room setting) because closure of this third is much simpler and safer after changing position (Fig. 20e).

As in other cases, finish by irrigating with povidone iodine solution diluted to 1% using physiological saline solution (Fig. 20f).
3.4 Use of Dye to Facilitate Circumscribing the Resection Margins of the Lesion (Figs. 21a–d)

Prior to starting resection of flat adenovillous lesions, difficulties may arise when attempting to circumscribe the margins of the lesion (Fig. 21a). In this context, it has been found useful to employ endoscopic staining techniques such as indigo carmine dye in the diagnosis of flat adenovillous lesions. Using a catheter that is introduced through one of the working ports, the lesion is irrigated with the dye (Fig. 21b), which allows for clear visualization of the border between the adenovillous tissue and healthy mucosa (Fig. 21c). This facilitates to circumscribe the area occupied by the lesion, thus enabling to perform oncologically sound resection with margins that extend into healthy mucosa (Fig. 21d).
3.5 Neoadjuvant Chemoradiation Therapy Followed by Resection Using TEO® in Cases of T₂N₀ Rectal Adenocarcinomas (Figs. 22a–g)

Standard treatment for stage T₂N₀ rectal adenocarcinoma is total excision of the mesorectum. Preoperative chemotherapy in combination with radiotherapy and subsequent resection of the lesion using TEO® are therapeutic options that are only indicated in special conditions, such as in patients rejecting radical surgery involving a permanent stoma or in clinical trials.

In the majority of cases, a scarred rectal area will result from the effect of neoadjuvant therapy (Fig. 22a), but this does not necessarily mean that it adds technical complexity to the procedure. Taking into account the inherent characteristics of the pathology, we recommend a larger safety margin of more than 2 cm (Fig. 22b). Subsequently, great care is taken when performing full-thickness resection of the wall (Fig. 22c). In the course of resection, the degree of edema formation in the rectal wall will be higher than normal, but this does not complicate the procedure (Fig. 22d). Suturing is performed without any major technical difficulty using the normal procedure.
When we encounter complete clinical and histopathological remission, the lesion may not be detectable by diagnostic means. However, a whitish area of scarred tissue may always be visualized during rectoscopy in the topographical area described above (Fig. 22e). Resection is performed as described above (Figs. 22f, g).
3.6 Full-Thickness Rectal Excision after Polypectomy with Infiltrated Base – Preliminary Marking with a Clip (Figs. 23a–h)

In some cases of endoscopic resection of polypoid rectal lesions, histopathologic processing gives evidence of infiltrating adenocarcinoma and positive margins, while preoperative EUS and pelvic MRI staging is T0–1N0. In similar circumstances after polypectomy of submucosal lesions, we may be faced with a histopathologic assessment reporting on carcinoid tumor with positive margins. In these circumstances, full-thickness resection of the rectal wall using TEO® is indicated.

Marking the lesion with activated charcoal or India ink indicates the area, but the stain usually diffuses to 2 or 3 quadrants, which may cause loss of precision regarding the area where the polypectomy was performed. The best way is to collaborate with the endoscopists and make a prior consultation that the exact area of polypectomy be marked with a metal clip. The clip is temporarily left in situ in the rectal lumen for 2–3 weeks (Figs. 23a, b).

Resection of the lesion marked with a clip is relatively simple. Any problem in localizing the previous polypectomy site can be resolved by visualizing the clip in the mucosa. Once the rectoscope is placed, a distance of more than 2 cm around the clip is delineated using the normal technique (Figs. 23c, d).
Full-thickness resection of the rectal wall is then performed (Figs. 23e, f). Previous marking of the lesion with stains can be seen as staining of the perirectal fat. This does not help in visualizing the exact location of the lesion. Finally, because this is a small lesion, a continuous transverse suture is placed, starting at one of either sides (Figs. 23g, h).
Acknowledgements

To Dr. Salvador Navarro Soto, Director of the Surgical Section of the Department of General and Gastrointestinal Surgery at the Parc Taulí University Health Corporation, Associate Professor of the Department of Surgery, Parc Taulí Teaching Unit, Autonomous University of Barcelona, Spain, for his continuous support and inspiration in the development and publication of this therapeutic strategy.

To Drs. Manuel Alcantara, Isidro Ayguavives, Jordi Bombardó and Laura Mora from the Colorectal Team of the Parc Taulí University Health Corporation. Without them, it would have been impossible to finish this task.

To Mrs. Cristina Gomez Vigo, surgical nurse specializing in TEO® since its beginning, for her support and assistance in the editing and preparation of this and many other papers.

To the remaining colleagues who are part of the TEO® practical courses that are held nationally and internationally every year: Mrs. Gemma Arribas (surgical nurse), Dr. Eva Ballesteros (diagnostic radiologist), Mrs. Eva Bassa (surgical nurse), Dr. Rafael Campo (gastroenterologist), Dr. Alex Casolots (pathologist), Mrs. Laura Gelabert (surgical nurse), Dr. Felix Junquera (gastroenterologist), Mrs. Maria José Lopez (secretary and course logistics), Mrs. Anna Olle (surgical nurse), Dr. Jordi Pérez (anesthesiologist), Dr. Carles Pericay (medical oncology), Dr. Gemma Pujol (anesthesiologist).

To all of the physicians, residents and nurses from the Department of General and Gastrointestinal Surgery of the Parc Taulí University Health Corporation for their continuous help and support.

To the company KARL STORZ for its support and confidence in this project.
References


11. FUCINI C, SEGRE D, TROMPETTO M: Local excision of rectal polyp: indications and techniques. Tech Coloproctol 2004; 8: 300–4


Instruments for TEO®
Transanal Endoscopic Operations

TEO® – Video Operating Rectoscope
Operating Instruments and Rectoscope Holder

IMAGE1 SPIES™ Camera System and IMAGE1 SPIES™ Camera Heads
Monitors

KARL STORZ Cold Light Fountains, Electronic CO₂-ENDOFLATOR®
KARL STORZ AIDA® – Digital Archiving of Still Images,
Video Sequences and Audio Files
Recommended Configuration
for TEO® – Transanal Endoscopic Operations

24941 BA 1 HOPKINS® Forward-Oblique Telescope 30°, angled eyepiece, diameter 5 mm, length 21 cm, autoclavable, fiber optic light transmission incorporated, color code: red

495 NA 1 Fiber Optic Light Cable, with straight connector, diameter 3.5 mm, length 230 cm

24942 TK 1 TEO® Operating Rectoscope Tube, outer diameter 40 mm, working length 7.5 cm, with handle for holding system, Luer-Lock connector for vapor evacuation

24942 OK 1 TEO® Obturater, for use with Operating Rectoscope Tube 24942 TK

24942 AK 1 TEO® Working Attachment, with attachment for Telescope 24941 BA, 2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm, automatic sealing with silicone leaflet valve, Luer-Lock connector for insufflation, for use with 24942 TK

24942 T 1 TEO® Operating Rectoscope Tube, outer diameter 40 mm, working length 15 cm, with handle for holding system, Luer-Lock connector for vapor evacuation

24942 O 1 TEO® Obturater, for use with Operating Rectoscope Tube 24942 T

24942 A 1 TEO® Working Attachment, with attachment for Telescope 24941 BA, 2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm, automatic sealing with silicone leaflet valve, Luer-Lock adapter for insufflation, for use with 24942 TK

24942 TL 1 TEO® Operating Rectoscope Tube, outer diameter 40 mm, working length 20 cm, with handle for holding system, Luer-Lock connector for vapor evacuation

24942 OL 1 TEO® Obturater, for use with Operating Rectoscope Tube 24942 TL

24942 AL 1 TEO® Working Attachment, with attachment for HOPKINS® Telescope 24941 BAL, 2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm, automatic sealing with silicone leaflet valve, Luer-Lock adapter for insufflation, for use with Operating Rectoscope Tube 24942 TL

24941 BAL 1 HOPKINS® Forward-Oblique Telescope 30°, angled eyepiece, diameter 5 mm, length 28 cm, autoclavable, fiber optic light transmission incorporated, color code: red

24941 I 1 Insertion Aid, for silicone leaflet washers, in the working/sealing cap

24941 F 1 Sealing Cap, fenestrated, with holder for Fiber Optic Light Carrier 24960 B

24960 B 1 Fiber Optic Light Carrier, with connector pin for fiber optic light cable, with sealing ring

25352 PMR 1 CLICKLINE Universal Grasping Forceps “PARROTJAW”®, rotating, dismantling, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, single action jaws, jaws offset downwards, curved to the right, size 5 mm, length 36 cm, including:

Plastic Handle, with MANHES ratchet
Metal Outer Sheath, insulated Forceps Insert

25352 PML 1 CLICKLINE Universal Grasping Forceps “PARROTJAW”®, rotating, dismantling, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, single action jaws, jaws offset downwards, curved to the left, size 5 mm, length 36 cm, including:

Plastic Handle, with MANHES ratchet
Metal Outer Sheath, insulated Forceps Insert

25140 PL 1 KOH Macro Needle Holder, dismantling, distal curve, single action jaws, with ergonomic handle, pistol grip, with disengageable ratchet, ratchet position left, size 5 mm, length 33 cm, including:

Handle
Needle Holder

25351 MT 1 CLICKLINE Scissors, rotating, dismantling, insulated, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, single action jaws, jaws offset downwards, serrated, size 5 mm, length 36 cm, including:

Plastic Handle, without ratchet
Metal Outer Sheath, insulated Scissors Insert

25370 SC 1 Coagulating Suction Tube, insulated sheath, proximally and distally bent downwards, punctual, size 5 mm, length 33 cm

25370 KG 1 Dissecting Hook Electrode, insulated sheath, proximally and distally bent downward, needle-shaped, size 5 mm, length 33 cm

30805 1 Handle with Two-Way Stopcock, for suction and irrigation, autoclavable, for use with suction and irrigation tubes size 5 mm

39312 X 1 Plastic Container for Sterilizing and Storage, with separate rack 39312 XR and insert tray for storage of up to 12 instruments with diameter 2.5 to 10 mm up to 6 trocars, perforated, with transparent lid, external dimensions (w x d x h): 532 x 254 x 165 mm

28331101-1 1 HAMOU® ENDOMAT® SCB, power supply 100 – 240 VAC, 50/60 Hz, including:

Mains Cord
5x HYST Tubing Set®, for single use
5x LAP Tubing Set®, for single use
SCB Connecting Cable, length 100 cm
VACUsafe Promotion Pack Suction*, 2 l
Operating Rectoscopes
for TEO® – Transanal Endoscopic Operations

TEO® (Transanal Endoscopic Operations) combines the minimal invasiveness of an intervention via a natural orifice (NOTES) with the precision of resection under visual control. A wide lumen rectoscope enables precise guidance of surgical instruments under visual control.

Special Features:
- Available in lengths of 7.5, 15 and 20 cm
- Compatible with various working attachments
- Integrated telescope irrigation
- Connectors optimized for insufflation and vapor evacuation
- Can be used with instruments 3 – 14 mm

It is recommended to check the suitability of the product for the intended procedure prior to use.
Operating Rectoscope
for TEO® – Transanal Endoscopic Operations – Working length 7.5 cm

TEO® Operating Rectoscope
24941 BA  HOPKINS® Forward-Oblique Telescope 30°, angled eyepiece, diameter 5 mm, length 21 cm, autoclavable, fiber optic light transmission incorporated, color code: red

Working length 7.5 cm:
24942 TK  TEO® Operating Rectoscope Tube, outer diameter 40 mm, working length 7.5 cm, with handle for holding system, Luer-Lock connector for vapor evacuation
24942 OK  TEO® Obturator, for use with Operating Rectoscope Tube 24942 TK
24942 AK  TEO® Working Attachment, with attachment for Telescope 24941 BA, 2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm, automatic sealing with silicone leaflet valve, Luer-Lock connector for insufflation, for use with 24942 TK
Operating Rectoscope
for TEO® – Transanal Endoscopic Operations – Working length 15 cm

TEO® Operating Rectoscope
24941 BA HOPKINS® Forward-Oblique Telescope 30°, angled eyepiece, diameter 5 mm, length 21 cm, autoclavable, fiber optic light transmission incorporated, color code: red

Working length 15 cm:
24942 T TEO® Operating Rectoscope Tube, outer diameter 40 mm, working length 15 cm, with handle for holding system, Luer-Lock connector for vapor evacuation
24942 O TEO® Obturator, for use with Operating Rectoscope Tube 24942 T
24942 A TEO® Working Attachment, with attachment for Telescope 24941 BA, 2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm, automatic sealing with silicone leaflet valve, Luer-Lock connector for insufflation, for use with 24942 T
Operating Rectoscope
for TEO® – Transanal Endoscopic Operations – Working length 20 cm

TEO® Operating Rectoscope
24941 BAL  HOPKINS® Forward-Oblique Telescope 30°, angled eyepiece,
diameter 5 mm, length 28 cm, autoclavable,
fiber optic light transmission incorporated, color code: red

Working length 20 cm:
24942 TL  TEO® Operating Rectoscope Tube, outer diameter 40 mm,
working length 20 cm, with handle for holding system,
LUER-Lock connector for vapor evacuation
24942 OL  TEO® Obturator, for use with Operating Rectoscope Tube 24942 TL
24942 AL  TEO® Working Attachment, with attachment for HOPKINS® Telescope 24941 BAL,
2 channels for instrument size 5 mm and 1 channel for instruments up to size 12 mm,
automatic sealing with silicone leaflet valve, LUER-Lock adaptor for insufflation,
for use with Operating Rectoscope Tube 24942 TL
Accessories and Replacement Parts for Operating Rectoscopes
for TEO® – Transanal Endoscopic Operations

Accessories:

- **24941 F**  
  **Sealing Cap**, fenestrated, with holder for Fiber Optic Light Carrier 24960 B

- **24960 B**  
  **Fiber Optic Light Carrier**, with connector pin for fiber optic light cable, with sealing ring

- **24941 I**  
  **Insertion Aid**, for placement of inner silicone leaflet valves

- **24941 AKF**  
  **TEO® Working Attachment**, for use with 10 mm HOPKINS® telescopes, 2 channels for instruments up to size 14 mm and 1 channel for instruments up to size 10 mm, automatic sealing with silicone leaflet valve, for use with TEO® Operating Rectoscope Tube 24941 T/TK and 24942 T/TK

Replacement parts:

- **24941 SP**  
  **Sealing Set**, for TEO® Working Attachments 24941 A/AK and 24942 A/AK/AL

- **24941 SPF**  
  **Sealing Set**, for TEO® Working Attachment 24941 AKF
Operating Instruments
for TEO® – Transanal Endoscopic Operations
CLICKLINE Dissecting and Grasping Forceps, rotational, can be dismantled, with and without connector pin for unipolar coagulation

Size 5 mm

<table>
<thead>
<tr>
<th>Length</th>
<th>Handle</th>
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<tbody>
<tr>
<td></td>
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Single-action jaws

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<tr>
<td>25310 ME</td>
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</tr>
<tr>
<td>25410 ML</td>
<td>25451 ML 25452 ML 25453 ML 25461 ML 25462 ML 25463 ML</td>
</tr>
</tbody>
</table>

CLICKLINE Dissecting and Grasping Forceps, jaws offset downwards, multiple teeth, atraumatic, width of jaws 4.8 mm

CLICKLINE Universal Grasping Forceps, atraumatic, jaws offset downwards

CLICKLINE Dissecting and Grasping Forceps, jaws offset downwards, 2x 4 teeth

CLICKLINE Universal Grasping Forceps PARROT JAW®, jaws offset downwards, curved right

CLICKLINE Universal Grasping Forceps PARROT JAW®, jaws offset downwards, curved left

CLICKLINE KELLY Universal Grasping Forceps, long, jaws offset downwards
Operating Instruments
for TEO® – Transanal Endoscopic Operations
CLICKLINE Scissors, rotational, can be dismantled, with and without connector pin for unipolar coagulation

Size 5 mm

<table>
<thead>
<tr>
<th>Length</th>
<th>Handle</th>
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<tbody>
<tr>
<td>36 cm</td>
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<td></td>
<td>33161</td>
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<tr>
<td>43 cm</td>
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CLICKLINE Scissors, jaws offset downwards, serrated

<table>
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<td>25410 MAR</td>
<td>25451 MAR</td>
</tr>
<tr>
<td>25410 MAL</td>
<td>25451 MAL</td>
</tr>
</tbody>
</table>

CLICKLINE Scissors, jaws offset downwards, curved right

<table>
<thead>
<tr>
<th>Working Insert</th>
<th>Complete Instrument</th>
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<tbody>
<tr>
<td>25310 MT</td>
<td>25361 MT</td>
</tr>
<tr>
<td>25310 MAR</td>
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<td>25461 MAR</td>
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<tr>
<td>25410 MAL</td>
<td>25461 MAL</td>
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</table>

CLICKLINE Scissors, jaws offset downwards, curved left
Operating Instruments

for TEO® – Transanal Endoscopic Operations

Coagulation Suction Tubes, Dissection Hook Electrodes

<table>
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<th>Length</th>
<th>Instrument</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Distal End</th>
<th>Instrument</th>
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</thead>
</table>
|            | **25370 DM**  
Coagulation Suction Tube,  
proximally and distally bent downwards,  
needle-shaped |
|            | **25370 SC**  
Coagulation Suction Tube,  
proximally and distally bent downwards |

| Handle with Trumpet Valve,  
for suction or irrigation,  
autoclavable,  
for use with 5 mm coagulating suction tubes  
and 5 mm suction and irrigation tubes |
| 30804      |

| Handle with Two-Way Stopcock,  
for suction and irrigation,  
autoclavable,  
for use with suction and irrigation tubes size 5 mm |
| 30805      |

<table>
<thead>
<tr>
<th>Length</th>
<th>Instrument</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Distal End</th>
<th>Instrument</th>
</tr>
</thead>
</table>
|            | **25370 KG**  
Dissection Hook Electrode,  
proximally and distally bent downwards,  
needle-shaped |
|            | **25370 KGG**  
Dissection Hook Electrode,  
distally bent downward, needle-shaped |
KOH Macro Needle Holder, size 5 mm, dismantling, distally curved, consisting of:

- Handle
- Outer Sheath

The ergonomic handle and the optimal distal curve of the needle holder ensures easier handling for suturing and grasping the needle, particularly in the narrow space between the tube and the suture line at the rectosigmoid transition to the rectal side walls.

The jaw profile offers a secure hold that makes it easier to grasp the needle.

PD D. SCHUBERT, M.D.
Head of Department, Klinikum Saarbrücken, Germany

The reusable dismantling design offers the user the following benefits:

- Can be disassembled into two separate components
- Fully autoclavable
- Cleaning connector
- Choice of six different handles
- Jaws with tungsten carbide inserts
- User-friendly and ergonomic handling

PD D. SCHUBERT, M.D.
Head of Department, Klinikum Saarbrücken, Germany

Operating Instruments NEW
for TEO® – Transanal Endoscopic Operations
KOH Macro Needle Holder, dismantling, distally curved
Metal Handles
for KOH Macro Needle Holder, dismantling, distally curved

Handles, axial and pistol, with disengageable ratchet

<table>
<thead>
<tr>
<th>30173 AR</th>
<th>Handle, axial, with disengageable ratchet, ratchet position right</th>
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<td>30173 AL</td>
<td>Handle, axial, with disengageable ratchet, ratchet position left</td>
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<tr>
<td>30173 AO</td>
<td>Handle, axial, with disengageable ratchet, ratchet position on top</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>30173 PR</th>
<th>Handle, pistol-shaped, with disengageable ratchet, ratchet position right</th>
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</thead>
<tbody>
<tr>
<td>30173 PL</td>
<td>Handle, pistol-shaped, with disengageable ratchet, ratchet position left</td>
</tr>
<tr>
<td>30173 PO</td>
<td>Handle, pistol-shaped, with disengageable ratchet, ratchet position on top</td>
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</table>
Operating Instruments for TEO® – Transanal Endoscopic Operations
KOH Macro Needle Holder, dismantling, distally curved

Size 5 mm
Operating Instruments, length 33 cm,
with axial handle for use with trocars size 6 mm

<table>
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<tr>
<td>33 cm</td>
<td>30173 AR</td>
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Single action jaws

<table>
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<tr>
<th>Working Insert</th>
<th>Complete Instrument</th>
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</thead>
<tbody>
<tr>
<td>25140</td>
<td>25140 AR</td>
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Needle Holder, distally curved, diameter 5 mm

Operating Instruments, length 33 cm,
with pistol-shaped handle for use with trocars size 6 mm

<table>
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Single action jaws

<table>
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<td>25140 PR</td>
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Needle Holder, distally curved, diameter 5 mm
Holding Systems, U-shaped
for TEO® – Transanal Endoscopic Operations

Special Features:
- Simple, fast and accurate positioning
- All five joint functions can be fixed by means of a mechanical central clamp
- Variable height adjustment by using the socket
- Additional angle adjustment by using socket 28172 HR
- Sockets for use with European and United States standard rails of OR table
- Maintenance-free and autoclavable
- With quick release coupling KSLOCK

28272 KLD  Holding System, U-shaped, autoclavable, with quick release coupling KSLOCK
including:
Socket, to clamp to the OR table, for European and US standard rails, also suitable for rails 25 x 10 up to 35 x 8 mm, with lateral clamp for height adjustment of the articulated stand
Articulated Stand, reinforced version, U-shaped, with one mechanical central clamp for all five joint functions, with quick release coupling KSLOCK (female)

28272 RLD  Same, including:
Rotation Socket, to clamp to the OR table, for European and US standard rails, with lateral clamp for height and angle adjustment of the articulated stand
Holding Systems, U-shaped
for TEO® – Transanal Endoscopic Operations

28172 HK  **Socket**, to clamp to the OR table, for European and US standard rails, also suitable for rails 25 x 10 up to 35 x 8 mm, lateral clamp for height adjustment of the articulated stand

28172 HR  **Rotation Socket**, to clamp to the operating table, with one mounted Butterfly Nut 28172 HRS, for European and US standard rails, with lateral clamp for height and angle adjustment of the articulated stand

optional:

28272 UL  **Clamping Jaw**, universal, clamping range 0 to 18 mm, with quick release coupling KSLOCK (male)
**Mobile Equipment Cart**

**Units and Accessories:**

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<td>9627 NB</td>
<td>27&quot; FULL HD Monitor</td>
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<tr>
<td>TC 200EN</td>
<td>IMAGE1 CONNECT™, connect module</td>
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<tr>
<td>TC 300</td>
<td>IMAGE1 H3-LINK™, link module</td>
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<tr>
<td>TC 301</td>
<td>IMAGE1 X-LINK™, link module</td>
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<td>TH 100</td>
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<td>20133101-1</td>
<td>Cold Light Fountain XENON 300 SCB</td>
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<td>20090519</td>
<td>19&quot; KARL STORZ Touchscreen</td>
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<td>20046120-A</td>
<td>KARL STORZ AIDA® control NEO</td>
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<tr>
<td>UG 220</td>
<td>Equipment Cart</td>
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<tr>
<td>UG 500</td>
<td>Monitor Holding Arm</td>
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<tr>
<td>UG 606</td>
<td>Keyboard Drawer</td>
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<tr>
<td>UG 310</td>
<td>Isolation Transformer</td>
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<tr>
<td>UG 410</td>
<td>Earth Leakage Monitor</td>
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<tr>
<td>UI400S1</td>
<td>ENDOFLATOR® 40 SCB</td>
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<td>26331101-1</td>
<td>HAMOU® ENDOMAT® SCB</td>
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<tr>
<td>20535201-125</td>
<td>AUTOCON® II 400 High End Set</td>
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<tr>
<td>20017831</td>
<td>Three-Pedal Footswitch, for AUTOCON® II 400</td>
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<tr>
<td>29005 DFH</td>
<td>Foot Switch Holder</td>
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</tbody>
</table>
Economical and future-proof
- Modular concept for flexible, rigid and 3D endoscopy as well as new technologies
- Forward and backward compatibility with video endoscopes and FULL HD camera heads
- Sustainable investment
- Compatible with all light sources

Innovative Design
- Dashboard: Complete overview with intuitive menu guidance
- Live menu: User-friendly and customizable
- Intelligent icons: Graphic representation changes when settings of connected devices or the entire system are adjusted
- Automatic light source control
- SPIES™ VIEW: Parallel display of standard image and the SPIES™ mode
- Multiple source control: IMAGE1 SPIES™ allows the simultaneous display, processing and documentation of image information from two connected image sources, e.g., for hybrid operations

Dashboard
Live menu
Intelligent icons
SPIES™ VIEW: Parallel display of standard image and SPIES™ mode
Brilliant Imaging

- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

- Reflection is minimized
- Three SPIES™ technologies for homogeneous illumination, contrast enhancement and color shifting

FULL HD image

SPIES™ CLARA

SPIES™ CHROMA

SPIES™ SPECTRA A

SPIES™ SPECTRA B
**IMAGE1 SPIES™ Camera System**

*NEW*

**TC 200EN**

**IMAGE1 CONNECT™**, connect module, for use with up to 3 link modules, resolution 1920 x 1080 pixels, with integrated KARL STORZ-SCB and digital Image Processing Module, power supply 100 – 120 VAC/200 – 240 VAC, 50/60 Hz including:

- **Mains Cord**, length 300 cm
- **DVI-D Connecting Cable**, length 300 cm
- **SCB Connecting Cable**, length 100 cm
- **USB Flash Drive**, 32 GB, USB silicone keyboard, with touchpad, US

*Available in the following languages: DE, ES, FR, IT, PT, RU

**Specifications:**

| HD video outputs    | - 2x DVI-D  
| Format signal outputs | - 1x 3G-SDI  
| LINK video inputs | 3x  
| USB interface | 4x USB, (2x front, 2x rear)  
| SCB interface | 2x 6-pin mini-DIN |

For use with **IMAGE1 SPIES™**

**IMAGE1 CONNECT™** Module TC 200EN

**TC 300**

**IMAGE1 H3-LINK™**, link module, for use with IMAGE1 FULL HD three-chip camera heads, power supply 100 – 120 VAC/200 – 240 VAC, 50/60 Hz, for use with **IMAGE1 CONNECT™** TC 200EN including:

- **Mains Cord**, length 300 cm
- **Link Cable**, length 20 cm

**Specifications:**

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<thead>
<tr>
<th>Camera System</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
</table>
| Supported camera heads/video endoscopes | TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully SPIES™-compatible)  
| LINK video outputs | 1x |
| Power supply | 100 – 120 VAC/200 – 240 VAC |
| Power frequency | 50/60 Hz |
| Protection class | I, CF-Defib |
| Dimensions w x h x d | 305 x 54 x 320 mm |
| Weight | 2.1 kg |

**Supported camera heads/video endoscopes**

- **TH 2200-55**, 2200-56, 2200-53, 2200-60, 2200-61, 2200-54, 2200-85 (compatible without SPIES™ function)

**Supported camera heads/video endoscopes**

- **TH 2200-53**, 2200-61 (fully SPIES™-compatible)
**IMAGE1 SPIES™ Camera Heads**

For use with IMAGE1 SPIES™ camera system
IMAGE1 CONNECT™ Module TC 200EN, IMAGE1 H3-LINK™ Module TC 300
and with all IMAGE1 HUB™ HD Camera Control Units

**TH 100**  
**IMAGE1 H3-Z SPIES™ Three-Chip FULL HD Camera Head**, 50/60 Hz, SPIES™ compatible, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15 – 31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 SPIES™ and IMAGE1 HUB™ HD/HD

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>H3-Z SPIES™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 100</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 114 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>270 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

**TH 104**  
**IMAGE1 H3-ZA SPIES™ Three-Chip FULL HD Camera Head**, 50/60 Hz, SPIES™ compatible, autoclavable, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15 – 31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 SPIES™ and IMAGE1 HUB™ HD/HD

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>H3-ZA SPIES™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 104</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 100 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>299 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>
Monitors

9619 NB 19" HD Monitor, color systems PAL/NTSC, max. screen resolution 1280 x 1024, image format 4:3, power supply 100 – 240 VAC, 50/60 Hz, wall-mounted with VESA 100 adaption, including:
External 24 VDC Power Supply
Mains Cord

9826 NB 26" FULL HD Monitor, wall-mounted with VESA 100 adaption, color systems PAL/NTSC, max. screen resolution 1920 x 1080, image format 16:9, power supply 100 – 240 VAC, 50/60 Hz, including:
External 24 VDC Power Supply
Mains Cord

9627 NB 27" FULL HD Monitor, wall-mounted with VESA 100 adaption, color systems PAL/NTSC, max. screen resolution 1920 x 1080, image format 16:9, power supply 85 – 265 VAC, 50/60 Hz, including:
External 24 VDC Power Supply
Mains Cord

9627 NB-2 Same, with double video inputs
## Monitors

KARL STORZ HD and FULL HD Monitors

<table>
<thead>
<tr>
<th></th>
<th>19&quot;</th>
<th>26&quot;</th>
<th>27&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9826 NB</td>
<td>9627 NB</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Inputs:</th>
<th>19&quot;</th>
<th>26&quot;</th>
<th>27&quot;</th>
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</thead>
<tbody>
<tr>
<td>DVI-D</td>
<td>–</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fibre Optic</td>
<td>–</td>
<td>–</td>
<td>optional</td>
</tr>
<tr>
<td>3G-SDI</td>
<td>–</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>RGBS (VGA)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S-Video</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Composite/FBAS</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs:</th>
<th>19&quot;</th>
<th>26&quot;</th>
<th>27&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVI-D</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S-Video</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>Composite/FBAS</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>RGBS (VGA)</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>3G-SDI</td>
<td>–</td>
<td>●</td>
<td>optional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal Format Display:</th>
<th>4:3</th>
<th>5:4</th>
<th>16:9</th>
<th>Picture-in-Picture</th>
<th>PAL/NTSC compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>19&quot;</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>26&quot;</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>27&quot;</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Optional accessories:

- 9826 SF  **Pedestal**, for monitor 9826 NB
- 9626 SF  **Pedestal**, for 96xx monitor series

### Specifications:

<table>
<thead>
<tr>
<th></th>
<th>19&quot;</th>
<th>26&quot;</th>
<th>27&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KARL STORZ HD and FULL HD Monitors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Desktop with pedestal</strong></td>
<td>optional</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td>Product no.</td>
<td>9619 NB</td>
<td>9826 NB</td>
<td>9627 NB</td>
</tr>
<tr>
<td>Brightness</td>
<td>200 cd/m² (type)</td>
<td>500 cd/m² (type)</td>
<td>240 cd/m² (type)</td>
</tr>
<tr>
<td>Max. viewing angle</td>
<td>178° vertical</td>
<td>178° vertical</td>
<td>178° vertical</td>
</tr>
<tr>
<td>Pixel distance</td>
<td>0.29 mm</td>
<td>0.3 mm</td>
<td>0.3 mm</td>
</tr>
<tr>
<td>Reaction time</td>
<td>5 ms</td>
<td>8 ms</td>
<td>12 ms</td>
</tr>
<tr>
<td>Contrast ratio</td>
<td>700:1</td>
<td>1400:1</td>
<td>3000:1</td>
</tr>
<tr>
<td>Mount</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
</tr>
<tr>
<td>Weight</td>
<td>7.6 kg</td>
<td>7.7 kg</td>
<td>9.8 kg</td>
</tr>
<tr>
<td>Rated power</td>
<td>28 W</td>
<td>72 W</td>
<td>45 W</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>0–40°C</td>
<td>5–35°C</td>
<td>5–35°C</td>
</tr>
<tr>
<td>Storage</td>
<td>-20–60°C</td>
<td>-20–60°C</td>
<td>-20–60°C</td>
</tr>
<tr>
<td>Rel. humidity</td>
<td>max. 85%</td>
<td>max. 85%</td>
<td>max. 85%</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
<td>776 x 443 x 114 mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
<td>85–265 VAC</td>
</tr>
<tr>
<td>Certified to</td>
<td>EN 60601-1, protection class IPX0</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
</tr>
</tbody>
</table>
Accessories for Video Documentation

495 NL  Fiber Optic Light Cable, with straight connector, diameter 3.5 mm, length 180 cm
495 NA  Same, length 230 cm

Cold Light Fountain XENON 300 SCB

20133101-1  Cold Light Fountain XENON 300 SCB with built-in antifog air-pump, and integrated KARL STORZ Communication Bus System SCB power supply: 100–125 VAC/220–240 VAC, 50/60 Hz including:
   Mains Cord
   SCB Connecting Cord, length 100 cm
20133027  Spare Lamp Module XENON with heat sink, 300 watt, 15 volt
20133028  XENON Spare Lamp, only, 300 watt, 15 volt

Cold Light Fountain XENON NOVA® 300

20134001  Cold Light Fountain XENON NOVA® 300, power supply: 100–125 VCA/220–240 VAC, 50/60 Hz including:
   Mains Cord
20133028  XENON Spare Lamp, only, 300 watt, 15 volt
Data Management and Documentation
KARL STORZ AIDA® – Exceptional documentation

The name AIDA stands for the comprehensive implementation of all documentation requirements arising in surgical procedures: A tailored solution that flexibly adapts to the needs of every specialty and thereby allows for the greatest degree of customization.

This customization is achieved in accordance with existing clinical standards to guarantee a reliable and safe solution. Proven functionalities merge with the latest trends and developments in medicine to create a fully new documentation experience – AIDA.

AIDA seamlessly integrates into existing infrastructures and exchanges data with other systems using common standard interfaces.

WD 200-XX*  **AIDA Documentation System**, for recording still images and videos, dual channel up to FULL HD, 2D/3D, power supply 100-240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

WD 250-XX*  **AIDA Documentation System**, for recording still images and videos, dual channel up to FULL HD, 2D/3D, including SMARTSCREEN® (touch screen), power supply 100-240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

*XX Please indicate the relevant country code (DE, EN, ES, FR, IT, PT, RU) when placing your order.
Workflow-oriented use

**Patient**
Entering patient data has never been this easy. AIDA seamlessly integrates into the existing infrastructure such as HIS and PACS. Data can be entered manually or via a DICOM worklist. All important patient information is just a click away.

**Checklist**
Central administration and documentation of time-out. The checklist simplifies the documentation of all critical steps in accordance with clinical standards. All checklists can be adapted to individual needs for sustainably increasing patient safety.

**Record**
High-quality documentation, with still images and videos being recorded in FULL HD and 3D. The Dual Capture function allows for the parallel (synchronous or independent) recording of two sources. All recorded media can be marked for further processing with just one click.

**Edit**
With the Edit module, simple adjustments to recorded still images and videos can be very rapidly completed. Recordings can be quickly optimized and then directly placed in the report. In addition, freeze frames can be cut out of videos and edited and saved. Existing markings from the Record module can be used for quick selection.

**Complete**
Completing a procedure has never been easier. AIDA offers a large selection of storage locations. The data exported to each storage location can be defined. The Intelligent Export Manager (IEM) then carries out the export in the background. To prevent data loss, the system keeps the data until they have been successfully exported.

**Reference**
All important patient information is always available and easy to access. Completed procedures including all information, still images, videos, and the checklist report can be easily retrieved from the Reference module.
**HAMOU® ENDOMAT® with KARL STORZ SCB**

Suction and Irrigation System

26331101-1  HAMOU® ENDOMAT® SCB,
power supply 100 – 240 VAC, 50/60 Hz
including:
- Mains Cord
- 5x HYST Tubing Set*, for single use
- 5x LAP Tubing Set*, for single use
- SCB Connecting Cable, length 100 cm
- VACUsafe Promotion Pack Suction*, 2 l

Subject to the customer's application-specific requirements additional accessories must be ordered separately.

---

**ENDOFLOMIT® 40 with KARL STORZ SCB**

with High Flow Insufflation (40 l/min.)

UI400S1  ENDOFLATOR® 40 SCB,
Set, with integrated SCB module,
power supply 100 - 240 VAC, 50/60 Hz
including:
- ENDOFLATOR® 40
- Mains Cord, length 300 cm
- SCB Connecting Cable, length 100 cm
- Universal Wrench
- Insufflation Tubing Set, with gas filter, sterile, for single use, package of 5 *

Subject to the customer's application-specific requirements additional accessories must be ordered separately.

---

*This product is marketed by mtp.
For additional information, please apply to:

mtp medical technical promotion gmbh,
Take-Off Gewerbepark 46,
D-78579 Neuhausen ob Eck, Germany
Notes: