Transanal Endoscopic Surgery

Robert Khoo, MD, FRSCS(c), FACS
John of Arderne
1307-1392
solution was employed throughout the operation, some two to three pints being utilised.

On the following day the patient’s condition was much improved; the drainage-tube was replaced by a gauze plug on the third day and the latter was removed on the fourth day. On the second day after the operation pain in the right side of the chest was complained of and examination led to a diagnosis of “dry pleurisy” at the right base and “pneumonia” involving the left lower lobe; the chest was strapped. The temperature on the third day was 93° and the pulse-rate was 84 per minute. From this date the temperature became irregular, varying from 97° to 102·8°. The bowels were well opened on the third day and the patient enjoyed a fish diet on the eighth day. An increasing area of dulness was detected on the right side of the chest and on the eighteenth day this reached the middle of the scapula posteriorly; a diagnosis of probable “empyema” was made. The signs at the left base gradually cleared up. On the twentieth day an aspirating needle inserted through the ninth right intercostal space in the posterior axillary line withdrew a pint of very offensive pus mixed with gas; accordingly on the following day a portion of the ninth rib was resected. The general pleural cavity was shut off by adhesions, the dome of the diaphragm being considerably raised, and an incision through the latter revealed a large abscess cavity between the liver and diaphragm, from which another pint of pus was

Thirdly, the beneficial effect of the anti-coli serum and bacillus coli vaccine which showed itself in an attempt to stop the spread of the septic process to a great extent, and in the rapid recovery of the patient and rapid healing of the sinuses after evacuation of the pus.

In conclusion, I must express my thanks to Mr. Ballance for his kindness in allowing me to conduct the treatment of the case and for permission to publish these notes.

St. Thomas’s Hospital.

A METHOD OF PERFORMING ABDOMINO-PERINEAL EXCISION FOR CARCINOMA OF THE RECTUM AND OF THE TERMINAL PORTION OF THE PELVIC COLON.

BY W. ERNEST MILES, F.R.C.S. ENG., L.R.C.P. LOND.,
SURGEON TO THE CANCER HOSPITAL, BROMPTON, S.W., AND TO THE GORDON HOSPITAL FOR DISEASES OF THE RECTUM, VAUXHALL BRIDGE-ROAD, S.W.

REMOVAL of the rectum by a combined abdominal and perineal operation was first performed by Czerny in 1884. Since that time several other surgeons, notably Maunsell,
Anterior Resection
Mayo Clinic Operation

Claude Dixon
1930
The mesorectum in rectal cancer surgery—the clue to pelvic recurrence?

Five cases are described where minute foci of adenocarcinoma have been demonstrated in the mesorectum several centimetres distal to the apparent lower edge of a rectal cancer. In 2 of these there was no other evidence of lymphatic spread of the tumour. In orthodox anterior resection much of this tissue remains in the pelvis, and it is suggested that these foci might lead to suture-line or pelvic recurrence. Total excision of the mesorectum has, therefore, been carried out as a part of over 100 consecutive anterior resections. Fifty of these, which were classified as ‘curative’ or ‘conceivably curative’ operations, have now been followed for over 2 years with no pelvic or staple-line recurrence.
Total Mesorectal Excision
Rectal Cancer
Goals of Therapy

• Primary – cure
• Secondary – avoiding stoma, preserve good bowel function
Rectal Cancer

Radical surgery - low anastomosis, poor function
Lower 1/3 cancer - APR + colostomy
Rectal Cancer

Too ill for radical surgery
Refuse colostomy
Palliative – small cancer with metastases
Rectal Cancer

- Avoid major surgery risks
- Avoid abdominal incision
- Avoid morbidity of pelvic dissection
- Avoid anastomosis and risks
- Avoid colostomy

Local Therapy
Rectal Cancer

Local excision

Electrocoagulation

Endocavitary radiation

Alternatives to Radical Surgery
Alternatives to Radical Surgery
Low Rectal Cancer

Trans-sacral - Kraske

Local Excision
Alternatives to Radical Surgery
Low Rectal Cancer

Trans-sphincteric
- York-Mason

Local Excision
Alternatives to Radical Surgery
Low Rectal Cancer

Transanal excision

Local Excision
Local Excision
Rectal Cancer
Transanal Excision

- Potential incomplete excision of cancer
- No lymphadenectomy

Disadvantages
<table>
<thead>
<tr>
<th>Stage at Diagnosis</th>
<th>Stage Distribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localized (confined to primary site)</td>
<td>47.7</td>
</tr>
<tr>
<td>Regional (spread to regional lymph nodes)</td>
<td>29.6</td>
</tr>
<tr>
<td>Distant (metastasized)</td>
<td>15</td>
</tr>
<tr>
<td>Unknown (unstaged)</td>
<td>7.7</td>
</tr>
</tbody>
</table>
Local Excision Rectal CA

- St. Mark’s Hospital
- 1948-1962
- 2,305 rectal cancer patients
- Only 76 (3.3%) considered ‘early’

Rectal Cancer
Local Excision

Clinical Criteria
- <8 cm from anal verge
- <3-4 cm size
- Not ulcerated
- Not fixed
- <40% rectal circumference
## Early Results Local Excision

<table>
<thead>
<tr>
<th></th>
<th>Local Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morson 1977</td>
<td>8.4%</td>
</tr>
<tr>
<td>Gall 1992</td>
<td>10%</td>
</tr>
<tr>
<td>Willett 1994</td>
<td>4%</td>
</tr>
</tbody>
</table>
Criteria for the selection of 'early' carcinomas of the rectum. Are they valid?

- 76 abdominoperineal specimens
- evidence of positive lymph nodes found
  - <4.0 cm diameter - 50% of tumors
  - mod or well differentiated - 51% tumors
  - partial invasion muscle layer - 25% tumors

Arch Surg 1987;122(5):533-6
Local excision of rectal cancer without adjuvant therapy: a word of caution.

- 82 patients - T1 (n = 55) and T2 (n = 27) rectal cancer transanal excision
- all tumors were localized to the rectal wall, negative excision margins, moderately/well differentiated, no blood or lymphatic vessel invasion, no mucinous component

Local excision of rectal cancer without adjuvant therapy: a word of caution.

- Recurrence at 54 months of follow-up
  - 18% of T1 tumors
  - 37% of T2 tumors – 47% at 5 years

- 5 y survival
  - 65% T2 local excision
  - 81% T2 radical surgery

\[ P = 0.03 \]

Local Excision
Causes of Failure

Incomplete excision – positive margins
Involved regional nodes
Local Excision
Not all T1 Cancers are the same

SM3 – highest incidence of lymph node mets

Size of Lymph Node Mets
Rectal CA

101 distal rectal cancers – radical resection
45% all positive nodes <5 mm

Tiny lymph nodes:
1. Common
2. Hard to detect
3. Lead to systemic metastases and treatment failure

Ann Surg Oncol 2001;8:413-7
Rectal Cancer
Transanal Excision vs Radical Surgery

NCI database 2,124 pts

<table>
<thead>
<tr>
<th></th>
<th>Local Excision</th>
<th>Resection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>0.5%</td>
<td>1.8%</td>
</tr>
<tr>
<td>30-day mortality</td>
<td>5.6%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Overall Survival</td>
<td>61.7%</td>
<td>66.3%</td>
</tr>
<tr>
<td>Local recurrence</td>
<td>14.3%</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

“Gold” Standard for Rectal CA Radical Surgery
Total Mesorectal Excision

Heald:
Local recurrence 6% overall
In ‘curative’ resections – local recurrence 3% (405 pts)

Arch Surgery 1998;133:894-9
Local Excision Rectal CA
Improving Results

Endoscopic Posterior Mesorectal Excision

Dis Colon Rectum 2006;49:919-24
Local Excision Rectal CA
What More Should Be Done?

Adjuvant radiation and chemo:
Post-op

**CALGB 8984**
T2 rectal cancer – local excision post-op 5-FU and 5400 cGy

Local recurrence 18%, distant mets 12%
5 Y survival 64%

Steele Dis Colon Rectum 2008;51:1185-1194
Adjuvant radiation and chemo:

**Pre-op**

Multicenter prospective phase II trial **ACOSOG Z-6041**

Local excision for uT2N0 rectal cancer following 5040 cGy + Xeloda/Oxaliplatin

- high pathologic complete response rate and negative resection margins
- complications are high

Local Excision Rectal Cancer

- Lower morbidity
- Lower mortality
- Quality of life better

Compared to radical resection
Dr. Gerhard Buess
1948-2010
Transanal Endoscopic Microsurgery
Buess 1983

12 and 20 cm length

40 mm diameter

Martin arm
Transanal Endoscopic Microsurgery

Advantages:
Avoid open surgery and abdominal incision
Less pain, shorter hospital stay, quicker return to work
Improved access over conventional transanal – up to 22 cm

Disadvantages:
Expensive
Steep learning curve
Complex set-up
Positioning limited - ideal supine lithotomy
Transanal Endoscopic Microsurgery

Carcinoma:

1. Cure - T1 – well or mod differentiated
2. Limited chance of cure – T2
   – reasonable for elderly/high risk patients
3. Palliative cases – T3, <4 cm size

Transanal Endoscopic Microsurgery

326 patients 1983 – 1992
74 carcinomas
1. T1 n=51
2. T2 n=17
3. T3 n=6

Complications – 9% - dehiscense suture line, RV fistula

Mortality:
0.5% adenoma group
0% cancer group

Rectal Cancer & Adenoma
TEM compared to Transanal Excision

82 TEM compared to 89 transanal – mean follow-up 37 months

<table>
<thead>
<tr>
<th></th>
<th>TEM</th>
<th>Transanal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact specimen</td>
<td>94%</td>
<td>65%</td>
</tr>
<tr>
<td>Clear margins</td>
<td>90%</td>
<td>71%</td>
</tr>
<tr>
<td>Recurrence rate</td>
<td>5%</td>
<td>27%</td>
</tr>
</tbody>
</table>

Moore Dis Colon Rectum. 2008;51:1026-31
Rectal Cancer
TEM compared to Transanal Excision

TEM compared to transanal excision T1 and T2 rectal cancers

<table>
<thead>
<tr>
<th></th>
<th>TEM n=42</th>
<th>Transanal excision n=129</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmented specimen</td>
<td>6%</td>
<td>35%</td>
</tr>
<tr>
<td>Negative resection margin</td>
<td>98%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Rectal Cancer
TEM compared to Anterior Resection RCT

T1 rectal cancer TEM n = 24 compared to Anterior resection n = 26

Winde Dis Colon Rectum 1996;39:969-76
Rectal Cancer
TEM compared to Radical Surgery RCT

70 patients T2 rectal cancers all treated with Neoadjuvant therapy randomized to:
1. TEM
2. Laparoscopic total mesorectal excision

Median follow-up 84 months

<table>
<thead>
<tr>
<th></th>
<th>TEM</th>
<th>Radical Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local recurrence</td>
<td>5.7%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Probability of</td>
<td>94%</td>
<td>95%</td>
</tr>
<tr>
<td>disease-free survival</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEM Safety

Bleeding
Suture line breakdown – partial or complete
Perforation
Abscess
Rectovaginal fistula

Rate of complications: 6%
German experience – 1,400 adenomas and 286 carcinomas

Endosc Surg Allied Tecnol 1994;2:251-4
Rectal Cancer
Transanal Excision

Level

low as 5-7 cm
93 patients anorectal function studied pre-op and post-op after TEM

Transanal Endoscopic Microsurgery
Conclusions

Compared to conventional transanal excision:
Superior visualization
Clear margins
Intact specimen
Lower recurrence rate
Improved survival
Alternatives to TEM
Transanal Excision of a Rectal Adenoma Using Single-Access Laparoscopic Port

Robert E. H. Khoo, M.D.
Center for Colon and Rectal Surgery, Santa Rosa, California

ABSTRACT: Many rectal tumors can be excised transanally using inexpensive equipment. Transanal endoscopic microsurgery allows excision of lesions beyond the reach of conventional technique. Transanal endoscopic microsurgery is performed with specialized expensive instruments. Surgeons working in smaller community hospitals lack the budget to purchase transanal endoscopic microsurgery instruments. I modified the transanal endoscopic microsurgery technique by using a single-incision laparoscopic port that was inserted into the anal canal. Through this port, instillation with gas maintained exposure of the surgical site, a 30-degree 5-mm camera, a grasper, and electrosurgery were used to remove a large villous adenoma. This is the first report of the use of a single-access port to perform transanal endoscopic microsurgery. This modification is inexpensive compared with traditional transanal endoscopic microsurgery and allows more surgeons to perform difficult transanal tumor excisions (see Video, Supplemental Digital Content 1, http://links.lww.com/DCR/A39).

KEY WORDS: Transanal endoscopic microsurgery; Laparoscopy; Rectal adenoma; Knot tying.

REPORT OF A CASE: The patient is an 87-year-old man who presented with a 6-cm polyp in the posterior rectum 10 cm from the anal verge. Biopsy showed no cancer or dysplasia. Because the lesion was not amenable to colonoscopic polypectomy, he was referred for transanal excision. TEM was considered. After bowel preparation and coverage with intravenous antibiotics, the patient was positioned in supine lithotomy. Sedation and local anesthesia were administered. Because of excessive respiratory motion, general anesthesia was later used. A single-incision laparoscopic port was used as a TEM rectoscope. A single monitor was at the head of the bed. Instillation with carbon dioxide was set at 15 mm Hg. A 5-mm 30-degree laparoscope, a laparoscopic grasper, and cautery were inserted into the 3 remaining
Transanal minimally invasive surgery: a giant leap forward

Sam Aflah · Matthew Albert · Sergio Lancer

Abstract

Background: Our novel approach is a hybrid between transanal endoscopic microsurgery (TEM) and single-port laparoscopy that we have termed TransAnal Minimally Invasive Surgery (TAMIS). We report the clinical application of this technique and present preliminary data that show TAMIS to be an effective tool for resection of both malignant and benign lesions of the rectum.

Methods: Over a 3-month period (May–July 2008) all patients with rectal lesions who were candidates for conventional transanal excision were offered the option to undergo TAMIS resection. Patients with biopsy-proven malignant lesions were required to undergo endorectal ultrasonography to determine tumor stage. To perform TAMIS, a single-access laparoscopic surgery port (SILS Port, Coviiden) is introduced into the anal canal by applying steady manual pressure. Once centered in position, endoscopic access to the rectal vault is gained and parameters are established. With this access, ordinary laparoscopic instruments, including graspers, thermal energy devices, and needle drivers, are used to perform the transanal excisions.

Results: Six patients, aged 43–85 years old (mean = 59.8), underwent TAMIS resection of rectal lesions. The average distance from the anal verge was 9.3 cm and the mean tumor diameter as confirmed by pathology measured 2.8 cm. There were no conversions from TAMIS to conventional transanal excision. The average operating time was 86 min. Four of the six TAMIS resections (67%) were completed in less than 1 h. The mean set-up time was only 1.9 min and this may be one reason that the mean operative time was considerably less than the average experience time for TEM surgery (130–140 min). In short-term follow-up, there was no morbidity or mortality observed.

Conclusions: TAMIS is a feasible alternative to TEM, providing its benefits at a fraction of the cost.

Keywords: Transanal excision · Rectal cancer · TAMIS · Single-access port

Compared to conventional transanal excision, transanal endoscopic microsurgery (TEM) provides superior quality of resection, documented local recurrence, and improved survival, particularly among patients with histologically favorable stage I rectal cancer [1–5]. In long-term follow-up, the mortality of TEM excision of rectal tumors has proven to be safe and effective, with morbidity and mortality similar to that of conventional transanal excision [6–10]. However, although TEM has been in use for more than 20 years, it has been slow to be universally adopted by colorectal surgeons, in part because of a steep learning curve, but also because of the significant cost of the highly specialized instrumentation [11, 12].

Technology continues to undergo rapid evolution. In parallel, the surgeon’s minimally invasive surgery skill has advanced this advancement. Conversely, existing by which instrumentation designed for a single application can be used for a different task. Such is the case for natural orifice transluminal endoscopic surgery (NOTES) whereby endoscopes and even TEM instrumentation has been used to perform NOTES [13–16].
Endoeye
SILS Port Transanal Endoscopic Microsurgery

Less expense
Can use conventional laparoscopic instruments:
  45 degree 5 mm camera or endoeye
  Lap graspers
  Lap cautery
  Ligasure or Harmonic scalpel can be used
  Suture with Endostitch
  V-loc stitch to avoid tying knots

Advantages over TEM - 1
SILS Port Transanal Endoscopic Microsurgery

SILS Port soft, less traumatic dilatation of anal canal
Maneuverable – no need to place patient prone
Camera not fixed
Easier to learn

Advantages over TEM - 2
Other Names for TEM with SILS Port

TAMIS - transanal minimally invasive surgery
TEVA - transanal endoscopic video-assisted excision
TEO - transanal endoscopic operation
TES - transanal endoscopic surgery
SPA - single port access surgery
NOTES - natural orifice translumenal endoscopic surgery
Transanal Endoscopic Surgery
Transanal Glove Port

a Anal dilator in position
b Wound protector after insertion
c Wound protector in position
d Glove port with trocar sleeves
The Future

Transanal single-port low anterior resection in a cadaver model. Surg Endosc 2010;24:1765

NOTES transanal rectal cancer resection using TEM and laparoscopic assistance. Surg Endosc 2010;24:1205-10

Robotic TEM

Tech Coloproctol 2012;16:389-92
Modified TEM Scope
