Natural Orifice Translumenal Endoscopic Surgery (NOTES)
- Use of flexible endoscopy to perform surgery through natural orifices (rectum, vagina, stomach)

Transanal Endoscopic Microsurgery (TEM)
- First attempt at minimally invasive surgery through, and in, a natural orifice
- Use laparoscopic instruments through a rigid operating proctoscope
Developed by Professor Gerhard Buess
- From Tuebingen, Germany
- Became available for widespread use in 1983

One of the first methods of endoluminal surgery
- Uses the view of a proctoscope and the instruments of laparoscopy
Use of TEM

- For minimally invasive excision
  - Large endoscopically irretrievable rectal polyps and $T_1$ rectal cancers; some extended used for more advanced disease

- More precise than traditional transanal excision
  - More likely to get clean margins with less manipulation of the mass

- Avoids abdominal incision
Indications of TEM

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

- **Malignant**
  - Malignant rectal polyps
  - T<sub>1</sub>-T<sub>2</sub> rectal cancer
  - Palliative excision of T<sub>3</sub> cancer

Preoperative Evaluation of TEM

- Full colonoscopy
  - Rule out synchronous lesions

- Rigid proctoscopy
  - Determine level and position of lesion

- Endorectal ultrasound
  - Confirm stage of lesion/depth of penetration
  - Confirm uT₀ or uT₁ status
    - If uT₂ or uT₃ should do definitive surgery if patient a candidate
    - TEM is not generally used to treat N₁ disease

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Position of lesion determines positioning of patient on the operating room table.

The lesion should be made to be in the 6 o’clock position for the operator.
Patient Positioning in TEM

Lesion at right lateral position

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Equipments used in TEM

- Rigid proctoscope
- Operating instruments
- Stereoscope
- Insufflator-suction device

Setup available by Wolf Surgical Instruments Co. (Vernon Hills, IL, USA) or Karl Stortz GmbH & Co. (Tuttlingen, Germany)
Proctoscope used in TEM

- 40 mm operating proctoscope

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Operating Instruments in TEM

- Angle of instruments key in manipulation of tissues with limited range of motion
- Graspers, suction, electrocautery, needle-holders, etc.

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- Provides binocular vision
- Microscope – magnifies 6x
Visualization with TEM

monocular vision

binocular vision in the whole rectum with TEM
Insufflator–Suction Device used in TEM

- Maintains continuous pressure by constantly insufflating CO₂ into the rectum and suctioning CO₂ out – maximizes operating field
TEM
TEM: Marking
TEM: Excision
TEM: Closure
Professor Buess published early results in 1987
- 75 patients
- 3 experienced complications in short-term follow-up
- 1 with recurrence requiring salvage surgery

Later series by Buess in 1994
- 265 patients; 1989-1993
- 190 adenomas; 75 rectal cancers
- 14 month follow-up in >90% patients

Average OR time - 92 minutes
- Mucosectomy - 62 minutes
- Partial wall excision - 77 minutes
- Full thickness excision - 96 minutes
- Segment resection - 163 minutes
TEM: for Rectal Tumors

- Complications
  - Perforation of intraperitoneal rectal wall – unable to close using TEM in 3.9%
    - Required LAR (2 patients) or diversion (1 patient)
  - Early mild incontinence/soiling in 2.6%
    - Resolved by 10 weeks

- No mortality

TEM: Conclusions

- Technically demanding procedure
- Utilizes highly specialized instrumentation
- Advanced endoscopic technique
- Can spare selected patients laparotomy and anterior resection
- Adequate training is imperative
- Patient selection is paramount
Thanks

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