# ENDOANAL SONOGRAPHY IN PERINEAL SEPSIS

ROCHE B., DELÉAVAL J., MARTI M. C.

POLICLINIQUE DE CHIRURGIE, GENEVE, SUISSE

**Introduction:** In the past decade there has been a resurgence of interest in the use of endoluminal ultrasonography for a variety of anorectal applications.

The introduction of technology that allows real-time 360° radial scanning of the anorectum and the surrounding structures began a new era in endoluminal imaging. The ability of accurately stage rectal cancer preoperatively was the first real benefit realised by the use of this new modality; many other useful applications in the field of colorectal surgery have since become apparent.

## Generality

Ultrasonography is an imaging technique whose principle is based on the interaction between transmitted sound waves and the juxtaposed different tissue densities of the body. A transducer emits pulsed sound waves of a specific frequency with defined depth of penetration through the tissue layers. The sound waves pass through tissue planes, and at each interface between different tissue densities and acoustic impedance, some of the sound waves are reflected toward the transducer. The time difference between sound transmission and reception is calculated, and an image is generated by the digital sequential processing of a multitude of sound waves (5). The rectum and anal canal are well suited for ultrasonographic evaluation because of the variety of tissue density interfaces present in this readily accessible region.

Ultrasonography is less expensive, relatively quick and is well tolerated by the patient. Moreover, the patient is not exposed to radiation during the course of the examination.

The examination can also be performed as an intraoperative procedure, which may be helpful for detecting abscess cavities, fistula tracts, or internal openings.

Endoluminal ultrasonography has emerged as one of the newer diagnostic examinations that can complement the clinical examination and therefore provide relevant information with a direct impact on planned treatment.

## **Technique of Endoanal Ultrasonography**

There is no need for sedation, and therefore no need for specialised monitoring. The patient is placed in the gynecologic position. A digital rectal examination serves the dual purpose of excluding significant anal stenosis and lubricating the anal canal.

We currently use the 1846 Brüel & Kjaer (Naerum, Denmark) scanner and a 7.0 M H z 8539 transducer with a focal length of 2 to 5 cm. A small finger cot balloon is placed over the transducer and properly secured in place.

It is not necessary to use expensive degassed saline water as long as all bubbles have been evacuated from the water. By convention, the ultrasound probe is held with the spigot in the upright position, and the probe is maintained in the centre of the lumen. A sonolucent, tapered plastic cap is placed over the transducer. This cap is then filled with water and all bubbles are removed.

A condom containing ultrasound gel is placed over the probe, and this is lubricated with a water soluble lubricant.

Endoanal Ultrasonography

#### Normal image

Tjadra et al. (11) have performed elegant post-mortem and clinical studies and have identified the anatomic layers that correspond to the anal ultrasound images. The mucosa-submucosa complex typically appears as a hyperechoic band adjacent to the transducer and the cap. The internal anal sphincter is observed as a hypoechoic circle.

The internal anal sphincter has an average thickness of 2 to 4 mm which seems to increase with advancing age (1). There is no correlation between me sonographically determined anal sphincter thickness and the mean maximum resting pressure (4).

The external anal sphincter is a striated muscle that appears sonographically as a mixed echogenic band outside the hypoechoic internal anal sphincter. The outside borders of the external anal sphincter with the perirectal fat are not clearly defined (9).

It is easy to divide the anal canal into upper, middle and lower thirds based on anatomic lendmarks. At the level of the upper anal canal, the puborectalis muscle sling is observed as mixed echogenic U-shaped band, which encircles the rectum posteriorly (Fig 1).

Because of the sling anatomy of the puborectalis muscle, there is a hypoechoic gap anteriorly, which can be easily confused with anterior sphincteric defect. By filling a latex balloon with water or by introducing the finger in the vagina it is possible to avoid this artefact and measure the thickness of the anterior wall (Fig 1).

The hypoechoic internal anal sphincter becomes more prominent, and the anterior quadrant is replaced with the circumferential mixed echogenic fibers of the external anal sphincter. The middle canal is defined as the level of maximum wide internal anal sphincter (Fig 2). At this level the majority of sphincteric defects are discovered.

At the lower anal canal level, the majority of the musculature is the mixed echogenic subcutaneous portion of the external anal sphincter (Fig 3). This level of the anal canal may be the site where internal openings of anal fistulas are discovered.



Fig.1 Endoanal ultrasound at the level of the upper anal canal. Puborectalis muscle sling course posteriorly around the rectum. The relative lack of muscle fibres anteriorily is normal anatomy. By introducing the finger in the vagina it is possible to avoid this artefact and measure the thickness of the anterior wall.



# Fig. 2

- Normal endo-anal ultrasonography of the medial part of anal canal. 1. hyper-echogeneous layer: space between the balloon and the mucosa
- 2. hypo-echogeneous layer: mucosa
- 3. hyper-echogeneous layer: submucosa
- 4. hypo-echogeneous layer: internal sphincter
- hyper-echogeneous layer: (internal arrow) longitudinal muscle mixed echogeneous layer (between the two arrows): external sphincter



#### **Fig.** 3 Lower anal canal 1. Probe

2. Subcutaneous portion of the external anal sphincter

# Anal ultrasonography in the diagnosis and management of abscess and fistula disease of the anorectum

Most anal abscesses and anal fistulas have a similar cryptoglandular origin. Infection is thought to originate in the anal glands that lie in the intesphincteric space between the internal anal sphincter and the external anal sphincter of the anal canal (7-8). Most cases of anorectal sepsis are easily cured by drainage of pus and laying open superficial fistulas. In a few patients the diagnosis of anorectal sepsis is difficult because collections of pus are deep-seated and not obvious on clinical examination.

# 8.5.3.1 Methodology

Endoanal ultrasound should be no more painful than digital examination of the anus. Scanning is performed at different levels by gently moving the probe in and out of the anal canal. A general examination of me anal canal is performed, looking for any obvious gaps in the sphincter muscles. Defects in the sphincter muscles may result from damage caused by sepsis (Fig 4), or follow surgical division of the sphincter and division of the sphincter by a cutting seton. Tracts and collections of pus are identified. These may lie outside the anal sphincters (Fig 5), pass through the external sphincter as a transsphincteric tract (Fig 6), or lie in the intersphincteric space (Fig 7). It can be difficult to differentiate between a tract and a small collection at one level. Both tend to be hypoechoic, but tracts often have hyperechoic shadows in the middle, which represent gas within the tract. Injecting dilute hydrogen peroxide into the external opening accentuates the interface between the fistula tract and surrounding tissues, resulting in a hyperechoic image on ultrasound scanning (2). The technique is suited particularly to

## 8.5.3.2 Results

recurrent fistulas.

Endoanal ultrasonography using a rotating probe (10) or a linear sector probe (12) has been used for patients with Crohn's disea-



#### Fig.4 Fistula

Defects in the internal and external sphincter muscles at 6 o'clock may result from damage caused by sepsis



Fig. 5

Horse schoes collections of pus lying outside anal sphincters in the posterior part



#### Fig. 6

Anterior transsphincteric tract, passing through the external sphincter at 12 o'clock

se, abscesses and fistulas were identified around the anal canal and lower rectum that were not detectable by clinical examination. A number of studies have been performed to examine the usefulness of endoanal ultrasound scanning in crypto-glandular and anal sepsis (3-6). Denn et al (3) reported a consecutive series of 21 patients from Birmingham with complex anal fistulas. The ultrasound findings were compared with findings at surgery. Comparison of the sonographic and surgical findings are shown in (Table 1).

All fistula tracts and fluid collections were identified correctly. The internal opening was difficult to indentify with confidence in most patients.

Similar results for the use of endoanal ultrasound in assessing anal fistulas were reported by the group from St Mark's Hospital (Table 2) (6).

Criteria for identifying the internal opening include a hypoechoic breach of the subepithelial layer, a defect of the internal anal sphincter and a hypoechoic lesion in the intersphincteric space. Using these new criteria, the rate of accurately identifying the site of the internal opening now is more than 80% (Fig 8).

Endoanal ultrasound scanning is useful in excluding an anal origin for sepsis in the perianal region developing from hydredenits suppurativa or a pilonidal sinus.

# 8.5.3.3 Conclusions

Accurate preoperative assessment of an anal fistula is fundamental for successful surgical treatment. Endoanal ultrasound provides much useful information to the surgeon.

# Table 1.

Ultrasound Versus Surgical Assessment of Anal Fistulas. **Birmingham Series** 7

Component	Surgery	US Right	US wrong	Accuracy
Internal opening	20	2	0	10%
Horseshoe tract	11	10	1*	91%
Fluid collection	8	8	0	100%
Fistula tracts	37	37	0	100%

Table 2.

Ultrasound Versus Surgical Assessment of Anal Fistulas. St Mark's Series 18



Fig. 7

Collection of pus in the intersphincteric space from 2 to 7 o'clock



#### Fig. 8

Identification of 2 sites of fistula internal opening located at 12 and 6 o'clock

#### References:

- 1. Burnett, S. S. D., Bartram, C. I.: Endosonographic variations in the nor-
- Denkett, S. S. D., Dartalli, C. L. Endosonographic valuations in de nor-mal internal anal sphincter. Int. J. Colorec. Dis. 6: 2-4, 1991
  Cheouy, D.M.O., Nogueras, J. J., Wexner, S.D.: ... Analendosonograp-hy for recurrent anal fistulas: Image enhancement with hydrogen peroxi-de. Dis. Colon. Rectum. 36: 1158-1160,1993
  Deen, K. L., Williams, J. G., Hutchinson, R. et al.: Fistulas in ano: Endo-
- anal ultrasonographic assessment assists decision making for surgery. Gut. 35:391-394, 1994
- 4. Gantke, B., Schafer, A., Enck, P. et al.: Sonographic, manometric, and myographic evaluation of the anal sphincters morphology and function. Dis. Colon. Rectum. 36: 1037-1041,1993
- 5. Gould, R. G .: Fundamental physics of CT, MR, and ultrasound imaging. Perspect. Colon. Rectal. Surg. 2: 115-130, 1989 6. Law, P. J., Talbot, R. W., Bartram, C. J. et al.: Anal endosonography in the
- evaluation of perianal sepsis and fistula in ano. Br. J. Surg. 76:752-755,1989
- 7. Parks, A. G: Pathogenesis and treatment of fistula-in-ano. Br. Med. J. 1: 463-469,1961
- Parks, A. G. Morson, B. G: Fistula-in-ano. Proc. R. Soc. Med. 55: 751-758,1962
- 9. Sultan, A. H., Kamm, M. A., Talbot, I. C. et al.: Anal endosonography for identifying external sphincter defects confirmed histologically. Br. J. Surg. 81:463-465,1994
- Tio, T. L., Mulder, C. J. J., Wijers, O. B. et al.: Endosonography of peri-anal and peri-colorectal fistula and/or abscess in Crohn's disease. Gastrointest. Endosc. 36: 331-336,1990
- 11. Tjandra, J. J., Milsom, J. W., Stolfi, V. M. et al.: Endoluminal ultrasound defines anatomy of the anal canal and pelvic floor. Dis. Colon. Rectum. 35:465-470,1992
- 12. Van Outryve, M. I., Pelckmans, P. A., Michielsen, P. P. et al.: Value of transrectal ultrasonography in Crohn's disease. Gastroenterology 101: 1171-1177,1991

A superficial horseshoe tract at the anal verge was missed b ultrasound. Note: Results of two separate investigations into the accuracy of e n d o inal ultrasoundf scanning in assessing anal fistulas. The ultrasouns findings were copared with the findingsa at operation.