Original Article

Evaluation of Diagnostic Accuracy of Anal Fistula by 360° Endoanal Ultrasound

Singha JL[1], Ahmad S[2], Ahmed N[3], Nayeem SMZ[4], Rayhan F[5], Ahmed FU[6]

Conflict of Interest: None
Received: 05-08-2018
Accepted: 06-11-2018
www.banglajol.info/index.php/JSSMC

Abstract

Introduction: *360° endoanal ultrasound (EAUS) has become an effective imaging tool to diagnose anal fistulas for last three decades.*

Objectives: *To assess the diagnostic accuracy of 360° endoanal ultrasound imaging comparing pre and peroperative diagnosis in anal fistulas.*

Methods: *Between Jauary 2015 and June 2018, 240 patients with clinical anal fistula underwent endoanal sonographic assessment using a 360° endoanal transducer (7–15 MHz The sonographic findings, including the fistulas and other inflammatory lesions, were correlated with surgical results. The types of fistulas on endoanal sonography based on classification of Park and the internal opening of the fistula, both pre and peroperative, were compared to those of other studies.*

Results*: The 240 patients studied included 165 male and 75 female patients. Endoanal sonography was able to show and track hypoechoic lesions, their locations, and internal openings of the fistulas. Compared with surgical results, endoanal sonography had sensitivity of 94.6%, specificity of 100%, and accuracy of 94.1% for the diagnosis of perianal fistulas. Also, endoanal sonography had accuracy of 86.1% for determining fistula types based on the Parks classification and 92.8% for identifying internal openings of the fistulas.*

Conclusions*: Endoanal ultrasound is an accurate and noninvasive imaging modality for evaluation of fistulas. It is a very useful tool for preoperative management and surgical planning by providing precise and detailed information on fistulas.*

Key Words: Endoanal ultrasound; Anal fistula; Preoperative diagnosis, Accuracy.

[J Shaheed Suhrawardy Med Coll 2018; 10(2): 66-69]
DOI: https://doi.org/10.3329/jssmc.v10i2.41159

Introduction:

Anal fistula is a common infectious disorder in the rectum and anal canal. It has substantial morbidity and often requires multiple surgical treatments because of its high recurrence. Surgical treatment of perianal fistulas continues as a challenge for surgeons. Perfect preoperative evaluation of an anal fistula is important for adopting the best surgical strategy to avoid recurrences. The correct surgical classification of the fistula before the operation and the relationship with the anal sphincters is essential in choosing an adequate treatment. Clinically, fistulography and computed tomography (CT) have been used to assess anal fistulas, although they have limitations. In general, magnetic resonance imaging (MRI) is accepted extensively as the predominant imaging modality for management of perianal fistulas. In many countries, however, MRI is still not the mainstay for preoperative assessment of fistulas because of its high cost, unavailability and special coil requirements.

In the past, endoanal sonography was not a real time technique, instead using a rotary device attached to the transducer to rebuild a short-axis section image of the anal canal. Therefore, the imaging quality was poor without real-time capability. With technological developments, full 360° endoanal sonography with real-time imaging is now available for clinical applications, which can provide

1. Dr Jawhar Lal Singha, Associate Professor, Deprtment of Surgery, Shaheed Suhrawardy Medical College
2. Dr Sami Ahmad, Associate Professor, Deprtment of Surgery, Shaheed Suhrawardy Medical College
3. Dr Nadim Ahmed, Senior Consultant, Deprtment of Surgery, Shaheed Suhrawardy Medical College Hospital
4. Dr. S.M. Zulker Nayeem, Assistant Professor, Deprtment of Paediatric Surgery, Khulna Medical College, Khulna
5. Dr. Ferdoush Rayhan, Medical officer, Deprtment of Surgery, Shaheed Suhrawardy Medical College Hospital
6. Dr. Farhad Uddin Ahmed, Junior Consultant, Deprtment of Surgery, Shaheed Suhrawardy Medical College Hospital

Correspondence to: Dr. Jawhar Lal Singha, Email: jlsingha.surg@gmail.com

circular short-axis section imaging of the anal canal, as can MRI. The aim of this study was to assess the diagnostic accuracy of anal fistula on Park's classification comparing and correlating preoperative sono-diagnosis and peroperative findings and to suggest its potential implication in practice.

Materials and Methods:

In the study 240 patients with clinically diagnosed anal fistula underwent endoanal ultrasound for confirming diagnosis in Khulna Colon-Rectum Reseacrh Center (KCRC), Khulna from January 2015 to July 2018. Finally concordance was found in 226 patients of whom 195 patients underwent surgical treatment. 2D 360° radial array Probe (7-15 MHz, made in USA) was used in the study. The sonologist and the surgeon was the same person who is a classified colorectal surgeon and well trained in 360° endoanal ultrasonography. Informed consent was obtained from each patient. All patients were scanned in the left lateral position without any special bowel preparation or anesthesia. Only the pre scanning phosphate enema was used to cleanse the bowel. The 10-mm-diameter transducer was covered with a condom and with adequate lubrication. The position of patient was modified Sim's or left lateral. The 360° probe was manually introduced and rotated within anal canal and rectum. The transducer was moved up-down with tailored position of patient. After real-time scanning of the 'Anorectum', 3 typical imaging planes were acquired and stored digitally for later analysis: (1) Superficial level of an anal transverse section, which was the level of the distal anal canal showing the hyperechoic layer of the external anal sphincter. (2) Mid level of an anal transverse section, which was the mid level of the anal canal showing the hypoechoic internal anal sphincter, conjoined longitudinal anal muscles, external anal sphincter, perianal body, and perianal muscle and (3) Deep level of an anal transverse section, which was the proximal level of the anal canal showing the U-shaped hyperechoic puborectalis muscle. Endoanal sonography was attempted to identify the primary tract and its orientation with reference to the 'anal clock' and also to track its course and relationship with the anal sphincter complex for comparison with surgical results using the standardized surgical classification of Parks et al. The Parks classification includes the following categories and definitions: (1) Intersphincteric fistula, in which the course of the fistula passes through the internal anal sphincter to the intersphincteric space and then to the perineum; (2) Transsphincteric fistulae, in which the fistula, located in the lower portion of the anal canal, passes through the internal and external anal sphincters into the ischiorectal fossa and then to the perineum; (3) Suprasphincteric fistula, in which the fistula is located in the intersphincteric space superior to the puborectalis muscle and into the ischiorectal fossa and then to the perineum; and (4) Extrasphincteric fistula, in which the fistula starts from the perianal skin and passes through the levator ani muscles to the rectal wall and outside sphincters. The location of the internal opening of the fistula on endoanal sonography was determined by axial imaging using the surgical anal clock, where the 12-o'clock position is close to sacral, and the 6-o'clock position is close to the anterior perineum.

The sensitivity, specificity, overall accuracy, positive predictive value (PPV), and negative predictive value (NPV) of EAUS for diagnosis were calculated and compared with other studies.

Results:

The 240 patients were studied including 165 male and 75 female patients with an age range of 18 to 68 years (mean age, 43 years). All patients tolerated the examination well and no side effects or complications were reported. Endoanal sonography showed the anatomy of the perianal region and abnormal structures in detail. The layers of the anal, wall identified with endoanal sonography were the hyperechoic mucosa/ submucosa, the hypoechoic internal anal sphincter, the hyperechoic intersphincteric groove, the hypoechoic external anal sphincter, and the hypoechoic puborectalis muscle. Fistula tracts were visualized as hypoechoic Strip like lesions. The internal fistula opening was identified as a hypoechoic area as a defect in the internal anal sphincter at the intersphincteric plane. The endoanal sonographic findings were in accordance with surgical results in 226 of 240 patients. In 17 of the 240 cases, preoperative endoanal sonography missed the anal fistulas, which were detected by surgery. In 34 of 226 cases, endoanal sonography showed no anal fistulas, instead showing other abnormalities, including simple anal abscesses (16), sweat anal gland inflammation (2), perianal submucosal abscesses (7), hemorrhoids (3), a subcutaneous fistula (4), and a pilonidal sinus abscess (2), and the sonographic diagnoses were consistent with surgical results. The sensitivity, specificity, PPV, NPV and overall accuracy of endoanal sonography for detection of perianal fistulas are shown in Table I.

A total of 195 cases of anal fistulas (178 male and 17 female) detected by endoanal sonography were confirmed by surgical results. The types of anal fistulas were also confirmed by surgery. The sonographic findings were also consistent with surgical results in 168 of 195 cases based on the Parks classification. However, in 27 of 195 cases, the preoperative sonographic classifications did not match the surgical results (Table II).

In 181 of 195 cases, endoanal sonography was able to show the internal openings, including multiple internal openings in 11 cases, which were consistent with surgical findings.

Table-I

Sensitivity, Specificity, PPV, NPV, and Overall Accuracy of Endoanal Sonography for Detection of Aanal Fistulas

Parameter	Value
Sensitivity , %(n)	94.6% (195/206)
Specificity, % (n)	100%(34/34)
PPV, % (n)	100% (195/195)
NPV. % (n)	66.6% (34/51)
Accuracy , % (n)	94.1% (226/240)

Table-II

Accuracy of Endoanal Sonography for Anal Fistula Types:

Classification	Sonographic finding	Surgical finding	Accuracy
Intersphincteric	53	63	84.12%
Transphincteric	107	117	91.45%
Suprasphincteric	4	7	57.14%
Extrasphincteric	4	8	50.00%
Total	168	195	86.1%

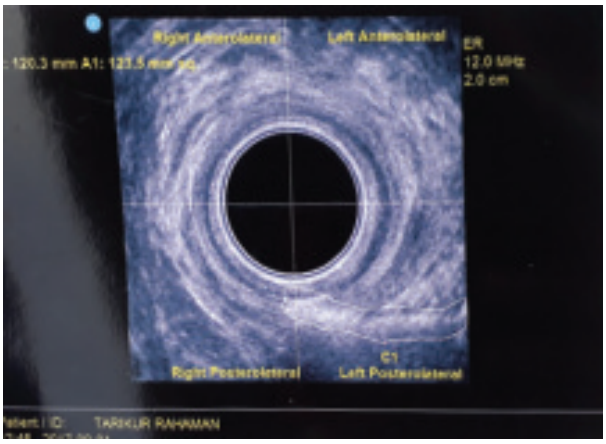

Fig.-1

Discussion

Anal fistula is a chronic disorder of the lower gastrointestinal tract with substantial morbidity. Since imaging techniques have played a limited role in evaluation of perianal fistulas in the past, these fistulas were often associated with high recurrence rate and required repeated surgical treatments. Recurrence is usually caused by an tract that is undetected and untreated completely. The purpose of surgery is to remove the fistula completely with minimal damage to the sphincter for the retention of sphincter functions. Incorrect classification or determination of the extent increases the risk of incomplete healing, recurrence, and inadvertent sphincter injury, which may cause postoperative incontinence. Therefore, precise preoperative diagnosis and classification of perianal fistulas are very important for clinical management. Fistulography and CT have their limitations in assessing perianal fistulas. Fistulography is an anteroposterior projective radiographic method, which cannot classify fistulas without adequate depiction of anatomy; therefore, it is often unclear and difficult to interpret. MRI and endoanal sonography for evaluation of anorectal fistulas have attracted more attention and motivation. Pelvic MRI provides excellent anatomic and pathologic information on anorectal fistulas which is required for guiding surgical planning. However, the fact that MRI needs a special costly coil that can hinder its clinical applications. It is better in assessing sphincter damage and atrophy. The procedure can be painful for patients. EAUS is a real-time cross-sectional imaging modality with advantages of high resolution, less pain, lack of radiation, continence and cost-effectiveness. Moreover, because of a lack of air in the anal canal, the anus lies tightly around the endocavitary transducer and excellent imaging of the anal canal wall can be obtained. EAUS can show the anatomy of the internal and external anal sphincters and the conjoined longitudinal anal muscles as well as the location of the internal opening of a fistula. Grayscale imaging is superior to other imaging modalities for soft tissue imaging, especially in near-field structures. In this study, 360° real time ultrasound transducer was used which is superior to the previous mechanical rotary endoanal probe. It can show the axial image constantly and has excellent intrinsic soft tissue resolution of anorectum and peri-anorectum. The results of study indicate that endoanal sonography has high sensitivity and specificity with good overall accuracy, as shown in Table-I.

In the past, surgeons performed fistula operations on the basis of the Goodshall criterion without imaging assessment. At present, the Parks classification with 4 types of fistulas based on the relationship between the fistula and sphincters, is the most widely used classification guiding surgical interventions. Since the surgical approach is related to the type of fistula, surgeons prefer to obtain accurate information and clarify the type of fistula before the procedure. The preoperative classification by endoanal sonography in this study

revealed that the total diagnostic accuracy rate was 86.1% (168 of 195) compared with surgical results. Thus, endoanal sonography is feasible for classification of perianal fistulas for clinical management and treatment choices.

Recurrence of a complex anal fistula after surgery is very common mainly because of incomplete surgical removal of fistula tract and the inability to identify internal openings. With the use of the 360° circular endocavitary transducer, axial images of the anal and perianal structures were clearly displayed especially for precise localization of the internal opening. Compared with traditional sonography, accuracy for determining the internal opening was increased. In many studies, the use of a variety of endosonographic methods has been reported with high accuracy for delineation of the internal openings in fistula cases. Buchanan et al reported that anal endosonography was especially good in correctly predicting the internal opening in 91% of patients which was close to our study i.e. 92.8%. Sun et al study showed the rate of diagnosis confirmed by surgery and it was 94.6% which is comparable to 94.1% of our study. Thus EAUS could improve surgical outcomes and reduce fistula recurrence by better identification of the internal opening before surgery. Because the field of view of sonography is small, EAUS has a limited depth and area for showing perianal structures compared with MRI. In our study, endoanal sonography was able to image and assess transsphincteric and intersphincteric fistulas with high classification accuracy (91.45% and 84.12%, respectively). However, only 50% of extrasphincteric fistulas and 57.14% of suprasphincteric fistulas were correctly diagnosed and classified. Thus, EAUS has inherent limitations for fistulas located in the deep area or high level of the anal canal or if the fistula is associated with a gas-containing abscess or recurrent lesions. Furthermore, its clinical use has a moderate learning curve. EAUS is highly operator dependent and it has a limited ability to resolve suprasphincteric and extrasphincteric fistulas. However, it can effectively distinguish between infections and fibrosis with the use of color Doppler flow imaging.

Conclusion:

Endoanal sonography can provide excellent imaging of the anorectal wall along with the surrounding sphincteric structures. Its real-time imaging capability can dynamically track and map the course of fistulas for presurgical assessment, which is helpful for planning the surgical approach and reducing the risks of recurrence and postoperative incontinence. Endoanal sonography is an inexpensive, rapid, real-time, and easy-to-perform imaging modality, which is suitable for assessment of fistulas, especially for classification and diagnosis and for detection of the internal openings. It should be integral first line imaging tool for every colorectal surgeon to provide better assessment and treatment.

References:

1. Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-inano. Br J Surg 1976; 63:12.
2. Sharma G, Khandige G, Mohan M. Magnetic resonance imaging in perianal fistulas: a pictorial atlas. Indian J Gastroenterol 2016; 35:337–342.
3. Kruskal JB, Kane RA, Morrin MM. Peroxide-enhanced anal endosonography: technique, #image |interpretation, and clinical applications. Radiographics 2001; 21(special issue):S173–S189.
4. Sofic A, Beslic S, Sehovic N, Caluk J, Sofic D. MRI in evaluation of perianal fistulae. Radiol Oncol 2010; 44: 220–227.
5. Halligan S, Stoker J. Imaging of fistula in ano. Radiology 2006; 239:18– 33.
6. Soker G, Gulek B, Yilmaz C, et al. The comparison of CT fistulography and MR imaging of perianal fistulae with surgical findings: a casecontrol study. Abdom Radiol (NY) 2016; 41:1474–1483.
7. Akhtar S, Rana A, Latif U, et al. MRI in the pre-operative evaluation of perianal fistula. J Postgrad Med Inst 2014; 28:264–269.
8. deSouza NM, Hall AS, Puni R, Gilderdale DJ, Young IR, Kmiot WA. High resolution MRI of the anal sphincter using a dedicated endoanal coil: comparison of MRI with surgical findings. Dis Colon Rectum 1996; 39:926–934.
9. Cho DY. Endosonographic criteria for an internal opening of fistulain- ano. Dis Colon Rectum 1999; 42:515–518.
10. Zbar AP. David Henry Goodsall: reassessment of the rule. Tech Coloproctol 2009; 13:185–188.
11. Buchanan G, Halligan S, Williams A, et al. Effect of MRI on clinical outcome of recurrent fistula in ano. Lancet 2002; 360:1661–1662.
12. Santoro G A, Fortling B. The advantages of volume rendering in three-dimensional endosonography of the anorectum. Dis Colon Rectum 2007; 50:359–368.
13. Fields S, Rosainz L, Korelitz BI, Panagopoulos G, Schneider J. Rectal strictures in Crohn's disease and coexisting perirectal complications. Inflamm Bowel Dis 2008; 14:29–31.
14. Buchanan GN, Halligan S, Bartram CI, Williams AB, Tarroni D, Cohen CR. Clinical examination, endosonography, and MR imaging in preoperative assessment of fistula in ano: comparison with outcome-based reference standard. Radiology 2004; 233: 674–681.
15. Berger T, Garrido F, Green J, Lema PC, Gupta J. Bedside ultrasound performed by novices for the detection of abscess in ED patients with soft tissue infections. Am J Emerg Med 2012; 30:1569–1573. Sun et al—Endoanal Sonography for Evaluation of Perianal Fistulas 98 J Ultrasound Med 2018; 37:93–98.