Comparison of Endoanal Ultrasound with Clinical Diagnosis in Anal Fistula Assessment

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Background: *Anal fistula anatomy and its relationship with anal sphincters are important factors influencing the results of surgical management. Pre-operative definitions of fistulous track(s) and the internal opening play a primary role in minimizing damage to the sphincters and recurrence of the fistula.*
Objective: *To evaluate the relative accuracy of digital examination and endoanal ultrasound for pre-operative assessment of anal fistula by comparing operative findings.*
Material and Method: *A retrospective review was conducted of all patients with anal fistula admitted to the surgical unit between May 2008 and May 2012. Physical examination and hydrogen peroxide-enhanced endoanal ultrasound (utilising a 10 MHz endoprobe, HITACHI: EUB-7500), were performed in 142 consecutive patients. Results were matched with surgical features to establish their accuracy in preoperative anal fistula assessment.*
Results: *A total of 142 patients (107 men, 35 women), 28 of whom had had previous surgery, were included in the study. Their mean age was 40 (range 18-71) years and their mean BMI was 26.37 (range 17.30-36.11) kg/m^2. The majority of the fistulas were transphincteric (90.4%) and the rest were intersphincteric (9.6%). The accuracy rates of clinical examination and endoanal ultrasound were 55.63 and 95.07 percent ($p<0.01$), respectively.*
Conclusion: *Endoanal ultrasound is superior to digital examination for pre-operative classification of anal fistula.*

Keywords: *Fistula in ano, Endoanal ultrasonography, Clinical examination, Accuracy*

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Anal fistula is a common condition defined by an abnormal perianal track that connects two epithelialized surfaces, usually the anal canal and the perianal skin. The aim of surgical treatment of an anal fistula is to eradicate the fistula while at the same time maintaining anal continence. Factors predictive of developing a postoperative recurrence following fistula surgery include inability to locate the internal opening and failure of the primary procedure. Appropriate classification of the fistulous tracts in patients with fistula in ano is of value for surgical planning. Various methods have been used to predict the course of fistula tracks: Goodsall's rule has been reported to vary in accuracy[1], while fistulography has been wholly disappointing[2]. Computerized tomography (CT) is of limited usefulness since it is extremely uncomfortable for the patient due to the need to undergo a dose of radiation; moreover, it offers very little clinical information[3,4]. Endoanal ultrasound (EAUS), on the other hand, has been demonstrated to be a very helpful diagnostic tool, showing interesting features in accurately assessing all fistula characteristics, and the addition of hydrogen peroxide injection through the external opening of the fistula appears to improve the diagnostic accuracy of standard EAUS[5,14]. Magnetic resonance imaging (MRI) can provide comparable accuracy in uncomplicated fistulas, and would be better in complex fistulas. However, the limited availability of MRI instruments and of specific expertise in their use with fistulas, together with the high costs involved, are some of the major problems preventing its widespread use in the clinical setting[8,9].

The aim of this study is to evaluate the relative levels of accuracy of digital examination and endoanal ultrasound for pre-operative assessment of anal fistula by comparing operative findings.

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Material and Method

A review of all patients with anal fistulas in Rajavithi Hospital, Bangkok, Thailand was carried out between May 2008 and May 2012. One hundred forty-

two patients (107 men, 35 women), 28 of whom had had previous treatment for fistula, were included in the study. Their mean age was 40 (range, 18-71) years, and their mean BMI was 26.37 (range, 17.30-36.11) kg/m^2. They were evaluated in the hospital by digital examination after which they underwent conventional hydrogen peroxide-enhanced endoanal ultrasound. Each procedure investigated the following fistula characteristics: 1) primary track, categorized according to the criteria of Parks et al[15] as intersphincteric, transphincteric, extrasphincteric, or suprasphincteric; 2) collection, present or absent, and 3) whether the fistulas were simple or complex[16].

Digital examination

After visualization of the external opening, palpation of the subcutaneous induration was performed, followed by rectal examination. During rectal examination, presence of the internal opening (induration) was noted.

Endoanal ultrasound

All patients underwent office-based endoanal ultrasonography with HITACHI: EUB-7500 using a 10 MHz endoprobe. The external opening of the fistula tract was cannulated with a silastic catheter (18-21 gauge Angiocath) connected to a 3 cc syringe filled with hydrogen peroxide. The hydrogen peroxide was slowly injected while ultrasonic scanning of the anal canal was performed. With instillation of hydrogen peroxide, any fistula tracts, collection and internal openings become hyperechoic (Fig. 1).

Operative assessment

All patients were assessed in the prone jackknife position. Examinations were performed under general anaesthetic or spinal block, after which careful digital examination with a probe and infused hydrogen peroxide was performed by the surgeon. The site of external and internal opening(s), number of identified fistula tracks, and areas of fluid collection were recorded for comparison with digital examination and ultrasound findings, after which the appropriate surgical treatment was chosen.

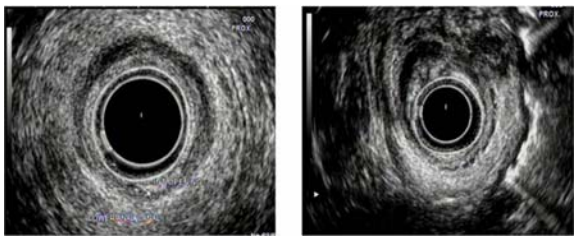

Fig. 1 Left) Internal opening at posterior midline. Right) Collection at left ishioanal space.

Statistical analysis

Chi-square test or Fisher exact test were used to compare independent proportions, and Student's t-test was used to compare mean values. Statistical significance was defined as a *p*-value of less than 0.05.

Results

From May 2008 to May 2012, the study population comprised 107 males and 35 females. The mean age was 40 years (range, 18-71 years) with mean BMI of 26.37 kg/m^2 (range, 17.30-36.11 kg/m^2). Twenty-eight (19.7%) of the patients had a history of prior fistula surgery, 5 (3.5%) had a diagnosis of inflammatory bowel disease, 1 (0.7%) had an infection, and 1 (0.7%) had cancer. The median length of hospital stay was 3 days (range, 1-10 days), and the mean follow-up time was 90 days (range, 12-430 days). Most of the fistula were transphincteric (90.4%), and the rest were intersphincteric (9.6%).

Table 1. shows the data obtained by digital examination for pre-operative assessment of anal fistula compared to the operative findings, classified according to various parameters of the sample.

The variables in Table 1 were analyzed using student's t-test, and this showed that BMI, collection, and complex fistula were associated with the accuracy of the physical examination compared to surgery ($p<0.05$).

Table 2 shows the data obtained by endoanal ultrasound for pre-operative assessment of anal fistula compared to the operative findings, classified according to various parameters of the sample.

Chi-square test did not find any variable that correlated with the accuracy of the endoanal ultrasound (Table 2).

The accuracy rates of digital examination and endoanal ultrasound were 55.63 and 95.07 percent ($p<0.01$) respectively.

Multivariate analysis factors associated with accuracy on examination are shown in Table 3. A BMI $\geq$30 was associated with statistical significance (p = 0.009). BMI $\geq$30 had a statistically significant impact on the accuracy of digital examination.

Discussion

Surgical treatment for anal fistula is based on

Table 1. Accuracy of fistula assessment by digital examination

Factors	Clinical correct			*p*-value
	Total (n = 142)	Yes (n = 79)	No (n = 63)	
Age (years)				
<60	135	74 (54.8)	61 (45.2)	
≥60	7	5 (71.4)	2 (28.6)	
Mean ± SD	40.70±11.50	39.96±11.52	40.48±11.7	0.794
BMI (kg/m^2)				
<30	100	65 (65.0)	35 (35.0)	
≥30	42	14 (33.3)	28 (66.7)	
Mean ± SD	24.82±9.98	25.44±4.20	27.53±5.4	0.010*
Bowel diseases				0.241
No	135	77 (57.0)	58 (43.0)	
Yes	7	2 (28.6)	5 (71.4)	
Clinical classification				<0.001*
Intersphincteric	16	3 (18.8)	13 (81.3)	
Transphincteric	90	76 (84.4)	14 (15.6)	
Extrasphincteric	9	0 (0)	9 (100.0)	
Cannot evaluate	27	0 (0)	27 (100.0)	
Collection				0.007*
No	56	39 (69.6)	17 (30.4)	
Yes	86	40 (46.5)	46 (53.5)	
Complex				0.008*
No	65	44 (67.7)	21 (32.3)	
Yes	77	35 (45.5)	42 (54.5)	
Previous surgery				0.274
No	114	66 (57.9)	48 (42.1)	
Yes	28	13 (46.4)	15 (53.6)	

Value are represented as Mean ± SD and number (%)
* Significant at $p<0.05$

healing of the fistula and preserving continence. Therefore, it is important to know the anatomy of the primary track, the site of internal opening, and secondary extensions or collections. Fistulography and CT have very limited value in the assessment of perianal fistulas[2-4,17,18]. Endoanal Ultrasonography (EAUS), on the other hand, is being increasingly utilized in the evaluation of perirectal inflammatory conditions because the procedure is quick, relatively painless, and inexpensive when compared to other radiologic procedures; furthermore, it carries no risk of radiation exposure. EAUS provides an excellent image of the anal sphincter complex, enabling the relationship of the fistula tract to this musculature to be well delineated. Cheong et al[19] were the first to describe the use of Hydrogen Peroxide-Enhanced Endoanal Ultrasound (HPEU) in order to accentuate tissue interface layers at the level of the fistula tract. This was first performed on two patients with recurrent fistula, and hydrogen peroxide injection yielded hyperechoic imaging of the pre-injection hypoechoic horseshoe fistula tract. HPEU findings were confirmed at the time of surgery in both patients. In a prospective study of 21 patients with fistula in ano, Poen et al[6] evaluated the results of HPEU in comparison with physical examination, standard ultrasound, and surgery. With conventional ultrasound, the assessment of fistula in ano was correct in 13 patients (62%), and defects in one or both sphincters were also found. With HPEU, the fistula tract was classified correctly in 20 patients, and the overall concordance with surgery was 95%. The number of correctly identified internal openings was found with HPEU in 10 patients (48%). Barker et al[20] analyzed the accuracy of MRI for anal fistula compared to the "blinded" surgical findings. The sensitivity, specificity, and positive predictive values for fistula were 89%,

Table 2. Accuracy of fistula assessment by endoanal ultrasound

Factors	Ultrasonography correct			*p*-value
	Total (n = 142)	Yes (n = 135)	No (n = 7)	
Age (years)				1.000
<60	135	128 (94.8)	7 (5.2)	
≥60	7	7 (100.0)	0 (0.0)	
Mean ± SD	41.58±11.56	40.03±11.59	43.14±11.54	0.491
BMI (kg/m^2)				0.674
<30	100	94 (94.0)	6 (6.0)	
≥30	42	41 (97.6)	1 (2.4)	
Mean ± SD	24.85±4.47	26.53±4.89	23.24±4.05	0.810
Bowel diseases				0.304
No	135	129 (95.6)	6 (4.4)	
Yes	7	6 (85.7)	1 (14.3)	
Ultrasonography classification				0.331
Intersphincteric	16	12 (75.0)	4 (25.0)	
Transphincteric	118	117 (99.2)	1 (0.8)	
Suprasphincteric	6	6 (100)	0 (0)	
Extrasphincteric	1	0 (0)	1 (100)	
Can't evaluate	1	0 (0)	1 (100)	
Collection				1.000
No	56	53 (94.6)	3 (5.4)	
Yes	86	82 (95.3)	4 (4.7)	
Complex				0.247
No	65	60 (92.3)	5 (7.7)	
Yes	77	75 (97.4)	2 (2.6)	
Previous surgery				0.345
No	114	107 (93.9)	7 (6.1)	
Yes	28	28 (100)	0 (0)	

Value are represented as mean ± SD and number (%)
* Significant at $p<0.05$

Table 3. Multivariate analysis

Factor	Crude OR (95% CI)	*p*-value	Adjusted OR (95% CI)	*p*-value
Obesity (BMI ≥30)	3.71 (1.70-7.96)	0.001*	2.92 (1.29-6.59)	0.009*
Collection	2.64 (1.30-5.37)	0.007*	1.73 (0.66-4.54)	0.264
Complex	2.51 (1.27-5.00)	0.008*	1.25 (0.48-3.27)	0.649

* Significant at $p<0.05$

71%, and 93%, respectively; furthermore, for the internal opening, the values were 100%, 97% and 85%, respectively. However, MRI is more costly and less widely available than anal ultrasonography; thus, although it may be a more accurate test, it has not gained widespread popularity.

In our study, digital examination failed to identify the fistula tract in 27 patients (19%) and identified collection in only 7% (10/142 patients), whereas endoanal ultrasound failed to identify the fistula tract in only 1 patient (0.7%) and had a 99% success rate in identifying collection. Failure to identify the fistula tract by digital examination occurred more often in obese patients with BMI of more than 30, which

suggests that endoanal ultrasound may be more effective for this type of patient. In line with the findings of previous reports, obesity had a negative impact on outcomes after fistula surgery[21,22].

The limitations of this study were the unequal distribution of fistula type; the low prevalence of high-type fistula made it difficult to conclude how effective endoanal ultrasound was in detecting high-type fistula.

In conclusion, endoanal ultrasound is superior to digital examination for pre-operative classification of anal fistula, especially in high BMI patients.

What is already known on this topic ?

Previous study showed only in sensitivity and specificity of endoanal ultrasonography.

Previous study show anatomical relation of fistula in ano but did not have surgical relation or result.

What this study adds ?

Showed accuracy compared with physical examination alone.

Showed a benefit in patient selection for endoanal ultrasonography examination.

Potential conflicts of interest

None.

References

1. Cirocco WC, Reilly JC. Challenging the predictive accuracy of Goodsall's rule for anal fistulas. Dis Colon Rectum 1992; 35: 537-42.
2. Corman ML. Anorectal abscess and fistula. In: Corman ML, editor. Colon and rectal surgery. 2nd ed. Philadelphia: JB Lippincott; 1989: 125-70.
3. Yousem DM, Fishman EK, Jones B. Crohn disease: perirectal and perianal findings at CT. Radiology 1988; 167: 331-4.
4. Schratter-Sehn AU, Lochs H, Vogelsang H, Schurawitzki H, Herold C, Schratter M. Endoscopic ultrasonography versus computed tomography in the differential diagnosis of perianorectal complications in Crohn's disease. Endoscopy 1993; 25: 582-6.
5. Deen KI, Williams JG, Hutchinson R, Keighley MR, Kumar D. Fistulas in ano: endoanal ultrasonographic assessment assists decision making for surgery. Gut 1994; 35: 391-4.
6. Poen AC, Felt-Bersma RJ, Eijsbouts QA, Cuesta MA, Meuwissen SG. Hydrogen peroxide-enhanced transanal ultrasound in the assessment of fistula-in-ano. Dis Colon Rectum 1998; 41: 1147-52.
7. Iroatulam A, Nogueras J, Chen H. Accuracy of endoanal ultrasonography in evaluating anal fistula. Gastroenterology 1997; 112 (Suppl): A1450.
8. Gustafsson UM, Kahvecioglu B, Astrom G, Ahlstrom H, Graf W. Endoanal ultrasound or magnetic resonance imaging for preoperative assessment of anal fistula: a comparative study. Colorectal Dis 2001; 3: 189-97.
9. West RL, Zimmerman DD, Dwarkasing S, Hussain SM, Hop WC, Schouten WR, et al. Prospective comparison of hydrogen peroxide-enhanced three-dimensional endoanal ultrasonography and endoanal magnetic resonance imaging of perianal fistulas. Dis Colon Rectum 2003; 46: 1407-15.
10. Lengyel AJ, Hurst NG, Williams JG. Pre-operative assessment of anal fistulas using endoanal ultrasound. Colorectal Dis 2002; 4: 436-40.
11. Buchanan GN, Bartram CI, Williams AB, Halligan S, Cohen CR. Value of hydrogen peroxide enhancement of three-dimensional endoanal ultrasound in fistula-in-ano. Dis Colon Rectum 2005; 48: 141-7.
12. Ortiz H, DeMiguel M, Marzo J, Jimenez G. Ultrasound study of anal fistulas with hydrogen peroxide enhancement. Dis Colon Rectum 2004; 47: 1423.
13. Kruskal JB, Kane RA, Morrin MM. Peroxide-enhanced anal endosonography: technique, image interpretation, and clinical applications. Radiographics 2001; 21 (Spec No): S173-89.
14. Schaffzin DM, Wong WD. Surgeon-performed ultrasound: endorectal ultrasound. Surg Clin North Am 2004; 84: 1127-49.
15. Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in-ano. Br J Surg 1976; 63: 1-12.
16. Whiteford MH, Kilkenny J 3rd, Hyman N, Buie WD, Cohen J, Orsay C, et al. Practice parameters for the treatment of perianal abscess and fistula-in-ano (revised). Dis Colon Rectum 2005; 48: 1337-42.
17. Kuijpers HC, Schulpen T. Fistulography for fistula-in-ano. Is it useful? Dis Colon Rectum 1985; 28: 103-4.
18. Weisman RI, Orsay CP, Pearl RK, Abcarian H. The role of fistulography in fistula-in-ano. Report of five cases. Dis Colon Rectum 1991; 34: 181-4.
19. Cheong DM, Nogueras JJ, Wexner SD, Jagelman DG. Anal endosonography for recurrent anal fistulas: image enhancement with hydrogen peroxide. Dis Colon Rectum 1993; 36: 1158-60.

20. Barker PG, Lunniss PJ, Armstrong P, Reznek RH, Cottam K, Phillips RK. Magnetic resonance imaging of fistula-in-ano: technique, interpretation and accuracy. Clin Radiol 1994; 49: 7-13.
21. Sirikurnpiboon S, Awapittaya B, Jivapaisarnpong P. Ligation of intersphincteric fistula tract and its modification: Results from treatment of complex fistula. World J Gastrointest Surg 2013; 5: 123-8.
22. Schwandner O. Obesity is a negative predictor of success after surgery for complex anal fistula. BMC Gastroenterol 2011; 11: 61.

การศึกษาเปรียบเทียบความถูกต้องของลักษณะกายวิภาค ฝีคัณฑสูตร ระหว่างการตรวจร่างกาย และการตรวจด้วยการทำอัลตร้าซาวด์ผ่านทางทวารหนัก

สิริพงศ์ สิริกุลพิบูลย์, อรดี พัฒนะเอนก, บุรินทร์ อาวพิทยา

ภูมิหลัง: *ลักษณะทางกายวิภาคและความสัมพันธ์ของฝีคัณฑสูตรกับกล้ามเนื้อหูรูดนั้นเป็นปัจจัยที่สำคัญในการเลือกวิธีการผ่าตัดรักษา ในการตรวจและเตรียมการก่อนผ่าตัด มีการตรวจหลายวิธีเพื่อให้รู้ลักษณะกายวิภาคของท่อทางเดินของฝีคัณฑสูตรรูเปิดภายใน เพื่อลดโอกาสการเกิดการทำลายของกล้ามเนื้อหูรูดทวาร และเก็บรักษาภาวะการกลั้นอุจจาระให้ปกติที่สุด โดยการทำอัลตร้าซาวด์ผ่านรูทวารนั้นเป็นการตรวจก่อนผ่าตัดที่ทำได้ง่าย สะดวก และไม่เป็นอันตรายต่อผู้ป่วย*

วัตถุประสงค์: *เพื่อประเมินความถูกต้องของการตรวจก่อนผ่าตัดด้วยการตรวจทางทวารหนัก เปรียบเทียบกับการตรวจด้วยการทำอัลตร้าซาวด์ผ่านรูทวาร โดยดูผลความถูกต้องจากการผ่าตัด*

วัสดุและวิธีการ: *ศึกษาย้อนหลังโดยดูจากเวชระเบียนผู้ป่วยที่เข้ารับการรักษาที่แผนกศัลยกรรม โรงพยาบาลราชวิถี ตั้งแต่ เดือนพฤษภาคม พ.ศ. 2551 ถึง เดือนพฤษภาคม พ.ศ. 2555 โดยเปรียบเทียบผลการตรวจร่างกายกับผลการทำอัลตร้าซาวด์ผ่านรูทวาร (โดยเครื่อง HITACHI: EUB-7500) สามารถรวบรวมจำนวนเวชระเบียนได้ 142 ราย จากนั้นนำผลทั้งสองมาเปรียบเทียบกับผลที่ได้จากการผ่าตัด*

ผลการศึกษา: *จำนวนเวชระเบียน 142 ราย โดยแบ่งเป็น ชาย 107 ราย หญิง 35 ราย โดยมีค่าอายุเฉลี่ยที่ 40 ปี (18-71 ปี) และมีค่า BMI เฉลี่ยที่ 26.37 (17.30-36.11) กิโลกรัมต่อตารางเมตร และพบว่า มี 28 ราย มีประวัติเคยรับการผ่าตัดรักษามาก่อน ชนิดของฝีคัณฑสูตรที่พบมีดังนี้ transphincteric 90.4% และ intersphincteric 9.6% ผลความถูกต้องของการตรวจร่างกายคือ 55.63% และผลของการตรวจโดยอัลตร้าซาวด์ผ่านทางทวารคือ 95.07% ($p<0.01$)*

สรุป: *การตรวจด้วยอัลตร้าซาวด์ผ่านทางทวารนั้นให้ผลความถูกต้องทางข้อมูล ลักษณะกายวิภาคของฝีคัณฑสูตรได้ดีกว่าการตรวจร่างกายเพียงอย่างเดียว*