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Original Article

Evaluation of diagnostic accuracy of 3-D endoanal ultrasound in perianal fistula in comparison with intraoperative findings

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ABSTRACT

Objective: Perianal fistula is a common and debilitating disease. The definite treatment is surgery, identifying of primary and secondary tract, internal opening of fistula has important role in planning of surgical techniques. This study's goal was to determine the diagnostic accuracy of 3-D ultrasound in perianal fistula in comparison with intraoperative findings.
Materials and methods: This study is a cross-sectional study. Adult patients (18–85 years old) with anal fistula have been selected. 3-D EUS was done for all patients by gastroenterologist. Then surgery was done. Check lists filled by endoscopist and surgeon was studied and data analysis was done.
Results: The study examined 76 patients, in according to results for kappa coefficient there was a perfect agreement between 3-D ultrasound results and surgery in internal opening that was 96% ($p < 0.001$) and concordance was 0.974. In extension tract the agreement was 0.973 and concordance was 0.987 ($p < 0.001$).
Conclusion: There was perfect agreement between 3-D ultrasound and surgical findings in internal opening, primary tract and trunk expansion. 3-D ultrasound shows a high diagnostic accuracy when compared with surgery to assessment of perianal fistula before surgery.

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Avaliação da precisão diagnóstica da USE 3D endoanal em casos de fístula perianal, em comparação com os achados cirúrgicos

Palavras-chave:
Fístula anal
Ultrassonografia endoscópica tridimensional
Cirurgia

RESUMO

Objetivo: A fístula perianal é doença comum e debilitante. O tratamento definitivo é cirúrgico. A identificação dos tratos primário e secundário e de abertura interna da fístula desempenha papel importante no planejamento das técnicas cirúrgicas. O objetivo do presente estudo foi determinar a precisão diagnóstica da USE 3D em casos de fístula perianal, em comparação com os achados cirúrgicos.

Materiais e métodos: Este é um estudo transversal. Foram selecionados pacientes adultos (18-85 anos) com fístula anal. Todos os pacientes foram examinados por USE 3D realizada por um gastroenterologista. Em seguida, procedeu-se à cirurgia. O endoscopista e o cirurgião estudaram as listas de verificação, com análise dos dados.

Resultados: Nesse estudo foram examinados 76 pacientes. De acordo com os resultados para o coeficiente kappa, foi observada perfeita concordância entre os resultados da USE 3D e cirurgia para IO, de 96% ($p < 0,001$), com concordância de 0,974. Na extensão do trato a concordância foi 0,973 e concordância de 0,987 ($p < 0,001$).

Conclusão: Foi observada concordância perfeita entre USE 3D e os achados cirúrgicos em abertura interna, trato primário e expansão do tronco. USE 3D demonstra elevada precisão diagnóstica, quando comparada com a cirurgia, para avaliação da fístula perianal antes da operação.

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Introduction

Perianal fistulas are abnormal pathways that create a connection between two epitheliums, the anal canal and perianal skin. The prevalence has been reported to be 2 per 8000 people per year, most cases occur between the ages of 80–90 and men are more prone than women. In the treatment of anal fistula, focusing on maintaining control over defecation and non-recurrence are the main objectives. Therefore, comprehensive assessment, particularly careful examination of fistula and its anatomy is necessary before the fistulotomy surgery.

As the results of this evaluation get more accurate and reliable, risk of complications like recurrence and incontinence decrease. As a result, in addition to obtaining an appropriate history and performing an accurate physical examination there is a necessity for further para-clinical measures.[1,2] An accurate rectal examination with or without the use of anesthesia is considered as a basic diagnostic measure, although a rectal examination may not be able to detect complex fistulas. It is now well established that the use of imaging methods before surgery can closely indicate multiple characteristics of fistula, including the main body of fistula, secondary expansion and opening of the fistula. This plays an important role on surgeon's planning and determining the surgery method.

Identification of fistulas characteristics is possible in various ways, such as physical examination, MRI and endoanal sonography. Sonography is an easily accessible and affordable method with no radiations in examining the anal canal for perianal disease, therefore it is used before surgery to help the surgeon determine an appropriate surgical procedure.[3,4] Currently, endoanal ultrasound is frequently used in the evaluation of fistula before the surgery, although preliminary assessment of this type of ultrasound was not satisfactory, but technological advances in this field, including the use of hydrogen peroxide as contrast and use of three-dimensional imaging has increased the accuracy of endoanal ultrasound.[5,6]

Methods

Adult patients (18–65 years of age) with perianal fistula who referred to Ayatollah Taleghani Hospital, Tehran, Iran in 2015 were involved in this cross-sectional study. Sample size was determined using the following formula and approximately 95% were determined with a precision of 0.01.

$$n = \frac{Z_{\alpha}^2}{\delta^2} \frac{p_0(1-p_0)}{(1-p_{\varepsilon})^2}$$

Patients with inflammatory bowel disease (IBD), history of rectal cancer, pelvic radiotherapy or perianal fistula surgery were excluded from the study. Eligible patients underwent three-dimensional endoscopic anal ultrasound with and without H_2O_2 as contrast by a specialist. Sonographic findings were recorded accurately (components such as the entrance place, exit place, fistula direction toward the anal sphincter) and this information was presented to an assistant available at the patient's bedside for comparing characteristics expressed by the surgeon during the surgery with the form filled by the gastroenterologist. In case of any conflict or if the surgeon was not able to find the fistula route then the endosonography information will be given to the surgeon so using that, the surgeon could look for fistula. At the beginning of the surgery the surgeon was not aware of the findings of the endosonography.

Data analysis was performed using SPSS version 21. As for statistical analysis, McNemar and chi-square tests were used furthermore sensitivity, specificity and Kappa statistics were also reported.

Results

Seventy-six patients were recruited in this study. The most common complaint of patients was feces secretion. From a total of 76 patients, 54 patients (71.1%) were men and 22 (28.9%) were women. The patients age ranged from 22 to 83 years old. Mean age was 45.40 ± 13.3.

The most common internal opening (IO) was 6 o'clock position of anus (42.1%) and after that the 12 o'clock position (26.3%), lowest prevalence was at 3 o'clock, where no cases were found (0%) (Table 1).

The most common external opening (EO) was 6 o'clock position of anus (22.7%) and after that the 12 o'clock position (14.5%) (Table 2).

Regarding the main trunk of fistula, the most common fistulas were transverse sphincter (57.9%) and after that intra-sphincter (38.1%) (Table 3).

Regarding the fistula trunk expansion (ET), the most common expansion types were intra-sphincter (75% of cases) and after that transverse sphincter (17.1% of cases) (Table 4).

The agreement between the results of endoanal ultrasound and surgery was evaluated and the kappa statistics was 0.96% ($p < 0.001$) and the concordance rate was 0.974.

For ET kappa was 0.973 ($p < 0.001$) and concordance was 0.98 and in fistula expansion kappa and concordance were 0.973 ($p < 0.001$) and 0.987, respectively (Table 5).

Table 1 – Comparison of three-dimensional endoanal ultrasound and results of surgery of internal opening (IO).

Surgery		Ultrasound			
Percent	Frequency	Percent	Frequency		
3.9	3	5.3	4	1	
3.9	3	3.9	3	2	
1.32	1	0	0	3	
1.32	1	1.32	1	4	
1.32	1	1.32	1	5	
42.1	32	42.1	32	6	
3.9	3	3.9	3	7	
1.32	1	1.32	1	8	
1.32	1	1.32	1	9	Location
1.32	1	1.32	1	11	
26.3	20	26.3	20	12	
5.3	4	5.3	4	6–12	
1.32	1	1.32	1	6-9-10	
1.32	1	1.32	1	6-10-12	
1.32	1	1.32	1	6-7-11	
1.32	1	1.32	1	2–4	
1.32	1	1.32	1	3–6	
100	76	100	76	Total	

Table 2 – Comparison of three-dimensional endoanal ultrasound and results of surgery of external opening (EO).

Surgery		Ultrasound			
Percent	Frequency	Percent	Frequency		
0	0	1.32	1	Unknown	
9.2	7	9.2	7	1	
3.9	3	3.9	3	2	
9.2	7	9.2	7	3	
7.9	6	7.9	6	4	
2.6	2	2.6	2	5	
22.7	18	22.7	18	6	
6.6	5	6.6	5	7	
3.9	3	3.9	3	8	
5.3	4	3.9	3	9	
1.32	1	1.32	1	10	Location
1.32	1	1.32	1	11	
14.5	11	14.5	11	12	
1.32	1	1.32	1	1–5	
1.32	1	1.32	1	1–6	
1.32	1	1.32	1	2–4	
1.32	1	1.32	1	6–12	
1.32	1	1.32	1	11–12	
1.32	1	1.32	1	6-9-10	
1.32	1	1.32	1	6-10-12	
1.32	1	1.32	1	6–7-11	
100	76	100	76	Total	

Table 3 – Comparison of three-dimensional endoanal ultrasound and results of surgery of the primary tract (PT).

		Ultrasound		Surgery	
		Frequency	Percent	Frequency	Percent
Category	ES	1	1.3	1	1.3
	IS	29	38.2	30	39.5
	TS	44	57.9	43	56.6
	TS-IS	2	2.6	2	2.6
	Total	76	100	76	100

Table 4 – Comparison of three dimensional endoanal ultrasound and surgery results of fistula extension tract.

		Ultrasound		Surgery	
		Frequency	Percent	Frequency	Percent
Category	Non	1	1.3	0	0
	IS	57	75	57	75
	TS	13	17.1	14	18.4
	HS	1	1.3	1	1.3
	TS-IS	4	5.3	4	5.3
	Total	76	100	76	100

Table 5 – Comparison of kappa statistics and concordance rate between three-dimensional ultrasound and surgery.

	Accuracy	Kappa
IO	0.974	0.96
Primary tract	0.987	0.973
Extension tract	0.987	0.973

Discussion

According to the current study, among the patients referring to Taleghani Hospital the most common type of perianal fistula is trans-sphincteric. While according to Harrison and Schwartz, Intersphincteric fistula is the most common form. The reason for this difference maybe the small population. However, the difference in the prevalence of this disease in Iran compared to other countries should also be considered.

IO proportions in this study were similar to those in other studies and references.

According to the results of this study (Table 5) there was complete agreement between three-dimensional endoscopic ultrasound and surgery results, which included IO, PT and ET in all cases. It was shown in this study that three-dimensional endoanal sonography has a higher diagnostic accuracy compared to surgery and it can be used as a tool for planning and a guide prior to surgery. Thus surgical complications would be less.

With the help of endoanal sonography before the surgery, anatomical features of the fistula and its relationship with the anal sphincter can be shown, and this will be a guide for determining the surgical method. Thus, the risk of recurrence and damage caused by manipulation of the sphincter will be decreased. Using proper surgical technique leads to adequate abscess drainage and probability of early recurrence and postoperative fistula residual will be decreased; moreover, iatrogenic sphincter damage will be less. In other words, the appropriate surgical treatment depends on appropriate evaluation of fistula and its relationship with the Sphincter.

This is possible in Iran with the help of 3-D EUS, a simple, inexpensive, accessible method without hazardous rays. Moreover, because ultrasound is an operator-dependent procedure, it can also be concluded that the experience of Taleghani Hospital's operator is acceptable.

Conclusion

Compared to surgery, three-dimensional endoanal ultrasound has a higher diagnostic accuracy and there was complete agreement in all cases (inlet and outlet and the primary tract and the extension tract of fistula) between results from three-dimensional endoscopic sonography and results from the surgery, appropriate surgical treatment depends on a careful examination of the details of fistula and its relationship with the sphincter. Since three-dimensional endoanal ultrasound is an easy, inexpensive and available method in Iran, further study is required in different age groups for decreasing complications of surgery; therefore, increasing the effectiveness of three-dimensional endoanal sonography in diagnosis of perianal fistula. Moreover, making necessary plans in order to use this method as a detailed guidance for surgeons in order to reduce complications and recurrence possibility.

Conflicts of interest

The authors declare no conflicts of interest.

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