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Original Article

ROLE OF MRI WITH ENDORECTAL COIL IN MANAGEMENT OF PERIANAL FISTULA

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Aim: *The management of fistula in-ano has been based on digital examination and operative findings. This study was conducted to asses the diagnostic accuracy of magnetic resonance imaging (MRI) with endorectal coil in perianal fistula.*
Patients And Methods: *Twenty patients with anal fistula were classified into two groups. The first one included those who had primary fistula (10 patients) and the second included those with recurrent fistula (10 patients). All patients underwent preoperative MR imaging using endorectal coil. The findings were compared to examination under anesthesia (EUA) and final surgical findings.*
Results: *Comparing MRI with operative data (EUA and final surgical results); in the first group with simple fistula, MR imaging showed additional information than examination under anesthesia in only one patient (10%) and did not diagnose one fistulous tract at all. In the second group, MRI detected 8 internal openings correctly and one opening was missed. MRI added information than EUA in 6 patients, its falacies was noted in 2 patients.*
Conclusion: *MRI with endorectal coil could be very useful and reliable in defining fistula anatomy, assesing relationship with anal sphincter, identifying secondary extensions (particularly horseshoe tracts) and planning surgical strategy.*

Keywords: *Fistula in ano, MRI, Examination under anaesthesia.*

INTRODUCTION

Majority of anal fistulae have a single simple tract that is easily identified during surgery.[1] However 5-15% of anal fistulae have more complicated course with secondary extensions outside the anal sphincter (horseshoe fistulae, ischiorectal and supralevator abscesses). These complex fistulae are often complicated with recurrence[2] and anal incontinence.[3] The correct balance between eradication of infection and maintenance of continence depends upon accurate preoperative assessment of fistula, detection of the site and level of any internal opening, anatomy of primary track and presence of any secondary extensions.[4]

The knowledge of the anatomy of the anal canal and perianal structures has grown rapidly over last decades by the use of fistulography,[5] endo-anal sonography,[6] computed tamography (CT)[7] and recently MRI.[8]

With MRI, the complete sphincter complex, including the external sphincter and tracks are adequately visualized. Fistula appears as hypo-, iso- or hyper-intense depending on the activity of the inflammatory process and the presence of fibrous tissue.[8] Some authors[9,10] have reported high accuracy values of MRI in the detection of fistula tract and secondary extensions. Many techniques were used in diagnosis of perianal fistula by MRI. Firstly, body coil was used then endorectal coil. MRI with endorectal coil allows a detailed description of anal canal and perianal structures in three dimensions.[11,12] It is however unclear whether these high accuracy values also lead to better surgery. In this study, twenty cases having anal fistulae in Mansoura University Hospital were assessed preoperatively using MRI with endorectal coil. The purpose of this work was to asses the accuracy of magnetic resonance imaging (MRI) with endo-rectal coil in diagnosis of peri-anal fistula especially the complex one

and its relations to anal sphincters compared with examination under anesthesia (EUA) with reference to final surgical finding .

PATIENTS AND METHODS

This study was conducted between March 2002 and May 2003 on 20 patients, who had been admitted to colorectal unit in Mansoura University Hospital with peri-anal fistula. The patients were classified into two groups. The first one included those who had primary fistula (10 patients) and the second included those with recurrent fistula (10 patients). Patients of the first group were considered to have simple fistula and those of the second group were considered to have complex fistula. All patients were males (mean age 38.81 ± 8.27 years; range 26-61 years). After informed consent, the patients underwent preoperative laboratory investigations then MR imaging using endorectal coil was performed and its findings were recorded on a standardized fistula surgery sheet, which was put into an envelope then sealed without discharging the information to the surgeon.

Imaging technique: Imaging was done without bowel preparations. Intramuscular injection of 20 mg hyoscine was given to the patient before imaging to reduce bowel motions. No contrast media was given before imaging. Imaging was done using a 1.5 Telsa superconducting magnet (Magnetom Symphony MRease VA12 Siemens medical system) with a prototype endorectal coil (fixed, tuned, rectangular, rigid coil 60mm long 16 mm wide).

With the patient in the lateral decubitus position, the coil covered with a rubber sheath (condom) was positioned within the anal canal across the sphincter. The patient was then turned supine and the coil was immobilized by external clamp.

Imaging was done using inversion recovery (either STIR or SPIR using T1 weighted or T2 weighted sequences). Axial, coronal and sometimes sagital planes were used with respect to the axis of the coil.

Images evaluation: The MR images were evaluated by a radiologist who was experienced in reading pelvic MR images. He evaluated the images for the presence of the primary fistula tract and its relations to the sphincters classifying it according to Parks' classification to superficial, intersphincteric, transsphincteric, suprasphincteric or extrasphincteric. If there was a sinus it was also classified according to Parks' classification. Internal opening was also observed for its site according to clock considering that the patient was lying prone. Secondary extensions as horseshoe fistulas were also detected and classified either to intersphincteric, infralevator or supralevator horseshoe. Any abscesses or collections were recognized and classified either to intersphincteric, ischiorectal or supralevator.

A (yes or no) score was given for each fistulous tract type, each type of abscess, horseshoe extensions and also for the presence of internal opening.

Surgery: Surgery was performed by a surgeon who did not know the MRI result. The patients received general anesthesia and positioned in lithotomy position.

Examination under anaesthesia (EUA) was firstly performed by cannulating the fistulas with probes and by laying open all primary tracts, extensions, and abscesses. The presence and site of primary fistula tract, the site of internal and external opening, the presence and site of any abscess or horseshoe fistula, and the Park's classification were recorded on a separate fistula surgery sheet (initial surgical results). While the patient was still under anesthesia his corresponding envelope containing the MRI results was opened and the surgical findings were compared with MRI results.

When the MRI results suggested more extensive disease, the surgeon went back to verify these additional MRI finding (final surgical results).

All excised parts of fistulous tracts were sent for pathological examination.

Analysis and statistical data: MRI findings were compared with examination under anesthesia and final surgical findings. Categoric frequencies for the findings assessed were calculated as simple percentages. The sensitivity and specificity values were calculated for MRI and EUA in predicting the presence and exact location of the primary tracts, abscesses, horseshoe fistulas and internal openings.

RESULTS

Examination under anesthesia (EUA), MRI and final surgical findings are summarized in Table 1. EUA classified fistulous tracts into superficial tract (2 cases), intersphincteric (9 cases), trans-sphincteric (5 cases) and extrasphincteric (4 case). Of the twenty patients, horse-shoe extension was detected in 3 cases and supralevator abscess cavity in one case. Internal openings were detected in 14 cases

MRI findings were as follow; superficial tract (1 case), inter-sphincteric (9 cases), trans-sphincteric (5 cases), extra-sphincteric (4 case) and non visualized tract in 1 case. With MRI, horse-shoe extension was detected in 5 cases and abscess cavity was seen in 5 cases (3 ischiorectal and 2 supralevator), internal openings were detected in 14 cases.

Final surgical results after reading MRI reports were as follow; superficial tract (2 cases), inter-sphincteric (9 cases), trans-sphincteric (5 cases), and extra-sphincteric (4 case). Of all patients, horse-shoe extension was detected in 6 cases (1 intersphincteric and 5 infralevator) and abscess cavity was seen in 5 cases (2 supralevator and 3 ischiorectal), internal openings were detected in 16 cases.

In the first group with simple fistula, MR imaging showed additional information than EUA in only one patient (10%), (Fig 1), who had extrasphincteric sinus with supralevator abscess (detected by surgery only after reading MRI report). On the other hand MRI did not diagnose one fistulous tract at all. This patient had a very superficial fistula, which was hidden in posterior anal fissure. Considering the detection of internal opening in this group MRI detected 6 internal openings correctly while 3 patients had sinuses.

In the second group MRI added information than EUA in 6 patients (60 %); MRI detected 3 ischeorectal abscesses (Fig 2) and 2 horse-shoe extensions (Fig 3), the abscesses and horse-shoe extensions were found on meticulous surgery. The sixth patient had two branches of transsphincteric fistula; one of them was missed during initial surgery and only detected after reading MRI report (Fig 4).

Fallacies of MRI were observed in two patients in the second group (recurrent). In the first patient, one transsphincteric sinus was misclassified by MRI as extrasphincteric tract (Fig 5) and also MRI missed an infralevator horseshoe extension, which detected by surgery. In the second patient, an extrasphincteric tract was misdiagnosed as transsphincteric sinus.

The sensitivities and specificities of EAU and MRI for detection of primary tracts, abscesses, horseshoe fistulas, and internal openings are given in Tables 2, 3, and 4 in group 1, 2 and all patients respectively.

Seven patients were treated by fistulectomy, one of them developed minor incontinence. Six patients treated by staged fistulectomy (setton) that removed three months latter. Four patients treated with fistulotomy and lay open and the last three patients treated by advancement flap. Follow up of the patients was ranging from 12-18 months. There was no recurrence along the follow up period.

Table 1. EUA, MRI and final surgical findings of all patients.

Pathology	EUA	MRI	Final surgical finding
Primary track			
Superfecial	2	1	2
Intersphincteric	9	9	9
Transsphincteric	5	5	5
Extrasphincteric	4	4	4
Abscess			
Ischiorectal	0	3	3
Supralevator	1	2	2
Horse-shoe fistula			
Intersphincteric	1	1	1
Infralevator	2	4	5
Internal opening detection	14	14	16

Table 2. Sensitivity and specificity of EUA and MRI in diagnosis of fistulae in group1 (simple fistula) (in relation to final surgical finding).

Pathology	Sensitivity		Specificity	
	EUA	MRI	EUA	MRI
Primary track	100%	90%	100%	100%
Abscess	--	100%	--	100%
Internal opening detection	100%	85.7%	100%	100%

Table 3. Sensitivity and specificity of EUA and MRI in diagnosis of fistulae in group 2 (complex fistula) (in relation to final surgical finding).

Pathology	Sensitivity		Specificity	
	EUA	MRI	EUA	MRI
Primary track	90%	80%	100%	100%
Abscess	25%	100%	--	100%
Horse shoe fistula	50%	83%	--	100%
Internal opening	77.7%	88.8%	100%	100%

Table 4. Sensitivity and specificity of EUA and MRI in both group (in relation to final surgical finding).

Pathology	Sensitivity		Specificity	
	EUA	MRI	EUA	MRI
Primary track	95%	85%	100%	100%
Abscess	12.5%	100%	--	100%
Horse shoe fistula	25%	91.5%	--	100%
Internal opening detection	88,9%	87.2%	100%	100%

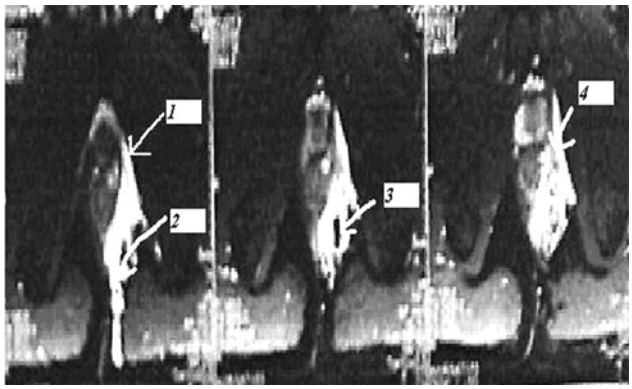

Fig 1. MRI by endo rectal coil. Arrows no. 1 and 4 refer to supralevator abscess that was missed during initial surgery while no. 2 and 3 refer to extrasphincteric tract ends by sinus.

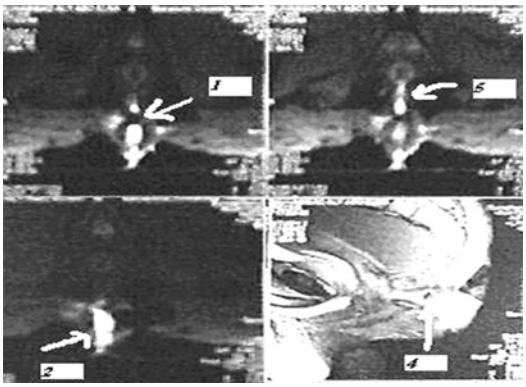

Fig 2. Arrows no. 1 refers to an ischiorectal abscess while 2 and 3 refer to intersphincteric tract in axial images. arrow no. 4 refers to ischiorectal abscess and tract in sagittal images. The abscess was missed during initial surgery.

Fig 3. Arrows no. 1 and 2 refer to intersphincteric tract, which ends with sinus and arrows no. 3, 4, 5, and 6 refer to intfralevator horseshoe extension to the left side. Both sinus and horseshoe were missed during initial surgery.

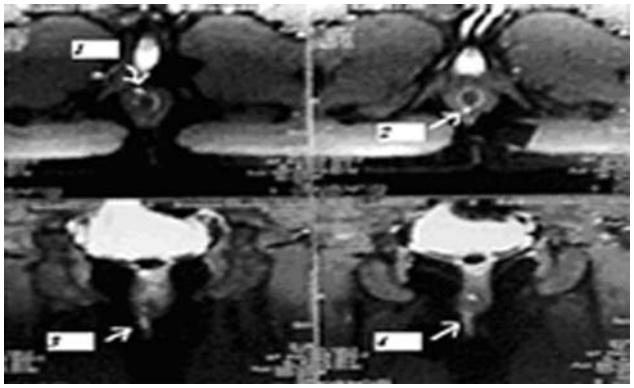

Fig 4. show two transsphincteric tracts; the first with its internal opening at 11 o′ clock (arrow 1) and missed during initial surgery, while the other has internal opening at 5 o′ clock (arrow 2). Arrow 3 and 4 refer to the same tracts at coronal images.

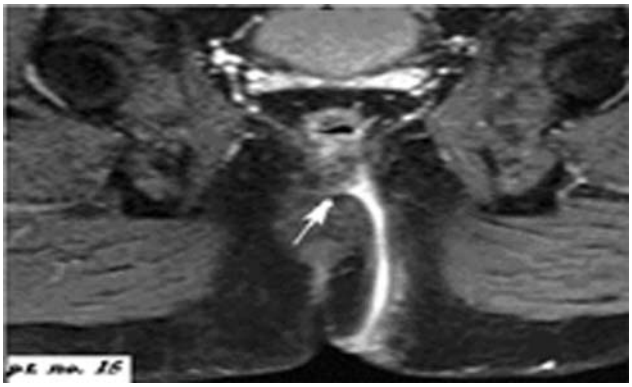

Fig 5. MRI misclassified a transsphincteric fistula as extrasphincteric one.

DISCUSSION

Perianal fistulas are usually simple and mostly due to non specific cryptoglandular inflammation but may also be due to specific secondary causes.[13]

Perianal fistulas can be classified primarily by physical examination including inspection, bidigital palpation and proctosigmoidoscopy. Scarring from previous surgery makes palpation of tracts much harder. Better assessment can be done by EUA aided by gentle probing of the fistulous tract and injection of colored liquids like methyline blue or effervescent solutions like hydrogen peroxide.[4]

Our results confirm a low overall accuracy of EUA for evaluation of perianal fistulas that although its accuracy concerning the detection of primary tracts was 95% (100% in simple fistulas and 90 % in complex fistulas) its accuracy in detection of abscesses was only 12.5% (0% in simple fistulas and 25% in complex fistulas) and its sensitivity in detection of horseshoe extension was 25% (all in complex group). Also the sensitivity to internal opening detection was 77.7% in the complex group while it was 100% in the simple one with overall accuracy 88.9%. EUA correctly classified perianal fistulas in 15 patients from the 20 patients upon whom the study was done, so its overall accuracy was 75%.

In Choen et al series, the accuracy of EUA reached about 85% for the detection of primary tracts while it was 71.4% and 78.8% for detection of secondary tracts and internal openings respectively.[14]

EUA was able to identify 87.5% of internal openings and 50% of horseshoe tracts[15] while Poen et al.[16] correctly diagnosed primary tracts in 38% of patients, whereas 62% of patients were unclassified. In Ratto et al[17] study, only 65.4% of fistulas were correctly classified by EUA.

Imaging of perianal fistulas with MRI showed, in most of studies, high accuracy in detection of secondary extensions and collections.[18-19] In our study the additional clinical value of preoperative MRI with endoanal coil, as compared with surgery alone, were evaluated. Overall, it led to further surgery in seven patients (35%). One patient had primary fistula (10% of the first group) while six patients had secondary fistulas (60% of the second group) and all of them had no recurrence at a median follow up of 14.4 months. The largest additional information was seen in the detection of abscesses (5 of 5) and horseshoe extensions (5 of 6).

The results of our study are much higher than that reported by Regina et al.[21] where MRI findings led to further surgery in 24% of patients with recurrent fistulas while in patients with simple primary fistulas the percentage was only 8 %. In a larger study[20] of 71 patients with recurrent anal fistula where there was agreement between MR imaging and surgical findings in 35.2% of cases; MR imaging findings led to further surgery and, ultimately, agreement in 21.6% versus 35% in our study. Recurrence at a median of 14.4 months for the surgeons who always, sometimes, or never acted on discrepant MR imaging findings were 16%, 30%, and 57%, respectively, confirming the value of MR imaging in picking up clinically undetected sepsis and the significant impact that this can have on outcome.

By contrast Scholefield et al[22] stated that MRI is of little value in the surgical treatment of perianal fistulas as MRI added additional information than initial surgery in only 7.4%. Most of patients in this study had simple primary fistulas.

In general, the sensitivities and specificities figures for the detection of fistula tracts, horseshoe fistula, and internal openings by MRI with endorectal coil in this study are relatively nearby those in other studies.[20,21]

Sensitivity of primary tract detection in our study was 85% in comparison with 100% in other reports.[21,23] Both studies used MRI with endoanal coil. On the other hand, the sensitivity was 81 & 87% in other studies.[24,25] Whereas the specificity of detection of primary tract was 100% in comparison with 86 % in Regina et al. study.[21]

Regina et al.,[21] considered the low specificity in comparison to high sensitivity of MRI is due to misdiagnosis of healed fibrous tracts as inactive fistulous tract as it gives the same hypointense signal without the hyperintese signal of fluid inside.

With surface body coil, Chapple et al.,[24] reported specificity of MRI in detection of fistulous tracts to be 73% in comparison to 46% by surgery.

Beckingham et al.,[26] also used MRI with surface body coil but with 100% specificity and 97% sensitivity. Most of patients had simple fistulas.

The sensitivity of MRI with endorectal coil in detection of secondary extensions and abscesses were 91.5% and 100% respectively in our study. While the specificity were 100% for both abscesses and horse shoe.

Initial surgery sensitivity for horseshoe extensions was only 25% in comparison to 91.5% with MRI.

Matching with our study deSouza et al.,[27] found that sensitivity and specificity of MRI with endorectal coil in detection of secondary extensions and abscesses were 100% for both. Chapple et al.,[24] reported that the sensitivity and specificity were 81% and 73% respectively (MRI was done with surface body coil).

In other reports[28] the sensitivity of MRI with endoanal coil in detection of collections and secondary extensions was only 68% in comparison to 97% with surface body coil. The extensions missed by endorectal coil were gluteal abscesses and labial extension. Endoanal coil has limited field of view,so, it is poor in diagnosis of these remote extensions.

MR imaging remains superior in all respects.[29] Matching with our results, Regina et al.,[21] found MRI with endoanal coil has high sensitivity in detection of both abscesses and secondary extensions. For abscesses diagnosis sensitivity was 96% and specificity was 97% while for horseshoe extensions both were 100%. For internal opening detection sensitivity was 81.8% in comparison to 87.5% in ours. Also specificity was 90% in comparison to 93% in ours.

In conclusion, MRI with endorectal coil could be very useful and reliable in defining recurrent or complex fistula anatomy, assesing relationship with anal sphincter and planning surgical strategy. Also it helps in identification of secondary extensions, particularly horseshoe tracts and abscesses.

REFERENCES

1. Lunniss PJ, Armstrong P, Barker PG, Reznek RH, Phillips RK: Magnetic resonance imaging of anal fistulae. Lancet. 1992;340:394-6.

2. Lunniss PJ, Barker PG, Sultan AH, Armstrong P, Reznek RH, Bartram CI, et al: Magnetic resonance imaging of fistula-in-ano. Dis Colon Rectum. 1994,;37:708-18.

3. Shouler PJ, Grimley RP, Keighley MR, Alexander-Williams J: Fistula-in-ano is usually simple to manage surgically. Int J Colorectal Dis. 1986;1:113-5.

4. Seow-Choen F, Phillips RKS: Insights gained from the management of problematic anal fistulae at St Mark's hospital. 1984-88. Br J Surg. 1991;78:539-41.

5. Kuypers HC: Diagnosis and treatment of fistula-in-ano. Neth Surg. 1982;34:147-52.

6. Williams AB, Cheetham MJ, Bartram CI, Halligan S, Kamm MA, Nicholls RJ, et al: Gender differences in the longitudinal pressure profiles of the anal canal related to anatomical structure as demonstrated on three dimensional anal endosonography. Br J Sur. 2000;87:1674-9.

7. Youssem DM, Fishman EK, Jones B: Chron's disease: perirectal and perianal finding at CT. Radiology. 1988;67:331-4.

8. Hussain SM, Stoker J, Schouten WR, Hop WC, Lameris JS: Fistula in ano: endoanal sonography versus endoanal MRI in classification. Radiology. 1996;200:475-81.

9. 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.

10. Spencer JA, Chapple K, Wilson D, Ward J, Windsor AC, Ambrose NS: Outcome after surgery for perianal fistula: Predective value of MR imaging. AJR Am J Roentgenol. 1998;171:403-6.

11. Rociu E, Stoker J, Eijkemans MJC, Laméris JS: Normal anal sphincter anatomy and age- and sex-related variations at high-spatial resolution endoanal MR imaging. Radiology. 2000;217:395-401.

12. Tan IL, Stoker J, Zwamborn AW, Entius KA, Calame JJ, Lameris JS: Female pelvic floor: endovaginal MR imaging of normal anatomy. Radiology. 1998;206:77-83.

13. Fenger C, Filipe MI: Pathology of the anal glands with special reference to their mucin histochemistry. Acta Pathol Microbiol Scand. 1977;85:273-85.

14. Choen S, Burnett S, Bartrom CI, Nicholls RJ: Comparison between anal endosonography and digital examination in the evaluation of anal fistula. Br J Sur. 1991;78:445-7.

15. Deen KI, Williams JG, Hutchinson R, Keighley MR, Kumar D: Fistulas in ano: endoanal ultrasound assessment assists decision making for surgery. Gut. 1994;35:391-4.

16. Poen AC, Felt-Bersma RJ, Eijsbouts QA, Cuesta MA, Meuwissen SG: Hydrogen peroxide enhased transanal ultrasound in the assesdment of fistula in ano. Dis Coln Rectum. 1998;41:1147-52

17. Ratto C, Gentile E, Merico M, Spinazzola C, Mangini G, Sofo L, et al: How can the assessment of fistula in ano be improved? Dis Colon Rectum. 2000;43:1375-82.

18. Halligan S, Buchanan G: MR imaging of fistula-in-ano.Eur J Radiol. 2003;47:98-107.

19. Schaefer O, Lohrmann C, Langer M: Assessment of anal fistulas with high resolution subtraction MR fistulography: comparison with surgical findings. 2004;19:91-8.

20. Buchanan G, Halligan S, Williams A, Cohen CR, Tarroni D, Phillips RK, Bartram CI: Effect of MRI on clinical outcome in recurrent fistula-in-ano. Lancet. 2002;360:1661-2.

21. Regina G.H, Geerard L.B, Arthur G. van der Hoop, Alfons G.H, Roy F.A, Cor G.M, et al: Preoperative MRI of anal fistulas: Does it realy help the surgeon? Radiology. 2001;218:5-84.

22. Scholefield JH, Berry DP, Armitage NC, Wastie ML: Magnetic resonance imaging in the management of fistula in ano. Int J Colorectal Dis. 1997;12:276-9.

23. 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;39:926-34.

24. Chapple KS, Spencer JA, Windsor AC, Wilson D, Ward J, Ambrose NS: Prognostic value of magnetic resonance imaging in the management of fistula in-ano. Dis Colon Rectum. 2000;43:511-6.

25. Schwartz DA, Wiersema MJ, Dudiak KM, Fletcher JG, Clain JE, Tremaine WJ, et al: A comparison of endoscopic ultrasound, magnetic resonance imaging, and exam under anesthesia for evaluation of Chron's perianal fistulas. Gastroenterology. 2001;121:1064-72.

26. Beckingham IJ, Spencer JA, Ward J, Dyke GW, Adams C, Ambrose NS.: Prospective evaluation of dynamic contrast-enhanced magnetic resonance imaging in the evaluation of fistula-in-ano. Br J Surg. 1996;83:1396-8.

27. deSouza NM, Gilderdale DJ, Coutts GA, Puni R, Steiner RE: MRI of fistula in ano; a comparison of endoanal coil with external phased array coil techniques. J Comput Assist Tomogr. 1998;22:357-63.

28. Halligan s, Olive I: MRI of fistula in ano: Are endo anal coils the gold standard? AJR. 1989;171:407-12.

29. Buchanan GN, Halligan S, Bartram CI, Williams AB, Tarroni D, Cohen RG: Clinical Examination, Endosonography and MR imaging in preoperative assessment of fistula in ano: comparison with outcome-based reference standard. Radiology. 2004;233:674-81.