Original Research Article

MRI evaluation in diagnosis and preoperative classification of perianal and anal fistulas and comparison with surgical findings

Ashish Mondal[1], R Sundara Raja Perumal[2*]

[1,2]Department of Radio Diagnosis, Command hospital Eastern command, Chennai, Tamil Nadu, INDIA.
Email: rsr_peru@yahoo.co.in

Abstract

Perianal and anal fistulas are common pathology in Indian population which cause substantial discomfort and morbidity to the patient thus affecting productive man hours and quality of life. Even though, most of the perianal fistulas are easily recognized by clinical examination, complex fistula will be difficult for clinical examination and for planning for further treatment. In the past, imaging techniques played a limited role in evaluation of perianal fistulas, now it is increasingly used, especially magnetic resonance imaging MRI, play a crucial role for better evaluation of perianal fistula, its extension, relationship to external sphincter and its related complication. Furthermore, radiologists can provide detailed anatomic descriptions of the relationship between the fistula and the anal sphincter complex, thereby allowing surgeons to choose the best surgical treatment. MRI findings of perianal fistula was compared with post operative findings. Aim of this study is to evaluate the sensitivity, specificity, positive predictive and negative predictive value in identifying the perianal fistulous tracts, lateral branches, internal opening, and associated perianal abscess and supralevator extension. This was a prospective study conducted in the department of Radio diagnosis, Command hospital Eastern command, Kolkata for about 50 patients of anal fistulas referred for fistulogram evaluation from department of surgery. All patients underwent MRI study and results were complied and analyzed. Patients who were opted for surgery, surgical findings were noted and corroborated with MRI findings. In our study, the commonest type of ano-rectal fistula encountered was Grade-I seen in 37.5 %. 26 patients underwent surgery for fistula. MRI showed sensitivity and specificity of 100% and 50% respectively in detecting internal openings, 100% and 93.33 % respectively in detecting abscesses, 100% and 89.47% respectively in depicting secondary tracts, 85.71 % and 100% respectively in detection of simple non branching tracts. MRI was 100% sensitive and specific in detecting horseshoe abscesses and supralevator extensions. St. James's University Hospital classification of perianal and anal fistulas correctly assessed fistulas in 23 88.5% patients. The concordance with surgery was 89.1 %.

Key words: Perianal fistula, Perianal abscess, MRI Fistulogram, Supra levator extension, Parks classification of perianal fistula, St James's University Hospital Classification Of Peri-Anal Fistula

***Address for Correspondence:**
Dr. R Sundara Raja Perumal, Department of Radio Diagnosis, Command hospital Eastern command, Chennai, Tamil Nadu, INDIA.
Email: rsr_peru@yahoo.co.in
Received Date: 02/04/2019 Revised Date: 28/05/2019 Accepted Date: 11/07/2019
DOI: https://doi.org/10.26611/10081119

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 25 July 2019

INTRODUCTION

Fistula is defined as an abnormal communication between two epithelium lined surfaces. Perianal and anal fistulas are abnormal connections between the epithelialised surface of the skin and anal canal and usually in continuity with one or more external opening in the perianal skin. Perianal fistulas have been studied since ancient times. The first to describe the diagnosis and treatment of anal fistula was Sushruta around 600 BC. Around 430 BC, Hippocrates 460-370 BC described perianal fistulas in more detail.[1] It is remarkable that some of his guidelines carry worldwide popularity up to today. The incidence of perianal fistula ranges from

How to cite this article: Ashish Mondal, R Sundara Raja Perumal. MRI evaluation in diagnosis and preoperative classification of perianal and anal fistulas and comparison with surgical findings. *MedPulse – International Journal of Radiology.* July 2019; 11(1): 36-41. http://www.medpulse.in/Radio%20Diagnosis/

approximately 1-2 per 10,000 individuals with an approximate 2:1 male to female predominance. The maximum incidence is between the third and fourth decades of life.[2-4] Perianal fistulas account for a substantial discomfort and morbidity to the patient thus affecting productive man hours and quality of life. Although many fistulas are easily recognized and treated, others can be complex and difficult to treat. The definite treatment of perianal and anal fistulas is surgery. Though this is successful in most cases, it is also associated with a significant prevalence of recurrence [5]. For the surgical management of anal fistulas accurate, detailed preoperative assessment of the course of the primary fistulous track and the site of any secondary extension or abscesses is required.[6] In the past, imaging techniques played a limited role in evaluation of perianal fistulas, it is now increasingly recognized that magnetic resonance imaging MRI, can play a crucial role. MR imaging used to identify the infected tracks and associated abscesses that would otherwise remain undetected. MRI also provide the site and extension of perianal pathology and their relationship with anal sphincter and also evaluate the supralevator extension and helps in surgical treatment. It reduces recurrence of the disease or possible secondary effects of surgery, such as fecal incontinence.[7,8] The role of MR imaging in the diagnosis of perianal fistulas and their complications is significant. The MR imaging appearance of this condition shows greater concordance with surgical findings than does any other imaging evaluation. Many different MR imaging techniques have been used in the coronal, sagittal and axial planes demonstrates fistulous tracks in relation to the sphincter complex, ischiorectal fossa, and levator plate.

MATERIALS AND METHODS

This was a prospective study conducted in the department of Radio diagnosis for about 50 patients of anal fistulas referred for fistulogram evaluation from department of surgery. All patients underwent MRI study and results were complied and analyzed. Patients who were opted for surgery, surgical findings were noted and corroborated with MRI findings **.**The patients who are clinically diagnosed to have anal or perianal fistulas in all ages and both sexes were included in this study and MRI was done after taking their written consent. Patients who present with fistulas due to carcinoma of the rectum or previous radiation therapy, All congenital fistulas, Patients with potential contraindications for MRI, Patients who are not willing to participate in this study were excluded from this study. All patients included in the study presenting with local pain and discharge or associated abscess were evaluated by pelvic magnetic resonance imaging without any bowel preparation. Any contraindication for MRI imaging was evaluated and patient with contraindication were excluded. MR imaging was performed using Siemens 1.0 T with a phase array coil. The patients were placed in supine position during image acquisition. The imaging volume was planned to incorporate the distal rectum and subcutaneous tissue with inclusion of anal canal, the sphincter muscles, the ischiorectal fossa, the levator muscle and the supralevator space.

MRI PROTOCOL

The following MRI protocol were done for all patients-

T1 TIRM AXIAL, T1 TIRM CORONAL, T1 TIRM SAGGITAL OBLIQUE OPTIONAL, T2 TSE AXIAL and T2 TSE CORONAL. The coronal plane runs parallel to the length of the canal which is visualized in the saggital survey images.

RESULTS AND DISCUSSION

Table 1: The used MRI parameters are

MRI SEQUENCES	T1 TIRM AXIAL	T1 TIRM CORONAL	T1 TIRM SAG OBLIQ	T2 TSE AXIAL	T2 TSE CORONAL
TR/TE msec	6780/27	6410/28	8790/28	6180/115	8490/99
FOV cm	350	350	350	350	350
Section thickness mm	4	4	3	3	3
Intersection gapmm	0.8	0.8	0.8	0.8	0.8
Matrix	512X512	512X512	512X512	256X256	512X512

MRI findings and surgical findings were recorded on a predesigned Performa and was managed using Microsoft Excel 2007 Microsoft Corp, Redmond, WA. Free online software packages like Openepi and Medcalc were used for statistical analysis. Sensitivity how accurate the test is in positive cases, specificity how accurate the test is in negative cases, positive predictive value how accurate the test is when it gives a positive result and negative predictive value how accurate the test is when it gives a negative result of MRI in detecting internal opening, abscess, secondary tracks, supralevator extension were assessed. Cohen's Kappa coefficient was used to analyze the agreement between MRI and surgical findings. The diagnostic standard of reference in all cases will be the surgical findings.

Primary tract: Active tracks are filled with pus and granulation tissue and thus appear hyperintense on T2WI and STIR sequences. On contrast enhanced T1WI, active granulation tissue will enhance while fluid in the tract remains hypo intense.

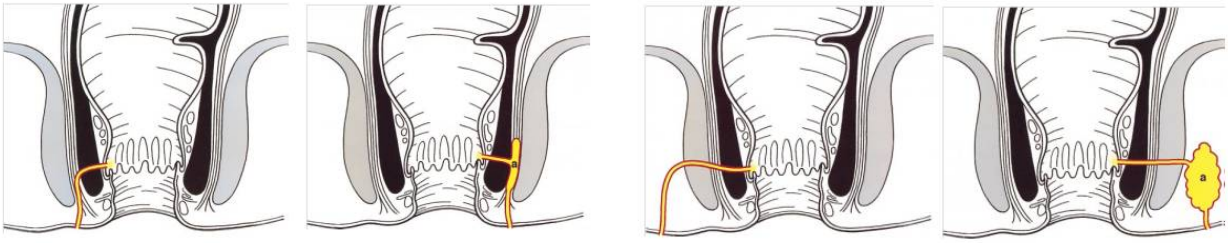
Internal opening: The radial site of the internal opening is easy to identify if the fistula tract can be traced right to the anal mucosa. The radial site is reported with respect to a clock face, where 12 o'clock being directly anterior.
Extensions: Complex tract systems may often become dilated to create an abscess. They appear as hyper intense regions on T2WI and STIR sequences and wont enhance if intravenous contrast material is used.
External opening: External opening of the fistula if present on the skin can be identified at T2/STIR hyper intense focus. However, it is usually evident at surgical inspection and doesn't require radiological demonstration.

PARK'S CLASSIFICATION OF PERI-ANAL FISTULA

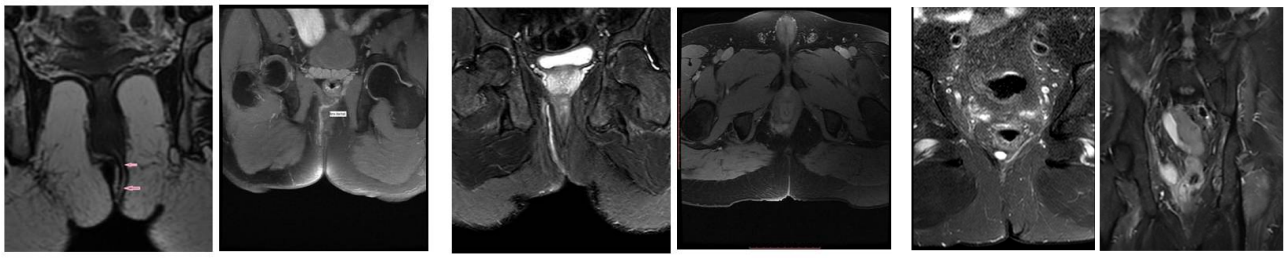
The fistula course is described in coronal plane and its relationship to the internal opening. No significant abnormality is seen external sphincters. Fistulas are classified into four groups.
Inter-sphincteric 70%: Fistula crosses the intersphincteric space and doesn't cross the external sphincter.
Trans-sphincteric 25%: Fistula crosses from the intersphincteric space, through the external sphincter and into the ischiorectal fossa.
Supra-sphincteric 4%: Fistula passes upwards into the intersphincteric plane, passes over the top of the puborectalis muscle, then descends through the levator plate to the ischio-rectal fossa and finally to the skin.
Extra-sphincteric 1%: Fistula passes from the perianal skin through the ischiorectal fossa and levator muscles then into the rectum.
MR imaging findings are included in the parks classification system.

ST JAMES'S UNIVERSITY HOSPITAL CLASSIFICATION OF PERI-ANAL FISTULA

This classification is easy to use because it utilizes axial anatomic landmarks familiar to radiologists.
Grade 1: Simple Linear Intersphincteric Fistula — In a simple linear intersphincteric fistula, the fistulous track extends from the skin of the natal cleft or perineum to the anal canal, and the ischiorectal and ischioanal fossa are not involved.
Grade 2: Intersphincteric Fistula with Abscess or Secondary Track—Intersphincteric fistulas with an abscess or secondary track are also bounded by the external sphincter. and the secondary fistulous tracks may be of horseshoe type, crossing the midline or they may ramify in the ipsilateral intersphincteric plane.
Grade 3: Trans-sphincteric Fistula— trans-sphincteric fistula pierces through both layers of the sphincter complex and then arcs down to the skin through the ischiorectal and ischioanal fossa.
Grade 4: Trans-sphincteric Fistula with Abscess or Secondary Track within the Ischiorectal Fossa—a trans-sphincteric fistula can be complicated by sepsis in the ischiorectal or ischioanal fossa.
Grade 5: Supralevator and Trans-levator Disease.—in rare cases, perianal fistulous disease extends above the insertion of the levator ani muscle.



Grade 1:perianal fistula **Grade 2:** perianal fistula **Grade 3:** perianal fistula **Grade 4:** perianal fistula



Grade 1 **Grade 2** **Grade 3** **Grade 4** **Grade 5** **Grade 6**

Grade 1: Perianal fistula **Grade 2:** Perianal fistula **Grade 3:** Perianal Fistula **Grade 4:** Perianal Fistula **Grade 5:** Perianal Fistula **Grade 5:** Perianal Fistula With Abscess

In our study 35 patients were males and 9 were females and their age ranged from 10 to 73 years with a mean of 38.9 years. This was in agreement with Halligan *et al*,[9] who stated that the disease predominantly strikes young adults and men are more commonly affected. The average age was 28 years in a study by H AI P Baddar[10], the oldest was 42 years while the youngest was 10 years old. Most of our patients presented with a complaint of pain and discharge in perianal region and most common clinical diagnosis was primary fistula in ano in 50.6%. Mullen *et al*.[11], who study the indications and contribution of MR imaging of fistula in ano to surgical assessment in 40 patients had perianal sepsis in 50% of their study group. Five of our patients had recurrent perianal fistula and 7 out of 44 patients had undergone previous fistula surgery and had presented with recurrence. Khera *et al*[12], in their retrospective study in 43 patients found recurrent perianal fistula in 3 patients and 8 patients had recurrence after previous fistula surgery. The commonest type of ano-rectal fistula encountered in this study was Grade-I seen in 37.5 %. Grade-II fistulas are seen in 13.6 %, Grade-III in 18.2 %, Grade-IV in 22.7 % and Grade-V in 11.4 % of study population. 3 6.8% patients had no perianal fistula. In a study done to evaluate the role of MRI in preoperative assessment of ano-rectal fistula in 24 patients, Rania E *et al*[13] have found 37.5 % Grade 1 fistulas, 12.5% Grade 2 fistulas, 12.5 % Grade 3 fistulas, 20.8 % Grade 4 fistulas and 16.7 % Grade 5 fistulas. Grade 1 was the commonest type recognized in 9 patients. H AI P Badder[10] studied MRI findings in 50 patients with clinical evidence of anal fistulas and detected 30 % Grade 1 fistulas, 38 % Grade 2 fistulas, 10 % Grade 3 fistulas, 10 % Grade 4 fistulas and 12 % Grade 5 fistulas. Grade 2 was the commonest type followed by Grade 1 fistulas. In a prospective study by Naglaa D *et al* [14] in 25 patients with perianal sepsis, 3 12% were Grade 1, 2 8% were Grade 2, 9 36% cases Grade 3, 9 36% cases Grade 4 and 2 8% were Grade 5. External opening was not visualized in 2 patients with diagnosis of perianal abscess and sinus. This may be due to early stage of fistula formation, thus supporting crypto-glandular hypothesis [14]. Most common location of external opening in our study population was 5 and 6 o'clock location seen in 50% of the patients. In our study internal opening was demonstrated in MRI in 39 patients 88.7%. The most common location of internal opening in our study was at 6 o'clock seen in 18 40.9% patients. The next common location was 7 o'clock seen in 8 18.2% patients. Rania E *et al* [13] in their study found 6 o'clock location of internal opening as most common and seen in 50% of study group. Out of 26 patients who undergone surgery, MRI showed agreement with surgical findings with respect to internal opening in 23 patients 88.5%. In the remaining 3 patients, internal opening was not found at surgery. Sometimes, the accurate location of the internal opening can be difficult to recognize at surgery due to local anatomical conditions as it is usually narrow, small or intermittently closed. The sensitivity, specificity, positive predictive value and negative predictive value of MRI in our study, in detecting internal opening were 100%, 50%, 86.96% and 100% respectively. Beets-Tan RG *et al* [16] found that MR imaging is 96 % sensitive, 90% specific with 90% positive predictive value and 96% negative predictive value in detecting internal opening. Demonstration of level of the internal opening at MRI is important since this will determine the extent of sphincter division during fistulotomy. Stoker *et al* [17] stated that the internal opening was successfully depicted by T2WI and STIR images and were in agreement with the surgical findings. In our study out of 41 patients who had perianal fistulas, simple non branching tracks were observed in 27 65.85% patients, secondary tracks in 14 34.15% patients, abscess in 15 patients 36.69%, horseshoe abscess in 4 patients 9.76% and supralevator extension in 5 patients 12.2%. No trans-sphincteric fistula was encountered in our study. In Ranai E. Mohamed[13] study, simple non branching tracks were observed in 79.2% patients, secondary tracks in 20.8% patients, abscess in 20.8%, and horseshoe abscess in 16.4% and supralevator extension in 20.8% patients. All the 12 out of 26 patients who had simple tracks at MRI showed the same at surgery. 2 patients who showed branching tracks at MRI were actually simple track at surgery. Retrospective review of MRI showed that the adjacent inflammation was misinterpreted as secondary tracks. The sensitivity, specificity, positive predictive value and negative predictive value of MRI in our study, in detecting simple tracks were 85.71%, 100%, 100% and 85.71 % respectively. Beets –Tan RG *et al* [16] in their study found that MR imaging is 100 % sensitive, 86% specific with 88% positive predictive value and 100% negative predictive value in detecting simple tracks. Villa C *et al*[18] in their study stated that MRI is 100% sensitive and 86 % specific for depiction of simple tracks. Our study findings are in agreement with these two studies.Two out of 9 patients in whom MRI showed secondary tracks did not agree with surgical findings. This false positive was due to confusion between neural and vascular elements within the ischio-anal fossa. Sensitivity and specificity of MRI in detecting secondary tracks is 100% and 89.74% respectively with 77.78 % positive predictive value and 100% negative predictive value. 11 out of 12 patients in whom MRI showed abscess correlated with surgical findings. One patient in whom MRI showed abscess did not have abscess at surgery. This may be due to spontaneous discharge of abscess content before surgery.

Hence Sensitivity and specificity of MRI in detecting abscess is 100% and 93.33% respectively with 91.67 % positive predictive value and 100% negative predictive value. Beets –Tan RG *et al* [16] in their study found that MR imaging is 96 % sensitive, 97% specific with 89% positive predictive value and 99% negative predictive value in detecting abscess. Villa C *et al* [18] in their study stated that MRI is 96% sensitive and 97 % specific for depiction of abscess. Our study showed MRI has 100% sensitivity and specificity with respect to horseshoe abscesses and supralevator extension. Beets-Tan RG *et al* [16] also found similar result in their study in detecting horseshoe abscesses and supralevator extension. They also stated that the greatest additional value of MRI is its ability to detect horse shoe abscesses and supralevator extension. The greatest difficulty encountered in our study was identification of internal opening and active side tracks. Most of the comparative studies between MRI and other imaging studies like endoanal sonography agreed that MRI is significantly superior [19]. A recently published paper [20] has demonstrated that the accuracy of endosonography, MRI and surgical exploration was 91%, 87% and 91 % respectively and reached up to 100% if two of these modalities were combined. A prospective study by Gordon N *et al* [21] summarized that MR imaging is the most accurate pre operative technique for classification of fistula in ano and performs best in the evaluation of the primary track and any secondary extension. Anal endosonography, although inferior to MR findings, was always superior to clinical examination. Darius W *et al* [22] concluded that MRI is accurate in assessment of the perianal fistulous tracts in soft tissue and thus recommended it as diagnostic method of choice which should be improved and applied more commonly in this pathology. In the current study, the type of fistula was identified by using the St. James University Hospital classification in 44 subjects with a mean age of 38.9 years. Males outnumbered females. Most of the patients presented with perianal pain and discharge from external orifice. The commonest type of ano-rectal fistula encountered in the study was Grade-I seen in 37.5 %. Grade-II fistulas are seen in 13.6 %, Grade-III in 18.2 %, Grade-IV in 22.7 % and Grade-V in 11.4 % of study population. 26 patients underwent surgery for fistula. MRI showed sensitivity and specificity of 100% and 50% respectively in detecting internal openings, 100% and 93.33 % respectively in detecting abscesses, 100% and 89.47% respectively in depicting secondary tracts, 85.71 % and 100% respectively in detection of simple non branching tracks. MRI was 100% sensitive and specific in detecting horseshoe abscesses and supralevator extensions. St. James's University Hospital classification of perianal and anal fistulas correctly assessed fistulas in 23 88.5% patients. The concordance with surgery was 89.1 %. Our results show that MRI findings were in substantial agreement Cohen's kappa coefficient of 0.67 with the surgical findings. To summarize, our results revealed that MRI is an essential tool in pre-operative evaluation of the perianal and anal fistulas. It provided high resolution images of the anatomy of the anorectal region with delicate depiction of the fistulous tracts with their associated secondary ramifications and abscesses.

CONCLUSION

MRI is a highly accurate, rapid and non-invasive tool in pre-operative evaluation of the perianal and anal fistulas. It provides high resolution images of the anatomy of the anorectal region with precise definition of the fistulous tracts, their associated secondary tracts and abscesses. Also, MRI evaluation and classification of perianal fistulae has a high degree of diagnostic accuracy. The use of MRI for the diagnosis and classification of perianal fistula can provide reliable information which has both preoperative and prognostic value. St James University Hospital classification, which is an MR imaging based grading system for perianal fistula is very useful for effective radiological-surgical communication thus contributing to improved patient care. The largest additional value of MR imaging is in assessing complex fistulas where the radiologist can alert the refereeing physician about supralevator and translevator extension that may require expert surgical management. In recurrent fistula-in ano, preoperative MRI has a therapeutic impact with decreased recurrence rates. Overall, MRI can be identified as the modality of choice for preoperative evaluation of patients with perianal fistula.

REFERENCES

1. Corman ML. Classic articles in colon and rectal surgery. Hippocrates: On fistulae. Diseases of the colon and rectum. 1980: 23:56-9
2. Sainio P. Fistula-in ano in a defined population. Incidence and epidemiological aspects. Annales chirurgiae et gynaecologiae . 1984; 73:219-24
3. Zanotti C, Matinez- Puente C, Pascual I eta l. An assessment of the incidence of fistula- in ano in four countries of the European Union. International journal of colorectal disease. 2007; 22:1459-62
4. Morris J, Spencer J A , Ambrose NS. MR imaging classification of perianal fistulas and its implications for patient management. Radiographics 2000 ; 20:623-635
5. Lilius HG. Fistula- in –ano, an investigation of human foetal anal ducts and intramuscular glands and a clinical study of 150 patients. Acta Chir Seand Suppl 1968; 383:7-88
6. Seow- Choen, Philips RK. Insights gained from the management of problematical anal fistulae at St. Mark's Hospital, 1984-88. Br J Surg 1991; 785 : 539-541

7. Beckingham IJ, Spencer JA *et al.* prospective evaluation of dynamic contrast enhanced magnetic resonance imaging in the evaluation of fistula in ano. Br J Surg 1996 ; 83 10: 1396-1398
8. Buchanan G, Halligan S, Williams A *et al.* effect of MRI on clinical outcome of recurrent fistula in ano. Lancet 1934; 2245804 : 1150-1156.
9. Halligan S, Stroker J. imaging of fistula in ano. Radiology 2006; 2391: 18-33.
10. H AI P Badder. The role of MRI in perianal fistula. Bull. Alex. Fac Med 43 No 1 , 2007.
11. Mullen R *et al.* MR imaging of fistula in ano: indications and contribution to surgical assessment. Acta Chir Belg 2011; 1116: 393-7.
12. Pushpinder S Khere *et al.* MRI in perianal fistula. Indian J Radiology imaging 2010; 201: 53-57.
13. Rania EM, Dina M. Role of MRI in pre operatives' assessment of the ano-rectal fistula. The Egyptian journal of radiology and nuclear Medicine 2014. L4-5: 35-47.
14. Naglaa D *et al.* MRI evaluation of perianal fistula. The Egyptian journal of radiology and nuclaear medicine.
15. Parks AG. Pathogenesis and treatment of fistula in ano. BMJ 1961; 15224: 463-469.
16. Beets-Tan RG, Beets GL, van der Hoop AG, *et al.* Preoperative MR imaging of anal fistulas: does it really help the surgeon? Radiology 2001; 2181: 75–84.
17. Stroker J, Rociu E, Wisersma T *et al.* Imaging of anorectal diseases, Br J Surg 2000: 87: 10-27.
18. villa C *et al.* Role of MRI in evaluation of the activity of perianal Crohn' disease. Eur J Radiol 2011; 81: 616-22.
19. Soendersing D, Shahid M. MRI of perianal fistulas. Semin Ultrasound CT MRI 2005 ; 26: 247-258.
20. Schwartz D, Wiersema MJ, Dudiak KM *et al.* A comparative of endoscopic ultrasound, MRI and exam under anesthesia for evaluation of Crohn's perianal fistula. Gastroenterology 2001; 121: 1064-1072.
21. Gordon N. *et al.* Clinical examination, endosonography and MR imaging in preoperative assessment of fistula in ano. Radiol 2004; 233: 674-681.
22. Dariusz W, Tomasz A, JerzY A, *et al.* Usefulness assessment of preoperative MRI Fistulography in patients with perianal fistulas. radiol 2011; 764: 40-44.

Source of Support: None Declared
Conflict of Interest: None Declared