

Comparison of Preoperative MRI and Intra-operative Findings for Evaluation of Perianal Fistula – A Diagnostic Accuracy Study.

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Abstract

Background : Perianal fistula is a tract lined by infected granulation tissue that connects anal canal or rectum to the skin around anus. The surgical treatment of anal fistulas requires identification of the course of the primary and secondary tracts and their relation with the sphincteric musculature in order to properly manage the fistula and drain any present abscess.

Aim: To determine diagnostic accuracy of preoperative MRI in detection of perianal fistula compared to intra operative findings.

Methodology: This is a prospective study conducted in 35 patients referred in radiodiagnosis department with suspected perianal fistulae having one or more external openings. Imaging was done on 1.5 Tesla magnetic resonance imaging. MRI findings were classified according to “St. James’s University Hospital MR Imaging Classi-

fication of Perianal Fistulae” and correlated with intraoperative findings.

Results and Conclusion: In our study among 35 patient, MRI showed agreement with surgical findings with respect to presence of internal opening in 34 patients (97.1%).

The most common location of internal opening was 6 o’clock which was found in 57.2% of patients. Most common fistula was grade 1 (40%). Sensitivity, specificity, PPV, NPV and diagnostic accuracy of MRI in inter sphincteric and Trans sphincteric type of fistula were 100 %, 94.7 %, 94.1 %, 100 % and 97.1% respectively. Diagnostic accuracy for detection of abscess was 97.1% and for branching and horseshoe extension was 100%.

Keywords: Perianal fistula, MRI, Primary tract, Internal opening.

Introduction

Perianal fistula is one of the common anorectal disorders in surgical practice (1) with high prevalence, which predominantly affects young adult males (1). Perianal fistulae has been affecting mankind since antiquity and are mentioned in literature from the time of Hippocrates. As many great kings and rulers have also suffered from the disease, much has been written on the subject (3).

Physical examination alone is not as accurate as imaging modalities in detecting the features of the fistula, and recurrences are usually due to missed or inadequately managed infective components.

Magnetic resonance imaging (MRI) is the preferred imaging modality for detecting anal fistulas. (2)

Perianal fistula is a tract lined by infected granulation tissue that connects anal canal or rectum to the skin around anus. Its wall is made of inflammatory granulation as well as fibrous tissue. Perianal fistulae occur in approximately 10 out of 10,000 persons (3). It usually occurs in adult men with maximum incidence between third and fifth decades. Perianal fistulae are not only painful and irritating but can also be a nidus for systemic spread of infection. The most common presenting symptom is discharge (65% of cases) (3). Perianal fistulae sometime leads to acute abscess formation where immediate surgical decompression becomes necessary, however, most simple fistulae can be treated electively using fistulotomy. The goal of treatment in an anal fistula is to eliminate the primary opening, any associated tracts and any secondary openings without loss of continence (3).

Before the era of magnetic resonance imaging (MRI), fistulography was used to evaluate fistula-in-ano. However, this technique has a low diagnostic accuracy (~ 16%), and inability to visualize secondary tracts, abscesses and the sphincter complex due to its suboptimal contrast

opacification. As a result, fistulograms are not able to provide information about the relationship between fistula tracts and anal sphincters. Endoanal ultrasonography is the first imaging technique that provides the anatomical details of anal canal. It can be used for the diagnosis and management of not only abscesses and fistula-in-ano, but also anorectal and prostate tumors. Endoanal ultrasonography is particularly helpful in identifying primary fistulous tracts and internal openings with high accuracy rates (7). However, the limited field of view is regarded as an inherent limitation of this technique, discounting its value to evaluate secondary tracts or supra levator extensions of a primary tract. Recently, MRI has been considered the 'gold standard' technique for the preoperative evaluation of fistula-in-ano. An accurate and comprehensive assessment to detect primary tracks, associated ramifications and abscesses plays a crucial role in determining surgical outcomes and minimizing complications, such as fecal incontinence, as well as recurrent lesions. (7)

The advent of MRI with its superior soft-tissue contrast resolution and multiplanar imaging capabilities, brought a dramatic change in imaging of perianal fistulas. Surgical procedures after MRI have showed significantly better results. Still, MRI for perianal fistulas has yet to gain wider acceptance. Numerous studies have been done comparing the efficacy of MRI with the other imaging modalities available. Much work has also been done on refining the MRI protocol for evaluating perianal fistulas from the use of endorectal coils to the use of newer and advanced sequences. The use of MRI in Perianal fistulas is continuously evolving. Recurrence is one of the most important problems following surgery, so identification of the extensions of the Ano-rectal fistula with proper imaging methods decreases the percentage of its recurrence. (8)

The magnetic resonance imaging (MRI) plays an important role in the preoperative evaluation of the Ano-rectal fistulas as it allows identification of the infected tracts and abscesses as well as detailed anatomic descriptions of the relationship between the fistula and the anal sphincter complex. (9)

Parks classification used to classify perianal fistulae is basically a surgical classification. To easily report all the relevant imaging findings St. James's University Hospital MR Imaging Classification of Perianal Fistulae was proposed by radiologists though it does not represent an official surgical reference. Being a simple classification to apply and remember it helps in better describing the disease so that surgeons can understand the relevant findings. (3)

The role of imaging is very important to outline all hidden tracts and define the relationship of the fistula to the anal sphincter so the unintentional damage to the anal sphincter, which can lead to anal incontinence can be easily avoided.

Therefore, we planned this study to determine the diagnostic accuracy of preoperative MRI for preoperative evaluation of anal fistula regarding activity, tract identification.

Material and methods

This is an observational study to compare the preoperative MRI finding with intraoperative finding in patients with perianal fistula undergoing surgeries. Total 35 patients who had fistula on MRI underwent surgical examination. Imaging was done with 1.5 tesla magnetic resonance imaging equipment from Philips. Images were obtained in the axial, coronal, and sagittal planes. MRI sequences 1) T1 TSE 2) T2 TSE 3) T2 TSE FS 4) VISTA 5) DWI 6) T1 FS Pre contrast 7) 3D T1 FS post contrast were taken. Exclusion criteria included patients who omitted from MR imaging for any cause, who refused surgical

interference, and patients who had surgical interference after more than 1 week of MR imaging were not enrolled in the study.

St. James University Hospital classification was used to determine the grade of perianal fistula on preoperative MRI.⁽¹⁵⁾

MRI findings were compared with the operative findings of the patients and accuracy of MRI findings was evaluated.

For each MRI characteristic, 2x2 contingency table was used to calculate sensitivity, specificity, and diagnostic accuracy. Agreement between the MRI and surgical findings was assessed. Obtained data were presented as mean ± SD, ranges, numbers, and ratios. Numbers and ratios were analyzed using chi-square test (X² test). Sensitivity, specificity, and diagnostic accuracy were calculated by using standard formula. P value less than 0.05 was taken as significant.

Results

The study included 35 patients with fistula in Ano who underwent Surgery after initial evaluation of MRI of the fistula in Ano. In our study age of patients ranged from 10 – 89 years. Age group between 30-39 and 40-49 years accounted for maximum number of cases (31.4%) and they comprised mostly male patients. Discharge was the most common complaint in 77% patient. Demographic data are summarised in table 1.

Parameters	Total no.	percentage
Gender		
Male	33	94.29
Female	02	5.71
Complaint		
Discharge	25	71
Pain and discharge	10	29

Table 1: graphic data of subjects.

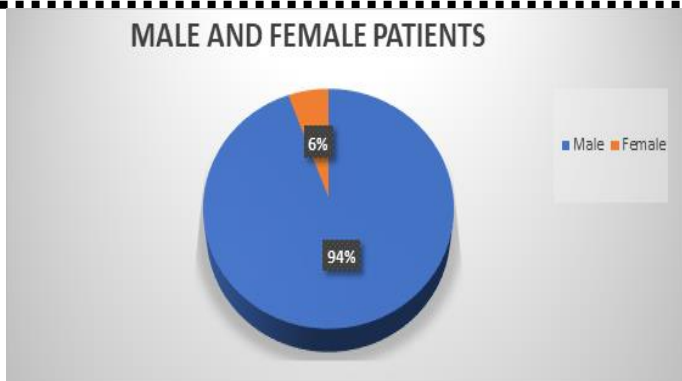


Chart 1:

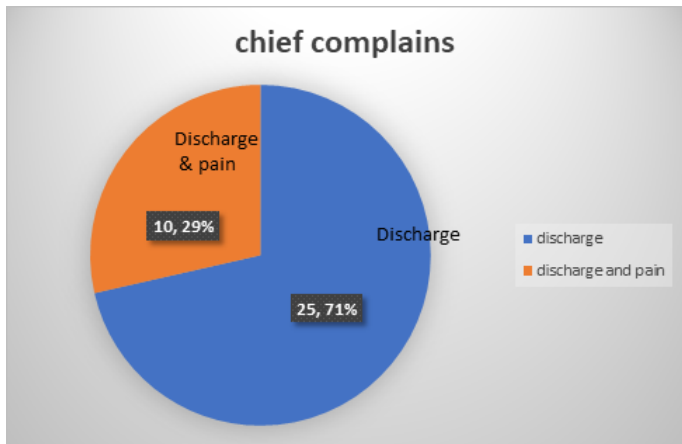


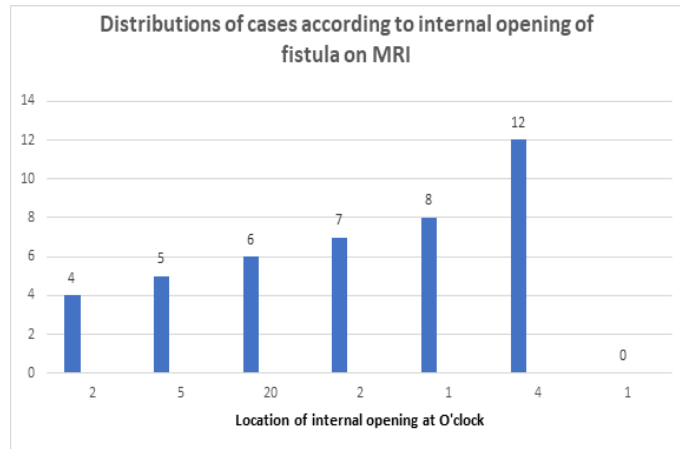
Chart 2:

In our study, internal opening seen in 34 patients among 35 patient (97.1%). The most common location of internal opening was 6 o'clock which was found in 20 patients (57.2%). Next common location was 5 o'clock which was found in 5 patients (14.2%) followed by 12 o'clock in 4 patients (11.4%), 7 o'clock and 4 o'clock in 2 patients (5.7%) and 8 o'clock in 1 patient (2.8%). Distribution of cases according to internal opening of fistula on MRI summarized in Table 2.

Location of internal opening at O'clock (Radiological)	No.	%
4	2	5.7
5	5	14.2
6	20	57.1
7	2	5.7
8	1	2.8

12	4	11.4
Not seen	1	2.8
Total	35	100%

Table 2: Distribution of cases according to internal opening of fistula on MRI.

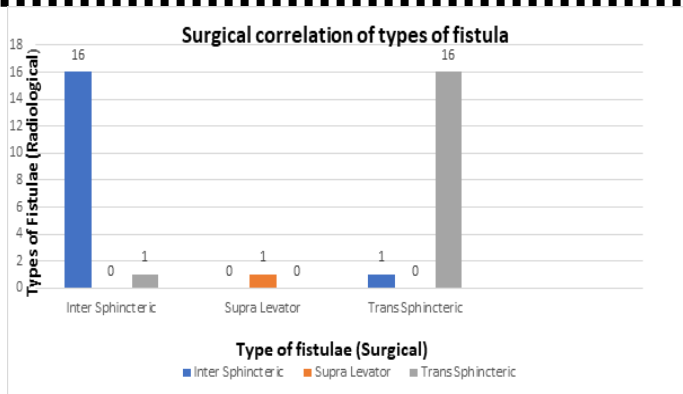


Graph 1

Classification of fistula was done according to St. James's University Hospital Classification of perianal fistula in our study. Grade 1 fistula seen in 14 patients (40%), grade 2 fistula seen in 5 patients (14.2%), grade 3 fistula seen in 3 patients (8.5%), grade 4 fistula seen in 12 patients (34.2%) and grade 5 fistula seen in 1 patient (2.8%). The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy are summarized in table 3.

Types of Fistulae (Radiological)	Sensitivity	Specificity	PPV	NPV	Accuracy
Inter Sphincteric	100	94.71	94.1	100	97.14
Supra Levator	100.00	100.00	100.00	100.00	100.00
Trans Sphincteric	100	94.7	94.1	100	97.14

Table 3: Diagnostic accuracy of MRI in view of types of fistulae

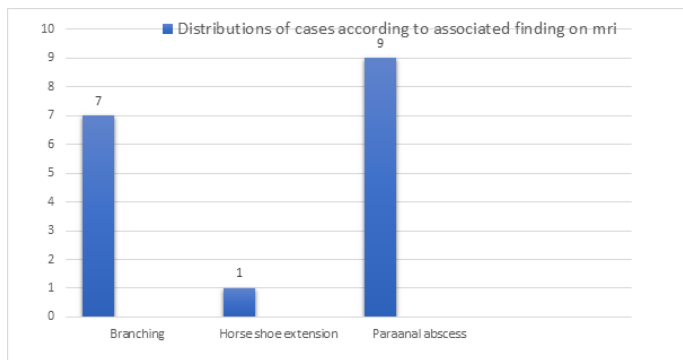


Graph 2

Our study among 35 patients, branching was found in 7 patients (20%). 5 patients had single branching and 2 patients had multiple branch ings. Horseshoe extension seen in 1 patient (2.85%) and 9 patients (25%) had abscess. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy are summarized in table 4.

Associated findings (Radiological)	Sensitivity	Specificity	PPV	NPV	Accuracy
Branching	100.00	94.7	85.7	100.00	97.1
Horseshoe extension	100.00	100.00	100.00	100.00	100.00
Perianal abscess	100.00	100.00	100.00	100.00	100.00

Table 4: Sensitivity, specificity, PPV, NPV and Diagnostic accuracy of MRI in view of associated findings



Graph 3

Discussion

Perianal fistula is a tract lined by infected granulation tissue that connects anal canal or rectum to the skin around anus. Its wall is made of inflammatory granulation as well as fibrous tissue. They are thought to be a result of anal gland obstruction, with secondary abscess formation and external rupture of the abscess.

Initial diagnosis of perianal fistula is based on history-taking and physical examination which should include a detailed anal inspection with a rectal examination. Approximately 5% of fistulae have a difficult, branched, complex course, with the tract reaching above the puborectalis muscle. Frequently, the internal orifice is narrowed, small or periodically closed.

The surgical treatment of anal fistulas requires identification of the course of the primary and secondary tracts and their relation with the sphincteric musculature in order to properly manage the fistula and drain any present abscess. Physical examination alone may not be enough to delineate these features and recurrence is usually due to missed infective foci at the first surgery . MRI is the most accurate imaging tool to define anal canal anatomy and anal fistulas

Fistulography, as the earliest X-rays method, cannot classify fistulae due to the inadequate visualization of anatomic structures, so that frequently it is unclear and difficult for the interpretation. In a retrospective review of fistulography images from 25 patients to ascertain the utility of contrast material enhanced fistulography, correct diagnoses were achieved in only 16% of the patients, demonstrating that this approach was inaccurate and unreliable. CT can identify the existence of fistulous passages, either through non-ionic water soluble contrast media being inserted per rectum or through the fistulous opening. However, it is not sufficient for a more detailed analysis of the whole complex of primary and numerous

secondary branches in the fistulous system. Conventional fistulo graphy, ultra sono graphy and computed Tomo graphy have proved to be insufficient in correct assess ment of the disease.

The study included 35 patients with fistula in Ano who underwent Surgery after initial evaluation of MRI of the fistula in Ano . In our study age of patients ranged from 10 – 89 years. Age group between 30-39 and 40-49 years accounted for maximum number of cases (31.4%) and they comprised mostly male patients. Discharge was the most common complaint in 77% patient.

In our study , internal opening seen in 34 patients among 35 patient (97.1%). The most common location of inter nal opening was 6 o'clock which was found in 20 patients (57.2%). Next common location was 5 o'clock which was found in 5 patients (14.2%) followed by 12 o'clock in 4 patients (11.4%) , 7 o'clock and 4 o'clock in 2 patients (5.7%) and 8 o'clock in 1 patient (2.8%). Among 35 patients 1 patient did not have internal open ing on MRI. Out of 35 patients who underwent surgery, MRI showed agreement with surgical findings with respect to presence of internal opening in 34 patients (97.1%) which was similar to study of Buchanan et. al. In the remaining 1 patients, internal opening was found in surgery which was not seen on MRI. In our study, diagnostic accuracy of detection of presence of perianal fistula was 100% and presence of internal opening by a rate of 97.1% in comparison to surgical findings with 100% true positive detection rate . In line with these findings, algazzar et. al reported that MRI could detect internal opening of perianal fistula by rate of 95.4% with 100% PPV.

Classification of fistula was done according to St. James's University Hospital Classification of perianal fistula in our study. Grade 1 fistula seen in 14 patients

(40 %) , grade 2 fistula seen in 5 patients (14.2%) , grade 3 fistula seen in 3 patients (8.5%) , grade 4 fistula seen in 12 patients (34.2%) and grade 5 fistula seen in 1 patient (2. 8%). In our study most common fistula was grade 1 (40%) followed by grade 4 (34.2%) , grade 2 (14. 2%) , grade 3 (8.5 %) and grade 5 (2.8%) was least com mon.

We have also shown a significant contribution of MRI in detecting complex fistulas. Our study among 35 patients ,branching was found in 7 patients (20%). 5 patients had single branching and 2 patients had multiple branching . Branching or ramification is secondary tract similar to primary tract. These appear as hyperintense regions on T2-weighted and STIR images and enhance if intrave nous contrast material is used. Horseshoe extension seen in 1 patient (2.85%)

In our study 9 patients(25%) had abscess out of 35 patients. The abscesses appear slight hypo- or isointense signal on T1 weighted imaging. Singh et all study stated that abscess , ramifications were accurately detected on T2 TSE FS and post contrast T1 FS sequence.

Among 35 patients, 33 patients (94.2%) had peri tract inflammation. Peritrack inflammation is characterized by mild T2 and STIR hyperintense signal surrounding the more hyperintense fistulous track. According to the study by Algazzar et al , CE-T1WI improve fistula conspicuity with comparable diagnostic performance to T2WI.

Fistulous track was best visualized on fat saturated T2 weighted sequences. This is in corroboration with study by Charles which stated that T2W images (TSE and fat-suppressed) provide a good contrast between the hyper intense fluid in the tract and the hypointense fibrous wall of the fistula, and providing a good delineation of the layers of the anal sphincter. T2 weighted images help differentiate the boundaries between internal and external sphincters because sphincters and muscles have low

signal intensity while active tracks and extensions have high signal intensity¹⁰⁵. T2 FS sequence is better than conventional T2 weighted sequence because the high signal intensity of fat can hide active fistulous tracks or abscesses, which also have high signal intensity. On T2 FS images, fluid, pus, and granulation tissue are seen as areas of high signal intensity on a background of low-signal-intensity fat. Tissues surrounding the tract may also show hyperintensity on T2 weighted imaging if there is edema or inflammation. Granulation tissue with increased vascularity is thought to account for the T2-weighted imaging hyperintensity.

The 3D imaging technique has several advantages over 2D imaging: There is no operator dependence in acquiring images in any obliquity, a larger volume can be covered, thinner sections without intersection gaps can be obtained, a higher signal- to-noise ratio can be achieved, and imaging time can be reduced. In our study VISTA sequence provide excellent anatomical details and superior to T2 FS in detection of fibrous inactive tracts.

Unenhanced T1 weighted images provide an excellent anatomic overview of the sphincter complex, levator plate, and the ischioanal fossae. Fistulous tracks, in inflammation, and abscesses, however, appear as areas of low to intermediate signal intensity and may not be distinguished from normal structures such as the sphincters and levator ani muscles.

The exact location of the primary tract (ischio anal or inter sphincteric) is most easily visualized on axial images; the presence of disruption of the external anal sphincter differentiates a trans-sphincteric fistula from an inter sphincteric one. The internal opening of the fistula is also best seen in this plane. Coronal images depict the levator plane, thereby allowing differentiation of supra levator from infra levator infection. A combination of an

axial and a longitudinal series (coronal, sagittal, or radial) will provide all the necessary details.

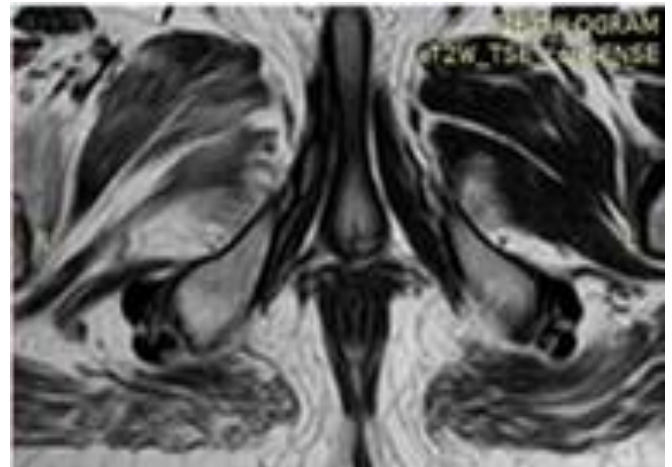


Figure 1: On axial T2W image of the anal canal shows the simple inter sphincteric fistula.

(grade 1)

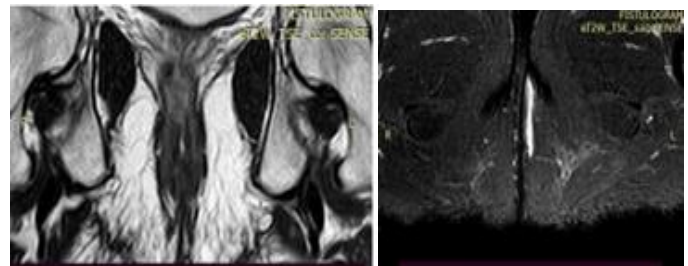


Figure 2: T2W coronal image shows inter sphincteric fistula on left side of the anal canal with associated sub cutaneous collection. (grade 2)

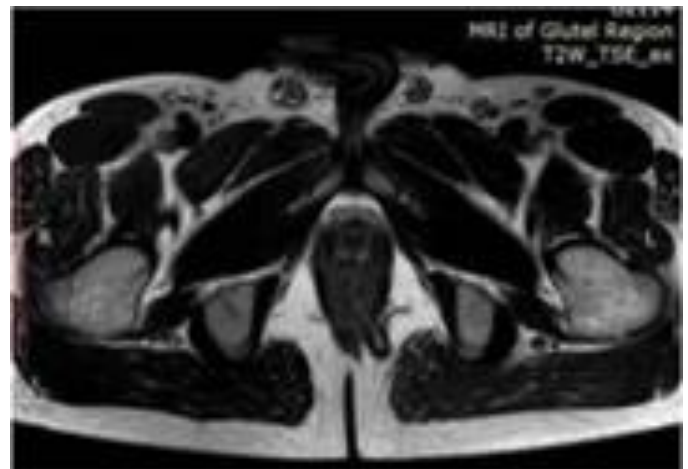


Figure 3: T1W images shows simple trans-sphincteric fistula on left side of the anal canal.

(grade 3)

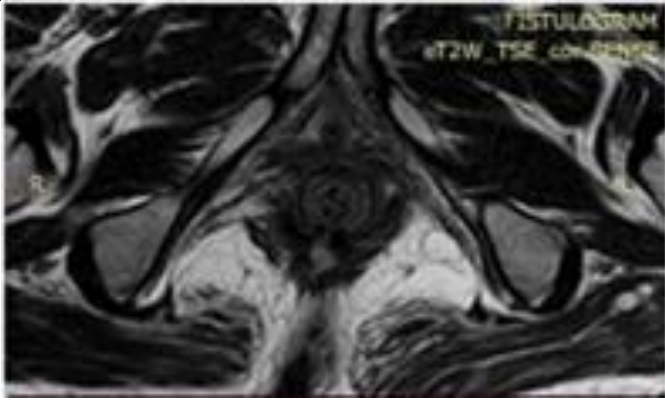


Figure 4: T2WI images show trans-sphincteric fistula on the right side of anal canal which shows minimal branching pattern and contralateral side extension , (grade 4)

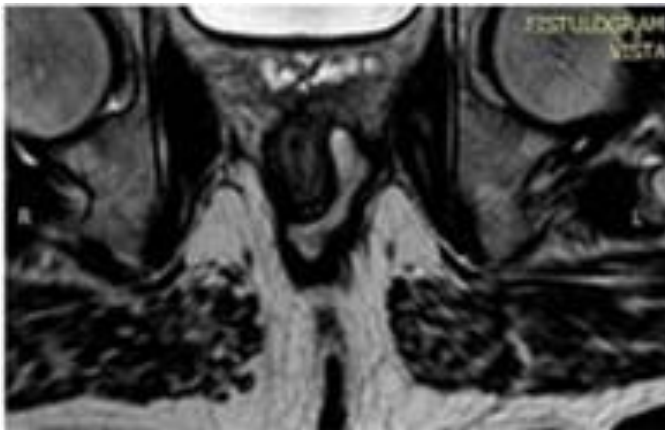


Figure 5: VISTA coronal images of the anal canal shows a supra levator fistula with abscess located the left side of the anal canal. (Grade 5).

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