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## RESEARCH ARTICLE

# MAGNETIC RESONANCE IMAGING OF PERIANAL FISTULA: WHAT COULD IT ADD TO THE CLINICAL DIAGNOSIS?

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### ABSTRACT

**Background:** Perianal fistula is a chronic inflammation that may be simple or complex. It mainly affects adult males. Their precise diagnosis is important as improper evaluation could result in many unnecessary operations or serious post-operative complications.

**Aim of work:** Was to describe MRI findings of different types of perianal fistulas and to enhance its role in adding great information to the surgeon.

**Patients and Methods:** The study population comprised of 58 patients ranging in age from 8 to 68 years with clinical evidence or suspicion of anal fistulas. MRI was done using phased array coil, before and after IV contrast, using multiple pulse sequences i.e. T1, T2 and STIR. Findings were classified according to St. James classification into 5 grades.

**Results:** MRI could prove the presence of fistula in 82.8% of patients. Male to female ratio = 3:1. Most fistulas were of grade 1 and 2 (38.2%), 62.5% was single. Most internal openings were located at 6 o'clock (89.5%). 25.9% showed post contrast enhancement of the fistulous track and 5.2% showed enhancement within abscess lesions.

**Conclusion:** MRI is ideal in diagnosing and grading of perianal fistulas and in detecting associated complications that add much to the clinical examination.

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## INTRODUCTION

Perianal fistula is an abnormal connection between the anal canal and the perineal skin. It is a common disease that affects middle aged males more than females (ratio = 2:1). Patients usually presented with discharge or less frequently local pain due to repeated inflammation. Anal fistula may be complicated by infection with abscess formation and secondary fistulous tracks (Charles *et al.*, 2012). Medical treatment is used mainly to alleviate the local pain and inflammation, but definitive treatment is usually surgical (Charles *et al.*, 2012). The aim of surgery is to eradicate the source of infection and fistulous tracks with preservation of the anal sphincter integrity. Successful surgical treatment of anal fistulas requires precise preoperative study of the course of the primary fistulous track and the location of any secondary extension or abscesses to reduce the incidence of recurrence. (Seow-Choen and Phillips 1991). Many imaging techniques have been used to investigate perianal fistulas and their complications such as fistulogram, CT and endoanal US, but none of them separately could give full details about the exact location, secondary extension, associated sepsis formation and the relation of fistulous tracks to the anal sphincters.

The latter is a crucial point that should be fully studied before operation to avoid post-operative fecal incontinence (Charles *et al.*, 2012). MRI is crucial in preoperative planning of perianal fistula because it can accurately study the anatomy of the anal canal and anal sphincters, and the relation of any fistulous track to the pelvic diaphragm, isorectal fossa and supralelevator space. It can also determine the presence of fistulous ramifications and local inflammation or abscesses (Kim *et al.*, 2010; Khera *et al.*, 2010). MRI has been considered as the technique of choice for diagnosing and classifying anal fistulas. There are two famous classifications of perianal fistulas mentioned in literatures, Parks classification and St James's University Hospital classification.

### Parks Classification

On the basis of surgical findings from 400 patients referred to the St Mark's Hospital surgery department in London, England, (Parks *et al.*, 1976) described perianal fistulas in the coronal plane according to the course of the fistula and its relationships to the internal and external anal sphincters. Fistulas were classified into four groups: intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric. In Parks classification, the external sphincter is used as the keystone (Parks *et al.*, 1976).

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## St James's University Hospital Classification, 2000

Because relevant MR imaging findings are not included in the Parks classification, an MR imaging-based classification was proposed that relates the Parks surgical classification to anatomic MR imaging findings in the axial and coronal planes. This classification considers the primary fistulous track as well as secondary extensions and abscesses in evaluating and classifying fistulas (Morris *et al.*, 2000). The classification grades fistulas into five groups: grade 1, simple linear intersphincteric fistula. The fistulous track is always observed in the intersphincteric space and is entirely confined by the external sphincter; grade 2, intersphincteric with abscess or secondary track in the intersphincteric space. They are always confined by the external sphincter, which is never crossed. Extensions and abscesses may be of the horseshoe type, crossing the midline, or may branch in the ipsilateral intersphincteric plane; grade 3, transsphincteric fistula which is distinguished by location of the enteric entry point in the middle third of the anal canal, at the level of the dentate line, which is best evaluated in the coronal plane; grade 4, transsphincteric with abscess or secondary track in ischioanal or ischioanal fossa where it is complicated by an abscess or extension; grade 5, in rare cases supralevator and translevator extension occurs. These fistulas indicate the existence of primary pelvic disease with extension through the levator plate (Morris *et al.*, 2000). Gathering all these data about the fistulous extension, grading and complications allows the surgeons to choose the optimum surgical approach, notably decreasing recurrence of the disorder or probable secondary complications of operation, the most serious is fecal incontinence (Beckingham *et al.*, 1996; Buchanan *et al.*, 2002).

### Aim of work

The aim of this study was to describe MRI findings of different types of perianal fistulas and to enhance its role in adding more information to the surgeon and consequently its value in reducing postoperative complications and recurrence.

## MATERIALS AND METHODS

**Design of Study:** An observation cross section study was carried out in the department of diagnostic radiology after obtaining an ethical approval from the medical ethics committee. The study was done during 2012-2013.

**Patients:** The study population comprised of 58 patients (45 males and 13 females), their age ranged from 8 years to 68 years, with clinical evidence or suspicion of anal fistulas. Patients were referred to the MRI unit for pelvic MRI specific for perianal region. Written consent was taken prior to the procedure.

### MRI Techniques

**Patient preparation:** Previous preparation was not required for this procedure, but in some cases we needed to give the patient "Buscopan injection" 20 mg IM to reduce bowel motion artifacts. Blood test for "creatinin level" to check the renal functions was asked for before giving contrast media. All

metallic objects were removed prior to the study. MRI studies were carried out on "Siemens machine, Symphony, 1.5-Tesla MRI system". Scanning was done in the supine position (head first). Phased array surface coil was used. No catheters or coils were inserted into the anus, thus maintaining a completely non-invasive technique. Post contrast study was done using a "Gadoteric Acid (Dotarem)", concentration: 0.5 mmol/ ml, volume: 20 ml, injection dose: 0.2 ml/ kg if GFR  $\geq$  30 "normal", and 0.1 ml/kg if GFR  $<$  30. Contrast injection rate of 2 ml/sec using power injector, dynamic injection. The scan delay for dynamic post contrast was 30 sec. Patient was given instructions not to move during the procedure.

### MRI Sequence Parameters

- T2- weighted sequence with HASTE "Half Fourier Acquisition Single Shot Turbo Spin Echo" sequence in the coronal plane,
- T2- weighted Turbo Spin-Echo (TSE) sequences in the sagittal plane,
- T2- weighted TSE sequences with fat suppression (FS) in the axial and coronal planes.
- T2- weighted High-Resolution(HR) sequences in the coronal plane and axial planes.
- T1- weighted in-out phase sequences in the axial plane
- T1- weighted sequence with Volume Interpolated Breath hold Examination (VIBE), three-dimensional imaging, with fat suppression in the axial plane pre- contrast.

After intravenous contrast agent dynamic injection, subtraction images were obtained for the fistulas track; T1-weighted sequence with VIBE with fat suppression in the axial, coronal and sagittal planes. Then all images were sent to the PACS system.

**Image interpretation:** The images produced were autonomously evaluated using PACS workstation. The following parameters were considered: presence of a primary fistula and its location, the level of the internal opening- which determines the extent of sphincter division during fistulotomy-, the relation of fistulas to the anal sphincters, presence of secondary extensions, abscesses, sinuses and findings of Crohn's disease if any. MRI findings were classified according to the St. James, 2000 MR imaging classification of perianal fistula into five grades.

**Statistical analysis:** Statistical analysis was performed using the "SPSS 16.0". Analysis the data was carried out using the crosstabs method between variables. Significant relationship between the variables was considered if p-value (P)  $<$  or =0.05. If the correlation coefficient is close or equal to (0) there is no linear relationship and if the correlation coefficient close or equal [1, -1] there is strong [positive, negative] linear relationship .

## RESULTS

The study included 58 patients. Males were more presented than females (77.6% and 22.4% respectively). The average age of patients was 38.3 years. Most patients were in the 20s. By analyzing the patients' complain and clinical history, we found most patients presented by known or suspected perianal fistula

(82.8%). Other signs, symptoms and related medical conditions are illustrated in Figure 1. MRI could prove the presence of fistula in 82.8% of patients, while 17.2% were normal. Out of the positive cases, males were much more affected than females (79.2% versus 20.8% respectively).

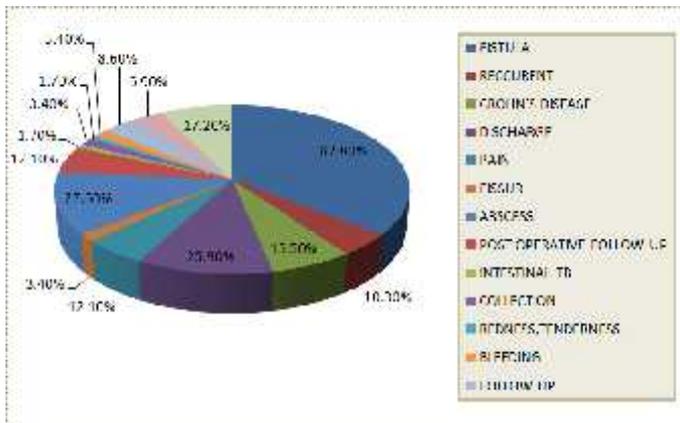


Fig. 1. The distribution of clinical history among the whole sample

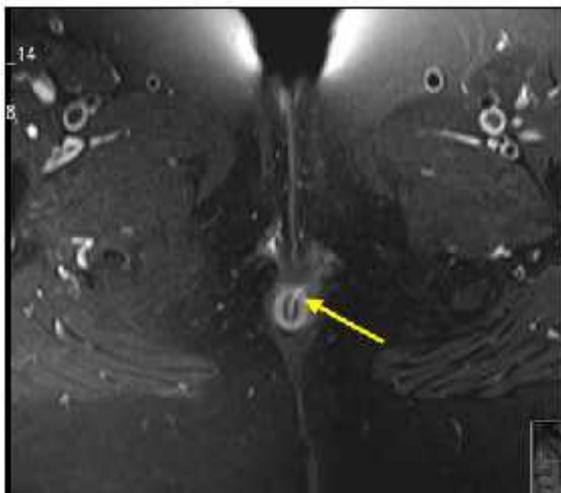


Fig. 2. Axial MRI T2 weighted-fs, grade 3 simple trans-sphencteric fistula at 1 o'clock (arrow)



Fig. 3. Axial MRI T2 weighted-TSE, trans-sphencteric fistula grade 3, outer opening at 6 o'clock (arrow)

The total number of fistulas detected was 76. The number of fistulous tracks per patient ranged from one to five with the average number was 1.6. However; most patients (62.5%) had one fistula. Branching fistulas represented 86.3%. Regarding the location of perianal fistulas; most of them (89.5%) located at 6 o'clock (Figures 2 & 3). Other locations are illustrated in Figure 4.

Perianal fistulas were classified into 5 grades. Most fistulas were of grade 1 and grade 2 (38.2 % for each), while the least number was of grade 5 (10.3%) (Figure 5). By studying MRI criteria of different grades of perianal fistulas, we found- in the series of post contrast injection images- 69 % cases didn't show any enhancement after contrast, and 25.8 % showed enhancement of the fistulous tracks and 5.2% showed enhancement in associated abscess lesions (Figure 6).

Statistical analysis showed no significant relationship between fistulous grading and post contrast enhancement (the p value was > 0.05). All fistulas were hypointense on T1WI and hyperintense on T2WI. Fat suppression images are essential in MRI of perianal fistulas. Two cases of grade 2 showed horse shoe fistulas which were best seen in fat suppression images (Figure 7). A statistically significant correlation was found between detection of fistulas in T1WI, T2WI and fat suppression images with the p-value =0.018. In addition to proving the presence of clinically suspected fistulas, MRI could also disprove some clinical suspects, or add more information which may be crucial to the surgeon. Three patients came to the MRI with clinical indication of abscess, but after MRI study there was no evidence of abscess with the (p-value =0.00). Other two patients presented with clinically suspected fistulas, and MRI findings were those of sinus tracts rather than fistulas. MRI also changed the clinically diagnosed perianal fistula in another patient into fistula communicating with a sinus tract with the p-value =0.01.

## DISCUSSION

Perianal fistula is a chronic inflammation that may be simple or complex, usually caused by underlying Crohn's disease or local anal cryptoglands inflammation. Clinical assessment alone usually fails to give full information about the fistulous track length, number, branches or associated abscesses. MRI - depending on its inherent high soft tissue characterization and its multiplanner capability -has been recently used to evaluate perianal fistulas and give detailed study that greatly helps surgeons before operative intervention (Siddiqui *et al.*, 2012). In our study, the mean age of affected patients is 38.3 years and most patients are in the 20s. In addition, males are more affected than females by a ratio of about 3:1. This association was also proved in the study of (Halligan and Stoker 2006), who found adult males are mostly affected by perianal fistulas. Using different MRI pulse sequences helps greatly in detection of fistulous tracks and inflammations that may be overlooked during surgery. (Charles *et al.*, 2012) stated that "T2WI (TSE and fat-suppressed) provide good contrast between the hyperintense fluid in the track and the hypointense fibrous wall of the fistula, while providing a good delineation of the layers of the anal sphincter". He also found Gadolinium - enhanced T1WI fat suppressed images are useful to differentiate a fluid

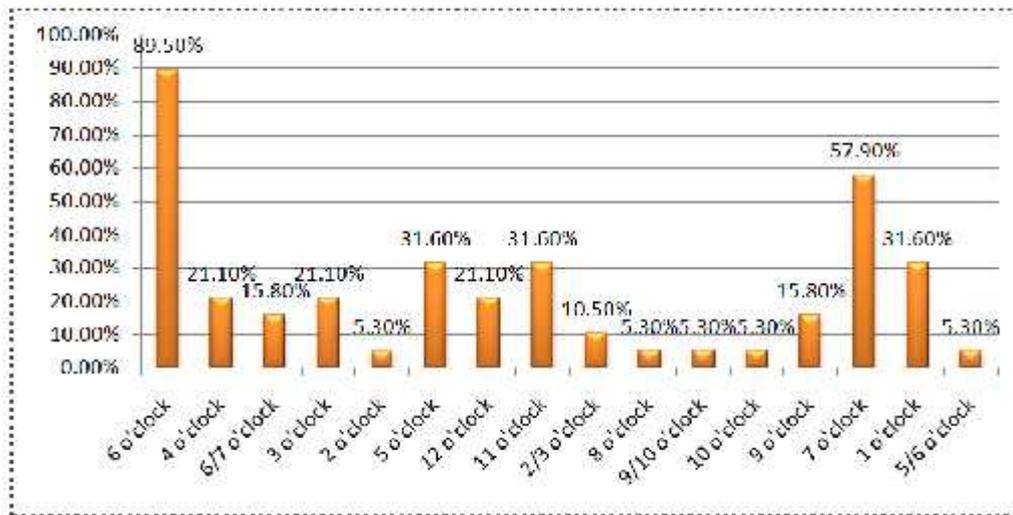


Fig. 4. The distribution of fistulas' location among the study group

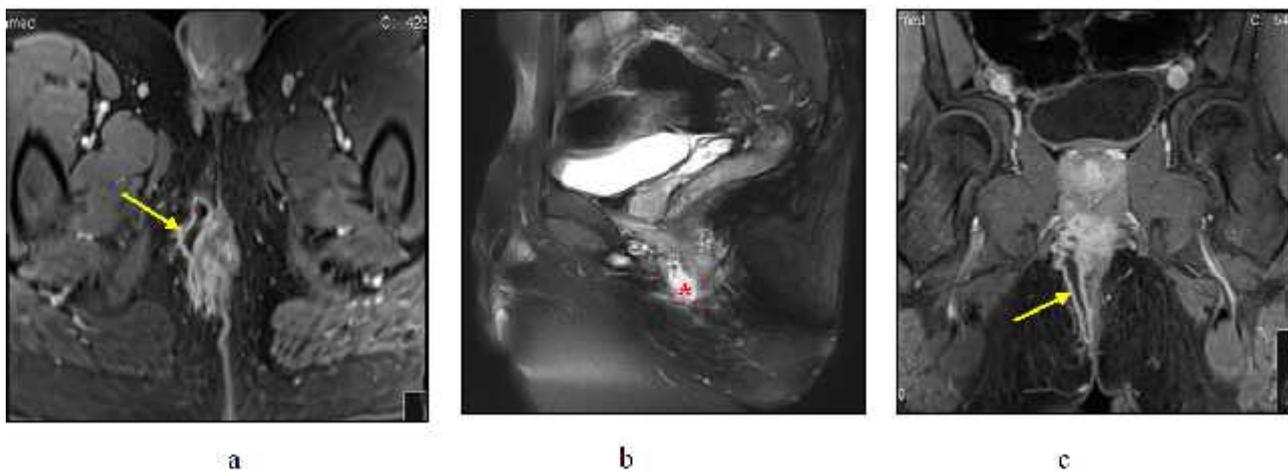


Fig 5 (a-c). Grade 5 trans-sphenteric fistula with extra sphenteric abscess (\*) and supra levator extension (arrows). (a) Axial MRI 3D vbe-post contrast, (b) Sagittal MRI T2 weighted-fat suppression, (c) Coronal MRI T1 weighted -vibe-post contrast

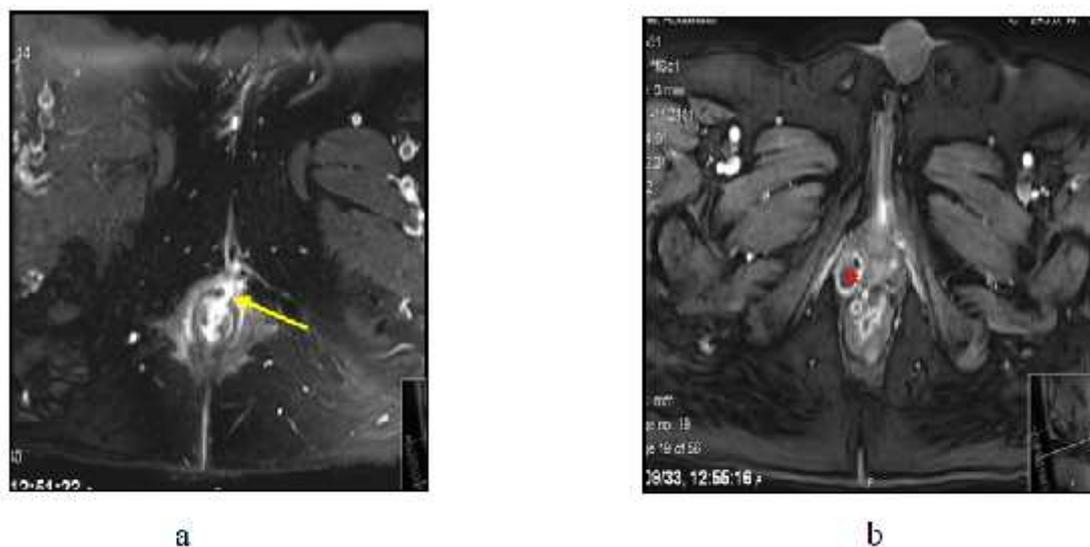


Fig 6 (a & b). Grade 4 trans-sphenteric fistula with abscess formation. (a) Axial MRI T2 weighted-fat suppression, extrasphenteric fistula at 1 o'clock (arrow) (b) Axial MRI T1 weighted-fat suppression-vibe-post contrast, right abscess (\*) at 11 o'clock

filled track from an area of inflammation (Charles *et al.*, 2012). This matches with our study; Two cases of horse shoe fistulas were best diagnosed using STIR images, in addition, post contrast study could exclude three clinically suspected cases of perianal abscesses where no enhancement was depicted, denoting underlying non inflammatory fluid collections ( $p$  value = 0.00).



Figure 7. MRI, T2WI. Horse shoe, grade 2 fistula (arrows)

The high soft tissue contrast resolution of MRI could change the clinical diagnosis of fistula into sinus in two patients ( $p$  value = 0.01). MRI could also detect fistulous ramification in 86.3% which is an important point in preoperative planning. (Garros *et al.*, 2014) mentioned the underestimation of the clinical assessment of multiple or ramified fistulous tracks 44/68 (65%). He also mentioned that clinical examination failed to diagnose half of the radiological abscesses. According to our study, MRI could diagnose perianal fistulas in 82.3% of patients. These findings could greatly help the surgeon before planning the operation so, reducing the recurrence and complications.

Buchanan *et al.* (2002) in their study stated that “there was a threefold decrease in recurrence rate after surgical interventions based on appropriate diagnostics using MR only”. Although the sensitivity of MRI can increase after local administration of contrast agent into the fistulous track (MRI fistulogram) as mentioned by (Waniczek *et al.*, 2011), yet we did not use this technique to keep our study non-invasive examination. In addition, we used only phased array surface coil which showed high sensitivity in fistulous detection. (Scholefield *et al.*, 1997) mentioned that endo anal coil does not easily recognize extrasphincteric or supralelevator tracks and this may limit its significance in complex fistula. Classification of the perianal fistula is important for guiding the surgeon. We followed “St. James, 2000 MR imaging classification systems”. Grade 1 and 2 were the commonest among the study population (38.2% for each), while the least was grade 5 (10.3%). Our results match with those of (Ozkavukcu *et al.*, 2011) who

found the most common fistulas tracks were the transsphincteric and intersphincteric types. There is usually an internal enteric opening in the anal canal at the level of the dentate line-that is, at the original site of the duct draining the infected gland; in most cases this is at the 6 o'clock location (Halligan and Stoker 2006). This could explain the high percentage of perianal fistula at 6 o'clock in the current study (89.5%) as well as in other studies e.g. (Yıldırım *et al.*, 2012). MRI is a valuable, noninvasive modality that can provide important information regarding perianal inflammatory disease prior to treatment and surgical planning. It is more superior to other imaging modalities in evaluating perianal fistulas. Buchanan *et al.* (2002) stated that “MR increases the accuracy of diagnosis by 10% in comparison to endo anal ultrasound (EAUS).

## Conclusion

Our results indicate that MRI is the imaging modality of choice in the diagnosis and grading of perianal fistula and detection of its complications without the need of invasive procedures. Fat suppression techniques – before and after IV contrast- are essential in MRI protocol. Most fistulas are of grade 1 & 2 (38.2% for each), single (62.5%), branching (86.3%) and most fistulous openings are seen at 6 o'clock. MRI can provide great information before operative procedures so, reducing the possible recurrence and postoperative complications.

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