ORIGINAL ARTICLE

Role of MR Fistulogram in Preoperative Assessment of Anorectal Fistulas and Its Correlation with Intraoperative Findings

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Abstract

Introduction: Perianal fistula is a common condition with significant morbidity pertaining to lower intestinal tract. Fistulas are usually classified surgically on the basis of types described by Park, which are of four types: (a) Intersphincteric (b) transsphincteric (c) suprasphincteric and (d) extrasphincteric. The various radiological methods of perianal fistula evaluation are X-ray fistulography, ultrasonography and MRI fistulogram. The aim of our study was to find out the incidence of different types of fistula and compare the imaging findings on MRI fistulogram with surgery.

Methods: 32 patients who underwent MR fistulogram were selected for the study. The following were assessed: type of fistula, position of internal opening, presence of secondary tracts & abscess and grading of fistula by St. James's University Hospital MRI Classification, following which, the accuracy of MRI findings were correlated with intra operative findings.

Results: Among 32 patients with perianal fistulas, 25 (78.1%) were diagnosed as intersphincteric, 6 (18.7%) as transsphincteric and 1 (3.1%) as suprasphincteric fistulas on both MRI and surgical findings. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting type of fistula and position of internal opening was 100%. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting the number of internal openings was 95.65%, 90%, 95.65%, 90% and 93.93%. Similarly, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting abscess was 81.81%, 92%, 81.81%, 92% and 88.88%. For detecting secondary tracts, sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI was 90.9%, 95.65%, 90.9%, 95.65% and 94.11% respectively.

Conclusion: MR fistulogram was found to be a valuable modality of imaging in pre-surgical evaluation of perianal fistulas.

Keywords: Anorectal, fistula, fistulogram, MRI, preoperative

Introduction

Perianal fistula is a common condition with significant morbidity pertaining to lower intestinal tract. The following surgeons described perianal fistula in detailed and simpler form: Frederick Salmon at St Mark's Hospital; Goodsall, who described the course of fistulous tracks from external opening in the skin to internal opening in the anus[1] and Parks, whose classification of fistulas in relation to anal anatomy is commonly used in daily surgical practice.[2]

The site and direction of fistulous tracks is usually described in reference to the "anal clock". The anal canal sphincter complex comprises of internal and external sphincter. Between the two, external sphincter is important, because it is responsible for continence.[3] Researchers believe that fistulas occur mainly secondary to anal gland infection as proposed by the cryptoglandular hypothesis. Fistulas are usually classified surgically on the basis of types described by Park, which are of four types: (a) Intersphincteric, (b) transsphincteric, (c) suprasphincteric, and (d) extrasphincteric.

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Different radiological methods of perianal fistula evaluation are as follows:

X-ray fistulography[4]

It is a simple and widely available technique, but has two major drawbacks[5]– (a) difficult to assess secondary tracks due to lack of proper filling with contrast material and (b) inability to visualize the anal sphincters and to determine their relationship to the fistula.

Ultrasonography

The benefits of ultrasonography over magnetic resonance imaging (MRI) are its wide availability, lower operating costs and less scan time.[6,7] The various ultrasonography methods for the evaluation of perianal fistulae are - (a) endoanal ultrasound, (b) transvaginal ultrasound, and (c) transperineal ultrasound.

MRI

Various modified applications of MRI are being used nowadays like CSF flow quantification in brain MRI[8] and body fat measurement using body MRI.[9] Likewise, in perianal region, technique of introducing normal saline through the external opening and scan taken subsequently (MRI fistulogram) is widely used for study of perianal fistula.[10]

The external opening is visible to naked eye, thus by passing a blunt probe from the external opening along the tract and by visualizing through proctoscopy, the surgeon can determine the internal opening. The importance of MRI lies here in accurately delineating the course of the tract between these external and internal openings. MRI is highly accurate for delineation of both the primary tract (sensitivity100%; specificity86%) and abscesses (sensitivity96%; specificity97%.)[11] 1.5, 3-T MRI and higher systems can be used to obtain high-resolution images of the pelvis. More recently, there has been increase in the applications of 3-T systems in abdominal imaging due to its ability to offer increased signal-to-noise ratio at the higher field strength, even at higher matrix.[12 13]

The aim of our study was to find out the incidence of different types of fistula and compare the imaging findings on MRI fistulogram with surgery.

Methods

This was a cross-sectional study carried out in the Department of Radiology, Pokhara Academy of Health Sciences. Census method was adapted for collection of study sample. Data was collected using data collection form (proforma). Collected data was analyzed by means of SPSS version 20. For analysis, mean, proportion, percentage and ratio were used. Comparative analysis was done using sensitivity, specificity, positive predictive value, negative predictive value and accuracy.

In a study by Patil et al[14], the sensitivity of MR fistulogram in diagnosis of anorectal fistulas was found to be 86.7%. Considering the prevalence of anorectal fistulas as 1% based on various studies, the estimated sample size for the study was

$$n = \frac{Z^2 \times \text{sensitivity}\ (1 - \text{sensitivity})}{W^2 \times \text{prevalence}}$$

Taking 95 % confidence interval, value of Z= 1.96, w=0.05

n = 177.19

But the total number of operated cases of anorectal fistulas in Western Regional Hospital in the fiscal year 2077/2087, according to the OT registry was 38.38

So, for finite population, the sample size was:

$$n = \frac{NXn}{N+n-1}$$

= 31.4

Hence a minimum of 32 cases were taken as sample size for the study.

32 patients presenting with perianal discharge or other perianal complaints were subjected to MR fistulogram using Philips 1.5- Tesla unit system. Brief history was taken and any contraindication to MRI assessed. Consent was taken from patients before the procedure. Different MRI sequences like oblique axial and coronal T1W FSE, T2W FSE, fat suppressed oblique axial and coronal T1 and T2W FSE were taken. In patients with cutaneous fistulous opening, 5–10 ml of 2% lignocaine gel was introduced through the external opening using syringe and scan taken subsequently (MRI fistulogram). The following were assessed: type of fistula, position of internal opening, presence of secondary tracts & abscess and grading of fistula by St. James's University Hospital MRI Classification

St James's University Hospital classification is as follows: Grade 1: Simple linear intersphincteric, Grade 2: Intersphincteric with abscess or secondary track, Grade 3: Transsphincteric, Grade 4: Transsphincteric with abscess or secondary track within the ischiorectal fossa, and Grade 5: Supralevator and translevator extension.

Results

In this study, 32 cases of perianal fistula who underwent MR fistulogram were included and analysed, out of which 22 (68.75%) were male and 10 (31.25%) were female. The mean age of patients was 31.18 +/-10.96 years (range: 14-60 years). Distribution of patients according to age is summarized in table I, with maximum number of patients in age group 31-40.

Table 1: Age distribution of patients with perianal fistulas

Age groups	Frequency	Percentage
11-20	1	3.12
21-30	7	21.87
31-40	14	43.75
41-50	5	15.62
51-60	5	15.62
Total	32333332	100

Among 32 patients, 25 had intersphincteric fistulas, 6 had transsphincteric fistulas and 1 had suprasphincteric fistula while none of the patients had extrasphincteric fistula on both MR fistulogram and surgical findings as shown in figure I.

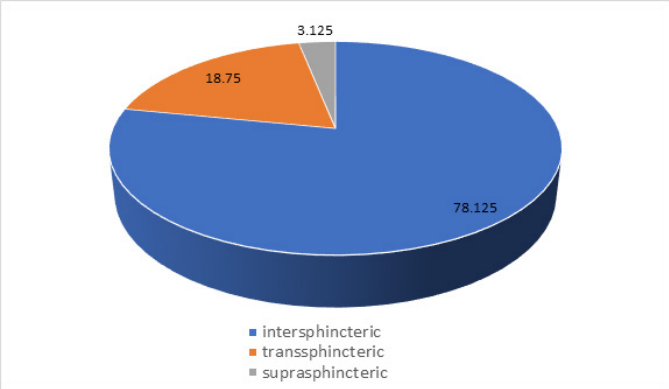


Fig 1: Pie chart showing distribution of types of fistula.

Similarly, 14 cases had internal opening located anteriorly, 16 had posteriorly and internal opening was not visualized in 1 case on both MR fistulogram and surgical findings. Thus, present study showed that the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting type of fistula and position of internal opening was 100%.

In this study, among 32 patients, 23 patients had single internal opening, 8 had multiple openings and internal opening was not visualized in 1 case on MRI. Surgical findings showed that 22 patients had single internal opening, 9 had multiple openings and internal opening was not visualized in 1 case. Thus, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting number of internal openings was 95.65%, 90%, 95.65%, 90% and 93.93% respectively.

Out of 32 patients, 7 had secondary tract on MRI while 9 patients had secondary tract on surgical findings. Hence for detecting secondary tract, sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI was 81.81%, 92%, 81.81%, 92% and 88.88%.

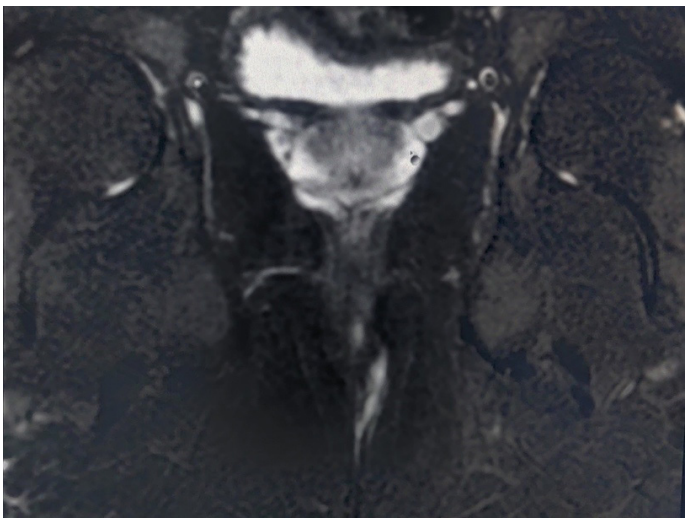
Likewise, among 32 patients, 9 had abscess on MRI while 10 cases had abscess on surgical findings. Thus, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in detecting abscess was 90.9%, 95.65%, 90.9%, 95.65% and 94.11%. These findings have have been tabulated in table II.

Table 2: Diagnostic index of MRI to detect various parameters in perianal fistula

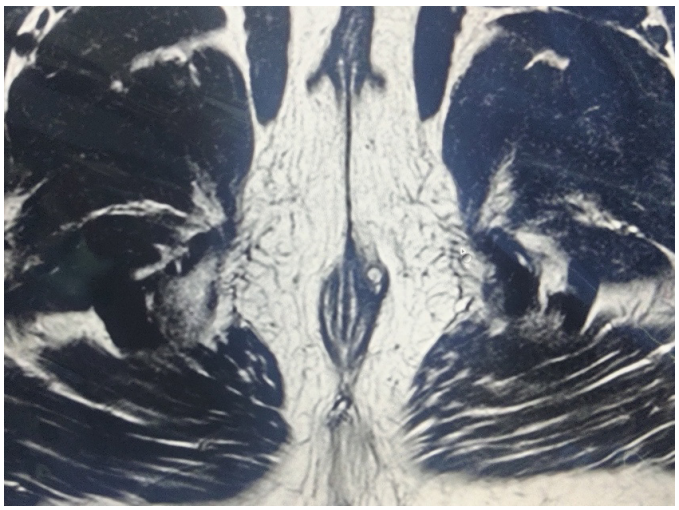
MRI findings	Sensitivity	Specificity	PPV	NPV	Accuracy
Type of fistula	100	100	100	100	100
Position of internal opening	100	100	100	100	100
Number of internal opening	95.65	90	95.65	90	93.93
Presence/absence of secondary tract	81.81	92	81.81	92	88.88
Presence/absence of abscess	90.9	95.65	90.9	95.65	94.11

Out of 32 cases, MRI classified them into St James University hospital grading as follows: grade I-18, grade II-7, grade III-2, grade IV-4 and grade V-1.

ILLUSTRATION



T2 SPAIR coronal image showing simple linear intersphincteric fistulous tract in left perianal region (St. James grade I) with extrenal opening at 5 o' clock position. Surgical findings were similar.



T2 axial image showing internal opening at 2 o' clock position.

Discussion

Reading of MRI fistulogram requires knowledge of relevant pelvic anatomy, pathophysiology, classification of fistula types and its basis for treatment. Inadequate treatment due to deeper extension and involvement of the anal and pelvic musculature and perianal spaces can lead to significant disease burden. Pelvic MRI has the ability to obtain high spatial resolution images with multiplanar capabilities, providing minor details of the pelvis, making it the modality of choice for diagnosis and assessment of perianal fistulas.[15]

Initial classification of perianal fistulas was based on surgical anatomy described by Parks etal.[16] It was subsequently modified by Morris etal[3] on the basis of radiologic anatomy on pelvic MRI, which is known as the St. James' University Hospital Classification and has been widely used thereafter. Both classification systems rely on the relationship of the fistulous tract to the sphincter complex, integrity of the external anal sphincter, the presence of secondary tracts or abscesses and cranial extension into the pelvis. The St. James' University Hospital MRI classification of peri-anal fistula is described as below:

Grade 1: Simple linear intersphincteric fistula, grade 1 fistula arises from the anal canal, penetrates the internal anal sphincter, and extends caudally through the intersphincteric space to its cutaneous opening. There are no secondary tracts, superior extension above the levator ani or associated abscess. The tracts are limited by the external sphincter with maintained integrity of the external sphincter.

Grade 2: Intersphincteric fistula with intersphincteric abscess or secondary fistulous tract. In this type, there are branching secondary tracts or associated abscess. The "horse-shoe" fistula subtype has a secondary tract that extends towards contralateral side and circumferentially surrounds both sides of the internal sphincter.

Grade 3: Transsphincteric fistula, grade 3 fistula arises from the anal canal, penetrates both the internal and external anal sphincters and passes through the ischiorectal or ischioanal fossae to open into its cutaneous opening. There is no associated secondary tract, abscess, or extension superior to the levator ani.

Grade 4: Transsphincteric fistula with abscess or secondary tract within the ischioanal or ischiorectal fossa, grade 4 fistula consists of a transsphincteric fistula complicated by secondary tracts or abscess. The abscess may occur anywhere along the primary tract, secondary tracts, or within the ischioanal or ischiorectal fossae, but not cranial to levator ani.

Grade 5: Supralevator and translevator disease, grade 5 fistulas include a variety of complex tracts which extend above the levator ani and can be extrasphincteric and suprasphincteric. Suprasphincteric fistulas arise from the anal canal, penetrate the internal sphincter, and then pass through the intersphincteric space into the supralevator space. The fistula then pierces the levator ani as it descends through the ischio-rectal fossae on its way to its cutaneous opening.

Extrasphincteric fistulas are a separate entity caused by primary pelvic disease (e.g., Crohn disease, diverticulitis, or carcinoma) that extends superiorly through the levator plate, crossing the ischiorectal fossa, and terminates at the cutaneous opening without involving the internal or external anal sphincters.

Others (Not specifically described in the Parks or St. James' Classification): Submucosal fistulas arise superficially from the anal canal and extend inferiorly to the skin surface without involving the internal or external anal sphincters.[16] Superficial tracts which donot have an internal opening or communication with the anal canal are classified as sinus tracts.[18]

Active fistulous tract appears hypointense on T1-weighted imaging and hyperintense on T2-weighted imaging (best visualized with fat saturation) relative to muscle and enhances with IV contrast agent. It is believed that granulation tissue with increased vascularity is responsible for the T2-weighted imaging hyperintensity and contrast enhancement.[15] Tissues surrounding the tract may also appear hyperintense on T2-weighted imaging due to edema or inflammation. MRI, thus, can be used to assess treatment response, as suggested by Savoye-Colletetal.[19]

As soon as a fistula tract is detected, its relationship to the sphincter complex and location of the internal and external openings should be described by the radiologist interpreting the MRI examination. The internal opening can be described according to anterior-posterior and right-left locations or according to the "anal clock" with the patient in the supine position. Most perianal fistulas arise at the dentate line posteriorly.[3] Finally, the integrity of the levator ani should be checked to assess for suprasphincteric or translevator disease.

Detection of Secondary Tracts or Abscesses: Secondary tracts have features similar to those of the primary tract, and their position and course should be defined relative to the sphincters, levator ani and overlying skin. Perianal abscesses can occur anywhere along a fistulous tract. They show central T2 hyperintensity representing pus with peripheral rim enhancement owing to the fibrous wall and surrounding inflammation. The pelvis should be carefully evaluated to assess for a primary pelvic source in case of any tracts that cross levator ani.

Conclusion

Indepth understanding of relevant pelvic anatomy and fistula classification on MRI examinations is essential in accurately reporting perianal fistulas. MRI is especially helpful in evaluating clinically undetectable disease, which has a direct effect on guiding medical and surgical therapy to help minimize recurrence and better predict outcome compared with surgical exploration.

By this study, we can conclude that MR fistulogram is highly sensitive, specific and accurate for assessment of type, internal opening, secondary tract and abscess in perianal fistulas and can be used pre-operatively for proper surgical planning and management of these fistulas.

One of the major limitations of this study is the relatively small sample size, which was due to the lesser number of cases who underwent surgery for perianal fistulas in our institute.

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