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Research Article

A STUDY ON MAGNETIC RESONANCE IMAGING FISTULOGRAM EVALUATION OF PERIANAL DISCHARGE IN AN INDIAN POPULATION

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ABSTRACT

Objective: Pre-operative assessment of perianal fistulas is very important for best planning of surgery and prevention of relapse. The goal of magnetic resonance imaging (MRI) of perianal discharge is to demonstrate accurately the anatomy of the perianal region. MRI can clearly show the relationship of fistulas to the anal sphincter complex, levator plate, and the ischiorectal/ischioanal fossa. The aim of the study was to find out the various types of fistula and compare MRI fistulogram with surgery findings.

Methods: In the present study, 38 number of patients were included who were sent for pre-operative MRI evaluation of perianal discharge and their post-operative data were collected for analysis. Surgical grading was according to Park's surgical classification. Fistulas were graded in MRI according to St James's University Hospital MRI classification of perianal fistulas.

Results: It was found from the study that most of the patients were adults (35/38), whereas one was a child and one was adolescent. Almost all were male (36/38) except two were female. Around 50% of patients had previous history of surgery and had come for persistent/recurrent lesion. According to MRI, all except one had true fistula, rest one had sinus, and one had ischioanal abscess. Percentage of Grade I, Grade II, Grade III, and Grade IV fistula were 31.58, 13.16, 15.79, and 34.21, respectively. Percentage of intersphincteric (I and II) type was 44.74 (17 in no) and transsphincteric (III and IV) was 55.26 (21 in no.), and supra- and extra-sphincteric type was 0 in number. Most had internal anal canal opening posterior to transverse anal line, out of which most were around 6 o'clock position. MRI successfully described fistula tract in all except for two cases (36/38).

Conclusion: MRI is very accurate in pre-operative evaluation and planning for surgery of perianal fistulas.

Internal opening was mostly around posterior midline which may be due to predominance of posterior anal gland infection. It may be postulated that posterior anal glands are more prone to infection and subsequent fistulation.

Intersphincteric and transsphincteric types are the most common types of fistula.

Keywords: Magnetic resonance imaging, Fistula, Anal sphincter.

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INTRODUCTION

Perianal fistula is an important cause of morbidity related to lower intestinal tract. Pioneers in surgery who described perianal fistula in detailed and simpler form are as follows: Frederick Salmon at St Mark's Hospital who operated on patient named Charles Dickens; Goodsall, who described the course of fistulous tracks from the skin to the anus [1] and Parks, whose classification of fistulas in relation to anal anatomy is widely used in surgical practice [2]. The site and direction of fistulous tracks is usually described by referring to the "anal clock" (Fig. 1).

The anal canal sphincter complex consists of internal and external sphincter. Of them, external sphincter is important, because a division of the external sphincter can lead to incontinence [3].

It is suggested that fistulas occur mainly secondary to anal gland infection as proposed by the cryptoglandular hypothesis.

Fistulas are generally classified surgically according to types described by Park, which are of four types: (a) Intersphincteric, (b) transsphincteric, (c) suprasphincteric, and (d) extrasphincteric (Fig. 2) [3,4].

Different radiological methods of perianal fistula evaluation are as follows:

X-ray fistulography [4]

It has two major drawbacks [5] – (a) difficult to assess secondary extensions 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. It is evident from X-ray images shown in Figs. 3 and 4.

Ultrasonography

The benefits of ultrasonography over magnetic resonance imaging (MRI) are its lower operating costs [6,7]. The different 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 MRI of brain [8] and body fat measurement using body MRI [9]. Similarly, in perianal region, introducing normal saline through the external opening using syringe and scan taken subsequently (MRI fistulogram) is used for study of perianal fistula [10].

The external or cutaneous opening is visible to naked eye, so by passing a blunt probe from the external opening along the tract and by visualizing through proctoscopy the surgeon can be able to determine the internal

opening. The importance of MRI lies here in accurately defining the course of the track between these external and internal openings.

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

METHODS

This is a retrospective analytical study conducted in the Department of Radiodiagnosis and Surgery, S.C.B. Medical College and in B.S.R Diagnostics, Cuttack, during January 2014 to October 2016.

A total of 38 patients who underwent MRI pelvis and perineal region examination referred with complains of perianal discharge were included in the study. The post-operative data of patients were collected after surgery.

All the MRI scans in this study were performed using GE Signa HD_x MR Machine at S.C.B. Medical College with 1.5 Tesla field strength and with PHILIPS INTERA 1.5 T MRI Scanner with 8 Channel at BSR diagnostics. Brief history was obtained and any contraindication to MRI was assessed. Consent was taken from patients before the procedure. Various MRI protocols were applied and scan images were analyzed subsequently (Table 1).

As most of the patients had external fistula opening, 5–10 ml of normal saline was introduced through the external opening using syringe and scan was taken subsequently (MRI fistulogram). However, intravenous contrast was not given to any of the patients.

In MRI, fistulas were classified according to St James's University Hospital classification [10] and it 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.

Statistical analysis

The obtained data were analyzed using a software Statistical Package for the Social Sciences (SPSS version 20). Frequency and descriptive analyses were used to describe the data. Furthermore, paired samples t-test was used to differentiate between two numerical data sets. Any difference or correlation was considered significant if $p \leq 0.05$.

RESULTS

Of the 38 patients taken into account, the most common age group was 31–40 years with mean age 38.96 and SD 13.52 (Table 2).

More than 90% of patients were male and female were <10% with male-female ratio 35:3 (Table 3).

Half of patients had a history of previous perianal region surgery (Table 4).

According to MRI, the most common type was found to be Grade IV (34.21%), the second common type was Type I (31.58%), rest Type II was 13.16%, and Type III was 15.79%. No Type V was observed in our study (Table 5).

MRI scan of different fistulas is given in below images (Figs. 5-10).

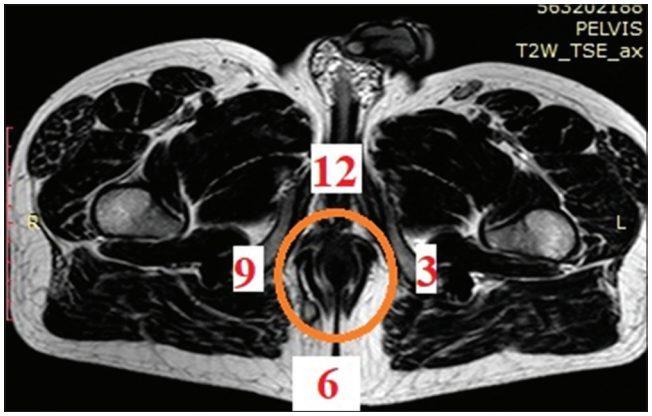

Fig. 1: Axial T2W TSE image with circle and digits interposed over it representing "anal clock." The 12 o'clock represents the anterior perineum, and at 6 o'clock, the natal cleft; 3 o'clock refers to the left lateral aspect, and 9 o'clock to the right lateral aspect of the anal canal

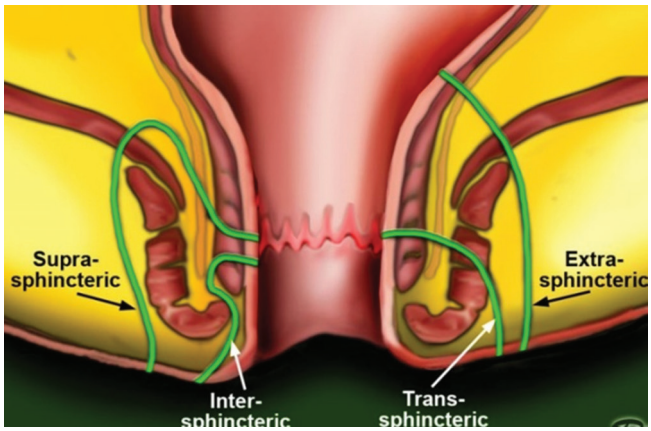

Fig. 2: Different type of fistula in relation to sphincters as classified under surgical classification. Intersphincteric fistula is seen in between internal and external anal sphincter. Transsphincteric type is seen traversing external anal sphincter. Suprasphincteric type does not involve external sphincter but traverses internal sphincter. Extrasphincteric type does not involve any of anal sphincters {Source of image: Radiology assistant.nl%2Fen%2Fp492a8bd748185%2Frectum-perianal fistulas.html&psig = AOvVaw3KCYb1uUJZZNMw4of0dcaW&ust = 1513876347979132}

Table 1: A combination of following MRI protocol was applied for fistulogram study

Imaging plane	Sequence	FOV (in cm)	TR/TE	Slice thickness/Slice gap (in mm)	Matrix
Sagittal	T2W Turbo Spin Echo fat suppression	30	3259.4/100	4/1	256×126
Axial	T2W Turbo Spin Echo	30	3259.4/100	5/1.5	256×126
Coronal Oblique	T2W TSE Fat suppression	30	3266.5/80	5/1	256×126
Coronal Oblique	T2W Turbo Spin Echo	30	3000/90	5/1	256×126
Coronal Oblique	T1W Turbo Spin Echo	30	457.5/10	5/1	256×126
Sagittal	T2W TSE	30	3000/90	4/1	256×126
Axial	T2W FAT suppression	34.11	4352.4/80	5/1.5	256×126
Sagittal	T1W turbo spin echo	30	457.5/10	4/1	256×126
Axial	T1W TSE	30	420.2/10	5/1.5	256×126

As per surgery types, transsphincteric (55.26%) type was more common than intersphincteric (44.74%) type (Table 6). No extrasphincteric type was detected in our study.

One patient had internal opening both anteriorly and posteriorly. The predominant internal opening was seen posteriorly (Tables 7 and 8), mostly around 6 o'clock position, which is evident from the scatter plot image (Fig. 11). Most of the patients had single internal opening, only two patients had more than one internal opening (Table 8).

Fig. 3: X-ray fistulogram showing perianal fistula with contrast extension in rectum/anal canal

Fig. 4: X-ray fistulogram showing catheter introduced along the fistula tract and contrast in rectum. This is another disadvantage, as because the tract is catheterized, so any secondary tract cannot be delineated

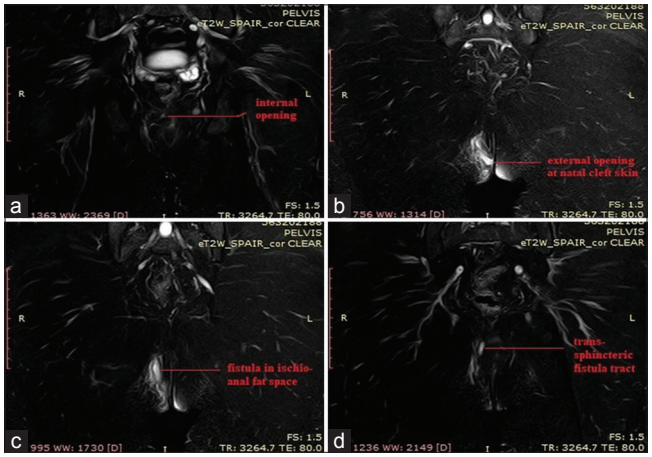

Fig. 5: Transsphincteric fistula: Series of coronal images (a-d) delineating fistula tract traversing through external sphincter (Type III fistula). These are T2W FAT SAT coronal images of the same patient as in Fig. 3 who had undergone X-ray fistulogram. In X-ray, the fistula tract was not properly described

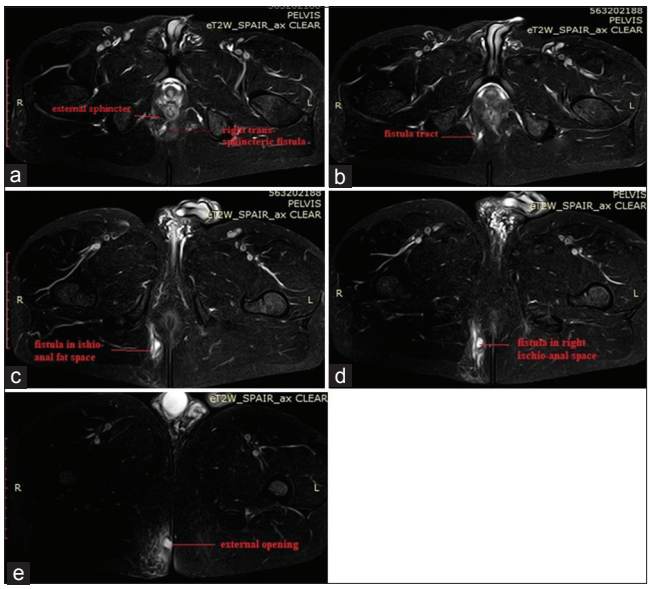

Fig. 6: Transsphincteric fistula: Series of fat-suppressed images (a-e) taken superior to inferiorly shows fluid signal tract on the right side traversing through external sphincter – no secondary tract or abscess seen (Type III fistula)

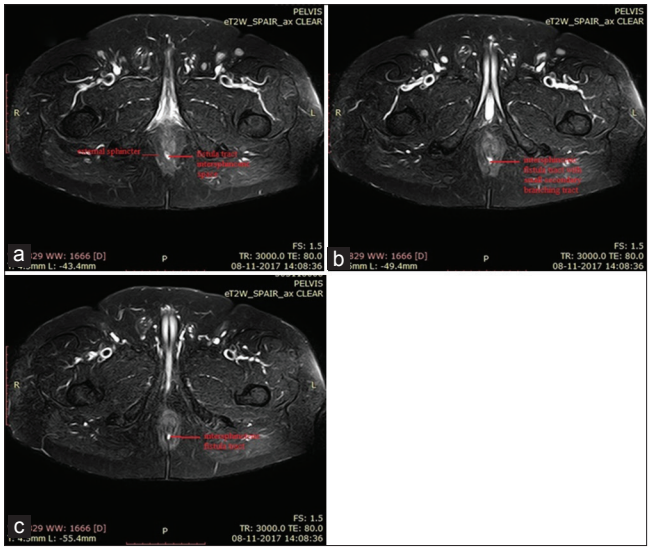

Fig. 7: Axial FAT SAT images (a-c) showing fistula in intersphincteric space with a small secondary tract in intersphincteric space [Type II fistula]

Table 2: Age distribution of patients

Age group (in years)	Number of cases (%)
0–18	02 (5.26)
19–30	08 (21.05)
31–40	14 (36.84)
41–50	07 (18.42)
51–60	06 (15.79)
61–70	01 (2.63)

Table 3: Distribution of patients as per sex

Sex	Number of cases (%)
Male	3 (7.89)
Female	35 (92.11)
Total	38 (100)

Table 4: Distribution of patients as per history of surgery

History of surgery	Number of cases (%)
Present	19 (50)
Absent	19 (50)
Total	38 (100)

Table 5: Distribution of patients as per MRI types

MRI grade	Number of cases (%)
I	12 (31.58)
II	5 (13.16)
III	6 (15.79)
IV	13 (34.21)
V	0 (0)
Other	2 (5.26)

MRI: Magnetic resonance imaging

Table 6: Distribution of patients as per surgery types

Types	Number of cases (%)
Intersphincteric (I & II)	17 (44.74)
Transsphincteric (III & IV)	21 (55.26)
Suprasphincteric	0 (0)
Extrasphincteric	0 (0)

MRI could detect the presence of fistula tract in all 38 cases indicating sensitivity of 100%. Except for two, 36 out of 38 cases, MRI correctly described the types of fistula indicating specificity of 94.73% (Table 9).

DISCUSSION

In our study, male-female ratio was 35:3 and mean age of patients was 38.96 with SD 13.52. Most of the patients in the current study were males that were similar to that reported in literature [10,11] but is in disagreement with others who did not revealed any significant differences in predilection according to gender [12].

In a study conducted by Sainio, the male-to-female ratio was 1.8:1 and the mean patient age was 38.3 years [13] which is in agreement with age distribution but differ with sex ratio as compared to our study. According

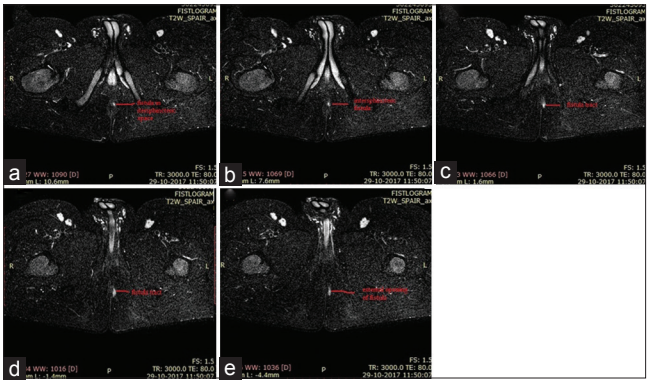

Fig. 8: Axial FAT SAT images (a-e) showing fistula in intersphincteric space. No abscess/secondary tract seen [Type I fistula]

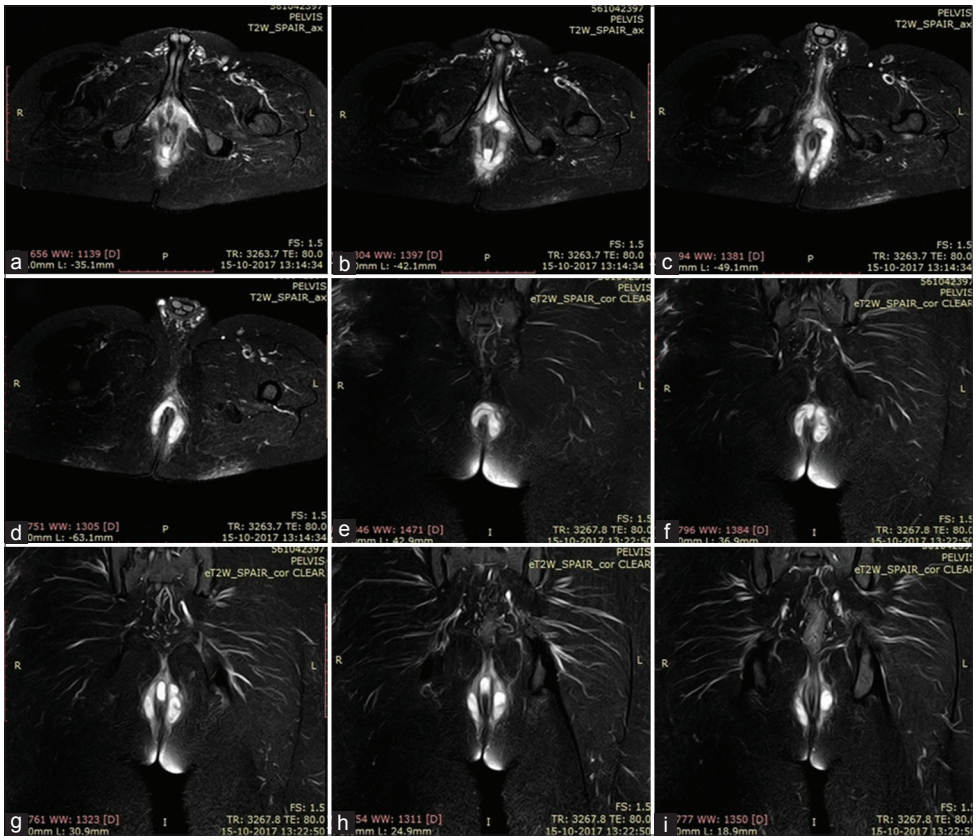

Fig. 9: Axial images (a-d) and coronal images (e-i) showing a large horseshoe-shaped abscess in intersphincteric space [Type II fistula]

to Read and Abcarian, perianal fistula usually affects men, in their fourth decade [14]. Men are affected 2- to 4-time more commonly; the reason is thought to be partially due to the higher abundance of anal glands [12]. Our study showed still higher ratio of male as compared to female.

According to our study, half of our cases had previous history of surgery which is in disagreement with study conducted by Malouf *et al*. where only 8.5% of patients had an abscess that drained previously [15].

Table 7: MRI distribution of patients as per internal anal canal opening

Internal opening	Number of cases (%)
Anterior	6 (15.79)
Posterior	31 (81.58)
Not visualized	2 (5.26)
Total patient	38

MRI: Magnetic resonance imaging

Table 8: MRI distribution of patients as per number of internal opening

Number of internal opening	Number of cases (%)
Singe	33 (86.8)
Multiple	3 (7.9)
Not visible	2 (5.3)
Total patient	38 (100)

MRI: Magnetic resonance imaging

Table 9: MRI comparison with surgery

MRI type	Number of cases	Surgery type	Number of cases
I & II	17	Intersphincteric (I & II)	17
III & IV	19	Transsphincteric (III & Iv)	21
Other	2	Other	0

MRI: Magnetic resonance imaging

The rate of intersphincteric fistulae reported in our study was 44.74% and 55.26% of fistulae are transsphincteric. No extrasphincteric or suprasphincteric fistula was detected. The result was comparable with the findings as mentioned by Vasilevsky *et al*. [16]. Trans- and inter-sphincteric fistula is the most common type of fistula also described by Parks *et al*. [2].

In a study conducted by Daabis *et al*. taking 25 patients with perianal sepsis found that 3 cases were Grade 1 (simple linear intersphincteric fistula) =12%, 2 cases Grade 2 (intersphincteric fistula with abscess or secondary track) =8%, 9 cases Grade 3 (transsphincteric fistula) =36%, 9 cases Grade 4 (transsphincteric fistula with abscess or secondary track within the ischiorectal fossa) =36%, and 2 cases Grade 5 (supralevator and translevator disease) =8% [17]. This study showing that Type I and II are very less in number and Type III and IV dominate the data.

However, according to our study, the most common type was found to be Grade IV. The percentage of types of fistula according to MRI grades were Type I=31.58%, Type II=13.1%, Type III=15.79%, and Type IV=34.21%. No Type V case was detected in our study. Our study shows that incidence of Type I and IV is comparable similar to Type II and III.

Studies have found that MRI helps to accurately demonstrate disease extension, predict prognosis, make therapy decisions, and monitor therapy [10,18]. MRI could detect the presence of fistula tract in all 38 cases (100%). Hence, the sensitivity of MRI in our study was 100%. Except for two, 36 out of 38 cases (94.73%), MRI correctly described the types of fistula. Hence, accuracy of MRI in our study was 94.73%. The two cases where MRI could not detect fistula tract properly were due to fibrotic changes around fistula, sequelae to partial medical treatment, or body response to infection.

Study conducted by Daabis *et al*., in 2013, describes similar MRI accuracy findings as our study [17].

Missed extensions at surgery are usually the cause of recurrence and adequate surgery is warranted in more extensive disease [19]. As per

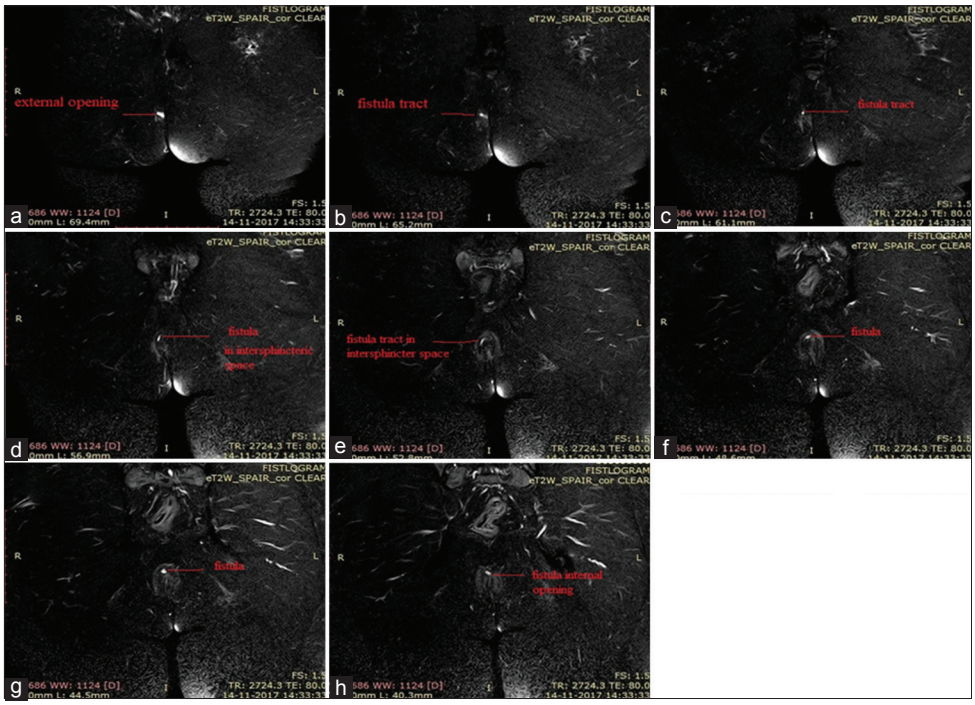

Fig. 10: Series of FAT SAT images showing fistula in intersphincteric space. No secondary tract or abscess seen [Type I fistula]. This is the MRI of the same patient as shown in Fig. 4

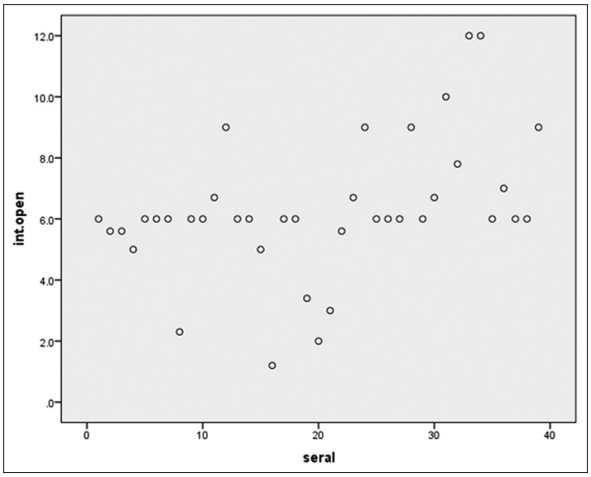

Fig. 11: Scatter plot image indicating position of internal opening according to anal clock. Internal opening was mostly around 6 o'clock as evident from scatter plot

our study, half of patients had a history of repeated fistula/perianal discharge. This could be due to some added effect of improper or incomplete pre-operative evaluation as they had not undergone MRI evaluation before surgery.

Finally, in our study patients, the predominant internal opening was seen posterior to transverse anal line, mostly around 6 o'clock position, which is evident from the scatter plot image (Fig. 11). This observation may be due to predominance of posterior anal gland infection. It may be postulated that posterior anal glands are more prone to infection and subsequent fistulation.

CONCLUSION

MRI is very accurate in pre-operative evaluation and planning for surgery of perianal fistulas.

Intersphincteric and transsphincteric types are the most common types of fistula.

Internal opening was mostly around posterior midline which may be due to predominance of posterior anal gland infection. It may be postulated that posterior anal glands are more prone to infection and subsequent fistulation.

CONFLICTS OF INTERESTS

Authors have none to declare.

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