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

SANTOSH KUMAR PANDA¹, MADHURI PANIGRAHI²*

¹Department of Radiodiagnosis, Pandit Raghunath Murmu Medical College, Baripada, Odisha, India. ²Department of Physiology, All India Institute of Medical Sciences Bhubaneswar, Bhubaneswar, Odisha, India. Email: santosh160@gmail.com

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 perianal fistula 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.

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) supra-sphincteric, 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 d.c. cstenalon 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 complaints 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, 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≤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).

**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 | 256x126 |
| Axial         | T2W Spin Echo | 30 | 3259.4/100 | 5/1.5 | 256x126 |
| Coronal Oblique | T2W TSE Fat suppression | 30 | 3266.5/80 | 5/1 | 256x126 |
| Coronal Oblique | T2W Turbo Spin Echo | 30 | 3000/90 | 5/1 | 256x126 |
| Coronal Oblique | T1W Turbo Spin Echo | 30 | 457.5/10 | 5/1 | 256x126 |
| Sagittal      | T2W TSE | 30 | 3000/90 | 4/1 | 256x126 |
| Axial         | T2W FAT suppression | 34.11 | 435.24/80 | 5/1.5 | 256x126 |
| Sagittal      | T1W turbo spin echo | 30 | 457.5/10 | 4/1 | 256x126 |
| Axial         | T1W TSE | 30 | 420.2/10 | 5/1.5 | 256x126 |
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).

---

**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)           |
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 to Sainio [13], the number of patients who had a history of surgery was 19 (50%) and the number of patients who did not have a history of surgery was 19 (50%).

| 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)            |

| Table 6: Distribution of patients as per surgery types |
|-------------------------------------------------------|
| Types                                                | Number of cases (%) |
| Intersphincteric (I & II)                           | 17 (44.74)          |
| Transphincteric (III & IV)                          | 21 (55.26)          |
| Suprasphincteric                                    | 0 (0)               |
| Extrasphincteric                                    | 0 (0)               |

**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]
Asian J Pharm Clin Res, Vol 11, Issue 5, 2018, 284-289

Panda and Panigrahi

The rate of intersphincteric fistulae reported in our study was 44.74% and 55.26% of fistulae are transsphincteric. No extraspincteric or suprasphincteric fistula was detected. The result was comparable with the findings as mentioned by Vasilevsky et al. [16]. Trans- and intersphincteric 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 (transspincteric fistula) =36%, 9 cases Grade 4 (transspincteric 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

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 (%) |
|----------------------------|---------------------|
| Single                     | 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

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
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.

REFERENCES
1. Goodsall DH, Miles WE. Diseases of the Anus and Rectum. London, England: Longmans, Green; 1900.
2. Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in-ano. Br J Surg 1976;63:1-12.
3. Morris J, Spencer JA, Ambrose NS. MR imaging classification of perianal fistulas and its implications for patient management. Radiographics 2000;20:623-35.
4. Halligan S, Stoker J. Imaging of fistula in Ano. Radiology 2006;239:18-33.
5. De Miguel Criado J, Del Salto LG, Rivas PF, del Hoyo LF, Velasco LG, de Las Vacas MI, et al. MR imaging evaluation of perianal fistulas: Spectrum of imaging features. Radiographics 2012;32:175-94.
6. Hwang JY, Yoon HK, Kim WK, Cho YA, Lee JS, Yoon CH, et al. Transperineal ultrasonography for evaluation of the perianal fistula and abscess in pediatric Crohn disease. Ultrasonography 2014;33:184-90.
7. Visscher AP, Felt-Bersma RJ. Endoanal ultrasound in perianal fistulae and abscesses. Ultrasound Q 2015;31 (2): 130-137.
8. Thalakotumage AH, Sethaput T. Quantification of CSF velocity through the narrowest point in the aqueduct of Sylvia for normal and normal pressure hydrocephalus patient by CFD analysis. Int J Pharm Pharm Sci 2016;8 Suppl 2:52.
9. Pathak KY, Mohanan A, Acharya S, Mandavia D, Jadhav HR. Exploring visceral adiposity index as a predictor of visceral adiposity dysfunction and evaluating its performance in predicting hepatic insulin resistance in Indian Type 2 diabetes. Int J Pharm Pharm Sci 2016;8:297-301.
10. Jaime de MC, Laura GS, Patricia FR, Luis FA, Leticia GV, Isabel DP, et al. MR imaging evaluation of perianal fistulas: Spectrum of imaging features. Radio Graph 2012;32:175-94.
11. Wu CL. Experience on the treatment of acute anorectal abscess with primary fistulotomy. Gaoxiong Yi Xue Ke Xue Za Zhi 1990;6:218-23.
12. Lunnis PJ, Jenkins PJ, Besser GM, Rerry LA, Phillips RK. Gender differences in incidence of idiopathic fistula-in-ano are not explained by circulating sex hormones. Int J Colorect Dis 1995;10:25-8.
13. Sainio P. Fistula-in-ano in a defined population. Incidence and epidemiological aspects. Ann Chir Gynaecol 1984;73:219-24.
14. Read DR, Abecarian H. A prospective survey of 474 patients with anorectal abscesses. Dis Colon Rectum 1979;22:566-8.
15. Malouf AJ, Cadogan MD, Bartolo DC, Canal CA. In: Corson JD, Williamson RC, editors. Surgery. London: Mosby; 2001. p. 1-26.
16. Visscher CA, Gordon PH. Results of treatment of fistula in ano. Dis Colon Rectum 1984;28:225-31.
17. Daabes N, El Shafey Y, Zakaria Y, Elkhadrawy O. Magnetic resonance imaging evaluation of perianal fistula. Egyptian J Radiol Nuclear Med 2013;44:705-11.
18. Ziech M, Felt-Bersma R, Stoker J. Imaging of perianal fistulas. Clin Gastroenterol Hepatol 2009;7:1037-45.
19. Maier AG, Funovics MA, Kreuzer SH, Herbst F, Wunderlich M, Teleky BK, et al. Evaluation of perianal sepsis: Comparison of anal end sonography and magnetic resonance imaging. J Magn Reson Imaging 2001;14:254-60.

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.