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COMPARATIVE STUDY OF NON-CONTRAST AND POST-CONTRAST MR FISTULOGRAM IN THE EVALUATION OF FISTULA IN ANO

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ABSTRACT

Background: Fistula in ano is a common inflammatory condition with significant morbidity. To evaluate the disease before planning any treatment, MRI has become a cornerstone involving both non-contrast and post contrast imaging as a routine protocol.
Aim: The current study has aims to evaluate the diagnostic efficacy of non-contrast MRI over post contrast MRI in the evaluation of perianal fistulas.
Methods: 122 patients of perianal fistulas were included in this observational study who had undergone contrast enhanced MRI prior to surgery. Non contrast data sets were compared with the post contrast data sets.
Results: The sensitivity of delineating Grade 1 perianal fistulas, as per St James university classification, on non-contrast imaging was found to be 81.03 %. The sensitivity was found to be 75%, 88.66% and 91.30% for Grade 2, 3 and 4 fistulas respectively, that increases to 100% in Grade 5 perianal fistulas.
Conclusion: On comparison of the non-contrast data set with the post contrast images, the findings were found comparable. In higher grades of perianal fistulas, the sensitivity of evaluating the disease on non-contrast images is at par with the post contrast imaging. Contrast study, being more expensive, time consuming and risky modality, should be avoided as a routine and could be considered in low grade perianal fistulas on case to case basis.

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INTRODUCTION:

Fistula in ano is an abnormal communication tract between the anal canal and the perianal skin surface [1]. The prevalence of this inflammatory condition is approx 0.01 % with male: female ratio of 2: 1. The disease causes significant morbidity evident by local pain and recurrent perianal discharge from the external skin opening [2]. Magnetic resonance imaging (MRI) has now become an

inescapable modality for evaluation of the perianal fistulas due to its non- invasive nature and highly accurate results before planning any surgical treatment. In addition to the delineation of the primary tract, MRI is quite sensitive to delineate various secondary branching tracts and local abscesses. In addition to the conventional spin-echo sequences, fat-suppressed and contrast-enhanced imaging is routinely done to demonstrate the anatomy of the disease [3]. A MRI imaging-based radiological grading system of Fistula in ano has been proposed by the St James University Hospital in the year 2000[2,4]. Contrast-enhanced MRI images have been proved advantageous over non-contrast MR images for the depiction of perianal fistulous anatomy and has now become a routine sequence of MRI imaging protocol in many institutions [3]. However, the use of Gadolinium contrast not only leads to increased cost but also increased health risk to patients, especially with compromised renal function [5]. Also, the evidence of deposition of Gadolinium contrast in deep brain nuclei during repetitive contrast imaging has been given in many previous studies in the literature [6,7].

AIM:

The study aims to assess the diagnostic efficacy of non-contrast MR fistulogram with the post contrast images as reference standard.

MATERIALS AND METHODS:

The present study was carried out in a tertiary care hospital of North India. 122 patients comprising of both males and females, in the age group of 25 to 65 years, who reported with a complaint of recurrent perianal discharge with local pain in the outpatient dept., clinically suspected and radiologically diagnosed perianal fistulas and who have undergone Contrast MRI study before surgery were included in this cross-sectional observational study. Post contrast MRI negative cases for the perianal fistulas were excluded from the study.

MRI study in these patients was conducted on GE HDX 1.5 tesla machine with 8 channel body coil and image analysis using processor AW MR Advantage Windows 4.4 volume share. T2 –weighted (TR/TE -5460/59 msec), STIR (TR/TE/TI – 6660/48/150 msec) and Gadolinium-enhanced T1 weighted fat-saturated images (CET1FS) were taken in both axial and coronal planes using slice thickness of 5 mm and FOV of 29 x 29 mm.

Both non-contrast and post-contrast data sets were evaluated separately by two radiologists having nine years and four years of experience in abdominal imaging independently. The radiologists evaluated both the data sets, viz. non-contrast data set (combined T2WI – STIR) and post-contrast data set (combined T2WI – STIR – CETIFS), independently. The cases were randomized in both the data sets during evaluation. For each data set, recordings were made of the type of perianal fistula (simple/complex), internal opening concerning anus, presence/ absence of secondary branching tracts and/or local abscesses.

The data was collected on a Microsoft Excel spreadsheet and studied for comparison. Statistical analysis of the data was done using McNemar and Fisher's exact test. Sensitivity, positive predictive value and diagnostic accuracy of non-contrast images were calculated as compared to the post-contrast images for each grade of perianal fistulas separately, as classified according to the St James University Hospital classification. Clearance from the institutional ethical committee was obtained for the study. Written informed consent of the patients was waived for the present study.

RESULTS:

Out of 122 patients in the study, 104 (85 %) were males and 18 (15 %) were females (Figure 1). The mean age of the population in our study was 43.2 years, with graded distribution as depicted in Figure 2.

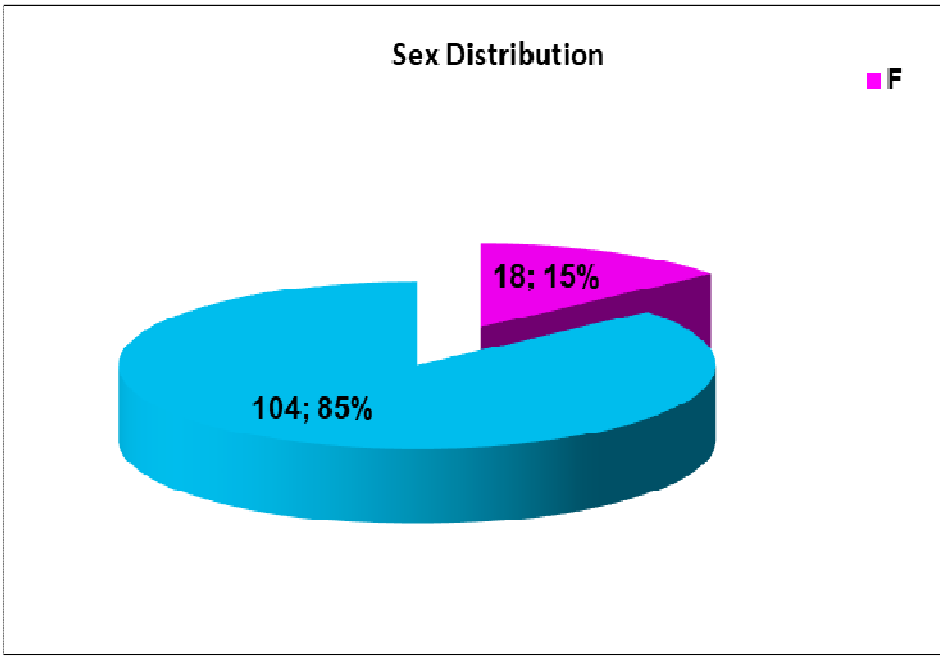

Figure 1: Pictoral representation of gender distribution.

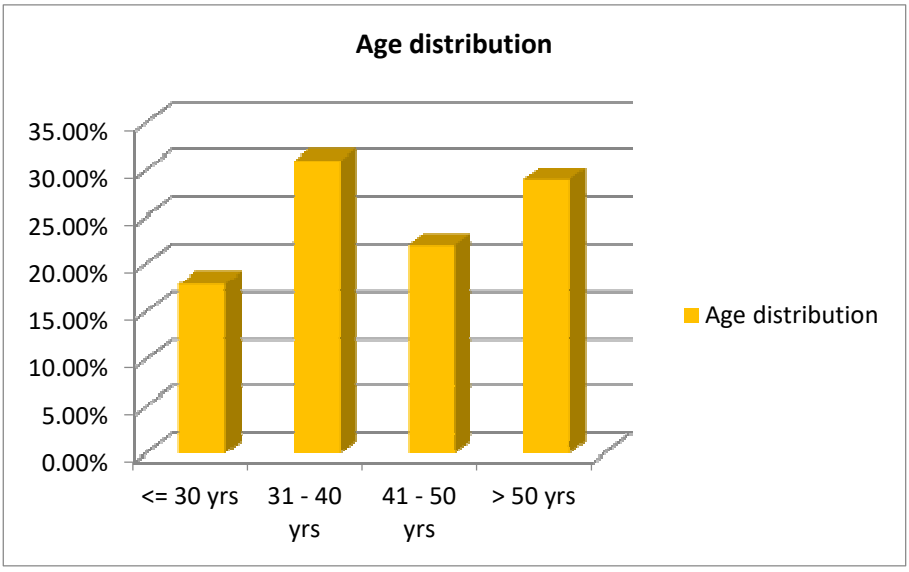

Figure 2: Column chart of age distribution.

According to the St James University Hospital classification (Table 1), Grade 1 perianal fistula was found most commonly in the present study, followed by Grade 3, Grade 4, Grade 2 and Grade 5 respectively (Figure 3).

In the present study, the most common position of the external opening of fistula was found posteriorly on the left (53 cases, 43.4 %), while that of internal opening is at midline posteriorly (68 cases, 55.7 %).

Table 1: Classification of perianal fistula according to St James University Hospital classification.

Grade	Description of fistula
I	Intersphincteric fistula - simple linear/ curvilinear
II	Intersphincteric fistula with local abscess +/- secondary branching tracts
III	Trans- sphincteric fistula - simple linear/ curvilinear
IV	Trans- sphincteric fistula with local abscess +/- secondary branching tracts
V	Supralevator / Translevator disease

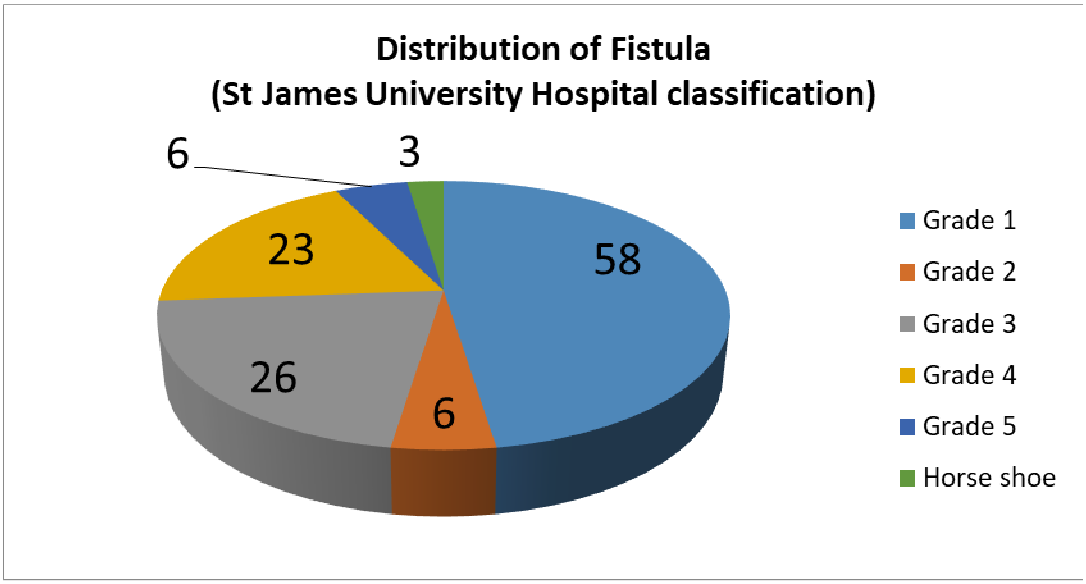

Figure 3: Gradewise distribution of perianal fistulas (According to St James University Hospital classification).

In the present study of 122 cases, 28 cases (22.9 %) were found to have secondary branching tracts and 26 cases (21.3 %) had local abscesses in the perianal region. Gradewise distribution of perianal fistulas with the respective statistical analysis of non–contrast data set (combined T2WI- STIR) as compared to post-contrast data set (combined T2WI- STIR – CET1FS) is shown in Table 2. In the present study, three cases of Horseshoe tract perianal fistula were found, which were identified and delineated in both non-contrast and post-contrast data sets with 100 % sensitivity, positive predictive value (PPV) and diagnostic accuracy.

Table 2: Gradewise cases of perianal fistulas with respective statistical analysis.

Grade	Non–contrast data set (combined T2WI- STIR)	Post contrast data set (combined T2WI- STIR-CET1FS)	Sensitivity (%)	PPV (%)	Accuracy (%)	Remarks
I	48	58	81.03	97.92	79.66	One case overdiagnosed in non contrast data set
II	06	08	75.0	100	100	-
III	26	29	88.66	100	100	-
IV	21	23	91.03	100	100	-
V	06	06	100	100	100	-

DISCUSSION:

MR imaging has lately become an inescapable requirement for preoperative assessment of any perianal fistula. This is because of the high accuracy of the modality to assess the perianal anatomy in detail and demonstrate all clinically hidden fistula tracts, sinuses and local abscesses in the perianal region.

Most of the MR centers routinely use Gadolinium contrast agents to delineate the exact anatomy of the inflammatory tracts and local abscesses, which provide holistic view to the surgeon and guide him to address the illness and prevent recurrence post-surgery [3,4,8]. However, the use of Gadolinium contrast has its demerits like an extra cost, increased imaging time, contraindication to renal patients and other health risks. To obviate the routine use of contrast agents for pre-op evaluation of perianal fistula patients, the present study was conducted to evaluate the diagnostic efficacy of non-contrast images with the post contrast images as a reference standard.

In the present study, all the perianal fistulas were evaluated and classified as per the St James University Hospital classification. However, the same is comparable to the frequently followed clinico-anatomical classification proposed by Park et al [9] in the year 1976, wherein the perianal fistula are classified as intersphincteric, trans-sphincteric, suprasphincteric and extrasphincteric types. As per the aforesaid two classification systems, the distribution of the types of fistulous tracts in the present study as compared to the previous studies in the literature are shown in Table 3. Some differences of data are seen between the present study and previous studies, as shown in table 3, which may be attributed to exclusion of perianal sinus cases in the present study contrary to the previous studies.

Table 3: Comparative distribution of perianal fistulous tracts and abscesses in the study with literature.

	Relative percentages in various studies				
Perianal fistulous tracts	**Khera et al [10]**	**Rehman et al [11]**	**Mahmoud et al [12]**	**E Essawy et al [13]**	**Present study**
Intersphincteric	60	63.6	45	58.9	54.1
Trans- sphincteric	14	18.4	25	25	42.6
Supra-/ Extra-sphincteric	07	09	20	12	4.9

In the present study, the inter-observer agreement between both the readers was calculated using kappa coefficient. The post-contrast data set had the highest agreement between the observers as compared to the non-contrast data set (Table 4).

Table 4: Inter-observer agreement between Reader 1 and Reader 2.
(values expressed as kappa coefficient)

	Non – contrast data set (combined T2WI- STIR)	**Post contrast data set (combined T2WI- STIR-CET1FS)**
Type of perianal fistula (St James classification)	0.96	1.00
Secondary branching tracts	0.92	0.95
Local abscesses	0.95	0.96

The present study found that the diagnostic confidence scores of post contrast data set with respect to both the readers is more as compared to the non-contrast data set. This is comparable to the other previous studies in the literature. The study by Cavusoglu et al [14] in the year 2017 showed high confidence score of combined T2 - CET1FS images as compared to isolated T2-weighted images. Baik et al [15] in their study reported comparable accuracy between the isolated T2 – weighted, combined T2- DWI (Diffusion-weighted image) and post-contrast data set in the range of 89 – 93 %. In a study done by Hori et al [16], addition of DWI sequence found to improve the anatomical visualization of the internal opening of perianal fistula by 25 %, as compared to isolated T2- weighted sequence. In a study done by Singh et al [17], the sensitivity and PPV of identifying secondary branching fistulas was reported as 93.75 % and 88.24 % respectively. Singh et al in their study also reported higher accuracy in diagnosing internal fistulous opening by non-contrast data set as compared to post contrast data set. In a study done by K Cattapan et al [18] in the year 2018, no significant difference was observed between the post contrast MR data set and the non-contrast MR data sets (isolated T2 or the combined T2 –DWI), in delineating perianal secondary fistulous tracts or abscesses.

In the present study, the sensitivity of identifying secondary branching tracts +/- local abscesses ranges between 75 – 91 % between the intersphincteric and trans-sphincteric perianal fistulas. However, the PPV and diagnostic accuracy in respect to the above reaches almost 100 %. It was also observed that the detection of the disease was higher in patients with actively discharging perianal fistulas/ sinuses as compared to the ones without the same. The study showed no significant difference between the non-contrast and post contrast data sets in higher grade perianal fistulas; however, mild difference in detection rate was observed in lower grade perianal fistulas.

Present study had several limitations. Firstly, only those patients were selected who were diagnosed having perianal fistulas prior to the study which leads to an overestimation of the radiological findings. Secondly, the study took post contrast images as a reference standard, which may also miss out some smaller non – inflamed fistulous tracts.

CONCLUSION:

Contrast study, being more expensive, time consuming and risky modality should be avoided as a routine and can be considered in low grade perianal fistulas and on case to case basis.

CONFLICTS OF INTEREST

There were no conflicts of interest reported between the authors.

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