

## ASSESSMENT OF ROLE OF DIFFUSION-WEIGHTED IMAGING IN THE EVALUATION OF PERIANAL FISTULAE

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### Abstract

**Background:** To assess role of diffusion-weighted imaging in the evaluation of perianal fistulae. **Materials and Methods:** Fifty- four cases of perianal fistulae of both genders underwent an MRI scan of pelvis using the Philips Ingenia 1.5 Tesla machine in a supine position with phased-array surface coil. The perianal fistula was evaluated on T1W, T2W, DWI, VISTA, and fat-suppressed postcontrast T1W sequences. **Result:** Out of 54 patients, males were 34 and females were 20. There were 40 active and 14 inactive fistulae. Secondary ramification of the primary fistula tract was seen in ischioanal space/ ischiorectal fossa in 25, intersphincteric space in 19 and supralelevator space in 10 cases. St James classification grade 1 was seen in 18, grade 2 in 12, grade 3 in 10, grade 4 in 8 and grade 5 in 6 patients. The difference was significant ( $P < 0.05$ ). MRI sequence DWI had visibility score 2 was seen in 32 in active and 8 inactive, score 1 seen in 8 active and 6 inactive. T2W score 2 in 28 active, score 1 in 9 and score 0 in 3 active and score 2 in 6 inactive, score 1 in 4 and score 0 in 4 inactive. Combined score 2 in 40 active and 13 inactive. DWI-T2W score 1 in 1 inactive. CEMRI score 2 in 40 active and 12 inactive, score 1 in 2 inactive. The difference was significant ( $P < 0.05$ ). **Conclusion:** The best performance was observed for combined DWI-T2W image evaluation in perianal fistulas.

## INTRODUCTION

Perianal fistulas represent a common inflammatory condition of the anal canal and perianal tissues. Most of these fistulas occur due to idiopathic inflammation of the cryptogenic glands in the anal mucosa.<sup>[1]</sup> Less common causes include Crohn's disease, child birth-related trauma, or radiotherapy. Surgical excision of the fistulous tract is the treatment option for perianal fistulas. Recurrence of fistula occurs up to 25 to 30% after surgery, usually due to the infection that escaped during surgery and/or fistula gone untreated.<sup>[2]</sup>

The advent of MRI has offered a major help to these patients as it allowed the direct visualization of the fistulous tract, its site in relation to the anal sphincters, and the extent of the fistula—and its abscess—in relation to the anal sphincters and levator ani muscle.<sup>[3]</sup> This has further improved the surgical outcome for these patients.<sup>[4]</sup> Excellent soft-tissue contrast and multiplanar capability of MRI, it

is the ideal preoperative imaging of choice for characterizing perianal fistulae over other imaging modalities such as conventional fistulogram, endoanal/endorectal ultrasonography, perianal ultrasonography, and computed tomography fistulography. Preoperative MRI in FIA can impact surgical planning, decreases the rate of recurrence, and modify the surgical outcome of various types of fistulae.<sup>[5]</sup>

Diffusion-weighted imaging (DWI) has been extensively studied whether it adds any value to other MRI sequences in the assessment of perianal inflammation. Few researchers mentioned that DWI is more sensitive than T2W sequence regarding the visibility of the fistula.<sup>[6,7]</sup> Others suggested that restricted diffusion indicated activity of the fistula, and it represents a good alternative for post-contrast imaging in case gadolinium cannot be used.<sup>[8]</sup> We performed this study to assess role of diffusion-weighted imaging in the evaluation of perianal fistulae.

## MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected fifty- four cases of perianal fistulae of both genders. Patients' consent was obtained before starting the study.

Data such as name, age, gender etc. was recorded. All patients underwent an MRI scan of pelvis using the Philips Ingenia 1.5 Tesla machine in a supine position with phased-array surface coil. The presence and numbers of visible perianal fistulas, internal openings, secondary ramifications, sphincteric extension, and associated complications like horseshoe fistula or abscess formation etc. were

recorded. The completely healed fistula was defined when no T2-weighted (T2W) hyperintense signal intensity observed in perianal fistula with no contrast enhancement after gadolinium injection. The perianal fistula was evaluated on T1W, T2W, DWI, VISTA, and fat-suppressed postcontrast T1W sequences. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

## RESULTS

Out of 54 patients, males were 34 and females were 20 [Table 1].

**Table 1: Patients distribution**

Total- 54		
Gender	Males	Females
Number (%)	34	20

**Table 2: Assessment of parameters**

Parameters	Variables	Number	P value
Type	Active	40	0.01
	Inactive	14	
Secondary ramification of the primary fistula tract	Ischioanal space/ ischiorectal fossa	25	0.92
	intersphincteric space	19	
	supralelevator space	10	
St James classification	Grade 1	18	0.05
	Grade 2	12	
	Grade 3	10	
	Grade 4	8	
	Grade 5	6	

**Table 3: Visibility score of DWI, T2W, CEMRI, and combined T2W-DWI MRI sequences**

MRI sequence	Visibility score	Active (40)	Inactive (14)	P value
DWI	Score 2	32	8	0.04
	Score 1	8	6	
	Score 0	0	0	
T2W	Score 2	28	6	0.01
	Score 1	9	4	
	Score 0	3	4	
Combined	Score 2	40	13	0.01
DWI-T2W	Score 1	0	1	0.05
	Score 2	0	0	
CEMRI	Score 2	40	12	0.02
	Score 1	0	2	
	Score 0	0	0	

There were 40 active and 14 inactive fistulae. Secondary ramification of the primary fistula tract was seen in ischioanal space/ ischiorectal fossa in 25, intersphincteric space in 19 and supralelevator space in 10 cases. St James classification grade 1 was seen in 18, grade 2 in 12, grade 3 in 10, grade 4 in 8 and grade 5 in 6 patients. The difference was significant ( $P < 0.05$ ) [Table 2].

MRI sequence DWI had visibility score 2 was seen in 32 in active and 8 inactive, score 1 seen in 8 active and 6 inactive. T2W score 2 in 28 active, score 1 in 9 and score 0 in 3 active and score 2 in 6 inactive, score 1 in 4 and score 0 in 4 inactive. Combined score 2 in 40 active and 13 inactive. DWI-T2W score 1 in 1 inactive. CEMRI score 2 in

40 active and 12 inactive, score 1 in 2 inactive. The difference was significant ( $P < 0.05$ ) [Table 3].

## DISCUSSION

MR imaging of suspected perianal inflammatory pathologies is an established method for diagnosis and defining the extent of this inflammation.<sup>[9,10]</sup> The standard MRI sequences used for those patients include basic anatomical sequences with pre- and post-contrast images.<sup>[11,12]</sup> The principle role of MRI in the setting of perianal fistulas is to define the extension of the tract, side branches, and whether there are any deep abscesses, especially at supra-lelevator level.<sup>[13,14]</sup> We performed this study to assess

role of diffusion-weighted imaging in the evaluation of perianal fistulae.

Our results showed that out of 54 patients, males were 34 and females were 20. Mohsen et al,<sup>[15]</sup> evaluated the visibility of perianal inflammation on DWI and evaluate the diffusion characteristics of perianal fistulas and abscesses and how accurately can DWI classify perianal disease. Mean age of patients was  $37 \pm 8.9$  years old. The study included 30 fistulas and 15 abscesses. Seven patients had more than 1 fistula or fistula and abscess. Perianal abscesses were well visualized equally on DWI and T2W images and correctly classified by DWI, when compared to post-contrast images. Perianal fistulas without abscesses, on the other hand, had variable visibility scores. Although the visibility of these fistulas on DWI was generally less than T2W and combined DWI and T2W, yet this did not reach a significant level and it was not significantly different between positive and negative inflammatory groups. Combined DWI and T2W evaluation had the highest performance and accurately classified 97.8 % of perianal fistulas and abscesses, and only 1 case was misclassified (2.3%). There were 40 active and 14 inactive fistulae. Secondary ramification of the primary fistula tract was seen in ischioanal space/ ischiorectal fossa in 25, intersphincteric space in 19 and supralevator space in 10 cases. St James classification grade 1 was seen in 18, grade 2 in 12, grade 3 in 10, grade 4 in 8 and grade 5 in 6 patients. Boruah et al,<sup>[16]</sup> determined the role of diffusion-weighted MRI in the evaluation of perianal fistulae. The study group composed of 47 patients of perianal fistula. MRI with diffusion-weighted imaging (DWI) was performed with Philips 0.5 T Ingenia scanner. DWI with different b -values (b = 50, b = 400, and b = 800s mm<sup>2</sup>) were obtained. The MRI findings were correlated with local clinical examination and or surgical findings. Fifty-nine perianal fistulas in 47 patients were included in the study sample. The visibility of perianal fistula on DWI was less than T2-weighted (T2W) and combined DWI-T2W images. Distinctly visualized (visibility score 2) perianal fistulas were observed in 47 fistulas (79.6%) on DWI, 54 (91.5%) on T2W, and 58 (98.3%) on DWI-T2W images. The mean of apparent diffusion coefficient (ADC) values of active fistula was  $0.972 \pm 0.127$  [SD]  $10^{-3}$  mm<sup>2</sup> /s and inactive was  $1.232 \pm 0.185$  [SD]  $10^{-3}$  mm<sup>2</sup> /s with a significant difference. A cut-off mean ADC value of  $1.105 \times 10^{-3}$  mm<sup>2</sup> /s was used to differentiate active from the inactive fistula with a sensitivity of 87.5% and specificity of 73.3%.

We observed that MRI sequence DWI had visibility score 2 was seen in 32 in active and 8 inactive, score 1 seen in 8 active and 6 inactive. T2W score 2 in 28 active, score 1 in 9 and score 0 in 3 active and score 2 in 6 inactive, score 1 in 4 and score 0 in 4 inactive. Combined score 2 in 40 active and 13 inactive. DWI-T2W score 1 in 1 inactive. CEMRI score 2 in 40 active and 12 inactive, score 1 in 2 inactive.

Cavusoglu et al,<sup>[17]</sup> showed a sensitivity of 72-79% and specificity of 100% for preoperative detection of perianal fistula with T2W images alone, while combined DWI and T2W sequences showed sensitivity of 96 to 100% and specificity of 100%.

Yoshizako et al,<sup>[18]</sup> assessed the feasibility of using diffusion-weighted magnetic resonance (MR) imaging (DWI) in 24 patients with clinically suspected perianal fistula who underwent a total of 28 MR examinations after conservative treatment with antibiotics. DWI was performed at 1.5 T, using b-values of 0 and 1000 s/mm<sup>2</sup>. Apparent diffusion coefficient (ADC) maps were created and ADCs of the lesions were measured. Lesions were classified into two groups based on the need for surgery and surgical findings: positive inflammation activity (PIA) and negative inflammation activity (NIA). The ADC (in  $10^{-3}$  mm<sup>2</sup>/s) of the PIA group ( $0.908 \pm 0.171$ ) was significantly lower ( $P=0.0019$ ) than that of the NIA group ( $1.124 \pm 0.244$ ). The area under the ROC curve was 0.749. An optimal cut-off ADC of 1.109 yielded a sensitivity of 95.7%, a specificity of 50%, a positive predictive value of 71%, and a negative predictive value of 90%.

## CONCLUSION

The best performance was observed for combined DWI-T2W image evaluation in perianal fistulas.

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