



## PRESACRAL SOFT TISSUE OEDEMA IN PERI ANAL FISTULA-- MRI CORRELATION

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**ABSTRACT** **OBJECTIVE :** The purpose of this study was to assess the association between the presacral soft tissue oedema with or without altered signal intensities in the sacrum and coccyx in cases of perianal fistula and its significance in relation to its occurrence in patients who came for pelvic MR for other complaints.

**MATERIALS AND METHODS:** The images from 46 MR examinations in patients with perianal fistula; age range, 15-68 years; mean, 38.44±12.64) were retrospectively reviewed in consensus by two observers. Images from STIR axial, sagittal, coronal and T2 coronal planes were evaluated and classified based on the St. James's University Hospital Classification of perianal fistula. Features evaluated included the presence of oedema in the presacral space with or without altered signal intensities in the sacrum and coccyx with respect to the grade and the internal opening of the perianal fistula. The same features were assessed retrospectively in the 50 pelvic MR examinations of patients who came for some other complaints to the radiology department and used as control population.

**RESULTS:** A total of 46 MR examinations of patients with perianal fistula and 50 pelvic MR examinations of patients (control) with other complaints were evaluated. Of the 46 patients 32 were male (70%) and 14 were female (30 %). The most common position of internal opening was at 6'O clock in 29 patients followed by 12'Oclock in 7 patients. The most common grade being Grade I of St. James's University Hospital Classification (20 patients ) followed by Grade II(9), Grade III(11), Grade IV (6) and Grade V (0). The control population were of same age, 36 male and 14 female. Among the 46 patients, 9 patients had presacral soft tissue oedema with altered signal intensities in the sacrum and coccyx. While in control of the only one had presacral soft tissue oedema. Thus when comparing the occurrence of presacral soft tissue oedema with or without altered signal intensities in the sacrum and coccyx, there was a statistically significant association among the patients with perianal fistula. Even though these findings were present in 19.5 % of the study population, there is no statistical significance associated with the Grading and the internal opening of the fistula (anterior and posterior openings)

**CONCLUSION:** The occurrence of Presacral soft tissue oedema has a statistically significant association in patients with perianal fistula when comparing to the control population. Though a common finding in the MR fistulogram of patients with perianal fistula, especially with internal opening at 6'oclock position, there is no statistically significant association between its occurrence and various grades of fistula or the position of internal opening of the fistula.

**KEYWORDS :** Presacral soft tissue oedema, MR fistulogram, Perianal Fistula.

**INTRODUCTION:** An abnormal communication between the epithelial linings define a fistula. An abnormal communication between the perianal skin externally and the rectal or anal canal wall internally defines the Fistula-in-ano[1]. MRI fistulogram has become the investigation of choice for evaluation of the perianal fistulae, because of its ability to delineate the extent, detailed anatomy of the perianal space, ramification, internal and external opening of fistula, and allowing to evaluate orthogonally in sagittal, coronal and axial planes[3,4]. Though various classification of fistulae are currently in use , the grading followed in this study is the St. James's University Hospital Classification which states as described in Table 1. Other important rules and classification include the Park et al classification, Goodsall's Rule[2]. In our study we are concerned with yet another finding of pre sacral oedema in the patients with Peri anal fistula. The various causes for presacral soft tissue oedema like heart failure, sacral mass, post radiotherapy, infected rectal duplication cyst and Crohn's disease were excluded from the study population

**TABLE 1**

Grade	Description
0	Normal Appearance
1	Simple linear intersphincteric fistula
2	Intersphincteric fistula with intersphinteric abscess or secondary fistulous track
3	Trans-sphincteric fistula

4	Trans-sphincteric fistula with abscess or secondary track within ischioanal or ischiorectal fossa
5	Supralelevator or translevator disease
Source — Modified from spencer et al(3)	

### MATERIALS AND METHODS

#### SUBJECTS

After obtaining institutional review board approval, we retrospectively reviewed the electronic radiology information databases at our institution. The requirement for informed consent was waived. Forty Six MR examinations performed from January 2020 to May 2020, were identified. MR fistulogram of 46 patients (32male, 14 female; age range, 15-68 years; mean, 38.44 years) were included in this study. The most common presenting clinical symptoms were perianal discharge. 50 Pelvic MR examination of patients with other complaints other than perianal discharge were used as control population

**INCLUSION CRITERIA:** Patients with complaints of perianal discharge who came for MR fistulogram.

**EXCLUSION CRITERIA:** Patients with other co morbidities like sacral mass, Crohn's disease with perianal fistula, heart disease, recurrent fistula, post-surgical patients, patients with congenital anomalies were excluded from the study

#### MR FISTULOGRAPHY TECHNIQUE

All examinations were performed with a 1.5-T superconducting closed-configuration MRI system (Aera, Siemens). A sagittal localizer acquisition using external phased array coil was performed with a T2-weighted Fast Spin echo sequence (TR/TE,6460/ 91; flip angle, 159°; slice thickness, 5 mm; matrix size, 266 × 320; field of view, 270mm). From this series, a truly axial and coronal image along the long axis of the anal canal is obtained. T2 , STIR(short inversion time inversion recovery) and DWI (Diffusion weighted Imaging ) sequences were used in axial , coronal and sagittal planes were used to assess the anatomical site, extent, ramification, internal , external opening of the fistula and the conspicuity of the presacral edema could be defined efficiently. No specific preparation was needed prior to performing the study.

**TABLE 2**

Sequence	TE	TR	Flip Angle	Matrix	FOV
T2 Axial/ coronal	91ms	6460ms	159o	266x320	270mm
STIR Axial/ Coronal/Sagittal	41ms	4850ms	147o	224x320	270mm
Diffusion Weighted	61ms	3800	152o	84x128	270mm

**MRI FEATURE ANALYSIS**

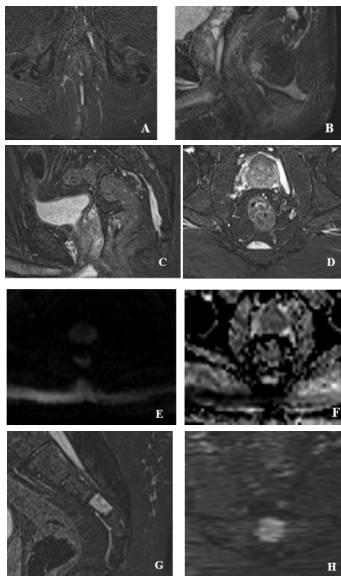
Two abdominal radiologists (6 and 4 years of experience in reading abdominal MR images) in consensus retrospectively evaluated the images at a PACS work station. Each perianal fistula was classified based on the St. James's University Hospital Classification into varying grades. Besides grading the fistula, the presence of presacral soft tissue oedema with or without altered intensities in sacrum and coccyx were analysed in all studies.

The presence of presacral soft tissue oedema is characterised by the hyper intensities anterior to the body of sacrum and coccyx in fluid sensitive sequences like T2 and STIR. Diffusion weighted sequence was analysed for the differentiation between the abscess and the oedema.

**TABLE 3 – APPEARANCE OF PRESACRAL EDEMA IN THE VARIOUS SEQUENCES**

Sequence	Signal intensity
T2	Hyper intensity
STIR	Hyper intensity
DWI	No restriction

**Fig 1:** STIR axial (A) and Sagittal (B) views show a well defined linear hyperintense fistulous tract running antero superiorly to end at 6'O clock position internally. (C)Midline sagittal STIR image shows a linear hyperintensity along the anterior surface of the body of sacrum extending from S3-S5. (D)STIR Axial views shows hyperintensity anterior to the sacral body. (E) and (F) Diffusion weighted and ADC images in axial view shows hypointensity on DWI and Hyperintensity on ADC images (no diffusion restriction)- presacral soft tissue oedema in a case of perianal fistula. STIR sagittal(G) and Axial (H) views in another patient showing altered signal intensity in the lower sacral vertebral body.



**STATISTICAL ANALYSIS:**

The data was entered in Microsoft Excel Sheet after collection and compilation Analysis was done using Statistical software SPSS version 16. All Continuous variables will be expressed as Mean and Standard Deviation. All Categorical variables will be expressed as Percentages and Proportions. The Chi Square Test was used for analysis of variance and the test will be considered Significant if P<0.05, at 95% Confidence Interval.

**RESULTS:**

Among the 46 patients with perianal discharge all patients had perianal fistula. About 63% of study population (29 patients ) had internal opening at 6'O'clock position followed by 12'O clock position(15%) (Table 4). As per the St. James's University Hospital Classification, Grade I was more common following Grade II,III and IV (Table 5). While in control population only 1 among 50 had presacral soft tissue oedema. On comparing the occurrence between the cases and control there was a statistically significant association between the presence of presacral oedema and perianal fistula with the 'p' value of 0.01. (Table 6). Association between the presacral and precoccygeal oedema and internal opening of the fistula was statistically not significant with a P value of 0.3 for the fistulae with internal opening at posterior positions position(4, 5, 6, 7 and 8'o'clock positions) (Table 7). And there was no significant association between the presacral soft tissue oedema with or without altered signal intensities and the various Grades of fistula as per St. James's University Hospital Classification.

**TABLE 4:INTERNAL OPENING POSITION FINDINGS OF FISTULA IN THE STUDY POPULATION:**

Position on Internal Opening	Value (N=46) n (%)
1 'o' clock	1 (2%)
2 'o' clock	2 (5%)
3 'o' clock	2 (5%)
4 'o' clock	1 (2%)
5 'o' clock	1 (2%)
6 'o' clock	29 (63%)
7 'o' clock	1(2%)
8 'o' clock	0(0)
9 'o' clock	1 (2%)
10 'o' clock	1 (2%)
11 'o' clock	0 (0)
12 'o' clock	7 (15%)

**TABLE 5:GRADING OF FISTULA IN THE STUDY POPULATION**

Grade	Value (N=46) n (%)
Grade I	20 (43%)
Grade II	9 (20%)
Grade III	11 (24%)
Grade IV	6 (13%)
Grade V	0 (0)

**TABLE 6 : ASSOCIATION OF PRESACRAL SOFT TISSUE OEDEMA IN PERIANAL FISTLA AND CONTROL POPULATION**

	Presacral soft tissue oedema +	No Oedema	P value
Perianal fistula	9(9%)	37(39%)	0.01
control	1(1%)	49(51%)	

**TABLE 7: ASSOCIATION BETWEEN INTERNAL OPENING POSITION- ANTERIOR / POSTERIOR AND EDEMA CHARACTERISTICS OF THE STUDY POPULATION:**

INTERNAL OPENING POSITION (N=43)	EDEMA		P Value
	PRESENT (N=8) n%	ABSENT (N=35) n%	
ANTERIOR(1, 2, 10,11,12'O CLOCK POSITION)	1(2%)	10(23%)	0.30
POSTERIOR (4, 5, 6, 7, 8 'O CLOCK POSITION)	7(16%)	25(58%)	

**TABLE 8: ASSOCIATION BETWEEN GRADING OF FISTULA AND EDEMA CHARACTERISTICS OF THE STUDY POPULATION:**

GRADE	EDEMA		P VALUE
	PRESENT (N=9) n%	ABSENT (N=37) n%	
Grade I	4 (9%)	16(35%)	0.94
Grade II	2 (4%)	7(15%)	0.82

Grade III	3 (7%)	8(17%)	0.46
Grade IV	0(0)	6(13%)	0.19

P Value < 0.05 will be considered significant

Fig 2 : Among the 46 patients , 32 (70%)were male and 14(30%) were female.

FIGURE 2 : Gender

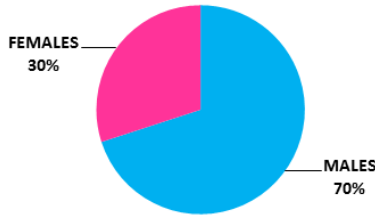


Fig 3 : Grading Of Fistula In The Study Population

FIGURE 3: GRADING OF FISTULA

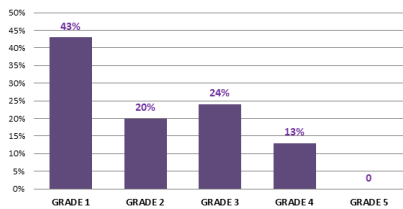


Fig 4 : Association between grading of fistula and edema characteristics of the study population.

FIGURE 4:ASSOCIATION BETWEEN GRADING & EDEMA

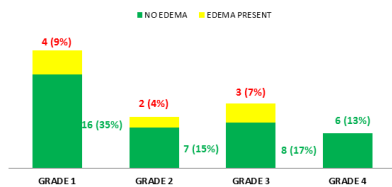
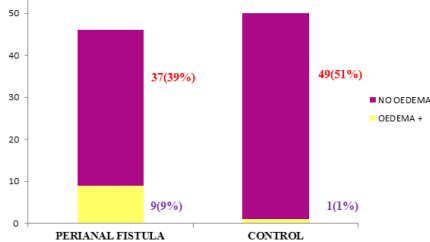


Fig5: Association between the presence of presacral soft tissue oedema in patients with perianal fistula and in controls

FIGS: ASSOCIATION BETWEEN THE PRESENCE OF PRESACRAL SOFT TISSUE OEDEMA IN PATIENTS WITH PERIANAL FISTULA



**DISCUSSION :**

Pre sacral space in a clinically important space which is at the intersection of the axial skeleton, neuraxis and the pelvic soft tissue[5] Pre sacral space is an anatomical space bounded superiorly by the peritoneal reflections, inferiorly by levator ani and coccygeus muscle, laterally by ureter and iliac vessels. Its content include fat, mesenchymal tissue, lymph nodes, nerve plexus and blood vessels [6]. It is supplied by the median and lateral sacral vessels, a direct posterior branch of the abdominal aorta just proximal to the bifurcation of the common iliac arteries[7]. Arteries accompanied by medial sacral vein and drains into the left common iliac vein. Presacral venous plexus formed by the median and the lateral sacral veins, courses into the pelvic fascia just anteriorly along the border of the sacrum [8].

Anal canal is surrounded by internal anal sphincter (upper 2/3) and external anal sphincter (lower 2/3, thus over laps the internal anal sphincter. Internally the anal canal is divided into the 2 parts by the pectinate line. Anal canal has dual venous drainage[6]. Above the pectinate line, superior rectal vein which empties into the inferior mesenteric vein (portal venous system) and below the pectinate line , inferior rectal vein , which empties into the internal pudendal vein, into the internal iliac vein (systemic venous supply)[9,10]

The drainage of the anal canal (lower 2/3<sup>rd</sup>) and that of the pre sacral space has a communication through the sacral venous plexus. Thus in cases of perianal fistula, there occurs venous congestion, resulting in the venous reflux from the internal iliac vein through the internal pudendal vein and lateral sacral vein along the sacral venous plexus into the median sacral veins causing increased permeability through the veins casing presacral soft tissue oedema and altered signal intensities in the body of sacrum and coccyx.

In our study, even though the occurrence of the presacral soft tissue oedema with or without altered signal intensities in sacrum and coccyx is common , occurring in 20% of patients with perianal fistula , compared to the occurrence of only 2% in normal population ( 50 pelvic MR studies were analysed and one showed the presence of presacral soft tissue oedema with altered signal intensity in the sacrum), there is no statistical significance for this finding with the internal opening or various grade of fistula.

Since there are no similar studies done in the previous years, there may be a need for future studies with greater study population for evaluating the occurrence of presacral soft tissue oedema with varying grades, clock positions and their response to surgery or treatment.

**LIMITATIONS :**

Study population did not include the patients with recurrent fistula and post surgical cases. The follow up of the patients with presacral soft tissue oedema after surgical management was not done and thus the significance of presacral edema with the prognosis of the disease was not ascertained. The occurrence of presacral edema in grade V fistula was not ascertained as no cases of grade V in or study population.

**CONCLUSION :**

We evaluated the association of oedema in the presacral space with or without altered signal intensities in sacrum and coccyx between patients with perianal fistula and non-fistulous patients (control) which showed statistically significant association of presacral soft tissue oedema among perianal fistula patients in relation to its occurrence in non-fistulous patients. Even though presacral soft tissue oedema is a common finding among fistula patients with internal opening at 6'o clock position, the association of presacral soft tissue oedema with the position of internal opening of the perianal fistula and the various grades of fistula based on the St. James's University Hospital Classification were not statistically significant.

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