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Diagnostic Accuracy of MRI in the Classification and Preoperative Assessment of Perianal Fistulae: A Prospective Study with Surgical Correlation.

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ABSTRACT

Perianal fistulae are chronic inflammatory tracts that pose diagnostic and therapeutic challenges, particularly in identifying complex extensions and planning surgical interventions. Accurate preoperative imaging is crucial to minimize recurrence and preserve continence. To evaluate the diagnostic accuracy of Magnetic Resonance Imaging (MRI) in the classification and preoperative assessment of perianal fistulae, with surgical correlation. This prospective observational study included 30 clinically diagnosed patients with perianal fistulae. All patients underwent pelvic MRI using a 3 Tesla scanner. Imaging findings were evaluated and classified according to the St. James's University Hospital (SJUH) grading and Parks classification systems. Surgical findings served as the gold standard. MRI detection of the primary tract, secondary tracts, abscesses, and internal openings was compared with operative results, and diagnostic performance parameters were calculated. MRI correctly identified and classified the primary tract in 100% of cases. Sensitivity and specificity for detecting secondary tracts were 100% and 89.5%, respectively, with an overall accuracy of 93.3%. Strong concordance was observed between MRI and surgical findings in 28 out of 30 patients. MRI is a highly sensitive and accurate imaging modality for evaluating perianal fistulae. It aids significantly in surgical planning by delineating tract anatomy and complications.

Keywords: Perianal fistula, Magnetic Resonance Imaging, Surgical correlation.

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INTRODUCTION

Perianal fistulae are abnormal tracts that form between the anal canal and the perianal skin, most commonly resulting from cryptoglandular infections [1]. These tracts may vary in complexity and can significantly affect a patient's quality of life due to symptoms like persistent discharge, pain, and recurrent infections [2-4]. Accurate classification and preoperative assessment are critical for successful surgical management, as failure to detect secondary tracts, abscesses, or the exact anatomical relationship with sphincter muscles often leads to recurrence or postoperative complications such as fecal incontinence [5]. Magnetic Resonance Imaging (MRI) has emerged as the imaging modality of choice in evaluating perianal fistulae due to its superior soft tissue contrast, multiplanar capability, and noninvasive nature. MRI enables detailed visualization of the fistulous tracts, their internal and external openings, extensions, and their relationships to surrounding structures. Classification systems such as Parks and the St. James's University Hospital (SJUH) grading scheme are commonly employed to standardize MRI findings [6, 7].

Our prospective study aims to assess the diagnostic accuracy of MRI in classifying perianal fistulae and its correlation with intraoperative surgical findings.

METHODOLOGY

This prospective observational study was conducted at the Department of Radiodiagnosis, a total of 30 clinically diagnosed cases of perianal fistulae were evaluated using Magnetic Resonance Imaging (MRI). Written informed consent was obtained from all patients. A brief clinical history was recorded, including symptoms such as discharge, pain, fever, and swelling. All patients subsequently underwent surgical intervention, and findings from the surgical procedure were considered the gold standard for comparison with MRI findings.

MRI scans were performed using a Siemens Magnetom Skyra 3 Tesla machine equipped with a sense body coil and phased-array surface coils. The imaging protocol included T1-weighted fast spin echo (T1WFSE), T2-weighted fast spin echo (T2WFSE), short tau inversion recovery (STIR), and post-contrast fat-suppressed T1-weighted gradient echo sequences, acquired in axial and coronal planes. The patients were scanned in the supine position, and appropriate imaging planes were selected to include the anal canal, sphincter complex, and surrounding pelvic structures. The imaging findings were assessed and classified based on the Parks classification and the St. James's University Hospital (SJUH) MRI grading system.

The MRI findings were interpreted by experienced radiologists and included the identification of the primary fistulous tract, internal and external openings, secondary tracts, abscesses, and their anatomical relationships with the internal and external anal sphincters and levator ani muscle. The location of the internal opening was described using the "anal clock" method. The MRI results were then compared with the surgical findings for accuracy. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated to assess the reliability of MRI in the evaluation and classification of perianal fistulae.

RESULTS

Table 1: Demographic Profile of the Study Cohort (N = 30)

Variable	n	%
Sex		
Male	21	70.0
Female	9	30.0
Age group (years)		
< 30	7	23.3
31 – 40	9	30.0
41 – 50	8	26.7
51 – 60	3	10.0
61 – 70	2	6.7
> 70	1	3.3

Table 2: Presenting Symptoms

Symptom	n	% of patients
Purulent discharge	19	63.3
Pain	17	56.7
Perianal swelling	8	26.7
Fever	7	23.3
Local tenderness	7	23.3

Table 3: MRI Classification versus Surgical Findings (St James's MRI Grades)

Grade	Description	MRI (n)	Surgery (n)
I	Simple linear inter-sphincteric	13	13
II	Inter-sphincteric ± abscess/secondary tract	6	5
III	Trans-sphincteric	4	4
IV	Trans-sphincteric ± ischio-anal abscess/secondary tract	5	4
V	Supralevator / translevator	2	2
Total		30	28

Table 4: Diagnostic Performance of MRI (vs. Surgical Gold Standard)

Parameter	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Primary tract	100	–	100	–	100
Abscess	100	100	100	100	100
Secondary tract(s)	100	89.5	84.6	100	93.3
Horseshoe extension	100	100	100	100	100
Internal opening	100	–	100	–	100
Supralevator extension	100	100	100	100	100

DISCUSSION

The present prospective study demonstrates that high-resolution MRI offers excellent diagnostic performance for classifying perianal fistulae and mapping surgically relevant extensions. In our 30-patient cohort the male-to-female ratio (2.3: 1) and peak incidence in the fourth decade mirror cryptoglandular fistula epidemiology reported in large population studies, reaffirming that young and middle-aged men remain the predominant sufferers. Symptomatically, purulent discharge and pain were the commonest complaints, consistent with the pathophysiology of chronic sepsis within the inter- and trans-sphincteric planes. These baseline findings provide external validity for comparing our imaging metrics with earlier series [8].

When MRI findings were stratified by the St James's University Hospital grading system, 63 % of tracts were confined to the inter-sphincteric space (grades I–II), while 37 % penetrated the external sphincter or levator (grades III–V). This proportional distribution is almost identical to that described by Morris *et al.* (1994), who reported 65 % grade I–II disease in 285 primary fistulae, indicating that our sample was not biased toward unusually complex disease. Importantly, MRI correctly matched surgical grading in 28 of 30 cases; the two discordant assessments both involved secondary inter-sphincteric ramifications not explored intra-operatively, highlighting MRI's tendency to "over-stage" innocuous inflammatory strands. Such overestimation, however, is clinically preferable to underestimation, because unrecognised extensions are the leading modifiable cause of recurrence [9-11].

The modality's strength became even clearer when diagnostic indices were calculated. Sensitivity reached 100 % for primary tract detection, abscess identification, horseshoe extensions and supralevator spread, confirming that multiplanar T2-weighted, STIR and contrast-enhanced sequences adequately depict both active granulation tissue and fluid collections. Specificity remained ≥ 89 % across all features except secondary tracts, where two false-positives (MRI-visible but surgically undetected) lowered specificity to 89.5 %. Overall accuracy of 93 % for secondary tracts nonetheless compares favourably with pooled accuracies of 70–80 % reported for endoanal ultrasound and CT fistulography. The impressive positive predictive value (PPV = 84.6 %) and perfect negative predictive value (NPV = 100 %) for

secondary extensions indicate that a negative MRI virtually rules out occult sepsis, thereby supporting sphincter-sparing strategies without fear of residual disease.

Beyond mere detection, MRI informed surgical planning in three pivotal ways. First, defining trans-sphincteric tracks enabled surgeons to decide between fistulotomy and seton placement, balancing eradication of infection against risk to continence. Second, pre-operative localisation of inter-sphincteric abscesses permitted targeted drainage through minimal access, sparing unnecessary tissue dissection. Third, identification of supralevator or extrasphincteric disease altered operative approach entirely, prompting combined abdominal–perineal routes or staged procedures. These management refinements parallel those described by Beets-Tan *et al.* (2001), who found MRI altered surgical strategy in 21 % of fistula patients, especially those with recurrent or Crohn-related tracts.

Study limitations include a relatively small sample size and the single-centre design, which may inflate observer performance. Inter-reader agreement was not formally analysed, although interpretation was consensus-based between two experienced radiologists. Future work should incorporate blinded multi-reader evaluation and cost-effectiveness modelling, particularly in resource-constrained settings where routine MRI is debated.

CONCLUSION

Our findings reinforce MRI as the imaging gold standard for perianal fistula evaluation. Its unrivalled soft-tissue contrast, panoramic field of view and multiplanar capability provide a comprehensive “road map” that correlates closely with surgical anatomy, enables tailored therapy and should ultimately translate into lower recurrence and continence-related morbidity.

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