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Research Article

Incidence of Perianal Fistula and Its Clinical Spectrum Following Perianal Abscess: A Prospective Observational Study

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ABSTRACT
Background: Perianal abscess is a common anorectal condition arising from cryptoglandular infection, and a substantial proportion of patient's progress to fistula-in-ano despite adequate incision and drainage. Reported incidence rates of fistula formation vary widely (20-56%), and the factors that predict progression remain incompletely defined, particularly in Indian settings.
Aim: To estimate the incidence of perianal fistula in patients with perianal abscess, to assess its clinical spectrum, and to identify factors associated with fistula development.
Methods: This prospective observational study included 92 patients with perianal abscess managed by incision and drainage at a tertiary care hospital. Patients were followed up for the development of fistula-in-ano, and demographic, clinical, microbiological, and postoperative variables were analysed for their association with fistula formation using the chi-square test ($p<0.05$ significant).
Results: Fistula-in-ano developed in 40.2% (37/92) of patients. Recurrent abscess (53.2% vs 26.7%, $p=0.02$), abscess depth ≥3 cm (70.8% vs 6.8%, $p<0.001$), pus volume ≥15 ml (45.5% vs 13.3%, $p=0.01$), fecal organisms on culture (69.2% vs 18.9% with skin flora, $p=0.0001$), and delayed wound healing beyond 30 days (57.7% vs 27.8%, $p=0.04$) were significantly associated with fistula formation. Age, sex, occupation, education, residence, addiction, comorbidities, and antibiotic choice showed no significant association.
Conclusion: Fistula-in-ano is a common sequela of perianal abscess, occurring in two-fifths of patients, and its development is driven predominantly by disease severity and microbiological profile rather than demographic factors. Early identification of deep, recurrent, or fecal-flora-associated abscesses may help target patients for closer follow-up.

Keywords: Perianal Abscess, Fistula-In-Ano, Incision and Drainage, Risk Factors, Recurrence, Cryptoglandular Infection.

INTRODUCTION

Perianal abscess and fistula-in-ano represent two closely related entities within the spectrum of anorectal sepsis and constitute a significant proportion of surgical emergencies encountered in general surgical practice. Perianal abscess is an acute suppurative condition that commonly arises from infection of the anal glands, whereas fistula-in-ano is a chronic abnormal communication between the anal canal and the perianal skin, most often developing as a sequela of inadequately resolved or recurrent abscesses.[1] The cryptoglandular theory explains the pathophysiological continuum between these two conditions, and they are increasingly regarded as different stages of the same disease process rather than isolated clinical entities.[2]

According to the cryptoglandular theory, which accounts for nearly 90% of cases of anorectal sepsis, infection originates in the anal glands located at the level of the dentate line.[3] Obstruction of the glandular ducts leads to stasis of secretions and bacterial proliferation, most commonly with mixed aerobic and anaerobic gut flora. The resulting cryptitis may remain localised or progress to suppuration, most frequently spreading into the intersphincteric space before extending inferiorly to form a perianal abscess.[4] Failure of complete drainage, delayed presentation,

repeated infection, or persistent ductal obstruction predisposes to chronic inflammation and epithelialisation of the tract, resulting in a fistula. Classical work by Parks and colleagues reported fistula formation in nearly 30% of patients following abscess drainage, establishing the foundational understanding of this disease continuum.[5]

Despite prompt surgical incision and drainage, a substantial proportion of patients with perianal abscess go on to develop anal fistulas, leading to chronic symptoms, recurrent infections, repeated surgical interventions, and impaired quality of life. Host-related factors such as diabetes mellitus, immunosuppression, and inflammatory bowel disease impair local immune response and wound healing, thereby increasing the likelihood of fistula formation, while local factors such as abscess depth, pus volume, and microbiological profile have also been implicated, though findings remain inconsistent across populations.[6]

Reported incidence rates of fistula formation following perianal abscess drainage vary widely across studies, ranging from approximately 20% to over 50%, reflecting differences in study populations, follow-up duration, abscess characteristics, and management strategies.[7] Certain patient and disease characteristics, including recurrent abscess, complex or deep abscess cavities, and enteric organism growth on culture, have been associated with a higher risk of chronic fistula development, whereas superficial abscesses that are promptly and adequately drained are less likely to progress.[8]

Clinically, fistulas display a wide spectrum ranging from simple, low intersphincteric tracts with minimal symptoms to complex, recurrent fistulas with secondary extensions and significant morbidity. The Parks classification (intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric) remains the anatomical basis for description, while MRI-based grading systems have since been developed to better characterise disease complexity for surgical planning.[9]

The clinical presentation of an established fistula is equally variable, ranging from intermittent, minimally symptomatic discharge to persistent pain, recurrent abscess formation, and, in longstanding or complex cases, faecal soiling and sphincter dysfunction. Identifying the internal opening at the dentate line and characterising the tract's relationship to the sphincter complex are essential for definitive management, and this anatomical variability underlies the broad clinical spectrum encountered in everyday surgical practice — from a simple low intersphincteric tract managed by fistulotomy to a high transsphincteric or supralevator fistula requiring staged, sphincter-preserving techniques.[9] Understanding which abscesses are more likely to evolve into this spectrum of disease, rather than resolving completely after drainage, is therefore of direct practical relevance to surgical decision-making and follow-up planning.

Given the significant morbidity associated with fistula-in-ano and the wide variability in reported outcomes, there is a continued need for region-specific data evaluating the incidence of fistula formation and its associated risk factors following perianal abscess drainage. The present study was therefore undertaken to estimate the incidence of perianal fistula following drainage of perianal abscess, to assess its clinical spectrum, and to identify the clinical and disease-related factors associated with fistula development in a tertiary care surgical population.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital over a period of 18 months. All eligible patients presenting with perianal abscess to the outpatient and emergency departments during this period were evaluated for inclusion.

Sample Size and Sampling Method

Purposive sampling was employed, with all consecutive eligible patients enrolled until the calculated sample size was reached. Using an expected prevalence of fistula formation of 39.79%, a precision of 10%, and a 95% confidence level (Z=1.96), the required sample size was calculated as 92 patients.

Inclusion and Exclusion Criteria

Patients aged between 18 and 65 years presenting with perianal abscess, in whom regular follow-up could be ensured, and who provided written informed consent, were included. Patients with a pre-existing or active anal fistula, Crohn's disease, multiple perianal abscesses, long-term steroid therapy, or immunocompromised status (HIV infection, malignancy, or immunosuppressive drug use) were excluded.

Procedure and Data Collection

Following institutional ethics committee approval and written informed consent, all patients underwent detailed history-taking and clinical examination, including local perianal examination and digital rectal examination. Routine laboratory investigations were performed, and pus samples were collected intraoperatively for microbiological culture. All patients underwent incision and drainage of the abscess under appropriate anaesthesia, with breakdown of loculations and saline irrigation of the cavity; no primary fistulotomy was attempted unless a fistula was clinically obvious and safe to address. Abscess depth, pus volume, and consistency were recorded at the time of surgery. Endoanal ultrasonography was used in selected cases to assess sphincter anatomy and occult tracts.

Patients were followed up at regular intervals in the outpatient department to assess wound healing, recurrence of abscess, and development of fistula-in-ano, with further evaluation, including imaging, undertaken when fistula was suspected.

Statistical Analysis

Data were compiled and analysed using descriptive statistics, with categorical variables expressed as frequencies and percentages. Comparative analysis was performed using the chi-square test, with a p-value <0.05 considered statistically significant.

RESULTS

Of the 92 patients enrolled with perianal abscess, 37 (40.2%) developed fistula-in-ano during follow-up, while 55 (59.8%) healed without fistula formation. Demographic factors, including age, sex, occupation, education, and residence, showed no statistically significant association with fistula development, nor did addiction status or comorbidities such as diabetes mellitus and hypertension. Symptom duration (pain and fever) and abscess consistency also showed no significant correlation with outcome, and the choice of antibiotic regimen did not influence fistula formation.

In contrast, several disease-related and microbiological factors showed strong associations with fistula development. Patients with a history of recurrent abscess had a significantly higher incidence of fistula formation compared to those without recurrence (Table 1).

Table 1: History of Recurrent Abscess and Fistula Development

Recurrent Abscess	Fistula, N (%)	No Fistula, N (%)
Yes (N=47)	25 (53.2%)	22 (46.8%)
No (N=45)	12 (26.7%)	33 (73.3%)
Total (N=92)	37 (40.2%)	55 (59.8%)

p = 0.02 (significant)

Abscess depth showed the strongest association with outcome: abscesses measuring ≥3 cm in depth were markedly more likely to progress to fistula than shallower abscesses (Table 2).

Table 2: Abscess Depth and Fistula Development

Abscess Depth	Fistula, N (%)	No Fistula, N (%)
<3 Cm (N=44)	3 (6.8%)	41 (93.2%)
≥3 Cm (N=48)	34 (70.8%)	14 (29.2%)
Total (N=92)	37 (40.2%)	55 (59.8%)

P < 0.001 (highly significant)

The volume of pus drained at the time of surgery was also significantly associated with fistula formation, with larger collections carrying substantially higher risk (Table 3).

Table 3: Amount of Pus Drained and Fistula Development

Pus Drained	Fistula, N (%)	No Fistula, N (%)
<15 Ml (N=15)	2 (13.3%)	13 (86.7%)
≥15 Ml (N=77)	35 (45.5%)	42 (54.5%)
Total (N=92)	37 (40.2%)	55 (59.8%)

p = 0.01 (significant)

Microbiological analysis of pus culture revealed a highly significant association between organism type and outcome, with fecal organisms conferring markedly higher risk of fistula formation than skin flora (Table 4).

Table 4: Organism in Culture and Fistula Development

Organism	Fistula, N (%)	No Fistula, N (%)
Skin Flora (N=53)	10 (18.9%)	43 (81.1%)
Fecal Organisms (N=39)	27 (69.2%)	12 (30.8%)
Total (N=92)	37 (40.2%)	55 (59.8%)

p = 0.0001 (highly significant)

Finally, wound healing duration correlated significantly with fistula development, with delayed healing beyond 30 days associated with substantially higher fistula rates than healing within 25 days (Table 5).

Table 5: Wound Healing Duration and Fistula Development

Wound Healing (Days)	Fistula, N (%)	No Fistula, N (%)
≤25 Days (N=36)	10 (27.8%)	26 (72.2%)
26-30 Days (N=30)	12 (40.0%)	18 (60.0%)
>30 Days (N=26)	15 (57.7%)	11 (42.3%)
Total (N=92)	37 (40.2%)	55 (59.8%)

p = 0.04 (significant)

Postoperative complications such as delayed healing, postoperative fever, and wound infection, when analysed as isolated events, showed similar distribution between the fistula and non-fistula groups (p=0.96) and did not independently predict outcome outside the wound-healing-duration analysis above.

DISCUSSION

In the present study, fistula-in-ano developed in 40.2% of patients following incision and drainage of perianal abscess, a figure that falls within the wide range of 29.8% to 56.1% reported in comparable studies. Hasan reported a fistula formation rate of 45.6% in a Baghdad cohort followed for a mean of 18 months, with fistula occurring almost exclusively in male patients.[10] Elhassan et al. reported a lower incidence of 20.2% in a Saudi Arabian tertiary hospital, identifying diabetes mellitus, obesity, and hypertension as predisposing factors, although these comorbidities did not reach statistical significance in the present cohort.[11] He et al., in a Chinese cohort with rigorous long-term follow-up including pelvic MRI, reported a considerably higher fistula formation rate of 56.15%, while finding no significant association between fistula formation and the anatomical type or location of the original abscess, similar to our finding that abscess consistency did not predict outcome.[15]

Multicentre and registry-based studies from the Middle East have reported intermediate incidence figures: Yusuf et al. documented fistula formation in 33.9% of patients in Bahrain, with over a third of fistulas diagnosed within six months of the index procedure, while Khalil et al. reported an incidence of 29.8% in Dubai and, notably, found no statistically significant predictors among gender, smoking, abscess location, or diabetes status.[16,17] Skovgaards et al., in a large Danish cohort with an extended median follow-up exceeding three years, reported a fistula incidence of 33.7% and identified low intersphincteric and ischioanal abscesses, Crohn's disease, recurrent abscess or repeat surgery, Escherichia coli-positive cultures, and elevated preoperative C-reactive protein as significant risk factors — findings that closely parallel our own observations regarding recurrence and fecal organism growth.[18]

The strong association between recurrent abscess and fistula formation observed in this study (53.2% vs 26.7%, p=0.02) is consistent with the broader literature suggesting that repeated cycles of infection and incomplete drainage promote epithelialisation of a chronic tract. Similarly, the highly significant relationship between abscess depth and fistula development (70.8% in abscesses ≥3 cm vs 6.8% in shallower abscesses, p<0.001) and between pus volume and outcome (45.5% vs 13.3%, p=0.01) mirrors the findings of Latha et al., who identified abscess cavity depth greater than 3 cm and pus volume exceeding 15 ml as significant predictors of fistula formation in a South Indian cohort.[12] These parameters likely

serve as surrogate markers of the extent of underlying cryptoglandular infection and tissue destruction, with deeper, higher-volume collections reflecting more extensive glandular and intersphincteric involvement that is less amenable to complete resolution by simple drainage.

The microbiological findings of the present study, wherein fecal organisms were associated with a markedly higher fistula rate (69.2%) than skin flora (18.9%, p=0.0001), corroborate the observations of Skovgaards et al. regarding Escherichia coli-positive cultures and support the pathophysiological principle that enteric organisms gaining access to the intersphincteric space produce more destructive, tract-forming infection than typical skin commensals.[18] In contrast, the choice of postoperative antibiotic regimen did not influence fistula formation in our cohort, a finding consistent with the PPAC2 trial, which found no significant difference in fistula rates between packed and non-packed abscess cavities and demonstrated that avoiding routine packing reduces postoperative pain without increasing recurrence or fistula risk.[19]

The association between delayed wound healing (>30 days) and higher fistula incidence (57.7%) observed in this study aligns with the findings of Dong, who identified extensive abscess cavities and surgical technique as independent predictors of postoperative recurrence or fistula formation, and emphasised that accurate assessment of abscess extent is critical to improving cure rates.[20] Delayed healing in this context likely reflects persistent low-grade infection along an already-forming fistulous tract rather than a purely mechanical wound-care issue, reinforcing the value of extended clinical surveillance in patients whose wounds fail to close within the expected timeframe.

Notably, demographic variables such as age, sex, occupation, education, and residence, as well as comorbid diabetes mellitus and hypertension, did not show significant associations with fistula development in this cohort. This is broadly consistent with Khalil et al. and Elhassan et al., both of whom found limited or inconsistent predictive value of demographic and comorbid factors across different populations, suggesting that local disease severity and microbiological characteristics are more reliable predictors of outcome than patient demographics alone.[11][17] Choi et al., studying perianal disease in the specific context of ulcerative colitis, similarly found that male sex and extensive colitis — rather than routine demographic variables — were the significant predictors of perianal sepsis, reinforcing that disease-specific and anatomical factors, rather than general demographics, drive fistula risk across diverse clinical contexts.[13] Yadu and Toppo, in an Indian tertiary care cohort, similarly emphasised that most fistulas followed a preceding perianal abscess and that early diagnosis with timely surgical intervention remained the cornerstone of favourable outcomes, a principle directly supported by the present findings.[14]

Taken together, these findings suggest that the progression from perianal abscess to fistula-in-ano is governed less by who the patient is and more by how extensive and how microbiologically aggressive the underlying infection is. Clinically, this supports a risk-stratified approach to follow-up: patients presenting with deep (≥3 cm) or high-volume abscesses, those with a history of recurrent abscess, and those whose pus culture grows fecal organisms warrant closer postoperative surveillance and earlier re-evaluation if wound healing is delayed beyond 30 days, since these patients constitute the subgroup at highest risk of subsequently developing a fistula. Limitations of this study include its single-centre design and comparatively modest sample size, which may limit generalisability, and the non-routine use of MRI, which may have led to underestimation of abscess extent and occult fistula tracts in some patients; larger multicentric studies incorporating routine imaging would help refine these risk estimates further.

With regard to clinical spectrum, the fistulas identified during follow-up in this cohort were predominantly low, single-tract lesions amenable to fistulotomy, consistent with the pattern described in most cryptoglandular series, in which intersphincteric and low transsphincteric tracts account for the majority of cases while high or complex fistulas remain comparatively uncommon. This distribution reinforces that, although a substantial minority of patients with perianal abscess will go on to develop a fistula, most of these fistulas are anatomically straightforward, and it is the subset arising from deep, recurrent, or fecal-flora-associated abscesses that warrants the greatest clinical vigilance.

CONCLUSION

Fistula-in-ano remains a frequent and clinically significant outcome following perianal abscess drainage, occurring in approximately 40.2% of patients in this cohort, consistent with the 29.8-56.1% range reported in the existing literature. The progression to fistula is predominantly influenced by disease-related and microbiological factors rather than demographic or treatment variables, with abscess depth ≥3 cm, fecal organisms on culture, recurrent abscess, larger pus volume, and delayed wound healing beyond 30 days all reflecting greater severity and deeper origin of infection. Early identification of these high-risk abscess characteristics, meticulous surgical drainage, and structured postoperative follow-up are essential to reduce the incidence and long-term morbidity associated with fistula-in-ano.

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