

Factors influencing fistula formation following perianal abscess treatment

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ABSTRACT

Objectives: Perianal abscesses are frequently encountered in clinical practice and are primarily attributed to a cryptoglandular origin. Despite prompt incision and drainage, a subset of patients still develop anal fistulas. This study aims to identify risk factors associated with fistula formation after perianal abscess management.

Methods: A total of 145 patients (64 females, 81 males) with perianal abscess were retrospectively reviewed between 2020 and 2024. All underwent urgent incision and drainage under anesthesia. Demographic characteristics, comorbidities, type of surgical intervention, and postoperative outcomes were analyzed. Postoperative complications were assessed at both early (≤ 30 days) and late (> 30 days) time points. Univariate and logistic regression analyses were conducted to determine independent predictors of fistula formation.

Results: The median patient age was 42 years (IQR: 35-50), and 37.9% had at least one comorbidity (17.2% diabetes mellitus, 13.8% hypertension). Intraoperative fistulas were identified in 37.9% of cases and managed via fistulotomy or seton placement when feasible. Early postoperative complications occurred in 24.1% of patients, most of which were minor. Over a median follow-up of 7 months (IQR: 4-12), abscess recurrence was observed in 6.9% and new-onset fistula in 14.5%. Comorbidities such as diabetes mellitus were associated with a higher likelihood of fistula formation. Anal incontinence was documented in 2.8% of patients, most cases resolving spontaneously or with conservative measures.

Conclusions: Although urgent incision and drainage generally yields favorable early outcomes, a notable proportion of patients develop late complications, particularly fistula formation. Close follow-up and tailored surgical strategies, including fistulotomy or seton placement when indicated, may help reduce morbidity. Prospective and multicenter studies with extended follow-up are warranted to further refine treatment protocols and identify high-risk individuals.

Keywords: Perianal abscess, anal fistula, fistulotomy, seton placement, postoperative complications, cryptoglandular disease

Anal infections may present as acute abscesses or chronic anal fistulas, with perianal abscesses ranking among the most frequently encountered conditions in proctological practice [1, 2].

Although perianal abscesses can be associated with various comorbidities, most are attributed to a primary cryptoglandular origin [3]. According to the cryptoglandular theory initially described by Parks and Eisen-

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hammer, obstruction of the anal crypt gland ducts causes infection within the intersphincteric space, which may subsequently spread into the ischioanal fossa or drain into the anal canal [2, 3]. A thorough understanding of anal canal anatomy is therefore critical for accurate diagnosis and effective management, as timely intervention often prevents severe complications such as anal incontinence or recurrence [4, 5]. Nonetheless, certain cases follow a more challenging clinical course, necessitating advanced treatment approaches to minimize morbidity [6-8]. Numerous studies have evaluated outcomes following standard interventions, including incision and drainage, fistulotomy, cavity packing, and postoperative management strategies such as abscess cavity packing [6-8]. However, comparative data on how these strategies influence subsequent fistula formation remain limited, underscoring the need for risk-stratified analyses. Despite these efforts, some patients still experience persistent disease or recurrence [9-11].

Therefore, our study aims to retrospectively investigate the factors influencing fistula development following perianal abscess management, with the ultimate goal of guiding future treatment strategies and improving patient outcomes.

METHODS

This retrospective study was conducted between 2020 and 2024, involving patients diagnosed and treated for perianal abscess at our institution. Abscesses were anatomically classified as simple perianal, ischioanal, or horseshoe based on operative notes and pre-operative imaging. A total of 145 patients, aged between 18 and 75 years, were included in the analysis. The sample comprised 64 females and 81 males. Patient selection was based on the completeness of medical records and the availability of relevant clinical data. Individuals whose records were incomplete or otherwise inadequate were excluded from the study.

All data were obtained from the patients' medical files and the institutional electronic medical record system. For each patient, demographic characteristics (e.g., age and sex) and pertinent clinical information (e.g., comorbidities, surgical procedure type, and postoperative outcomes) were systematically documented. The collected data were de-identified and anonymized to pro-

tect patient confidentiality. This study was approved by the Biruni University Ethics Committee (2024-BİAEK/06-50) and complied with the principles outlined in the Declaration of Helsinki. Written informed consent (where applicable and/or in line with institutional policy for retrospective studies) was obtained to ensure the protection of patient rights and privacy.

Early readmission was defined as an unplanned hospital stay within 30 days of the index operation. Minor complications were adverse events requiring only bedside or outpatient care (e.g., superficial wound infection, self-limited bleeding), whereas major complications necessitated re-operation, image-guided drainage, or intensive-care monitoring.

Statistical Analysis

All statistical analyses were performed using SPSS version 25. Continuous variables were presented as means ± standard deviations, while categorical variables were reported as frequencies and percentages. The chi-square test or Fisher's exact test was used to assess the relationship between categorical variables, and continuous variables were compared using either the Student's t-test or the Mann-Whitney U test, depending on the normality of the data distribution. To identify independent risk factors influencing fistula

Table 1. Baseline demographic and clinical characteristics (n=145)

Characteristic	Data
Age, years (range)	18-75
Median age [IQR]	42 [35-50]
Sex Distribution	
Female	64 (44.1%)
Male	81 (55.9%)
Comorbidities (≥1)	55 (37.9%)
Diabetes Mellitus	25 (17.2%)
Hypertension	20 (13.8%)
Other (e.g., COPD, CAD)	10 (6.9%)
Mean symptom duration, days (mean±SD)	6.2±2.4
Total patients analyzed	145

COPD=chronic obstructive pulmonary disease, CAD=coronary artery disease, IQR=interquartile range, SD=standard deviation

formation, a logistic regression analysis was conducted. Statistical significance was defined as a P-value of less than 0.05. Variables with $P < 0.10$ on univariate testing were entered into a multivariable logistic-regression model; adjusted odds ratios (OR) with 95 % confidence intervals (CI) are reported.

RESULTS

A total of 145 patients (64 females and 81 males) aged between 18 and 75 years were included in this retrospective evaluation of perianal abscess management conducted from 2020 to 2024. The median age was 42 years (interquartile range 35-50), and 37.9% of all patients reported at least one comorbidity, most frequently diabetes mellitus (17.2%) and hypertension (13.8%). The mean duration of symptoms prior to clinical presentation was 6.2 ± 2.4 days, with pain (98.6%), swelling (87.6%), and erythema (69.0%) constituting the most common complaints (Table 1).

All patients underwent urgent incision and drainage under anesthesia. Intraoperative assessment revealed a clinically identifiable fistula in 55 (37.9%) cases, leading to fistulotomy or seton placement when feasible. Antibiotic prophylaxis was administered to 114 (78.6%) patients. The mean operative time was 33.1 ± 8.2 minutes (Table 2).

Cavity packing was used in 40 (27.6 %) patients. Eight (5.5 %) abscesses were classified as horseshoe; seven of these patients ultimately developed a fistula.

Table 2. Operative details (n=145)

Parameter	Data
I&D alone	70 (48.3%)
I&D+Fistulotomy	50 (34.5%)
I&D+Seton placement	25 (17.2%)
Intraoperative Fistula Detection	55 (37.9%)
Antibiotic prophylaxis	114 (78.6%)
Mean operative time (minutes)	33.1 ± 8.2
Type of anesthesia	
General	120 (82.8%)
Spinal or Regional	25 (17.2%)

Data are shown as mean \pm standard deviation or n (%).

I&D=incision and drainage

Table 3. Early postoperative outcomes (≤ 30 days) (n=145)

Outcome	n (%)
No Early complications	110 (75.9)
Minor complications	20 (13.8)
Local infection or wound issues	12 (8.3)
Mild bleeding/hematoma	8 (5.5)
Major complications	8 (5.5)
Severe infection or reoperation	5 (3.4)
Other (e.g., thromboembolic events)	3 (2.1)
Early readmission	7 (4.8)
Mortality	0 (0.0)

Within the first 30 days after surgery, 110 (75.9%) patients experienced no complications, whereas 20 (13.8%) developed minor issues such as wound infection or mild bleeding managed conservatively, and 8 (5.5%) had major complications requiring additional intervention (Fig. 1). Early readmission occurred in 7 (4.8%) cases, primarily related to severe infection or re-accumulation of an abscess (Table 3).

Late postoperative outcomes were evaluated beyond 30 days, with a median follow-up period of 7.0 months (interquartile range 4-12) (Fig. 1). As shown in Table 4, 10 (6.9%) patients experienced abscess recurrence, and 21 (14.5%) developed an anal fistula confirmed on examination or imaging. Eleven of those fistulas ultimately required additional surgical intervention, whereas 10 were managed conservatively. Four (2.8%) instances of mild anal incontinence were documented; in two cases, this resolved spontaneously, and in the other two, pelvic floor rehabilitation was recommended. Late readmission occurred in 10 (6.9%) patients, typically related to fistula management or recurrent infection.

Table 5 summarizes baseline and peri-operative characteristics according to fistula status. Compared with patients who remained fistula-free (n=124), those who developed a fistula (n=21) were more likely to have diabetes mellitus (42.9 % vs 12.9 %; $p = 0.004$), a horseshoe-type abscess (28.6 % vs 1.6 %; $P < 0.001$) and a longer pre-operative symptom duration (median 7 days [IQR 5-9] vs 6 days [IQR 4-7]; $P = 0.021$). Early complications occurred more often in the fistula group, although the difference did not reach statistical

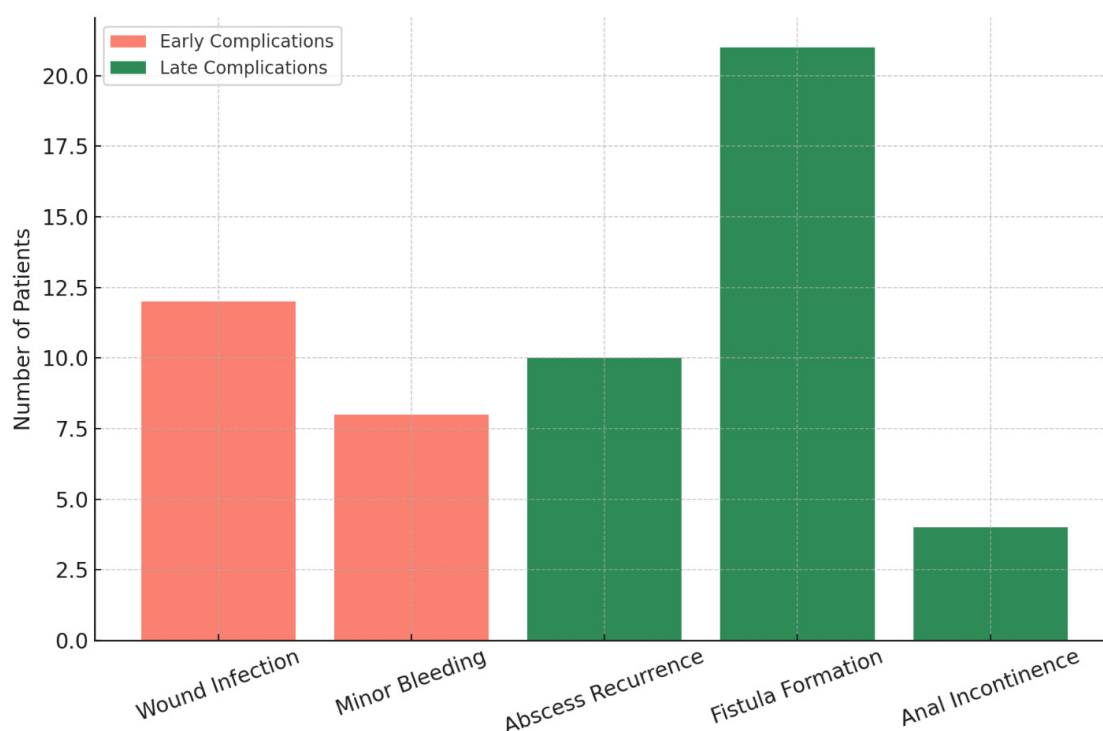


Fig. 1. A stacked bar chart comparing early and late complications by category.

significance (33.3 % vs 16.9 %; $P=0.08$). The use of postoperative cavity packing was comparable between groups (33.3 % vs 26.6 %; $P=0.54$).

Multivariable logistic regression confirmed three independent predictors of fistula formation: diabetes mellitus (OR 2.6, 95 % CI 1.1-6.4), horseshoe abscess configuration (OR 3.9, 95 % CI 1.4-11.1) and symptom duration > 7 days (OR 1.8, 95 % CI 1.0-3.3). The median interval from the index operation to fistula diagnosis was 3.2 months (IQR 2.1-4.6).

Transient anal incontinence was observed exclu-

sively in patients whose procedures involved internal-sphincter division (4/18, 22 %); no incontinence occurred among individuals managed with incision-and-drainage \pm cavity packing alone (0/127).

DISCUSSION

In this retrospective analysis of 145 patients who underwent urgent incision and drainage for perianal abscess between 2020 and 2024, we observed that 37.9% of patients had an intraoperatively detectable fistula, supporting the close relationship between perianal abscess and anal fistula formation [2, 3, 12]. This finding aligns with the cryptoglandular theory, which posits that obstruction of the anal crypt glands leads to infection within the intersphincteric space and can ultimately result in fistula formation [2, 3]. Our results further indicate that, despite the overall safety and effectiveness of incision and drainage (as evidenced by the 75.9% rate of no early complications and zero mortality), some patients still develop late complications, including fistula (14.5%) and abscess recurrence (6.9%), underscoring the importance of meticulous anatomic evaluation and vigilant long-term follow-up

Table 4. Late postoperative outcomes (>30 days) (n=145)

Outcome	n (%)
No late complications	100 (69.0)
Abscess recurrence	10 (6.9)
Fistula formation	21 (14.5)
Required further surgery	11 (7.6)
Managed conservatively (Seton, etc.)	10 (6.9)
Anal incontinence (temporary or minor)	4 (2.8)
Late readmission	10 (6.9)

Table 5. Comparison of patients with and without fistula formation

Variable	Fistula (n=21)	No fistula (n=124)	P value
Median age (years) (IQR)	43 (36-51)	42 (35-50)	0.72
Diabetes mellitus, n (%)	9 (42.9)	16 (12.9)	0.004
Horseshoe abscess, n (%)	6 (28.6)	2 (1.6)	<0.001
Cavity packing used, n (%)	7 (33.3)	33 (26.6)	0.54
Median symptom duration (days) (IQR)	7 (5-9)	6 (4-7)	0.021
Early complication rate, n (%)	7 (33.3)	21 (16.9)	0.08

[3-5, 13].

Our multivariable analysis confirmed diabetes mellitus and horseshoe anatomy as strong, independent drivers of fistula development, while cavity packing showed no significant protective or harmful effect. These findings support a tailored approach: aggressive drainage and loose-seton placement for horseshoe abscesses or diabetics, versus sphincter-preserving incision and drainage for low-risk cases.

Comorbidities such as diabetes mellitus and hypertension emerged relatively frequently in our cohort, suggesting that metabolic and vascular factors may impair wound healing and increase susceptibility to infection progression [9, 10, 14]. Patients with such comorbidities may therefore require more aggressive perioperative management (e.g., optimized glucose control, careful infection surveillance) to reduce the risk of adverse outcomes [9, 10, 14]. Although the overall rate of fistula formation in this study (14.5%) is comparable with rates reported in prior literature [6-8], our findings emphasize that the standard incision and drainage procedure alone may not suffice in all cases. A subset of patients needed additional surgical interventions, including fistulotomy or seton placement, either at the time of initial surgery or during follow-up. Such individualized treatment planning - including consideration of patient risk factors, anal sphincter integrity, and fistula complexity - is essential to minimize morbidity and optimize healing [6-8, 15].

A subgroup review demonstrated that all four cases of transient incontinence followed procedures that divided the internal sphincter, reinforcing the importance of sphincter-sparing techniques whenever anatomical conditions permit.

Our observation that most patients experienced no significant early complications (75.9%) with a low

major complication rate (5.5%) reaffirms the safety profile of urgent incision and drainage for perianal abscess [1,7]. However, the fact that severe infection or reoperation occurred in 3.4% of patients highlights the need for close postoperative surveillance and timely intervention when warranted. Furthermore, although we noted a relatively low incidence of anal incontinence (2.8%), it is crucial to remain mindful of this potential complication, particularly when fistulotomy or more extensive sphincter manipulation is required [4, 5]. Where minor incontinence did occur, conservative measures such as pelvic floor rehabilitation appeared beneficial.

Limitations

Because our study was retrospective, data completeness depended on the accuracy of electronic medical records, and certain clinical variables could not be evaluated in detail. Additionally, as this was a single-center experience, the generalizability of our findings may be limited. Future multicenter and prospective studies with longer follow-up periods are needed to better delineate the risk factors associated with fistula development and to refine treatment algorithms [6-8, 9-11]. Future studies should also evaluate quality-of-life outcomes and cost-effectiveness across anatomical subtypes.

CONCLUSION

While urgent incision and drainage is largely successful and safe for perianal abscess management, the relatively high incidence of fistula formation and recurrence in specific patient subsets (e.g., those with diabetes or hypertension) underscores the need for tailored treatment approaches and vigilant follow-up.

Precise anatomical assessment and, when indicated, additional procedures such as fistulotomy or seton placement can improve long-term outcomes. Prospective, large-scale investigations will further clarify risk stratification and foster optimized, individualized management strategies for perianal abscess and associated anal fistulas. Explicit attention to abscess anatomy, metabolic comorbidities, and symptom duration can improve risk-stratification and guide operative decision-making.

Ethical Statement

This study was approved by the Biruni University Scientific Research Ethics Committee (Decision no.: 2024-BİAEK/06-50, date: 20.01.2025).

Authors' Contribution

Study Conception: AH, SNKÇ; Study Design: N/A; Supervision: AH; Funding: AH, SNKÇ; Materials: AH, SNKÇ; Data Collection and/or Processing: AH; Statistical Analysis and/or Data Interpretation: AH; Literature Review: AH; Manuscript Preparation: AH; and Critical Review: AH, SNKÇ.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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