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RESEARCH ARTICLE

Long-Term Anal Fistula Formation After Incision and Drainage of Cryptoglandular Perianal Abscess: A Single-Center Retrospective Cohort Study with 10-Year Follow-up

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ABSTRACT

Objective: Perianal abscess (PA) and anal fistula (AF) are considered sequential manifestations of cryptoglandular infection. Long-term data on fistula formation and recurrence after incision and drainage (I&D) remain limited. Most published series use short follow-up periods. This study aimed to determine the long-term AF formation rate (primary outcome) and abscess recurrence rate (secondary outcome) after I&D for PA, using a cohort with a minimum follow-up of 10 years.

Materials and Methods: This single-center retrospective cohort study included all consecutive adult patients who underwent I&D for PA between April 2014 and April 2016. Later events were ascertained by cross-referencing the institutional surgical database (2014–2026) with the Turkish national e-Health record system (e-Nabız), so fistula or recurrence episodes treated at other institutions could be captured. Patients with inflammatory bowel disease, colorectal malignancy, prior perianal surgery, immunosuppression, or age under 18 years were excluded. The study was reported using the STROBE guidelines.

Results: A total of 226 patients were included (145 male [64.2%]; mean age: 37.4 ± 12.0 years). AF developed in 54 patients (23.9%) at a median of 11.0 months (range: 1–105 months) after I&D. Transsphincteric fistulas were the most common (35/54, 64.8%). Abscess recurrence occurred in 53 patients (23.5%) (median: 9.1 months [range: 1.0–99.6 months]). Two outcomes overlapped in 29 patients. The observed fistula rate was consistent with published estimates (25–40%). The wide range of time-to-diagnosis (1–105 months) indicates that short follow-up may underestimate the cumulative incidence.

Conclusion: Approximately one-quarter of patients developed AF, and a further quarter developed recurrent abscesses. Events occurred beyond the early postoperative period. Within the limits of a database-based design, these findings support counseling about the long-term risk of fistula formation and recurrence after I&D for PA.

Keywords: Anal fistula, cryptoglandular, drainage, follow-up studies, perianal abscess, recurrence

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INTRODUCTION

Perianal abscess and anal fistula correspond to the acute and chronic stages, respectively, of cryptoglandular infection that originates from the anal glands located at the dentate line. The cryptoglandular theory continues to serve as the principal pathophysiological framework.[1,2] Obstruction and subsequent infection of these glands lead to the accumulation of pus and the formation of abscesses. Incomplete drainage may subsequently lead to the development of a persistent epithelialized fistulous tract.[2,3]

Incision and drainage (I&D) is widely recognized as the primary surgical intervention for perianal abscess.[4] However, a significant proportion of patients subsequently develop an anal fistula, and another subset experiences recurrent abscess for-

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mation. Reported fistula rates vary widely, from approximately 25% to 40% in most adult series, reflecting differences in study population, follow-up duration, and diagnostic methods.[5,6]

Long-term data are particularly valuable, as fistulas may develop months to years after the index drainage. However, most published series rely on short follow-up periods, and few have systematically cross-referenced hospital records to capture patients who present later, often under a different registration number. This may lead to an underestimation of the true cumulative event rate.

We conducted a single-center retrospective cohort study of patients who underwent I&D for cryptoglandular perianal abscess between April 2014 and April 2016. Later events were ascertained through a cross-referential search of the institutional surgical database using patient name and national identification number, providing a minimum potential observation period of 10 years. The primary outcome was anal fistula formation; the secondary outcome was abscess recurrence.

MATERIALS and METHODS

Study Design and Setting

This single-center, retrospective cohort study included patients who underwent incision and drainage of anal abscesses at the Department of General Surgery, Ağrı State Hospital (subsequently restructured as Ağrı Training and Research Hospital), which served as the referral center for a province with a population of approximately 550,000 during the study period. Ethics approval was granted by the Ethics Committee of Ağrı İbrahim Çeçen University on April 1, 2026 (approval number: 200). The study was conducted in accordance with the principles outlined in the Declaration of Helsinki.[7] As this was a retrospective study based entirely on data obtained from the hospital database, the ethics committee waived the requirement for informed consent. All data were anonymized in accordance with the Turkish Personal Data Protection Law.

Patient Selection

All consecutive patients who underwent I&D for a primary cryptoglandular perianal abscess between April 1, 2014, and April 1, 2016, with the surgery code of "perianal abscess drainage," were included. Inclusion criteria were age equal to or greater than 18 years and I&D as the sole primary procedure. Exclusion criteria were the presence of inflammatory bowel disease, the presence of malignant colorectal disease, immunosuppressive therapy, prior perianal surgery, age under 18 years, and unavailability of follow-up data.

Data Collection and Follow-Up Strategy

Baseline data were extracted from operative records, anesthesia charts, and discharge summaries. Ascertainment of later events did not rely on active clinical follow-up or scheduled outpatient visits. Instead, later fistula and recurrence events were identified retrospectively through a systematic cross-referential search of the complete institutional surgical database (April 2014 to April 2026). Because patients in the Turkish hospital registration system receive a new protocol number at each admission, a matching strategy based on patient name and national identification number was used alongside protocol-number matching, so that repeat surgical encounters for the same patient could be linked regardless of the admission number. To capture events managed outside our institution, each patient's record was additionally verified against the Turkish national e-Health system (e-Nabız), a centralized platform that aggregates diagnosis, procedure, and admission data from all public and private healthcare providers nationwide. This allowed confirmation of each patient's treatment status and identification of fistula or recurrence procedures performed at other centers, substantially reducing the risk of missed events and of misclassifying patients as event-free.

Outcome Definitions

- **Primary outcome:** Anal fistula formation, confirmed clinically or by imaging at any point during the observation period. Fistulas were classified according to the Parks classification.[8] The date of fistula diagnosis was defined as the date of the surgical encounter or imaging study at which the fistula was first documented.
- **Secondary outcome:** Recurrent perianal abscess, defined as a repeat surgical drainage procedure for perianal abscess after the index operation.

The two outcomes were not mutually exclusive and were analyzed both independently and with respect to their overlap. For time-to-event analysis, follow-up began on the date of index drainage. For the primary outcome, patients without a documented fistula were censored at the end of the study observation period (April 1, 2026), yielding a minimum potential follow-up of 10 years and a maximum of 12 years. Time-to-event was recorded in months for both outcomes.

Statistical Analysis

Continuous variables with skewed distributions and time-to-event data were reported as median with range (minimum–maximum). Categorical variables were presented as frequency and percentage. The chi-square test and Fisher's exact test were used to assess associations between categor-

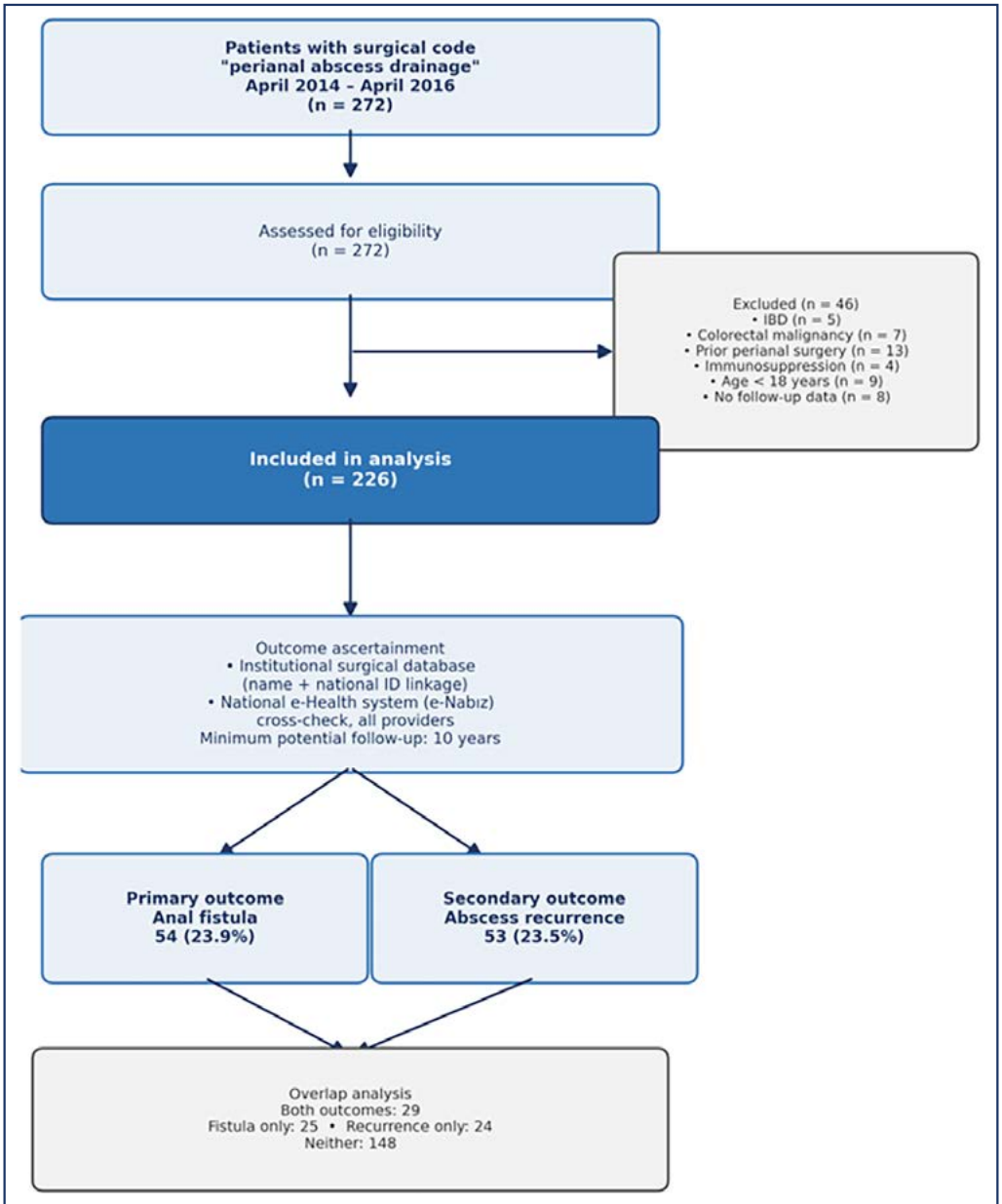

Figure 1. STROBE flow diagram of participant selection and outcome ascertainment. Later events were identified by linking the institutional surgical database with the national e-Health system (e-Nabiz). Exclusion sub-counts are shown

ical variables, with Fisher's exact test applied when expected cell counts were fewer than five.

For time-to-event analysis, the Kaplan-Meier method was used to estimate fistula-free survival, with follow-up measured from the date of index drainage. Patients who developed a fistula were treated as events at the date of diagnosis; all remaining patients were censored at the end of the study observation period (April 1, 2026), since the database search extended to that date and no patient was known to have died or emigrated. Because abscess complexity and other risk factors were not consistently recorded, no multivariable model was fitted, and any subgroup comparison was considered exploratory and hypothesis-generating only.

A two-tailed p-value below 0.05 was considered statistically significant. Analyses were performed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA). The study was reported in accordance with the STROBE statement for observational studies, and the flow of participants is shown in Figure 1.

Table 1. Baseline patient and operative characteristics (n=226)

Variable	n (%) or mean±SD
Sex	
Male	145 (64.2)
Female	81 (35.8)
Age (years)	
Mean±SD (range)	37.4±12.0 (18-90)
Anesthesia type	
Local	96 (42.5)
Sedation + Local	92 (40.7)
Spinal	31 (13.7)
General	7 (3.1)
Drain placed	39 (17.3)
Penrose	35 (15.5)
Other	4 (1.8)
Intraoperative probing	9 (4.0)
Fistula identified	2 (0.9)
No fistula	7 (3.1)
Perioperative antibiotic prophylaxis	226 (100)
Cefuroxime & Metronidazole	214 (94.7)
Ciprofloxacin+Metronidazole	10 (4.4)
Piperacillin-tazobactam (Tazocin)	2 (0.9)

SD: Standard deviation

Table 2. Primary outcome - anal fistula formation (n=54)

Variable	n	% (of fistula patients)
Fistula formation, overall	54 / 226	23.9% of cohort
Fistula type		
Transsphincteric	35	64.8
Intersphincteric	15	27.8
Extrasphincteric	4	7.4
Confirmation		
Imaging (Pelvic MRI)	49	90.7
Surgical re-exploration	5	9.3
Treatment		
Seton placement	27	50.0
Fistulotomy	20	37.0
Fistulectomy	5	9.3
Flap repair	1	1.9
Conservative management	1	1.9
Time to fistula (months)		
Median (range)		11.0 (1–105)

Table 3. Secondary outcome - abscess recurrence (n=53)

Variable	n	% of cohort
Abscess recurrence, overall	53/226	23.5
Time to recurrence (months) Median (range)		9.1 (1.0–99.6)

RESULTS

Patient Characteristics

During the study period, 272 patients with the surgical code of perianal abscess drainage were assessed for eligibility. Forty-six patients were excluded (inflammatory bowel disease, n=5; colorectal malignancy, n=7; prior perianal surgery, n=13; immunosuppression, n=4; age under 18 years, n=9; no follow-up data, n=8), leaving 226 patients in the final analysis (Fig. 1). Table 1 shows their demographic and operative characteristics.

There were 145 male patients (64.2%) and 81 female patients (35.8%), with a mean age of 37.4 ± 12.0 years (range: 18–90). Anesthesia was local in 96 patients (42.5%), sedation with local in 92 (40.7%), spinal in 31 (13.7%), and general in 7 (3.1%). The procedure consisted of incision over the point of maximal fluctuance, evacuation of pus, and irrigation of the abscess cavity with hydrogen peroxide and/or isotonic saline. A surgical drain was placed at the operating surgeon's discretion when the cavity was large or when dependent drainage was considered necessary; a drain was used in 39 cases (17.3%), most commonly a Penrose drain (35 of 39). Intraoperative probing to identify an internal opening was performed only when an overt fistulous tract was evident at drainage, in 9 patients (4.0%); of these, a fistula was identified in 2. The median follow-up for patients who did not develop a fistula (censored observations) was 122.3 months (10.2 years; range: 99.7–144.9 months), confirming that the great majority of the cohort was observed for at least 10 years.

Primary Outcome: Fistula Formation

Among 226 patients, 54 (23.9%) developed an anal fistula during the observation period (Table 2; Fig. 2). The median time from index drainage to fistula diagnosis was 11.0 months (range: 1–105 months). Transsphincteric fistulas were the most common type, observed in 35 patients (64.8%), followed by intersphincteric fistulas in 15 patients (27.8%) and extrasphincteric fistulas in 4 patients (7.4%).

Fistula diagnosis was confirmed by pelvic MRI in 49 patients (90.7%) and by surgical re-exploration in 5 patients (9.3%). Seton placement was the most frequently performed pro-

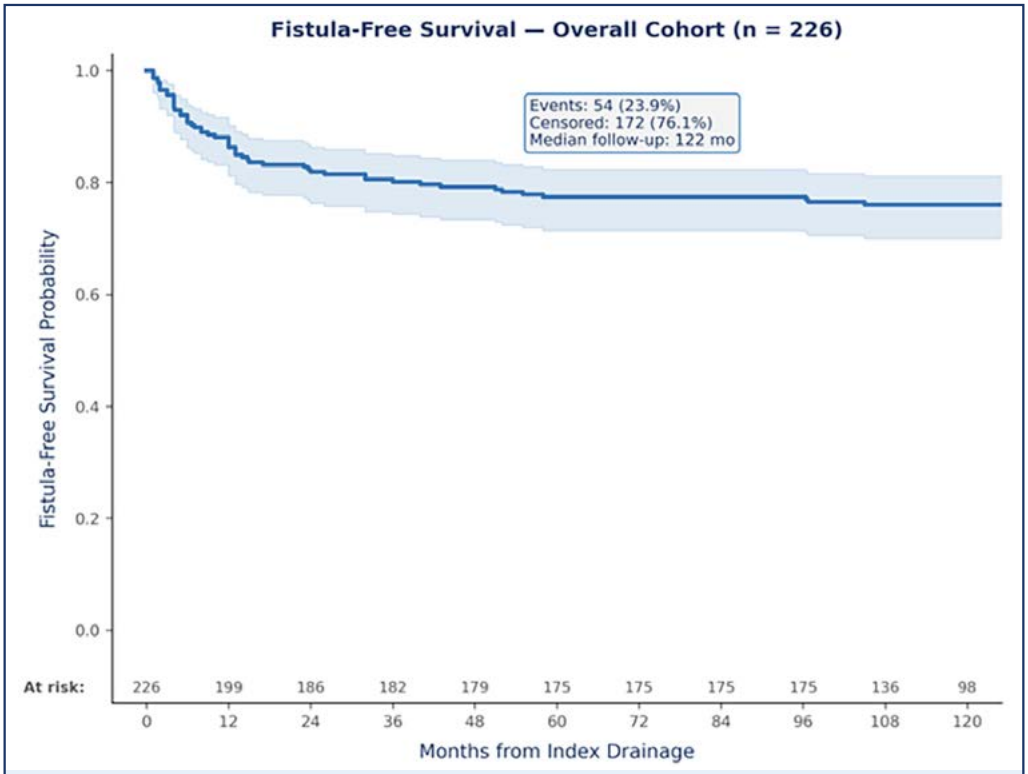

Figure 2. Kaplan-Meier fistula-free survival curve for the overall cohort (n=226). Tick marks indicate censored patients, and the table below the x-axis shows the number at risk at each time point. All patients without a documented fistula were censored at the end of the observation period (April 1, 2026)

cedure (27 patients, 50.0%), followed by fistulotomy (20 patients, 37.0%), fistulectomy (5 patients, 9.3%), advancement flap repair (1 patient, 1.9%), and conservative management (1 patient, 1.9%).

Secondary Outcome: Abscess Recurrence

Perianal abscess recurred in 53 patients (23.5%) during the observation period (Table 3). The median time to first recurrence was 9.1 months (range: 1.0–99.6 months). The primary and secondary outcomes were not mutually exclusive: 29 patients experienced both fistula formation and recurrence, 25 developed a fistula without recurrence, 24 had recurrence without a documented fistula, and 148 experienced neither during the observation period. The cross-referential search using patient name and national identification number was necessary to capture readmission episodes that were registered under new protocol numbers and would otherwise have been missed.

Exploratory Analysis: Anesthesia Type and Fistula Formation

As a hypothesis-generating analysis reported only for completeness, we examined the crude association between anesthesia type and fistula formation. Fistula formation was less frequent in patients drained under local anesthesia than under non-local techniques (12.5% vs. 32.3%). This unadjusted difference must not be interpreted as causal. It is very likely explained by confounding by indication, because smaller and more superficial abscesses are typically drained under local anesthesia, while deeper or more complex abscesses require spinal or general anesthesia; abscess size, depth, and anatomical complexity were not recorded and could not be adjusted for. Recurrence did not differ between groups.

DISCUSSION

In this single-center retrospective cohort, anal fistula developed in 23.9% of patients and recurrent abscess in 23.5% after I&D for cryptoglandular perianal abscess. The administrative observation window spanned April 2014 to April 2026, giving a potential follow-up of 10 to 12 years, and the median follow-up for censored (non-event) patients was 10.2 years. Rather than claiming that these represent the longest available follow-up data, we interpret them as a reminder that a substantial share of adverse events occurs late and would be missed by the short follow-up used in most studies.

The 23.9% fistula rate is consistent with prospective and observational series. In a multicenter observational study, Pearce et al.[5] found that roughly one in five patients developed a fistula within six months of drainage. Hasan et al.[6] reported a fistula incidence of 33.9%, with most cases diagnosed within six months. The American Society of Colon and Rectal Surgeons and the European Society of Coloproctology guidelines similarly describe fistula rates in the range of one-quarter to one-third after simple drainage.[9,10] Our figure sits within this range, reinforcing that a clinically important minority of patients will develop a fistula despite adequate initial drainage.

The median time to fistula formation was 11.0 months, but events were recorded as late as 105 months after drainage. Because most prospective trials use follow-up windows of 6 to 18 months, a meaningful proportion of late fistulas would escape detection in such designs. This is consistent with primary cohort studies that used longer observation: in a multicenter cohort of 475 patients followed for a median of approximately three years, 33.7% developed an anal fistula, while an earlier cohort of 148 patients followed for a mean of 38 months reported a cumulative fistula or recurrent-sepsis rate of 36.5%.[11,12] Our data support counseling patients that fistula risk persists well beyond the first postoperative year.

Transsphincteric fistulas predominated (64.8%). These tracts cross part or all of the external sphincter and are generally more complex to manage than intersphincteric fistulas; the frequent use of seton placement (50.0%) in our cohort reflects a sphincter-preserving approach appropriate to this anatomy.[3] However, because abscess anatomy was not systematically recorded, we cannot determine whether these fistulas arose from deeper index abscesses or were occult at the time of initial drainage.

The 23.5% recurrence rate is consistent with the understanding that simple drainage does not address the internal opening that maintains the cryptoglandular process.[2] The substantial overlap between recurrence and fistula formation (29 patients) supports the view that these outcomes share a common anatomical origin.

All patients received perioperative antibiotic prophylaxis, most commonly cefuroxime with metronidazole; ten patients with recorded allergies received ciprofloxacin with metronidazole, and two with more severe presentations received piperacillin-tazobactam. Because every patient received antibiotics, this cohort has no untreated comparison group and cannot evaluate whether antibiotics influence fistula formation or recurrence. We therefore draw no conclusion regarding antibiotic effectiveness; the antibiotic regimen is reported only to describe institutional practice.

The exploratory finding of a lower fistula rate after local anesthesia is, as noted above, most plausibly explained by confounding by indication and should not be regarded as a clinical signal. We include it only to document the distribution of outcomes across anesthesia groups and to caution against overinterpretation of such associations in retrospective data.

A methodological strength of this study is that ascertainment was not confined to our own institutional records. In addition to cross-referential linkage of surgical records by patient name and national identification number, each patient was verified against the national e-Health system (e-Nabız), which aggregates records from all public and private providers in the country. This national-level cross-check materially reduces the principal weakness of single-center retrospective follow-up, namely the loss of patients who seek later care elsewhere, and increases confidence that the observed event rates approximate the true cumulative incidence in this cohort.

Limitations

This study has important limitations. First, outcomes were ascertained retrospectively rather than through active, scheduled clinical follow-up. Although the national e-Health cross-check substantially reduced the likelihood of missing events treated at other institutions, any event not captured in that system — for example, one managed entirely without a coded procedure — could still be missed; the 10- to 12-year interval therefore represents potential observation time rather than uniformly confirmed active follow-up.

Second, several clinically important risk factors for fistula formation were not consistently recorded, including diabetes mellitus, smoking status, body mass index, abscess size, abscess depth, and anatomical location or complexity. Their absence precluded any multivariable adjustment and means that no risk-factor analysis could be performed; in particular, the lack of abscess classification is a substantial limitation for interpreting fistula risk.

Third, the anesthesia analysis is exploratory and vulnerable to confounding by indication, as discussed above, and should not inform clinical decisions.

Fourth, all patients received antibiotic prophylaxis, so no inference about an antibiotic effect is possible.

Fifth, the single-center design for index treatment and the absence of a comparison group treated with an alternative strategy limit generalizability and preclude causal infer-

ence. These limitations should temper the interpretation of all findings reported here.

CONCLUSION

Within the constraints of a retrospective, single-center, database-based design, this study provides a real-world estimate of the rate of anal fistula formation and abscess recurrence after I&D for cryptoglandular perianal abscess. Anal fistula developed in 23.9% of patients and recurrent abscess in 23.5%, with events occurring as late as 105 months (median: 11.0 months for fistula), indicating that a substantial share of adverse events arises well beyond the early postoperative period. Because ascertainment relied on existing records, these figures should be regarded as a lower-bound estimate.

Two practical implications follow:

1. Prospectively planned, structured databases with active long-term follow-up are needed to define these risks more precisely.
2. Operative and surgical progress notes should be standardized to routinely record abscess size, abscess type, anatomical location, and the surgical technique used, as the absence of these variables was the principal barrier to risk-factor analysis in the present cohort.

Until such data are systematically captured, patients undergoing abscess drainage should be counseled about the meaningful long-term risk of fistula formation and recurrence.

Disclosures

Ethics Committee Approval: The study was approved by the Ağrı İbrahim Çeçen University Ethics Committee (No: 200, Date: 01/04/2026).

Informed Consent: As this was a retrospective study based entirely on data obtained from the hospital database, the ethics committee waived the requirement for informed consent.

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