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PREDICTORS OF DELAYED HEALING FOLLOWING SURGICAL TREATMENT OF CHRONIC ANAL FISSURE

Dr. Qusay Ahmed Njati Younus*

M.B.Ch.B/ C.A.B.H.S(General Surgery)

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***Corresponding Author: Dr. Qusay Ahmed Njati Younus**

M.B.Ch.B/ C.A.B.H.S(General Surgery).

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ABSTRACT

Background: Chronic anal fissure is a common benign anorectal disorder characterized by severe anal pain and rectal bleeding. Although lateral internal sphincterotomy is considered the gold standard surgical treatment, healing outcomes may vary among patients, and several factors may contribute to delayed postoperative recovery. **Objectives:** To evaluate healing outcomes following surgery for chronic anal fissure and to identify factors associated with delayed healing among patients treated at Al Salam Teaching Hospital, Mosul. **Methods:** This retrospective cross-sectional study was conducted at Al Salam Teaching Hospital, Mosul, Iraq, from April 2024 to January 2026. A total of 87 patients who underwent surgical treatment for chronic anal fissure after failure of conservative management were included. Demographic, clinical, and operative data were collected from hospital records. Healing outcomes and postoperative complications were assessed during follow-up. Statistical analysis was performed using SPSS version 27. Associations between potential risk factors and delayed healing were evaluated using Chi-square and logistic regression analyses. A P value of less than 0.05 was considered statistically significant. **Results:** The mean age of the patients was 38.7 ± 11.2 years, and males constituted 56.3% of the study population. Posterior fissures were the most common presentation, accounting for 75.9% of cases. Complete healing was achieved in 76 patients (87.4%), while delayed healing occurred in 11 patients (12.6%). Persistent postoperative pain was reported in 13.8% of patients, whereas recurrence and minor incontinence occurred in 5.7% and 3.4% of cases, respectively. Delayed healing was significantly associated with diabetes mellitus (P = 0.008), smoking (P = 0.021), prolonged symptom duration exceeding six months (P = 0.011), and chronic constipation (P = 0.034). Multivariate logistic regression analysis identified diabetes mellitus (OR = 3.42, 95% CI: 1.18–9.93, P = 0.023), smoking (OR = 3.11, 95% CI: 1.10–8.77, P = 0.031), and symptom duration greater than six months (OR = 2.87, 95% CI: 1.06–7.79, P = 0.038) as independent predictors of delayed healing. **Conclusions:** Surgical treatment of chronic anal fissure achieved a high healing rate with low recurrence and acceptable postoperative morbidity. Diabetes mellitus, smoking, and prolonged symptom duration were identified as significant independent predictors of delayed healing. Optimization of modifiable risk factors and timely surgical intervention may improve healing outcomes and reduce postoperative complications.

KEYWORDS: Chronic anal fissure, Delayed healing, Diabetes mellitus, Lateral internal sphincterotomy, Smoking, Surgical outcomes.

1-INTRODUCTION

Chronic anal fissure is one of the most common benign anorectal disorders encountered in surgical practice and is a frequent cause of anal pain and rectal bleeding. It is characterized by a longitudinal ulcer in the distal anal canal that persists for more than six weeks and is often associated with exposure of the internal anal sphincter fibers, hypertrophied anal papilla, and sentinel skin tag. Although the condition is not life-threatening, it can significantly impair patients' quality of life because of severe pain during and after defecation, fear of bowel movements, and associated psychological distress.[1]

The pathogenesis of chronic anal fissure is multifactorial, with increased resting pressure of the internal anal sphincter playing a central role. Elevated sphincter tone

leads to reduced anodermal blood flow and local ischemia, resulting in impaired healing of the fissure. Other contributing factors include chronic constipation, passage of hard stools, prolonged straining during defecation, diarrhea, pregnancy, obesity, and inflammatory bowel disease. The posterior midline of the anal canal is the most common site of fissure formation because of its relatively poor blood supply.[2]

The diagnosis of chronic anal fissure is usually based on clinical history and physical examination. Patients typically present with severe pain during defecation accompanied by bright red rectal bleeding. Chronic fissures are often associated with characteristic findings such as a sentinel pile, hypertrophied anal papilla, and visible exposure of the internal sphincter muscle. Early diagnosis and appropriate management are essential to prevent disease progression and chronic symptoms.[3]

The management of chronic anal fissure initially involves conservative measures aimed at reducing sphincter spasm and promoting healing. These measures include dietary modification, increased fiber intake, stool softeners, sitz baths, and topical pharmacological agents such as glyceryl trinitrate and calcium channel blockers. Botulinum toxin injection has also been used as a non-surgical treatment option in selected patients. Despite these interventions, a considerable proportion of patients fail to achieve complete healing and ultimately require surgical treatment.[4]

Lateral internal sphincterotomy is widely regarded as the gold standard surgical treatment for chronic anal fissure because of its high healing rates and rapid symptom relief. The procedure involves partial division of the internal anal sphincter, thereby reducing resting sphincter pressure, improving blood flow to the anoderm, and facilitating fissure healing. Healing rates following lateral internal sphincterotomy have been reported to exceed 90% in most published studies. However, healing may be delayed in some patients, and a minority may experience recurrence or postoperative complications.[5]

Several factors have been reported to influence healing outcomes following surgery for chronic anal fissure. Patient-related factors such as advanced age, diabetes mellitus, obesity, smoking, and chronic constipation may negatively affect tissue repair and wound healing. Disease-related factors including prolonged symptom duration, recurrent fissures, and previous failed treatment have also been implicated. Furthermore, operative factors and postoperative compliance with dietary and medical recommendations may contribute to variations in healing rates among patients.[6]

Understanding the factors that affect healing after surgery for chronic anal fissure is important because delayed healing may prolong symptoms, increase healthcare utilization, reduce patient satisfaction, and predispose to recurrence. Identification of modifiable risk factors may allow surgeons to optimize perioperative management and improve surgical outcomes. Although numerous studies have evaluated the effectiveness of lateral internal sphincterotomy, data regarding predictors of healing and delayed recovery remain limited, particularly in developing countries.[7]

In Iraq, chronic anal fissure is frequently encountered in colorectal and general surgical clinics, and lateral internal sphincterotomy remains the most commonly performed surgical procedure for patients who fail conservative treatment. However, local studies evaluating factors affecting postoperative healing are scarce. Therefore, this study aims to assess healing outcomes following surgery for chronic anal fissure and to identify patient-related and clinical factors associated with delayed healing among patients treated at Al Salam Teaching Hospital in Mosul.

2-PATIENTS AND METHODS

Prior to data collection, the Nineveh Directorate of Health ethics committee provided clearance. All participants provided verbal or written informed permission prior to being included in the study. Patient anonymity was preserved throughout the study by employing anonymous data collecting forms, and all obtained information was utilized solely for scientific research. This retrospective cross-sectional study was conducted at Al Salam Teaching Hospital, Mosul, Nineveh Governorate, Iraq, to evaluate factors affecting healing after surgery for chronic anal fissure. The study period extended from April 1, 2024, to January 31, 2026. A total of 87 patients who underwent surgical treatment for chronic anal fissure during the study period were included in the study.

Patients were identified through a review of hospital medical records, operative reports, outpatient clinic records, anesthesia records, and postoperative follow-up documentation. Adult patients aged 18 years and older with a diagnosis of chronic anal fissure who underwent surgical treatment after failure of conservative management were eligible for inclusion. Patients with inflammatory bowel disease, anorectal malignancy, tuberculosis, human immunodeficiency virus infection, previous anorectal surgery, or incomplete medical records were excluded from the study.

Data were collected using a structured data collection form. Demographic variables included age, sex, body mass index, and smoking status. Clinical variables included duration of symptoms, history of chronic constipation, diabetes mellitus, hypertension, previous medical treatment, and fissure location. Operative variables included type of surgical procedure, operative duration, and length of hospital stay.

All patients underwent lateral internal sphincterotomy with or without fissurectomy under regional or general anesthesia according to surgeon preference. The

procedure involved controlled division of the internal anal sphincter to reduce resting anal pressure and improve local blood supply, thereby facilitating fissure healing. Standard postoperative care included analgesia, dietary advice, increased fiber intake, stool softeners, and regular follow-up visits.

The primary outcome measure was complete fissure healing, defined as complete epithelialization of the fissure with resolution of symptoms during follow-up. Delayed healing was defined as persistent symptoms or incomplete fissure healing beyond eight weeks postoperatively. Secondary outcomes included recurrence, postoperative pain, bleeding, wound infection, and minor fecal incontinence when present.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. Associations between healing outcomes and potential risk factors were assessed using the Chi-square test or Fisher's exact test for categorical variables and the independent samples t-test for continuous variables. Multivariate logistic regression analysis was performed to identify independent predictors of delayed healing. A P value of less than 0.05 was considered statistically significant.

3-RESULTS

A total of 87 patients who underwent surgical treatment for chronic anal fissure at Al Salam Teaching Hospital between April 2024 and January 2026 were included in this study. All patients underwent lateral internal sphincterotomy with or without fissurectomy after failure of conservative treatment.

Table 1 presents the demographic and clinical characteristics of the study population. The mean age of the patients was 38.7 ± 11.2 years, with the highest proportion of patients belonging to the 30–39-year age group (34.5%), followed by those younger than 30 years (25.3%). Males constituted 56.3% of the study population, while females represented 43.7%, resulting in a male-to-female ratio of approximately 1.3:1. Chronic constipation was identified in 58.6% of patients and represented the most common associated clinical condition. Diabetes mellitus was present in 16.1% of patients, whereas 24.1% were smokers. These findings indicate that constipation and other comorbid conditions were common among patients undergoing surgery for chronic anal fissure.

Table 1: Demographic and clinical characteristics of the studied patients (n=87).

Variable	Number (%)
<30 years	22 (25.3%)
30–39 years	30 (34.5%)
40–49 years	21 (24.1%)
≥50 years	14 (16.1%)
Male	49 (56.3%)
Female	38 (43.7%)
Chronic constipation	51 (58.6%)
Diabetes mellitus	14 (16.1%)
Smokers	21 (24.1%)

Table 2 demonstrates the fissure-related characteristics among the studied patients. Posterior midline fissures were the predominant presentation, accounting for 75.9% of cases, whereas anterior fissures and multiple fissures represented 18.4% and 5.7% of cases, respectively. Symptoms had been present for more than six months in 43.7% of patients, indicating delayed presentation in a considerable proportion of cases. Previous unsuccessful medical treatment was documented in 69.0% of patients, reflecting the failure of conservative measures and the subsequent need for surgical intervention.

Table 2: Fissure-related characteristics of the studied patients (n=87).

Variable	Number (%)
Posterior fissure	66 (75.9%)
Anterior fissure	16 (18.4%)
Multiple fissures	5 (5.7%)
Symptoms ≤6 months	49 (56.3%)
Symptoms >6 months	38 (43.7%)
Previous medical treatment	60 (69.0%)

Table 3 summarizes the operative characteristics of patients undergoing surgery for chronic anal fissure. Lateral internal sphincterotomy alone was the most frequently performed procedure, accounting for 80.5% of cases, while combined lateral internal sphincterotomy with fissurectomy was performed in 19.5% of patients. The mean operative time was 24.6 ± 6.8 minutes, reflecting the relatively straightforward nature of the procedure. The mean hospital stay was 1.2 ± 0.6 days, indicating that most patients were discharged shortly after surgery without prolonged hospitalization.

Table 3: Operative characteristics of the studied patients (n=87).

Variable	Value
Lateral internal sphincterotomy only	70 (80.5%)
Sphincterotomy + fissurectomy	17 (19.5%)
Operative time (minutes)	24.6 ± 6.8
Hospital stay (days)	1.2 ± 0.6

Table 4 presents the healing outcomes and postoperative complications following surgery for chronic anal fissure. Complete healing was achieved in 76 patients (87.4%), whereas delayed healing occurred in 11 patients (12.6%). Persistent postoperative pain lasting longer than two weeks was observed in 13.8% of patients and represented the most common postoperative complaint. Postoperative bleeding occurred in 8.0% of patients, while recurrence of fissure and minor fecal incontinence were reported in 5.7% and 3.4% of patients, respectively. These findings

demonstrate a high overall healing rate with relatively low postoperative morbidity.

Table 4: Healing outcomes and postoperative complications among the studied patients (n=87).

Variable	Number (%)
Complete healing	76 (87.4%)
Delayed healing	11 (12.6%)
Persistent pain >2 weeks	12 (13.8%)
Postoperative bleeding	7 (8.0%)
Recurrence	5 (5.7%)
Minor incontinence	3 (3.4%)

Table 5 demonstrates the relationship between selected patient-related factors and delayed healing after surgery. Delayed healing was significantly more frequent among diabetic patients, occurring in 35.7% compared with 8.2% among non-diabetic patients (P = 0.008). Similarly, smokers experienced significantly higher rates of delayed healing than non-smokers (28.6% versus 7.6%, P = 0.021). These findings suggest that diabetes mellitus and smoking adversely affect the postoperative healing process and may contribute to delayed recovery following surgery for chronic anal fissure.

Table 5: Association between patient-related factors and delayed healing (n=87).

Variable	Delayed Healing	Complete Healing	P value
Diabetes mellitus	5 (35.7%)	9 (64.3%)	**0 .008**
No diabetes	6 (8.2%)	67 (91.8%)	
Smokers	6 (28.6%)	15 (71.4%)	**0.021**
Non-smokers	5 (7.6%)	61 (92.4%)	

Table 6 shows the association between clinical characteristics and healing outcomes. Patients with symptoms lasting longer than six months experienced significantly higher rates of delayed healing compared with those whose symptoms were present for six months or less (23.7% versus 4.1%, P = 0.011). Chronic constipation was also significantly associated with delayed healing, with affected patients demonstrating higher rates of delayed recovery than those without constipation (17.6% versus 5.6%, P = 0.034). These findings indicate that prolonged disease duration and persistent constipation may negatively influence postoperative healing.

Table 6: Association between clinical factors and delayed healing (n=87).

Variable	Delayed Healing	Complete Healing	P value
Symptoms >6 months	9 (23.7%)	29 (76.3%)	**0.011**
Symptoms ≤6 months	2 (4.1%)	47 (95.9%)	
Chronic constipation	9 (17.6%)	42 (82.4%)	**0.034**
No constipation	2 (5.6%)	34 (94.4%)	

Table 7 presents the results of multivariate logistic regression analysis performed to identify independent predictors of delayed healing following surgery for chronic anal fissure. Diabetes mellitus was associated with a 3.42-fold increased risk of delayed healing (OR = 3.42, 95% CI: 1.18–9.93, P = 0.023), while smoking increased the risk by approximately threefold (OR = 3.11, 95% CI: 1.10–8.77, P = 0.031). Symptom duration exceeding six months remained a significant independent predictor of delayed healing (OR = 2.87, 95% CI: 1.06–7.79, P = 0.038). Although chronic constipation showed an increased risk, it did not reach statistical significance after adjustment for other variables (P = 0.196). These findings indicate that diabetes mellitus, smoking, and prolonged symptom duration are the most important independent determinants of delayed postoperative healing.

Table 7: Multivariate logistic regression analysis of predictors of delayed healing (n=87).

Variable	OR	95% CI	P value
Diabetes mellitus	3.42	1.18–9.93	0.023
Smoking	3.11	1.10–8.77	0.031
Symptoms >6 months	2.87	1.06–7.79	0.038
Chronic constipation	1.94	0.71–5.32	0.196

4- DISCUSSION

The present study evaluated healing outcomes and factors affecting recovery following surgical treatment of chronic anal fissure. The findings demonstrated a high overall healing rate of 87.4%, with delayed healing occurring in 12.6% of patients. Diabetes mellitus, smoking, prolonged symptom duration, and chronic constipation were significantly associated with delayed postoperative healing, while diabetes mellitus, smoking, and symptom duration greater than six months remained independent predictors after multivariate analysis.

The mean age of patients in the current study was 38.7 ± 11.2 years, with the majority of patients belonging to the third and fourth decades of life. This observation is consistent with the epidemiological characteristics of chronic anal fissure, which predominantly affects young and middle-aged adults. Similar findings were reported by **Ortiz *et al.***, who found that chronic anal fissure is most frequently encountered among economically active adults and is associated with significant impairment in quality of life.[8]

In the present study, posterior fissures represented 75.9% of all cases and were considerably more common than anterior or multiple fissures. This finding is in agreement with the established pathophysiology of chronic anal fissure, whereby the posterior midline is particularly susceptible because of its relatively poor blood supply. Comparable observations were reported by **Lund and Scholefield**, who demonstrated that reduced perfusion of the posterior anoderm contributes significantly to fissure formation and delayed healing.[9]

Complete healing was achieved in 87.4% of patients following surgery. This high healing rate supports the effectiveness of lateral internal sphincterotomy as the standard surgical treatment for chronic anal fissure. Similar outcomes were reported by **Menteş *et al***., who documented healing rates exceeding 90% after surgical intervention and emphasized the superiority of sphincterotomy over prolonged conservative treatment in selected patients.[10]

Persistent postoperative pain was the most common postoperative complaint in the current study, affecting 13.8% of patients. Although most patients experienced rapid symptom relief, a minority reported prolonged discomfort during the healing period. Similar findings were described by **Hananel and Gordon**, who observed that postoperative pain may persist temporarily despite successful fissure healing and is often related to local inflammation and tissue remodeling.[11]

Recurrence was observed in 5.7% of patients in the present study. This relatively low recurrence rate is consistent with published reports demonstrating durable long-term outcomes following lateral internal sphincterotomy. Comparable findings were reported by **Nelson *et al***., who found that recurrence rates following surgery generally remain below 10% when adequate sphincter division and postoperative care are achieved.[12]

A significant association was identified between diabetes mellitus and delayed healing. Diabetic patients experienced considerably higher rates of delayed healing than non-diabetic patients, and diabetes mellitus remained an independent predictor after multivariate analysis. This finding may be explained by impaired tissue perfusion, delayed collagen synthesis, reduced immune response, and impaired wound repair associated with diabetes. Similar observations were reported by **Margolin *et al***., who demonstrated that diabetes adversely affects healing outcomes following anorectal surgical procedures.[13]

Smoking was also significantly associated with delayed healing and remained an independent predictor in logistic regression analysis. The detrimental effects of smoking on tissue oxygenation, microvascular circulation, and collagen deposition are well documented. Similar findings were reported by **Sorensen *et al***., who concluded that smokers have significantly delayed wound healing and increased postoperative complications compared with non-smokers.[14]

Patients with symptom duration exceeding six months demonstrated significantly higher rates of delayed healing compared with those presenting earlier. This finding may reflect chronic fibrosis, persistent sphincter hypertonicity, and prolonged local ischemia associated with longstanding disease. Comparable observations were reported by **Ortiz *et al***., who emphasized that delayed presentation and prolonged symptom duration negatively influence healing outcomes following surgical treatment of chronic anal fissure.[15]

Chronic constipation was significantly associated with delayed healing on univariate analysis; however, it did not remain an independent predictor after adjustment for other variables. Nevertheless, persistent constipation likely contributes to repeated anodermal trauma and increased anal sphincter pressure, thereby impairing tissue recovery. Similar observations were reported by **Brisinda *et al***., who highlighted the importance of postoperative bowel regulation and dietary modification in promoting fissure healing and preventing recurrence.[16]

This study has several limitations that should be considered when interpreting the findings. The retrospective design depended on the accuracy and completeness of medical records, which may have introduced information bias. In addition, the study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the results to other populations. Furthermore, variations in patient compliance with postoperative dietary recommendations, stool softeners, and follow-up schedules could not be fully assessed. Long-term functional outcomes and quality-of-life measures were also not evaluated. Despite these limitations, the study provides valuable local data regarding healing outcomes after surgery for chronic anal fissure and identifies important factors associated with delayed healing.

5- CONCLUSION AND RECOMMENDATION

The present study demonstrated that surgical treatment of chronic anal fissure achieved a high healing rate with acceptable postoperative morbidity. Complete healing was achieved in the majority of patients, while delayed healing occurred in a small proportion of cases. Diabetes mellitus, smoking, and prolonged symptom duration were identified as significant independent predictors of delayed healing following surgery. Early diagnosis and timely surgical intervention, together with optimization of diabetes control, smoking cessation, and effective management of chronic constipation, may improve postoperative healing outcomes and reduce the risk of delayed recovery. Surgeons should pay particular attention to patients with these risk factors during preoperative assessment and postoperative follow-up. Further prospective multicenter studies with larger

sample sizes and longer follow-up periods are recommended to validate these findings and evaluate long-term functional outcomes and recurrence rates.

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