

## Predictive Factors for Recurrence of Fistula-in-Ano After Surgery: A 10-year Experience in a Single Center Study

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### ABSTRACT

**OBJECTIVE** This study aimed to evaluate the recurrence rate of fistula-in-ano treatment and factors associated with recurrence.

**METHODS** A retrospective cohort study was performed of cryptoglandular-cause fistula-in-ano patients who underwent surgery between January 2010 and June 2020. Cox's regression analysis was used to identify predictive factors for recurrence FIA.

**RESULTS** The study included 282 patients of whom 233 (82.6%) were male, 76 (27.0%) had previous anal fistula surgery, 77 (27.3%) had a complex type of fistula, 72 (25.5%) were high transphincteric, 3 (1.0%) were suprasphincteric, and 2 (0.7%) were extrasphincteric. Five types of operations were performed: 106 (37.6%) fistulotomies, 43 (15.2%) fistulectomies, five (1.8%) setons, six (2.1%) endorectal advancement flaps (ERAF), and 122 (43.3%) ligations of the intersphincteric fistula tract (LIFT). The recurrence rate was 20.1% (57 patients) among whom 54 (94.0%) were detected at follow-up within 12 months, 2 patients were detected in the second year, and 1 patient was detected in the third year. Four independent factors associated with the recurrence of FIA after surgery were identified: female gender (HR 2.67; 95% CI 1.34-5.34), BMI >25 kg/m<sup>2</sup> (HR 2.47; 95% CI 1.38-4.44), complex type of fistula (HR 2.02; 95% CI 1.02-3.97), and anterior opening (HR 2.14; 95% CI 1.12-4.10). Compared to the LIFT procedure, fistulotomy was the protective factor (HR 0.12; 95% CI 0.03-0.46) while ERAF had a higher rate of recurrence (HR 6.12; 95% CI 1.87-20.03).

**CONCLUSIONS** Patients with high BMI and female patients should be advised of the higher chance of recurrence after anal fistula surgery. More complex fistula-in-ano and sphincter-preserving surgery was also associated with a higher recurrence rate. The complete healing of the surgery should be monitored for two years after surgery.

**KEYWORDS** predictive factors, recurrence, fistula-in-ano, anal fistula

### INTRODUCTION

Fistula-in-ano is one of the complex diseases for general and colorectal surgery. It is defined as the epithelialization of the tract that connects

the perineal skin to the anal canal (1). There are varieties of fistula types involving different levels of anatomical complexity. The condition can result from various etiologies, e.g., cryptoglandular

infections, Crohn's disease, and iatrogenic causes, making its management complex and multifaceted. In Thailand, most cases are caused by cryptoglandular infection which is the focus of this study. While surgical intervention has been the cornerstone of treatment for fistula-in-ano, recurrence remains a significant concern, affecting the quality of life and well-being of afflicted individuals. Moreover, the treatment must be concerned about anorectal function and that the anal sphincter complex should be preserved. Numerous treatments for FIA have been proposed, but none has become the standard treatment. A number of novel surgical techniques and innovations for cryptoglandular anal fistula have been presented, but recurrence has remained around 2-28% (2-5). The recurrence of fistula-in-ano is a significant problem not only clinically but also in terms of the economic and psychological burden both on patients and health-care systems. Patients with a recurrence of fistula-in-ano frequently suffer from recurrent pain, discharge, abscess formation requiring multiple surgeries and prolonged healing periods. Many studies have been conducted to address predictive factors for recurrence which can be identified before the surgery. Factors affecting recurrence can be divided into three groups: patient factors, e.g., age, gender, BMI, and illness, fistula-related factors, e.g., type of fistula, number and location of tracts, and treatment-related factors, e.g., operative techniques and use of antibiotics (6, 7). This study aimed to evaluate the recurrence rate of FIA after surgical treatment and to identify modifiable factors that can potentially affect the outcome of surgery.

## METHODS

### Patients

This retrospective cohort study was conducted at Chiang Mai University Hospital where data was collected on patients with cryptoglandular anal fistula who underwent curative surgery from January 2010 to June 2020. This study was approved by the Institutional Ethics Committee of the Faculty of Medicine Chiang Mai University (Study code: SUR-2566-0135, Ethical approval number 184/2566) with a waiver for informed consent. Patients with tuberculosis-related, Crohn's disease-related, or malignancy-related causes of FIA were excluded.

### Fistula classification

As mentioned above, the complexity of FIA is determined by the pathway connecting the internal and external opening of the fistula tract to the anal sphincter. There are numerous classifications of FIA. This study focused on cryptoglandular etiology which divides FIA into a simple type (consisting of intersphincteric and low trans-sphincteric fistulas) and a complex type (determined by number of the tract, external sphincter involvement >30%, suprasphincteric type or extrasphincteric type) as well as patients' history of previous surgery and the location of the tract and the position of the opening using a clockface description). This classification system helps surgeons with operation planning and advising the patient.

### Fistula surgery and treatment

In this study, the treatment approach for fistula management was determined through a combination of physical examination and intraoperative evaluation. If the physical examination indicated a complex type of FIA, additional imaging modalities such as endoanal ultrasonography or MRI were employed to assess the tract and assist in operative planning. In cases where the physical examination revealed the presence of an active abscess or an incompletely formed tract, the primary treatment methods involved drainage procedures or antibiotic therapy. Definitive surgery was deferred until the tract had become well-organized and more amenable to surgical intervention. The choice of definitive surgery was made based on the complexity of the case and the patient's preferences after receiving guidance and recommendations from the surgeon. On the operative day, patients were typically placed in a lithotomy or prone jackknife position. A proctoscopy examination was performed, and the internal opening (IO) was identified prior to the definitive surgery. For simple fistula types, fistulotomy (with or without marsupialization) and fistulectomy were the usual surgical procedures. In the case of complex FIA, the main curative treatments included LIFT (ligation of the intersphincteric fistula tract), anorectal advancement flap, and the use of a cutting seton.

### Recurrence of fistula-in-ano

The complete or successful healing of a fistula is defined as the complete epithelization of the

external opening without any discharge from the previous external opening (EO) or surgical wound. The evaluation of successful healing was conducted three months after the definitive surgery. Failure of fistula surgery comprises two different definitions: persistence and recurrence (2, 6, 8). Persistence of an anal fistula is defined as failure of complete healing of the anal fistula more than six months after surgery. Recurrence is defined as the clinical reappearance of the fistula after complete healing of the surgical wound. Persistence and recurrence are the primary treatment outcomes of this study.

### Data collection and follow-up protocol

The data were collected retrospectively from medical records in the Chiang Mai University Hospital Database. Patients who had never attended a follow-up clinic and those who could not be contacted by any means were excluded from the study.

### Statistical analysis

Stata version 16 (Stata Corp., College Station, TX, USA) was used for statistical analysis. Continuous data are reported as mean  $\pm$  standard deviation or median (interquartile range, IQR). Categorical data are given as numbers (percentages). Recurrence analysis used time-to-event analysis. Cox's regression (univariable and multivariable analysis) was used to investigate potential prognostic factors' effect on recurrence. Factors potentially associated with recurrent fistula based on a literature review and those with  $p < 0.20$  from the univariable analysis were included in the multivariable analysis. Kaplan-Meier's Curve was used to describe recurrence for each potential prognostic factor including statistical significance. Statistical significance was set at  $p < 0.05$ .

## RESULTS

Two hundred ninety-seven patients met the inclusion criteria of whom fifteen patients were excluded: 5 patients due to tuberculosis-related fistula, 4 patients with malignancy-related fistula, and 6 patients lost follow-up. Finally, 282 patients were analyzed in this study. Most of the patients were male ( $n = 233$ , 82.6%) with a mean age of 43 years. The average BMI was approximately 25.

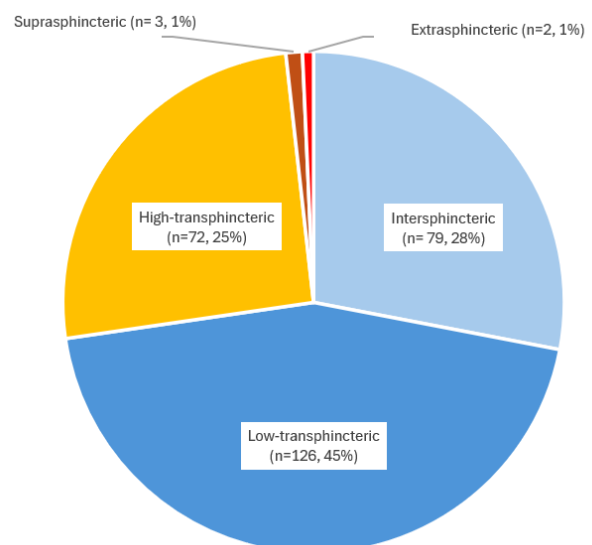
### Characteristics of the fistula

The most common type of fistula in this study was low transphincteric fistula ( $n = 126$ , 45%) followed by intersphincteric fistula ( $n = 79$ , 3%). Of the fistulas, 73% were categorized as a simple fistula. One-fourth of the patients had complex FIA, as shown in Figure 1.

In more than half the patients ( $n = 149$ , 52.8%) had the external opening was located posteriorly (3-9 o'clock), while 17 (37.1%) had only an anterior opening (10-2 o'clock) and 29 patients (10.3%) had multiple openings located both anteriorly and posteriorly. A total of 225 patients (80.0%) had only a single external opening.

### Operations and treatments

The majority of the operations in this study were carried out under spinal anesthesia, with occasional general anesthesia. In our hospital, five common surgical procedures were performed to treat FIA. Among these procedures, the most frequently performed was the Ligation of the Intersphincteric Fistula Tract (LIFT), with 122 cases (67.0%) followed by fistulotomy with 106 cases (37.6%), and fistulectomy with 43 cases (15.2%). A smaller proportion of patients, six individuals (2.1%), underwent the Endorectal Advancement Flap procedure. The five remaining cases (1.7%) were treated with a Seton technique, as shown in Table 1.



**Figure 1.** Types of anal fistula categorized by Park's Classification. The light blue and dark blue color represent the "Simple" fistula type. Yellow, orange, and red represent the "Complex" type of fistula

**Table 1.** Intra-operative factors

Parameters	Recurrence (n=57)	No recurrence (n=225)	p-value
Operation, n (%)			<0.001
Fistulotomy	3 (5.3)	103 (45.8)	
Fistulectomy	12 (21.1)	31 (13.8)	
ERAF	5 (8.8)	1 (0.4)	
Seton	0 (0.0)	5 (2.2)	
Lift	37 (64.9)	85 (37.8)	

ERAF, endorectal advancement flap

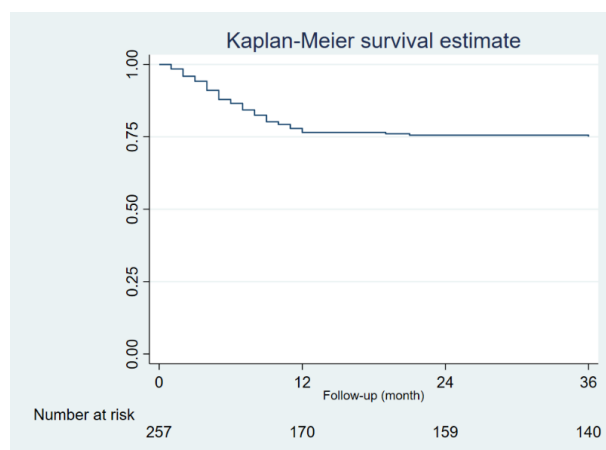
After surgery, 258 patients (91.5%) were prescribed oral antibiotics. The majority of these prescriptions (73.1%) consisted of a combination of third-generation oral cephalosporin or fluoroquinolone (ciprofloxacin) along with anaerobic antibiotics such as metronidazole or clindamycin. Another antibiotic used was oral amoxicillin and clavulanate, which accounted for 18.4% of the prescriptions and was favored by patients indicated by their better compliance.

### Primary outcome

The primary outcome was the recurrence of the fistula which was defined above. The median follow-up time was 13 months (interquartile range, 3-34 months). Fifty-seven patients (20.2%) had a recurrent fistula in the same position or at a surgical wound. Fistulas occurring at a new location were excluded from this study. Notably, 54 patients (94.7%) were diagnosed with recurrence in the first 12 months following surgery, two were diagnosed in the second year and one in the third year after surgery (Figure 2).

The demographic data of patients in both the recurrence and non-recurrence groups are presented in Table 2. Individuals with a BMI exceeding 25 kg/m<sup>2</sup> experienced a significantly higher recurrence rate (54.4% compared to 45.6%). However, the presence of underlying illnesses (e.g., diabetes, HIV infection) or steroids usage and alcohol consumption did not reveal any significant differences between the two groups.

Furthermore, there was a statistically significant difference in the type of fistula between the two groups. The recurrence group had a higher percentage of complex fistulas (50.9% vs 21.3%), as well as a higher percentage of cases with multiple tracts (29.8% vs 17.3%). Additionally, anterior openings and combined openings were significantly higher in the recurrence group.



**Figure 2.** Kaplan-Meier survival curve of patients with fistula in Ano surgery after 36-month follow-up

Interestingly, there was no statistically significant difference observed between patients who did not use antibiotics and those who were prescribed Amoxicillin-Clavulanate or a combination of antibiotics.

A history of previous fistula surgery from another hospital occurred at a significantly higher rate in the recurrence group (42.1% vs 23.1%). Additionally, the choice of operative technique was found to have a significant impact on the treatment outcome. However, as can be seen in Table 3, the type of fistula itself played a pivotal role in determining the choice of operation.

For more complex types of fistulas, such as high transphincteric and suprasphincteric fistulas, the choice of operation did not significantly affect the treatment outcome. In these cases, the complexity of the fistula type often dictated the surgical approach, resulting in a reduced reliance on fistulotomy and fistulectomy. This underscores the importance of tailoring the surgical strategy to the specific characteristics of the fistula, especially when dealing with complex types, where the choice of operation may have less influence on treatment outcomes.

**Table 2.** Demographic data between recurrence and non-recurrence group of fistula after surgery

Parameters	Recurrence (n=57)	No recurrence (n=225)	p-value
Gender, n (%)			0.119
Male	43 (75.4)	190 (84.4)	
Female	14 (24.6)	35 (15.6)	
Age (years), mean (SD)	43.13 (13.6)	42.88 (15.2)	0.913
BMI (kg/m <sup>2</sup> ), mean (SD)	25.61 (5.7)	24.52 (4.3)	0.108
BMI (kg/m <sup>2</sup> ), n (%)			0.015
≤25	26 (45.6)	144 (64.0)	
>25	31 (54.4)	81 (36.0)	
Diabetes, n (%)	4 (7.0)	13 (5.8)	0.756
Smoking, n (%)	9 (15.8)	27 (12.0)	0.505
Alcohol, n (%)	24 (42.1)	82 (36.4)	0.447
Steroid use, n (%)	1 (1.8)	6 (2.7)	1.000
HIV infection, n (%)	0 (0.0)	4 (1.8)	0.586
Long sitting activities, n (%)	26 (65.00)	109 (70.8)	0.563
Types of fistula, n (%)			<0.001
Intersphincteric	5 (8.8)	74 (32.9)	
Low-transphincteric	23 (40.4)	103 (45.8)	
High-transphincteric	25 (43.9)	47 (20.9)	
Suprasphincteric	2 (3.5)	1 (0.4)	
Extrasphincteric	2 (3.5)	0 (0.0)	
External opening position, n (%)			0.001
Anterior tract	32 (56.1)	72 (32.0)	
Posterior tract	18 (31.6)	131 (58.2)	
Combined tract	7 (12.3)	22 (9.8)	
Number tract, n (%)			0.041
Single tract	40 (70.2)	186 (82.7)	
Multiple tracts	17 (29.8)	39 (17.3)	
Direction, n (%)			0.292
Straight tract	46 (80.7)	195 (86.7)	
Curved tract	11 (19.3)	30 (13.3)	
Pus or tract culture, n (%)			0.586
No	57 (100.0)	221 (98.2)	
Yes	0 (0.0)	4 (1.8)	
Pathological request, n (%)			0.011
No	16 (28.1)	107 (47.6)	
Yes	41 (71.9)	118 (52.4)	
Antibiotics use, n (%)			1.000
No	5 (8.8)	19 (8.4)	
Augmentin	10 (17.5)	42 (18.7)	
ATB	42 (73.7)	164 (72.9)	
History previous fistula, n (%)			0.007
No	33 (57.9)	173 (76.9)	
Yes	24 (42.1)	52 (23.1)	

BMI, body mass index; ERAF, endorectal advancement flap; LIFT, ligation of intersphincteric fistula tract

### Factors affecting fistula recurrence

Factors reported in the literature and demographic data demonstrated to be statistically significant in the in this study were used in univariable and multivariable models as shown in [Table 4](#). The results show that female gender, BMI > 25 kg/m<sup>2</sup>, complex fistula group, higher number

of tracts, anterior tract, the specific operative technique, and a history of previous fistula surgery are associated with a higher rate of fistula recurrence.

In multivariable analysis, the independent factors statistically significantly associated with fistula recurrence were female gender (HR 2.67; 95%CI,

**Table 3.** Demonstrate operation and recurrence rate in each type of fistula

Parameters	Recurrence (n=57)	No recurrence (n=225)	p-value
Intersphincteric, n (%)			0.041
Fistulotomy	1 (20.0)	52 (70.3)	
Fistulectomy	4 (80.0)	20 (27.0)	
Seton	0 (0.0)	2 (2.7)	
Low-transphincteric, n (%)			<0.001*
Fistulotomy	2 (8.7)	50 (48.5)	
Fistulectomy	6 (26.1)	10 (9.7)	
ERAF	2 (8.7)	1 (1.0)	
Seton	0 (0.0)	2 (2.0)	
LIFT	13 (56.5)	40 (38.8)	
High-transphincteric, n (%)			0.316
Fistulotomy	0 (0.0)	1 (2.1)	
Fistulectomy	1 (4.0)	1 (2.1)	
ERAF	2 (8.0)	0 (0.0)	
Seton	0 (0.0)	1 (2.1)	
LIFT	2 (88.0)	44 (93.7)	
Suprasphincteric, n (%)			1.000
Fistulectomy	1 (50.0)	0 (0.0)	
ERAF	1 (50.0)	0 (0.0)	
LIFT	0 (0.0)	1 (100.0)	

ERAF, endorectal advancement flap; LIFT, ligation of intersphincteric fistula tract

**Table 4.** Factors affecting recurrence of fistula in ano after surgery

Parameters	Univariable analysis		Multivariable analysis	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Gender				
Male	1.00	[Ref]	1.00	[Ref]
female	1.77 (0.96-3.24)	0.065	2.67 (1.34-5.34)	0.005
Age (Year)	1.00 (0.98-1.01)	0.621	0.99 (0.97-1.01)	0.305
BMI (Kg/m <sup>2</sup> )				
≤25	1.00	[Ref]	1.00	[Ref]
>25	1.80 (1.06-3.04)	0.029	2.47 (1.38-4.44)	0.002
Steroid use	0.64 (0.09-4.64)	0.660	3.29 (0.41-26.58)	0.263
Alcohol	1.13 (0.67-1.92)	0.644	1.33 (0.74-2.37)	0.343
Diabetes	1.08 (0.39-3.00)	0.876	0.77 (0.25-2.36)	0.653
History previous fistula	2.12 (1.25-3.60)	0.006	0.84 (0.45-1.57)	0.595
Complex type				
Simple type	1.00	[Ref]	1.00	[Ref]
Complex type	3.31 (1.96-5.60)	<0.001	2.02 (1.02-3.97)	0.042
Direction				
Straight tract	1.00	[Ref]	1.00	[Ref]
Curved tract	1.48 (0.77-2.86)	0.244	0.65 (0.31-1.36)	0.251
External opening position				
Anterior opening	2.58 (1.43-4.66)	0.002	2.14 (1.12-4.10)	0.022
Posterior opening	1.00	[Ref]	1.00	[Ref]
Combined opening	2.16 (0.90-5.22)	0.086	1.60 (0.56-4.52)	0.379
Number tract				
Single tract	1.00	[Ref]	1.00	[Ref]
Multiple tracts	1.97 (1.11-3.48)	0.020	1.67 (0.81-3.45)	0.167
Operation				
Fistulotomy	0.07 (0.02-0.24)	<0.001	0.12 (0.03-0.46)	0.002
Fistulectomy	0.87 (0.45-1.67)	0.676	1.57 (0.70-3.56)	0.276
ERAF	3.17 (1.24-8.11)	0.016	6.12 (1.87-20.03)	0.003
LIFT	1.00	[Ref]	1.00	[Ref]

ERHR, hazard ratio; CI, confidence interval; BMI, body mass index; ERAF, endorectal advancement flap; LIFT, ligation of intersphincteric fistula tract

1.34-5.34), BMI > 25kg/m<sup>2</sup> (HR 2.47; 95% CI, 1.38-4.44), complex type of fistula (HR 2.02; 95% CI, 1.02-3.97), and anterior opening (HR 2.14; 95% CI, 1.12-4.10). When compared to the LIFT procedure, the operative technique with fistulotomy (HR 0.12; 95% CI, 0.03-0.46) had a lower rate of recurrence while ERAF (HR 6.12; 95% CI, 1.87-20.03) increased the chance of recurrence. The survival curve for gender, BMI, and complex fistula is shown in Figure 3.

**DISCUSSION**

This study included 282 patients with cryptoglandular fistula-in-ano. The recurrence rate was approximately 20 percent, the same as a report from Siriraj Hospital and Khon Kaen Hospital (2). Recurrence was defined to include a persistent fistula and the recurrence of the fistula in the same external opening and/or surgical wound which could have occurred in the LIFT procedure.

Most of the patients in this study were male which in concordance with several studies. This could be due to the fact that the lifestyles and occupations of male males generally include less hygiene care than those of females. However, females showed a higher recurrence rate, which may be explained by the fact that sphincter-saving procedures were often chosen for females to reduce the risk of incontinence (4, 9-12).

The classification defined by Park (3) can also predict the recurrence of FIA. High-transphincteric, suprasphincteric, and extrasphincteric fistulas are categorized as more the complex group (13). This complexity arises from the difficulty in eliminating the fistula tract and draining all infected tissue in these types of fistulas. Additionally, the formation of a horseshoe fistula presents a particular challenge for surgical intervention (14). Surgical techniques such as laying open or excising the entire tract may be limited due to the potential

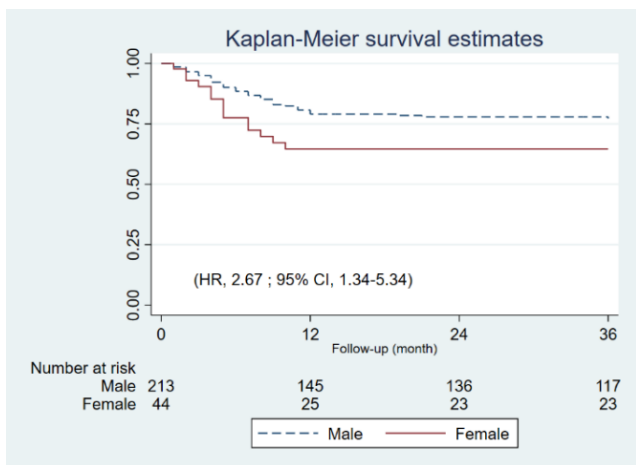


Figure 3.1

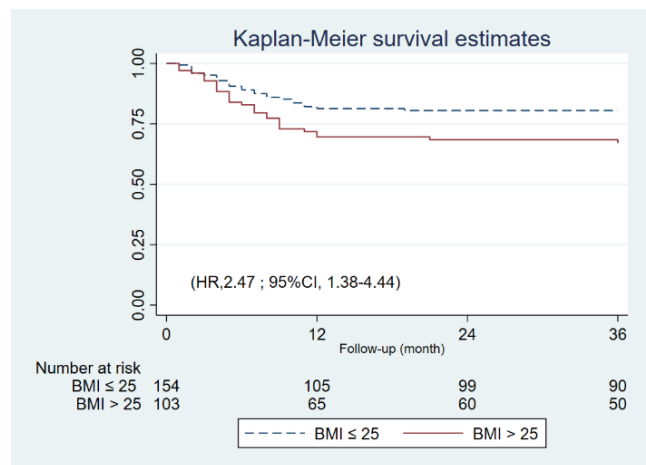


Figure 3.2

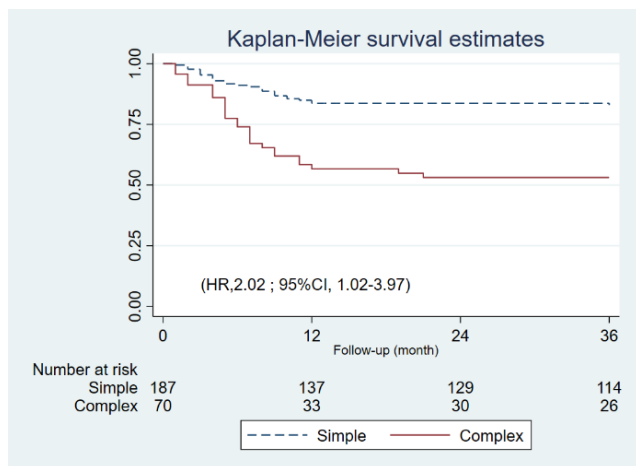


Figure 3.3

Figure 3. Kaplan-Meier survival curve shows survival without recurrence of anal fistula after surgery of gender (Figure 3.1), BMI (Figure 3.2), and complex fistula type (Figure 3.3) HR, hazard ratio; CI, confidence interval; BMI, body mass index

risk of postoperative incontinence. As a result, sphincter-preserving surgical procedures are often preferred when dealing with this kind of complex fistula as was found to be the case in this study. Some studies have stated that the correlation between the complex type with a higher recurrence rate is due to unidentified or misidentified internal openings and tracts during the surgery. Preoperative high-quality imaging, such as 3-tesla MRI or 3D transrectal ultrasound, might help confirm the tract and improve the success of the operation (1).

In this study, co-morbidity did not show a significant association with fistula recurrence. However, existing evidence suggests that certain co-morbidities can impact the healing process and increase the risk of recurrence in FIA. For instance, diabetes mellitus has been reported to affect the healing process and increase the risk of recurrence (15). This is attributed to factors such as delayed tissue formation and the impairment of the host's immune response against infection in diabetic individuals. Similarly, the use of steroids can also suppress the host's immunity and has been linked to a higher recurrence rate in patients with FIA. Steroids can weaken the body's ability to combat infection and inflammation, potentially leading to treatment challenges and increased recurrence risk.

BMI was significantly associated with the recurrence of FIA. Lu et al. demonstrated a strong relationship between BMI and fistula recurrence (16). Additionally, Schwandner et al. identified obesity (BMI > 30 kg/m<sup>2</sup>) as an independent factor for recurrence, with a hazard ratio of 3.35 ( $p < 0.02$ ) (17). In this study, a similar relationship was observed, though with a slightly lower BMI threshold of > 25 kg/m<sup>2</sup> contributing to being associated with a higher recurrence rate. These results underscore the importance of considering BMI as a relevant factor when assessing the risk of FIA recurrence, planning appropriate treatment and advising patients.

In this study, it was observed that multiple openings appeared to have a potential relationship with recurrence. This finding is consistent with the categorization of multiple tracts as one of the criteria for a complex fistula type in the

literature (1, 3, 18). However, Chadbunchachai et al. reported that having multiple tracts was not a risk factor for recurrence in their study (2). This highlights the complexity of assessing the impact of multiple openings on fistula recurrence and suggests that further research may be necessary to clarify its role as a predictive factor. There has been an ongoing debate regarding whether multiple simple fistulas should be categorized as part of the simple group. It is possible that excluding this subgroup might help increase understanding of factors associated with recurrence.

The operative technique employed in this study was found to have a significant impact on the treatment outcome. However, it is important to note that the choice of operative technique is often influenced by factors such as the complexity of the fistula and the surgeon's expertise. In cases of more complex fistulas, the preferred operative procedures may include Ligation of the Intersphincteric Fistula Tract (LIFT), Endorectal Advancement Flap (ERAF), and staged Seton placement. However, experienced coloproctologists may combine multiple procedures within a single operation while striving to preserve the anal sphincter function. This approach aims to achieve both effective treatment of the fistula and better functional outcomes for the patient. Ultimately, the choice of operative technique should be tailored to the specific characteristics of the fistula, patient factors, and the surgeon's expertise to optimize treatment outcomes while preserving anal function (19, 20). Further studies should focus on one technique in each fistula type so the outcomes could be compared to studies reporting results from the LIFT procedure (21, 22).

One year after surgery was the most beneficial time to evaluate the recurrence of fistula which accounted for 94% of cases in this study. However, another study reported recurrence in the second year (2) which suggests that ongoing follow-up beyond the first year after surgery is also essential to detect potential recurrences. Patients should be informed about the possibility of recurrence and the clinical symptoms associated with it. Surgeons should encourage patients to get timely medical attention as it can lead to more effective treatment outcomes.

## Limitations

This study has several limitations. It was a retrospective investigation that relied on data collected since 2011 and thus may have introduced biases and limitations inherent in retrospective study designs. Furthermore, the study was conducted in a single institution, potentially limiting the generalizability of the findings to the general population with fistula-in-ano. The patient population and treatment approaches in this institution may not fully represent the normal incidence of fistula types and recurrence rates, as it primarily serves as a referral institution for more complex cases. The study did not include a detailed analysis of the factors and limitations specific to each type of FIA operation; future research could focus on individual fistula types and surgical techniques to provide a more nuanced understanding. Lastly, the study did not include an assessment of functional outcomes following FIA treatment, such as anal sphincter function and quality of life, which are important aspects of treatment evaluation.

## CONCLUSIONS

Patients with high BMI and female patients should be advised of the higher risk of recurrence after anal fistula surgery. More complex Fistula-in-ano and sphincter-preserving surgery are associated with a higher recurrence rate. The completeness of healing after surgery should be monitored for two years.

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## CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

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