

Comparison of preoperative MRI and surgical findings in perianal fistulas and factors affecting recurrence

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Cite this article as: Baysal H, Kazıcı ZN, Alimoğlu O. Comparison of preoperative MRI and surgical findings in perianal fistulas and factors affecting recurrence. *J Health Sci Med.* 2023;6(6):1380-1386.

Received: 21.09.2023

Accepted: 20.10.2023

Published: 29.10.2023

ABSTRACT

Aims: Anal fistula occurs most commonly when the anal glands become obstructed and infected in the intersphincteric plane. Although it has a high recurrence rates, its treatment is surgical. Magnetic resonance imaging (MRI) is the gold standard for accurate preoperative evaluation of the patient and detection of the relationship to the muscle groups that provide continence. The aim of this study was to evaluate the compatibility of MRI with surgery and to determine the parameters effective on recurrence.

Methods: Primary perianal fistulas with MRI between 2016 and 2023 were retrospectively evaluated. Patient demographics were documented. Fistula classifications according to MRI findings, abscess locations, internal and external opening regions on MRI were compared with surgical findings. The surgical procedures performed were documented. Univariate and multivariate evaluations of recurrence performed by Cox regression analysis. Disease-free survival data were analyzed.

Results: A total of 180 cases with a mean age of 43.75 ± 12.57 years were included in the study. At the end of MRI, there were 69 (38.3%) cases with an fistula external orifice > 3 cm. The largest group in Parks classification were intersphincteric patients with 127 (66.7%), 52 (28.9%) of the patients were in the complex group. The level of agreement between surgery and MRI internal opening was 13.4% and statistically significant (Kappa coefficient of agreement 0.134; $p < 0.01$). Total recurrence was observed in 33(18.3%) patients. Recurrence was statistically significant in patients with external orifice > 3 cm, transsphincteric, complex and patients requiring loose seton in surgery ($p=0.001$, $p=0.001$, $p=0.001$, $p=0.001$, $p=0.007$; $p < 0.01$ respectively).

Conclusion: In our study, we found that the recurrence rate was higher in patients with an external orifice of more than 3 cm, transsphincteric, 3-4th degree complex fistulas, and patients with loose setons.

Keywords: Anal fistula, magnetic resonance imaging, recurrence, classification

INTRODUCTION

Perianal fistula is an abnormal condition that develops between the anal canal and the perineal skin or in the perianal region.¹ Anal fistula results from infected anal glands, most commonly secondary to perianal abscesses.² Although the overall incidence is not high, it causes serious morbidity in young and middle-aged men.³ Anal fistula is a vexing problem due to their its high recurrence rate and serious postoperative complications. Patients with perianal fistulas may be completely asymptomatic or present with local pain and discharge.⁴ In general, anal fistulas do not heal spontaneously and require surgical management. The primary aims of surgery are to control the local infection, eliminate the fistula and achieve of anal continence.⁵ The classification of the

fistula, the degree of involvement of the surrounding pelvic structures, secondary tracts and abscesses are factors that affect the success of surgical treatment. Therefore, physical examination alone is not as successful as imaging methods in detecting these features of the fistula and recurrences are usually due to missed or inadequately treated infectious components. Therefore, accurate and comprehensive preoperative evaluation of perianal fistulas is an important diagnostic strategy that can increase the success rate of surgery.⁶

Magnetic resonance imaging (MRI) is the most accurate and widely accepted gold standard imaging modality for defining the anatomy of the anal canal and perianal fistulas.⁷

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The use of MRI for the preoperative evaluation of perianal lesions can help to accurately identify potential risk factors and assist in the selection of the best surgical approach to minimize recurrence. Recurrences are common and difficult to manage after anal fistula surgery and can lead to significant morbidity, multiple surgeries, increased local fibrosis and increased risk of continence problems. This has a negative impact on patient's quality of life.

The aim of this study was to evaluate the compatibility of MRI with surgery in perianal fistula and its characterization and to determine the parameters that may be effective in recurrence.

METHODS

The study was carried out with the permission of Göztepe Prof. Dr. Süleyman Yalçın City Hospital Ethics Committee (Date: 23.08.2023, Decision No: 2023/0546). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study was conducted at a single center. Surgically treated patients with perianal fistula between 2016 and 2023 in the department of General Surgery were investigated retrospectively. Patients between 18-77 years of age with a perianal fistula and preop MRI were included. We obtained an informed consent form from all patients for procedure.

Exclusion criteria were as follows: patients with other perianal diseases, fistula due to inflammatory disease, recurrent cases, secondary operations with seton exchange and patients who did not attend regular follow-up visits. All surgical procedures were performed by a surgeon with at least 10 years of proctologic experience. All MRI results were evaluated by a radiologist with 5 years of experience in abdominal radiology in perianal diseases. Demographic data and operative notes were documented from the hospital data system. Parks and Standard Practice Task Force (SPTF) classification, St. James classification, presence of abscess, internal orifice status and level, secondary tract, and external orifice information were obtained from MRI imaging. Fistulas were classified as high and low type according to the position of the internal opening. Parks classification was performed according to intersphincteric, transsphincteric, suprasphincteric and extrasphincteric types. In SPTF classification, fistulas were defined as simple and complex fistulas.

In the postoperative period, patients with clinical discharge examination findings after the 3rd month were considered as recurrent fistulas. The internal and

external opening areas were determined according to the clock dial and the agreement between MRI and surgical findings was compared. Disease-free survival was analyzed.

Statistical Analyses

NCSS (Number Cruncher Statistical System) 2020 Statistical Software (NCSS LLC, Kaysville, Utah, USA) was used for statistical analyses while evaluating the findings obtained in the study. While evaluating the study data, quantitative variables were shown with mean, standard deviation, median, min and max values, and qualitative variables were shown with descriptive statistical methods such as frequency and percentage. Shapiro Wilks test and Box Plot graphs were used to evaluate the conformity of the data to normal distribution. Kappa concordance test was used to compare qualitative data. Kaplan Meier test was used for disease-free survival analysis. Cox regression analysis was used to determine the risk factors affecting recurrence. Results were evaluated at 95% confidence interval and significance was evaluated at $p < 0.05$ level. Sensitivity: The ability of the test to identify patients among real patients. Specificity: The ability of the test to identify intact patients among the real intact patients. Positive predictive value: A measure of the conditional probability that the subject is actually sick when the test gives a positive (sick) result. Negative Predictive Value: The probability that the subject is actually healthy when the test gives a negative (healthy) result.

RESULTS

A total of 180 patients were included in the study, of whom 77.2% (n=139) were male and 22.8% (n=41) were female. The age of the patients ranged between 18 and 77 years, with a mean age of 43.75 ± 12.57 years (**Table 1**).

Table 1. Distribution of descriptive characteristics

		n (%)
Gender	Male	139 (77.2)
	Female	41 (22.8)
Age	Mean \pm SS	43.75 \pm 12.57
	Median (Min-Max)	43 (18-77)

The external orifice was below 3 cm in 61.7% (n=111) and above 3 cm in 38.3% (n=69) of the cases. When the St. James' grades of the cases were analyzed according to MRI; 57.2% (n=103) were grade 1, 12.2% (n=22) were grade 2, 21.1% (n=38) were grade 3, 8.9% (n=16) were grade 4, 0.6% (n=1) were grade 5. When analyzing the Parks' classifications, 66.7% (n=120) of the cases were intersphincteric, 32.2% (n=58) were transsphincteric and 1.1% (n=2) were suprasphincteric. In the SPTF classification, 71.1% (n=128) were simple, while 28.9%

(n=52) were complex. The MRI findings of the fistula orifice level, secondary tracts, abscesses and their locations, and the findings of the fistula external orifice regions according to the clock quadrant are given in the table. (Table 2)

When the surgical methods applied were analyzed; 26.1% (n=47) loose seton, 23.9% (n=43) cutting seton, 21.1% (n=38) fistulotomy, 22.8% (n=41) fistulectomy, 2,2% (n=4) were LIFT, 10% (n=18) laser, 5.6% (n=10) drainage, and 0.6% (n=1) anocutaneous advancement flap. Drainage procedure was additionally performed in 5 fistulotomy, 3 loose seton, 1 cutting seton and 1 fistulectomy cases in cases with abscess. Considering the patients who underwent more than one surgical procedure in the same case; fistulectomy and loose seton were performed in 6 cases, fistulotomy and loose seton in 3 cases, and fistulectomy and cutting seton in 3 cases.

Recurrence was observed in 18.3% of the cases (n=33). The duration of recurrence varied from 5 to 72 months; the mean duration was 21.06±19.82 months.

According to the result of surgical orifice, 92.8% (n=167) of the cases were positive, whereas according to the MRI result, 99.4% (n=179) of the cases were positive. While 13 cases with negative surgical internal opening results, only 0.6% (n=1) of these cases were negative and 6.7% (n=12) were positive by MRI. While 167 cases with positive surgical internal orifice results were detected, 92.8% (n=167) of these cases were positive by MRI. The agreement between surgical and MRI internal orifice results was 13.4% and was found to be statistically significant (Kappa coefficient of agreement: 0.134; p<0.01). Accordingly, the sensitivity of the test was 100%, specificity was 7.69%, positive predictive value was 93.3%, negative predictive value was 100%, and accuracy was 93.33%. (Table 3)

Table 3. Evaluation of the compatibility of internal opening sites in MRI and surgery

	Surgery-site of internal opening			P
	Absent n (%)	Present n (%)	Total n (%)	
MRI- site of internal opening				0.001** Kappa=0.134
No	1 (0.6)	0 (0)	1 (0.6)	
Yes	12 (6.7)	167 (92.8)	179 (99.4)	
Total	13 (7.2)	167 (92.8)	180 (100)	
Sensitivity	100.0			
Specificity	7.69			
Positive predictive value	93.30			
Negative predictive value	100.0			
Accuracy	93.33			

**p<0,01

Table 2. Distribution of characteristics of the cases

	n (%)
External opening	
<3 cm	111 (61.7)
>3 cm	69 (38.3)
MRI St. James's grade	
Grade 1	103 (57.2)
Grade 2	22 (12.2)
Grade 3	38 (21.1)
Grade 4	16 (8.9)
Grade 5	1 (0.6)
MRI Park's classification	
Intersphincteric	120 (66.7)
Transsphincteric	58 (32.2)
Suprasphincteric	2 (1.1)
MRI SPTF classification	
Simple	128 (71.1)
Complex	52 (28.9)
MRI opening level	
Low site	174 (97.2)
High site	5 (2.8)
MRI secondary tract	
No	156 (86.7)
Yes	24 (13.3)
MRI internal opening	
No	1 (0.6)
Yes	179 (99.4)
Surgery external opening	
No	13 (7.2)
Yes	167 (92.8)
MRI site of internal openings	
6-8 o'clock	104 (57.2)
3-5 o'clock	27 (15.0)
12-2 o'clock	31 (17.2)
9-11 o'clock	18 (10.0)
Abscess	
No	158 (87.8)
Yes	22 (12.2)
Abscess site	
Intersphincteric	14 (63.6)
Perianal region	7 (31.8)
Supralevator	1 (4.5)
External opening site-MRI	
6-8 o'clock	110 (61.1)
3-5 o'clock	38 (21.1)
12-2 o'clock	18 (10)
9-11 o'clock	14 (7.8)
External opening site at surgery	
6-8 o'clock	105 (58.3)
3-5 o'clock	37 (20.6)
12-2 o'clock	17 (9.4)
9-11 o'clock	13 (7.2)
Multiple	8 (4.4)
•Surgical method	
Loose seton	47 (26.1)
Cutting seton	43 (23.9)
Fistulotomy	38 (21.1)
Fistulectomy	41 (22.8)
LIFT	4 (2.2)
Laser	18 (10.0)
Drainage	10 (5.6)
Advacement flap	1 (0.6)
Recurrence	
No	147 (81.7)
Yes	33 (18.3)
Recurrence time (months) (n=33)	
Mean±Ss	21.06±19.82
Median (Min-Max)	12 (5-72)

•More than one surgical method was applied. LIFT: ligation of the intersphincteric fistula tract. SPTF:Standard Practice Taske Force

There were 105 cases with surgical external sinus opening in the 6-8 region, and 61% (n=105) of the cases were found in this region by MRI. There were 37 cases with surgical external sinus orifice in the 3-5 region, while only 20.3% (n=35) of the cases were detected in the 3-5 region by MRI. There were 17 cases with surgical external opening in the 12-2 region, and 9.9% (n=17) of the cases were found in this region by MRI. There were 13 cases with surgical external opening in the 9-11 region, while only 7% (n=12) of the cases were found in the 9-11 region by MRI. The agreement between surgical and MRI external orifice results was 96.9% and statistically significant (Kappa coefficient of agreement: 0.969; p<0.01). Accordingly, the sensitivity of the test was 100%, specificity 62.80%, positive predictive value 95.20%, negative predictive value 100% and accuracy 98.30%. (Table 4) There was a statistically significant difference between internal and external orifice on MRI in cases with an external orifice above 3 cm (p=0.001; p<0.01). The ratio of patients with an external opening zone of 6-8 on MRI to internal opening zones of 6-8 and 9-11 on MRI was higher than the ratio of patients with an internal opening zone of 3-5 and 12-2 on MRI. (Table 5)

Univariable and multivariable Cox proportional hazards regression analyses were performed to determine the factors affecting recurrence. In univariable evaluations, the effects of external orifice, St. James'

grade, Park's classification and, SPTF classification on MRI, loose seton surgical method on recurrence were found to be statistically significant (p=0.001, p=0.001, p=0.001, p=0.001, p=0.001, p=0.001; p=0.007; p<0.01, respectively). The level of dehiscence on MRI, surgical internal orifice, internal opening zone on MRI, and surgical methods of cutting seton, fistulotomy, and fistulectomy did not differ significantly according to recurrence (p>0.05).

Variables that were found to have significant or near significant (p<0.200) effects in the univariable evaluation were included in the multivariable evaluation. As a result of the evaluation performed using the Enter method, it was observed that Park's classification on MRI and SPTF classification on MRI were significantly included in the model. When intersphincteric was taken as the reference value in Park's classification on MRI, transsphincteric was found to increase the recurrence rate 5.568 times [HR (95% CI)= 5.598 (1.613-19.219), p=0.007]. When low localization was taken as the reference value in SPTF classification on MRI, high localization was found to increase the recurrence rate by a factor of 3.240 times [HR (95% CI)= 3.240 (1.094-1.117), p=0.044]. (Table 6) In a total of 180 operations, 147 patients (81.7%) survived disease-free, while 33 recurrences were observed. The mean disease-free survival was 79.483±2.417 (95% CI: 74.746 - 84.220) months (Figure).

Table 4. Evaluation of the compatibility of external opening sites in MRI and surgery

	Surgery-site of external opening				Total n (%)	P
	6-8 n (%)	3-5 n (%)	12-2 n (%)	9-11 n (%)		
MRI- site of external opening						0.001** Kappa=0.969
6-8	105 (61.0)	2 (1.2)	0 (0)	1 (0.6)	108 (62.8)	
3-5	0 (0)	35 (20.3)	0 (0)	0 (0)	35 (20.3)	
12-2	0 (0)	0 (0)	17 (9.9)	0 (0)	17 (9.9)	
9-11	0 (0)	0 (0)	0 (0)	12 (7.0)	12 (7.0)	
Total	105 (61.0)	37 (21.5)	17 (9.9)	13 (7.6)	172 (100.0)	
Sensitivity	100.0					
Specificity	62.80					
Positive predictive value	95.20					
Negative predictive value	100.0					
Accuracy	98.30					

**p<0,01

Table 5. Comparison of internal and external opening sites on MRI in cases with external opening >3 cm (N=69)

	MRI-site of internal openings				P
	6-8	3-5	12-2	9-11	
MRI-site of external openings					0.001**
6-8	19 (59.4)	2 (22.2)	5 (27.8)	7 (70.0)	
3-5	7 (21.9)	6 (66.7)	6 (33.3)	0 (0)	
12-2	0 (0)	0 (0)	6 (33.3)	0 (0)	
9-11	6 (18.8)	1 (11.1)	1 (5.6)	3 (30.0)	

Fisher Freeman Halton Test, **p<0,01

Table 6. Univariate and multivariate assessments of risk factors on recurrence

DF	Nux		Univariable		Multivariable	
	No	Yes	HR (95% CI)	p	HR (95% CI)	p
External opening						
<3 cm	100 (90.1)	11 (9.9)	Reference			
>3 cm	47 (68.1)	22 (31.9)	3.745 (1.813-7.737)	0.001**	0.967 (0.354-2.642)	0.948
MRI St. James's grade						
Grade 1	96 (93.2)	7 (6.8)	Reference	0.001**		0.060
Grade 2	20 (90.9)	2 (9.1)	1.298 (0.270-6.251)	0.745	1.930 (0.395-9.438)	0.417
Grade 3	25 (65.8)	13 (34.2)	6.644 (2.633-16.766)	0.001**	5.906 (0.002-1.783)	0.900
Grade 4	6 (35.3)	11 (64.7)	16.917 (6.479-44.175)	0.001**	2.218 (0.005-6.718)	0.888
MRI Park's classification						
Intersphincteric	111 (92.5)	9 (7.5)	Reference			
Transsphincteric	35 (60.3)	23 (39.7)	7.202 (3.308-15.678)	0.001**	5.568 (1.613-19.219)	0.007**
MRI SPTF classification						
Simple	115 (89.8)	13 (10.2)	Reference			
Complex	32 (61.5)	20 (38.5)	4.840 (2.396-9.774)	0.001**	3.240 (1.094-1.117)	0.044*
MRI opening level						
Low site	142 (81.6)	32 (18.4)	Reference			
High site	4 (80)	1 (20.0)	0.848 (0.116-6.216)	0.871		
Surgery internal opening						
No	11 (84.6)	2 (15.4)	Reference			
Yes	136 (81.4)	31 (18.6)	1.305 (0.312-5.456)	0.716		
MRI internal opening						
6-8 o'clock	82 (78.8)	22 (21.2)	1.938 (0.456-8.240)	0.371		
3-5 o'clock	22 (81.5)	5 (18.5)	1.710 (0.332-8.812)	0.522		
12-2 o'clock	27 (87.1)	4 (12.9)	1.175 (0.215-6.417)	0.852		
9-11 o'clock	16 (88.9)	2 (11.1)	Reference	0.687		
Surgical procedures						
Loose Seton						
No	115 (86.5)	18 (13.5)	Reference			
Yes	32 (68.1)	15 (31.9)	2.560 (1.289-5.088)	0.007**	1.200 (0.543-2.625)	0.652
Cutting seton						
No	110 (80.3)	27 (19.7)	1.375 (0.567-3.334)	0.480		
Yes	37 (86.0)	6 (14.0)	Reference			
Fistulotomy						
No	113 (79.6)	29 (20.4)	2.185 (0.768-6.222)	0.143		
Yes	34 (89.5)	4 (10.5)	Reference			
Fistulectomy						
No	112 (80.6)	27 (19.4)	1.530 (0.631-3.710)	0.347		
Yes	35 (85.4)	6 (14.6)	Reference			

*p<0,05 , **p<0,01

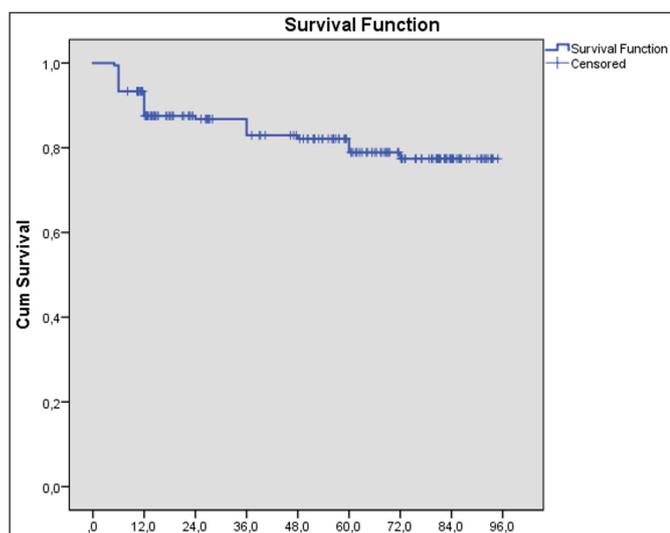


Figure. Disease free survival graph in all cases

DISCUSSION

Most cases of perianal fistula are considered idiopathic and the most common theory of pathogenesis is the cryptoglandular hypothesis. Perianal fistula mainly affects young and middle-aged men. Our study included 139 males and 41 females with a median age of 42 (18-77) and 45 (25-74) years, respectively. These results are consistent with the literature.⁸

In the surgical management of anal fistulas, it is very important to control infection, and identify secondary tracts and define the relationship of the tracts to the sphincteric musculature.⁹⁻¹¹ We may not have information about these features by physical examination alone, and MRI is the gold standard for recognizing these features.¹² It has been shown that surgeons' awareness of MRI

results before perianal fistula surgery can decrease the recurrence rate.¹³ While most patients have a single tract, multiple tracts can be detected in some patients. In our study, 156 and 24 patients had single and multiple tracts, respectively. The classification of perianal fistulas according to MRI results is very important in terms of the chances of successful treatment. In the Park classification, the course of the fistula tract is divided into 4 groups as intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric according to its relationship with the internal and external anal sphincters. In our study, the intersphincteric group was found in 120 (66.7%) cases and the transsphincteric group was found in 58 (22%) cases in accordance with the literature.⁶ Evaluating the fistula channel, secondary tracts and associated abscesses with the findings obtained from MRI, the St. James classification is classified into 5 degrees.¹⁴ In our study, grade 1 constituted the largest group with 103 (57.2%) cases. According to SPTF classification, there were 128 (71.1%) simple and 52 (28.9%) complex cases. Fluid collection in the perianal region or enlargement of the fistula diameter more than 10 mm is considered as abscess. We detected abscess in 22 (12.2%) cases in our series.

In order to use the appropriate surgical option, the course of the pathway between the fistulas should be well known and defined.^{15,16} The agreement between the results of surgical opening of the fistula external opening according to the clock quadrant was found to be significant at 96.9%. Accordingly, the sensitivity of the test was 100%, specificity 62.8%, PPV 95.2%, FPV 100% and accuracy 98.3%. In a study that evaluated MRI findings of internal opening and surgical findings, sensitivity and specificity were 85.4% and 80%, respectively.¹⁷ In our study, we found agreement of 13.4%, sensitivity 100%, specificity 7.69%, PPV 93.3%, FPV 100% and accuracy 93.3% in evaluating internal orifice compliance.

A serious rate of recurrence occurs after anal fistula surgery. According to a meta-analysis, the recurrence rate was reported between 10%-57%.¹⁸ In our series, the recurrence rate was 18.3%. It is important that the disease with such a wide range of recurrence rates can be quite complex and that no single surgical method is the most effective. In addition to partial sphincter-sparing procedures such as fistulotomy, fistulectomy and cutting seton, many sphincter-sparing methods such as loose seton, advancement flap, ligation of the intersphincteric fistula tract (LIFT), fibrin glue, fistula plug (FP), Fistulo-tract Laser Closure (FiLaC), video assisted anal fistula treatment (VAAFT) have been used and the search is still continuing. Depending on the type of fistula, sphincter-sparing may be chosen for

those with a high probability of recurrence, while more aggressive techniques with more precise results may be chosen for those with a low probability of recurrence. In a study, inadequate preoperative diagnosis and incomplete incision of the internal orifice were found to be important in recurrence.¹⁹ In Cox regression analyses performed for factors affecting recurrence in our series, higher recurrence rates were found in fistulas with an external opening of more than 3 cm, transsphincteric, grade 3-4 and complex fistulas. In a meta-analysis, the overall recurrence rate was found to be 20%. Previous anal surgery, high-transsphincteric fistulas, inability to detect the internal orifice, horseshoe fistulas, multiple fistula tracts and operations using seton were found to have higher recurrence rates.²⁰ In our study, recurrence was significantly higher in patients who underwent loose seton operation ($p=0.007$; $p<0.01$).

Limitations of our study; the study was retrospective and recurrence cases and patients with previous surgery were not included. Postoperative management differences of patients and the number of all operations were not close to each other to evaluate recurrence.

CONCLUSION

Magnetic resonance imaging has become a prerequisite for a successful surgical procedure due to its sensitivity and accuracy for all types of perianal fistulas. In addition to showing the internal and external orifice of fistulas, it is also a modality that can be used for classification. Our study evaluated the internal and external orifice of fistulas on MRI findings compared with surgical exploration findings and found statistical agreement. Advanced surgical procedures for anal fistula, a complex and recurrent disease, are constantly being investigated. In our study, we found a higher recurrence rate in patients with external orifice >3 cm, transsphincteric, grade 3-4 complex fistulas and loose seton use. Pragmatic large cohort studies are needed to understand the relationships and specific factors between certain factors and recurrence using objective data synthesis methods. Our study strengthens clinical awareness by identifying patients at high risk of recurrence and managing them accordingly.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Göztepe Prof. Dr. Süleyman Yalçın City Hospital Ethics Committee (Date:23.08.2023, Decision No: 2023/0546).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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