Original Investigation

Pilonidal Sinus Disease: An Analysis of the Factors Affecting Recurrence

Murat Kanlioz, MD; Uğur Ekici, MD; Faik Tatli, MD; and Turgay Karatas, MD

ABSTRACT

OBJECTIVE: To assess the success of treatment methods at reducing recurrence, the most important problem in pilonidal sinus disease (PSD), along with factors affecting the occurrence of PSD and posttreatment recurrence.

METHODS: The researchers retrospectively analyzed files of patients treated for PSD between 2003 and 2018. Three study groups were created: G1, G2, and G3. G1 included all PSDs with recurrence, and a comparable number of cases without recurrence were selected randomly for the G2 group. The control group, G3, included healthy individuals without PSD. In all groups, the following were recorded: body mass index, skin color and oiliness, family history of PSD, hair overgrowth, smoking habit, time spent sitting per day, and number of baths per week. The following were additionally recorded for G1 and G2: treatment methods, follow-up periods, pretreatment abscess(es), and time of onset of complaints before treatment. The number of recurrences and the period between last treatment and recurrence were also recorded for G1.

RESULTS: G1 comprised 234 patients; G2, 247 patients; and G3, 128 healthy individuals. The significant factors causing recurrence included body mass index, family history, bathing habits, hair overgrowth, skin color and oiliness, time spent sitting per day, smoking habit, abscess(es), and duration of symptom(s) ($P < .05$). Limberg flap repair was the most successful treatment method. Sixty-three (27%), 135 (58%), and 185 (79%) recurrences occurred in the first 6 months, in the first year, and in the first 2 years, respectively.

CONCLUSIONS: The researchers recommend Limberg flap repair for treatment. It is possible to reduce recurrence by taking preventable factors into consideration.

KEYWORDS: etiological factors, follow-up time, pilonidal sinus disease, recurrence, treatment methods, treatment success

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INTRODUCTION

Pilonidal sinus disease (PSD) was first described by Hodges.[1] As a result of many years of debate on the congenital or acquired nature of PSD, a consensus has been reached that PSD is an acquired, infectious, chronic disease.[2] Starting at approximately 5 cm from the anus in the anal cleft in the sacrococcygeal region, PSD is characterized mostly by multiple sinus tracts in the midline and manifests with hair accumulation in the sinus.[3] Although the disease presents geographic differences, the female-to-male ratio ranges from 1:3 to 1:5. It occurs mostly between the ages of 20 and 25 years, although it may occur earlier in women.[4]

Today, there are many surgical and nonsurgical methods described for PSD treatment. However, no consensus has so far been reached on optimal treatment because of the cosmetic concerns, posttreatment complications, treatment duration and costs, and, most importantly, posttreatment recurrence. In terms of recurrence, surgical treatments including Limberg flap repair (LFR) and Karydakis flap repair (KFR) are the most common.[5] Apart from treatment, many other factors are implicated in recurrence, including, but not limited to, extended sitting, high body mass index (BMI), excessive hair growth, dark skin color, oily skin, bath and hygiene habits, presence of active infection and abscesses before treatment, and family history of PSD.[6–8] This study aimed to analyze the factors leading to occurrence of PSD and its recurrence after treatment.

METHODS

The authors retrospectively analyzed the files of patients who received treatment for PSD in Ankara Sincan State Hospital and Malatya State Hospital between 2003 and 2016 and, where required, contacted the patients to find out whether recurrence occurred after treatment. Then, the authors invited those who could pay a visit to the clinic and performed their final check-ups. Those who could not visit the clinic were questioned regarding their

Murat Kanlioz, MD, is General Surgery Specialist, Private Beylikdüzü Kolan Hospital, Clinic of General Surgery, Istanbul, Turkey. Uğur Ekici, MD, is General Surgery Specialist, Istanbul Gelişim University, Istanbul. Faik Tatli, MD, is Associate Professor, Faculty of Medicine, Department of General Surgery, Harran University, Şanlıurfa. Turgay Karatas, MD, is General Surgery and Anatomy Specialist, Faculty of Medicine, Department of Anatomy, İnönü University, Malatya. The authors have disclosed no financial relationships related to this article. Submitted January 31, 2020; accepted in revised form March 11, 2020.

pre- and posttreatment periods, and this information was entered in their files. Only patients with complete available information were included in the study.

The researchers then formed three study groups: G1, G2, and G3. G1 included patients who experienced PSD recurrence. The patients who did not develop recurrence after treatment were included in G2 and were selected by random sampling mainly for the purpose of comparison with G1 patients. Control group G3 included 128 healthy individuals between 18 and 40 years who were not diagnosed with PSD and comprised volunteer participants (patients and patients' relatives) who applied to the authors' outpatient clinic in 2019.

For all patients/individuals in the three groups, the following information was recorded either from their files or after physical examination: age, sex, BMI, skin color (brown, tan, fair), oiliness of skin (oily, normal, dry), family history of PSD (in immediate family), presence (or absence) of excessive hair growth, smoking habit, the average time spent sitting per day, and the number of baths per week. The researchers also recorded the following information for G1 and G2 patients: most recent treatment (phenol therapy [PT], midline primary closure [MPC] after resection, LFR, KFR, other surgical methods [de-epithelialization, mini resection, etc], other nonsurgical methods [laser, curettage, etc]), follow-up periods after treatment, the number of times they developed abscess(es) 4 weeks before treatment, the presence (or absence) of abscess(es) within 4 weeks before treatment, and the time of onset of complaints to the treatment. Also, for the G1 patients, the number of recurrences and the time period between last treatment and recurrence were recorded.

Ethics

This study was approved by the relevant institutional review board. Further, approval was obtained for the use of medical record data provided that the identity of the patients remained confidential. The patients were informed that participation in the study was not a prerequisite for treatment and would not affect the quality of service they would receive. The control group participants were included in the study after they were informed of the research and their written consents were obtained. The study followed the principles of the Declaration of Helsinki.

Statistical Analysis

The researchers used Kolmogorov-Smirnov test to perform distribution analysis of the groups. Group homogeneities, however, were evaluated by Levene test. In groups that met parametric assumptions, the researchers used independent-samples *t* test and analysis of variance, whereas groups that did not meet the parametric conditions were analyzed by Mann-Whitney *U* test and Kruskal-Wallis test. For the groups that showed significant differences, the researchers used one-way analysis of variance for cross-evaluation between groups. In all tests, values less than .05 were considered significant. Analyses were made using SPSS Statistics for Windows version 25.0 (IBM Corp, Armonk, New York).

RESULTS

There were 234 patients (60 women and 174 men) in G1, 247 patients (50 women and 197 men) in G2, and 128 healthy individuals (42 women and 86 men) in the control group G3. Participants had a mean age of 24.42 ± 4.66 years, 24.1 ± 4.02, and 26.52 ± 4.82, respectively.

In the analyses where all groups were evaluated together, the following parameters were found to create significant differences: BMI ($P < .001$), family history of PSD ($P < .001$), time spent sitting per day ($P < .001$), smoking habit ($P < .001$), skin color ($P = .018$), skin oiliness ($P < .001$), number of baths per week ($P < .001$), and excessive hair growth ($P < .001$). Table 1 presents the results and cross-comparative analysis of the groups.

In patients who developed recurrence after PSD treatment, the mean recurrence period was 16.08 ± 16.64 months (women, 9.55 ± 5.9 months; men, 18.33 ± 18.47 months). The treatment method with the longest duration between treatment and relapse was LFR, followed by KFR. The method with the highest likelihood of recurrence was PT in women and MPC in men. Sixty-three (27%), 135 (58%), 178 (76%), and 185 (79%) recurrences occurred in the first 6 months, the first year, the first 18 months, and the first 2 years, respectively (Table 2).

When the researchers compared the successes of the treatment methods in terms of recurrence development, they found that LFR was the most successful treatment, followed by KFR. Table 3 compares the success rates of treatment methods in terms of recurrence. Of the recurrences, 183 (78.2%), 45 (19.2%), and 6 (2.6%) experienced one, two, or three or more recurrences, respectively.

In G1 patients, the mean follow-up period was 17.35 ± 16.92 months (median, 12; minimum, 2; maximum, 94). In G2 patients, the mean follow-up period was 41.17 ± 29.4 months, (median, 32; minimum, 2; maximum, 104). The mean time of onset of PSD-related complaints before treatment was 2.98 ± 0.88 months in G1 and 2.79 ± 0.95 months in G2 ($P = .04$). G1 had significantly fewer abscesses in the last 4 weeks before treatment ($P = .005$; Table 4).

DISCUSSION

Body mass index is an important factor in terms of both the occurrence and recurrence of PSD. In this study, occurrence and recurrence of PSD were most likely in the G1 group, which had the highest mean BMI, followed

Table 1. ANALYSIS AMONG GROUPS

Parameter	G1	G2	G3	*P*
Sex, n (%)				<.05
Female	60 (25.6)	50 (20.2)	42 (32.8)	
Male	174 (74.4)	197 (79.8)	86 (67.2)	
Total	234	247	128	
Age, y, mean ± SD				>.05
Female	24.42 ± 4.66	24.1 ± 4.02	26.52 ± 4.82	
Male	27.2 ± 5.99	25.15 ± 4.68	25.1 ± 4.57	
Total	26.48 ± 5.79	24.94 ± 4.56	25.57 ± 4.68	
Median age, y (minimum-maximum)				>.05
Female	24 (17–36)	23 (17–37)	27 (18–38)	
Male	27 (16–43)	25 (16–42)	24 (17–37)	
Total	26 (16–43)	24 (16–42)	24.5 (17–38)	
BMI, kg/m^2 (mean ± SD)				G1–G2: <.001
Female	27.75 ± 2.36	25.96 ± 2.68	25.82 ± 3.03	G1–G3: <.001
Male	27.67 ± 3.22	26.79 ± 3.08	24.72 ± 2.99	G2–G3: <.001
Total	27.69 ± 3.02	26.62 ± 3.01	25.08 ± 3.03	
Family history of pilonidal sinus, n (%)				G1–G2: = .71
Yes	99 (42.3%)	94 (38.1%)	7 (5.5%)	G1–G3: < .001
No	135 (57.7%)	153 (61.9%)	121 (94.5%)	G2–G3: < .001
Daily sitting time, hr				G1–G2: = .52
Mean ± SD	8.77 ± 2.27	9.01 ± 2.02	7.41 ± 2.02	G1–G3: < .001
Median (minimum-maximum)	9 (4–14)	9 (4–14)	8 (3–12)	G2–G3: < .001
Smoking habit, n (%)				G1–G2: < .001
No smoking	100 (42.7)	142 (57.5)	83 (64.8)	G1–G3: < .001
5 cigarettes or fewer per day	29 (12.4)	35 (14.2)	11 (8.6)	G2–G3: = .8
6–10 cigarettes per day	33 (14.1)	39 (15.8)	17 (13.3)	
11–20 cigarettes per day	47 (20.1)	25 (10.1)	15 (11.7)	
More than 20 cigarettes per day	25 (10.7)	6 (2.4)	2 (1.6)	
Skin color, n (%)				G1–G2: = .62
Brown	83 (35.1)	74 (30)	29 (22.7)	G1–G3: = .016
Tan	121 (51.7)	139 (56.3)	73 (57)	G2–G3: = .07
White	30 (12.8)	34 (13.8)	26 (20.3)	
Skin oiliness, n (%)				G1–G2: = .065
Oily	122 (52.1)	108 (43.7)	28 (21.9)	G1–G3: < .001
Normal	100 (42.7)	115 (46.6)	84 (65.6)	G2–G3: < .001
Dry	12 (5.1)	24 (9.7)	16 (12.5)	
No. weekly baths				G1–G2: = .18
Mean ± SD	2.74 ± 1.52	3.02 ± 1.8	3.85 ± 1.58	G1–G3: < .001
Median (minimum-maximum)	2 (1–7)	3 (1–7)	4 (1–7)	G2–G3: < .001
Excessive hair, n (%)				G1–G2: = .002
No	111 (47.4)	155 (62.8)	119 (93)	G1–G3: < .001
Yes	123 (52.6)	92 (37.2)	9 (7)	G2–G3: < .001

by G2 and G3, respectively. Further, the difference between each group was significant ($P < .001$). In their studies, Sievert et al[4] and Onder et al[9] report that obesity is an important factor in the development of recurrence after PSD treatment, and that the number of cases of PSD have increased in parallel with rates of obesity, which is one of the most important health problems today.

The family history of PSD was approximately seven times higher in G2 and eight times higher in G1 compared with G3 ($P < .001$). Although a positive family history of PSD was significant in the occurrence of disease ($P < .001$), it was insignificant in terms of relapse ($P = .71$). Arnous et al[8] reported that there was a significant difference between patients with and without a family history of PSD in terms of recurrence ($P = .003$). Onder et al[9] also state that family history is a determining factor in recurrence.

Further, the researchers observed that longer daily sitting time was a factor leading to the occurrence of PSD ($P < .001$), but it was not a significant factor in recurrence after treatment ($P = .52$). However, Harlak et al[10] report that extended sitting is among the most important factors

Table 2. DISTRIBUTION OF RECURRENCE BY TREATMENT AND TIME TO RECURRENCE IN PATIENTS WITH PILONIDAL SINUS

Parameter	Phenol Therapy	Midline Primary Closure	Limberg Flap Repair	Karydakis Flap Repair	Other Surgical Methods	Other Nonsurgical Methods	TOTAL
Recurrence, mo							
Mean ± SD	6.36 ± 3.5	11.94 ± 8.55	28.05 ± 23.43	19.33 ± 16.13	6 ± 2.22	4.5 ± 2.74	16.08 ± 16.64
Median (minimum-maximum)	6 (2–13)	10 (3–52)	16 (4–94)	14 (3–63)	5.5 (4–9)	4.5 (2–7)	10 (2–94)
Sex, n (%)							
Female	24 (73)	18 (22)	6 (10)	6 (14)	3 (25)	3 (50)	60 (26)
Male	9 (27)	63 (78)	53 (90)	37 (86)	9 (75)	3 (50)	174 (74)
Total	33	81	59	43	12	6	234
Time to recurrence, % (n)							
6 mo	64 (21)	23 (19)	10 (6)	19 (8)	50 (6)	50 (3)	27 (63)
12 mo	91 (30)	63 (51)	27 (16)	47 (20)	100 (12)	100 (6)	58 (135)
18 mo	100 (33)	81 (66)	51 (30)	72 (31)	100 (12)	100 (6)	76 (178)
24 mo	100 (33)	91 (74)	51 (30)	72 (31)	100 (12)	100 (6)	79 (185)
> 24 mo	100 (33)	100 (81)	100 (59)	100 (43)	100 (12)	100 (6)	100 (234)

causing PSD. Automation and screen time have significantly increased daily sitting time and therefore the incidence of PSD should be expected to increase further in the future.

In terms of smoking habit, there was a significant ($P < .001$) difference between G1 and both G2 and G3, whereas there was no significant difference between G2 and G3 ($P = .8$). Thus the authors conclude that smoking impacts recurrence but is not a determining factor in the occurrence of PSD. The researchers believe that this is attributable to the adverse effects of smoking on tissue perfusion after surgery. Iesalnieks et al[7] point out that smoking adversely affects wound healing after PSD treatment and is also implicated in the formation of pilonidal abscess(es), wound infection, and recurrence.

The authors conclude that dark skin and oily skin increase the likelihood of disease occurrence but that these factors have no effect on recurrence after treatment. These findings are in agreement with the literature.[3] The authors further conclude that the number of baths taken per week influences PSD occurrence but has no correlation with recurrence after treatment in accordance with Harlak et al's conclusions.[10]

In their analysis on excessive hair growth, the authors found significant correlations among groups. Harlak et al[10] report that excessive hair growth and thick hair are among the factors that increase the risk of PSD. Petersen[11] also reported that more PSD was observed in those with excess hair growth.

When all treatment methods were evaluated together, the recurrence rate in the first year was 58%; however, the authors found a recurrence rate of 91% among those treated with PT, 63% for MPC, 27% for LFR, and 47% for KFR upon analysis by treatment groups. Halleran et al[12] noted that 80% of the recurrences occurred in the first year. Although the rate of recurrence among women in G1 was 25.6%, it was 20.2% in G2. Those rates show that the disease recurs more in women. The higher recurrence rates in women are likely caused by choice of treatment because women mostly abstain from high-tech techniques such as PT and MPC because of cosmetic concerns.

Arnous et al[8] emphasized the higher recurrence rates of MPC in their study. In the present study, researchers observed that the most successful technique in terms of preventing recurrence was LFR. In their series of 634 PSD cases, Kartal et al[13] compared MPC, LFR, and KFR techniques and reported MPC as the least and KFR as the most successful treatment in terms of recurrence. Doll et al[14] concluded that flap techniques are more successful than primary closures regardless of geographic area, and yet another study reinforced that LFR is a more successful technique compared with KFR.[5] However, Prassas et al[15] concluded that there was no difference in terms of recurrence between KFR and LFR.

This study showed that the sooner treatment was implemented after the onset of PSD symptoms, the lower the rate of recurrence. The authors also observed that the time between onset of symptoms and treatment was longer in G1 than in G2.

The rate of occurrence of abscess(es) in the last 4 weeks before treatment was 41% in G1 and 29% in G2. This finding suggests that if the researchers can treat the cases that have no abscess in the last 4-week period, the recurrence rate would be low. In a study examining 507 PSD cases, Burney[16] reported that 44% of patients had abscesses before the procedure, and the recurrence rate was highest in those individuals.

Table 3. COMPARISON OF TREATMENT SUCCESS BY RECURRENCE

Treatment Method	Comparator	Difference	*P*
Phenol treatment	Midline primary closure	–5.575	<.001
	Limberg flap reconstruction	–21.687	<.001
	Karydakis flap reconstruction	–12.962	<.001
	Other surgical methods	0.364	1
	Other nonsurgical methods	1.864	.949
Midline primary closure	Phenol treatment	5.575	<.001
	Limberg flap reconstruction	–16.113	<.001
	Karydakis flap reconstruction	–7.387	.1
	Other surgical methods	5.938	<.001
	Other nonsurgical methods	7.438	.002
Limberg flap reconstruction	Phenol treatment	21.687	<.001
	Midline primary closure	16.113	<.001
	Karydakis flap reconstruction	8.725	.349
	Other surgical methods	22.051	<.001
	Other nonsurgical methods	23.551	<.001
Karydakis flap reconstruction	Phenol treatment	12.962	<.001
	Midline primary closure	7.387	.1
	Limberg flap reconstruction	–8.725	.349
	Other surgical methods	13.326	<.001
	Other nonsurgical methods	14.826	<.001
Other surgical methods	Phenol treatment	–0.364	1
	Midline primary closure	–5.938	<.001
	Limberg flap reconstruction	–22.051	<.001
	Karydakis flap reconstruction	–13.326	<.001
	Other nonsurgical methods	1.500	.992
Other nonsurgical methods	Phenol treatment	–1.864	.949
	Midline primary closure	–7.438	.002
	Limberg flap reconstruction	–23.551	<.001
	Karydakis flap reconstruction	–14.826	<.001
	Other surgical methods	–1.500	.992

Table 4. SYMPTOMATIC PERIOD AND PRESENCE OR ABSENCE OF ABSCESS(ES) BEFORE AND AFTER TREATMENT BY GROUP

Parameter	G1	G2	*P*
Follow-up period after treatment, mos			<.001
Mean ± SD	17.35 ± 16.92	41.17 ± 29.4	
Median (minimum-maximum)	12 (2–94)	32 (2–104)	
Pilonidal sinus complaints started several mos before treatment, mean ± SD	2.98 ± 0.88	2.79 ± 0.95	= .04
Abscess in the last 4 weeks before treatment, % (n)			= .005
No	59 (138)	71 (176)	
Yes	41 (96)	29 (71)	
Abscess(es) in the last 4 weeks, n			= .062
None	39	49	
One	96	115	
Two or more	99	83	

Limitations

Patients with no informed consent form and missing data were excluded from the study. Because the authors planned this study to investigate the causes of recurrence after treatment, especially in PSD, they included all patients with recurrence in the study. They then created a group that was large enough to be compared with patients who relapsed after treatment with a randomized sampling method.

CONCLUSIONS

Except for unmodifiable factors such as family history of PSD, oily skin, dark skin color, and so on, it is possible to take precautions against all other causes leading to the development of recurrence after PSD treatment. Individuals can reduce the likelihood of recurrence by avoiding extended sitting, ensuring weight control, epilating the sacrococcygeal area, paying attention to personal hygiene and increasing bathing frequency, receiving PSD treatment at the earliest 4 weeks after abscess treatment, ensuring good wound care after surgery, selecting an appropriate treatment method, and so on. ●

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