

## Comparison of Karydakis Flap versus Tension-Free Primary Midline Closure in Pilonidal Sinus Treatment

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**Abstract:** We aimed to evaluate the perioperative findings and postoperative outcomes of patients with non-infected pilonidal sinus disease (PSD) undergoing Karydakis Flap (KF) or tension-free primary midline closure (TFPC). The medical data of 136 patients who were operated for non-infected pilonidal sinus disease (PSD) by a single surgeon between May 2017 and January 2021 were retrospectively analyzed. A total of 127 patients (mean age of  $25.2 \pm 6.2$  years) were included in the study. There were no significant differences between groups in terms of gender, hematoma, wound dehiscence, infection, recurrence and length of hospital stay ( $p > 0.05$ ). The mean operative time was significantly longer for TFPC group than KF group (27.8 min vs. 35.9 min,  $p < 0.05$ ). Seroma rate was 35.3% in TFPC group, compared to 11.9% of KF group ( $p < 0.05$ ). TFPC method can be preferred as the first treatment for PSD, as it is an easy method and has long-term results similar to Karydakis flap procedures.

### INTRODUCTION

Pilonidal sinus disease (PSD) is a chronic inflammation of the natal cleft, which constitutes a significant portion of patients treated by general surgeons in district hospitals <sup>1</sup>. PSD is usually seen in healthy young men aged 15-30 and has a reported incidence rate of 26/100.000 people per year <sup>2,3</sup>. In the past, the pilonidal sinus was regarded as a malformation and congenital defect, but is now considered an acquired disease. The etiology of PSD is unclear, but may be related to the implantation of loose hair deep into the natal cleft <sup>4</sup>. The development of the disease can be prevented by paying attention to hygiene conditions together with regular shaving or depilation of the perineal area <sup>5</sup>.

Although many treatment methods have been described, there is no consensus on the ideal treatment method for PSD. Discussions in surgical treatment have focused largely on closure techniques. There are a number of defined surgical treatments, including primary midline closure (PMC), tension-free primary midline closure (TFPC), secondary recovery following complete excision of the cyst, Karydakis flap (KF) and Limberg flap transposition (LTF) <sup>6</sup>. This study aimed to evaluate the outcomes of patients with non-infected PSD who underwent either KF or TFPC in pilonidal sinus treatment.

### MATERIALS and METHODS

The data of 136 patients who were operated for non-infected PSD by a single surgeon between May 2017 and January 2021 were retrospectively analyzed. Patients who underwent LTF (n = 1), sinusectomy (n = 3), or marsupialization (n = 1) and had previous PSD surgery (n = 4) were excluded from the study. The patients were divided into two groups according to the type of surgery. The patients who underwent KF were included in group 1 and TFPC group 2. Age, gender, length of hospital stays (LOS), postoperative complications (hematoma, seroma, wound dehiscence, infection, recurrence), overall complication rates, and follow-up time were compared between groups. Recurrence was accepted when a fistula formation, wound dehiscence with abscess or purulent drainage from incision line was observed from any previously healed wound in the first year after the operation.

#### *Surgical procedure*

All operations were performed in the jack-knife position under spinal anesthesia. Two grams of intravenous cefazolin sodium was administered as antibiotic prophylaxis before the induction of

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general anesthesia. The surgical area was shaved free of hair and then washed with povidone-iodine. The skin was pulled on both sides with bandages to expose the intergluteal sulcus. Methylene blue was injected into each sinus orifice before excision. The excision of all sinus tracts and scar tissues was performed deeply until reaching the presacral fascia and surrounding intact fibrolipomatous tissues.

#### ***Karydakís flap procedure***

The surgical technique was performed in the same way as the original description of the Karydakís procedure. An asymmetrical ellipsoid incision involving the sinuses was used. The pilonidal cyst was excised completely up to the presacral fascia with adequate intact surrounding tissue. For the closure of the defect, an advancement flap involving adipocutaneous tissue with a medial edge 1 cm deep and extending 2-3 cm inwards was prepared. After mobilizing the flap, a hemovac drain was routinely placed. The flap was displaced medially and stitched to the presacral fascia using 1/0 polyglactin sutures. The subcutaneous tissue was closed with an interrupted layer of 3/0 absorbable suture, the skin was closed with 2/0 polypropylene vertical mattress suture.

#### ***Tension-free primary closure procedure***

Following the midline elliptical incision, the diseased area was removed up to the presacral fascia with intact surgical margins. To prevent the defect from closing under tension, the fascia of both gluteus maximus muscles were separated approximately 2-3 cm from the overlying subcutaneous tissue and posterior sacral fascia margin. 1/0 polyglactin sutures were advanced through the fascia of the gluteus maximus muscle, the presacral fascia, and the gluteus maximus fascia on the opposite side. After checking for bleeding, a hemovac drain was routinely placed in the presacral fascia in each patient. Pre-prepared sutures were tied. The subcutaneous tissue was closed with a layer of interrupted 3/0 absorbable suture and the skin 2/0 polypropylene vertical mattress suture.

Patients were mobilized as soon as they could tolerate postoperative pain or tension. Topical creams containing nadifloxacin were used in wound dressings in all patients. Hemovac drain was removed when drainage was less than 25 mL per day for two days in a row. The patients were advised to protect the operation area for 10-15 days postoperatively and not to expose this area to excessive pressure. Stitches were removed according to the wound healing status.

#### ***Statistical analysis***

SPSS (Statistical Package for Social Sciences) for Windows 20.0 program was used for statistical analysis. Along with descriptive statistical methods (mean or median and standard deviation) in the evaluation of study data's; Student T test was used to determine the difference between the means in quantitative groups, and the Chi-square test was used to determine the difference between the means in qualitative groups. A value of  $p < 0.05$  was accepted as statistically significant.

### **RESULTS**

A total of 127 patients (mean age of  $25.2 \pm 6.2$  years) were included in the study. The male:female ratio for the KF group was 48:11 and 53:15 for the TFPC group. There were no significant differences between groups in terms of gender ( $p > 0.05$ ). The mean operative time was significantly longer for TFPC group than KF group (27.8 min vs. 35.9 min,  $p < 0.05$ ). Postoperative complications are summarized in Table 1. There were no significant differences between the two groups regarding hematoma, wound dehiscence, infection, and recurrence.

Seroma rate was 35.3% in TFPC group, compared to 11.9% of KF group ( $p < 0.05$ ). Overall complication rate was 24.4%. In group 1, the complication rate was 22% while in group 2 it was 26.5%. There were no statistical difference between groups for length of hospital stay (3.2 days for KF group vs. 3.5 days for TFPC group,  $p > 0.05$ ).

**Table 1.** Patients' demographics and clinical outcomes.

	KF Group	TFPC Group	Total	P value
Age (years)	25.4 ± 6.2	25 ± 6.3	25.2 ± 6.2	0.717
Gender				
Female	11 (18.6%)	15 (22.1%)	26 (20.5%)	0.799
Male	48 (81.4%)	53 (77.9%)	101 (79.5%)	
Operation time (min)	27.8 ± 4	35.9 ± 5.2	32.1 ± 6.2	<0.0001
Complications (%)				
Hematoma	1 (1.7%)	2 (2.9%)	3 (2.4%)	0.553
Seroma	7 (11.9%)	24 (35.3%)	31 (24.4%)	0.023
Wound dehiscence	3 (5.1%)	5 (7.4%)	8 (6.3%)	0.723
Infection	3 (5.1%)	4 (5.8%)	7 (5.5%)	0.579
Recurrence	1 (1.7%)	5 (7.4%)	6 (4.8%)	0.215
Overall complication	13 (22%)	18 (26.5%)	31 (24.4%)	0.709
Length of hospital stay (day)	3.2 ± 1	3.5 ± 2	3.3 ± 1.6	0.216
Median follow-up time (month)	32 (1-45)	32.5 (20-44)	32 (1-45)	0.496
Total	59 (46.5%)	68 (53.5%)	127	

## DISCUSSION

Pilonidal sinus disease is a chronic benign disease of the sacrococcygeal area<sup>6</sup>. Although the disease is thought to have a hereditary etiology, it has been reported to be acquired recently. Some theories emphasize that shed hair causes the disease, while others state that hair follicles are responsible for the etiology<sup>7,8</sup>. Increased intergluteal sulcus depth leads to an anaerobic environment and increased anaerobic bacteria content. However, the vacuum effect created between heavy hips is thought to play an additional role in the development of PSD. These factors will also play an important role in the recurrence of the disease<sup>9-11</sup>. Today, many conservative and surgical treatment methods are used for PSD treatment, but there is still no approach that is accepted as the ideal treatment, and most importantly, none of them eliminate the risk of recurrence of the disease<sup>12</sup>. Surgical treatment is generally preferred in PSD. The mainstay of surgical treatment for chronic or persistent disease is the excision of all pilonidal sinus tracts<sup>13</sup>. The optimal technique to close the wound following excision is controversial. Although many surgical techniques have been described for PSD, most of these procedures fall short in achieving their goals. The ideal operation for pilonidal sinus treatment should be easy to perform; this technique should be cost-effective, not require long hospitalization, allow early return to social life, and have a low recurrence rate<sup>14-15</sup>.

Karydakias suggested asymmetric excision and primary closure to prevent hair from entering the natal cleft. In this operation, the natal slit was flattened and the incision line was moved laterally from the midline. Karydakias reported a recurrence rate of 1%, a complication rate of 8%, and a length of hospital stay of 3 days<sup>8</sup>. In a similar study using the Karydakias method, the recurrence rate was 4.2% during the follow-up period of approximately 8 years<sup>16</sup>. In another study, the recurrence rate was 2.2%, seroma rate 4.3%, infection rate 5.2%, wound dehiscence rate 8.2% and length of hospital stay was 2.1 days in KF group<sup>17</sup>. In our study, the results in the KF group are consistent with the literature. Primary midline closure has been used in the treatment of PSD for years and is still important as a treatment modality for many surgeons. However, it should be kept in mind that recurrence rates are highest in PMC. Another reason for recurrence is PMC surgeries performed in cases of acute infection. Therefore, it is recommended to plan a sinus excision in another session after abscess drainage is performed and inflammation decreases<sup>18</sup>. One review suggested that the ideal treatment for PSD should not have a midline suture line. In another study, it was emphasized that tension-free healing was the main determinant in the treatment of PSD rather than midline scar tissue<sup>19,20</sup>. In a prospective randomized study comparing KF, LTF and TFPC techniques in pilonidal sinus surgery, the recurrence rates were 6%, 6%, and 4%, respectively, and there was no statistically significant difference between the groups in terms of recurrence rates<sup>21</sup>. In this study, it was said that tension-free primary closure is as effective as a flap procedure and is also easier to perform. Our study had a similar recurrence rate. The recurrence rate in the TFPC group was 7.4%, and when compared with the KF group, there was no statistical difference in terms of recurrence.

The main cause of complications after pilonidal sinus surgery is the dead space and both skin and subcutaneous tension in the operation area<sup>7</sup>. There has been a trend towards using drains, especially after flap procedures. On the other hand, the effectiveness of the use of drains in reducing postoperative recurrence is controversial. Gurer et al said that routine use of drains during the flap procedure didn't affect the recurrence rate, but reduced fluid accumulation and prevented the development of other complications<sup>22</sup>. In our study, a hemovac drain was used routinely in all cases in both groups. The outcomes between the groups in terms of hematoma and wound dehiscence were similar. The seroma rate was higher in the

TFPC group and also the operation time was significantly longer. We thought that detachment of a larger area on the posterior sacral fascia in the TFPC group might have increased the incidence of seroma, and this situation also prolonged the operation time. We do not know if the routine use of drain has an impact on our results, it may have reduced recurrence.

While the flap repositioning methods are considered better in terms of complications and recurrence according to the current literature, recently it has been reported that primary closure methods have good results<sup>23</sup>. In our study, the results are similar between the groups, except for the operation time and seroma. Reoperation is needed especially when recurrence is seen after flap repositioning operations, and this causes serious disorders in the sacrococcygeal region.

## Conclusion

We obtained similar results in the TFPC method compared to the KF procedure. TFPC method can be preferred as the first treatment for PSD, as it is an easy method and has long-term results similar to Karydakias flap procedures.

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