



Surgical outcome between Karydakis flap and Limberg flap in pilonidal sinus: A comparative study

¹Dr. Kolasani Venkata Padmavathi, ²Dr. AY Kshirsagar, ³Dr. Burhanuddin Bhindarwala

^{1,3}Resident, ²Professor, Department of General Surgery, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

Corresponding author: Dr. Kolasani Venkata Padmavathi, Resident, Department of General Surgery, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

Email: dr.padmavathikolasani@gmail.com

ABSTRACT

Aim: The purpose of this study is to evaluate and contrast the surgical efficacy of the karydakis flap and the limberg flap in the treatment of pilonidal sinus.

Materials and Methods: The research consisted of a total of fifty different participants. Group A consisted of 25 patients who were going to have the karydakis flap treatment done, and Group B consisted of 25 patients who were going to have the limberg flap procedure done. Participants were only considered for inclusion in the trial if they had a diagnosis of pilonidal sinus, were between the ages of 16 and 62, and gave their agreement to have the surgery. Individuals who had co-morbid diseases such as diabetes mellitus, immunodeficiency, abscess, recurrence, or secondary infections, as well as those who were not ready to undergo operation, were not included in the research.

Results: With the Karydakis flap technique, the mean operating time was 46.25±2.85 minutes, while for the Limberg flap method, the mean operative time was 58.11±2.89 minutes. In comparison to the Limberg flap approach, the Karydakis flap method resulted in much less blood loss (75-95 ml) during the surgical procedure (85-105 ml). After the removal of the drain, the Karydakis flap had a mean length of 3.7 days, whereas the Limberg flap had a mean duration of 3.4 days. The mean amount of discomfort experienced on day one (3.91 and 6.42) and day four (2.11 and 4.25) after a Karydakis flap or a Limberg flap, respectively. In the Karydakis flap group, the average length of hospital stay was 5.11±1.1 days, which was less than the average length of stay for the Limberg flap group, which was 5.52±0.88 days. In comparison, 9 patients who had the Karydakis flap procedure performed instead of the Limberg flap method presented with a recurrence of their cancer.

Conclusion: Comparable outcomes were seen for both the Karydakis flap and the Limberg flap; however, the Karydakis flap treatment demonstrated a quicker operational time and decreased blood loss. Patients who had Limberg's flap had less early post operation problems, had early pain-free toileting, and had no recurrence of the condition.

Keywords: karydakis flap, limberg flap, pilonidal sinus

Introduction

Pilonidal sinus disease, also known as PSD, is a persistent inflammation and infection of the sacrococcygeal region. It is characterized by a deposit of thin hair in the hair follicles. Pilonidal sinus disease, also known as PSD, is a persistent inflammation and infection of the sacrococcygeal region that is characterized by an accumulation of thin hair in the hair follicles ^[1].

The most typical symptoms are localized soreness, edema, and a purulent discharge from the affected area. As a result of the disease's tendency to recur, it causes severe morbidity in the form of extended periods during which one's schooling or employment are disrupted. Until a few decades ago, PSD was thought to be a congenital disorder; however, many experts now believe that it is an acquired disease rather than a congenital issue. The explanation that Bascom provided for this notion was, "Just the bones go up when humans stand up." It is necessary for the sacrum to grasp and pull up on the skin, fat, and muscles in order for the buttocks to move. The pulling in this location produces a suction action that spreads over the gluteal region. When someone has minor folliculitis, hair will enter the pit as a consequence of the vacuum formed by the activity of the gluteal muscles ^[2,3-5]. After releasing the largest pilonidal sinus case series in 1992, Karydakis came up with the most logical explanation about the aetiology and etiopathogenesis of the illness. His hypothesis is referred to as the "Karydakis Hypothesis." As a consequence of his 35 years of research on pilonidal sinus, he concluded that the aetiology is acquired. This conclusion was reached. The illness is most often brought on by very little trauma to the affected area ^[6]. According to Karydakis^[7], the process of hair penetration serves as the foundation of the pilonidal sinus.

Invaders formed by free hair, the force that produces hair embedding, and the sensitivity of the skin that permits hair embedding deeper in the gluteal region are the three primary factors that lead to hair embedding. When all three of these symptoms are present, a condition known as pilonidal sinus disease may develop ^[7,6]. As a consequence of this, in recent years the vast majority of surgeons have come to the conclusion that the condition is acquired. Excision followed by secondary intention healing, marsupialization, excision followed by primary closure, and various types of excision followed by flap repair are some of the treatment options that are provided. Pilonidal illness is difficult to treat since there is a higher risk of the wound not healing properly, developing a post-operative infection, and experiencing recurrence. Comparing the surgical success rates of the Karydakis flap versus the Limberg flap in patients with pilonidal sinus was the objective of the current investigation.

Materials and Methods

After receiving clearance from the Institutional Ethics Committee, it was an observational research that was carried out at a tertiary care center. The research consisted of a total of fifty different participants. Group A consisted of 25 patients who were going to have the karydakis flap procedure done, and Group B consisted of 25 patients who were going to have the limberg flap procedure done. Participants were only considered for inclusion in the trial if they had a diagnosis of pilonidal sinus, were between the ages of 16 and 62, and gave their

agreement to have the surgery. Individuals who had co-morbid diseases such as diabetes mellitus, immunodeficiency, abscess, recurrence, or secondary infections, as well as those who were not ready to undergo operation, were not included in the research. All of the patients who met the inclusion criteria and provided their permission for the treatment, as well as those who were deemed anesthesiologically fit after undergoing a baseline evaluation were brought into surgery under spinal anaesthetic. On the day of the operation, intravenous antibiotics were given to each one of them individually. Sticky tape was used to retract both buttocks to the side of the patient's body so that the surgeon could have a better view of the surgical area. The patients were then moved into a position that would allow for a better view of the surgical area. After being draped, the surgical area was given a cleaning with a 10% povidone-iodine solution.

In the Limbergflap group, an operation known as rhomboid excision was carried out. The lower end of the incision was made 2 centimeters laterally from the midline, and it covered the entire region where the sinus had spread. The hemostasis was examined with the help of electrocautery. After releasing the flap at the bottom, including the gluteal fascia, and sliding it to the medial side in order to conceal the defect, the goal was to guarantee that there was no strain in the repaired area. Every patient had a suction drain placed in the affected area of their body. In order to seal the subcutaneous tissue, a 2/0 vicryl suture was used, and a 3/0 ethilon mattress suture was used to close the skin. After the quantity of drainage produced by the drain fell below 20 mL/d, it was removed.

Karydakis's definition of the Karydakis flap (KF) group encompasses the operations that are carried out. An asymmetrical elliptic excision was performed using this method. The lower and upper ends of the incision were situated approximately 2 centimeters laterally to the natal cleft. All defective tissues were removed until reaching the healthy borders of the incision. Following that, the medical wound edge was mobilized, and the flap was slid by suturing to the fascia and skin appropriate wound layers on the lateral wound edge that corresponded to one another. This was done in order to close the wound. It was a 2/0 vicrylsuture that was used to close the subcutaneous tissue, and a 3/0 ethilon mattress suture was used to seal the skin. A suction drain was placed in the area of each patient's body that required treatment. When the quantity of draining was less than 20 mL per day, it was removed.

Variables and the many ways for measuring them, together with the various standardization approaches, Age, sexual orientation, and the ability to determine sexual orientation based on age were independent factors. Variables related to outcomes included the length of the surgery, the likelihood of a second occurrence, the length of time spent in the hospital, the amount of time needed to go back to work, early post-operative problems, post-operative discomfort, patient satisfaction, and pain-free toileting.

This study collected information regarding the patient's age, gender, body mass index (BMI), preoperative complaint, preoperative discharge history, preoperative antibiotics use, duration of operation, hospital stay time, drain removal time, painless sitting time, return-to-work or school time, cosmetic dissatisfaction, recurrence, and whether or not the operation was recommended to others. Examining the patients as they were being dressed after surgery allowed for the collection of data. daily access was required in order to the patients' wounds so that they could be dressed. After being evaluated once a week for the first month, the

patient was then evaluated once every month for the first six months. Following that, patients were instructed to get in touch with if they had any difficulties.

Statistical Analyses

Every piece of information was jotted down on a proforma and then put into an excel file. Tables, figures, bar charts, and pie diagrams were used to depict the data, with continuous variables shown as the mean and standard deviation, and categorical variables shown as the frequency and percentage of occurrence. The t-test was used to analyze the mean difference between continuous variables, while the chi-square test was used to analyze the differences between categorical variables. SPSS version 25.0 was used for all of the statistical analyses, and a p-value of less than 0.05 was regarded to be statistically significant.

Results

After obtaining the patients' informed agreement, the current research comprised a total of fifty patients, with group A consisting of twenty-five patients who had the Karydakis flap treatment and group B consisting of twenty-five patients who underwent the Limberg flap procedure. In this study, the average age of patients was found to be 34.11 ± 6.39 years old. The average age of patients who had Limberg flap surgery was 34.61 years old, while the average age of patients who had Karydakis flap surgery was 33.19 years old. Of the total patients, 38 (76%) were male and 12 (24%) were females. Eight females and 17 males underwent the Limberg flap procedure, while four females and 21 males underwent the Karydakis flap procedure. With the Karydakis flap technique, the mean operating time was 46.25 ± 2.85 minutes, while for the Limberg flap method, the mean operative time was 58.11 ± 2.89 minutes. In comparison to the Limberg flap approach, the Karydakis flap method resulted in much less blood loss (75-95 ml) during the surgical procedure (85-105 ml).

Comparison of duration of drain removal among the patients between the groups is shown in following table 1.

Table 1 Basic parameter of the patients

	Limberg flap	%	Karydakis flap	%
Gender				
Male	17	68	21	84
Female	8	32	4	16
Age	34.61		33.19	
Operative time	58.11 ± 2.89		46.25 ± 2.85	
blood loss	85-105 ml		75-95 ml	

Table 2: Comparison of the duration of drain removal

Drain Removal POD	Limberg Flap	Karydakis Flap	p-value
3	13 (52%)	11 (44%)	0.25
4	12 (48%)	11 (44%)	
5	0	3 (12%)	

After the removal of the drain, the Karydakis flap had a mean length of 3.7 days, whereas the Limberg flap had a mean duration of 3.4 days. The mean amount of discomfort experienced on day one (3.91 and 6.42) and day four (2.11 and 4.25) after a Karydakis flap or a Limberg flap, respectively. In the Karydakis flap group, the average length of hospital stay was 5.11 ± 1.1 days, which was less than the average length of stay for the Limberg flap group, which was 5.52 ± 0.88 days.

Table 3: Comparison of distribution of finding of follow-up and scar satisfaction between the groups

	Limberg Flap		Karydakis Flap	
	Number	%	number	%
Follow-up 1 month				
Healthy scar	21	84	16	64
Hypertrophic scar	2	8	3	12
Wound gaping	2	8	6	24
Follow-up 6 month				
Nil	23	92	16	64
Recurrence	2	8	9	36
Scar satisfaction				
No satisfaction	0	0	14	56
Moderate	8	32	9	36
Complete	17	68	2	8

In comparison, 9 patients who had the Karydakis flap procedure performed instead of the Limberg flap method presented with a recurrence of their cancer. The percentage of patients who would suggest the procedure to others, as shown in table 3, applies to both of the available treatment options.

Discussion

The treatment of pilonidal illness is difficult since there is a higher risk of the wound not healing properly, developing a post-operative infection, and experiencing recurrence. In spite of the fact that there were a great number of non-surgical and surgical treatment choices, there was no one method that was universally accepted as being the gold standard. Among the possible procedures are excision followed by secondary intention healing, marsupialization, excision and primary closure, and different kinds of excision followed by

flap repair. Patients diagnosed with pilonidal sinus who were between the ages of 16 and 62 years old were included in the current observational research, which was carried out at the department of surgery. The purpose of this study was to compare the surgical outcomes of the Karydakias flap versus the Limberg flap in the treatment of pilonidal sinus. After obtaining the patients' informed agreement, the current research comprised a total of fifty patients, with group A consisting of twenty-five patients who had the Karydakias flap treatment and group B consisting of twenty-five patients who underwent the Limberg flap procedure.

The average age of patients in this research was determined to be 34.11 ± 6.39 years old, and there was no statistically significant difference in the average age of the patients between the two groups. It was determined by Alvandipour et al. that the patients in their research had a mean age of 34.19 years, with a standard deviation of 10.47 years^[8].

When gender was taken into account, there was a much higher number of males (76%), compared to females (24%). It was discovered that the male to female ratio was 3.17:1. The distribution of patients was same across all three groups, indicating that there was no discernible difference between them. A male majority was detected in previous research as well^[8-13], which is comparable to what was found in the current study. Comparing the Karydakias flap technique to the Limberg flap method, this research discovered that the operating time required by the Karydakias flap method was noticeably less than that required by the Limberg flap method. With the Karydakias flap technique, the mean operating time was 46.25 ± 2.85 minutes, while for the Limberg flap method, the mean operative time was 58.11 ± 2.89 minutes. In a research that was quite similar to the one that is being presented here, Alvandipour et al. found that there was a significant difference in the length of surgery (in minutes) between the groups; specifically, it was shorter in the KF group (29.15 ± 7.69 minutes vs. 23.03 ± 6.06 minutes)^[8]. According to the findings, the length of the Karydakias flap operation is likely to be less than that of the Limberg flap surgery. Ates M et al. reported that the mean operation time for the Karydakias group was shorter (42.32 ± 8.64 minutes) than that for the Limberg group (50.14 ± 6.96 minutes)^[14]. This finding is in accordance with the findings of the current research.

Comparing the Karydakias flap technique to the Limber flap method, the Karydakias flap method was shown to have much less blood loss than the Limber flap approach did when performing the operation. The current investigation demonstrated that there were no patients in any of the groups who had any surgical site infections among them. This was based on an evaluation of surgical site infections. After the removal of the drain, the Karydakias flap had a mean length of 3.7 days, whereas the Limberg flap had a mean duration of 3.4 days. According to a research carried out by Alvandipour et al., fluid collection was the most prevalent postoperative consequence for both groups. Moreover, the KF group had a significantly higher incidence of fluid generation compared to the LF group. In none of the groups was there any sign of a hematoma, hemorrhage, or flap necrosis. In the LF group, there were two patients who had wound infection, whereas the KF group included six patients who developed wound infection. Furthermore, wound dehiscence and recurrence were discovered in one of the patients who was part of the KF group^[8].

It was discovered by Bostanoglu S et al. that patients who had the Karydakias treatment had quicker recovery times after the surgery, while they also spent less time in the hospital and

missed less time from work.^[15] Patients undergoing Karydakis flap surgery had a significantly higher rate of seroma formation, as compared to patients undergoing Limberg flap or modified Limberg flap surgery, according to the findings of a study carried out by Arslan et al. on 295 patients. The study was conducted in the United Kingdom. In addition to this, individuals who received Karydakis flap surgery had a greater incidence of wound dehiscence and flap maceration^[16].

When the hospital stays of the patients in each group were compared to one another, there was found to be no significant difference between the groups; however, the Karydakis flap group had a shorter period of hospital stay (5.11 ± 1.1 days) than the Limberg flap group (5.52 ± 0.88 days). Comparing the LF group to the KF group, the duration of hospital stay (days) in the LF group was greater (1.48 ± 0.50 days vs. 1.41 ± 0.49 days), although this difference did not reach statistical significance. A similar finding was made by Alvandipour et al. in the current research.^[8] Ahmed Z et al. showed that the average length of stay in the hospital for group-A was 2.93 ± 0.66 days, whereas the average length of stay for group-B was 3.97 ± 0.71 days^[17].

In the current research, a comparison was made between the Karydakis flap technique and the Limberg flap method, and 9 patients who had undergone the Karydakis flap method presented with recurrence. In a research conducted by Ates M et al., it was shown that three percent of the patients in the Karydakis group had a recurrence, while six point nine percent of the patients in the Limberg group experienced the same thing^[14]. The researchers Bostanoglu S and colleagues^[15] found that there was no statistically significant difference in the recurrence rate between the two groups. On the other hand, Bostanoglu S et al. found that the Limberg flap group had a greater risk of wound dehiscence, wound infection, and hematoma/seroma. The Karydakis approach, which is one of the most common surgical techniques used in the treatment of Pilonidal sinus illness, should be the preferred method^[15]. This is because the Karydakis approach involves a shorter operation time, a shorter stay in the hospital, less time lost from work, and fewer complications.

Besa et al. reported recurrent illness in one patient, which accounts for 2% of the whole population, in the modified Karydakis group, and in two patients, which accounts for 3% of the total population in the modified Limberg group. In the modified Karydakis group, 58 patients (97 percent) were pleased with the aesthetic result and would suggest the surgery to others. In the modified Limberg group, 43 patients (72 percent) were satisfied with the cosmetic outcome and would recommend the operation. Both approaches are effective in treating pilonidal sinusitis, and the surgery required for either one may be completed in a single day. The modified Karydakis flap has a much shorter time required for operations, a lower incidence of full-thickness wound disruption, and a higher proportion of patients who are satisfied with the procedure^[12]. In a study that was very similar to the one that is being presented here, Bali et al. documented that the use of the Limberg flap was associated with lower rates of complications, shorter lengths of hospital stays, early returns to work, low pain scores, high patient satisfaction, and better complete healing duration^[18].

Conclusion

Comparable outcomes were seen for both the Karydakis flap and the Limberg flap; however, the Karydakis flap treatment demonstrated a quicker operational time and decreased blood loss. Patients who had Limberg's flap had less early post operation problems, had early pain-free toileting, and had no recurrence of the condition. This procedure was suggested to individuals with similar conditions. Because of this, the Limberg flap treatment is still the superior choice for patients when compared to the Karydakis flap procedure.

References

1. Bascom J, Eugene O. Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment. *Surgery*. 1980;87(5):567-72.
2. Alkurt E G, Vardar Y, Tüzün. Comparison of Limberg Flap and Karydakis Flap Repair in Pilonidal Sinus Surgery: A Prospective Case-Control Study. *Cureus*.2022; 14(9): e28933. DOI 10.7759/cureus.28933
3. Bascom J. Pilonidal disease: long-term results of follicle removal. *Dis Colon Rectum*. 1983;26(12):800-7.
4. Mahmood F, Hussain A, Akingboye A. Pilonidal sinus disease: Review of current practice and prospects for endoscopic treatment. *Ann Med Surg*. 2020;57:212-7.
5. Bascom J, Bascom T. Utility of the cleft lift procedure in refractory pilonidal disease. *Am J Surg*. 2007;193(5):606-9. Discussion 609
6. Karydakis GE. New approach to the problem of pilonidal sinus. *Lancet*. 1973;302(7843):1414-5
7. Bascom J, Eugene O. Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment. *Surgery*. 1980;87(5):567-72
8. Alvandipour M, Zamani MS, Ghorbani M, Charati JY, Karami MY. Comparison of Limberg Flap and Karydakis Flap Surgery for the Treatment of Patients with Pilonidal Sinus Disease: A Single-Blinded Parallel Randomized Study. *Ann Coloproctol*. 2019;35(6):313-8
9. Søndena K, Andersen E, Nesvik I, Søreide JA. Patient characteristics and symptoms in chronic pilonidal sinus disease. *Int J Colorectal Dis*. 1995;10(1):39-42
10. Muzi MG, Milito G, Cadeddu F, Nigro C, Andreoli F, Amabile D, *et al*. Randomized comparison of Limberg flap versus modified primary closure for the treatment of pilonidal disease. *Am J Surg*. 2010;200(1):9-14
11. Khan KJ, Ghaffar A, Choudhry S, Irshad K. Comparison of Early Outcome between Modified Limberg and Karydakis Flap Procedures in Patients with Sacrococcygeal Pilonidal Sinus. *PJMHS*. 2016;10(2):631-4
12. Bessa SS. Comparison of Short-term Results Between the Modified Karydakis Flap and the Modified Limberg Flap in the Management of Pilonidal Sinus Disease. *Dis Colon Rectum*. 2013;56(4):491-8
13. Tokac M, Dumlu EG, Aydin MS, Yalcın A, Kilic M. Comparison of Modified Limberg Flap and Karydakis Flap Operations in Pilonidal Sinus Surgery: Prospective Randomized Study. *Int Surg*. 2015;100(5):870-7

14. Ates M, Dirican A, Sarac M, Aslan A, Colak C. Short and long-term results of the Karydakis flap versus the Limberg flap for treating pilonidal sinus disease: a prospective randomized study. *Am J Surg.* 2011;202(5):568-73
15. Bostanoglu S, Sakcak I, Avsar F, Cosgun E, Hamamci E. Comparison of Karydakis technique with Limberg Flap Procedure in Pilonidal Sinus Disease: Advantages of Karydakis technique. *Pak J Med Sci.* 2010;26(4):773-7
16. Arslan K, Kokcam SS, Koksall H, Turan E, Atay A, Dogru O. Which flap method should be preferred for the treatment of pilonidal sinus? A prospective randomized study. *Tech Coloproctol.* 2014;18(1):29-37
17. Ahmed Z, Shahid M, Malik MS, Hussain S. Comparison of karydakis technique with limberg flap procedure for sacrococcygeal pilonidal sinus disease in terms of hospital stay and work loss. *Pafmj,* 2017, 67. (1 se-original articles
18. Bali I, Aziret M, Sözen S, Emir S, Erdem H, Çetinkünar S, *et al.* Effectiveness of Limberg and Karydakis flap in recurrent pilonidal sinus disease. *Clinics.* 2015;70(5):350-5