

COMPARISON OF THE KARYDAKIS FLAP PROCEDURE AND THE LIMBERG FLAP PROCEDURE IN THE TREATMENT OF SACROCOCCYGEAL LOCALIZED PILONIDAL SINUS DISEASE

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Published: 15 December 2025

ABSTRACT

Objective: To compare the outcome of Limberg flap versus Karydakis flap for treatment of sacrococcygeal localized pilonidal sinus disease.

Study Design: Randomized controlled trial

Study place and period: Department of Surgery, Rawalpindi Teaching Hospital, Rawalpindi from July 2025 to November 2025.

Methodology: Total seventy patients were included and randomized into 2 surgical groups. In group A, limberg flap was applied. In group B, patients Karydakis flap was applied. Surgical time was noted. Total hospital stay was also recorded. Patients were also evaluated for complete wound healing and complications including fluid collection, infection, and recurrence necrosis. Data will be recorded in proforma. Data was analyzed in SPSS v.25. Both surgical groups were compared for mean surgical time, hospital stay and days required for complete wound healing by applying independent samples t-test and for complications by applying chi-square test, keeping $P \leq 0.05$ as significant.

Results: The mean age of individuals in Limberg flap group was 45.54 ± 19.73 years and in Karydakis flap group was 58.31 ± 14.34 years. In limberg flap group, there were 23 (65.7%) males and 12 (34.3%) females. In Karydakis flap group, there were 25 (71.4%) males and 10 (28.6%) females. In limberg flap group, the mean surgical time was 44.54 ± 11.11 min and in karydakis flap group was 36.29 ± 8.66 min ($p=0.001$). The mean hospital stay was 3.00 ± 0.77 days vs. 1.57 ± 0.50 days, mean duration of wound healing was 24.37 ± 4.86 days vs. 18.46 ± 2.65 days, fluid collection was observed in 12 (34.3%) vs. 3 (8.6%) individuals, infection in 11 (31.4%) vs. 2 (5.7%) while recurrence in 5 (14.3%) vs. nil (0%), respectively.

Conclusion: The outcomes of Karydakis flap group was better than Limberg flap group.

KEYWORDS: Limberg flap, Karydakis flap, sacrococcygeal localized pilonidal sinus disease, surgical time, complete wound healing

INTRODUCTION

A puncture or a hole in the natal cleft called the pilonidal sinus can become infected and cause excruciating discomfort. It is claimed that the evidence base for treating pilonidal sinus is fast expanding, poorly focused, and of low quality.¹ Despite being prevalent, pilonidal sinus illness is a difficult condition to treat. It typically manifests in the sacrococcygeal region as either an acute abscess or a chronically painful discharging sinus.² The literature has extensively reported complications including carcinomatous transformation, but there is very little information on coccygeal osteomyelitis as a direct consequence of sacrococcygeal pilonidal sinus disease.^{3,4} Owing to the higher prevalence of post-treatment complications and recurrence of the disease, the ultimate management for pilonidal sinus disease has not yet been determined, despite the fact that numerous surgical and nonsurgical approaches have been developed.^{5,6} The optimal choice for better treatment and less recurrence of the disease is still up for debate.^{7,8} The two most popular off-midline closure methods in the management of pilonidal sinus disease are; (i) Limberg flap and (ii) Karydakis flap repair methods. There is currently conflicting evidence regarding the best method.^{9,10} The Limberg Flap proven to be a popular and dependable and primary method with less recurrence, despite the fact that it required difficult surgical skills. It proved to be a successful

surgical treatment for neonatal cleft pilonidal sinus illness because it showed reduced rates of wound infection, dehiscence, and recurrence.¹¹

Rationale of this trial was to compare the outcome of Limberg flap versus Karydakias flap for treatment of sacrococcygeal localized pilonidal sinus disease. It was observed through literature that karydakias flap is more beneficial in terms of less surgical time, thus less exposure of wound to the outer atmosphere, as compared to limberg flap. But conflicting evidence has been reported earlier and no local study conducted before in this regard. Therefore, this trial was conducted to confirm whether the Karydakias flap is more reliable enough to implement for sacrococcygeal localized pilonidal sinus disease and can replace Limberg flap method in local population. This would help to improve surgical practice and in future, the results would be implemented in local setting and treatment of patients by using better flap option at least to avoid prolonged surgeries, early healing and interventions for complications patients.

METHODOLOGY

This randomized controlled experiment was conducted in the Department of Surgery, Rawalpindi Teaching Hospital, Rawalpindi, during July 2025 to November 2025.

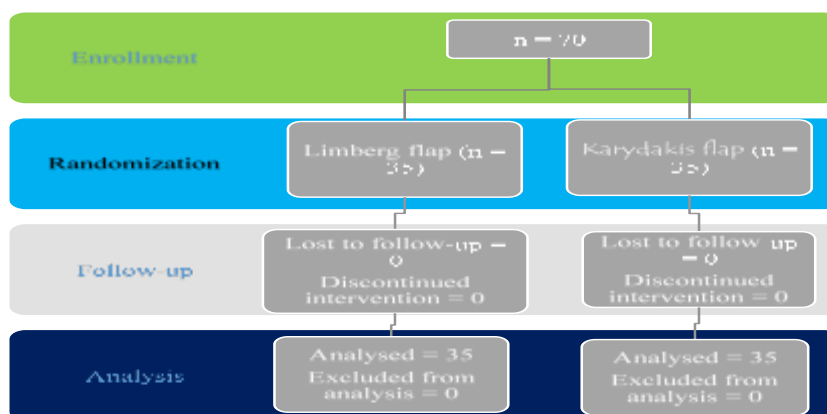
Using openepi.com, a sample size of 70 cases—35 in each group—is determined with a 95% confidence level, a 90% research power, and a mean surgery time of 29.15 ± 7.69 minutes for the Limberg flap and 23.03 ± 6.06 minutes for the Karydakias flap.¹² The Non Probability, Consecutive sampling technique was used to enroll the patients who fulfilled criteria given below:

Inclusion Criteria: Patients aged 20-80 years, both genders presenting with sacrococcygeally localized pilonidal sinus disease were included in the trial. Sacrococcygeal localized pilonidal sinus disease was defined as presence of a sinus in sacrococcygeal area causing subcutaneous cavity lined by granulation tissues and filled with nests of hair for >3 months.

Exclusion Criteria: Pregnant females, scars from previous pilonidal surgery, abscess presentations, immunodeficiency, neurological disorders (as per medical record), drug addiction or alcoholism, ASA III–IV, orifice located > 3 cm from the sinus centre were excluded.

All the patients were included from operation theatre. Written consent was obtained before enrollment. Demographic details including name, age, gender, BMI, duration of symptoms, residence, socioeconomic status, smoking, hypertension, diabetes, anemia, ASA status (I, II), wound size were noted. Then patients were divided randomly into 2 surgical groups by using random number table. In group A, surgery was performed by applying limberg flap. In group B, surgery was performed by applying Karydakias flap. Surgical time was noted in terms of minutest from incision in the skin until stitching at end of procedure. After procedure, patients were moved to post-surgical wards for 48 hours and after recovery, were discharged from there. Post-surgical total hospital stay was noted when patient was able to go to washroom on his own. Then patients were followed-up in OPD for complete healing of wound in terms of days required to heal the surgical wound completely without any complication including infection or necrosis. Total days for complete healing were noted. Patients were also evaluated for complications including fluid collection (serous drainage, or blood serum, from wound with tissue damage), infection (presence of pus at wound site), and recurrence (within 3 months). Data was recorded in proforma.

Figure-1: Patient Flow Diagram (n= 70)



Data was analyzed using SPSS v.25. Numeric variables like age, duration of symptoms, BMI, wound size, surgical time, hospital stay and days required for complete wound healing were calculated as mean $\pm$ SD. Categorical variables like sex, ASA, residence, socioeconomic status, smoking, hypertension, diabetes, anemia, and complications (fluid collection, infection, and recurrence) were presented as frequency and percentage. Both surgical groups were compared for mean surgical time, hospital stay and days required for complete wound healing by applying independent samples t-test and for complications by applying chi-square test, with $p \leq 0.05$ as cut-off for significance level.

RESULTS

In this trial, we enrolled total 70 individuals of pilonidal sinus disease and randomized them in two groups. The mean age of individuals in Limberg flap group was 45.54 ± 19.73 years and in Karydakakis flap group was 58.31 ± 14.34 years. In limberg flap group, there were 23 (65.7%) male and 12 (34.3%) female. In Karydakakis flap group, there were 25 (71.4%) male and 10 (28.6%) female. The mean BMI of individuals in limberg flap group was 27.23 ± 4.78 kg/m² and in karydakakis flap group was 25.70 ± 5.84 kg/m². ASA Physical status I was more commonly observed in both groups than ASA physical status II. In limberg flap group, there were 15 (42.9%) smokers, 11 (31.4%) had hypertension, 14 (40%) had diabetes, and 17 (48.6%) were anemic. In karydakakis flap group, there were 12 (34.3%) smokers, 23 (65.7%) had hypertension, 14 (40%) had diabetes, and 16 (45.7%) were anemic. The mean wound size was 1.94 ± 0.76 cm in limberg flap group and 2.18 ± 0.77 cm in karydakakis flap group. The mean pain score at presentation was 5.34 ± 0.91 in limberg flap group and 5.60 ± 1.06 in karydakakis flap group. The mean duration of symptoms was 16.23 ± 9.01 days in limberg flap group and 17.46 ± 7.56 days in karydakakis flap group. Residence and socioeconomic status are given in table below. Table-I

In limberg flap group, the mean surgical time was 44.54 ± 11.11 min that was significantly higher than karydakakis flap group (36.29 ± 8.66 , $p=0.001$). The mean hospital stay was 3.00 ± 0.77 days vs. 1.57 ± 0.50 days ($p<0.001$), respectively. The mean duration of wound healing was 24.37 ± 4.86 days vs. 18.46 ± 2.65 days ($p<0.001$), respectively. During follow-up period, fluid collection was observed in 12 (34.3%) vs. 3 (8.6%) individuals, infection in 11 (31.4%) vs. 2 (5.7%) while recurrence in 5 (14.3%) vs. nil (0%), respectively. Table-II

Table-I: Demographics and clinical profile of individuals (n = 70)

	Group	
	Limberg flap	Karydakakis flap
n	35	35
Age, years	45.54 ± 19.73	58.31 ± 14.34
Gender		
Males	23 (65.7%)	25 (71.4%)
Females	12 (34.3%)	10 (28.6%)
BMI, kg/m ²	27.23 ± 4.78	25.70 ± 5.84
ASA Physical Status		
ASA I	26 (74.3%)	23 (65.7%)
ASA II	9 (25.7%)	12 (34.3%)
History of		
Smoking	15 (42.9%)	12 (34.3%)
Hypertension	11 (31.4%)	23 (65.7%)
Diabetes	14 (40%)	14 (40%)
Anemia	17 (48.6%)	16 (45.7%)
Wound size, cm	1.94 ± 0.76	2.18 ± 0.77
Pain at presentation, VAS	5.34 ± 0.91	5.60 ± 1.06
Duration of symptoms	16.23 ± 9.01	17.46 ± 7.56
Residence		
Rural	15 (42.9%)	12 (34.3%)
Urban	5 (14.3%)	10 (28.6%)
Semi-urban	7 (20%)	5 (14.3%)
Urban slums	8 (22.9%)	8 (22.9%)
Socioeconomic status		
Low	14 (40%)	17 (48.6%)
Middle	8 (22.9%)	8 (22.9%)
High	13 (37.1%)	10 (28.6%)

Table-II: Comparison of per- and post- surgical outcomes in both groups (n = 70)

	Group		Significance
	Limberg flap n = 35	Karydakis flap n = 35	
Surgical time, min	44.54 ± 11.11	36.29 ± 8.66	0.001!
Hospital stay, days	3.00 ± 0.77	1.57 ± 0.50	<0.001!
Wound healing, days	24.37 ± 4.86	18.46 ± 2.65	<0.001!
Post-surgical complications			
Fluid collection	12 (34.3%)	3 (8.6%)	0.018*
Infection	11 (31.4%)	2 (5.7%)	0.012*
Recurrence	5 (14.3%)	nil	0.054*

Note: ! = independent samples t-test; * = Fischer exact test

DISCUSSION

In this trial, we observed that in limberg flap group, the mean surgical time was 44.54 ± 11.11 min and in karydakis flap group was 36.29 ± 8.66 min (p=0.001). The mean hospital stay was 3.00 ± 0.77 days vs. 1.57 ± 0.50 days, mean duration of wound healing was 24.37 ± 4.86 days vs. 18.46 ± 2.65 days, fluid collection was observed in 12 (34.3%) vs. 3 (8.6%) individuals, infection in 11 (31.4%) vs. 2 (5.7%) while recurrence in 5 (14.3%) vs. nil (0%), respectively.

According to a study by Abd-Elfattah et al., the limberg flap needed a longer mean operating time (51.5±4.17 minutes) than the Karydakis flap (41.7±4.22 minutes), and the mean wound healing time was 21.6±3.41 vs. 18±3.05 days (p<0.05).⁵ In a trial, Alvandippour et al. discovered that the limberg flap required a longer mean operating time (29.15±7.69 min) than the Karydakis flap (23.03±6.06 min). Similarly, the mean hospital stay was 1.48 ± 0.50 vs. 1.41 ± 0.49 days, and the mean wound healing time was 9.56 ± 1.31 vs. 11.51 ± 3.16 days (p<0.05). Fluid collection (11.1% vs. 35.1%), infection (3.7% vs. 8.1%), and recurrence (0% vs. 2.5%) were reported as post- surgical complications.¹²

According to Karaca et al., the hospital stays for the Limberg and Karydakis flap procedures were 1.1 and 1 day, respectively.¹³ In a research by Bali et al., the Limberg flap and Karydakis flap groups spent one and two days in the hospital, respectively. Furthermore, the Limberg and Karydakis flap procedures took 29.25 and 22.03 minutes, respectively, to complete.¹⁴ The reported lengths in a related study were 42.32 and 50.14 minutes, respectively.¹⁵ Karydakis flap surgery takes less time than Limburg flap surgery (22–48 minutes vs. 29–54 minutes), according to the findings of multiple studies.^{14, 16}

Bessa discovered that individuals undergoing modified Limberg flap surgery had much greater wound dehiscence (0 patients vs. 9 patients) in a research involving 120 patients undergoing modified Karydakis flap surgery. Patients undergoing the modified Karydakis flap procedure had comparable overall rate of complications (23% vs. 40%), surgical site infection (3% vs. 5%), and fluid collection (5% vs. 0%). The recurrence rates, however, did not significantly differ between individuals treated with the modified Karydakis flap method and those treated with the modified Limberg flap technique (3% vs. 2%).¹⁷

Additionally, in a research on 295 individuals having pilonidal sinus disease, the risk of developing post-surgical seroma was significantly more with Karydakis flap procedure than with standard or modified Limberg flap procedure (19.8% vs. 5.2% vs. 7.4%). Additionally, risk of wound dehiscence was also high with Karydakis flap (15.4% vs. 2.1% vs. 3.7%).¹⁸

In a comparable study involving twenty patients with pilonidal sinus illness, Jayparakash et al. found that the Karydakis group had a lower mean operating time (41.7 ± 4.22 minutes) than the Limberg group (51.5 ± 4.17 minutes). In both groups, the rate of complications was nearly equal. The Karydakis flap healed considerably faster than the Limberg flap (18 ± 3.05 vs. 21.6 ± 3.41 days, P=0.023). From each group, just one patient (10%) experienced a recurrence. Additionally, they found that although the Karydakis flap requires less time to operate than the Modified Limberg flap, both procedures carry a comparable risk of recurrence and post- surgical problems.¹⁹

Anwar et al. also noted that, in comparison to the Limberg technique, the Karydakis flap required less time for surgery and resulted in a shorter hospital stay after six months of treatment. (p = 0.000) Additionally, Karydakis flap caused less pain (p=0.003). Seroma (p=0.673), infection (p=1.0), and recurrence (p=0.493) were examples of post-surgical complications that were similar in both groups with all (p>0.05). The Karydakis flap was deemed superior to all other flaps in the treatment of pilonidal sinus illness due to its shorter operating time and hospital stay, less pain perception, and similar post-surgical sequelae.²⁰

CONCLUSION

The outcomes of Karydakis flap group was better than Limberg flap group. These findings also matches with results reported in literature and Karydakis was found to be significantly better for the treatment of sacrococcygeal

localized pilonidal sinus disease. Now we observed that Karydakís flap is reliable enough to implement for treatment of sacrococcygeal localized pilonidal sinus disease in local population. In future, we will use karydakís flap for such cases to prevent post- surgical complications and risk of recurrence as well.

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