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Original Research Article

A Comparative Study between Karydakis Procedure versus Rhomboid Excision with Limberg Flap in the Management of Sacrococcygeal Pilonidal Sinus

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Abstract:

Introduction: Pilonidal sinus disease is prevalent in young adults and is often linked to factors such as hirsutism and prolonged sitting, which can lead to chronic inflammation in the sacrococcygeal region.

Aim: To compare the effects and outcomes of the Karydakis procedure versus Rhomboid excision with Limberg Flap in the treatment of uncomplicated sacrococcygeal pilonidal sinus disease.

Material and Methods: This study was conducted at JLN Medical College, Ajmer, from June 2022 to June 2024, and compared the Karydakis flap and Limberg flap surgical techniques. Eighty patients were randomized into two groups: 40 patients who underwent the Karydakis flap and 40 who underwent the Limberg flap.

Results: Key outcomes such as operation time, intraoperative blood loss, postoperative complications, pain scores, healing time, and recurrence rates were assessed. The results indicated that both procedures were effective however, the Limberg flap provided better postoperative pain reduction, quicker recovery and fewer complications. Patient satisfaction was also higher with the Limberg flap, particularly in terms of comfort and cosmetic results. Although the Karydakis flap had a shorter operation time, it resulted in longer hospital stays and more postoperative discomfort.

Conclusion: This study concluded that the Limberg flap is preferable for faster recovery and better outcomes, and further research is needed for comprehensive validation.

Keywords: Pilonidal sinus disease, surgical flap, post-operative complication, Recurrence.

Introduction

Pilonidal sinus is a common condition characterized by chronic inflammation and the development of one or more sinuses in the midline of the natal cleft, typically containing hair and debris. It primarily affects young men and can present with symptoms such as localized pain, swelling, and seropurulent discharge. The condition arises from infected hair follicles, leading to the formation of a sinus tract. In some cases, the disease can involve multiple follicles and result in lateral fistulization, with multiple sinus tracts extending outside the midline [1,2].

The incidence of pilonidal disease varies, with reported occurrences of 26 per 100,000 in the US [3] and 48 per 100,000 in Germany [4]. In India [5], the incidence is estimated to be 6.6% of the general population. The disease is often diagnosed clinically based on the presence of a midline pit or epithelial track in the skin of the natal cleft. Management options for pilonidal sinus include excision with secondary intention healing, marsupialization, primary closure, and flap repair techniques. Surgical options such as rhomboid excision with Limberg flap, Karydakis, V-Y advancement, Z-plasty, and Myocutaneous flaps have been studied for their effectiveness. Among these, flap reconstruction techniques, especially the Limberg flap, have shown success in treating sacrococcygeal pilonidal sinus [6]. These procedures work by flattening the intergluteal sulcus and using fewer hairy fasciocutaneous flaps, which reduces the risk of recurrence and improves overall healing compared

to simpler methods like primary closure.

Aims and Objectives: To compare the effects and outcomes of Karydakis procedure versus Rhomboid excision with Limberg Flap in the treatment of uncomplicated sacrococcygeal pilonidal sinus disease and to determine the difference in both groups with regard to (a) Recurrence of disease (b) Rate of wound healing (c) Duration of hospital stay (d) post-operative complications (e) Operative time and blood loss (f) Patients satisfaction with scar.

Material and Methods

This randomized, prospective study compared the Karydakis procedure and Limberg flap with rhomboid excision for the treatment of uncomplicated sacrococcygeal pilonidal sinus.

Conducted at J.L.N. Medical Hospital (June 2022–June 2024), it evaluates pain, healing, and recurrence through clinical follow-ups at 7 days, 14 days, 1 month, and 6 months post-surgery.

Observations

Table 1: Operation Time and Blood Loss

Operation time (min)	**Group A (KARYDAKIS)**	**Group B (LIMBERG Flap)**
30-45	17 (42.50%)	1 (2.50)
46-60	23 (57.50%)	32 (80.00%)
>60	0 (0.00)	7 (17.50%)
Total	**40**	**40**
Mean ± SD	**46.08 ± 3.60**	**56.20 ± 5.31**
t value = 9.77, p value <0.0001		
Blood Loss (ml)		
<75	0 (0%)	0 (0%)
75-100	40 (100%)	36 (90%)
>100	0 (0%)	4 (10%)
Total	**40 (100%)**	**40 (100%)**
Mean ± SD	**84.75 ± 6.30**	**93.25 ± 9.97**
t value = 4.588, p value <0.0001		

Table 2: Post-Operative

POD-4 pain score	**Group A (KARYDAKIS)**	**Group B (LIMBERG Flap)**
Mild Pain (1-3)	**28 (70%)**	**34 (85%)**
Moderate (4-6)	**12 (30%)**	**6 (15%)**
Severe (7-9)	**0 (0)**	**0 (0)**
Very Severe (10)	**0 (0)**	**0 (0)**
Mean ± SD	**2.85 ± 0.98**	**2.38 ± 0.98**
t value = 2.145, p = 0.0351		
Day of pain free sitting (Days)		
7-14	7 (17.50%)	30 (75%)
15-21	28 (70%)	10 (25%)
>21	5 (12.50%)	0 (0)
Mean ± SD	**17.45 ± 3.55**	**12.45 ± 2.77**
t value = 7.023, p value <0.0001		
Day of pain free toilet sitting (Days)		
<4	1 (2.50%)	6 (15%)
4-5	24 (60%)	25 (62.5%)
>5	15 (37.5%)	9 (22.5%)
Mean ± SD	**5.05 ± 0.88**	**4.63 ± 1.00**
t value = 1.994, p value <0.0001		
Drain Removal (Days)		
5-6	33 (82.50%)	0 (0)
7-8	7 (17.50%)	30 (75%)
>8	0 (0)	10 (255)
Mean ± SD	**5.88 ± 0.69**	**7.88 ± 0.79**
t value = 12.06, p value <0.0001		
Duration of hospital stay (Days)		
1-2	18 (45.00%)	27 (67.50%)
3-4	17 (42.50%)	12 (30.00%)

>4	5 (12.50%)	1 (2.50%)
Mean ± SD	**2.9 ± 1.03**	**2.35 ± 0.66**
t value = 2.84, p value 0.005		

Table 3: Return to the Work (Post-Operative Day)

Return to the work (post-operative days)	Group A (KARYDAKIS)		Group B (LIMBERG Flap)		t value	p value
	Number	Percent	Number	Percent		
8-10	10	25.00	28	70.00		
11-12	19	47.50	10	25.00	**5.186**	**<0.0001**
>12	11	27.50	2	5.00		
Total	**40**	**100.00**	**40**	**100.00**		
Mean ± SD	**11.63 ± 1.31**		**9.98 ± 1.51**			

Table 4: Completely Healed (Post-Operative Days)

Completely Healed (Post-operative days)	Group A (KARYDAKIS)		Group B (LIMBERG Flap)		t value	p value
	Number	Percent	Number	Percent		
15-20	9	22.50	17	42.50		
21-25	15	37.50	13	32.50	**1.934**	**0.56**
>25	16	40.00	10	25.00		
Total	**40**	**100.00**	**40**	**100.00**		
Mean ± SD	**23.6 ± 3.56**		**22.08 ± 3.47**			

Table 5: Patient Satisfaction with Scar

Patient Satisfaction with scar	Group A (KARYDAKIS)		Group B (LIMBERG Flap)	
	Number	Percent	Number	Percent
Poor	5	12.50	2	5.00
Fair	9	22.50	3	7.50
Good	21	52.50	25	62.50
Excellent	5	12.50	10	25.00
Total	**40**	**100.00**	**40**	**100.00**

Table 6: Recurrence of Disease

	Group A (KARYDAKIS)	Group B (LIMBERG Flap)
No. of patients	1	0

Discussion

It has also been determined that the mean operative time for the Karydakis flap procedure is lesser as compared to the Limberg flap procedure (46.08±3.60 vs. 56.20±5.31 minutes) ($p<0.001$). Antony et al. (2022) [7], Padmavathi et al. (2023) [8] and published similar mean operative times (Karydakis: 45.1±3.0 and Limberg: 57.7±3.7 mins), (K:46.25±2.85 mins vs. L:58.11±2.89 mins) respectively. The Karydakis flap procedure could be more time-efficient than the Limberg flap procedure because the Karydakis flap technique is less complicated than the Limberg [8,9].

Intraoperative blood loss was lower with the Karydakis flap procedure compare to Limberg flap procedure (84.75±6.30 vs. 93.25±9.97 ml) ($p< 0.0001$). This finding is consistent with that of Padmavathi et al. (2023)[8] who reported 75-95 ml and 85-95ml for the Karydakis flap and Limberg flap procedure, respectively. It is also consistent with Antony et al. (2022)[7] that reported 70 to 90 ml and 80 to 100 ml for Karydakis flap and Limberg flap procedures, respectively. Both techniques are associated with reduced handling of tissues which results in less blood loss that compared to the traditional techniques.

The pain levels calculated by Visual Analog Scale at different post-operative period, at 24 hours after the surgery the pain was moderate to severe in both group and VAS score was (Karydakis:7.05±1.55 vs. Limberg: 6.70±0.88, $p=0.2180$). The symptoms reduced to a mild to moderate level in both groups, (Karydakis: 2.85±0.98 vs Limberg: 2.38±0.98, $p=0.0351$) after 4 days of surgery. The study by Alvandipour et al. (2019)[10] found no difference between the groups (Karydakis:4.11±1.02 vs. Limberg: 4.00±0.96, $p=0.720$). However, the time point of data collection in the study by Alvandipour et al. (2019)[10] study remains unclear. The days up to pain-free toilet sitting was compare between the

groups (Karydakis: 5.05+0.88 days vs. Limberg: 4.63+1.00 days, p= 0.0496). Days of pain-free sitting were shorter for Limberg flap procedure group (Karydakis: 17.45±3.55 days vs. Limberg: 12.45±2.77 days, p <0.0001). In the study of Ahmed M Nawar et al. (2023)[11] it was found that painless toilet seating in Limberg flap was 4.16+0.85 days and in Karydakis flap it was 5.12+0.78 days with p value <0.0001 and sit without pain was 9.64+5.54 days in Limberg flap and 17.28+6.85 days in Karydakis (p<0.0001). The factors days to pain-free toilet seating and days to pain-free sitting are unique to our study and may be considered as important factors in the future. We found slightly shorter hospital stay for Limberg flap (Karydakis: 2.9±1.03 days vs. Limberg: 2.35±0.66 days, p=0.005). This can be explained by the fact that postoperative care is less complicated and the Limberg flap does not have many complications: hence patients were discharged early and all patients in both groups were discharged with drain in situ. Shorter hospital stays with the Limberg flap also present lower costs to the healthcare system, better resource allocation, and positive outcomes for the patient, which makes the operation more advantageous from medical and fiscal aspects. These results are corroborated by those by Padmavathi et al. (2023)[8] (Karydakis: 5.11±1.10 days vs. Limberg: 5.52±0.88 days) and contraindicated by Antony et al. (2022)[7] (Karydakis: 4.9±1.2 days vs. Limberg: 5.2±0.7 days). The timing of drain removal is critical for post-operative care. In the present study, the Limberg flap took longer time to have the drain (Karydakis: 5.88±0.69 days vs. Limberg: 7.88±0.79 days, p < 0.0001). The finding is in contraindication with Padmavathi et al.[8] (Karydakis: 3.7 days vs. Limberg: 3.4 days, p=0.25) and Antony et al. (2022)[7] (Karydakis: 3.8 days vs. Limberg: 3.5 days, p=0.0186), but fells in the range of 4 to 12 days reported in the literature. This variation could be due to the fact that the Karydakis flap entails more subcutaneous dissection and tension at wound edges that may take longer time to drain to prevent seroma formation. The Limberg flap, due to the rhomboid shape excision, large tissue dissection and tension free closure favors faster drainage and better healing but requires a long drainage time and delayed removal of drains and sutures, improving the patient's comfort and decreasing the anxiety.

Another attribute is the length of hospital stay. We found slightly shorter hospital stay for Limberg flap (Karydakis: 2.9±1.03 days vs. Limberg: 2.35±0.66 days, p=0.005). This can be explained by the fact that postoperative care is less complicated and the Limberg flap does not have many complications: hence patients were discharged early and all patients in both groups were discharged with drain in situ. Shorter hospital stays with the Limberg flap also present lower costs to the healthcare system, better resource allocation, and positive outcomes for the patient, which makes the operation more advantageous from medical and fiscal aspects. These results are corroborated by those by Padmavathi et al. (2023)[8] (Karydakis: 5.11±1.10 days vs. Limberg: 5.52±0.88 days) and contraindicated by Antony et al. (2022)[7] (Karydakis: 4.9±1.2 days vs. Limberg: 5.2±0.7 days).

The present study found a faster return to work for the Limberg flap procedure patients (Karydakis: 11.63±1.31 days vs. Limberg: 9.98±1.51, p<0.0001). There is similar finding amongst the comparative studies Alvandipour et al. (2019)[10] showed that Limberg flap procedure group had a faster return to work (K: 11.59±3.44 vs L: 9.15±2.52, p=0.005). There is significant difference amongst the other comparative studies Mohamed Abd- Elfattah et al. (2020)[12] (K: 14.6±2.46 vs. L: 16.8±2.39, p=0.05) from our study, and Alsesy AA et al. (2016)[13] found that Karydakis group had a faster return (21.73±6.49 vs. 28.66±7.50, p=0.012). Besides enhancing the patients' quality of life, this faster recovery also bears a lot of economic impact, which may in fact mean lower costs to the patients and the health care systems. Fewer days to recovery implies minimal time out of work which may be very important to persons holding high pressure jobs or those with limited sick days.

Approximately 35 out of 40 patients in the Limberg flap procedure group had good to excellent satisfaction with scars compared to 26 out of 40 patients in the Karydakis flap group. Antony et al. (2022)[7] found that the satisfaction level was higher in the Limberg flap procedure group (L: 100% had moderate-to-complete satisfaction vs. 46.7% in the K group, p <0.02). Mohamed Abd Elfattah (2020)[12] found that the cosmetic satisfaction may be higher for Karydakis flap procedure group (K: 7.87.8±1.03 vs. L: 4.2±0.92, p < 0.001). The discrepancy among the studies may be explained by the fact that an observer by Kumar NA et al. (2014)[14] stated that certain disease characteristics, such as the secondary sinus openings being too lateral, could influence the scarring much more than the choice of the procedure.

We found no patients with recurrence in the Limberg group and one case of recurrence in the Karydakis flap procedure. The recurrence rates described for both procedures were quite low across the studies [10,15]. Alvandipour et al. (2019)[10] found that the recurrence rate was the statistically similar (p=0.389), with no patients reporting recurrence in the Limberg flap procedure and one patient in the Karydakis flap procedure. Paudyal S et al. (2019)[15] reported that two of 39 patients had recurrence after undergoing the Limberg flap procedure at follow-up. These low recurrence rates have been attributed to the completeness of the initial excision and the tension free suturing offered

by both the techniques. Patients follow up is critical in order to evaluate the effectiveness of these surgical procedures since recurrences may be seen at a later stage.

Conclusion

The Limberg flap procedure is ideal for patients who prioritize faster recovery, less postoperative pain, and better cosmetic outcomes. Best for those seeking a quicker return to daily activities. The Limberg flap procedure is recommended for larger or recurrent pilonidal sinuses, as it offers reliable healing and lower recurrence rates. Suitable for cases requiring extensive tissue coverage. Both the Karydakis and Limberg Flap techniques are effective, but their selection should be tailored to individual patient needs, considering factors such as the extent of the disease, patient preferences, and desired post-operative results. Further research with larger sample sizes and longer follow-up periods is essential to confirm these findings and guide future surgical practices.

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