Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 1441-1447 | ISSN:2251-6727

Challenging the Midline: A Prospective Comparison Between Traditional Excision and Karydakis Flap in Pilonidal Sinus Management

Kritin Kondeti[1], Suarnalatha R K[1], Ramachandran Ponniah Iyyappan[1] , Dhiliphan A M[1], Sanniyasi Saravanan[2]

Department Of General Surgery ,Sri Ramachandra Institute Of Higher Education And Research

Corresponding author :Suarnalatha R K

(Received: 16 July 2025 Revised: 20 August 2025 Accepted: 20 September 2025)

KEYWORDS

Pilonidal sinus

Karyadakis flap

Excision only

Flap closure

Minimally Invasive Surgery

Secondary Intention Healing

Flap Reconstruction

Off-midline Closure

ABSTRACT:

Introduction: Pilonidal sinus disease predominantly affects young adult males and remains a challenging condition for surgeons. While various theories exist regarding its aetiology, the acquired theory—suggesting hair penetration and chronic inflammation in the natal cleft—is the most widely accepted. Surgical management is complicated by the high risk of postoperative wound infection, delayed healing, and recurrence, making the choice of operative technique critical to optimising outcomes.

Objectives: The aim of this study is to compare the excision-only technique with the Karydakis flap procedure in the management of uncomplicated sacrococcygeal pilonidal sinus disease. The comparison focuses on key clinical outcomes, including wound healing time, postoperative pain, duration of hospital stay, time to return to normal activity, postoperative complications, and recurrence rates.

Methods: All patients diagnosed with sacrococcygeal pilonidal sinus who fulfilled the inclusion criteria were enrolled in the study. The participants were then allocated into two groups: Group A underwent the Karydakis flap procedure, while Group B was treated with the excision-only technique. The groups were compared in terms of early postoperative complications, intensity of postoperative pain, and time taken to return to normal activities. Patients were followed up for a period of three months to assess wound healing and recurrence. Data analysis was performed using SPSS software, and the Chi-square test was applied for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results: In a study conducted at Sri Ramachandra Institute of Higher Education and Research, a total of 42 patients were included. The findings are as follows:

Patients who underwent the Karydakis flap procedure returned to work significantly earlier compared to those who underwent the excision-only technique. Similarly, the time required for complete wound healing was notably shorter in the Karydakis group. However, there was no statistically significant difference observed between the two groups with respect to postoperative pain and early postoperative complications.

Conclusions: The Karydakis flap offers clear advantages over the excision-only technique, including earlier return to physical activity, faster wound healing, and a shorter duration of hospital stay. Based on these findings, the Karydakis flap is recommended as the preferred surgical approach for the management of sacrococcygeal pilonidal sinus.

1. Introduction

The term pilonidal is derived from two Greek words: pilus, meaning “hair”, and nidus, meaning “nest”. Pilonidal disease is characterised by chronic inflammation involving one or more hair follicles, often accompanied by debris-filled sinus tracts located in the midline of the natal cleft. A free tuft of hair is typically found within the sinus. Although the condition primarily affects the sacrococcygeal region, it can also involve other sites such as the umbilicus and interdigital clefts—particularly in occupations like hairdressing.

Sacrococcygeal pilonidal sinus is a common condition, predominantly affecting adult males under the age of 45 years. Its estimated incidence ranges from 26 to 700 per

100,000 population [1]. The pathogenesis of the disease has long been debated, with both congenital and acquired theories proposed; however, the acquired theory is currently the most widely accepted. Patients may present acutely with an abscess or more commonly with chronic discharge and persistent infection [2]. The principal symptoms include localised pain, swelling, and seropurulent discharge. Due to its recurrent nature, the disease carries significant morbidity, often causing prolonged absence from work or education.

Diagnosis is primarily clinical, based on inspection and palpation of the affected area.

The management of pilonidal disease remains challenging, largely due to the increased risk of postoperative infection, delayed wound healing, and recurrence. Although numerous surgical and non-surgical techniques have been described, no single method has emerged as the definitive gold standard. Surgical options include wide excision with healing by secondary intention, marsupialisation, excision with primary closure, and various flap-based procedures. Flap reconstruction techniques have gained popularity due to their lower recurrence rates, shorter hospital stays, improved cosmetic outcomes, and enhanced patient satisfaction. Commonly used flaps include the rhomboid (Limberg), V-Y advancement, Z-plasty, and myocutaneous flaps.

Several studies have demonstrated up to a 60% reduction in recurrence rates with excision and healing by secondary intention when compared to midline primary closure [3–9]. In contrast, other studies have highlighted the superiority of off-midline closures over midline closures [10]. A Cochrane systematic review did not show a clear advantage of secondary intention healing over primary closure; however, it did affirm the benefit of off-midline closure techniques over midline closure [11].

Objectives

The aim of this study is to compare the excision-only technique with the Karydakis flap procedure in the management of uncomplicated sacrococcygeal pilonidal sinus disease. The comparison focuses on key clinical outcomes, including wound healing duration, time to return to normal activity, postoperative pain, length of hospital stay, postoperative complications, and recurrence rate.

2. Methods

Study Design and Ethics

This prospective observational study was conducted between July 2023 and May 2024 at Sri Ramachandra Institute of Higher Education and Research. The study was approved by the Institutional Ethics Committee, and informed written consent was obtained from all participants prior to enrolment.

Study Population and Inclusion Criteria

The study included patients aged above 18 years who were diagnosed with recurrent sacrococcygeal pilonidal sinus. A total of 42 patients were enrolled and divided equally into two groups:

- Group A: Karydakis flap procedure (n = 21)
- Group B: Excision-only technique (n = 21)

Patients with uncomplicated pilonidal disease, defined as a primary sinus with openings confined to the midline or associated with pilonidal abscess, were excluded from the study.

Surgical Procedure

After clinical diagnosis, all patients underwent surgical treatment under prone positioning. Methylene blue dye was instilled through the sinus opening to delineate the tract.

- In the excision-only technique, the sinus tract was excised in toto and the wound was left open to heal by secondary intention.
- In the Karydakis flap procedure, a D-shaped elliptical incision was made lateral to the midline. The sinus tract was excised along with surrounding tissue, and a well-vascularised flap was raised and mobilised across the midline to allow for off-midline primary closure. A suction drain was placed beneath the flap, and layered closure of the wound was performed.

Postoperative Care and Follow-Up

Postoperative monitoring included assessment of early complications such as bleeding, infection, haematoma, and pus discharge. Pain was assessed using a standardised pain score. The duration of hospital stay,

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 1441-1447 | ISSN:2251-6727

time to return to normal activity, and any complications were recorded. Patients were followed up for a period of three months to assess wound healing and recurrence.

Statistical Analysis

Data were entered into Microsoft Excel 2016 and analysed using IBM SPSS Statistics for Windows, Version 29.0 (Armonk, NY: IBM Corp.).

- Descriptive statistics (frequencies and percentages) were used for categorical variables, and means with standard deviations (SD) were used for continuous variables.
- Independent sample t-test and Mann–Whitney U test were used to compare continuous variables between the two groups.
- Chi-square test was used to analyse categorical data. Where expected cell frequencies were less than 5 in 2×2 contingency tables, Fisher's Exact Test was applied.
- A p-value of <0.05 was considered statistically significant for all analyses.

3. Results

The study population comprised patients admitted to the Department of General Surgery between July 2023 and May 2024. A total of 42 patients who met the inclusion and exclusion criteria were enrolled and divided into two groups: Group A underwent the Karydakis flap procedure, and Group B was treated with the excision-only technique. Both groups were assessed for early postoperative complications, pain tolerance, and duration of hospital stay. Patients were followed up for a period of three months to evaluate the outcomes of the procedures, with particular attention to wound healing and recurrence.

			Type of surgery		Total	χ2 - value	p-value
			Karydakis flap	Excision only			
Early post op complications	Bleeding	Count	1	1	2	2.105	0.349 #
		%	4.8%	4.8%	4.8%		
	Seroma	Count	2	0	2		
		%	9.5%	0.0%	4.8%		
	No complications	Count	18	20	38		
		%	85.7%	95.2%	90.5%		
Total		Count	21	21	42		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0 . 05 level							

Table 1:Comparison of Early post op complications and Type of surgery by Pearson 's Chi-Square test.

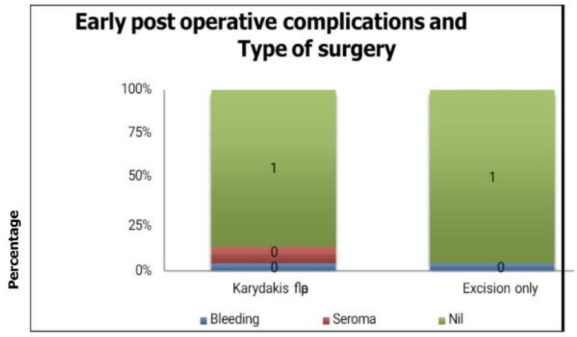

Figure1:Comparison of Early post op complications and Type of surgery by Pearson 's Chi-Square test

The above table presents a comparison of early postoperative complications with the type of surgery using Pearson's Chi-Square test (χ^2 =2.105, p = 0.349). Since the p-value is greater than 0.05, there is no statistically significant association between early postoperative complications and the type of surgery.

Variable	Type of surgery	N	Mean	SD	t-value	p-value
Mean hospital duration	Karydakis flap	21	5.76	2.77	0.000	1.000 #
	Excision only	21	5.76	2.43		
# No Statistical Significance at p > 0.05 level						

Table 2:Comparison of Mean hospital duration between type of surgery by Independent sample t - test

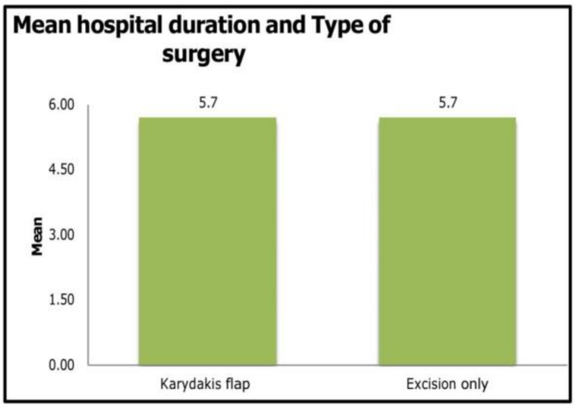

Figure 2:Comparison of Mean hospital duration and type of surgery by Independent sample t - test

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 1441-1447 | ISSN:2251-6727

The above table presents a comparison of mean hospital stay between the two surgical groups using an independent samples t-test. The analysis yielded a t-value of 0.000 and a p-value of 1.000, indicating no statistically significant difference in hospital stay between the groups (p > 0.05).

Variable	Type of surgery	N	Mean	SD	t-value	p-value
Return to work	Karydakis flap	21	23.05	8.19	3.153	0.003 **
	Excision only	21	31.90	9.93		
** Highly Statistical Significance at p < 0.01 level						

Table 3:Comparison of Return to work and Type of surgery by Independent sample t -test

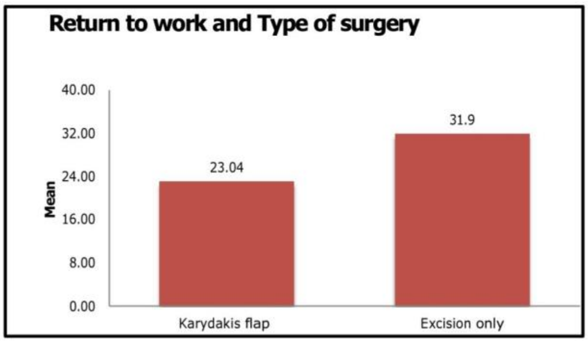

Figure 3:Comparison of Return to work and Type of surgery by Independent sample t -test

The above table shows a comparison of return to work between the two surgical groups using an independent samples t-test. The analysis yielded a t-value of 3.153 and a p-value of 0.003, indicating a highly statistically significant difference between the groups (p < 0.01).

Variable	Type of surgery	N	Mean	SD	t-value	p-value
Time of wound healing	Karydakis flap	21	13.62	2.31	19.219	0.0005 **
	Excision only	21	59.29	10.64		
** Highly Statistical Significance at p < 0.01 level						

Table 4:Comparison of Time of wound healing and type of surgery by Independent sample t- test

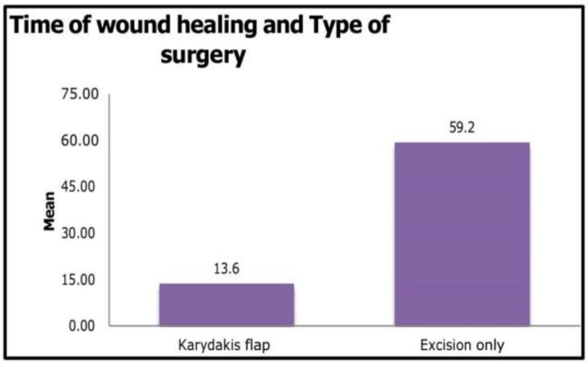

Figure 4:Comparison of Time of wound healing and Type of surgery by Independent sample t - test

The above table presents a comparison of time to wound healing between the two surgical groups using an independent samples t-test. The analysis produced a t-value of 19.219 and a p-value of 0.0005, indicating a highly statistically significant difference between the groups (p < 0.01).

Pain Score	Type of surgery	N	Mean	S.D	Median	IQR	Z-value	p-value
Pod 0	Karydakis flap	21	4.333	.7958	4.000	1.0	2.659	0.008 **
	Excision only	21	3.714	.5606	4.000	1.0		
Pod 1	Karydakis flap	21	4.000	.7746	4.000	0.5	2.167	0.030 *
	Excision only	21	3.476	.6016	4.000	1.0		
Pod 4	Karydakis flap	21	1.429	.7464	1.000	1.0	0.692	0.489 #
	Excision only	21	1.667	.9129	1.000	1.0		
** Highly Statistical Significance at p < 0.01 ,* Significant at p < 0.05 and # No Statistical Significance at p > 0.05 level								

Table 5:Comparison of Pain Score and Type of surgery by Mann - Whitney U test

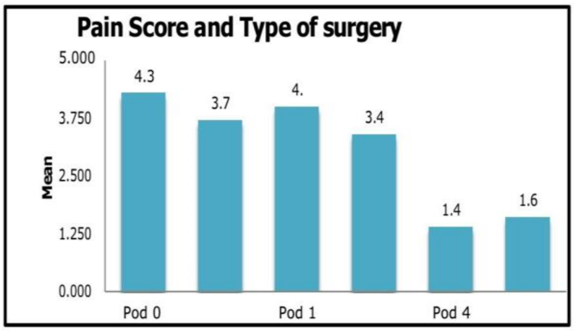

Figure 5:Comparison of Pain Score and Type of surgery by Mann - Whitney U test

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 1441-1447 | ISSN:2251-6727

The above table shows a comparison of postoperative pain scores between the two surgical groups using the Mann–Whitney U test. On postoperative day (POD) 0, the analysis yielded a Z-value of 2.659 and a p-value of 0.008, indicating a highly statistically significant difference ($p < 0.01$). On POD 1, the Z-value was 2.167 with a p-value of 0.030, demonstrating a statistically significant difference ($p < 0.05$). However, by POD 4, the Z-value was 0.692 with a p-value of 0.489, indicating no statistically significant difference ($p > 0.05$).

4. Discussion

Surgical intervention remains the primary treatment modality for sacrococcygeal pilonidal sinus; however, an ideal technique with minimal complications and low recurrence rates has yet to be established. Less invasive methods, such as simple sinus opening, curettage, or phenol injection, may facilitate hair removal and tract healing. However, these procedures are associated with prolonged healing of midline wounds and a notably high recurrence rate [12,13].

More invasive approaches, including flap techniques such as V-Y advancement, Z-plasty, and the Limberg flap, aim to cover the midline defect using full-thickness skin and subcutaneous tissue. While these methods have demonstrated efficacy, they are sometimes considered excessive for uncomplicated sacrococcygeal disease due to the extent of tissue displacement involved [13].

In the present study conducted at Sri Ramachandra Institute of Higher Education and Research, a total of 42 patients were enrolled, with 21 undergoing the Karydakis flap procedure and 21 undergoing the excision-only technique. The majority of patients were male (71.4%) and within the age group of 21 to 40 years (64.2%). These demographic findings are consistent with the study by Sondenaa et al., which reported that pilonidal sinus predominantly affects young adult males, with an incidence of 26 per 100,000 population [14].

Amir Keshvari et al. evaluated 321 patients, comparing outcomes between Karydakis flap and excision with healing by secondary intention. Their study found that although patients in the Karydakis group experienced higher pain on the first postoperative day, they reported significantly less pain after one week ($p < 0.001$) [15]. Similarly, in our study, patients who underwent the Karydakis flap procedure reported significantly greater pain on postoperative day 0 ($p = 0.008$) and day 1 ($p = 0.030$) compared to the excision-only group. By postoperative day 4, there was no significant difference in pain scores between the two groups ($p = 0.489$).

Regarding hospital stay, our study demonstrated no statistically significant difference between the two groups ($p > 0.05$). This aligns with findings by Al-Hasson et al., who also reported no significant association between surgical technique and length of hospital stay [16].

In a study by Testini et al., the mean time to return to normal activity was 25.7 days (range: 11–77 days) in the excision-only group, compared to 10.4 days (range: 5–32 days) in the primary closure group [17]. In our study, the Karydakis flap group returned to activity in an average of 23.1 days, which was significantly earlier than the excision-only group (31.9 days, $p = 0.003$).

With regard to wound healing, our study showed a significantly shorter healing time in the Karydakis group (mean 13.6 days) compared to the excision-only group (mean 59.3 days). This finding is consistent with studies by Keshvari et al. and Al-Hassan et al., which reported mean healing times of 16.4 and 80 days respectively in the Karydakis and excision-only groups [15,16].

Although Keshvari et al. noted lower complication and recurrence rates with the Karydakis flap [15], our study found no statistically significant difference in postoperative complications between the two groups. However, recurrence rates were lower in the Karydakis group over the three-month follow-up period, although this did not reach statistical significance—likely due to the limited sample size.

Figure 6:Karyadakis flap

Patient satisfaction with scar formation was assessed in only a few published studies. A Turkish study utilised a visual analogue scale (VAS) [19], while an Egyptian study categorised patients as ‘satisfied’ or ‘not satisfied’ [19]. Both concluded that patients undergoing primary closure reported greater satisfaction with the postoperative scar. Although scar satisfaction was not formally quantified in our study, subjective reports indicated a favourable response among patients treated with the Karydakis flap.

5. Conclusion

From our study, it can be concluded that the Karydakis flap technique results in significantly faster wound healing and an earlier return to normal activity compared to the excision-only technique. Postoperative pain was found to be significantly higher in the Karydakis group on postoperative days 0 and 1; however, by day 4, pain scores between the two groups were comparable. No statistically significant differences were observed in terms of hospital stay, postoperative complications, or recurrence rates.

While the excision-only technique remains widely used for the treatment of pilonidal sinus due to its technical simplicity, studies—including the present one—suggest that recurrence rates are comparable between excision-only and flap techniques. Given that pilonidal sinus predominantly affects young adult males—many of whom face disruption to work and daily life—there is a clear need for a surgical approach that ensures rapid recovery and minimises the burden of postoperative care. In this regard, the Karydakis flap presents a viable and effective alternative.

It is important to note that recurrence is a critical outcome parameter that cannot be reliably assessed within a short follow-up period of three months. Additionally, the limited sample size in our study highlights the need for further research with larger patient cohorts and extended follow-up durations to draw more definitive conclusions regarding long-term outcomes, particularly recurrence rates.

References

1.Chintapatla S, Safarani N, Kumar S, Haboubi N. Sacrococcygeal pilonidal sinus: historical review, pathological insight and surgical options. Tech Coloproctol 2003;7:3.

2.J. de Jaestecker, B.D. Mann A.E. Castellanos, Pilonidal disease: Medscape; 2006 [updated January 6, 2012]. Accessed December 15, 2014.

3. McGuinness JG, Winter DC, O’Connell PR. Vacuum-assisted closure of a complex pilonidal sinus. Dis colon rectum 2003; 46:274.

4.Kronborg O, Christensen K, Zimmermann-Nielsen C. Chronic pilonidal disease: a randomized trial with a complete 3-year follow-up. Br J Surg 1985;72:303.

5. Khawaja HT, Bryan S, Weaver PC. Treatment of natal cleft sinus: a prospective clinical and economic evaluation. BMJ 1992;304:1282.

6. Fuzun M, Bakir H, Soylu M, Tansug T, Kaymak E, Harmancioglu O. Which technique for treatment of pilonidal sinusdopen or closed? Dis Colon Rectum 1994;37: 1148.

7. Sondenaa K, Andersen E, Soreide JA. Morbidity and short term results in a randomised trial of open compared with closed treatment of chronic pilonidal sinus. EurSurg 1992; 158:351.

8. Fazeli MS, Adel MG, Lebaschi AH. Comparison of outcomes in Z-plasty and delayed healing by secondary intention of the wound after excision of the sacral pilonidal sinus: results of a randomized, clinical trial. Dis Colon Rectum 2006;49:1831.

9.Mohamed HA, Kadry I, Adly S. Comparison between three therapeutic modalities for non-complicated pilonidal sinus disease. Surgeon 2005;3:73.

10. McCallum IJ, King PM, Bruce J. Healing by primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis. BMJ 2008;336:868.

11.Al-Khamis A, McCallum I, King PM, Bruce J. Healing by primary versus secondary intention after surgical treatment for pilonidal sinus. Cochrane database Syst Rev; 2010:CD006213

12.Allen-Mersh TG. Pilonidal sinus: finding the right track for treatment. Br J Surg 1990;77:123.

13. Petersen S, Koch R, Stelzner S, Wendlandt TP, Ludwig K. Primary closure techniques in chronic pilonidal sinus: a survey of the results of different surgical approaches. Dis Colon Rectum 2002;45:1458.

14.Sondenaa K, Andersen E, Nesvik I, Soreide JA. Patient characteristics and symptoms in chroni c pilonidal sinus disease. Int J Colorectal Dis1995;10:39 - 42.

15.Keshvari A, Keramati MR, Fazeli MS, Kazemeini A, Meysamie A, Nouritaromlou MK. Karydakis flap versus excision -only technique in pilonidal disease. J Surg Res. 2015 Sep;198(1): 260 -6. doi: 10.1016/ j.jss.2015.05.039. Epub 2015 May 28. PMID: 26094093.

16.Al- Hassan HK, Francis IM, Neglen P. Primary closure or secondary granulation after excision of pilonidal sinus? ActaChir Scand 1990;156:695.

17.Testini M, Piccinni G, Miniello S, et al. Treatment of chronic pilonidal sinus with local anaesthesia: a randomized trial of closed compared with open technique. Colorectal Dis 2001; 3:427.

18.Mohamed HA, Kadry I, Adly S. Comparison between threetherapeutic modalities for non- complicated pilonidal sinus disease. The Surgeon: Journal of the Royal Colleges of Surgeonsof Edinburgh and Ireland 2005; 3(2): 73-7.

19.Ertan T, Koc M, Gocmen E, Aslar AK, Keskek M, Kilic M. Doestechnique alter quality of life after pilonidal sinus surgery?. American Journal of Surgery 2005;190(3):388 - 92.