

A Comparative Study Between Excision with Primary Closure and Rhomboid Excision with Limberg Flap for Pilonidal Sinus

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Abstract: *Background:* Pilonidal sinus disease is a chronic condition of the sacrococcygeal region that commonly affects young adults and is associated with prolonged morbidity, delayed wound healing, and frequent recurrence following surgery. Selection of an appropriate surgical technique is essential to improve outcomes and reduce recurrence. *Aim:* To compare the outcomes of excision with primary closure and rhomboid excision with Limberg flap in the management of sacrococcygeal pilonidal sinus. *Materials and Methods:* A prospective comparative study was conducted on 60 patients with uncomplicated pilonidal sinus admitted to a tertiary care hospital over a period of 24 months. Patients were randomly divided into two equal groups. Group A underwent rhomboid excision with Limberg flap, while Group B underwent excision with primary closure. Operative time, postoperative pain, complications, duration of hospital stay, time to suture removal, return to work, scar outcome, and recurrence were evaluated and statistically analyzed. *Results:* The mean operative time was longer in the Limberg flap group; however, postoperative complications were significantly lower compared to the primary closure group. Patients treated with the Limberg flap experienced less postoperative pain, shorter hospital stay, earlier return to work, and better scar outcomes. Recurrence at six-month follow-up was markedly lower in the Limberg flap group. *Conclusion:* Rhomboid excision with Limberg flap provides superior postoperative outcomes and lower recurrence rates when compared to excision with primary closure. It is a safe and effective surgical option for the management of sacrococcygeal pilonidal sinus.

Keywords: Pilonidal sinus, Limberg flap, Primary closure, Rhomboid excision, Recurrence

1. Introduction

Pilonidal sinus disease is a chronic inflammatory condition affecting the sacrococcygeal region and is most commonly seen in young adults, particularly males [1, 2]. The disease is now widely accepted to be acquired in origin, resulting from penetration of loose hair into the skin of the natal cleft, producing a foreign body reaction followed by chronic infection [3, 4, 5].

Despite the availability of multiple surgical techniques, management remains challenging due to postoperative wound complications, delayed healing, and high recurrence rates [2, 6]. Excision with primary closure is commonly practiced; however, midline closure is associated with higher morbidity and recurrence. Off-midline flap techniques, such as the Limberg flap, have been advocated to overcome these limitations [7-9].

This study aims to compare excision with primary closure and rhomboid excision with Limberg flap in terms of postoperative outcomes, recovery, recurrence, and patient satisfaction.

2. Material and Method

This prospective comparative study was conducted in the Department of General Surgery at Saraswathi Institute of Medical Sciences, Hapur, over a period of 24 months. Sixty patients with uncomplicated sacrococcygeal pilonidal sinus were included after obtaining informed consent and institutional ethical clearance, in accordance with standard surgical research protocols.

Patients were randomly allocated into two groups: Group A underwent rhomboid excision with Limberg flap, and Group B underwent excision with primary closure. Operative technique, postoperative care, and follow-up were performed using standard surgical principles described in established surgical literature.

Operative technique

All procedures were performed under spinal anesthesia with the patient placed in the prone position. The buttocks were retracted laterally using adhesive tapes to adequately expose the natal cleft. The operative field was prepared and draped under strict aseptic precautions.

Sinus tracts were delineated using a blunt probe or methylene blue injection to identify any secondary

extensions, as described in standard operative techniques for pilonidal sinus surgery [3,7].

1) *Group A- Rhomboid Excision with Limberg Flap*

In Group A, a rhomboid-shaped incision was marked to include all midline pits and any lateral extensions of the pilonidal sinus. The rhomboid area of skin and subcutaneous tissue containing the sinus tract was excised en bloc down to the presacral fascia, ensuring complete removal of diseased tissue. Following excision, a rhomboid fasciocutaneous Limberg flap was raised, incorporating skin, subcutaneous tissue, and the fascia overlying the gluteus maximus muscle. The flap was mobilized from the underlying muscle and transposed to cover the midline defect, while the donor site was closed in a linear fashion.

Layered closure was performed over a suction drain. Deep absorbable sutures using 1-0 Vicryl were placed to approximate the fascia and subcutaneous tissue, followed by skin closure with interrupted 2-0 Ethilon sutures. This technique resulted in a tension-free, off-midline closure using unscarred skin in the natal cleft. Skin sutures were removed after satisfactory wound healing.



2) *Group B- Excision with Primary Closure*

In Group B, a vertical elliptical incision was made around the sinus openings and extended down to the presacral fascia. The excision was carried out at least 1 cm away from the sinus tract to ensure complete removal of the diseased tissue. After achieving meticulous hemostasis, the wound was closed primarily in the midline over a suction drain using interrupted 2-0 Ethilon sutures. Skin sutures were removed once adequate wound healing was achieved.



In cases of postoperative complications such as infection, bleeding, hematoma, discharge, or wound dehiscence, a few sutures were removed to allow drainage, followed by regular wound care and treatment with appropriate broad-spectrum antibiotics. Postoperative parameters including duration of surgery, pain score (VAS), complications, hospital stay, time to suture removal, return to work, scar outcome, and recurrence were recorded and statistically analyzed.

3. **Observation and Result**

A total of 60 patients with uncomplicated sacrococcygeal pilonidal sinus were included in the study and equally divided into two groups: Group A (Rhomboid excision with Limberg flap) and Group B (Excision with primary closure).

Table 1: Distribution of patients according to sex

Sex	Number	Percentage
Male	44	73.34
Female	16	26.66

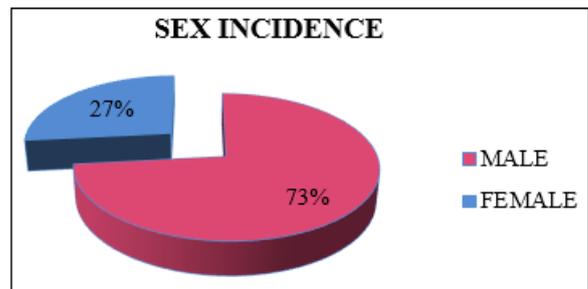


Figure 1: Sex distribution of study population

Table 2: Distribution of patients according to age

Age group (years)	Number	Percentage
≤20	8	13.3
21–30	38	63.3
31–40	11	18.3
>40	3	5.0

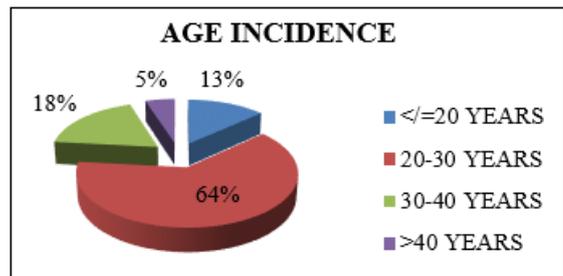


Figure 2: Age distribution of study population

Table 3: Occupational incidence

Occupation	No. of Patients	Percentage
Student	11	18.34%
Driver	12	20%
Shopkeeper	5	8.33%
Farmer	2	3.33%
Tailor	3	5.0%
Clerk	9	15%
Engineer	6	10%
Factory Worker	2	3.33%
Accountant	3	5.0%
Teacher	7	11.67%

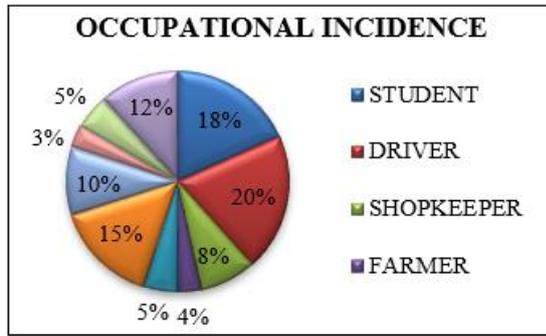


Figure 3: Occupational incidence

Table 4: Clinical presentation

Clinical Features	No. of Patients	Percentage
Pain	18	30%
Intermittent Discharge	30	50%
Swelling	12	20%

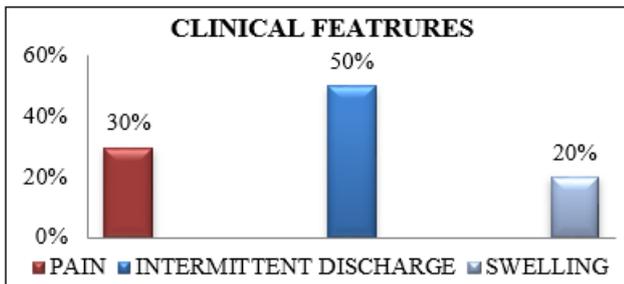


Figure 4: Clinical presentation

Table 5: Comparison of mean duration of surgery

Duration in Mins	Type of Surgery	Mean (in mins)	Standard Deviation	P Value
	Group A	56.0	7.36	
Group B	39.83	5.94		

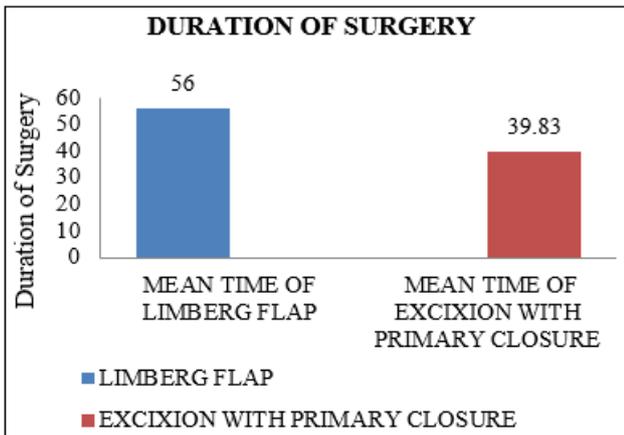


Figure 5: Comparison of mean duration of surgery between study groups

Table 6: Postoperative complications in relation to type of surgery

Post- OP Complications	Group A	Group B	P- Value
Nil (0)	21	10	0.006
Infection (1)	3	5	
Bleeding (2)	1	2	
Hematoma (3)	1	2	
Discharge (4)	2	5	
Wound Dehiscence /Week Scar (5)	2	6	

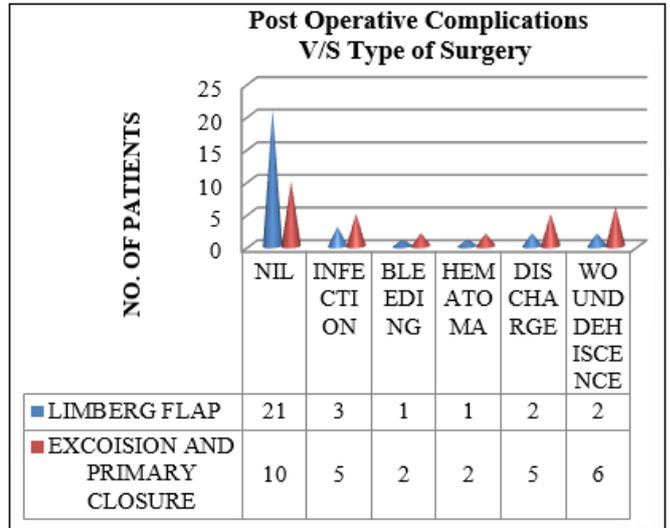


Figure 6: Postoperative complications in relation to type of surgery

Table 7: Post operative day1 pain grade

Post Operative Day 1 of Pain	Group A		Group B		P Value
	N	%	N	%	
Mild (1-3)	1	3.3	0	0	P = 0.001
Moderate (4-6)	15	50	4	13.3	
Severe (7-9)	14	46.67	25	83.3	
Very Severe (≥10)	0	0	1	3.3	

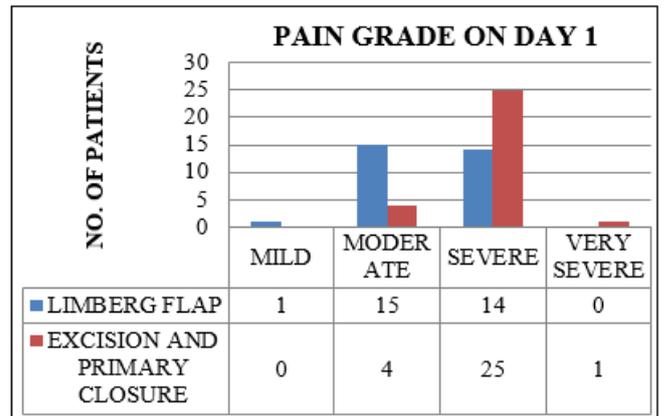


Figure 7: Post operative day1 pain grade

Table 8: Post operative day4 pain grade

Post Operative Day 4 of Pain	Group A		Group B		P Value
	N	%	N	%	
Mild (1-3)	27	90	0	0	P<0.001
Moderate (4-6)	3	10	23	76.67	
Severe (7-9)	0	0	4	13.3	
Very Severe (>10)	0	0	3	10	

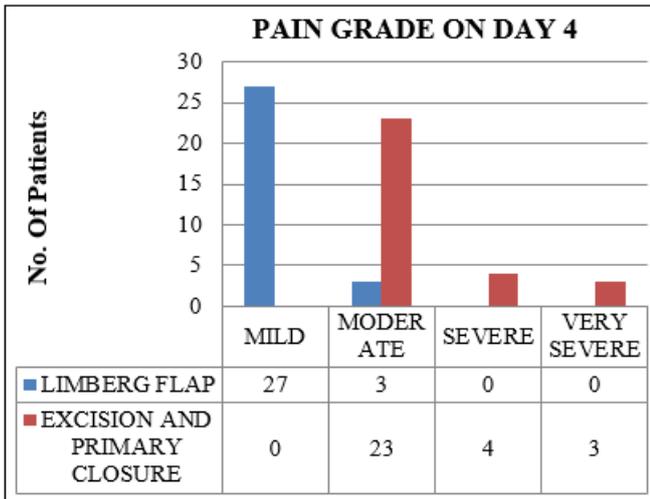


Figure 8: Post operative day4 pain grade

	Hospital Stay (Mean ± SD)	P Value
Group A	6.47 ± 1.28	P <0.001
Group B	9.83 ± 1.70	

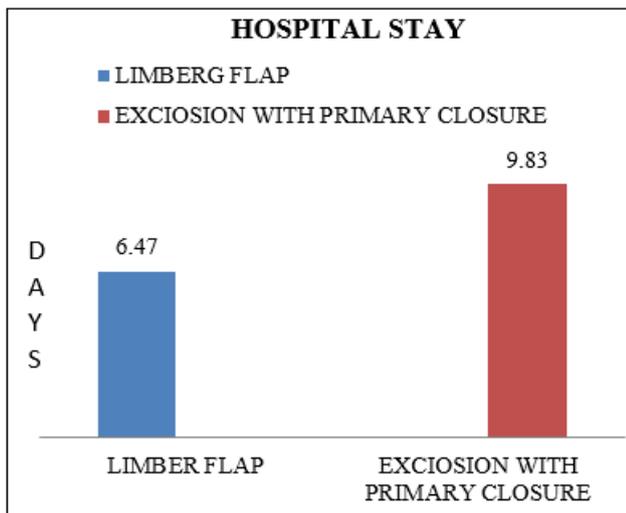


Figure 9: Hospital stay

	Return to Work in Days (Mean ± SD)	P Value
Group A	14.30 ± 1.97	P<0.001
Group B	18.60 ± 2.99	

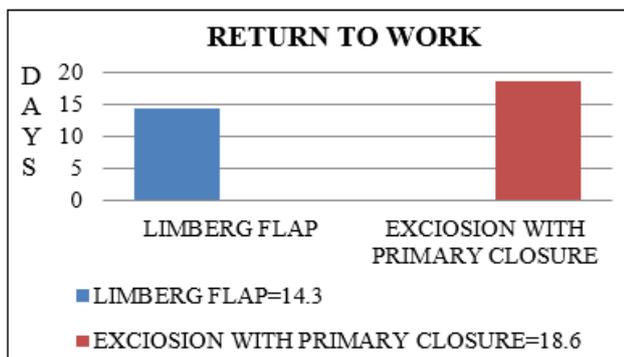


Figure 10: Return to work

Table 11: Recurrence

Six Month Follow Up	Group A (Limberg Flap)	Group B (Excision With Primary Closure)	P Value
No Recurrence (NR)	29	18	P<0.001
Recurrence (R)	1	12	

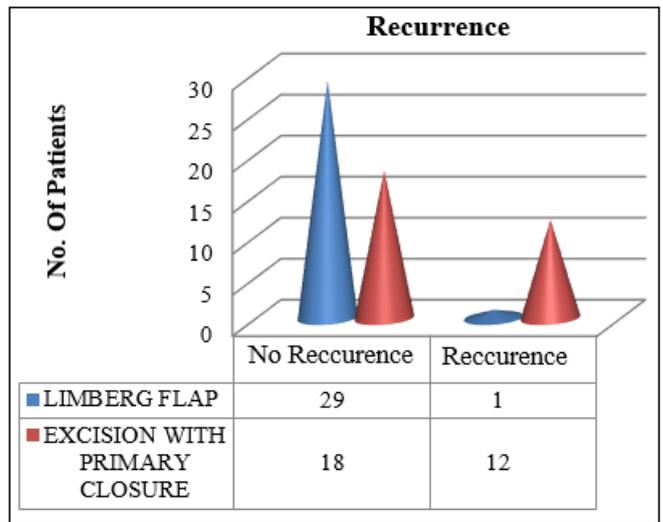


Figure 11: Recurrence

Table 12: Scar satisfaction

Patient Satisfaction With SCAR	Group A (LIMBERG FLAP)	Group B (Excision With Primary Closure)	P Value
Yes	29	10	P <0.001
No	1	20	

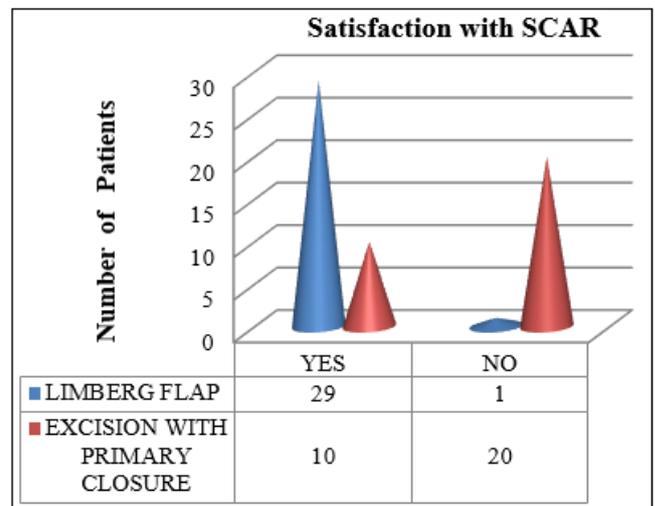


Figure 12: Scar satisfaction

4. Discussion

Pilonidal sinus disease (PSD) predominantly affects young adults and is associated with significant postoperative morbidity and recurrence, making the choice of surgical technique crucial. The present study compares Rhomboid excision with Limberg flap and excision with primary midline closure, focusing on demographic characteristics, operative variables, postoperative recovery, and long-term outcomes.

1) Demographic Characteristics

A marked male predominance (73.3%) was observed, which is consistent with earlier reports suggesting increased susceptibility in males due to higher hair density, deeper natal clefts, and occupational exposure. Similar gender distributions have been reported by Sondana et al., Surabhi P. Sai et al., and Karydakis, confirming male sex as a well-recognized risk factor for PSD. [5, 13, 16, 17]

Most patients belonged to the 20–30 year age group (63.3%), reaffirming PSD as a disease of young adults. This observation parallels findings by Shabbir et al. and Karydakis, who emphasized the rarity of PSD beyond the fourth decade of life. The age distribution in the present study closely reflects global epidemiological trends. [5, 13, 18]

Prolonged sitting emerged as a significant occupational risk factor, with drivers, students, and office workers forming the majority of cases. This supports the mechanical and local irritation hypothesis described in the classical “Jeep disease” phenomenon and is consistent with observations by Hull and Wu et al. [19]

2) Clinical Presentation

Intermittent discharge and pain were the most frequent presenting symptoms in this study. While symptom predominance varies across studies, our findings fall within the established clinical spectrum reported by Surabhi et al. and Sondana et al., reflecting the heterogeneous nature of PSD presentation. [16, 17]

3) Operative Outcomes

The Limberg flap procedure required a longer operative time compared to primary midline closure. However, this difference is clinically acceptable given the superior postoperative outcomes. Comparable operative durations have been reported by Akca et al., Kumar R et al., and Menten et al., who similarly noted marginally longer operative times for flap procedures. [9, 11, 15]

Postoperative complications were significantly lower in the Limberg flap group. In contrast, primary midline closure was associated with higher rates of infection, wound dehiscence, discharge, and hematoma. These findings align with Menten et al., Akca et al., demonstrated higher wound-related morbidity with midline closure, thereby supporting the advantage of off-midline techniques. [9, 11]

4) Postoperative Pain and Recovery

Patients undergoing Limberg flap surgery experienced significantly lower postoperative pain scores and faster pain resolution. Reduced tissue tension and improved wound geometry likely contribute to these outcomes. Similar observations have been documented by Katsoulis et al. [12]

Recovery parameters favored the Limberg flap group, with earlier pain-free sitting, shorter hospital stay, and faster return to work. These findings are consistent with those reported by Meena OK et al. and Menten et al., highlighting the functional benefits of off-midline closure techniques. [8, 9]

5) Scar Quality, Patient Satisfaction, and Recurrence

Cosmetic outcomes were significantly superior in the Limberg flap group, with healthier scars and higher patient

satisfaction. Given the young age of most patients, scar appearance is an important determinant of overall satisfaction. Similar cosmetic advantages of flap procedures have been reported by Meena et al. [8]

Recurrence rates were markedly lower following Limberg flap surgery compared with primary midline closure. This finding corroborates results reported by Karydakis and Menten et al., reinforcing the role of off-midline closure in minimizing long-term disease recurrence. [5, 9, 13]

5. Conclusion

Rhomboid excision with Limberg flap offers significant advantages over excision with primary closure in terms of postoperative pain, wound complications, hospital stay, cosmetic outcome, and recurrence. By providing tension-free off-midline closure and flattening of the natal cleft, the Limberg flap effectively addresses the key factors contributing to disease recurrence [7, 8, 9, 13].

Based on the findings of this study and supporting literature, the Limberg flap technique can be recommended as a preferred surgical option for the management of sacrococcygeal pilonidal sinus

6. Limitations

Small sample size: The study included a limited number of patients (60), which may reduce the generalizability of the results to a larger population.

Single-center study: As the study was conducted at a single tertiary care institution, institutional practices and surgeon expertise may have influenced outcomes.

Short follow-up period: Follow-up was limited, which may underestimate long-term recurrence rates and late complications.

Surgeon-dependent outcomes: Variations in surgical skill, flap handling, and postoperative care could have affected complication rates and recovery parameters.

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