

Comparison of Limberg Flap versus Excision with Secondary Wound Healing in the Treatment of Sacrococcygeal Pilonidal Sinus: An Observational Study

Qumruddin Ansari¹, Jagdish Chandra²

¹Associate Professor, Upgraded Department of Surgery, Darbhanga Medical College and Hospital, Laheriasarai, Bihar, India

²Professor, Upgraded Department of Surgery, Darbhanga Medical College and Hospital, Laheriasarai, Bihar, India

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Corresponding author: Dr. Qumruddin Ansari

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Abstract

Background: Sacrococcygeal pilonidal sinus is a chronic condition which is usually noted in males. Young adults with specific professions are the main victims of this ailment. Aim of this study is to evaluate the Limberg flap and 'excision with secondary wound healing in the surgical outcome of sacrococcygeal pilonidal sinus patients.

Methods: From August 2024 to July 2026, patients with sacrococcygeal pilonidal sinus who were admitted to the Upgraded Department of General Surgery at Darbhanga Medical College and Hospital in Laheriasarai, Bihar, participated in this prospective observational study. Surgical intervention for a chosen patient using one of two methods. Patients were divided into two groups based on the type of surgery performed: group A- Limberg flap (study group) and group B- excision with secondary wound healing (control group).

Results: The mean length of surgery was substantially longer in cases managed with the Limberg flap approach than in those managed with excision and secondary healing. At all follow-ups, Limberg flap cases had significantly reduced mean pain scores, wound infection, wound healing time, hospital stay, and time to return to normal activity compared to excision ($p < 0.05$). Patient satisfaction was significantly higher after the Limberg flap group ($p < 0.05$).

Conclusion: In terms of reduced post-operative pain, fewer complications, early recovery, early wound healing, shorter hospital stays, early return to normal activity, and increased patient satisfaction, rhomboid excision using Limberg's flap technique is superior to open excision with secondary healing technique. The Limberg flap technique's only drawback is a longer mean surgical time, which is explained by the extra time needed to raise and suture the flap after excision.

Keywords: Pilonidal sinus, Excision, Secondary healing, Limberg flap, wound healing.

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Introduction

Pilonidal sinus is a chronic inflammatory disorder of the sacro-coccygeal region/ natal cleft, usually caused by hair penetration into subcutaneous tissue, leading to a foreign body reaction and chronic inflammation, despite the fact that, this condition was initially thought to be congenital. Sinus tract development, recurrent infection, and sporadic purulent discharge are its hallmarks. Pilonidal sinus disease (PSD) is linked to considerable morbidity and recurrence. Due to the high incidence of postoperative complications and recurrence linked to different surgical procedures, pilonidal sinus disease management is still difficult. Pilonidal sinus can be treated surgically using a variety of

techniques, such as pit picking, unroofing, aspiration, curettage, or surgical excision. Conventional techniques like excision with secondary healing or midline primary closure have been utilized extensively, however they are linked to wound problems, protracted healing, and recurrence rates that range from 10% to 60%. The abnormalities resulting from surgically excised pilonidal sinus can be either left to heal by secondary intention or closed with flaps or grafts. Healing by secondary intention necessitates leaving the wound open and enabling the granulation tissue to epithelialize and contract the wound borders. The main disadvantage of secondary healing is the

increased risk of infection since these patients lack an epidermal barrier. On the other hand, the wound after pilonidal sinus excision has been managed using a variety of flap methods haveless recurrence, shorter hospital stay, reduced discomfort & morbidity following surgery, improved cosmesis and improved patient compatibility. There are variety of technique for closure of wound after excision of pilonidal sinus are karyadakis flap, Bascom cleft lift and limberg rhomboid flap technique. One of the most popular off-midline reconstructive methods for pilonidal disease is the Limberg rhomboid flap, which was initially reported by Limberg. A well-vascularized fascio-cutaneous flap is transposed after rhomboid excision of the sick tissue, enabling tension-free closure and obliteration of the natal cleft. The Limberg flap technique, which has a shorter learning curve, an excellent local acceptance rate in terms of flap viability and complications, and most importantly a low recurrence rate, is the most straightforward flap procedure for general surgeons. In DMCH, Limberg flap procedure for pilonidal sinus disease in prefer over other technique. So, this study is to evaluate the Limberg flap and 'excision with secondary wound healing in the surgical outcome of sacrococcygeal pilonidal sinus patients.

Material and Methods

From August 2024 to July 2026, patients with sacro-coccygeal pilonidal sinus who were admitted to the Upgraded Department of General Surgery at Darbhanga Medical College and Hospital in Laheriasarai, Darbhanga, Bihar, participated in this prospective observational study.

All cases of sacro-coccygeal pilonidal sinus in patients over the age of 18 were included, whereas patients with acute pilonidal disease with abscess formation, recurrent pilonidal disease or previous surgery in the sacro-coccygeal region, sinus opening >5 cm from the midline, sacrum osteomyelitis, and co morbidities such as diabetes mellitus, collagen diseases, and immunosuppressive therapy were excluded from the study. The study included all sacro-coccygeal pilonidal sinus patients who were scheduled to have surgery using a Limberg flap or an excision with secondary wound healing and met the inclusion and exclusion criteria. A detailed history of socio-demographic factors and clinical data was acquired. All patients were then treated to local and systemic examinations, with results noted. Patients

were then investigated to sinograms and ultrasonography (USG). Selection of the procedure was done by the operating surgeon in consultation with the patient after usual counselling and consent as part of routine treatment, and investigator was not allowed to choose the procedure. Depending upon the surgical procedure, patients were divided into two groups:- Group A- Limberg flap (study group), and Group B- excision with secondary wound healing (control group). Intra-operative data such as the kind of anaesthesia, surgical procedure, surgery time, and so on were recorded. In the post-operative phase, the patient was closely monitored until the time of discharge, and the overall length of hospital stay was recorded in days. The postoperative result was measured in terms of pain (VAS score) on days 1, 5, and 14, as well as postoperative complications. All patients were followed up at 14 days, 1 month, 3 months, and 6 months intervals to measure the following parameters: time of wound healing, return to normal activities, patient satisfaction (by VAS), and recurrence. Microsoft Excel was used to compile the data, and IBM Statistical Package for the Social Sciences (SPSS) trial version 25.0 was used for analysis. The independent t test (for continuous variables) or chi square test (for categorical variables) were used to compare two groups. Statistical significance was defined as a P value of less than 0.05.

Results

In all, 63 cases with sacrococcygeal pilonidal sinus were studied; 32 cases (50.8%) were treated with a Limberg flap, whereas 31 cases (49.2%) were treated with excision and secondary healing.

Patients enrolled in the Limberg flap group had an average age of 38.94 ± 11.49 years, while those in the Excision with secondary healing group had an average age of 35.10 ± 11.08 . Males made up 71.9% of the Limberg flap group and 74.2% of the excision with secondary healing group, whereas females made up just 28.1% and 25.8% of both groups, respectively. In both groups, all patients reported pain and discharge. We discovered no significant difference in age, gender, clinical characteristics, or tract length across the groups ($p > 0.05$). The observed difference in the number of openings between the groups was statistically significant ($p < 0.05$), with about 61.3% of cases in the excision group having two openings and 50% of cases in the Limberg flap group having three openings (Table 1).

Table 1: Comparison of baseline variables between the groups

Baseline variables	Surgery				P value
	Limberg flap(n=32)		Excision with secondary healing (n=31)		
	No. of cases	Percentage	No. of cases	Percentage	
Age (years)					
<30	9	28.1%	10	32.3%	0.25
31-40	6	18.8%	11	35.5%	
41-50	13	40.6%	6	19.4%	
>50	4	12.5%	4	12.9%	
Mean±SD	38.94±11.49		35.10±11.08		
Gender					
Male	23	71.9%	23	74.2%	0.84
Female	9	28.1%	8	25.8%	
Clinical features					
Pain	32	100.0%	31	100.0%	NA
Discharge	32	100.0%	31	100.0%	NA
Signs					
No. of openings					
1	0	0.0	10	32.3%	0.001
2	13	40.6%	19	61.3%	
3	16	50.0%	2	6.5%	
4	2	6.2%	0	0.0	
5	1	3.1%	0	0.0	
Mean±SD	2.72±0.73		1.74±0.575		
Length of tract (cm)					
2	5	15.6%	3	9.7%	0.92
3	14	43.8%	15	48.4%	
4	9	28.1%	9	29.0%	
5	4	12.5%	4	12.9%	
Mean±SD	3.38±0.907		3.45±0.850		

Patients treated with the Limberg flap approach had a considerably longer mean surgical time than those treated with excision and secondary healing (66.72±6.67 versus 47.74±6.033 minutes; $p<0.05$).

Pain scores were significantly reduced in Limberg flap cases compared to excision at all follow-ups ($p<0.05$). Wound infection occurred in 19.4% of cases treated with excision and secondary healing, compared to 3.1% in the Limberg flap group ($p<0.05$). The Limberg flap group experienced

significantly faster wound healing (13.47±1.722 days) compared to excision with secondary healing (34.71±14.48 days; $p<0.05$).

The limber flap group had a considerably shorter mean hospital stay than the excision group (6.13±1.008 versus 10.39±1.978 days; $p<0.05$). The excision group had a considerably longer mean time to return to normal activities than the Limberg flap group (39.97 versus 14.38 days; $p<0.05$) (Table 2).

Table 2: Comparison of outcome between the groups

Outcome	Surgery		P value
	Limberg flap (n=32)	Excision with secondary healing (n=31)	
	Mean±SD	Mean±SD	
VAS score			
Day 1	4.56±1.045	6.32±1.40	0.001
Day 5	2.94±0.840	4.94±1.28	
Day 14	1.75±0.803	3.35±1.473	0.001
Complications			
Seroma	2±6.2	0	0.157
Wound infection	1±3.1	6±19.4	0.04
Flap necrosis	0	0	NA
Time of wound healing(days)	13.47±1.722	34.71±14.48	0.001
Length of hospital stay(days)	6.13±1.008	10.39±1.978	0.001
Return to normal activity (days)	14.38±2.19	39.97±16.04	0.001

At one, three, and six months after surgery, patient satisfaction was measured using the VAS score. The mean patient satisfaction was found to be considerably greater in cases following the Limberg flap group than in the excision with secondary healing group ($p < 0.05$). Recurrence was evaluated in our trial at each follow-up point up to six months, but none of the patients in either group experienced recurrence at the one-month, three-month, or six-month follow-up points.

Discussion

In this study, patients managed with excision alone had a considerably shorter mean operation duration (47.74 ± 6.033 minutes) compared to those managed with the Limberg flap approach (66.72 ± 6.67 minutes; $p < 0.05$). The longer length could be attributable to the time necessary for elevating and suturing the flap in Limberg flap groups. Our study findings were supported by Kumar et al, who found that patients who underwent Limberg flap reconstruction had a higher mean operative time compared to excision alone, but the difference was statistically insignificant (52.8 ± 19.4 minutes vs. 45.3 ± 14.7 minutes; $p > 0.05$). [2] In a study by Akhtar et al, the mean operation time for Limberg flap excision was 55 minutes, with a range of 45 to 65 minutes, which is comparable to the current study. [3] The current study findings are consistent with Meena et al study, which found that patients with Limberg flaps had a longer mean operating time than those with primary midline closures (36.3 ± 3.24 minutes versus 24.93 ± 3.06 minutes; $p < 0.05$). [4]

We measured pain in all patients in both groups using a visual analog scale on days 1, 5, and 14 of the post-operative period. In our study population, patients managed with Limberg flap technique following excision had significantly lower mean VAS scores at day 1, day 5, and day 14 compared to those managed with excision alone (4.56 versus 6.32 at day 1, 2.94 versus 4.94 at day 5, and 1.75 versus 3.35 at day 14; $p < 0.05$). The increased discomfort in the excision group with secondary healing may be related to an open incision, scar contraction, and, in some circumstances, infection. [5]

Kumar et al. found that Limberg flap patients had significantly lower mean VAS scores than excision patients on post-operative days 1 (4.8 ± 2.6 versus 6.5 ± 2.1 ; $p < 0.05$), 2 (3.3 ± 1.3 versus 5.2 ± 1.7), and 3 (2.6 ± 0.5 versus 4.2 ± 0.8 ; $p < 0.05$). [2] Aziz et al found that patients in the Limberg flap group had significantly lower mean pain scores than those in the excision group ($p < 0.05$). [7] Our study findings contrasted with those of Chopade et al, who reported considerably higher pain during the initial postoperative period in the Limberg flap group compared to the excision group on days 1, 3, and 7.

However, after one and two months after surgery, the authors discovered no discomfort in the Limberg flap group, whereas pain in the excision group persisted, with mean VAS scores of 3 and 1, respectively. [7] The higher pain scores in the reference study were attributable to the use of non-absorbable nylon sutures and drain fixation on the skin, which were removed, resulting in significant pain reduction. [7]

We found no evidence of flap necrosis in patients handled with the flap method. Seroma developed in around 6.2% of the Limberg flap group after surgery, but none of the patients in the excision alone group did. We found no significant difference in seroma between the two groups ($p > 0.05$), but wound infection occurred in considerably more cases in the excision with secondary healing group compared to the Limberg flap group (19.4% versus 3.1%; $p < 0.05$). The elevated risk of infection in individuals treated with primary excision and secondary healing may be attributed to the presence of an open wound. Our findings were supported by the findings of Chopade et al, who found wound infection in 20% of the excision group but none in the Limberg flap reconstruction surgery group. [7] However, Jabbar et al found that wound infection occurred in 20% and 16.67% of cases following the excision and Limberg flap procedures, respectively. [8] In a research by Kumar et al, the authors recorded seroma in 12.5%, hematoma in 7.5%, and infections in 10% cases of the wide excision group, while the Limberg flap group had 5%, 2.5%, and 2.5%, respectively, with no significant difference between the groups. [2]

Thus, wound infection is a common consequence of broad excision followed by subsequent intention healing. Based on the immediate postoperative complication spectrum of the two procedures, it is possible to conclude that suppurative wound infections and wound disruptions are more common with simple excision, but wound collections (hematoma/seroma) are more likely with Limberg flaps.

In this study, Limberg flap patients had a substantially shorter time to wound healing (13.47 ± 1.722 days) compared to the excision with secondary healing group (34.71 ± 14.48 days; $p < 0.05$). Chopade et al found that the Limberg flap operation resulted in a considerably shorter healing period (20 ± 2 days) than excision (57 ± 11 days; $p < 0.05$). [7] Kumar et colleagues found that rhomboid excision with Limberg flap reconstruction had a mean healing time of 17 days, while open excision with secondary healing had a mean healing time of 60 days. The excision group had a significantly longer healing time ($p < 0.05$). [2] Berthier et al. conducted a meta-analysis that corroborated these findings, demonstrating that the Limberg flap is associated with a much shorter time

to complete wound healing as compared to the open lying approach.[9]

The Limberg flap group had a significantly shorter mean hospital stay (6.13 ± 1.008 days) than the excision alone group (10.39 ± 1.978 days; $p < 0.05$). Prolonged hospitalization in the excision group could be attributed to delayed wound healing and the presence of complications (wound infection) in a higher proportion of patients in that group. Our study findings were consistent with Kumar et al study, which found that patients in the Limberg flap group had a considerably shorter hospital stay than those in the excision group (4.6 days versus 6.9 days; $p < 0.05$).[1] Berthier et al. found that flap repair cases had considerably faster recovery times and shorter hospital stays than open laying procedures in their meta-analysis.[9] Limberg flap patients experienced faster recovery, with a lower pain level and shorter hospital stay, resulting in a considerably shorter time to return to normal activity compared to the excision with secondary healing group (14.38 days versus 39.97 days ($p < 0.05$). Kumar et al found that the excision group had a significantly longer time to return to work (10.8 ± 4.2 days) than the Limber flap group (8.3 ± 3.0 days; $p < 0.05$).[1] Our study findings were also corroborated by the findings of Chopade et al, who discovered that patients in the Limberg flap group returned to work after sutures were removed, whereas patients in the excision group took longer to return due to severe anxiety and the requirement for daily dressing.[7] In our study, we wanted to compare the intermediate results of two patient groups. Patient happiness was measured using the VAS score at one, three, and six months after surgery, and patients treated with the flap approach had a considerably higher patient satisfaction rate than patients treated with excision alone. Patient satisfaction scores in the Limberg flap and excision with secondary healing groups were 7.81 and 4.97 at 1 month, 8.69 and 6.94 at 3 months, and 9.94 and 8.16 at 3 months ($p < 0.05$). This could be related to early healing, low pain scores, a short hospital stay, and a prompt return to normal activity following the Limberg flap treatment. Kumar et al reported higher patient satisfaction in the Limberg flap group compared to the excision group (80% vs. 95%; $p < 0.05$).[1] However, Kaser et al reported no significant difference in overall patient satisfaction scores between the two interventional groups ($p > 0.05$).[10]

Conclusion

Rhomboid excision using Limberg's flap technique is superior to open excision with secondary healing technique in terms of postoperative pain, complications, early recovery, early wound healing, short hospital stay, early return to normal activity, and higher patient satisfaction. The main downside of the Limberg flap approach is a longer mean

duration of operation, which could be attributable to the increased time necessary for flap lifting and suturing after excision. Another downside of this approach is that it can result in seroma in certain patients. These findings are most likely due to the Limberg flap procedure, which flattens the natal cleft, lowering the risk of hair buildup, discomfort, and recurrence. Thus, rhomboid excision with Limberg flap is an acceptable and superior surgical technique for pilonidal sinus illness due to low recurrence rates and few complications, despite the fact that it requires specialized surgical skills. Thus, Limberg's flap approach is preferred over excision alone with subsequent wound healing in order to improve the success of sacrococcygeal pilonidal sinus surgery.

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