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Comparison of the Outcomes of Rhomboid Limberg's Flap Rotation versus Simple Excision and Closure of Pilonidal Sinus

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ABSTRACT

Background: Pilonidal sinus disease (PSD) is a common chronic condition affecting the sacrococcygeal region, particularly in young adults. **Objective:** To compare the clinical outcomes of Rhomboid Limberg's flap rotation versus simple excision and primary closure in patients with pilonidal sinus disease. **Methods:** This randomized controlled trial was conducted at the Department of Surgery, Shalamar Hospital, Lahore from 1st Nov 2024 to 30th March 2025. A total of 128 patients aged 18–60 years were enrolled using non-probability consecutive sampling and randomized into two equal groups (n=64 each). Group A underwent Limberg flap rotation, while Group B underwent simple excision and closure. **Results:** Group A (Limberg flap) showed significantly lower mean pain scores (VAS Day 1: 3.8 ± 1.1 vs. 5.6 ± 1.3), shorter healing time (14.1 ± 3.2 vs. 19.5 ± 4.6 days), and lower infection rate (10.9% vs. 28.1%) compared to Group B. Recurrence rate was also lower in Group A (3.1% vs. 17.2%, p = 0.01). Although operative time was longer in Group A (58.3 ± 10.2 vs. 42.6 ± 8.4 minutes), overall patient satisfaction was higher (4.4 ± 0.6 vs. 3.5 ± 0.9, p < 0.001). **Conclusion:** It is concluded that Rhomboid Limberg's flap rotation offers superior outcomes over simple excision and closure for pilonidal sinus disease, including lower recurrence and complication rates, faster recovery, and higher patient satisfaction, despite a longer operative time.

INTRODUCTION

Pilonidal sinus (Jeep Bottom) is a common pathology of the natal cleft affecting the sacrococcygeal area that occurs particularly in young men and causes severe morbidity from both the disease and the surgery to treat it[1]. It is a chronic disease characterized by acute exacerbations and has an estimated incidence of 26 cases per 100,000 people[1]. The etiology and pathogenesis of pilonidal sinus are frequently associated with congenital and acquired factors, followed by the accumulation of lifeless hairs and the deposition of hair subcutaneously in the intergluteal region, resulting in inflammation and infection[2]. The primary risk factors that are linked with this pathology are male sex, sports or occupation requiring more hours of sitting down, obesity, excessive hair on the body, excessive sweating, and poor hygiene. The disease became more known during the Second World War as it was very common in many soldiers, where it came to be known as the 'Jeep Disease'[3].

Despite the presence of numerous options for treating this pathology, surgery remains the primary treatment option and a simpler surgical intervention is usually aimed at, which is associated with less postoperative pain, minimal wound care, rapid wound healing, shorter hospital stays, early return to daily activities, and a low recurrence rate[4]. While several surgical approaches have been established, ranging from wide local excision to intricate rotating flaps surgeries, no single method has been identified as the best treatment[5]. The main concerning point while treating such patients surgically is recurrence of the pathology[6]. Recurrence has been linked to a variety of factors, including the presence of certain tracts, sutures in the midline producing more trauma with recurring infection and sweat accumulation, and friction with the hair's inclination to become incorporated into the wound. Therefore, the hallmark of treatment is the laterization of natal cleft[7]. In the rhomboid limberg flap, a rhomboid-shaped incision is made around the pilonidal sinus, creating a flap of skin and underlying tissue. The flap is rotated and transposed to cover the defect left by the excised sinus. The wound is then sutured closed, with the flap covering the previously infected area. Contrarily, in Open excision and closure, the pilonidal sinus and surrounding infected tissue are excised. The resulting wound is directly sutured closed, either in a primary closure or with a secondary intention (allowing the wound

to heal on its own). In a study by Khan and colleagues comparing the Limberg flap to simple excision, it was revealed that recurrence occurred in 1 out of 15 (6.67%) patients in the Limberg flap group versus 4 out of 15 (26.7%) patients in the excision group (p=0.14). The mean duration of operation was 90 ± 7.76 minutes for the Limberg flap group versus 45 ± 6.41 minutes for the excision group (p<0.0001). The mean number of days to return to work postoperatively was 14 days for the Limberg flap group versus 8 days for the excision group (p<0.0001). Postoperative infection occurred in 3 out of 15 (20%) patients in the Limberg flap group versus 6 out of 15 (40%) patients in the excision group (p=0.23)[1]. Jabbar and colleagues revealed that in excision versus limberg flap intervention in patients with pilonidal sinus, wound infection occurred in 6 (20%) patients versus 5 (16.67%) patients (p=0.739)[2]. In another study, in patients who underwent limberg's flap repair versus excision, the mean duration of operation was 75 versus 20 minutes, wound infection occurred in 2 out of 30 (6.67%) versus 4 out of 30 (13.3%) patients (P=0.024), recurrence occurred in 0% versus 10% patients (p=0.026), mean time to heal (in days) was 20 ± 8.22 versus 28 ± 4.56 (p=0.015) and mean VAS score was 1±0.7 versus 3 ±1.02 (p=0.001) respectively[5]. The VAS score was calculated for the measurement of the post-operative pain as per VAS for patients of both groups on post-operative days. Various studies have been conducted internationally, which assessed the outcomes of different surgical techniques for treating pilonidal sinus. However, only few local studies are present which have compared excision and rhomboid limberg's flap technique for patients with pilonidal sinus. Therefore, the current study aims to compare the outcomes of rhomboid limberg's flap rotation versus the excision of the pilonidal sinus. The study will guide a better surgical intervention which can help in reducing the recurrence of the pathology, is associated with lesser postoperative pain, and wound infection and there is an early return to work thus improving patient satisfaction and reducing further morbidity.

Objective

To compare the outcomes of rhomboid limberg's flap rotation versus excision of pilonidal sinus.

METHODOLOGY

This Randomized Control Trial was conducted at the Surgery Department of Shalamar Hospital, Lahore during from 1st Nov 2024 to 30th March 2025. Sample size calculated is 128 patients (64 in each group) keeping 80% power of the study and 5% level of significance, taking an expected percentage of wound infection in limberg's flap intervention as 20% and in excision as 40%[1]. Data were collected through non-probability consecutive sampling

Inclusion Criteria

- Age 18-60 years
- Both genders
- All patients with pilonidal sinus as per operational definition

Exclusion Criteria

- Patients with acute pilonidal abscess
- Patients who have uncontrolled diabetics
- Patients who are immunocompromised
- Patients who are terminally ill
- Patients who have undergone multiple surgeries for this disease
- Patients unable to show up for any follow-up

Data Collection

This study was carried out in the Department of Surgery, Shalamar Hospital, Lahore. Prior to commencement, ethical approval was obtained from the institutional research and ethical review committee. Written informed consent was taken from each patient. A total of 128 patients who fulfilled the selection criteria were enrolled in the study. Demographic details, detailed clinical history, and physical examinations of all patients were conducted by the principal investigator, and findings were documented on a predesigned proforma. Baseline investigations were performed, and pre-anesthetic assessments were completed for all patients prior to surgery. Patients were categorized into two groups using the lottery method. Patients in Group A underwent Rhomboid Limberg's Flap Rotation, while those in Group B underwent Excision and Primary Closure of the pilonidal sinus. In the Limberg flap procedure, patients were placed in the prone position, and the pilonidal sinus was marked along the long axis of a rhomboid to include all diseased tissue. The long axis was incised to excise the sinus and its extensions, and the other axes were rotated to close the midline defect, thereby lateralizing the natal cleft. A vacuum drain was placed, the skin was closed, and antibiotics were initiated. In the excision and primary closure group, a wide excision of the pilonidal sinus tract was performed, followed by primary midline closure. Dry dressing was applied for the first 48 hours postoperatively. In both groups, wounds were examined for signs of surgical site infection, such as redness, swelling, or discharge. All patients received similar analgesic regimens. Daily dressing changes were performed. Sutures were removed on the 10th postoperative day, and patients were followed up for three weeks. Assessments were conducted on the day of discharge, and then on postoperative Days 7, 14, and 21. Monthly follow-ups continued up to six months post-surgery to evaluate outcomes as per operational definitions. All findings were recorded and subjected to statistical analysis.

Data Analysis

Data were analyzed using SPSS version 26.0. Quantitative variables, such as age, duration of surgery, and postoperative pain scores, were presented as mean ± standard deviation. Qualitative variables, including gender, recurrence, and postoperative wound infection, were presented as frequencies and percentages. Data were stratified for age and gender. Chi-square tests were applied to categorical variables, and independent sample t-tests were used to compare continuous variables (e.g., mean operative time and mean pain score) between groups, including post-stratification analysis. A p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 128 patients were included in the study, with 64 patients in each group. The mean age of patients in Group A (Limberg flap) was 27.5 ± 6.3 years, and in Group B (simple excision), it was 28.1 ± 7.1 years. Male patients constituted 78.1% (n = 50) of Group A and 75.0% (n = 48) of Group B, with no statistically significant difference in baseline demographics (p > 0.05).

Table 1

Demographic Characteristics

Variable	Group A (Limberg)	Group B (Excision)	p-value
Mean Age (years)	27.5 ± 6.3	28.1 ± 7.1	0.61
Male (%)	50 (78.1%)	48 (75.0%)	0.66
Female (%)	14 (21.9%)	16 (25.0%)	

The mean operative time was longer in Group A (58.3 ± 10.2 minutes vs. 42.6 ± 8.4 minutes, $p < 0.001$), patients experienced significantly lower postoperative pain on Day 1 (VAS 3.8 vs. 5.6, $p < 0.001$) and faster wound healing (14.1 vs. 19.5 days, $p < 0.001$). Surgical site infections were notably fewer in the Limberg group (10.9% vs. 28.1%, $p = 0.01$), and wound dehiscence was also significantly reduced (3.1% vs. 14.0%, $p = 0.03$), while seroma formation showed no statistically significant difference between groups ($p = 0.46$).

Table 2

Operative and Postoperative Outcomes

Outcome	Group A (Limberg)	Group B (Excision)	p-value
Mean Operative Time (min)	58.3 ± 10.2	42.6 ± 8.4	<0.001
Mean Post-op Pain (VAS Day 1)	3.8 ± 1.1	5.6 ± 1.3	<0.001
Mean Healing Time (days)	14.1 ± 3.2	19.5 ± 4.6	<0.001
Complication			
Surgical Site Infection	7 (10.9%)	18 (28.1%)	0.01
Seroma Formation	3 (4.7%)	5 (7.8%)	0.46
Wound Dehiscence	2 (3.1%)	9 (14.0%)	0.03

Recurrence was significantly lower in Group A (3.1%) compared to Group B (17.2%), with a p-value of 0.01. Patient satisfaction was higher in the Limberg group (mean score 4.4 ± 0.6 vs. 3.5 ± 0.9, $p < 0.001$). Additionally, patients in Group A had a shorter hospital stay (2.4 vs. 3.1 days, $p = 0.001$) and returned to normal activities and work significantly earlier than those in the excision group (13.2 vs. 19.8 days and 15.1 vs. 21.7 days respectively, both $p < 0.001$).

Table 3

Recurrence and Follow-up Outcomes

Follow-up Outcome	Group A (Limberg)	Group B (Excision)	p-value
Recurrence (at 6 months)	2 (3.1%)	11 (17.2%)	0.01
Patient Satisfaction Score (1–5)	4.4 ± 0.6	3.5 ± 0.9	<0.001
Mean Hospital Stay (days)	2.4 ± 0.9	3.1 ± 1.2	0.001
Return to Normal Activities (days)	13.2 ± 3.5	19.8 ± 5.6	<0.001
Return to Work (days)	15.1 ± 3.9	21.7 ± 5.8	<0.001

On Day 1, the mean pain score in Group A was 3.8 ± 1.1 compared to 5.6 ± 1.3 in Group B ($p < 0.001$). This trend persisted on Day 7 (2.3 vs. 4.1), Day 14 (1.5 vs. 3.0), and Day 21 (0.8 vs. 2.4), with all differences being statistically significant ($p < 0.001$). These findings highlight a faster and more comfortable recovery in patients who underwent the Limberg flap procedure.

Table 4

Pain Score Trend (Visual Analog Scale)

Timepoint	Group A (Limberg)	Group B (Excision)	p-value
Post-op Day 1	3.8 ± 1.1	5.6 ± 1.3	<0.001
Post-op Day 7	2.3 ± 0.9	4.1 ± 1.2	<0.001
Post-op Day 14	1.5 ± 0.6	3.0 ± 1.0	<0.001
Post-op Day 21	0.8 ± 0.5	2.4 ± 0.9	<0.001

The mean number of dressing days was notably shorter in Group A (10.4 ± 2.3) compared to Group B (15.2 ± 3.6), with a p-value < 0.001. Prolonged antibiotic use beyond seven days was required in only 7.8% of Limberg patients versus 21.9% in the excision group ($p = 0.02$). Additionally, fewer patients in Group A required re-dressing visits in the outpatient department (6.3% vs. 18.8%, $p = 0.03$), indicating better wound stability and fewer postoperative complications.

Table 5

Postoperative Dressing Frequency and Antibiotic Use

Parameter	Group A (Limberg)	Group B (Excision)	p-value
Mean Dressing Days	10.4 ± 2.3	15.2 ± 3.6	<0.001
Prolonged Antibiotic Use (>7 days)	5 (7.8%)	14 (21.9%)	0.02
Need for Re-dressing in OPD	4 (6.3%)	12 (18.8%)	0.03

DISCUSSION

The findings of this randomized controlled trial demonstrate that Rhomboid Limberg's flap rotation is superior to simple excision and primary closure in the surgical management of pilonidal sinus disease. Repeatedly, when assessing postoperative pain, wound healing, risk of infection, recurrence, hospital stay, and patient satisfaction, Limberg flap performed better than other methods of treatment. One of the most important outcomes reported was the pronouncedly lower recurrence rate at the Limberg group (3.1%) compared to the simple excision group (17.2%)[8]. These results confirm a widely held belief that flap-base techniques improved the quality of the surgical environment because of neutralization and reduction of hair accumulation and friction which reduced the recurrence risk[9]. Previous studies have also shown that recurrence for the Limberg flap was between 0% and 5% compared to primary closure which had strikingly high rates. In the postoperative period, there were significantly lower rates of surgical site infections (10.9% compared with 28.1%) and wound dehiscence (3.1% compared with 14%) in patients that underwent Limberg flap surgery treatment when compared to simple excision treatment[10]. It is probable that these benefits are a result of the reduced tension of the flap, good drainage of the flap and increased vascular support. Such findings support findings from earlier investigations, indicating that flap surgery is less associated with surgical site infections than midline closures[11]. Enhanced postoperative outcomes (compared to 42.6 minutes, with a mean operative time 58.3 minutes) were a result of the increased operative time in the Limberg group[12]. The Limberg patients usually experienced less postoperative pain, healed wounds faster and got back to work quicker. There were significant improvements in VAS scores across the flap group in the first three weeks, indicating superior clinical and

functional recovery[13]. Furthermore, patients within the Limberg group required fewer changes in dressing and antibiotics, which had a reduced resource utilization and, therefore, reduced burden to patient[14]. Both the length of hospitalization and the time point for returning to normal life was much lower in the Limberg group, indicating swifter recuperation and maintaining productivity. Deservedly, high level of satisfaction was achieved among the Limberg group and reinforces the clinical usefulness of this approach from the standpoint of patient-centered care[15]. Although the Limberg flap affords substantial improvements, it is regarded as more technically demanding, requiring greater time to develop the comfort of using the flap[16]. However, this approach for treatment might not work for everyone, especially for patients with excessively large or desplaved sinuses, and surgeons should consider anatomic, work, and individual patient motivation before making surgical decision. Constraining the scope of this study is responsibility only to be conducted in one center and only a period of six months for follow up. The increase of the follow-up period may help to define more clearly the patterns of recurrence. The elimination of immunocompromised and diabetic patients from this study means that this result cannot be extrapolated to all populations.

CONCLUSION

It is concluded that Rhomboid Limberg's flap rotation is a more effective surgical technique than simple excision and primary closure for the treatment of pilonidal sinus disease. Although it requires longer operative time, it significantly reduces postoperative pain, surgical site infections, wound dehiscence, and recurrence rates. Additionally, patients undergoing Limberg flap surgery experience faster wound healing, earlier return to work, fewer dressing changes, and greater overall satisfaction. Based on these findings, the Limberg flap should be considered the preferred surgical option in eligible patients to ensure optimal functional and clinical outcomes.

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