IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 5 Ser. 1 (May. 2025), PP 77-81
www.iosrjournals.org

Limberg Flap Surgery: A Comprehensive Approach to Pilonidal Sinus Treatment

Dr. Goutom Kumar Ghosh[1], Dr. Md Sherajul Islam[2], Dr. AKM Shamsul Haque[3], Dr. Kh Mehedy Ibnay Mostofa[4], Dr. A S M Kutub Uddin Awal[5], Dr Md Golam Sharoar[6], Dr Md Majedul Islam[7] , Dr Aktar –Uj - Jaman[8]

1. *Associate Professor & Head, Pabna Medical College, Pabna, Bangladesh*
2. *Assistant Professor, Pabna Medical College, Pabna, Bangladesh*
3. *Assistant Professor, Pabna Medical College, Pabna, Bangladesh*
4. *Lecturer, Pabna Medical College, Pabna, Bangladesh*
5. *Junior Consultant, 250 Bedded General Hospital, Pabna, Bangladesh*
6. *Junior Consultant, 250 Bedded General Hospital, Pabna, Bangladesh*
7. *Assistant Registrar, 250 Bedded General Hospital, Pabna, Bangladesh*
8. *Indoor Medical Officer, 250 Bedded General Hospital, Pabna, Bangladesh*

Corresponding author: *Dr. Goutom Kumar Ghosh, Associate Professor & Head, Pabna Medical College, Pabna, Bangladesh*

Abstract

Background: *Pilonidal sinus disease is a common and often recurrent condition that typically affects young adults. Surgical intervention is often required for effective management, with various techniques available. The Limberg flap has gained attention as an effective surgical approach, offering satisfactory outcomes in terms of healing, recurrence, and cosmetic results.*

Aim of the study: *This study aimed to evaluate the clinical outcomes of Limberg flap surgery in the treatment of pilonidal sinus, focusing on postoperative recovery, complications, patient satisfaction, and healing time.*

Methods: *A cohort of 40 patients diagnosed with pilonidal sinus was treated with Limberg flap surgery. The demographic data, wound size, duration of surgery, hospital stay, complete healing time, and postoperative complications were recorded. Additionally, the Visual Analog Scale (VAS) was used to assess pain, and patient satisfaction regarding the cosmetic outcome was evaluated.*

Result: *The mean age of the cohort was 36.26 ± 4.53 years, with a male predominance (60.0%). The average duration of surgery was 33.79 ± 5.82 minutes, and the mean length of hospital stay was 2.36 ± 1.02 days. The complete healing time was 10.68 ± 2.51 days. Postoperative complications included fluid collection (17.5%), wound infection (10.0%), and flap necrosis (5.0%). No recurrences were observed. A high level of patient satisfaction was reported, with 88.89% of patients expressing positive views on the cosmetic outcome. The average VAS pain score was 4.15 ± 0.74.*

Conclusion: *The Limberg flap is an effective and reliable surgical technique for the treatment of pilonidal sinus, offering rapid recovery, low complication rates, and high patient satisfaction. Further studies with larger sample sizes and extended follow-up periods are recommended to confirm its long-term efficacy.*

Keywords: *Limberg flap, pilonidal sinus, surgical technique, postoperative outcomes, patient satisfaction, complications, healing time.*

I. INTRODUCTION

Pilonidal sinus is a common disease affecting the sacrococcygeal region, predominantly in young, hirsute males, and is characterized by a cyst, abscess, or sinus tracts with or without discharge [1,2]. The condition is rarely seen before puberty or after the age of 40 years [3]. The term "pilonidal" originates from Latin, meaning “nest of hairs,” which highlights the hair-related pathogenesis of the disease [1]. Initially, pilonidal sinus was thought to be of congenital origin, attributed to epithelial remnants from postcoccygeal epidermal cell rests. However, this view has shifted toward an acquired theory due to observations that congenital tracts lack hair and are lined by cuboidal epithelium [4]. The most widely accepted mechanism involves the implantation of shed hair into the natal cleft, facilitated by factors such as deep intergluteal sulcus, poor hygiene, local trauma, and excessive hairiness [5]. Karydakis identified three primary factors contributing to the condition: a high quantity of hair, extreme force, and the skin's susceptibility to infection. Pilonidal sinus disease significantly impacts patients due to its recurrent nature and the discomfort it causes, which can disrupt daily activities, education, or employment [4]. The estimated incidence of this disease is 26 cases per 100,000 people annually [1]. Among patients affected, more than half present with an acute sacrococcygeal abscess, while others develop chronic draining sinuses with

secondary infection and abscess formation [6]. Diagnosis of pilonidal sinus is primarily clinical, involving the identification of epithelialized follicle openings or the presence of chronic inflammation, persistent discharge, or abscess formation [7]. While conservative measures, such as incision and drainage, can manage acute abscesses, these approaches often fail to prevent recurrence [6]. Surgical excision of the sinus tract is considered the definitive treatment, with techniques ranging from primary closure to advanced flap reconstruction methods [7,8]. Among the surgical techniques, the Limberg flap procedure has emerged as a preferred method for managing sacrococcygeal pilonidal sinus due to its superior outcomes in recurrence and complication rates [9]. First described by Alexander Limberg in 1948, the technique involves rhomboid excision of the sinus area and tension-free closure using a transposition flap [6,10]. This flap design flattens the natal cleft, reducing sweating, maceration, and subsequent hair penetration, which are significant contributors to recurrence [11]. Reported outcomes of the Limberg flap procedure are highly favorable, with complication rates ranging from 0% to 16% and recurrence rates as low as 0% to 5% [9]. Compared to other surgical methods, the Limberg flap is associated with lower morbidity, fewer wound breakdowns, and better patient compliance [12]. This is attributed to its ability to eliminate the natal cleft's predisposing factors and provide a robust, well-vascularized flap for closure [9,13]. The aim of this study was to assess the outcomes and safety of Limberg flap surgery in treating pilonidal sinus disease.

II. METHODOLOGY & MATERIALS

This prospective observational study was meticulously conducted the Department of Surgery, 250 Bedded General Hospital, Pabna (Temporarily runs as Pabna Medical College Hospital), located in Pabna City, Bangladesh. Spanning seven years, from January 2013 to December 2019, focusing on evaluating surgical outcomes in patients undergoing Limberg flap surgery for pilonidal sinus disease. Using a purposive sampling approach, 40 patients admitted via the outpatient department were enrolled, forming a well-defined study cohort. The inclusion process followed rigorously established criteria to ensure reliability and clinical relevance of the findings.

Inclusion Criteria:
Patients aged 15 years and above diagnosed with pilonidal sinus disease were included in the study.

Exclusion Criteria:
Patients with any of the following conditions were excluded:

- Comorbid diseases
- Scars from previous pilonidal surgeries
- Abscess presentations
- Diabetes mellitus
- Immunodeficiency
- Neurological disorders
- Orifice located more than 3 cm from the sinus center

Surgical Approach

The Limberg flap surgery was performed under spinal anesthesia with patients positioned prone on the operating table. Antibiotic prophylaxis was administered using 1 g of intravenous cefazolin. Patients were placed in the jack-knife position to enhance visibility of the surgical site. Both buttocks were retracted laterally using adhesive tape, and the operating area was sterilized with 10% povidone-iodine solution. The surgical procedure followed the technique described by Mentes et al. (2004) [14]. A rhomboid excision was carried out, with the lower edge placed 2 cm lateral to the midline, encompassing the entire sinus area. Hemostasis was achieved using electrocautery. To ensure tension-free repair, the flap was mobilized from the gluteal fascia and repositioned medially to cover the defect. A suction drain was placed in all cases, and the subcutaneous tissue was closed with double layers of 2/0 polyglactin sutures (Ethicon US, LLC). Skin closure was performed using 3/0 polypropylene mattress sutures (Ethicon US, LLC). The drain was removed once drainage reduced to below 40 mL/day.

Data Collection

Data were systematically collected through a structured and validated questionnaire. Key variables recorded included demographic details (age, gender), wound size, duration of incapacity for work, and surgical details such as duration of surgery, length of hospital stay, complete healing time, and postoperative complications. Pain levels were measured using the Visual Analogue Scale (VAS), ranging from 0 (no pain) to 10 (pain as severe as imaginable). Recurrence rates were assessed at a 6-month follow-up. All data collection followed ethical guidelines, with written informed consent obtained from participants. Ethical approval was secured from the institutional ethics committee.

Statistical Analysis

The collected data were organized into tables for clarity and ease of interpretation. Statistical analyses were performed using SPSS software (version 26). Continuous variables were expressed as mean±standard deviation (SD), while categorical variables were summarized as frequencies and percentages.

III. RESULT

A total of 40 participants were included in this study. The mean age of the cohort was 36.26±4.53 years. The majority of participants (60.0%) were in the 31–45 age group, followed by 22.5% in the 46–60 age group, while only 12.5% were between 15–30 years, and 5.0% were over 60 years old. Males constituted a higher proportion (62.5%) of the study population compared to females (37.5%). The average wound size was recorded at 30.35±6.27 mm, whereas the mean duration of incapacity for work was 10.51±1.64 days (Table 1). The postoperative outcomes showed an average surgery duration of 33.79±5.82 minutes. The mean length of hospital stay was 2.36±1.02 days. Complete healing time was recorded at an average of 10.68±2.51 days. The mean VAS pain score was 4.15±0.74. Additionally, a high proportion of patients (90.0%) expressed satisfaction with the cosmetic outcome of the procedure (Table 2). Table 3 showed that postoperative complications occurred in a subset of the study participants. Fluid collection was the most common complication, occurring in 17.5% of cases, followed by wound infection in 10.0% of patients. Flap necrosis was noted in 5.0% of cases. No instances of recurrence were reported among the participants.

Table 1: Demographic profile of the study cohort (N=40).

Variables	Frequency (n)	Percentage (%)
	Mean±SD	
Age (years)		
15-30	5	12.5
31-45	24	60.0
46-60	9	22.5
>60	2	5.0
Mean±SD	36.26±4.53	
Gender		
Male	36	90
Female	4	10
Wound size (mm)	30.35±6.27	
Duration of incapacity for work (day)	10.51±1.64	

Table 2: Postoperative outcomes of the study cohort (N=40).

Variables	Frequency (n)	Percentage (%)
	Mean±SD	
Duration of surgery (min)	33.79±5.82	
Mean length of postoperative hospital stay (day)	2.36±1.02	
Complete healing time (day)	10.68±2.51	
VAS pain score	4.15±0.74	
Patients' cosmetic satisfaction	36	90.00

Table 3: Postoperative complications among study participants (N=40).

Complications	Frequency (n)	Percentage (%)
Fluid collection	7	17.50
Wound infection	4	10.00
Flap necrosis	2	5.00
Recurrence	0	0.00

IV. DISCUSSION

Pilonidal sinus is a chronic condition with a small skin cavity containing hair, typically located in the lower back. First described by Hodges, it is associated with persistent symptoms [15]. Several surgical techniques, including excision and packing, primary closure, marsupialization, and flap procedures, are available, but none fulfill all criteria such as low cost, ease of execution, short hospital stay, minimal pain, rapid healing, and low recurrence. The Limberg flap technique was developed to address these issues, as it flattens the natal cleft, lateralizes, and fills the excised defect without tension [16]. Despite various methods, no procedure has proven to be optimal with zero recurrence. The ideal surgical approach should not only remove the disease but also prevent recurrence by eliminating the natal cleft and the potential space for sinus formation [17]. The Limberg flap has proven advantageous, being simple, effective, and associated with fewer complications compared to other techniques, offering better hygiene and cosmetic outcomes [18]. In our study, Limberg flap surgery demonstrated favorable outcomes for pilonidal sinus treatment, with minimal complications and a high rate of patient

satisfaction. The average age of the participants was 36.26±4.53 years, with a predominance of males (60.0%). This finding aligns with existing literature, which suggests that pilonidal sinus disease is more prevalent among young adults, particularly males, due to factors such as increased body hair and a sedentary lifestyle. In studies by Gurer et al. [19] and Bali et al. [20], the mean ages were 25.5 and 24 years, respectively, with 95% of the participants being male. Similarly, in the study by Alvandipour et al., the mean age of the patients was 29 years, with 53% being male [21]. The mean duration of surgery in our study was 33.79 ± 5.82 minutes, reflecting a relatively short operative time. This aligns with previous research, indicating that Limberg flap surgery is a time-efficient option compared to other flap techniques [22]. Alvandipour et al. reported surgery durations of 29.25 minutes for the Limberg flap [21]. Similarly, Tukaram et al. observed operative times ranging from 35 to 45 minutes [23]. In contrast, other studies have reported longer durations, with times of 50.14 minutes for the Limberg flap and 42.32 minutes for the Karydakis flap [24].The average length of hospital stay in our study was 2.36 ± 1.02 days, suggesting a relatively rapid recovery and minimal hospital burden. This finding aligns with the results of Bali et al., who also reported brief hospital stays following Limberg flap surgery [20]. Similarly, Karaca et al., found an average hospital stay of 1.1 days for patients undergoing Limberg flap procedures [25]. Additionally, the average complete healing time in our cohort was 10.68 ± 2.51 days, aligning with the 10 to 14 days reported in other studies [23]. These findings are also consistent with those of Eryilmaz et al [26]. The mean VAS pain score of 4.15 ± 0.74 aligns with Kaya et al., confirming that the Limberg flap technique is associated with tolerable pain levels [27]. A significant 90.0% of our patients expressed high satisfaction with the cosmetic outcomes, highlighting the aesthetic advantages of the Limberg flap. These results align with those of Alvandipour et al., who similarly emphasized the superior cosmetic outcomes of this surgical technique when compared to alternative methods [21]. The overall complication rate observed in our study was relatively low. Specifically, fluid collection occurred in 17.5% of patients, wound infection in 10.0%, and flap necrosis in 5.0%. These rates are consistent with those reported in the existing literature, which identifies fluid collection and wound infection as the most frequent complications following Limberg flap surgery [21,26]. Notably, no recurrences were observed in our cohort, a finding that is in accordance with studies by Aydın et al. and Naveed et al., who also reported low complication and recurrence rates following Limberg flap reconstruction for pilonidal sinus [28-29]. The absence of recurrence in our study is of particular significance, as it further corroborates the effectiveness of the Limberg flap technique in minimizing recurrence. Furthermore, similar findings were reported by Singh et al., reinforcing the consistency and reliability of the Limberg flap technique across various studies [30].

Limitations of the study: Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. This study has several limitations. First, the short follow-up period limits our ability to assess long-term outcomes and recurrence rates. Additionally, the single-center design may restrict the generalizability of the results. We also did not account for potential influencing factors such as comorbidities, lifestyle habits, or psychological factors. Lastly, the assessment of patient satisfaction was subjective, and more objective measures would be beneficial in future research.

V. CONCLUSION

Limberg flap surgery for pilonidal sinus is an effective and reliable technique that is easily performed with a high rate of patient satisfaction. In our study, the procedure was associated with a complete cure and a low incidence of postoperative complications. The favorable outcomes, including quick recovery, minimal pain, and excellent cosmetic results, highlight the overall success of this approach in treating pilonidal sinus disease. With its low recurrence rate and manageable complication profile, Limberg flap surgery represents a valuable treatment option for patients suffering from this condition. Further studies with larger sample sizes and longer follow-up periods are recommended to confirm the long-term benefits and safety of this technique.

Funding: *No funding sources*
Conflict of interest: *None declared*
Ethical approval: *The study was approved by the Institutional Ethics Committee.*

REFERENCES

[1]. Sarkees ML, Bavry AA. Acute coronary syndrome (unstable angina and non-ST elevation MI). BMJ clinical evidence. 2009;2009.
[2]. Singh A, Museedi AS, Grossman SA. Acute coronary syndrome.
[3]. Members WG, Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, Das SR, de Ferranti S, Després JP, Fullerton HJ. Executive summary: heart disease and stroke statistics--2016 update: a report from the American Heart Association. Circulation. 2016 Jan 26;133(4):447-54.
[4]. Aboyans V, Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet (British edition). 2015 Jan 10;385(9963):117-71.
[5]. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, Chamberlain AM, Cheng S, Delling FN, Elkind MS. Heart disease and stroke statistics-2021 update: a report from the American Heart Association.

[6]. Song, F., Yu, M., Yang, J., Xu, H., Zhao, Y., Li, W., Wu, D., Wang, Z., Wang, Q., Gao, X. and Wang, Y., 2016. Symptom-onset-to-balloon time, ST-segment resolution and in-hospital mortality in patients with ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention in China: from China acute myocardial infarction registry. *The American journal of cardiology*, *118*(9), pp.1334-1339.

[7]. Montalescot G, Zeymer U, Silvain J, Boulanger B, Cohen M, Goldstein P, Ecollan P, Combes X, Huber K, Pollack C, Bénezet JF. Intravenous enoxaparin or unfractionated heparin in primary percutaneous coronary intervention for ST-elevation myocardial infarction: the international randomised open-label ATOLL trial. The Lancet. 2011 Aug 20;378(9792):693-703.

[8]. Weerasaksanti A, Siwamogsatham S, Kunlamas Y, Bunditanukul K. Factors associated with bleeding events from enoxaparin used for patients with acute coronary syndrome. BMC Cardiovascular Disorders. 2023 May 6;23(1):243.

[9]. Yusuf S, Mehta SR, Chrolavicius S, et al. Comparison of fondaparinux and enoxaparin in acute coronary syndromes. *N Engl J Med*. 2006;354(14):1464-147.

[10]. Sanderink GJ, Le Liboux A, Jariwala N, Harding N, Ozoux ML, Shukla U, Montay G, Boutouyrie B, Miro A. The pharmacokinetics and pharmacodynamics of enoxaparin in obese volunteers. Clinical Pharmacology & Therapeutics. 2002 Sep;72(3):308-18.

[11]. Lim W, Dentali F, Eikelboom JW, Crowther MA. Meta-analysis: low-molecular-weight heparin and bleeding in patients with severe renal insufficiency. Annals of internal medicine. 2006 May 2;144(9):673-84.

[12]. Collet JP, Thiele H, Barbato E, Barthélémy O, Bauersachs J, Bhatt DL, Dendale P, Dorobantu M, Edvardsen T, Folliguet T, Gale CP. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). European heart journal. 2021 Apr 7;42(14):1289-367.

[13]. Hirsh J, Warkentin TE, Raschke R, Granger C, Ohman EM, Dalen JE. Heparin and low-molecular-weight heparin. Chest. 1998;114(5):489S-510S.

[14]. PURSUIT Trial Investigators. Inhibition of platelet glycoprotein IIb/IIIa with eptifibatide in patients with acute coronary syndromes. New England Journal of Medicine. 1998 Aug 13;339(7):436-43.

[15]. O'Gara PT, Kushner FG, Ascheim DD, Casey DE, Chung MK, De Lemos JA, Ettinger SM, Fang JC, Fesmire FM, Franklin BA, Granger CB. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Journal of the American college of cardiology. 2013 Jan 29;61(4):e78-140.

[16]. Macie C, Forbes L, Foster GA, Douketis JD. Dosing practices and risk factors for bleeding in patients receiving enoxaparin for the treatment of an acute coronary syndrome. Chest. 2004 May 1;125(5):1616-21.