International Surgery Journal
Oli P et al. Int Surg J. 2026 Jul;13(7):xxx-xxx
https://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20261867

Case Series

Limberg flap as the standard treatment for pilonidal sinus

Prashant Oli*, Virendra K. Misra

Department of Surgery, B. D. Pandey District Hospital, Nainital, Uttarakhand, India

Received: 25 May 2026
Accepted: 12 June 2026

***Correspondence:**
Dr. Prashant Oli,
E-mail: Prashantoli54@gmail.com

ABSTRACT

Pilonidal sinus disease (PSD) is a chronic inflammatory condition of the sacrococcygeal region predominantly affecting young adult males. Traditional surgical approaches such as wide excision with secondary healing or primary midline closure are associated with prolonged healing and higher recurrence rates. Off-midline flap procedures, particularly the Limberg flap, have demonstrated improved outcomes with faster recovery and lower recurrence. This retrospective case series included five male patients aged 20–30 years with chronic or recurrent PSD who underwent rhomboid excision with Limberg flap reconstruction between July 2023 and October 2024 at a district hospital. Operative details, postoperative outcomes, complications, and follow-up data were analyzed. The mean operative time was 45±15 minutes. Closed suction drains were removed on postoperative day 5±1. Two patients developed mild wound edge erythema that resolved with conservative treatment. No flap necrosis, wound infection, or seroma formation occurred. Complete wound healing was achieved within three weeks in all patients. During a follow-up period of 6–18 months, no recurrence was observed. Limberg flap reconstruction is a safe and effective technique for the treatment of pilonidal sinus disease, offering rapid wound healing, minimal complications, and low recurrence. Proper surgical technique and postoperative care are essential for optimal outcomes.

Keywords: Pilonidal sinus disease, Limberg flap, Rhomboid excision, Sacrococcygeal sinus, Off-midline closure, Flap reconstruction

INTRODUCTION

Pilonidal sinus disease (PSD) is a chronic inflammatory condition affecting the sacrococcygeal region, predominantly seen in young adult males. It is believed to result from hair penetration into the natal cleft, leading to sinus formation, chronic infection, and intermittent discharge.[1,2] The condition can significantly impair quality of life due to pain, recurrent infections, and prolonged treatment.

Traditional surgical management includes wide excision with healing by secondary intention or primary midline closure. However, these approaches have been associated with prolonged wound healing, increased postoperative morbidity, and relatively high recurrence rates due to tension along the midline incision and unfavourable anatomical characteristics of the natal cleft.[3,4]

To overcome these limitations, several off-midline surgical techniques have been developed. Among these, the Limberg rhomboid flap has gained widespread acceptance due to its ability to flatten the natal cleft and lateralize the surgical scar, thereby reducing hair accumulation, moisture retention, and mechanical stress on the wound.[5,6]

Multiple randomized trials and meta-analyses have demonstrated that Limberg flap reconstruction provides lower recurrence rates, faster healing, and better patient satisfaction compared with primary midline closure.[7-11]

The Limberg flap has also shown favourable outcomes in both primary and recurrent pilonidal sinus disease, even when compared against wide-open excision with healing by secondary intention.[12,13] Comparative studies evaluating Limberg flap against Karydakis flap, primary

closure, and other techniques have demonstrated comparable or superior outcomes.[14-19] Limberg flap technique is associated with high cure rates, lesser complications, lower recurrence risk and better patient satisfaction.[20,21]

Recent studies have also explored modifications including vacuum-assisted closure (VAC) and enhanced recovery after surgery (ERAS) protocols to further improve recovery following Limberg flap reconstruction.[22,23]

Despite extensive literature from tertiary centres, data from district hospitals remain limited. The present study describes our experience with Limberg flap reconstruction in patients with pilonidal sinus disease and evaluates operative outcomes, postoperative complications, and short-term recurrence.

CASE SERIES

Material and methods

This retrospective case series was conducted at B. D. Pandey District Hospital, Nainital, from July 2023 to October 2024.

Inclusion criteria

Male patients aged 20–30 years and having chronic or recurrent pilonidal sinus disease were included.

Exclusion criteria

Patients with acute pilonidal abscess without chronic sinus and significant comorbidities affecting wound healing were excluded.

Surgical technique

All procedures were performed under spinal anaesthesia with the patient in the prone position. After preparation and draping, the sinus tract was delineated using methylene blue injection, which facilitates identification of all sinus tracts and reduces recurrence risk.[8] Skin marking of incision was done (Figure 1).

The sinus was excised in a rhomboid shape designed to include all tract tissue along with surrounding tissue up to presacral fascia to ensure complete removal of the tract (Figure 2).

Fascio-cutaneous flap transposition was done from adjacent gluteal skin for defect coverage (Figure 3), as described by Limberg et al. Flap was handled bare handed without instruments to minimize tissue trauma. A closed Romovac drain was placed in the dead space and removed after 5±2 days. Fasciocutaneous Limberg flap was then transposed to cover the defect, ensuring tension-free, well-vascularized closure.[9] Skin closure done in single layer using 2-0 prolene (Figure 4).

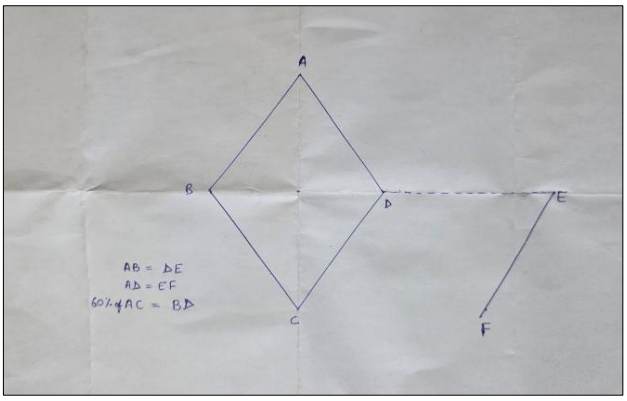

Figure 1: Skin incision marking.

Figure 2: Sinus tract excision up to presacral fascia.

Figure 3: Fasciocutaneous flap rotation to cover the defect.

Specimen sent for Histopathological analysis. Oral feeding was initiated 6 hours postoperatively. Patients were advised to avoid prolonged supine positioning during the early postoperative period to minimize pressure on the flap.

Skin sutures were removed in a staged manner: alternate sutures at 2 weeks (Figure 5), and the remainder at 3 weeks (Figure 6).

Patients were hospitalized for approximately one week due to the remote geographical location and to facilitate postoperative wound care.

Figure 4: Post defect closure.

Figure 5: Alternate suture removal at 2 weeks.

Figure 6: Complete healing at 3 weeks.

Postoperative antibiotics, analgesia, and wound hygiene instructions were provided. Follow-ups were scheduled at 2 weeks, 3 weeks, 3 months, and 6 months postoperatively to assess wound healing, complications, and recurrence.

Results

Operative time

The mean operative duration was 45±15 minutes.

Hospital stays

Average stay was about 1 week due to logistics, longer than typical reported stays of 2–3 days.

Drain removal

Romovac drains were removed on average at day 5±1, effectively preventing fluid accumulation; no seromas were recorded. Drain removed on day 7 in one patient due to prolonged discharge.

Complications

Minor wound edge erythema occurred in 2 patients (40%), managed successfully with conservative measures. No flap necrosis, wound infections, or dehiscence were observed.

Follow-up

Complete primary wound healing was noted within 3 weeks in all cases. No recurrences were documented during 6-18 months of follow-up, aligning with low recurrence rates reported in literature.

Patient satisfaction

All patients reported satisfactory cosmetic outcomes and complete symptom resolution without functional impairment.

Table 1 shows case results.

Table 1: Case results.

Case no.	Age/ sex	Disease	Past surgery	Operative time (min)	Drain removal (day)	Hospital stays (days)	Complications	Follow-up period (months)	Recurrence
1	28/M	Secondary	I and D for acute abscess	60	7	10	Prolonged drain output	18M	No
2	20/M	Primary	No	45	4	7	Minor wound edge erythema	16M	No
3	27/M	Secondary	I and D for acute abscess	45	5	7	None	8M	No
4	27/M	Recurrent	Operated twice	50	6	8	Minor wound edge erythema	6M	No
5	28/M	Primary	No	40	5	7	None	14M	No

DISCUSSION

The management of pilonidal sinus disease remains controversial due to the variety of surgical techniques available. The ideal procedure should achieve complete disease eradication, minimize postoperative complications, reduce recurrence, and allow rapid return to normal activities.

In this case series, Limberg flap reconstruction demonstrated favourable outcomes with a mean operative time of approximately 45 minutes and complete wound healing within three weeks. These findings are consistent with previously reported outcomes in studies evaluating Limberg flap procedures.[9-12]

One of the major advantages of the Limberg flap technique is the off-midline closure, which reduces wound tension and decreases the risk of recurrence. Flattening of the natal cleft also minimizes hair accumulation and moisture retention, factors that contribute to recurrence.[5,6] Comparative studies between Limberg flap, Karydakis flap and other techniques have shown similar recurrence rates but better natal cleft flattening with the Limberg flap.[12,14-19]

Postoperative complications in our study were minimal. Mild wound edge erythema was observed in two patients and resolved with conservative treatment. No major complications occurred. The routine use of closed suction drainage likely contributed to the absence of seroma formation by eliminating dead space and promoting flap adherence.[20]

Recurrence is a critical outcome in pilonidal sinus surgery. Closed suction drainage was routinely used in our patients, which has been reported to reduce seroma formation and promote flap adherence.[22] Previous studies have reported recurrence rates below 5% following Limberg flap surgery, supporting the effectiveness of the procedure.[20-22] In our series, no recurrence was observed during the follow-up period.

A descriptive cross-sectional study reported a complication rate of 15.7% following Limberg rhomboid flap surgery, including wound infection, flap necrosis, and recurrence.[24] In our case mild wound edge erythema resolved with conservative management, no other complications were reported. Initial incision and drainage followed by delayed definitive surgery has been shown to reduce long-term recurrence in patients presenting with acute abscess.[25] Two patients in our study had previously undergone drainage before definitive surgery.

Low recurrence rates in long term follow up with Limberg flap procedure significantly improves quality of life.[26] In a study of 205 patients Limberg flap reconstruction produced better quality of health scores, especially in terms of mental health and bodily pain. There was a higher tendency towards anxiety and depression in the primary closure group.[7] Recent high-impact studies demonstrate that modified Limberg flap with VAC and ERAS protocols accelerates recovery and improves patient satisfaction.[22,23]

The primary limitation of this study is the small sample size and limited follow-up duration. Even small case series have demonstrated favourable outcomes with the Limberg flap technique, supporting its reliability as a surgical option.[27-29] However, the results are consistent with previously published studies and support the use of Limberg flap reconstruction as an effective surgical option for pilonidal sinus disease.

Another important observation is that these procedures were performed in a district hospital setting rather than a tertiary care centre. Despite potential resource limitations, outcomes were comparable with those reported in larger institutional studies.

CONCLUSION

Limberg flap reconstruction is a safe and reliable surgical technique for the management of pilonidal sinus disease. In this series, the procedure resulted in rapid wound healing, minimal complications, and no recurrence during mid-term follow-up. The technique provides important advantages including off-midline closure, flattening of the natal cleft, and reduced wound tension. Standardized surgical technique, careful postoperative management, and the potential use of ERAS protocols or VAC-assisted drain closure can further enhance outcomes. Our experience demonstrates that the procedure can be successfully performed even in district hospital settings with outcomes comparable to tertiary care centres. Further prospective studies with larger sample sizes and longer follow-up are required to confirm these findings.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Karydakis GE. Easy and successful treatment of pilonidal sinus after explanation of its causative process. Aus N Zealand J Surg. 1992;62(5):385-9.
2. Bascom J. Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment. Surgery. 1980;87(5):567-72.
3. Milone M, Manigrasso M, Sosa Fernandez LM. Contemporary management of pilonidal sinus disease: a systematic review and meta-analysis. Int J Colorectal Dis. 2021;36(10):2041-52.
4. Topgül K, Ozdemir E, Kiliç K, Gökbayir H, Ferahköşe Z. Long-term results of limberg flap procedure for treatment of pilonidal sinus: a report of 200 cases. Dis Colon Rectum. 2003;46(11):1545-8.
5. Bi S, Sun K, Chen S, Gu J. Surgical procedures in the pilonidal sinus disease: a systematic review and network meta-analysis. Sci Rep. 2020;10(1):13720.

6. Berthier C, Bérard E, Meresse T, Grolleau JL, Herlin C, Chaput B. A comparison of flap reconstruction vs the laying open technique or excision and direct suture for pilonidal sinus disease: A meta-analysis of randomised studies. Int Wound J. 2019;16(5):1119-35.
7. Duman K, Ozdemir Y, Yucel E, Akin ML. Comparison of depression, anxiety and long-term quality of health in patients with a history of either primary closure or Limberg flap reconstruction for pilonidal sinus. Clinics (Sao Paulo). 2014;69(6):384-7.
8. Maak M, Oetzmann von Sochaczewski C, Hackmann T, Bonni M, Braun-Münker M, Doll D. The Use of Methylene Blue in Pilonidal Sinus Surgery Reduces the Risk of Recurrence: A Systematic Review and Meta-Analysis. Med (Kaunas, Lithuania). 2026;62(2):238.
9. Fu C, Deng Y, Liu M. Limberg Flap for Recurrent Pilonidal Sinus. Dis Colon Rectum. 2023;66(6):e298.
10. Khan PS, Hayat H, Hayat G. Limberg flap versus primary closure in the treatment of primary sacrococcygeal pilonidal disease; a randomized clinical trial. Indian J Surg. 2013;75(3):192-4.
11. Altintoprak F, Gundogdu K, Ergonenc T, Dikicier E, Cakmak G, Celebi F. Retrospective review of pilonidal sinus patients with early discharge after Limberg flap procedure. Int Surg. 2014;99(1):28-34.
12. Emile SH, Elfeki H, Shalaby M, Sakr A, Giaccaglia V, Sileri P, et al. Endoscopic pilonidal sinus treatment: a systematic review and meta-analysis. Surg Endosc. 2018;32(9):3754-62.
13. Chopade SP, Adhikari GR. Comparative Study of Limberg Flap Reconstruction With Wide-Open Excision and Healing by Secondary Intention in the Management of Pilonidal Sinus: Our Experience at a Tertiary Care Center in India. Cureus. 2022;14(6):e26396.
14. Erkent M, Şahiner İT, Bala M, Kendirci M, Yıldırım MB, Topçu R, et al. Comparison of Primary Midline Closure, Limberg Flap, and Karydakis Flap Techniques in Pilonidal Sinus Surgery. Med Sci Monit. 2018;24:8959-63.
15. Dass TA, Zaz M, Rather A, Bari S. Elliptical excision with midline primary closure versus rhomboid excision with limberg flap reconstruction in sacrococcygeal pilonidal disease: a prospective, randomized study. Indian J Surg. 2012;74(4):305-8.
16. Arnous M, Elgendy H, Thabet W, Emile SH, Elbaz SA, Khafagy W. Excision with primary midline closure compared with Limberg flap in the treatment of sacrococcygeal pilonidal disease: a randomised clinical trial. Ann R Coll Surg Engl. 2019;101(1):21-9.
17. Gavriilidis P, Bota E. Limberg flap versus Karydakis flap for treating pilonidal sinus disease: a systematic review and meta-analysis. Can J Surg. 2019;62(2):131-8.
18. Bali İ, Aziret M, Sözen S, Emir S, Erdem H, Çetinkünar S, et al. Effectiveness of Limberg and Karydakis flap in recurrent pilonidal sinus disease. Clinics (Sao Paulo). 2015;70(5):350-5.
19. Karaca AS, Ali R, Capar M, Karaca S. Comparison of Limberg flap and excision and primary closure of pilonidal sinus disease, in terms of quality of life and complications. J Korean Surg Soc. 2013;85(5):236-9.
20. Mandloi VK, Saxena G. A study on limberg flap procedure for pilonidal sinus at a tertiary care centre. Int J Surg Sci. 2024;8(3):102-4.
21. Wasadikar PP, Harbade SR, Vaidya PN, Kasbe VP. "Limberg Flap Procedure for Sacrococcygeal Pilonidal Sinus Disease". Asian J Res Surg. 2025;8(1):198-203.
22. Xu M, Wang Y, Ma X, Liu Y, Xue C, Dai H. Simplified and modified Limberg flap plus vacuum-assisted closure for treatment of sacrococcygeal pilonidal sinus disease. Int Wound J. 2024;21(1):e14353.
23. Lu W, Huang S, Ye H, Xiang S, Zeng X. The application of ERAS in pilonidal sinus: comparison of postoperative recovery between primary suture and Limberg flap procedure in a multicenter prospective randomized trial. Front Surg. 2024;11:1120923.
24. Shrestha BB, Karmcharya M, Bogati L, Ghimire P. Prevalence of Complications after Limberg Rhomboid Flap in Patients with Cutaneous Defects at A Tertiary Care Hospital. JNMA J Nepal Med Assoc. 2019;57(216):113-5.
25. Doll D, Matevossian E, Hoenemann C, Hoffmann S. Incision and drainage preceding definite surgery achieves lower 20-year long-term recurrence rate in 583 primary pilonidal sinus surgery patients. J German Society Dermatol. 2013;11(1):60-4.
26. König J, Settmacher U, Deeb AA, Rohland O, Dondorf F, Bauschke A, et al. Long term results and quality of life after primary excision followed by Limberg plasty in pilonidal sinus disease. Langenbecks Arch Surg. 2025;410(1):193.
27. Dahmiwal T, Zade A, Tote D, Reddy S, Thatipalli N, Khurana J, et al. Limberg Transpositional Fasciocutaneous Flap in Sacrococcygeal Pilonidal Sinus Disease (SPSD): A Case Series. Cureus. 2024;16(5):e61086.
28. Sinnott CJ, Glickman LT. Limberg flap reconstruction for sacrococcygeal pilonidal sinus disease with and without acute abscess: Our experience and a review of the literature. Arch Plast Surg. 2019;46(3):235-40.
29. Aithal SK, Rajan CS, Reddy N. Limberg flap for sacrococcygeal pilonidal sinus a safe and sound procedure. Indian J Surg. 2013;75(4):298-301.

Cite this article as: Oli P, Misra VK. A Limberg flap as the standard treatment for pilonidal sinus. Int Surg J 2026;13:xxx-xx.