



A PROSPECTIVE COMPARATIVE STUDY EVALUATING Z-PLASTY FLAP VERSUS MIDLINE PRIMARY CLOSURE FOR SACROCOCCYGEAL PILONIDAL SINUS: ANALYSIS OF HEALING, MORBIDITY, AND RECURRENCE.

General Surgery

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ABSTRACT

Background: Pilonidal sinus disease is a chronic inflammatory condition of the natal cleft, commonly affecting young adults, with high morbidity and a propensity for recurrence. Numerous surgical techniques have been described; however, procedures involving midline primary closure are associated with higher complication and recurrence rates. **Aim:** To compare clinical outcomes of patients undergoing Z-plasty flap reconstruction versus midline primary closure for sacrococcygeal pilonidal sinus. **Materials And Methods:** This prospective comparative study was conducted with 70 patients. Patients aged over 15 years with primary or recurrent pilonidal sinus were enrolled and divided into two groups randomly. Outcomes assessed included wound healing time, postoperative complications, hospital stay, return to normal activity, cosmetic satisfaction, and recurrence. **Results:** Both groups were comparable in age, sex distribution, and occupational risk factors. The mean wound healing time was significantly longer in Group B compared to Group A, (13.03 ± 2.35 days vs 37.11 ± 4.61 days; $p < 0.001$). Postoperative complications such as wound infection, dehiscence, and wound collection were significantly higher in the midline primary closure group. Recurrence was higher in the midline primary closure group (34.3%) compared to the Z-plasty group (14.3%); however, this difference did not reach statistical significance ($p = 0.051$), although a strong trend favoring Z-plasty was observed. **Conclusion:** Z-plasty flap reconstruction offers superior outcomes compared to midline primary closure, with faster wound healing, lower postoperative morbidity, improved cosmesis, and reduced recurrence.

KEYWORDS

Pilonidal sinus, Flap reconstruction, midline primary closure, Complication, Recurrence.

INTRODUCTION

Pilonidal disease, derived from “pilus” (hair) and “nidus” (nest), is a chronic inflammatory disorder characterized by a sinus tract in the natal cleft containing hair and granulation tissue. First described by Hodges in 1880, it predominantly affects young males between 15–30 years and is associated with prolonged sitting, deep natal clefts, obesity, and hirsutism.

Historically termed “Jeep disease,” its incidence surged during World War II due to prolonged driving over rough terrain. The disease manifests variably as asymptomatic pits, recurrent discharging sinuses, or acute abscesses. The annual incidence is estimated at 26 per 100,000 population, with a prevalence of 0.7%.

Although numerous surgical procedures have been described—excision with secondary healing, Midline primary closure, Karydakias flap, Bascom procedure, Limberg flap, Z-plasty—no single technique has been universally accepted as ideal. Operations involving midline primary closure have higher recurrence rates, whereas flap techniques that lateralize the suture line and obliterate the natal cleft show promising outcomes.

This study compares the traditional midline primary closure method with Limberg or Z-plasty flap techniques to evaluate differences in morbidity, healing, hospital stay, complications, and recurrence.

Despite growing evidence favoring off-midline techniques, limited prospective data from Indian tertiary centers exist comparing Z-plasty with midline primary closure.

MATERIALS AND METHODS:

This prospective comparative study was conducted in the Department of General Surgery at Mahatma Gandhi Medical College and Hospital, Jaipur, over a period of one year from May 2024 to April 2025. The study population comprised 70 patients clinically diagnosed with sacrococcygeal pilonidal sinus. Patients aged more than 15 years, including both primary and recurrent cases, who were fit for spinal or general anaesthesia and willing to undergo surgery and follow-up were included in the study. Immunocompromised patients, those with

pilonidal disease at atypical sites, patients with active perianal fistula, and individuals with uncontrolled diabetes or other significant systemic illnesses were excluded.

Grouping:

Group A — Flap Reconstruction (Z-plasty)

Group B — Midline primary closure

Statistical Analysis:-

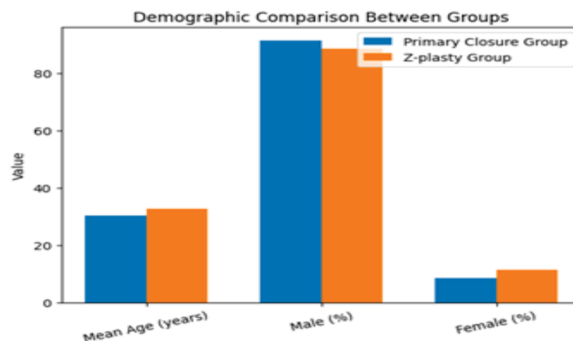
Significance level: $p < 0.05$

Software: SPSS v26.0 and Microsoft Excel.

Continuous variables were analyzed using Student's t-test and categorical variables using Chi-square test.

OBSERVATIONS AND RESULTS

The age distribution was comparable between the two groups, with most patients belonging to the 21–40-year age group. The mean age was 30.31 ± 5.33 years in the midline primary closure group and 32.60 ± 8.43 years in the Z-plasty group, with no statistically significant difference ($p = 0.180$). Both groups showed male predominance, with males constituting 91.4% in the midline primary closure group and 88.6% in the Z-plasty group; the difference was not significant ($p = 0.690$).



Graph 1: Age Distribution Between Both The Groups

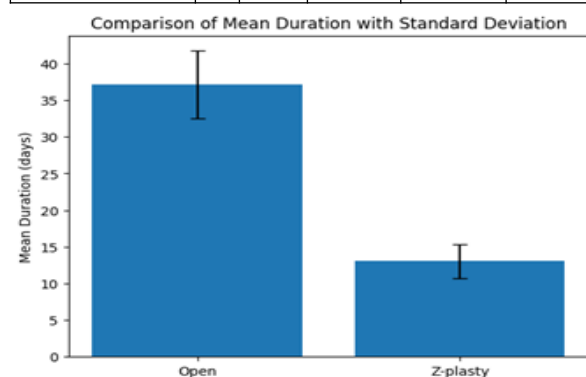
Table 1: Age Distribution Between Both The Groups

Parameter	Midline Primary Closure Group	Z-plasty group	P-value
Mean Age (years)	30.31 ±5.33	32.6 ±8.43	0.180
Male (%)	91.4	88.6	0.690
Female(%)	8.6	11.4	0.690

The mean wound healing time was significantly longer in the midline primary closure group (37.11 ±4.61 days) compared to the Z-plasty group (13.03 ±2.35 days), with a highly significant difference ($p < 0.001$).

Table 2: Mean Healing Time Distribution Between Both The Groups

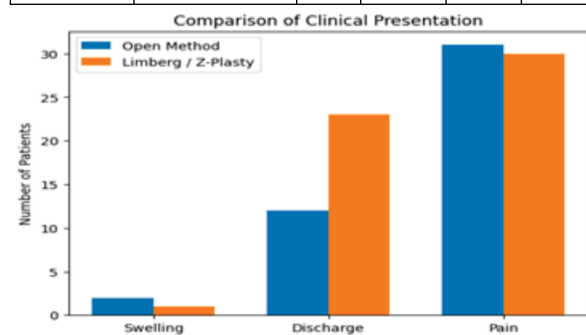
Technique	No.	Mean	Std. Deviation	Range	P-value
Midline primary closure	35	37.11	4.613	30-45 days	$p < 0.001$
Z-plasty	35	13.03	2.345	9-18 days	
Total	70	25.07	12.662		

**Graph 2: Mean Healing Time Distribution Between Both The Groups**

Discharge at presentation was significantly more frequent in the Z-plasty group (65.7%) than in the midline primary closure group (34.3%) ($p = 0.009$). Swelling and pain are similarly distributed between the two groups, with no significant differences ($p = 0.555$ and $p = 0.721$, respectively).

Table 3: Clinical Presentation

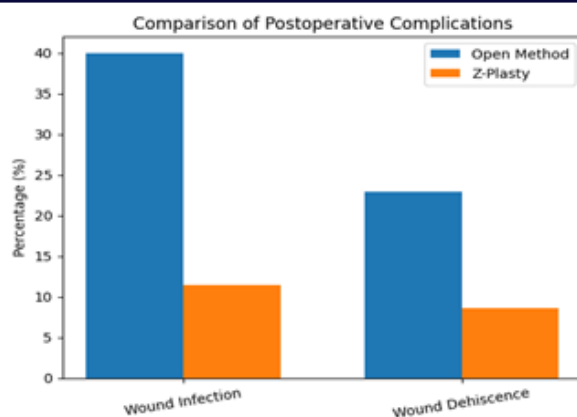
Clinical Presentation	Midline primary closure		Limberg/ Z-Plasty		P-value
	No.	%	No.	%	
Swelling	2	5.7%	1	2.9%	0.555
Discharge	12	34.3%	23	65.7%	0.009
Pain	31	88.6%	30	85.7%	0.721

**Graph 3: Clinical Presentation**

Postoperative complications were significantly higher in the midline primary closure, including wound infection 40.0% vs Z-Plasty 11.4%, (p -value = 0.006), wound dehiscence (22.9% vs 8.6%, $p = 0.032$).

Table 4: Incidence Of Postoperative Complications

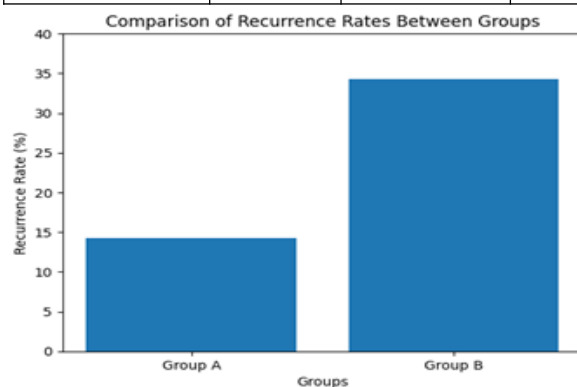
Complication	Midline primary closure		Z-Plasty		p-Value
	No.	%	No.	%	
Wound Infection	14	40%	4	11.4%	0.006
Wound Dehiscence	8	22.9%	3	8.6%	0.032

**Graph 4: Incidence of Postoperative complications**

Recurrence was higher in the midline primary closure group (34.3%) compared to the Z-plasty group (14.3%); however, this difference did not reach statistical significance ($p = 0.051$).

Table 5: Comparison Of Recurrence Rate Between Two Groups

Parameter	Z plasty(%)	Midline Primary Closure(%)	p-value
Recurrence Rate	14.3	34.3	0.051

**Graph 5: Comparison of recurrence Rate between two groups**

DISCUSSION:

Pilonidal sinus disease continues to be a challenging surgical condition due to its chronicity, recurrence, and significant impact on patient quality of life.¹ The two principal surgical approaches-midline excision with midline primary closure and off-midline flap techniques such as Z-plasty-differ fundamentally in wound biology, tension distribution, vascularity, and recurrence propensity.²

Midline primary closure is technically simple and cost-effective; however, it is associated with higher recurrence due to midline tension, poor local hygiene, and unfavorable wound environment.³ Extensive dressing requirements and delayed return to work further limit its utility, particularly in young active individuals.⁴ Reported recurrence rates following primary midline closure range up to 30–38%.⁸

In contrast, flap techniques such as Z-plasty aim to eliminate the deep intergluteal cleft-an important etiological factor in disease persistence.⁵ Z-plasty, being a tension-free transposition flap that increases the transverse dimension and reduces midline drag forces, offers favorable outcomes with minimal flap necrosis.^{5,6} By decreasing friction, moisture, and hair entrapment, flap procedures demonstrate faster healing, lower infection rates, and superior cosmetic outcomes.⁶

Literature consistently supports flap-based procedures, particularly for recurrent or complex pilonidal disease.⁷ Meta-analyses and long-term outcome studies report recurrence rates of 1–5% with off-midline flap closure, significantly lower than midline primary closure techniques.^{6,7} The findings of the present study are comparable with international literature and further reinforce Z-plasty as a superior surgical option. The technique provides reduced postoperative morbidity, faster wound

healing, and lower recurrence tendency. These advantages may help surgeons select the optimal surgical approach based on disease severity, patient preference, and cosmetic considerations.^{4,7} In resource-limited settings, Z-plasty remains a cost-effective alternative to more complex flap reconstructions. The statistically significant reduction in wound healing time represents a clinically meaningful benefit, particularly for young working-age individuals.⁹

Limitation:

Single-center study- Findings may not be generalizable to other institutions or populations.

Relatively small sample size (n = 70) - May limit statistical power, particularly for recurrence analysis (p = 0.051). Lack of randomization and short follow-up may underestimate long-term recurrence. Non-randomized design - Potential selection bias between surgical groups cannot be completely excluded. Surgeon-dependent variability - Outcomes may vary depending on surgical expertise and technique execution.

CONCLUSION:

Flap procedures (Z-plasty) represent conceptually superior techniques for pilonidal sinus disease by addressing the root anatomical contributors such as deep natal cleft and midline tension. Compared to conventional midline primary closure and primary repair, flap reconstructions are associated with faster recovery, improved cosmesis, and lower recurrence.

DECLARATION:

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Conflict Of Interest: None declared

REFERENCES:

1. Hull TL, Wu J. Pilonidal disease. *Surg Clin North Am.* 2002;82(6):1169–1185.
2. McCallum IJD, King PM, Bruce J. Healing by midline primary closure versus open healing after surgery for pilonidal sinus disease. *Cochrane Database Syst Rev.* 2007;(4):CD006213.
3. Petersen S, Koch R, Stelzner S, Ludwig K. Midline primary closure techniques in chronic pilonidal sinus. *Dis Colon Rectum.* 2002;45(11):1458–1467.
4. Al-Khamis A, McCallum I, King PM, Bruce J. Healing by midline primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis. *BMJ.* 2010;340:c283.
5. Karydakis GE. Easy and successful treatment of pilonidal sinus after explanation of its causative process. *Aust N Z J Surg.* 1992;62(5):385–389.
6. Akin M, Gokbayir H, Kilic K, Topgul K, Ozdemir E, Ferahkose Z. Rhomboid excision and Limberg flap for managing pilonidal sinus: long-term results in 411 patients. *Colorectal Dis.* 2008;10(9):945–948.
7. Enriquez-Navascues JM, Emparanza JI, Alkorta M, Placer C. Meta-analysis of randomized controlled trials comparing techniques with midline primary closure for chronic pilonidal sinus. *Tech Coloproctol.* 2014;18(10):863–872.
8. Kitchen PR. Pilonidal sinus: experience with the Karydakis flap. *Br J Surg.* 1996;83(10):1452–1455.
9. Limberg AA. Design of local flaps. In: Gibson T, editor. *Modern Trends in Plastic Surgery.* London: Butterworth; 1966.