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Original Research Article

Comparative study between excision with primary closure versus Z-plasty in the management of pilonidal sinus in the natal cleft

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ABSTRACT

Background: Pilonidal sinus disease (PSD) is a chronic inflammatory condition of the sacrococcygeal region with significant morbidity and recurrence. Although excision with primary closure is technically simple and facilitates faster recovery, off-midline techniques such as Z-plasty aim to reduce wound complications and recurrence by altering natal cleft anatomy. This study compares outcomes between primary closure and Z-plasty in the management of pilonidal sinus.
Methods: A randomized controlled study was conducted in the Department of General Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur, from March 2024 to January 2026. Patients aged 18-75 years diagnosed with pilonidal sinus were allocated to excision with primary closure or Z-plasty. Demographic variables, intraoperative parameters, and postoperative outcomes including wound infection, flap necrosis, and recurrence were analyzed. Statistical analysis was performed using SPSS v26.0, with $p<0.05$ considered significant.
Results: Baseline characteristics were comparable between groups. Operative time was significantly shorter in the primary closure group (49.07±12.79 min) compared to Z-plasty (66.80±14.56 min; $p<0.001$). Wound length was also significantly less with primary closure ($p<0.001$), while blood loss was similar ($p=0.260$). Early postoperative infection was more frequent in the primary closure group, though not statistically significant. No flap necrosis was observed. At 6 months, recurrence occurred in 3.3% of the primary closure group and none in the Z-plasty group ($p=1.000$).
Conclusions: Both techniques are safe and effective for sacrococcygeal pilonidal sinus. Primary closure offers shorter operative time, whereas Z-plasty shows a favorable trend toward reduced postoperative infection and recurrence. Procedure selection should be individualized based on patient and surgical factors.

Keywords: Pilonidal sinus, Primary closure, Z-plasty, Recurrence, Surgical outcomes

INTRODUCTION

Pilonidal sinus disease (PSD) is a chronic inflammatory disorder of the sacrococcygeal region, predominantly affecting young males.[1,2] Current evidence supports an acquired origin, wherein loose hair penetrates the natal cleft due to friction and mechanical forces, triggering a foreign body reaction, sinus formation, and recurrent abscesses.[3,4] Predisposing factors include male gender, obesity, deep natal cleft, excessive body hair, and prolonged sitting.[5,6] The condition is associated with pain, discharge, recurrent infection, and significant morbidity.[1,2]

Surgical management remains the definitive treatment for chronic or recurrent disease.[7] Excision with secondary healing offers lower recurrence but prolonged recovery, whereas midline primary closure enables faster healing at

the cost of higher wound complications and recurrence.[7,8] Off-midline flap techniques, such as Z-plasty, aim to flatten the natal cleft, reduce tension, and lateralize the scar, potentially improving healing and reducing recurrence.[9,10]

This study compares excision with primary closure and Z-plasty in sacrococcygeal pilonidal sinus, evaluating postoperative complications, healing time, recurrence, and overall outcomes.

METHODS

This randomized controlled study was conducted in the Department of General Surgery at Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur, over a 22-month period (March 2024-January 2026). Consecutive patients aged 18-75 years diagnosed with pilonidal sinus and fit for anesthesia were enrolled after obtaining written informed consent. Participants were allocated to undergo either excision with primary closure or Z-plasty. Patients with bleeding disorders were excluded. Demographic variables and clinical characteristics (age, duration of symptom, number of pits), intraoperative findings, and postoperative outcomes (Wound infection, flap necrosis and recurrence) were systematically recorded using a structured proforma for analysis.

All patients underwent detailed history taking and thorough clinical examination. Baseline investigations included complete blood count, renal function tests, liver function tests, coagulation profile, and viral markers, and body mass index was calculated for all participants. Patients with comorbidities such as diabetes mellitus, hypertension, or malignancy were evaluated and optimized preoperatively in consultation with relevant specialists. After pre-anesthetic evaluation, patients underwent surgery under spinal or general anesthesia. The surgical procedures included excision with primary closure or excision with Z-plasty according to the planned treatment modality, and all operations were performed under standard aseptic precautions. Postoperatively, patients were monitored.

Statistical analysis

Significance level was $p<0.05$. Software used SPSS v26.0 and Microsoft excel. Continuous variables were analyzed using student's t test and categorical variables using Chi-square test.

RESULTS

Baseline demographic and clinical characteristics were comparable between the groups. Mean age (30.97±8.85 vs 31.23±9.10 years; p=0.909), BMI (26.98±2.42 vs 26.94±2.50 kg/m²; p=0.950), duration of symptoms (13.27±9.23 vs 13.40±9.15 months; p=0.953), and mean number of pits (2.53±1.17 vs 2.52±1.18; p=0.944) showed no statistically significant difference.

Table 1: Demographic and clinical profile.

Variables	Primary closure	Z plasty	P value
Age (in years)	30.97±8.85	31.23±9.10	0.909
BMI (kg/m²)	26.98±2.42	26.94±2.50	0.950
Duration of symptom	13.27±9.23	13.40±9.15	0.953
Number of pits	2.53±1.17	2.52±1.18	0.944

Intraoperative assessment revealed a significantly shorter operative time in the primary closure group compared to the Z-plasty group (49.07±12.79 vs 66.80±14.56 minutes; p<0.001). Mean wound length was also significantly less with primary closure (6.71±1.20 vs 8.72±1.21 cm; p<0.001). However, intraoperative blood loss was comparable between the groups (35.27±13.27 vs 39.20±13.49 mL; p=0.260).

Table 2: Intraoperative parameters.

Intraoperative parameter	Primary closure	Z-plasty	P value
Surgical time (min)	49.07±12.79	66.80±14.56	<0.001
Intraoperative blood loss (mL)	35.27±13.27	39.20±13.49	0.260
Wound length (cm)	6.71±1.20	8.72±1.21	<0.001

Postoperative wound infection occurred mainly in the early period in both groups. On day 7, infection was observed in 16.7% of patients undergoing primary closure and 10.0% in the Z-plasty group (p=0.706). By day 14, infection persisted in 13.3% of the primary closure group, whereas no cases were noted in the Z-plasty group; this difference was not statistically significant (p=0.112).

Table 3: Comparison of post-operative wound infection.

Post-operative day	Primary closure	Z-plasty	P value
Day 7	5 (16.7%)	3 (10.0%)	0.706
Day 14	4 (13.3%)	0 (0.0%)	0.112

No statistically significant difference was observed between the groups on postoperative day 7 (p=1.000). Additionally, no cases of necrosis were noted in either group on days 14 or 21, with no significant difference at both intervals (p=1.000).

Recurrence was rare in both groups. No cases were observed at 3 months. At 6 months, recurrence occurred in 3.3% of patients in the primary closure group, while no

cases were reported in the Z-plasty group, with no statistically significant difference (p=1.000).

Table 4: Post-operative recurrence comparison.

Outcome (Yes)	Primary closure	Z-plasty	P value
Recurrence (3 months)	0 (0.0%)	0 (0.0%)	1.000
Recurrence (6 months)	1 (3.3%)	0 (0.0%)	1.000

DISCUSSION

The present study demonstrates that excision with primary closure and Z-plasty yield comparable baseline demographic and clinical profiles, ensuring appropriate group homogeneity for outcome comparison. Operative time was significantly shorter with primary closure, reflecting its technical simplicity and limited tissue mobilization.[7,8] In contrast, Z-plasty required longer operative duration and resulted in greater wound length, attributable to flap design and transposition.[9] However, intraoperative blood loss was comparable, indicating that both techniques are similar in surgical safety profile.

Postoperative wound infection was more frequent in the early period following primary closure, although the difference was not statistically significant. Off-midline closure techniques have been shown to reduce wound morbidity by decreasing midline tension and moisture accumulation.[8,10] The absence of flap necrosis in either group indicates that both techniques are safe when performed with meticulous surgical technique.

Recurrence rates were low in both groups during short-term follow-up. Although recurrence occurred only in the primary closure group at 6 months, the difference was not statistically significant. Previous meta-analyses have demonstrated lower recurrence rates with off-midline closure compared to midline primary closure.[8,10] The potential benefit of Z-plasty may be explained by lateralization of the scar and flattening of the natal cleft, reducing hair insertion and mechanical stress.[3,9] Overall, primary closure offers shorter operative time, whereas Z-plasty may provide improved wound-related outcomes without increasing complication risk.

Limitations

This study has certain limitations. The sample size was modest, which may limit statistical power for detecting differences in relatively infrequent outcomes such as recurrence. The follow-up duration was limited to six months, which may underestimate long-term recurrence rates. Additionally, being a single-center study, the findings may not be universally generalizable. Longer follow-up and multicentric trials with larger cohorts are required for more definitive conclusions.

CONCLUSION

Both primary closure and Z-plasty are safe and effective surgical options for sacrococcygeal pilonidal sinus. Primary closure offers shorter operative time and technical simplicity, whereas Z-plasty demonstrates a favorable trend toward lower postoperative infection and recurrence. Although differences in long-term outcomes were not statistically significant within the study period, Z-plasty may provide anatomical advantages that support improved wound healing and reduced recurrence. Selection of technique should be individualized based on patient factors, surgeon expertise, and available resources.

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