Finding the Perfect Spot: How Pits Location Shapes Surgical Choices in Chronic Sacrococcygeal Pilonidal Disease: Insights from a Specialized Center

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Introduction: SPND can present with varying symptoms, from asymptomatic cases to severe infections and abscesses, or chronic inflammation with recurrent discharge.

Aim of work: Various surgical techniques exist for managing chronic sacrococcygeal pilonidal disease, but standardization in choosing the appropriate procedure remains lacking. This study evaluates the choice of surgical technique based on pit location.

Patients and methods: A comprehensive analysis of 107 patients was conducted at a tertiary center. Surgical technique selection was informed by the surgeon's assessment of pit characteristics (Size, number, and location). Postoperative complications, one-year recurrence, and favourable outcomes were analysed.

Results: Preoperative findings revealed differences among flap-based techniques regarding recurrence, lateral pit number, and pit distance from the midline. Postoperative outcomes varied significantly across techniques concerning healing time, drain removal, resumption of daily activity, and complications like flap ischemia and wound dehiscence. A 6.5% recurrence rate was observed, with 83.2% showing favourable outcomes. Delayed healing predicted recurrence, while pit distance from the midline predicted better outcomes.

Conclusion: Patients with lateral pits up to 3 mm from the midline are suitable for primary closure. More lateral pits (Up to 20 mm) warrant rhomboid flaps, and those up to 30 mm are better managed with rotational flaps.

Key words: Pilonidal disease, pits location, surgical option.

Introduction

Sacrococcygeal pilonidal disease (SPND) is a prevalent condition affecting the skin and subcutaneous tissue at the upper portion of the natal cleft. It is marked by sinus tracts and recurrent inflammation, leading to frequent infections. This condition imposes a significant healthcare burden due to associated morbidity, diminished quality of life, and financial implications.[1-3] SPND primarily affects young men, with an incidence of 26 per 100,000 people.[4] It is caused by hair entering the natal cleft through negative suction, leading to a foreign body reaction and granuloma formation.[4,5]

SPND can present with varying symptoms, from asymptomatic cases to severe infections and abscesses, or chronic inflammation with recurrent discharge.[6,7] Various surgical approaches have been described for the management of chronic SPND, yet no single technique is universally accepted.[2] The objective of surgery is to remove the pits and their associated sinus tracts while preserving healthy tissue to minimize recurrence. Common techniques include excision with primary closure, lay open, or flap reconstruction.[10]

At Mansoura University Hospitals, our surgical team has managed a significant number of cases involving chronic sacrococcygeal pilonidal disease (SPND). Given the lack of consensus on optimal surgical technique selection, we aim to share our experience, which primarily relies on the location of pits in guiding surgical decisions.

Patients and methods

Study design

This retrospective study was conducted at the Department of General Surgery, Division of Colorectal Surgery, Mansoura University, Egypt, following the approval of the Institutional Review Board (IRB No.: R.23.02.2081). The study was designed retrospectively and was completed on May 28, 2023.

Participants

This study included patients diagnosed with primary or recurrent chronic sacrococcygeal pilonidal disease (SPND) who underwent surgical management between January and December 2022. Both male and female patients aged 18 to 60 years were eligible. Patients who were lost to follow-up were excluded from our study. This approach ensured a comprehensive evaluation of surgical outcomes in the management of SPND across a diverse patient population.

Surgical interventions

All patients underwent thorough preoperative evaluations, including a medical history review, physical examination, and necessary laboratory

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tests. Prior to surgery, patients were instructed to shave the surgical area. After obtaining written informed consent, surgeries were performed under spinal anesthesia in the prone position, with adhesive plasters retracting both buttocks for optimal exposure.

The surgeon's choice of procedure varied. For all cases, the pits were highlighted using methylene blue or povidone-iodine solutions for precise dissection. For the lay-open technique, an elliptical excision of the skin and subcutaneous tissue was performed to remove the pits, associated sinus tracts, and unhealthy granulation tissue till the lumbar fascia. The wound was then left to heal by secondary intention.

In contrast, for primary closure cases, a beveled skin flap was fashioned, and the wound was closed in layers over a subcutaneous suction drain. Each technique aimed to ensure complete removal of the affected areas while promoting optimal wound healing.

For the rhomboid flap, the technique was performed as described by Khadrawy et al.,[11] involving the excision of a rhomboid-shaped area containing the pits and tracts, followed by the creation of a nearby flap to cover the defect as shown in **(Fig. 1).** For rotational flaps, a vertical elliptical defect was made after excising the sinus tracts, and a horizontal flap of equal size was rotated over the gluteus muscle with a one-centimeter pivot at the inferior corner to close the defect.

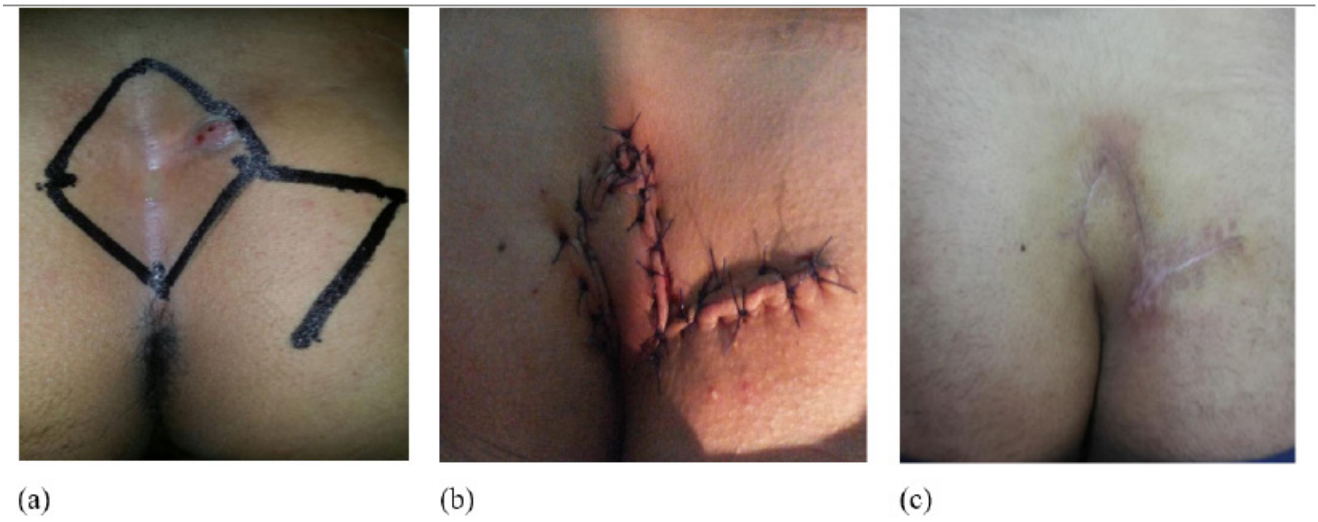

Fig 1: Showing photos of the procedure (a) intra-operative photo: marking of the pilonidal sinus pre-operative (b) post-operative photo: showing the rhomboid flap appearance after 1 week (c) post-operative photo showing the presentation of the rhomboid flap after 4 weeks.

Most patients were discharged the same or next day after surgery. They were followed weekly until suture and drain removal, with additional follow-ups every three months for one year, if needed. Postoperative complications, such as flap ischemia, surgical site infection (SSI), wound dehiscence, delayed wound healing, and recurrence, were documented during follow-up.

Preoperative, intraoperative and postoperative data were recorded in an Excel sheet upon patient admission, capturing demographic details (Age, gender, BMI), the diagnosis (primary or recurrent), the number of midline and lateral pits, the surgical method, time to drain removal, return to daily activities, and postoperative complications.

Outcome criteria

Our primary outcome was the achievement of favorable postoperative results. Secondary outcomes included the occurrence of recurrence and other complications. Unfavorable outcomes were defined as the recurrence of the disease, delayed wound healing due to surgical site infection (SSI) or flap ischemia, and wound dehiscence. Delayed wound healing was characterized as a healing time that exceeded the mean healing time of the cohort by more than two standard deviations (Mean + 2SD).

Statistical analysis

Statistical analysis was conducted using SPSS™ software, version 27 (IBM Corp., Chicago, IL). Parametric continuous variables were reported as mean ± standard deviation (SD), while non-parametric and discrete variables were expressed as median and range. Categorical data were presented as numbers and percentages. One-way ANOVA with Tukey-Kramer post-hoc testing was applied to compare means of continuous variables. The Kruskal-Wallis test with Dunn post-hoc analysis was used for non-parametric or skewed data, and categorical variables were assessed using the Chi-square test. Binary logistic regression was performed for multivariate analysis of outcome predictors. A p-value <0.05 was considered statistically significant.

Results

Between January and December 2022, 154 patients underwent surgical management for chronic SPND. After excluding those who had minimally invasive procedures, 107 patients were analyzed, having undergone excision with or without flap closure. The mean age was 29 ± 6 years, with males comprising 87.9% of the cohort. Patients' BMI ranged from 26 to 36.7 kg/m². All patients presented with infected sinus discharge, while 45.8% experienced itching, 23.4% reported pain, and 6.5% reported bleeding.

The duration of symptoms ranged from 6 to 24 months, with 15.9% having undergone previous surgical interventions. When comparing the three surgical techniques, no significant differences were observed in age, gender, or BMI across the groups. Midline openings were observed in all cases, with one to four pits identified per patient. Additionally, lateral openings were present in 42.1% of patients, with between one and three pits. The lateral pits were located 3 to 40 mm from the midline. The rhomboid and rotational flap groups demonstrated a significantly greater number of lateral pits, a higher percentage of patients with lateral pits, and a greater distance from the midline compared to the primary closure group (P<0.001), indicating these variables may influence the choice of surgical technique, as shown in **(Table 1).**

The Kruskal-Wallis test with post-hoc Dunn's test is used for analyzing data expressed in mean ± SD or median (Range), which are continuous variables. For categorical data, expressed in ratios or percentages, the Chi-square test is applied. Post-hoc analyses were conducted to compare surgical outcomes: P1 assesses the differences between primary closure and rhomboid flap, P2 compares primary closure and rotational flap, and P3 evaluates the differences between rhomboid and rotational flaps. This detailed statistical approach ensures the accurate evaluation of differences between the groups for SPND treatment.

In terms of procedures performed, primary closure was the most frequent, accounting for 65.4% of cases, while flap-based techniques were used in 29% of the patients. The average operative time for flap-based procedures was 46±8 minutes, significantly longer than the 13±3 minutes for open surgery. As indicated in Table 2, drains were placed in nearly all patients who underwent flap-based techniques, with a rate of 94.4%. Difference in operative time and the use of drains highlights the increased complexity of flap procedures.

Recurrence rate was significantly higher in the rhomboid and rotational flap groups than in the primary closure group (P<0.001). This indicates that the choice of surgical technique might impact recurrence rates, with primary closure potentially offering a lower risk of recurrence. The mean healing time for flap-based techniques was 17.3±4.7 days, significantly faster compared to 39.7±3.6 days in the lay-open surgery group. Healing was quicker with primary closure than with other flap techniques (P<0.001). The mean time for drain removal was 17.3±4.8 days, showing significant differences between the various flap-based techniques. Additionally, the mean time for resumption of daily activities was 22.8±5.3 days for flap-based techniques, compared to 8.3±5.9 days for lay-open surgery, with significant differences noted between all groups, as shown in **(Table 3).**

Data expressed as mean ± SD or as median with range were analyzed using the Kruskal-Wallis test with post-hoc Dunn's test, while categorical data presented as ratios or percentages were evaluated using the Chi-square test. P1 refers to post-hoc analysis between primary closure and the rhomboid flap, P2 compares primary closure with the rotational flap, and P3 analyzes differences between the rhomboid and rotational flaps. [SSI: surgical site infection.]

Concerning the postoperative complications, delayed wound healing was observed in 9.3% of the cohort, flap ischemia in 2.8%, surgical site infection (SSI) in 4.7%, and wound dehiscence in 1.9%. All patients with wound complications were managed conservatively until complete recovery. The one-year recurrence rate was 6.5%, and recurrence cases were treated using either a rotational flap or the open technique, with favorable outcomes in all cases. A receiver operating characteristic (ROC) curve analysis identified a healing time greater than 14 days as a significant predictor of recurrence, as shown in **(Fig. 2).**

To identify the cut-off distance for the furthest pit from the midline in predicting favorable outcomes with different flap-based techniques, a receiver operating characteristic (ROC) curve analysis was performed. The analysis revealed a cut-off distance of ≤6 mm for the entire cohort. Specifically, it was ≤3 mm for the primary closure, ≤20 mm for the rhomboid flap, and ≤30 mm for the rotational flap, indicating different thresholds for optimal outcomes based on the surgical technique employed, as shown in **(Fig. 3).**

Multivariate analysis of predictors for recurrence after surgical treatment of SPND indicated that factors such as age, gender, BMI, diagnosis (Primary or recurrent), pit distance from the midline, and the type of surgical technique were not statistically significant in predicting recurrence (P=0.99, p=0.55, p=1, p=1, p=0.06, and p=0.09, respectively). However, healing time emerged as a significant predictor of recurrence (P=0.014). While pit distance

was not directly predictive of recurrence, it played a crucial role in surgical decision-making, showing a strong correlation with the choice of technique (R=0.7, p<0.001).

Multivariate analysis of predictors for a favourable outcome following surgical management of SPND revealed that factors such as age, gender, BMI, and diagnosis (Primary or recurrent) were not statistically significant (p=0.42, p=0.52, p=0.49, and p=0.31, respectively). However, the distance of the furthest pit from the midline emerged as a significant predictor of favorable outcomes (P=0.005), indicating that this variable plays a crucial role in achieving better postoperative results in SPND management.

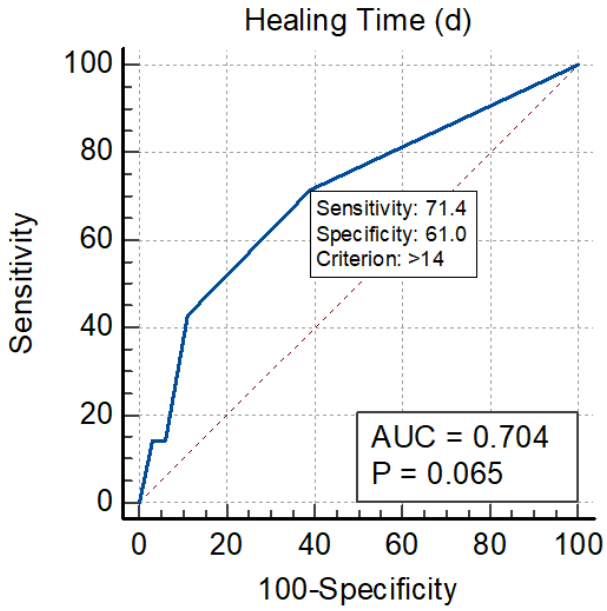

Fig 2: ROC curve analysis demonstrating the cut-off values of healing time from the midline to predict recurrence is > 14 days.

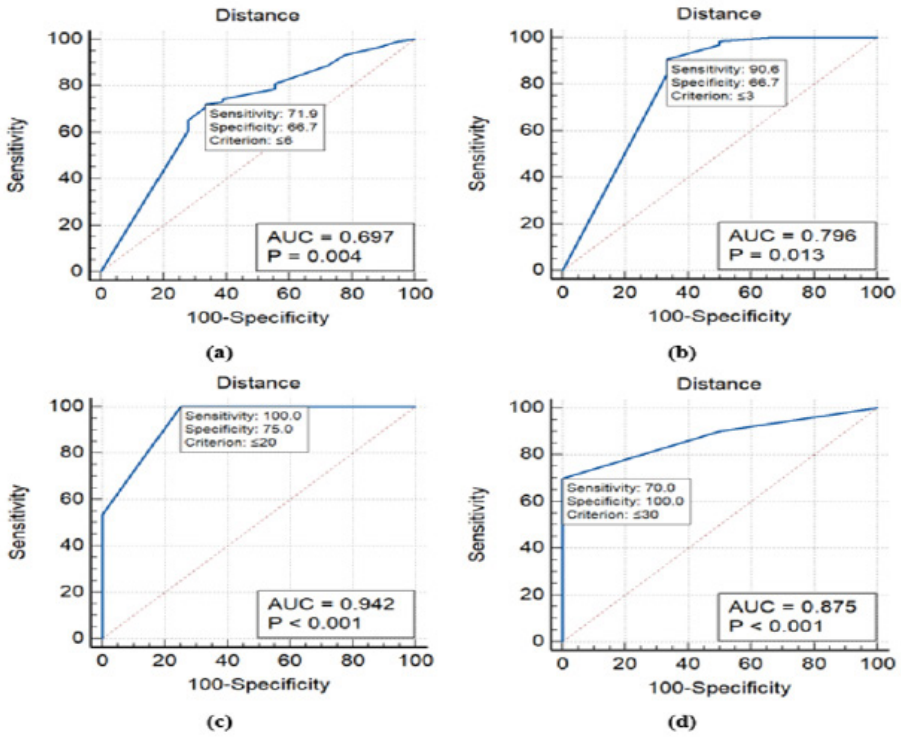

Fig 3: ROC curve analysis demonstrating the cut-off values of pits distance from the midline to achieve a favorable outcome: (a) with all closed flaps is ≤6 mm, (b) with primary closure is ≤3 mm, (c) with rhomboid flap is ≤20 mm, and (d) with rotational flap is ≤30 mm.

Table 1: Preoperative basic data in patients who underwent closed-flap surgery

Variable (Unit)/group (n)	Primary closure (70)	Rhomboid flap (19)	Rotational flap (12)	P value
Age (years)	29.6 ± 6	28.2 ± 6.8	27.9 ± 6.3	P=0.48, P1=0.34 P2=0.38, P3=0.94
Gender; male/female	62/8	15/4	11/1	P=0.48
BMI (Kg/m²)	29.7 ± 2.4	30.4 ± 3.1	29.6 ± 1.4	P=0.5, P1=0.37 P2=0.56, P3=0.26
SPND Diagnosis: primary/ recurrent	66/4	13/6	6/6	P<0.001
Number of midline pits	2 (1-3)	2 (1-3)	2 (1-3)	P=0.76, P1=0.54 P2=0.77, P3=0.49
Number of lateral pits	0 (0-1)	1 (1-2)	2 (1-2)	P<0.001, P1<0.001 P2<0.001, P3=0.37
Patients with lateral pits, n (%)	11 (15.7)	19 (100)	12 (100)	P<0.001
Farthest pit distance from midline (mm)	1.3 ± 3.2	18.8 ± 5.7	31.3 ± 5.7	P<0.001, P1<0.001 P2<0.001, P3=0.14

Table 2: Operative data in the entire cohort

Variable (Unit)	Result	P value
Surgery decision, n (%)		
Primary closure	70 (65.4)	<0.001
Rhomboid flap	19 (17.8)	
Rotational flap	12 (11.2)	
Lay open	6 (5.6)	
Operative Time (Minutes)		
Primary closure	34 ± 5	<0.001
Rhomboid flap	42 ± 6	
Rotational flap	51 ± 9	
Lay open	13 ± 3	
Drain insertion; yes/no	101/6	

Table 3: Outcomes of patients who underwent closed-flap surgery

Variable (Unit)/group (n)	Primary closure (70)	Rhomboid flap (19)	Rotational flap (12)	P value
Healing time (Days)	15.5 ± 3.6	20.6 ± 4.9	22.2 ± 4	P<0.001, P1<0.001 P2<0.001, P3=0.27
Duration until drain removal (Days)	15.5 ± 3.3	19.9 ± 4.2	25.1 ± 4.7	P<0.001, P1<0.001 P2<0.001, P3=0.033
Duration until normal daily activities (Days)	20.7 ± 3.4	26.1 ± 4.2	31.8 ± 5.3	P<0.001, P1<0.001 P2<0.001, P3=0.14
Complications, n (%)				
Delayed healing	2 (1.9)	2 (1.9)	1 (0.9)	0.33
Flap ischemia	0 (0)	2 (1.9)	1 (0.9)	0.03
SSI	3 (2.8)	1 (0.9)	0 (0)	0.74
Wound dehiscence	0 (0)	2 (1.9)	0 (0)	0.01
Recurrence, n (%)	4 (3.7)	1 (0.9)	1 (0.9)	0.93
Favorable outcome; yes/no	64/6	15/4	10/2	0.28

Discussion

This study showcases our department's experience in managing chronic SPND within the field of colorectal surgery. Beyond surgical expertise, the distance of the pits from the midline proved to be a crucial factor in determining the best surgical approach for this condition. Notably, our comprehensive literature review revealed a lack of prior studies addressing this specific factor, highlighting a unique and valuable contribution to the existing body of knowledge.

The age range of patients in our study, spanning from 19 to 42 years, aligns with findings from recent research, which identified SPND as a condition commonly affecting young adults, particularly those in adolescence through the third decade of life. This consistency further reinforces the relevance of our patient demographic in understanding the typical age-related patterns of this disease.[2] Similarly, a previous study corroborated our findings, as their patient population age also ranged between 18 and 40 years, further emphasizing the prevalence of SPND among young adults.[12]

In our study, approximately 88% of the patients were male. This gender disparity could be attributed to the fact that men typically have a higher density of body hair compared to women, which may increase their susceptibility to developing SPND.[13] Several studies have also consistently highlighted the strong association between the male gender and the prevalence of SPND, supporting our findings that this condition is significantly more common among men.[14,15] All our patients experienced discharge from the sinuses, a symptom primarily driven by recurrent infections in the sinus tract.[16] This recurrent infection may also account for the pain reported by the patients. Pruritus, also reported in our cohort, likely results from the body's reaction to trapped subcutaneous hair. Bleeding can occur as a consequence of these infections, further complicating the clinical presentation of SPND.[17]

In the current study, 15.9% of patients had undergone previous surgical interventions for SPND. Previous research has indicated recurrence rates as high as 40% following surgical treatment of SPND.[18-20] This highlights recurrence as a prevalent and challenging complication, posing significant concerns for both patients and surgeons, as it complicates the overall success of the surgical management of this condition.

In our study, the location of the pits relative to the midline significantly influenced the surgical approach selection. Most patients with lateral pits were treated with rhomboid or rotational flaps. Our findings suggest that simpler techniques, such as primary closure or lay-open, are suitable for pits located in or near the midline, while more complex approaches like rhomboid or rotational flaps are preferred for pits farther from the midline. The primary aim of our study was to establish the specific indications for each surgical technique based on pit location.

In our study, we observed a significantly longer operative time for flap-based techniques compared to lay-open surgery. This increase in duration is likely due to the additional time needed for meticulous flap reconstruction. Our findings are in line with other studies that have also reported extended operating times associated with flap-based procedures, highlighting the technical complexity and precision required for these techniques.[21-23] The recurrence rate in our study was 6.5% within one year post-surgery, which aligns closely with the 7.2%,[24] incidence reported by Almajid et al. Other studies have noted higher recurrence rates, reaching up to 40%.[18-20] Variations in recurrence rates may be attributed to differences in surgical techniques, follow-up durations, and postoperative wound care. Furthermore, no significant differences were observed between the two flap groups in recurrence rates, consistent with Okus et al.'s findings, which also showed no significant differences between primary closure and other flap techniques.[25]

The predictors of recurrence in our study merit particular attention. Healing time emerged as the only significant predictor of recurrence, while the specific surgical technique chosen by the surgeon did not significantly impact recurrence rates. However, the distance of the pits from the midline played a crucial role in influencing the surgeon's decision, with greater distances correlating with a higher risk of an unfavorable outcome. This suggests that while healing time directly affects recurrence, the pit location indirectly guides treatment choices, impacting the likelihood of successful results.

The incidence of surgical site infection (SSI) in our study cohort was 4.7%, which falls within the reported range of wound infection rates following the management of sacrococcygeal pilonidal disease (SPND). This range, cited in the literature, varies widely from 0% to 38.5%, reflecting differences in surgical techniques, patient populations, and postoperative care protocols. Our results align with these findings, indicating that while infections remain a concern, they are within the expected parameters for this type of surgical intervention.[26,27] Additionally, the incidence of surgical site infection (SSI) was statistically comparable across the three flap-based techniques in our study. This finding is in line with the observations of Enshaei and Motearefi, who also reported a similar incidence of SSI between primary closure and flap-based approaches in the management of sacrococcygeal pilonidal disease (SPND). This suggests that the choice of surgical technique might not significantly impact the risk of

SSI in these cases.[28]

This study has several limitations, including its retrospective design and its execution at a single surgical facility, which may limit the generalizability of the findings. Additionally, the small cohort size and the imbalance in the distribution of surgical groups present a potential risk of bias. Therefore, to strengthen these results, future research should focus on larger, multicentre prospective studies that can provide more robust evidence and validate the conclusions drawn from this analysis.

Conclusion

Based on our surgical experience, SPND with pits confined to the midline or lateral pits up to 3 mm from the midline can be effectively treated with excision and primary closure. For cases involving more distant pits, rhomboid flaps are suitable for pits up to 20 mm from the midline, while rotational flaps are recommended for pits up to 30 mm away. Additionally, delayed wound healing has been identified as a significant predictor of recurrence in these patients.

Declarations

Availability of data and materials: The research data is available from the corresponding author upon request.

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Conflict of interest: The authors declare no competing interests.

Authors' contribution: M.B. designed the study and shared in the data analysis and writing the manuscript. M.H.M and A.R.M contributed to the data collection and revision of the manuscript. A.F.H. and A.A. shared in the data analysis, interpretation, and revision of the manuscript. All authors read and approved the final version of the manuscript.

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