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ORIGINAL ARTICLE

Rhomboid Flap versus Semi Closure Technique in Treatment of Complex Pilonidal Sinus

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ABSTRACT

Background: Pilonidal sinus is a disease that most commonly arises in the hair follicles of the natal cleft of the sacrococcygeal area.The present study compared the Rhomboid flap and the semi-closure technique for the treatment of recurrent pilonidal sinus.

Methods: This prospective randomized comparative study includes thirty patients with complex sacrococcygeal pilonidal sinus. Patients were divided equally into group (A) patients who underwent the semi-closure technique and group (B) patients who underwent the rhomboid flap technique. Both groups were followed during post-operative care and at the 2nd, 3rd, 4th, and 6th post-operative months.

Results: There was a significant difference regarding pain duration, time of comfort sitting, total time of healing, and time of return to work between the two groups in favor of group B, which was markedly short in patients of group B. It was found that post-operative wound complications as regards delayed wound healing, wound infection, and wound dehiscence were more with patients operated by rhomboid flap than with closure technique.

Conclusions: The patient experienced the rhomboid flap technique, which shows a decrease in the duration of pain and time needed for sitting comfortably and an early return to work and normal daily activity.

Keywords: Pilonidal Sinus; Rhomboid Flap; Semi Closure Technique

INTRODUCTION

An inflammatory disorder mostly affecting the sacrococcygeal region is called pilionidal sinus disease (PSD). Males account for the majority of cases observed among young adults with the condition. The incidence has increased during the past few decades, ranging from 26 to 94 per 100 000. Acute gluteal cleft abscesses, chronic diseases with intermittent discharging sinuses, or asymptomatic PSD are all possible presentations [1].

For the treatment of chronic pilonidal sinus, minimally invasive techniques, healing by primary closure (including several forms of marsupialization), and healing by secondary intention are the surgical treatments that have been validated. Primary closure describes the closure of the wound on the midline of the natal cleft or to one side of the midline (off-midline closure, including flap procedures) either right away following surgery or after a delay. The Karydakis flap, the Bascom cleft lift, and the Limberg flap are the most commonly used flap methods [2].

Several guidelines suggest these strategies. The application of additional flap procedures, like the V-Y flap and Z-plasty techniques, has also been recorded in publications. Leaving the surgical wound open to heal naturally from the base up is known as secondary intention healing [3].

PSD is treated using a variety of methods, including minimally invasive and invasive procedures. The illness stage, the surgeon's preference, and patient compliance are factors that influence treatment decisions. The complete elimination of the illness, a speedy return to regular activities, and the least amount of morbidity are demands of the perfect PSD treatment. Many surgical techniques, such as incision with drainage, excision with primary closure, with or without multiple flaps, and excision with healing by secondary intention, were all reported for years as part of its treatment (Karydakis, Limberg, Rhomboid). Because the

Karydakis flap technique (KFT) has a low recurrence rate, surgeons prefer it. On the other hand, in the off-midline and primary closure cases, post-operative hematoma, seroma, and wound infection are basic issues that might impede wound healing [4].

Treatment options ranging from primary wound closure to secondary intention wound healing include partial primary closure (PPC). Even in the event of wound infection and dehiscence, the wound will be limited because it is left slightly open for the PPC operation. The fact that it can be applied to cases with persistent infections is another benefit. Compared to flap procedures, the surgery has a shorter learning curve and requires less skill to perform [5].

Therefore, this study aimed to compare two surgical techniques (the Rhomboid flap and the semi closure technique) of treatment of recurrent pilonidal sinus regarding to time of healing, time of returning to work, recurrence rate and cosmetic satisfaction in Zagazig University Hospitals.

Methods

This prospective randomized comparative study includes thirty patients with complex sacrococcygeal pilonidal sinus, which was carried out in the Department of General Surgery, Zagazig University Hospitals, in the period from May 2023 to November 2023. They were classified into two groups by random selection:

- Group A (Semiclosure method): This group included 15 patients who underwent a total excision of the pilonidal sinus. The wound was then semi-closed by suturing the upper half and letting the lower half heal by secondary intention.
- Group B (Rhomboid flap technique): included 15 patients who underwent total excision of the pilonidal sinus and closed the wound using a rhomboid flap.

Inclusion criteria:

All patients with complex pilonidal sinus operation using open or primary closing method. Age from 18 to 60 and both gender were included.

Exclusion criteria:

The patient refused to share or follow up. Patients with a History of sacrococcygeal surgery by a rhomboid flap. Patients with age >60 or <18. Contraindications to surgery such as bleeding tendency, and heart or chest disorders.

Ethical consideration:

Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (IRB#1206-2021). The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Pre-operative Assessment:

A thorough medical history was obtained for each patient, including the date and method of the prior pilonidal sinus surgery, the time of the recurrence, the length of the symptoms, the patient's occupation, and any family history of a similar problem. Local inspection of the recurrent sinus to count the apertures and check for discharge. Complete blood count, PT, PTT, INR, liver and kidney function tests, and hepatitis markers were among the studies carried out. The day before the procedure, every patient was brought into the hospital, where they underwent a standard pre-operative examination and gave their written informed permission for ethical reasons. The patients completely shaved the area surrounding the birth cleft on the day of the procedure.

Maneuver Description:

Every patient received an explanation of the surgical procedure. Under spinal anesthesia, the procedure was performed in a prone posture. Thirty minutes prior to surgery, a single intravenous dosage of metronidazole drip and third-generation cephalosporin (1 gm Ceftriaxone) was administered.

- ***Group A (Semi-closure technique):***

The patients were given spinal anesthesia and put in a prone posture. A 5-centimeter elliptical incision was created around the sinus, followed by the insertion of an IV cannula and the injection of methylene blue dye into the sinus cavity. Following the completion of an elliptical incision surrounding the mark, the whole ellipse encompassing the sinus tracts was removed, exposing the sacrococcygeal fascia. The upper portion of the wound was closed in two layers following full hemostasis. Allowing the lower portion of the incision to remain open so that granulation tissue can seal it off (second intention) **(Figure 1)**.

- ***Group B: (Rhomboid flap):***

The patients were given spinal anesthesia and put in a prone posture. Drawing on the glutei allows one to identify the extent of excision and flaps. On the skin, the problematic area that needs to be removed is marked. A rhombus with its long axis on the center line (ABCD) encloses this. Lines DA = CD = BC = AB. Lines CD and BD are bisected by a line DE of length equal to each side of the rhombus, which is then extended to make the angles. Line EF, which is parallel to the rhombus's long axis and has the same length. Following an injection of methylene blue into the

sinus tract, the epidermis and subcutaneous tissue were incised by deepening to the deep fascia along the marked lines. The removed specimen's rhomboid region encompassed the pilonidal sinus and all of its expansions. Next, the flap is raised and rotated to cover the midline rhomboid defect, encompassing skin, subcutaneous fat, and the fascia covering the gluteus maximus. After covering a suction drain with deep absorbable sutures (vicryl 2/0) to cover fat and fascia, the skin is closed with interrupted sutures **(Figure 2**).

Post-operative Care:

- ***Group A (semi-closure technique):***

After surgery, all patients were released from the hospital on the second day. The patients were examined for dressing changes and follow-up at the outpatient clinic every two days. Using sterile cotton gauze, the wound was cleaned with saline and disinfected with 10% povidone-iodine. Closures Following surgery in the bottom part, the dressing was left on for approximately one month, and the wounds in the top half were removed after about two weeks.

- ***Group B (Rhomboid flap) :***

The patient was instructed to avoid lying on his back until the incision had sufficiently healed. When the drain output was less than 50 ml per day, the suction drain was disconnected. Suture removal following a two-week period. For dressing changes and follow-up, we ask patients to visit the hospital in the outpatient clinic every two days.

STATISTICAL ANALYSIS

Data was analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 26.0) software for analysis. According to the type of data, qualitative represents numbers and percentages, and quantitative continues group represents mean±SD. Differences between quantitative independent multiple by ANOVA or Kruskal Wallis, P value was set at <0.05 for significant results &<0.001 for high significant results.

RESULTS

The current study included 15 patients who underwent the semi-closure technique and 15 patients who underwent the rhomboid flap technique. Males represented 80% and 86.4% of patients within semi-closure and rhomboid flap groups, respectively. The mean age of patients was 27.33 and 25.73 years for those within semi-closure and rhomboid flap groups, respectively. About 53% and 60% of patients within semi-closure and rhomboid flap groups complained of discharge. Six patients within each group had pain and discharge, which was statistically non-significant between both groups **(Table 1).**

No patient within semi-closure had intraoperative bleeding versus 33.3% of rhomboid flap groups, with a statistically significant difference. The mean operative time was 34.27 and 69.8 minutes for those within semi-closure and rhomboid flap groups, respectively, with a statistically significant difference **(Table 2).**

Mean pain duration was 12.6 and 3.87 days for those within semi-closure and rhomboid flap groups, respectively, with statistically significant differences. Mean comfort sitting was 13.13 and 8.00 days of those within semi-closure and rhomboid flap groups, respectively, with statistically significant differences. Mean toilet sitting was 10.93 and 10.4 days of those within semi-closure and rhomboid flap groups, respectively, with statistically significant differences **(Table 3).**

Mean time to complete healing was 76.87 and 20.13 days of patients within semi-closure and rhomboid flap groups respectively with statistically significant difference between both groups. Mean time to return to work was 26.93 and 19.67 days of patients within semi-closure and rhomboid flap groups respectively with statistically significant difference between both groups **(Table 4).**

Concerning post-operative complications, wound infection, delayed wound healing, and wound dehiscence occurred in 40% of patients within Rhomboid flap group versus 20% with semi-closure technique. As regard recurrence, three patients within rhomboid flap (20%) groups versus 0% within semi-closure technique. There is statistically non-significant between groups regarding post-operative complications **(Table 5).**

Table 1: Demographic data and pre-operative complaints between the studied groups

	Semi-closure technique	**Rhomboid flap technique**	**p**
	N=15 (%)	**N=15 (%)**	
Gender:			
Female	3 (20%)	2 (13.3%)	>0.999
Male	12 (80%)	13 (86.4%)	

	Mean ± SD	Mean ± SD	p
Age (year)	27.33 ± 8.93	25.73 ± 7.15	0.592
Complaint: Discharge Pain Pain and discharge	 8 (53.3%) 1 (6.7%) 6 (40%)	 9 (60%) 0 (0%) 6 (40%)	>0.999

0.999 is statistically non-significant

Table 2: Intraoperative data between the studied groups

	Semi-closure technique N=15 (%)	Rhomboid flap technique N=15 (%)	p-value
Intraoperative bleeding Absent Present	15 (100%) 0 (0%)	10 (66.7%) 5 (33.3%)	0.042*
	Mean ± SD	**Mean ± SD**	P
Intraoperative time (minutes)	34.27 ± 6.2	69.8 ± 8.27	<0.001**

**p<0.05 is statistically significant **p≤0.001 is statistically highly significant*

Table 3: Post-operative data between the studied groups

	Semi-closure technique Mean ± SD	Rhomboid flap technique Mean ± SD	t	P
Pain duration (days)	12.6 ± 3.66	3.87 ± 2.36	7.77	<0.001**
Comfort sitting (days)	13.13 ± 2.77	8.00 ± 1.0	6.742	<0.001**
Toilet sitting (day)	10.93 ± 1.3	10.4 ± 1.59	0.977	0.337

*independent sample t-test **p≤0.001 is statistically highly significant*

Table 4: Comparison between the studied groups regarding complete healing and time to return to work

	Semi-closure technique Mean ± SD	Rhomboid flap technique Mean ± SD	χ^2	P
Complete healing (days)	76.87 ± 13.61	20.13 ± 2.29	15.198	<0.001**
Return to work (days)	26.93 ± 2.25	19.67 ± 1.5	10.413	<0.001**

*t independent sample t-test χ^2Chi square test *p<0.05 is statistically significant **p≤0.001 is statistically highly significant*

Table 5: Post-operative complications between the studied groups regarding

	Semi-closure technique	Rhomboid flap technique	p
	N=15 (%)	N=15 (%)	
Wound infection			
Absent	12 (80%)	9 (60%)	
Present	3 (20%)	6 (40%)	0.426
Delayed wound healing			
Absent	12 (80%)	9 (60%)	
Present	3 (20%)	6 (40%)	0.426
Wound dehiscence:			
Absent	12 (80%)	9 (60%)	
Present	3 (20%)	6 (40%)	0.426
Recurrence:			
Absent	15 (100%)	12 (80%)	0.224
Present	0 (0%)	3 (20%)	

Chi-square test, p >0.05 statistically non-significant

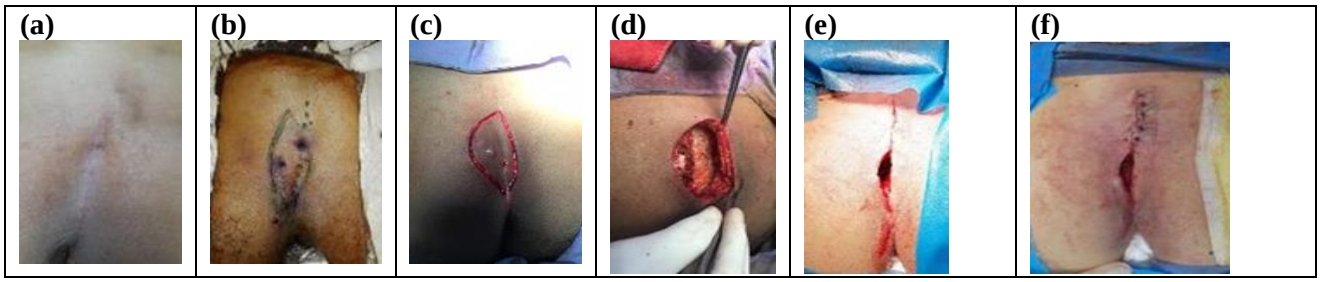

Figure 1: Surgical steps of the Semi-closure technique show (a) the pilonidal sinus, (b) the injection of methylene blue into the sinus tract, (C) the elliptical incision around the sinus tract to sacrococcygeal fascia, and (e,f) closure of the upper half in two layers leaving the lower half to act as a drain.

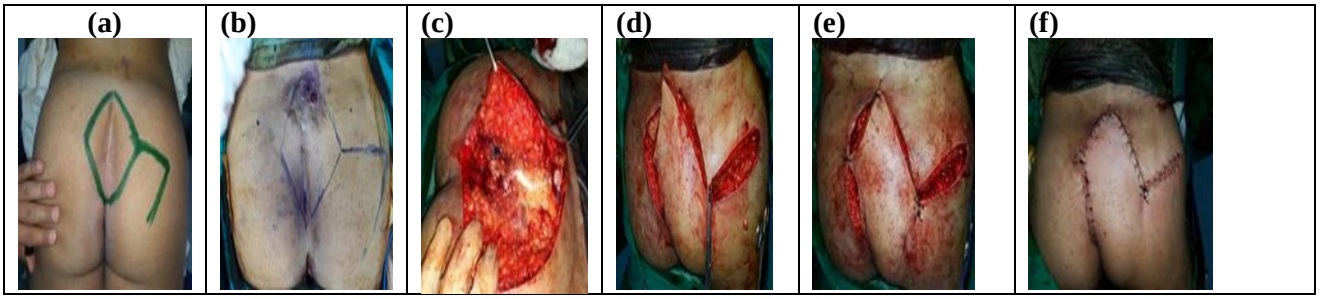

Figure ٢: Surgical steps of the Rhomboid flap technique show (a) the mapping of skin to a rhomboid-shaped map; (b) injection of methylene blue through the sinus tract ; (c) excision of a rhombus containing the sinus down to sacral fascia; (d) rising and rotating the flap to cover the midline rhombus defect; and (e,f) closure of the wound in two layers.

DISCUSSION

Typically, a painful sinus tract that discharges continuously or an abscess is the symptom of a pilonidal sinus. Regardless of how the illness manifests itself, its excruciating nature results in severe morbidity, frequently including a prolonged lack of normal activities. A speedy recovery that allowed patients to quickly resume their regular activities while minimizing morbidity and lowering the risk of sequelae would be the optimal course of treatment [6].

In our study, male predominance was found in both groups (86.5%). In both group A and group B, the patients were 19 to 37 years old, with a mean age of 27 years, respectively. All patients had been previously operated on with excision of the tract and primary closure of the wound for only one time; 8 patients had recurrence after 2 months, another 8 had recurrence after four months, six others had recurrence after 6 months, and the last 8 had their recurrence after one year of the operation.

This finding was computable with **Dass et al.** [7]**, which** involved a follow-up period of up to two years and was conducted using primary closure of the wound following sinus tract excision. The results showed a high recurrence rate, ranging from early recurrence within months to late recurrence after a year. Other studies that also used the primary closure method produced data supporting the primary closure of the wound, like **Elgohary and Oraby** [8] **and Khan et al.**[9]. According to their research, their patient had a primary sinus with only one open sinus at the time of presentation. The sinus tract was straightforward and had a short length after the sinus was cut.

At the time of presentation, 12 patients complained of both pain and discharge, 17 patients complained of only discharge, and the last one patient complained of only pain. This is compatible with **El-Khadrawy et al.** [10], who stated that the most frequent complaint among his research cases was from patients with recurrent pilonidal sinuses who discharged, either alone or in combination with pain.

To ensure standardization, pre-operative ceftriaxone and metronidazole single doses were administered to all patients in both groups in our study. **Matar** [11] and **Ahmed et al.** [12] who conducted similar investigations.

In our study, intraoperative mean time of semiclosure technique was 34.27 minutes compitable with results of **Ghareb et al.** [13], while some other studies reported longer time as **Abdelraheem and Magdy** [14] in rhomboid flap technique it takes longer time with mean 69.8 min. Similar finding in the studies of **Singh et al.** [15] **and Shabbir et al.** [16]**.**

According to the post-operative following up in our study, the pain duration , time needed to comfortably sit and the mean healing time in group A were (12.6 days), (13. 13 days) and (76.8 days) respectively was longer than in group B (3.87 days), (8 days) and (20.13 days) respectively. This finding were agreed with **Rabea study** [17].

The patients undergoing rhomboid flap method were encouraged to return to work was significantly shorter in this group (26.93 days) compared with the other group (19.67 days) similar to study results of **Horwood et al.** [18]**.**

The incidence of post-operative wound complications such as wound infection, wound dehiscence, and delayed wound healing was less among the group operated with a semi-closure technique in comparison with the other group operated with a rhomboid flap, we suggest that may return to factors related to the patient himself such as hirsute body, obesity or bad hygiene, as for wound dehiscence we asked the patient to regular, frequent dressing and using local spray antibiotic and as for delayed wound healing patients took good antibiotic coverage and the appropriate wound care. This is incompatible with **Ahmed et al.** [12], who revealed that among the Rhomboid flap group compared to the partial closure group, wound problems such as wound dehiscence and delayed wound healing were less common.

Akin et al. [19] **and Singh et al.** [15] utilized vacuum drains during rhomboid flap surgery in their research to eliminate dead space and avoid problems and recurrence. We employed suction drains in our study.

A smaller number of investigations, including a previous investigation by **Mentes et al.** [20], found no discernible difference in the surgical result between the use of drains and their lack of use.

During the follow up period of 6 months, our results showed that recurrence occurred in three patients in the flap group and no recurrence reported during the 6 post-operative months in semi closure group, However, due to our study limitations as small sample size, use of objective evaluation and the short period of our study (6 months) limit the further evaluation of any other recurrence possibility in both group. This is compatible with **Ahmed et al.** [12] **and El-Khadrawy et al.** [10].

The main causes of recurrence after surgical management of pilonidal sinus disease are the possible results of incomplete resection, post-operative dead space, excessive flap tension, chronic inflammation, and the nature of body hair and skin.

Finally, all patients with Semi closure technique were satisfied about the cosmetic appearance while three patients of the flap group complained of the cosmetic appearance of the scar. This agree with results of **El-Khadrawy et al.** [10] but disagreed with his results about complaining of numbness during our study time , we suggest that may returning to the size of the flap or injuring of some cutaneous nerves during his work .

Our study limitations included: a relatively small sample size, the use of subjective evaluation, and the short period of our study (6 months), limiting the further evaluation of any other possible recurrence in both groups.

CONCLUSION

Patient experienced rhomboid flap technique shows a decrease in the duration of pain and time need for sitting comfortably and an early return to work and normal daily activity.

The semi-closure technique shows fewer wound post-operative complications and better cosmetic appearance in relation to the rhomboid flap technique.

Semi closure technique was better as regard to recurrence; it shows zero recurrence rate in the time of study (6 months) while rhomboid flap group had three recurrence case in the 1st six post-operative months.

Conflict of interest: None

Financial Disclosure: None

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