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ORIGINAL ARTICLE

Evaluation of Different Methods of Treatment of Pilonidal Sinus; a Randomized Controlled Trial

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ABSTRACT

Background: Sacrococcygeal pilonidal disease is an infection of the skin and subcutaneous tissue at or near the upper part of the natal cleft of the buttocks. This results from the chronic infection of hair follicles and the subsequent formation of a subcutaneous abscess. Hair then enters the abscess cavity and provokes a foreign body tissue reaction with chronic suppuration and discharge. The aim of this study was to select the best method of treatment for pilonidal sinus.

Methods: This randomized controlled trial was conducted on 56 patients with the diagnosis of pilonidal sinus disease who were admitted to the Department of General Surgery, Zagazig University Hospitals, from March 2020 to September 2020. The patients were allocated randomly into four groups, each including 14 patients. Group (1): This was the conservative approach, which included medical treatment and drainage if necessary. The open technique was used in Group (2). Group (3): were operated by the Limberg flap technique. Group (4): were operated by Karydakis's technique. All patients were subjected to a history, a complete clinical examination, and preoperative laboratory investigations.

Results: Recurrence was significantly associated with open and conservative groups, while there was only one case in the Limberg group and no case in the Karydakis group.

Conclusions: The Karydakis flap procedure should be chosen instead of the Limberg flap for treating uncomplicated sacrococcygeal pilonidal disease because of its shorter operative time, earlier return to work, faster healing time, and significantly higher patient satisfaction.

Key words: Pilonidal Sinus; Sacrococcygeal; Sinus.

INTRODUCTION

Sacrococcygeal Pilonidal disease is an infection of the skin and subcutaneous tissue at or near the upper part of the natal cleft of the buttocks. Pilonidal cavities are not true cysts and lack a fully epithelialized lining; however, the sinus tracts may be epithelialized [1]**.** The incidence of pilonidal sinus disease (PSD) is estimated at 26 cases per 100,000 people. The mean age at intergluteal pilonidal disease onset is 19 years in women and 21 years in men. Generally, men are 2–4 times more prone to this disease. The risk factors for PSD include obesity, local trauma or irritation, prolonged sitting, a deep natal cleft, and a positive family history. The exact mechanism of the progression of pilonidal disease is uncertain, although hair and inflammation are recognized as contributing factors [2].Pilonidal sinus disease is characterized by natal cleft suppuration due to hair follicle infection. The disease results from chronic infection of hair follicles and the subsequent formation of a subcutaneous abscess because of persistent folliculitis. Hair then enters the abscess cavity and provokes a foreign body tissue reaction; chronic suppuration and discharge through a midline sinus follow [3]**.**For the acute abscess that presents early, with pain that is tolerable, and no evidence of cellulitis, broad-spectrum antibiotics and depilation alone may be sufficient to resolve the immediate problem. If symptoms resolve, a follow-up examination for the presence of pits or sinus tracks is recommended, along with long-term depilation and attention to hygiene. The majority of acute cases do, however, require urgent surgical intervention. When pain is severe or cellulitis is present, attempts at conservative treatment are

likely to be futile and will only prolong the patient's discomfort. Chronic disease can be successfully treated by shaving and meticulous hygiene, but recurrence rates are unknown [4].

The principles of surgical strategies require eradication of the sinus tract, complete healing of the overlying skin, and prevention of recurrence. Many methods are available for surgical management of PSD, which is treated by wide excision. After excision, the wound may be left open to heal with granulation tissue or may be immediately closed with a midline closure or by using a flap (Z-plasty, Karydakis, Bascom, or Rhomboid flaps). However, there is no agreement on the best treatment [5]. The aim of the current study was to select the best method of treatment for pilonidal sinus.

METHODS

This randomized controlled trial was carried out in the General Surgery Department, Zagazig University Hospitals, from March 2020 to September 2020. Written informed consent was obtained from all participants, and the study was approved by the research ethics committee of the Faculty of Medicine at Zagazig University. The study was done according to the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans**.** It included 56 patients with the diagnosis of PSD, divided randomly into four groups, each including 14 patients. Group (1): This was the conservative approach, which included medical treatment and drainage if necessary. The open technique was used in Group (2). Patients in Group 3 were operated on using the Limberg flap technique. Patients in Group 4 were operated on using Karydakis' technique. The age of these patients ranged from 19–39 years, with a mean age of 32 years and a male predominance of 80%. The duration of their preoperative complaints ranged from 6 to 36 months. After receiving approval from the research ethics committee, informed consent was obtained from every patient. All patients admitted to Zagazig University Hospitals with uncomplicated pilonidal sinus disease (not infected, not branched) who are older than 18 and younger than 45 years old were enrolled. Patients under the age of 18 and those over the age of 45, patients refusing to participate, patients with recurrent pilonidal sinus, patients with contraindications to surgery such as a bleeding tendency, and patients with complicated pilonidal were excluded from this study.

Before proceeding to surgery, a full history was taken from all patients regarding the duration of symptoms and history of abscesses. Patients were evaluated clinically to assess the number and site of pits and the extent of the disease. The laboratory investigations included a complete blood picture, liver function tests, kidney function tests, a random blood glucose level, a coagulation profile, and hepatitis markers. Electrocardiography and echocardiography were done for cardiac patients or for patients over 40 years old. Intravenous administration of a preoperative antibiotic (1 gramme of ceftriaxone IV). All patients were instructed to shave the natal cleft and a wide surrounding area the night of the operation, and that was checked and completed on the operating table if needed to make sure we had a clear surgical field before operating.

Technique:

Group 1: Conservative treatment

Patients who were admitted had early inflammation and proper hair shaving. Those patients were instructed to avoid prolonged sitting. Abscess drainage was done for some patients with abscess collection (Figure 1).

Group 2: Open technique

Patients were given spinal anesthesia and were given a prophylactic antibiotic (1 gramme of ceftriaxone IV). They were then placed in the prone position, and the buttocks were separated with strips of adhesive tape that were fixed to the sides of the operation table, and the site of attachment of these strips to the skin of the buttocks was reinforced by short lengths of adhesive tape. The skin of the back and buttocks was disinfected with a 10% povidone-iodine solution. The anus was excluded from the operative field by surgical drapes. Methylene blue dye was injected into the sinus orifices to help assess the extent of the sinus so that the whole sinus and its ramifications could be fully excised without inadvertent contamination of the wound by opening the track. An elliptical incision was made to remove all diseased tissue, and careful dissection was performed to prevent methylene blue leakage down to the presacral fascia. Good hemostasis was achieved before packing the cavity with gauze soaked in povidone-iodine solution (Figure 2).

Group 3: Limberg technique

Anesthesia, positioning, and dye injection were done as before. The extent of excision and flaps were determined by drawing on the glutei. The pathological area to be excised was mapped on the skin. It was enclosed by a rhombus-shaped design with its long axis in the middle line (ABCD). The line (AC) was drawn, and its length was measured. The (C) was adjacent to the perianal skin, and the (A) was placed so that all diseased tissue was included in the excision, with the line (BD) transecting the midpoint of the (AC) at right angles and measuring 60% of its length. Lines (AB), (BC), (CD), and (DA) were equal. The flap was planned so that (DE) was a direct continuation of the line

(BD) and was of equal length to the line (BA) to which it was sutured after rotation. The (EF) was parallel to the (DC) and of equal length; it was sutured to the (AD) after rotation. This defined the main flap (CDEF) and the triangular flap (ADE). The skin and subcutaneous fat within the (ABCD) area were excised down to (but not including) the deep fascia. The wound was temporarily packed, gloves were changed, and meticulous hemostasis was attained by diathermy. The flap of (CDEF) was raised so that it included the skin, subcutaneous fat, and the fascia overlying the gluteus maximus muscle. It was then rotated on a pedicle of (CF) to cover the midline rhomboid defect, and the defect created was closed in a linear fashion. Deep, absorbable sutures in the subcutaneous tissue and fat were placed over a suction drain. Finally, the skin was closed with interrupted sutures (Figure 3).

Group 4: Karydakis technique

Anesthesia, positioning, and dye injection were done as before. An asymmetrical elliptical incision was marked with its long axis parallel to the midline and located 2 cm away from it (the ellipse was based on the side of any secondary opening or fluctuation of the sinus after methylene blue injection). Therefore, in cases where the sinus was entirely central, either side was chosen. The ellipse was designed to be at least 5 cm in length (as there is increased tension on the closure of a short ellipse), with the medial side of the incision just crossing the midline but still encompassing all the diseased midline tissues. The lateral edge of the excised ellipse was designed in a sloping manner (even if it meant excision of more skin and fat well beyond the sinus) so that the final suture line was vertical and away from the midline. The ellipse was then excised down to the sacral fascia, removing a boat-shaped wedge of tissue, including the whole sinus. The whole length of the medial side of the incision was then mobilized by undercutting a distance of 2 cm at a depth of 1 cm, creating a flap of uniform thickness extending the full length of the wound. Any strapping that might have distracted the buttocks has now been removed. A layer of interrupted absorbable sutures was placed, with the needle being passed into the sacral fascia in the midline and then deeply into the fat at the base of the flap, taking a large bite that included both surfaces of the undercut, with the aim of drawing the flap over and creating a new shallow midline sulcus. As this series of sutures was tied, the assistant had to evert the edge with his fingers and use a thumb to push the base of the flap towards the midline to reduce tension and approximate the surface for knotting. A suction drain was then placed across these knots and brought out well laterally. Then, the second layer of sutures was placed to approximate the undersurface of the flap to the fat at the lateral edge of the wound. Finally, the skin was closed with interrupted non-absorbable sutures, with our final suture line lying a few centimeters from the midline. Following these steps, the patient would now have a new, shallow natal cleft with healthy, unscarred skin (Figure 4).

Post-operative care and follow-up:

All patients were seen weekly for the first four weeks after surgery to evaluate wound healing and detect any wound complications as early as possible until complete healing was achieved. Postoperative complications were reported based on clinical findings. Complications such as wound infection, adhesions, subcutaneous fluid collections, edema, and bleeding were highlighted.

STATISTICAL ANALYSIS

The collected data were coded, processed, and analyzed using the Statistical Package for Social Sciences (SSPS) version 22 (IBM, SPSS Inc., Chicago, IL, USA). The Shapiro-Wallis test was used to check the normal distribution of the data. Qualitative data were represented as frequencies and relative percentages. As indicated, the Chi square test and Fisher exact test were used to calculate the difference between qualitative variables. The mean ± standard deviation (SD) was used to express quantitative data. To compare two independent groups of normally distributed variables (parametric data), the independent samples t-test was used, while the Mann-Whitney U test was used for non-normally distributed data (non-parametric data). To compare multiple independent groups of normally distributed variables, the ANOVA test was utilized with post hoc Least Significance Difference test.

RESULTS

Table 1 revealed that there was no significant difference in age distribution, with ages distributed as 30.71±5.73, 32.21±6.58, 32.57±6.47 and 32.42±8.2 years among groups. Also, there was no significant difference in sex, with males outnumbering females in all groups. Table 1 shows that the conservative group had a significantly shorter duration than other groups. Regarding disease duration, there was no significant difference among the other groups. Regarding the number of sinuses, all of the conservative cases were single, and that was significantly different from other groups. Table 2, Operative time was significantly longer in the Limberg group than in the Karydakis group. The open group showed significantly shorter operation time than the other group. In terms of hospital stay, the open group showed a higher stay, followed by Limberg, and the shortest stay was detected in the Karydakis group. The postoperative complications for each technique were presented in Table 2. The visual

analog scale (VAS) was significantly higher in open cases. In addition, infection rates among the open were significantly higher than in the other groups. Karydakis' group was significantly lower regarding infection. Regarding bleeding, it was associated with open group only but had no statistical significance. Table 3, Healing and return work were significantly higher among open group and difficult defecation was also significantly associated with open group. In terms of healing, return to work, or defecation, there is no significant difference between the other two groups.

Table1: Demographic and clincal features among studied groups

		Conservative Group (No.: 14)	Open Group (No.: 14)	Limberg Group (No.: 14)	Karydakis Group (No.: 14)	F/ X^2	p-value
Age (years)		30.71±5.73	32.21±6.58	32.57±6.47	32.42±8.2	0.222	0.881
Sex	Male	12 (85.7)	11 (78.6)	12 (85.7)	10 (71.4)	1.24	0.74
	Female	2 (14.3)	3 (21.4)	2 (14.3)	4 (28.6)		
Duration (months)		8.57±1.91#	23.71±3.91	24.0±4.96	24.14±5.55	44.50	<0.001*
Number of sinuses	Single	14 (100) **	7 (50)	7 (50)	6 (42.9)	12.27	0.006*
	Multiple	0 (0)	7 (50)	7 (50)	8 (57.1)		

F= ANOVA; X^2 = chi square
Data presented as mean± SD or frequency (percentage)
*: Significant; **: Significant higher; #: Significant lower

Table 2: Operation characters and post operative complications distribution among surgery groups

		Open Group (No.: 14)	Limberg Group (No.: 14)	Karydakis Group (No.: 14)	F/ X^2	p-value
Operative time (minutes)		25.71±5.13#	55.71±4.32**	44.29±3.31	75.45	<0.001*
Hospital stay (days)		5.79±0.80 **	3.0±0.67	2.14±0.66#	98.68	<0.00*
Complication						
• **VAS**		7.57±0.93**	3.57±0.51	4.0±0.78	115.21	<0.001*
• **Seroma**	Negative	14 (100)	13 (92.9)	10 (71.4)	3.58	0.141
	Positive	0 (0)	1 (7.1)	4 (28.6)		
• **Edema**	Negative	14 (100)	9 (64.3)	11 (78.6)	3.96	0.122
	Positive	0 (0)	5 (35.7)	3 (21.4)		
• **Infection**	Negative	5 (35.7)	9 (64.3)	13 (92.9)	9.95	0.007*
	Positive	9 (64.3) **	5 (35.7)	1 (7.1) #		
• **Adhesion**	Negative	14 (100)	14 (100)	14 (100)	0.00	1.00
	Positive	0 (0)	0 (0)	0 (0)		
• **Bleeding**	Negative	10 (71.4)	13 (92.9)	13 (92.9)	3.5	0.174
	Positive	4 (28.6)	1 (7.1)	1 (7.1)		

VAS: visual analog scale; F: ANOVA; X2: Chi square
Data presented as mean± SD or frequency (percentage)
*: Significant; **: Significant higher; #: Significant lower

Table 3: Follow up data distribution among surgery groups

		Open Group (No.: 14)	Limberg Group (No.: 14)	Karydakis Group (No.: 14)	F/ X^2	p-value
Healing (days)		61.42±16.80**	22.5±5.57	21.21±5.2	102.76	<0.001*
Return to work (days)		78.57±16.45**	32.85±8.92	29.28±7.81	107.93	<0.001*
Defecation	Easy	2 (14.3)	9 (64.3)	8 (57.1)	14.68	0.023*
	Moderate	6 (42.9)	4 (28.6)	4 (28.6)		
	Difficult	6 (42.9) **	1 (7.1)	2 (14.3)		

F: ANOVA; X2: Chi square
Data presented as mean± SD or frequency (percentage)
*: Significant; **: Significant higher; #: Significant lower

Figure 1: Early pilonidal infection.

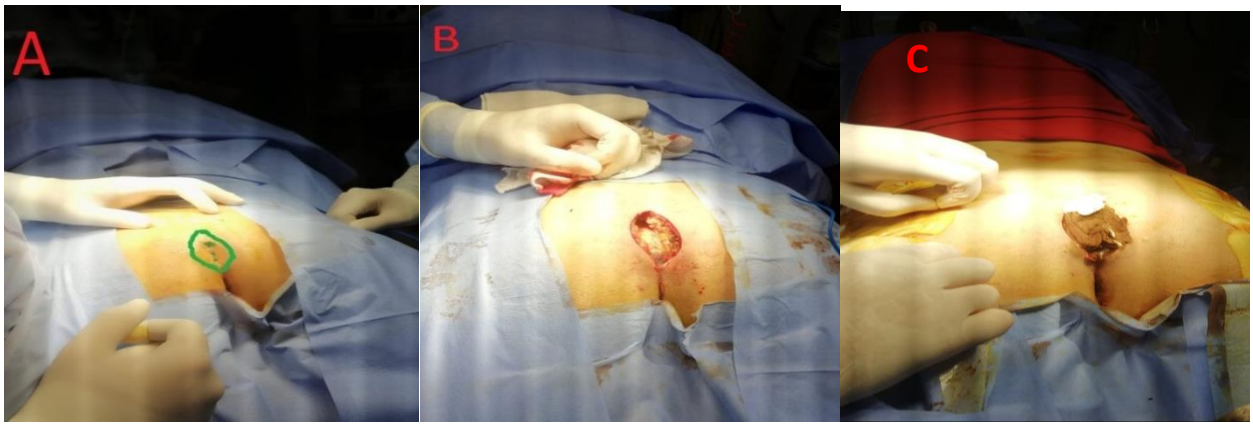
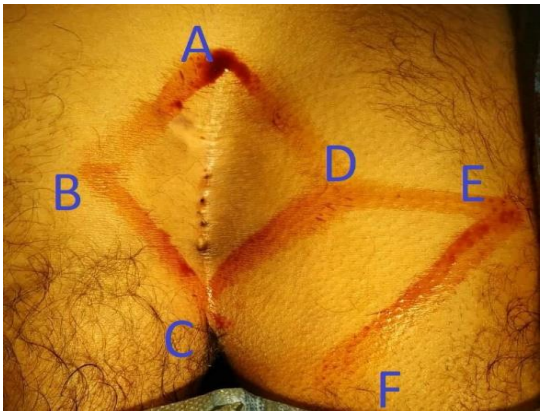


Figure 2: Open technique **(A)** marking of ellipse incision involving all diseased tissue; **(B)** ellipse incision and dissection till presacral fascia and good hemostasis was achieved; **(C)** After good hemostasis filling defect with povidone iodine-soaked gauze.

1



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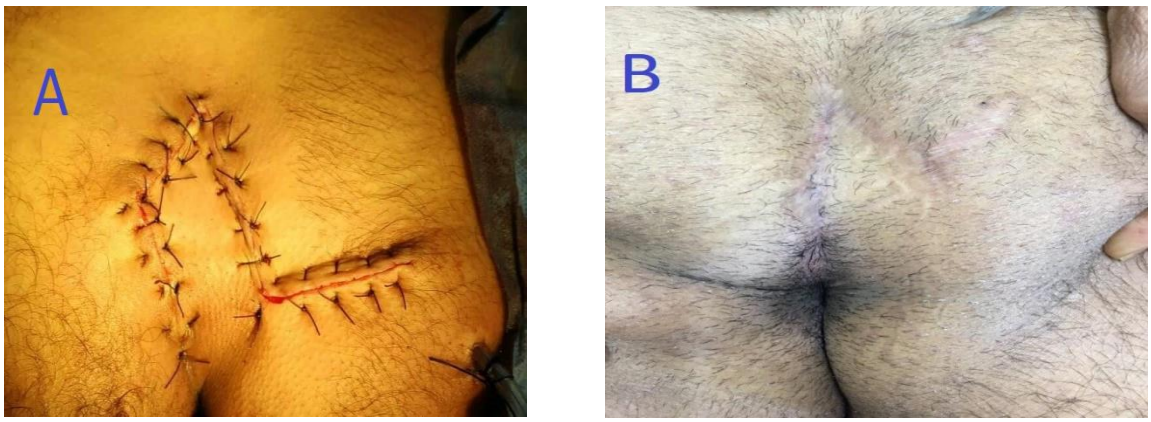

Figure 3: Limberg technique **(1)** The rhombus shaped area to be excised (ABCD) with main flap (CDEF) and the triangular flap (ADE), then the marked rhombic area was excised down to the deep fascia. **(2)** Both flaps were mobilized deep, at the level of the gluteal fascia (**3)** [A] The wounds were sutured in 2 layers and a suction drain was inserted; [B] shows scar appearance following the limberg flap procedure after 2 months.

Figure 4: Karydakis technique **(A)** drawing of the elliptical incision that was done with its long axis parallel to the midline; **(B)** Ellipse of skin and underlying fat, including the whole sinus, was excised down to sacral fascia; **(C, D)** The first sutures were placed between the limit of the undercutting incision and the deep fascia in the midline; **(E)** the final suture line is vertical and away from the midline; **(F)** scar appearance following karydakis technique after 3 months.

DISCUSSION

In this study, there was a male predominance in all groups with (85.7%) in group 1, (78.6%) in group 2, (85.7%) in group 3, and (71.4%) in group 4. The age of patients ranges from 19 to 39 years, with a mean±SD of (30.71±5.73) in group 1, (32.21±6.58) in group 2, **(**32.57±6.47) in group 3 and (32.42±8.2) in group 4. There was no significant difference in age distribution, and there was no significant difference in gender, with men

outnumbering women in all groups.This agrees with Ahmed and his coworkers [5], who recruited a total of 150 patients (75 patients in each group) in their consecutive non-probability sampling study, where patients of group (A) underwent the Karydakis flap technique and patients of group (B) underwent the rhomboid flap. In both groups, the majority of the patients were between the ages of 20 and 40. The mean age of the patients in groups (A) and (B) was 33.6±9.7 years and 32.2±9.8 years, respectively, with no significant difference between the two study groups. In addition, 82.7% of group A patients and 86.7 percent of group B patients were men, indicating a significant male predominance, which is consistent with our findings. However, this differs from Bahar and colleagues [6], who studied the management of 74 patients with pilonidal disease, with an age mean of 24.7±2.76 and 24.8±3.89 years in their two study groups and a 66% male predominance.

In this study, the duration of preoperative complaints varied from 6 to 36 months, with a mean±SD of 8.57±1.91 months in group 1, 23.71±3.91 months in group 2, 24.0±4.96 in group 3, and 24.14±5.55 in group 4. The conservative group was significantly shorter than the other groups, with no significant differences among them. This agrees with Bostanoglu et al. [7], who revealed that the Karydakis technique was used on 73 (54.9%) of the 133 patients in the study, and the Limberg flap procedure was used on 60 (45.1%), with a mean and SD of 2.1±1.2 and 1.9±1.8 years, respectively. However, Bali and his colleagues [8] included 71 patients in their prospective randomised study, 37 of whom (the Limberg flap group) presented with preoperative complaints with a duration of 14.32±10.12 months, and the other group (the Karydakis flap group) had a duration of 12.66±4.43 months, with no significant difference between the two groups.

In our study, the conservative group had a single sinus that was significantly different from the other groups in terms of the number of pits or sinuses. In groups 2 and 3, 50% of patients had multiple sinuses, while 57.5% of patients in group 4 had multiple sinuses. This differs from Abou Ashour et al. [9], who included a total of 70 patients in their study, with 35 patients in each group operated on using Karydakis and open methods with multiple sinus percentages of 28.5% and 40%, respectively. There was no significant difference between the two groups as regards preoperative presentations.

The next point to discuss is operative time, which was significantly longer in the Limberg group than in the Karydakis group and in the open group in this study. The open group was significantly shorter than other groups; it was 25.71±5.13 minutes in the open group, 55.71±4.32 minutes in the Limberg group, and 44.29±3.31 minutes in the Karydakis group. The reduction in operative time has been attributed to the relatively straightforward nature of the open and Karydakis flaps, in which extensive mobilization and transposition are not required [10]. This is in line with the results published by the previously mentioned study by Bostanoglu et al. [7], with an operative time of 43±10.5 minutes for Karydakis and 55±12.5 minutes for Limberg. This agrees with the previously mentioned study by Abou Ashour and his colleagues [9], who revealed an operative time of 23.4±4.05 minutes for the open technique and 45±7.27 for Karydakis. Furthermore, our study agrees with Borel et al. [11] in terms of the Open technique's shorter duration time compared to Karydakis, but with a shorter operative time of 16.4±7 and 25.5±4, respectively.

In terms of hospital stay, the open group was significantly higher than Limberg and Karydakis; the stay was 5.79±0.802 days for the open group, 3.0±0.67 days for Limberg, and 2.14±0.66 days for the Karydakis group. This agrees with the study done by Ahmed and his colleagues [5], who included a total of 150 patients that were divided into two groups with 75 patients in each group by using consecutive non-probability sampling. Hospitalization times for the Karydakis technique and the Limberg flap were 2.39±0.66 and 3.97±0.71 days, respectively. But it differs from a study previously mentioned by Borel et al. [11], who found hospital stays of 0.2±0.4 days for Karydakis and 0.5±0.6 days for open surgery, which was too short compared with our study.

Regarding postoperative complications for operative groups (Open-Limberg-Karydakis), postoperative pain according to VAS was 7.57±0.93 for the open group, 3.57±0.51 for the Limberg group, and 4.0±0.78 for the Karydakis group. The VAS was significantly higher in open cases, and the VAS was higher in the Karydakis group than the Limberg group. This is consistent with the results of a prospective study conducted by Ates and colleagues [12] comparing Karydakis vs. Limberg techniques on 135 patients in the Karydakis group and 134 patients in the Limberg group, with a VAS of 5.56±1.55 for the Limberg group and 5.58±1.52 for the Karydakis group. Regarding postoperative wound complications like seroma formation, none of the patients in the open group developed seroma as it cannot happen in an opened wound; 1 patient developed seroma in the Limberg group (7.1%), and 4 patients developed it in the Karydakis group (28.6%). This was attributed to the accidental dislodgment of the suction drain and to the slippage of the suction drain outside. Another complication like edema has the same result as seroma in the open group;

five patients (35.7%) developed edema in the Limberg group, and three patients (21.4%) presented with edema in the Karydakis group. Meanwhile, infection occurred in 9 patients (64.3%) in the Open group, 5 patients (35.7%) in the Limberg group, and 1 patient (7.1%) in the Karydakis group.Bleeding happened in 4 patients (28.6%) in the open group and in 1 patient (7.1%) in both the Limberg and Karydakis groups. Other complications, such as adhesion, were not seen in any of the three groups. So, we found that infection was significantly higher in rate among the open group than other groups, and Karydakis' group was significantly lower in regard to infection. Bleeding was associated with open groups only, but not significantly. This is consistent with Ates and colleagues' [12] study of 135 patients operated on using the Karydakis flap and 134 patients using the Limberg flap, which found that 8 Karydakis flap patients and 14 Limberg flap patients had wound dehiscence. Furthermore, four Karydakis flap patients developed postoperative wound infection, compared to eight Limberg group patients. This indicates that wound infection and wound dehiscence were observed more with the Limberg group, which supports our findings. However, their study reported 3 Karydakis flap patients with postoperative collection versus 6 in the Limberg flap group. These last findings disagree with our study, which is mostly attributed to our relatively small sample size (56 patients) compared to their study, where they operated on 269 patients. It also disagrees with the Ersoy et al. [13] study on 100 patients who were divided into 2 equal study groups where wound infection occurred in 13 out of 50 patients (26%) operated on via the Karydakis technique versus only 4 patients (8%) in the Limberg group, denoting a significant difference in favor of the Limberg flap technique. This disagreement, again, is mostly due to our small sample size. Besides, he mentioned he didn't insert a suction drain in some patients of the Karydakis group because they were too thin, which, in his opinion, might have led to wound infection. The study carried out by Can et al. [10] on 145 patients (72 patients in the Limberg group and 73 in the Karydakis group) did not discover significant differences between the two groups in terms of wound infection, collection, wound disintegration, seromas, hematomas, or total surgical area complications, which agrees with our study.

Regarding wound healing, it was significantly higher in the open group than in other groups. The Open group took 61.42±16.80 days, the Limberg group 22.5±5.57 days, and the Krydakis group 21.21±5.2 days. According to the previously mentioned study by Ashour and colleagues [9], wounds heal in 43.4±18.2 days for open groups and 16.3±4.3 days for Karydakis. But this differs from the study by Jamal et al. [14], with the mean time for complete healing of the wound after rhomboid excision and Limberg flap being 20.13±8.99 days (range 15–60 days) as in our study. However, it was significantly higher in patients who underwent simple excision (mean 120.08±31.59 days, range 60-180). Regarding time to return to work, in our study, it was significantly higher in the open group than in other groups. It was 78.57±16.45 days for the open group, 32.85±8.92 days for the Limberg group, and 29.28±7.81 days for the Karydakis group. This is in line with Ashour and his colleagues [9], who reported time to return to work of 50.47±8.1 days for the open group and 22.4±4.7 days for Karydakis' group, which resembles our study results with slightly fewer days off work. And this agrees with the previously mentioned study by Bostanoglu et al. [7], where the time to return to work was 14.6±6.1 days for Karydakis and 17.7±5.4 days for the Limberg group, assuming the same short time to return to work for Karydakis but with much fewer days.

CONCLUSION

The four techniques are effective in the treatment of pilonidal sinus; conservative is preferred at the early stage of the disease, and flap techniques have better results and higher satisfaction than open ones. However, the Karydakis flap procedure should be chosen instead of the Limberg flap for treating uncomplicated sacrococcygeal pilonidal disease because of its shorter operative time, earlier return to work, faster healing time, lesser incidence of wound complications, and significantly higher patient satisfaction.

Conflicts of interest

There are no conflicts of interest.

Financial Disclosures Non

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