



ORIGINAL ARTICLE

The Karydakis Flap Versus the Limberg Flap in the Treatment of Pilonidal Sinus Disease

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Submit Date: 2019-06-16

Revise Date: 2019-08-04

Accept Date: 2019-08-06

ABSTRACT

Background: The ideal operation for pilonidal sinus disease should be a simple one with low complication and recurrence rates. The aim of this study was to compare the efficiency and the results of the karydakis flap with that of the limberg flap for treating pilonidal sinus disease in Zagazig University hospitals. **Objectives:** To study the post-operative results and the effectiveness of Karydakis and Limberg flaps in the treatment of pilonidal sinus disease. **Methods:** 20 patients were enrolled in this interventional comparative clinical study and were divided into two equal groups. Group (1) were operated on via the the karydakis flap and group (2) via the limberg flap. **Results:** The mean operative time was shorter with the Karydakis group (41.7 ± 4.22 minutes) than with the Limberg group (51.5 ± 4.17 minutes). There was no significant difference between both groups regarding overall complication rate. The mean time off work was shorter with the Karydakis procedure (14.6 ± 2.46 days). The healing time was significantly shorter with the Karydakis group than with the Limberg group (18 ± 3.05 vs 21.6 ± 3.41 days, $P= 0.023$). The visual analogue score for the cosmetic satisfaction of patients in the Karydakis group was 7.8 ± 1.03 , whereas it was 4.2 ± 0.92 in the Limberg group with a p value (< 0.001). Only one patient (10%) from each group developed recurrence. **Conclusion:** Karydakis flap procedure should be chosen instead of Limberg flap because of its shorter operative time, earlier return to work, faster healing time with lesser incidence of wound disruption and significantly higher patient satisfaction.

Key words: Sacrococcygeal pilonidal disease, Limberg flap, Karydakis flap.

INTRODUCTION

Sacrococcygeal pilonidal disease is a chronic inflammation and infection of the natal cleft. It is common among young adults and usually presents as an abscess or a painful sinus tract with chronic seropurulent discharge^[1].

Although many surgical and nonsurgical treatment modalities have been devised for the treatment of pilonidal disease, an optimal option has not been yet established because of the high complication and recurrence rates^[2].

Pilonidal sinus disease has been widely regarded as an acquired condition rather than a congenital one. Therefore, modifying the natal cleft together with lateralization of the midline is of utmost importance to help eliminate the causative factors of this

condition^[3].

In this regard, numerous flap techniques such as the Karydakis flap, the Limberg flap, the Dufourmentel flap, the modified Limberg flap, and other advancement and plasty flap procedures have been constructed for treating pilonidal disease^[1].

Although flap techniques have been practiced at many centers with considerable success, recurrence is still encountered more often than predicted. Lately, the Karydakis and Limberg flap techniques have had low recurrence and complication rates compared with other flap procedures and have become more popular^[4].

SUBJECTS AND METHODS

Site of study:

This study was carried out in the Department

of General Surgery, Zagazig University Hospitals.

Sample size:

20 cases were included during the 10 month study period as a comprehensive sample.

Group (1): were operated on via the the Karydakis flap technique.

Group (2): were operated on via the Limberg flap technique.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria

All patients admitted to Zagazig University Hospitals with pilonidal sinus disease above the age of 18 years old.

Exclusion criteria

Patients under the age of 18 years old, history of other sacro-coccygeal surgeries, contraindication to surgery such as bleeding tendency, heart or chest disorders.

Type of study:

Interventional study

Technique:

Patients underwent spinal anaesthesia and were given prophylactic antibiotic (1 gm. ceftriaxone IV) on the operating table. They were then placed in prone position, buttocks were separated with strips of adhesive tape, which 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, applied at a right angle to the underlying layer forming a T-shaped pattern with exposure of the natal cleft and anal verge. The skin of the back and buttocks was disinfected with 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 ramification could be fully excised without inadvertent contamination of the wound by opening the track.

For Karydakis flap, An asymmetrical elliptical incision was marked, as shown in

fig.(1), 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 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. 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. A layer of interrupted absorbable sutures was placed between the sacral fascia in midline and the fat at the base of the flap. 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 under surface of the flap to the fat in 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 as in fig.(2).

For Limberg flap, Extent of excision and flaps were determined by drawing on the glutei. The pathological area to be excised was mapped on the skin as in fig.(3). 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. (C) was adjacent to the perianal skin and (A) was placed so that all diseased tissue were included in the excision, with the line (BD) transecting the midpoint of (AC) at right angles and measuring 60% of its length. Lines (AB) = (BC) = (CD) = (DA). 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. (EF) was parallel to (DC) and was of equal length and after rotation it was sutured

to (AD). 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 flap of (CDEF) was raised so that it included the skin, subcutaneous fat and the fascia overlying 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 s.c. tissue and fat were placed over a suction drain and then finally, the skin was closed with interrupted sutures.

Statistical analysis:

Data were checked, entered and analyzed by using the software SPSS (Statistical Package for the Social Sciences) version 20.

Data were expressed as Mean \pm SD for quantitative variables, number and percentage for descriptive variables.

Chi-square (X^2) or Fisher exact results and t test were used when appropriate.

To compare means of two groups, independent sample t test was used when data was normally distributed. Nonparametric test (Mann Whitney) was used to compare means when data was not normally distributed and to

compare medians in categorical data

$P < 0.05$ was considered statistically significant.

$P \leq 0.001$ was considered highly statistically significant.

RESULTS

The mean operative time was significantly shorter with the Karydakis group (41.7 ± 4.22 minutes) than with the Limberg group (51.5 ± 4.17 minutes) as shown in table(1). There was no significant difference between both groups regarding overall complication rate. The mean time off work with patients operated with Karydakis procedure (14.6 ± 2.46 days) was less than the time with the Limberg group (16.8 ± 2.39 days) as illustrated in table(2). The healing time was significantly shorter with the Karydakis group than with the Limberg group (18 ± 3.05 vs 21.6 ± 3.41 days, $P = 0.023$) as in table(3). The visual analogue score for the cosmetic satisfaction of patients in the Karydakis group was 7.8 ± 1.03 , whereas it was 4.2 ± 0.92 in the Limberg group with a p value (< 0.001) as shown in table(4). Only one patient (10%) from each group developed recurrence.

Table (1): Comparison between the studied groups regarding operative time (minutes):

	Karydakis Flap	Limberg flap	t	p	Sig
Operative time (minutes):					
Mean \pm SD	41.7 ± 4.22	51.5 ± 4.17	-5.23	<0.001	HS
Range	35 - 50	45 - 60			

Table (2): Comparison between the studied groups regarding time off work (days):

	Karydakis Flap	Limberg flap	t	p	Sig
time off work (days):					
Mean \pm SD	14.6 ± 2.46	16.8 ± 2.39	-2.027	0.058	NS
Range	12 - 20	14 - 22			

Table (3): Comparison between the studied groups regarding healing time (days):

	Karydakis Flap	Limberg flap	t	p	Sig
Healing time (days):					
Mean \pm SD	18 ± 3.05	21.6 ± 3.41	-2.488	0.023	S
Range	14 - 24	18 - 28			

Table (4): Comparison between the studied groups regarding patient satisfaction (based on a score from 1 to 10):

	Karydakis Flap	Limberg flap	t-	p	Sig
Patient satisfaction:					
Mean \pm SD	7.8 \pm 1.03	4.2 \pm 0.92	8.235	<0.001	HS
Range	6 – 9	3 - 6			



Fig.(1)



Fig.(2)

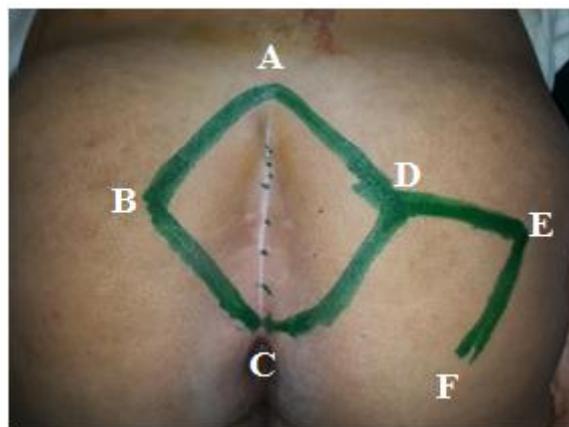


Fig.(3)

DISCUSSION

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 [5]. This results from chronic infection of hair follicles, eliciting a foreign body tissue reaction with chronic suppuration and discharge [6].

Pilonidal sinus disease has an incidence of approximately 26 per 100,000 population with a male:female ratio of 2:1 and a rare occurrence in children [7].

When these sinuses present as acute abscesses, they should be incised and drained. However, the mode of surgical management of the chronic discharging sinus is still a debate [8].

The Principles of Surgical strategies require eradication of the sinus tract; complete healing of the overlying skin, and prevention of recurrence. Many surgical options are available after wide excision of the sinus. After excision, the wound may be left open to heal with granulation tissue, or may be closed in the same setting with a midline closure or by using a flap (Z-plasty, karydakias, Bascom or Rhomboid flaps) [9].

Various studies have been carried out and the results have been compared. It was concluded by Allen-Mersh in 1990 that off-midline closure with flap techniques are better when compared to excision and primary closure and wide excision with secondary healing in terms of healing time and rate of recurrence [9]. The goal of these flap techniques is to prevent the midline

recurrences by removing the cavity in the natal cleft [10].

Several flap techniques have been described with recurrence rates ranging between zero and 6–8%, with Karydakias and Limberg flap techniques having the lowest recurrence rates (0%–4.6%) [11].

• In this study, there was a male predominance in both groups with (80%) in group (1) and (70%) in group (2), the age of patients range from 19 - 36 years with a mean±SD of (25.5 ± 5.17) in group (1) and (25 ± 5.16) in group (2) with no significant difference between both groups regarding demographic data.

This agrees with *Bahar and his co-workers* [12] 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 his two study groups and a male predominance of 66%.

• Regarding operative time, which, in our study, was significantly shorter with the karydakias flap operation with a (mean ± SD) of (41.7 ± 4.22) minutes than it was with the limberg flap procedure where it ranged from 45 to 60 minutes denoting a highly significant difference (P value < 0.001).

This goes in line with the results published by *Gavriilidis and Bota* [13] where they conducted a systematic review and meta-analysis of various randomized controlled trials in which a total of 1421 patients were involved in their selected studies, of whom 773 (54.4%) underwent Limberg and 648 (45.6%) underwent Karydakias flap reconstruction. The mean Operative time was

7 minutes shorter in the Karydakis group than in the Limberg group.

●Regarding postoperative wound complications, in our study none of the patients in group (1) presented with postoperative wound dehiscence or infection although two patients presented with seroma. This was attributed to the accidental dislodgment of the suction drain on the third and fourth postoperative days. Repeated aspiration for 2 to 3 times was sufficient for one patient. For the other case, we had to remove 2 sutures to drain the seroma.

Meanwhile, none of the patients in group (2) presented with postoperative collection, yet one patient presented with wound dehiscence (though he had no infection before wound disruption), which was managed conservatively at first but then required closure with sutures under local anaesthesia on the 17th day postoperative. Another patient suffered from wound infection which was managed with antibiotics along with daily dressings and did result in wound disruption. Other complications such as hematomas, flap necrosis or ischemia weren't observed in any of the patients of either group. All in all, there was no statistically significant difference between the two groups regarding postoperative wound complications.

This goes with *Ates and his colleagues* [14] study on 135 patients operated via The Karydakis flap and 134 patients via Limberg flap, stating that (8) karydakis flap patients versus (14) limberg flap patients were complicated with wound dehiscence. It also reported (4) karydakis flap patients with postoperative wound infection versus (8) in the limberg group. This denotes 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 limberg flap group.

To sum that up, (28) patients in the limberg group developed postoperative complications versus only (15) patients in the karydakis group with a P value of (0.029) denoting statistically significant difference.

These last two findings disagree with our study, which is mostly attributed to our relatively small sample size (20 patients) compared to their study where they operated on 269 patients.

●Regarding return to work, it was earlier with karydakis group than with limberg group. The time off work ranged from 12 to 22 days with patients of group (1) with a mean \pm SD of (14.6 ± 2.46) days off work, while patients of limberg group needed (16.8 ± 2.39) days to return to work with no significant difference between both groups.

This is in line with the study of *Ahmed and his coworkers* [9], who recruited A total of 150 patients (75 patients in each group) in their consecutive non-probability sampling study, group A (karydakis) and group B (rhomboid), and their result was that the mean work loss was (13.13 ± 1.15) days in group (A) and (15.53 ± 1.22) days in group (B). Significant difference was noted between two groups ($p < 0.001$).

●This current study showed that the mean healing time in group (1) was (18 ± 3.05) days with a range of (14 - 24) days, while the mean healing time in group (2) was (21.6 ± 3.41) days with a range of (18 - 28) days.

These findings disagree with *Bali and his colleagues* [11] who enrolled 71 patients in their prospective randomized study where 37 of them were treated with the Limberg flap technique and showed less healing time with a mean of (22.12 ± 8.69) days than the other 34 patients who were operated with the karydakis flap technique in which the mean healing time was (24.08 ± 6.59) days with a P value of (0.017) indicating a statistically significant less healing time in patients operated via the limberg flap technique.

●According to our thesis, recurrence was equally reported in both groups with (10%) each, so there was no statistically significant difference.

The patient who experienced recurrence in group (1), has had multiple midline pits together with lateral pits and a deeply extended disease. He suffered from seroma postoperatively which subsided with aspiration, returned to his work pretty soon and was still satisfied with the procedure till recurrence appeared.

The other patient from group (2), has had no lateral pits with a fairly superficial lesion, but he has had history of abscess and suffered from wound infection postoperatively which subsided with treatment, yet he developed recurrent disease.

And this goes with *Prassas and his colleagues* ^[15] study, where they conducted a meta-analytic study that included randomized controlled trials comparing karydakias flap to limberg flap, in which data from 7 studies including 995 patients were pooled. No statistically significant difference regarding recurrence rate was noted between the two groups ($p = 0.83$).

• Finally, regarding patient satisfaction, group (1) achieved a higher mean \pm SD (7.8 ± 1.03) and range (6-9) in comparison to group 2 that achieved a lower mean \pm SD (4.2 ± 0.92) and range (3-6).

There was statistically significant difference between Karydakias flap (group 1) versus Limberg flap (group 2) regarding patient satisfaction.

The patient with the lowest score in group (1) was the one who experienced recurrence, who was highly satisfied in terms of aesthetics till recurrence took place. While most of patients of group (2) expressed their dissatisfaction with the scar appearance, especially females, giving incredibly low scores.

Our results are in line with *Karaca et al.* ^[16] who reported the same observation of our research, where 46 out of 46 patients who were operated with karydakias flap recommended the operation unlike the 8 out of 31 patients operated with limberg flap who dismissed recommending the operation.

CONCLUSION

Both techniques provide an effective treatment for pilonidal sinus disease with low incidence of complications, decreased recurrence rates and can be performed safely as day-case surgeries. However, the Karydakias 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, and faster healing time with lesser incidence of wound disruption and significantly higher patient satisfaction

Acknowledgement

The authors are grateful for the patients without whom this study would not have been done.

Conflict of interest: The authors declare no conflict of interest

Funding sources : The authors have no funding to report

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Cite This Article - VANCOUVER Style

Mohamed Abd-Elfattah, A., Elsayed Fahmi, K., Eltih, O., Abd-Elhady, W. The Karydakias Flap Versus the Limberg Flap in the Treatment of Pilonidal Sinus Disease. *Zagazig University Medical Journal*, 2020; (900-907): -. doi: 10.21608/zumj.2019.13636.1257