

Comparative Study between Modified Limberg Flap Transposition and Karydakis Flap Reconstruction in Patients with Primary Sacrococcygeal Pilonidal Disease

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Background & aim: Many operative methods have been described for treatment of pilonidal sinus, however, no one is completely satisfactory. The Aim of this study was to compare modified Limberg flap transposition versus Karydakis flap reconstruction in patients with sacrococcygeal pilonidal disease.

Methods: A prospective randomized study was conducted on 40 patients with denovo sacrococcygeal pilonidal diseases at General Surgery Department in Tanta University Hospitals throughout the period from June 2013 to June 2014. The patients were randomly divided into two groups: Group "A" (The patients subjected to modified Limberg flap transposition) and Group "B" (The patients subjected to Karydakis flap reconstruction). This study Compares results of wound infection, wound disruption, wound haematoma, duration of surgery, time of hospital stay and recurrence rate.

Results: The majority of our patients were males(85%), drivers(48%),with no significant difference between the two groups regarding duration of surgery or hospital stay. 5% of the patients in group "A" developed wound infection versus 25% in group "B" while no patient in group "A" developed wound disruption versus 20% in group "B". No patient in group "A" had recurrent disease versus 15% in group "B" and this difference was statistically significant.

Conclusion: Modified Limberg flap had a superiority over Karydakis flap in the ability to excise all tracts if extensive pilonidal sinus, low incidence of wound infection, and wound disruption, shorter hospital stay with no recurrence. We recommend the use of modified Limberg flap in the treatment of pilonidal sinus disease.

Key words: Pilonidal sinus, Limberg flap, Karydakis flap.

Introduction:

Pilonidal sinus is a common disease in young adults that carries high postoperative morbidity and patients' discomfort.¹

Many operative methods have been described for treatment of pilonidal sinus. These include incisional methods (incision with marsupialization and lateral incision and excision of midline pits) and excisional methods (excision with or without closure, excision and Z-plasty and advancing flap operation (Karydakis procedure) However, each technique has its advantages as well as complications. The surgical treatment

should intend towards removing all the sinus tracts as well as the predisposing factors that contribute to the formation of pilonidal sinus.²⁻⁵

The goals of the ideal procedure for the treatment of this disease should be reliable wound healing with a low risk of recurrence, a short period of hospitalization, minimal inconvenience to the patient, and low morbidity with few wound-management problems. Also, treatment should allow the patient to resume normal daily activities as quickly as possible.⁶

The use of rhomboid excision and

closure of the defect with transposition flap have received growing attention in recent years and lower recurrence rates have been reported. The modified Limberg flap repair not only flattens the natal cleft, but also displaces the incision scar from the midline. Thus sweating resulting from frictional movements of the buttocks is decreased and complicating factors such as skin maceration and debris accumulation are eliminated with low recurrence rate (from 0%-5%).⁷

Rhomboid flap is suitable for cases where simpler operations have failed. It allows early return to full activity, does not necessitate prolonged postoperative care, and has very low recurrence and complications rates which may outweigh the disadvantages related to an unfavourable cosmetic appearance.⁸

Karydakis technique aims to take the scar away from the midline furrow and make the cleft quite shallow. Therefore, it reduces the vulnerability for hair re-insertion in the flattened intergluteal area. The midline scar in the natal cleft is an important factor in the recurrence of pilonidal sinus after surgery, as it allows a route for entry of hairs through the skin and recurrence of pilonidal sinus.^{9,10}

Patients and methods:

This prospective randomized study was conducted on 40 patients with denovo sacrococcygeal pilonidal diseases at General Surgery Department in Tanta University Hospitals throughout the period from June 2013 to June 2014. The patients were randomly divided into two groups: Group "A" included 20 patients subjected to modified Limberg flap transposition and Group "B" included 20 patients subjected to Karydakis flap reconstruction. This study compares results of wound infection, wound haematoma, wound disruption, hospital stay time and recurrence. Informed consent was taken for the operation and inclusion in this study after detailed description. Approval by the local ethical committee was obtained before initiating this study.

All patients diagnosed with pilonidal sinus disease who were fit to undergo surgery were included in the study. Patients

having sever comorbidities i.e. malignancy, diabetes mellitus and patients having spinal deformities, pediatric age group, recurrent and purulent discharging sinuses were excluded from the study. A single dose of 1 gm of Cefotaxime was given IV at induction of anesthesia.

Preoperative marking of the flap: Marking was done in prone position with the two buttocks strapped apart by adhesive tape. In modified Limberg flap transposition; marking was done by a rhomboid line that marked around the openings of pilonidal sinus in the natal cleft with its upper and lower apices 1.5 cm lateral to the midline then a line was marked on the gluteal region contralateral to the asymmetric lower apex of the rhomboid line. In Karydakis flap reconstruction; marking was done by a vertical eccentric elliptical line around the openings of pilonidal sinus with its upper and lower apices 1.5 cm lateral to the midline **Figure (1-A,B)**.

Anesthesia and patient positioning: The procedure was performed under general or spinal anesthesia. Patient was positioned on the operating room table in jack-knife position, with the cheeks of the buttocks strapped apart by adhesive tape, with exclusion of the anus from the operative field by surgical drapes then the surgical area was disinfected by application of 10% povidone-iodine. One ml of methylene blue was injected without pressure through the external opening of all pilonidal sinus.

Operative technique: In modified Limberg flap transposition; a wide rhomboid-shaped incision down to the post-sacral fascia was performed. Removal of the affected area plus a rim of a healthy tissue surrounding the cyst and sinuses. The flap was raised at fasciocutaneous plane and transposed to excised area. Keeping the lower end of incision line off the midline **Figures (2,3)**.

A good haemostasis with insertion of vacuum drain was done. The subcutaneous tissue was approximated with interrupted 2-0 vicryl sutures. The skin was closed by interrupted 2-0 polypropylene sutures **Figure (4)**.

In Karydakis flap reconstruction; a vertical



Figure (1): Marking of modified Limberg flap (A) and Karydakis flap transposition(B).

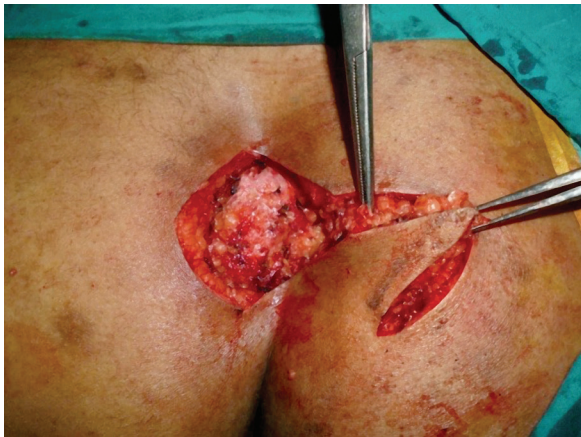


Figure (2): Excision of the sinuses and fashioning of the flap.



Figure (3): Mobilisation of fasciocutaneous transposition flap.



Figure (4): Insertion of vacuum drain with skin closure.



Figure (5): Removal of sinus tracts through eccentric elliptical incision.

eccentric elliptical incision was done and extended down to the postsacral fascia with complete removal of unhealthy tissue, plus a rim of normal tissue around the cyst and sinus tracts. Advancement of the flap across the midline and suturing of its edge to the lateral wound edge with close attention to be

lateralized more than 1.5cm from the midline, especially the lower apex of the incision line. Good haemostasis with insertion of vacuum drain was done. Approximation was done by interrupted 2-0 vicryl sutures between the subcutaneous tissue of medial wound edge and the sacral fascia and the



Figure (6): Wound closure in Karydakis flap reconstruction.



Figure (7): Disruption of the lower part of the wound (arrow).



Figure (8): Recurrence at the lower wound edge (arrow).

Table (1): Distribution of cases according to occupation in both groups.

Occupation	Groups				Total	
	Limberg Flap		Karydakis flap		No.	%
	No.	%	No.	%		
Driver	9	45	10	50	19	47.5
Farmer	5	25	3	15	8	20
House Wife	2	10	3	15	5	12.5
Shopkeeper	2	10	1	5	3	7.5
Student	2	10	3	15	5	12.5
Total	20	100	20	100	40	100
x2	17.519					
P	0.004					

skin was approximated by interrupted 2-0 polypropylene sutures **Figure (5,6)**.

The excised part containing the pilonidal sinus tissue was sent to histo-pathological examination for detection of any potential malignancy. Postoperatively an intravenous third generation cephalosporine and

metronidazole were given for 5 days with analgesic and anti-inflammatory agents. Patients were asked not to sit or use a semi-setting position or supine position for 15 days postoperatively. The drains were evacuated daily and removed once their output was less than 30 mL/24 hrs; the sutures were removed

Table (2): Distribution of Cases according to duration of surgery in both groups.

Duration of Surgery (minutes)	Groups				Total	
	Limberg Flap		Karydakias flap			
	No.	%	No.	%	No.	%
<40	2	10	12	60	14	35
41-50	6	30	4	20	10	25
>50	12	60	4	20	16	40
Total	20	100	20	100	40	100
Mean	51.83		42.97			
SD	4.41		9.32			
T	4.709					
P	0.736					

Table 3: Distribution of cases according to infection at stitches site in both groups

Infection at Stitches Site	Groups				Total	
	Limberg Flap		Karydakias flap			
	No.	%	No.	%	No.	%
No infection	19	95	15	75	34	85
Infection	1	5	5	25	6	15
Total	20	100	20	100	40	100
x ²	2 2.793					
P	0.003					

Table 4: Distribution of cases according to wound disruption in both groups

Wound Disruption	Groups				Total	
	Limberg Flap		Karydakias flap			
	No.	%	No.	%	No.	%
No disruption	20	100	16	80	36	90
Disruption	0	-	4	20	4	10
Total	20	100	20	100	40	100
x ²	2 4.053					
P	0.044					

after 15 days. Patients were asked to pay attention to hygiene rules and depilate any hairs around the gluteal region for 3 months. Follow up of the patients was done regularly every two weeks for the first 3 months then every 3 months thereafter. Any signs of wound complication or recurrence were recorded.

Statistical evaluation was properly done using Chi square test for categorical data

and “t” test for continuous data, X² and SD using SPSS version 16 and P value ≤0.05 was considered significant.

Results:

In our study 20 patients (50%) underwent modified Limberg flap transposition and 20 patients (50%) underwent Karydakias flap reconstruction, 34 patients (85%) were males while 6 patients (15%) were females. The

Table 5: Distribution of cases according to hospital stay (days) in both groups

Hospital Stay (days)	Groups				Total	
	Limberg Flap		Karydakias flap		No.	%
	No.	%	No.	%		
2	14	70	5	25	19	47.5
3	6	30	15	75	21	52.5
Total	20	100	20	100	40	100
Mean	2.30		2.77			
SD	0.47		0.43			
T	4.030					
P	0.393					

Table 6: Distribution of Cases according to recurrence on follow-up

Follow-Up	Recurrence	Groups				Total		x ²	P
		Limberg flap		Karydakias flap		No.	%		
		No.	%	No.	%				
No		20	100	17	85	37	92.5	13.469	<0.001
Yes		0	-	3	15	3	7.5		

Mean age of Limberg Flap group was 29.43 ±5.63 years (range 18-36 years) while in Karydakias flap reconstruction it was 27.27 ±5.01 years (range 18-32 years) and the difference was statistically insignificant (p >0.05).

In the presented study; 28 patients (70%) presented with discharge and 12 patients (30%) presented with pain, the duration of complaint ranged from 1 month to 24 months with a mean duration of 5.7 months and the majority of our patients (about half) were drivers with significant P value = 0.004 **Table (1)**.

Our study documented a statistically non-significant difference between operative time for the two procedures; a mean of 51.83 ±4.41 (range 40–60) minutes for Limberg flap against 42.97 ±9.32 (range 30–60) minutes for Karydakias group (P value = 0.736) **Table (2)**.

In our study; in modified Limberg flap group, one patient (5%) had superficial wound infection treated by appropriate antimicrobial therapy and dressing with no wound disruption. While in Karydakias flap group, 5 patients (25%) had wound infection

in its lower part, treated by antimicrobial therapy and dressing, 4 patients (20%) had dehiscence of the lower part of the wound treated by removing the sutures, appropriate antimicrobial therapy and dressing and this difference was statistically significant. No seroma or haematoma had occurred and neither ischaemia nor necrosis of the flaps was observed in both study groups **Tables (3,4), Figure (7)**.

In the present study; we observed a mean total hospital stay of 2.30 ±0.47 days (2-4 days) and 2.77 ±0.43 days (2-5 days) for the Limberg flap group and Karydakias flap group respectively and this difference was statistically insignificant (P value = 0.393) **Table (5)**.

In our study; the minimum follow-up period was 12 months and the maximum period was 24 months, during this period no recurrence detected in patients of modified Limberg group while in Karydakias group, recurrence occurred in 3 patient (15%) during the follow up period with significant P value (<0.001) **Table (6), Figure (8)**.

Discussion:

Pilonidal sinus is a common chronic disease of the sacrococcygeal region. The treatment of the pilonidal sinus is surgical with wide excision of the diseased tissue down to the sacral fascia. The closure of the defect is a matter for debate. A high recurrence rate results from tension on sutures, midline closure, remaining dead space, infection and limited excision.¹¹

The varied surgical techniques proposed for the eradication of pilonidal sinuses are evidences of the lack of a completely satisfactory method of management of this surgical problem. Most of the procedures have some merits and are based on seemingly sound surgical principles, but regardless of the methods employed, there is recurrence in a significant proportion of cases. There are several studies that have showed superiority of flap repair to primary closure techniques.^{12,13}

Despite the controversy about the best surgical technique for the treatment of pilonidal sinus, an ideal operation should minimize financial cost, allow patients to return earlier to work, be simple to perform, not require a prolonged hospital stay, inflict minimal pain, and have a low disease recurrence rate.⁹

The present study was conducted on 40 patients with de novo sacrococcygeal pilonidal diseases at General Surgery Department in Tanta University Hospitals throughout the period from June 2013 to June 2014. It is noticed that pilonidal sinus is prevalent in men, where 34 patients (85%) were males and 6 patients (15%) were females. This can be explained by the jobs of our patients require sitting on chairs for a long time for example car, motor cycle drivers and by heavy male hair in the back. This male predominance is consistent with the studies by Ahmet Tekin et al,¹⁴ Hayder H et al,¹⁵ Turgut Karaca et al,¹⁰ Amir S. Gendy et al¹⁶ who reported male incidence of 83.7%, 87%, 79%, 70% respectively.

In our study; the mean age of Limberg Flap group was 29.43 ±5.63 years(range 18-36 years) while in Karydakias flap reconstruction it was 27.27 ±5.01 years(range 18-32

years) and the difference was statistically insignificant ($p > 0.05$). This agree with the studies of Ayad H et al,¹⁷ Seyed V. Hosseini et al,¹⁸ Arslan K. et al,¹⁹ Ahmet Tekin et al,¹⁴ Mustafa Ates et al;²⁰ who reported a mean age of 27, 24, 24, 27, 25 years respectively. This age distribution is directly related to a certain phase in the patient's life at which the sex hormones affect pilosebaceous glands.

In our study; 28 patients (70%) presented with discharge and 12 patients (30%) presented with pain. This agree with the study of Mustafa Ates et al,²⁰ who reported that; the most frequent presenting symptoms were seropurulent discharge (78%) and pain (34%).

In the present study; the majority of our patients (about half) were drivers with significant P value (0.004). This occupational predominance is consistent with the study of Gopal Ram et al²¹ who reported the prevalence of occupation of car drivers in 48% of patients, while Mehmet Fatih et al²² in their study, reported the prevalence of occupation of car drivers and truck drivers of patients in 12.4%, this may be attributed to friction and sweating in hairy individuals.

In the present study regarding the viability of the flaps, it is noted that neither ischaemia nor necrosis of the flaps was observed in both study groups. This is consistent with the study with Mehmet Fatih et al,²² Ahmet Tekin et al,¹⁴ Abdou M.A. Darwish et al²³ who reported that no ischaemia or necrosis in all flaps in both groups, as the flaps are thick with good perfusion.

Our study documented a statistically non-significant difference between operative time for the two procedures; a mean of 51.83 ±4.41 (range 40–60) minutes for Limberg flap against 42.97 ±9.32 (range 30–60) minutes for Karydakias group. This is consistent with the study of Mehmet Fatih et al,²² who reported that; the duration of the operation was shorter in Karydakias procedure, the mean difference was 12 minutes between the 2 methods. This is also consistent with the study of Ates M et al²⁴ who reported the mean duration of surgery was shorter in the Karydakias flap group (mean operative time

was 42.32 minutes) than in the modified limberg flap group (mean operative time was 50.14 minutes).

In our study; 5 patients (25%) of Karydakis group had wound infection, this agree with the study of Bali et al,²⁵ who reported that; the incidence of wound infection in Karydakis group was 23% while Petersen S. et al²⁶ reported in their study a wound infection rate of 1.8% - 10.7%. On the other hand, one patient in modified Limberg group (5%) had superficial wound infection. This coincides with the study of Mentis BB. et al²⁷ who reported that; the incidence of wound infection in modified Limberg group was 6.5%) while Turgut Karaca et al¹⁰ found in their study no wound infection (0%).

In the present study; 3 patients (15%) of Karydakis group developed wound dehiscence while no patient in modified Limberg group developed wound dehiscence. This agrees with the studies of Turgut Karaca et al,¹⁰ Arslan K et al,¹⁹ who reported wound dehiscence rate in Karydakis group of (11.4%), (15.4%) respectively with no wound dehiscence in modified Limberg group, because the modified Limberg flap is completely tension free.

In our study; in Karydakis group, recurrence occurred in 3 patient (15%) and no recurrence detected in patients of modified Limberg group. This agree with the study of Ayad H et al¹⁷ and Darwish M.A. et al,²³ whom reported disease recurrence incidence in Karydakis group of 10% and 11% respectively with no recurrence detected in patients of modified Limberg group. This can be explained by that; in modified Limberg flap, there is flattening of the natal cleft (inspite this is cosmetically unaccepted by the females) but it decreases the skin maceration and the debris accumulation, all sinus tracts can be completely removed even if lateral sinus openings and large defects can easily be closed as tension-free.

Conclusion:

The techniques of Karydakis flap reconstruction and modified Limberg flap transposition have special characteristics in

the treatment of pilonidal sinus disease. For example; flattening of natal cleft and shifting of the scar from the midline especially the lower angle which is the commonest site of recurrence. With superiority of modified Limberg flap over Karydakis flap in the ability to excise all tracts if extensive pilonidal sinus, low incidence of wound infection and wound disruption and shorter hospital stay with no recurrence. We recommend the use of modified Limberg flap in the treatment of pilonidal sinus disease as it is safe, simple, easy to learn and effective.

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