

# Comparison of Limberg Flap with Karydakis Repair in Pilonidal Sinus Disease

Repair in  
pilonidal Sinus  
Disease

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## ABSTRACT

**Objective:** To compare Limberg flap with Karydakis repair in pilonidal sinus disease in terms of operative time and post-operative complications.

**Study Design:** Randomized controlled trial.

**Place and Duration of Study:** This study was conducted at the Department of General Surgery, Central Park Teaching Hospital, Lahore from July 2016 to June 2017.

**Materials and Methods:** A total of 204 patients who underwent surgery for pilonidal sinus disease were included. Patients were randomly divided into two equal groups of n patients each by lottery method. Patients in Group L underwent surgery via the Limberg flap technique while patients in Group K were managed by the Karydakis repair technique. Both groups were then compared in terms of mean operative time, VAS pain score, postoperative complications and recurrence rates.

**Results:** The mean operation time was  $50.59 \pm 9.1$  minutes in Group L versus  $41.04 \pm 8.63$  minutes in Group K, which was statistically significant ( $p < 0.001$ ). The mean VAS pain score was  $2.51 \pm 1.16$  in Group L versus  $3.19 \pm 1.45$  in Group K, which was also statistically significant ( $p < 0.001$ ). The difference in frequency of overall complications ( $p = 0.391$ ) and the recurrence rate ( $p = 0.268$ ) was statistically non-significant.

**Conclusion:** Karydakis repair is the better technique in terms of having lesser operation time and lesser frequency of wound dehiscence while Limberg flap technique is associated with lesser post-operative pain.

**Key Words:** Pilonidal sinus, Operation time, Recurrence, Limberg flap, Karydakis repair, Complications

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## INTRODUCTION

The earliest description of pilonidal sinus dates back to the year 1833 when Herbert Mayo described the disease.<sup>1</sup> The term "pilonidal" was conceived in 1880 from two Latin words "pilus" which means hair and "nidus" which means nest by Hodges.<sup>2</sup> The disease got recognition as the "Jeep bottom or simply jeep disease" in the Second World War for its high prevalence among the soldiers especially drivers. Some 79000 soldiers were operated for the disease at that time.<sup>3,4</sup> The commonest site involved in the boy is the natal cleft while the disease can also effect the web spaces of fingers, abdomen, neck, scalp and axilla.<sup>5</sup> Pilonidal sinus has been reported to affect between 26-700 patients per 100000 population with the peak sufferers being young patients between 15-24 years of age. The disease was reported to affect 8.8% of Turkish

military personnel.<sup>2,6</sup> A number of surgical procedures have been advocated by surgeons across the globe. They include minimally invasive techniques like sinusectomy or video-assisted endoscopic ablation procedure (EPSiT); wound excision and laying open; and closure techniques like Karydakis repair, Limberg flap, VYZ plasty, oval flap technique and Bascom cleft lift procedures amongst others.<sup>7-9</sup>

The lack of consensus on one technique highlights the lack of a gold standard procedure with studies reporting variable outcomes. An ideal procedure should completely cure the disease with minimum complications and should have minimal or no recurrence.<sup>2</sup> Limberg flap and Karydakis repair are two of the most widely performed procedures for pilonidal sinus disease. Both techniques consist of closure of natal cleft away from midline to avoid trapping of hair.<sup>10,11</sup>

## MATERIALS AND METHODS

This randomized controlled trial was carried out at Department of Surgery, Central Park Teaching Hospital Lahore from 1<sup>st</sup> July 2016 to 30<sup>th</sup> June 2017. Two hundred and four patients presenting with pilonidal sinus disease were included. They were divided in two groups; Limberg flap and Karydakis repair groups respectively. All the patients included in the study were operated on elective list. Inclusion criteria included patients of either gender presenting

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with sacrococcygeal pilonidal sinus; with age ranging from 15 to 60 years, and having ASA grade I to III. All those patients who presented with a concurrent abscess; recurrent pilonidal sinus; concurrent perianal pathology like fistula in ano; ASA grade IV and V; diabetes mellitus and compromised immune status were excluded from the study sample. The details of surgery were explained to the patients and both the group of patients were operated by the same surgical team. All the operations were carried out in Jack knife position under spinal anesthesia. The operative site was shaved before surgery and a dose of 1.2 grams of Augmentin (Amoxicillin and clavulunite) as prophylactic antibiotic was administered before anesthesia. Methylene blue dye was injected to delineate all the tracks of the pilonidal sinus. Patients in Group L were operated by the Limberg flap technique while Group K patients underwent surgery by the Karydakakis repair technique. In the Limberg flap group, a rhombus shaped area including the pilonidal sinus tract was excised up till the pre-sacral fascia. A rhombus shaped tension free fasciocutaneous flap was then placed to cover the defect as shown in Figure 1. While in the Karydakakis repair group, an elliptical D shaped incision was given and extended down till pre-sacral fascia to excise the pilonidal sinus tract. A double layered closure was then done with the suture line lying away from midline as shown in Figure 2. The operative time was recorded in both groups from the time of skin incision till the application of last stitch at the end of surgery. Both group of patients had a redivac suction drain placed which was removed if the drain output remained less than 20 mL in 24 hours.

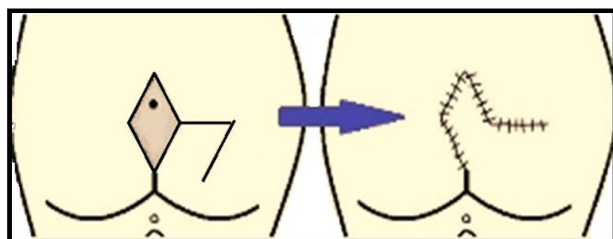


Figure 1: Limberg flap

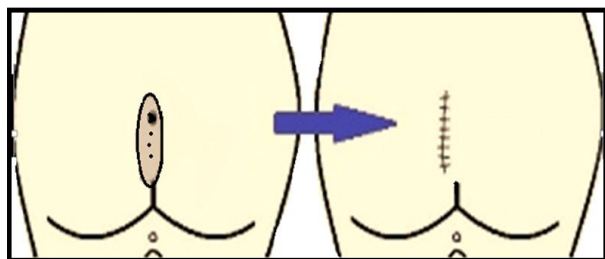


Figure 2: Karydakakis Repair

Postoperative complications that were assessed in both groups included postoperative pain according to the visual analogue scale; development of hematoma, seroma or surgical site infection and dehiscence. Pain score was determined on the 28<sup>th</sup> postoperative day for

comparison between the two groups. Patients were examined on the follow-up visits weekly in the first month and monthly thereafter. Any complications found on examination including wound dehiscence, hematoma formation, seromaformation, and surgical site infection were documented and adequately managed as required. Patients were also followed for development of recurrence within 3-6 months of surgery. The data was analyzed using through SPSS-25.

## RESULTS

The overall mean age of patients included in our study was  $27.21 \pm 8.24$  years. The mean age of patients in Group L was  $28.06 \pm 8.71$  years while in Group K, the mean age of patients was  $26.36 \pm 7.69$  years ( $p=0.142$ ). The study comprised predominantly of male patients with the male to female ratio being 1:0.23. The distribution of patients according to gender is depicted in Table 1. The difference between the two groups was not significant ( $p=0.281$ ).

The mean operation time was  $45.81 \pm 10.06$  minutes. In Limberg flap, the mean operation time was  $50.59 \pm 9.1$  minutes with a range 30-66 minutes while in karydakakis repair, the mean operation time was  $41.04 \pm 8.63$  minutes with a range 26-62 minutes. The difference between the groups was found to be significant ( $p<0.001$ ). The pain and discomfort was determined by the mean visual analogue score on the 28<sup>th</sup> postoperative day for comparison between the groups. The mean VAS pain score was  $2.51 \pm 1.16$  the Limberg flap group versus a score of  $3.19 \pm 1.45$  in the Karydakakis repair group, the difference between the groups being statistically significant ( $p<0.001$ ). As regards the overall complications, 24 patients (23.53%) in Limberg flap, and 19 patients (18.63%) in karydakakis repair developed complications. The difference between the two groups was statistically non-significant ( $p=0.391$ ). The frequency of different complications is shown in Table 2.

Table No. 1: Frequency of genders in both groups (n=204)

Gender	Limber Flap		Karydakakis Repair	
	No.	%	No.	%
Male	86	84.3	80	78.4
Female	16	15.7	22	21.6

Table 2: Distribution of complications (n=204)

Complication	Limber Flap		Karydakakis Repair	
	No.	%	No.	%
Wound dehiscence	16	15.9	6	5.9
Hematoma	8	7.8	3	2.9
Seroma	6	5.9	4	3.9
SSI	3	2.9	8	7.9
None	69	67.5	81	79.4

The most common complication observed in the study sample was wound dehiscence which was found in 15 patients (14.7%) in Limberg flap and 6 patients (5.9%) in Karydakakis repair, the difference being statistically

significant ( $p=0.038$ ). The comparison of individual complications has been expressed in Table 3.

**Table No.3: Summary of results**

Variable	Limberg Flap	Karydakís Repair	p value
<b>Overall complications</b>	24 (23.53%)	19 (18.63%)	0.391
<b>Wound Dehiscence</b>	15 (14.71%)	6 (5.88%)	0.038
<b>Hematoma</b>	6 (5.88%)	3 (2.94%)	0.306
<b>Seroma</b>	3 (2.94%)	4 (3.92%)	0.701
<b>Surgical site infection</b>	9 (8.82%)	7 (6.86%)	0.602
<b>Recurrence</b>	9 (8.82%)	5 (4.90%)	0.268

## DISCUSSION

Sacroccocygeal pilonidal sinus is a common disease of young adults with the disease having predilection for military personnel, and drivers. A number of surgical procedures have been practiced across the globe with variable success rates. The disease is notorious for recurrences and procedure related complications. It affects the individual's productivity by causing a loss of work days and also increases the financial burden. Very few studies have compared Limberg flap with Karydakís repair in the Pakistani population.

In our study the overall mean age of patients was  $27.21 \pm 8.24$  years. A study by Bostanoglu et al<sup>12</sup> reported the a comparable mean age of patients to be  $27.3 \pm 9.1$  years for Limberg group and  $26.2 \pm 6.5$  years for Karydakís group. Another national study on pilonidal sinus by Jabbar et al<sup>13</sup> reported the mean age of patients  $27.40 \pm 5.90$  years for Limberg flap group. Similarly Abdelraheem et al<sup>14</sup> reported a mean age of  $27.4 \pm 6.2$  years, while Bali et al<sup>15</sup> reported a mean age of 25 and 23.5 years for the two groups respectively. Ahmed et al<sup>16</sup> also reported a slightly higher mean age of  $32.2 \pm 9.8$  years for Limberg flap and  $33.6 \pm 9.7$  years for Karydakís repair groups respectively. Male patients comprised of 81.37% patients in our study. Bostanoglu et al<sup>12</sup> and Bessa et al<sup>17</sup> reported a higher frequency of males with 95.49% and 93.33% patients respectively.

We found a statistically significant lesser operative time with the Karydakís repair technique as compared to Limberg flap technique ( $p<0.001$ ). Similarly Bali et al<sup>15</sup> reported that the mean operative time was 48 minutes for Karydakís repair versus 54 minutes for Limberg flap with the difference being statistically significant ( $p=0.001$ ). Bessa et al<sup>17</sup> also reported that the mean operative time for Karydakís technique was 33 minutes versus 52 minutes for Limberg flap which was statistically significant ( $p<0.001$ ). Ates et al<sup>11</sup> also reported similar findings with a significantly less operative time of  $42.32 \pm 8.64$  minutes with Karydakís repair versus  $50.14 \pm 6.96$  minutes for Limberg flap group ( $p=0.001$ ). On the contrary a study by Tokac et al<sup>6</sup> in 2015 reported that the mean operative time was  $42.9 \pm 6.2$  minutes for Karydakís repair versus  $44.5 \pm 6.6$  minutes for Limberg flap with a non-significant difference ( $p>0.05$ ). Arslan et al<sup>18</sup> also reported an operative time of  $51.1 \pm 6.8$  minutes for Limberg flap

and  $50.9 \pm 7.3$  minutes for Karydakís repair with the difference being non-significant ( $p>0.05$ ).

Coming over to the complications, patients reported a higher pain score after 4 weeks of surgery in the Limberg flap group as compared to Karydakís repair group ( $p<0.01$ ). Similarly Ates et al<sup>11</sup> reported a VAS pain score of  $3.23 \pm 1.14$  in Limberg flap group versus a VAS score of  $2.22 \pm 1.01$  in the Karydakís repair group on the 30<sup>th</sup> postoperative day with a statistically significant difference ( $p=0.001$ ). On the contrary, Bali et al<sup>15</sup> reported that the mean pain score of 2 was significantly lower in the Limberg flap group versus a score of 4 in the Karydakís repair group ( $p<0.001$ ).

There was no difference in the overall complications between the two groups. We only found a statistically significant difference in the frequency of wound dehiscence between the two groups which was also the commonest complication as well ( $p=0.038$ ). No difference was found in terms of frequency of hematoma formation, seroma formation and surgical site infection between the two groups ( $p>0.05$ ).

Comparable results were reported in a study by Bessa et al<sup>17</sup> reported complications were observed in 23.3% patients in Karydakís repair group versus 40% patients in Limberg flap group. The difference was statistically non-significant ( $p=0.08$ ). None of the patients reported full thickness wound disruption or dehiscence in Karydakís group versus 15% patients in Limberg group which was statistically significant ( $p=0.003$ ). The difference between the two groups in terms of wound infection ( $p>0.99$ ) and fluid collection or seroma formation ( $p=0.24$ ) was also comparable to our study. Tokac et al<sup>6</sup> also reported that wound infection was noticed in 6.6% in Limberg flap group versus 6.5% Karydakís repair group, the difference being statistically non-significant ( $p>0.05$ ).

Another multicenter randomized controlled trial by Can et al also reported an overall complication rate of 12.9% in Limberg flap group versus 10.3% in Karydakís repair group with a statistically non-significant difference ( $p=0.467$ ). The frequency of wound infection was 3.9% in Limberg flap group versus 4.4% in Karydakís repair group. Similarly the frequency of wound dehiscence was 2.6% in Limberg flap group versus 2.9% in Karydakís repair group. Lastly the frequency of seroma formation was 2.6% in Limberg flap group versus 1.5% in Karydakís repair group respectively.<sup>19</sup> Another study by El Hadidi et al from Egypt also reported non-significant difference between the two groups in terms of complications ( $p=0.44$ ).<sup>20</sup>

Contrary to our results, a study by Bali et al<sup>15</sup> reported that the frequency of hematoma formation was 21.6% in Limberg flap versus 8.82% in Karydakís repair with a statistically significant difference ( $p=0.004$ ). Similarly 23.53% patients developed wound infection in Karydakís group versus 10.8% in Limberg flap which was also statistically significant ( $p=0.001$ ). Lastly the study reported that 2.7% patients developed wound dehiscence in Limberg flap group versus 5.88% patients in Karydakís repair group which was statistically non-significant ( $p=0.590$ ). Arslan et al<sup>18</sup> also reported a statistically significant difference between Limberg flap

group and Karydakias repair group in terms of seroma formation ( $p=0.002$ ). However the results of wound infection ( $p=0.322$ ) and hematoma formation ( $p=0.919$ ) were comparable to our study.

We followed our patients for a mean duration of 6 months and found that the frequency of recurrence varied by a non-significant difference between the two groups ( $p=0.268$ ). Can et al<sup>19</sup> also reported that the recurrence rate was 5.4% in Limberg flap group versus 4.8% in Karydakias repair group with a non-significant difference ( $p=1.000$ ). Ates et al<sup>6</sup> reported a recurrence rate of 3.1% with Karydakias repair and 6.9% with Limberg flap, but the difference was statistically non-significant ( $p=0.151$ ). (11) Comparable results were reported by Tokac et al<sup>6</sup> who reported a recurrence rate of 6.5% with Limberg flap and 4.4% with Karydakias repair ( $p>0.05$ ). On the contrary, Arslan et al<sup>18</sup> reported a recurrence rate of 6.3% with Limberg flap and 11.0% with Karydakias repair, with the difference being statistically significant (0.027).

On the basis of our findings, we favor the Karydakias repair technique for being simpler, quick to perform and having comparable results to the Limberg flap technique for sacrococcygeal pilonidal sinus. Studies on pilonidal sinus are limited in our population. Our study had a healthy sample size of 204 patients. The limitation of the study was the shorter follow up duration. We also did not compare the patients on the basis of number of sinuses and infection at the time of presentation. We recommend more studies on the topic with longer follow up durations and inclusion of more variables to ascertain the better technique in terms of management of pilonidal sinus disease..

## CONCLUSION

Both Limberg flap and Karydakias repair are effective surgical options for the management of pilonidal sinus disease. The two techniques have a comparable complication and recurrence rate. However Karydakias repair stands out as the better technique in terms of lesser operation time and lesser frequency of wound dehiscence while Limberg flap technique is associated with lesser post-operative pain.

### Author's Contribution:

Concept & Design of Study: Adeel Riaz  
 Drafting: Ammarah Afzal  
 Data Analysis: Muhammad Akram Dogar  
 Revisiting Critically: Adeel Riaz, Ammarah Afzal  
 Final Approval of version: Adeel Riaz

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

- Jain Aitchison College, Lahore Thambuchetty N. Management of pilonidal sinus disease: a 5 years retrospective analysis. *Int Surg J* 2016;3(2):586-8.
- Anandaravi BN, Viswanathan A. Comparative study between excision with lay open and excision with primary closure in treatment of pilonidal sinus. *Int Surg J* 2019;6(4):1242-6.
- Harlak A, Montes O, Kilic S, Coskun K, Duman K, Yilmaz F. Sacrococcygeal pilonidal disease: analysis of previously proposed risk factors. *Clinics (Sao Paulo)*. 2010;65(2):125-31.
- Duman K, Girgin M, Harlak A. Prevalence of sacrococcygeal pilonidal disease in Turkey. *Asian J Surg*. 2017;40(6):434-7.
- Sion-Vardy N, Osyntsov L, Cagnano E, Osyntsov A, Vardy D, Benharroch D. Unexpected location of pilonidal sinuses. *Clin Exp Dermatol* 2009;34(8):e599-601.
- Tokac M, Dumlu EG, Aydin MS, Yalcin A, Kilic M. Comparison of modified Limberg flap and Karydakias flap operations in pilonidal sinus surgery: prospective randomized study. *Int Surg* 2015;100(5):870-7.
- Iesalnieks I, Ommer A. The management of pilonidal sinus. *Dtsch Arztebl Int* 2019;116(1-2):12-21.
- Karapolat B, Büyükakıncak S, Kurnaz E, Küçüktülü Ü. Comparison of limberg flap and oval flap techniques in sacrococcygeal pilonidal sinus disease surgery. *Turk J Surg* 2018;34(4):311-4.
- Stauffer VK, Luedi MM, Kauf P, Schmid M, Diekmann M, Wieferich K, et al. Common surgical procedures in pilonidal sinus disease: A meta-analysis, merged data analysis, and comprehensive study on recurrence. *Sci Rep* 2018;8(1):3058.
- Gavrilidis P, Bota E. Limberg flap versus Karydakias flap for treating pilonidal sinus disease: a systematic review and meta-analysis. *Can J Surg* 2019;62(2):131-8.
- Ates M, Dirican A, Sarac M, Aslan A, Colak C. Short and long-term results of the Karydakias flap versus the Limberg flap for treating pilonidal sinus disease: a prospective randomized study. *Am J Surg* 2011;202(5):568-73.
- Bostanoglu S, Sakcak I, Avsar FM, Cosgun E, Hamamci EO. Comparison of Karydakias technique with Limberg Flap procedure in pilonidal sinus disease: advantages of karydakias technique. *Pak J Med Sci* 2010;26(4):773-7.
- Jabbar MS, Bhutta MM, Puri N. Comparison between primary closure with Limberg Flap versus open procedure in treatment of pilonidal sinus, in terms of frequency of post-operative wound infection. *Pak J Med Sci* 2018;34(1):49-53.
- Abdelraheem O, Khalil M. Comparative study between excision with primary closure versus Limberg flap for treatment of primary sacrococcygeal pilonidal sinus. *Int Surg J* 2017;4(11):3581-5.
- Bali İ, Aziret M, Sözen S, Emir S, Erdem H, Çetinküner S, et al. Effectiveness of Limberg and Karydakias flap in recurrent pilonidal sinus disease. *Clinics (Sao Paulo)* 2015;70(5):350-5.

16. Ahmed Z, Shahid M, Malik MS, Hussain S. Comparison of Karydakis technique with Limberg Flap procedure for sacrococcygeal pilonidal sinus disease in terms of hospital stay and work loss. *Pak Armed Forces Med J* 2017;67(1):141-4.
17. Bessa SS. Comparison of short-term results between the modified Karydakis flap and the modified Limberg flap in the management of pilonidal sinus disease: a randomized controlled study. *Dis Colon Rectum* 2013;56(4):491-8.
18. ArslanK, Said Kokcam S, Koksai H, Turan E, Atay A, Dogru O. Which flap method should be preferred for the treatment of pilonidal sinus? A prospective randomized study. *Tech Coloproctol* 2014;18(1):29-37.
19. Can MF, Sevinc MM, Hancerliogullari O, Yilmaz M, Yagci G. Multicenter prospective randomized trial comparing modified Limberg flap transposition and Karydakis flap reconstruction in patients with sacrococcygeal pilonidal disease. *Am J Surg* 2010;200(3):318-27.
20. El Hadidi A, Negma A, Abdelhalima M, Tahaa A, Noamana N, Dawoud I. Karydakis versus Limberg flap reconstruction for the treatment of recurrent pilonidal disease: a prospective randomized controlled trial. *Egypt J Surg* 2019; 38(2):369–75.