

## TREATMENT OF PILONIDAL SINUS BY DIFFERENT METHODS

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### ABSTRACT

*Background: The ideal operation for pilonidal sinus disease should be a simple one with low complication and low recurrence rates. This is achieved by flap techniques which flatten the natal cleft with an off-midline closure. The aim of the present study to determine the better procedure in treatment of pilonidal sinus disease, compare the efficiency and short-term results of conservative treatment, open excision, Karydak's flap and Rhomboid flap in treatment of pilonidal sinus disease. Patients and methods: A randomized controlled study included 56 patients with pilonidal sinus disease were admitted to General Surgery Department, Zagazig University Hospitals. The patients were allocated equally into: group (1) were treated with conservative method with medical treatment and drainage if needed; group (2) were operated by open technique; group (3) were operated by Limberg flap technique and group (4) were operated by Karydak's technique. Patients were subjected to full history and clinical examination, preoperative investigations and postoperative assessment. Results: The present study showed no significant difference regard age distribution as age was distributed as  $30.71 \pm 5.73$ ,  $32.21 \pm 6.58$ ,  $32.57 \pm 6.47$  and  $32.42 \pm 8.2$  respectively among groups. Conservative group was significantly shorter duration of symptoms than other groups with no significant difference. Operative time was significantly longer among Limberg group than Karydak's group and finally open group as it was significantly shorter than other group. Visual analog scale (VAS) was significantly higher among open cases. Healing and return work were significantly higher among open group compared to other groups. Recurrence was significantly associated with open and conservative groups while there was only one case in Limberg Group and no case in Karydak's Group. Bad and good satisfaction were significantly associated with open and conservative groups while excellent was significantly associated with Limberg Group & Karydak's Group. Conclusion: The four techniques are effective in treatment of pilonidal sinus while Conservative is preferred at early stage of the disease and flap techniques has better results and satisfaction than Open one. The Karydak's flap is preferred the Limberg flap for treating uncomplicated Sacrococcygeal pilonidal disease due to shorter operative and healing time with superior patient satisfaction.*

**Keyword:** Karydak's ; Limberg; Pilonidal Disease; Recurrence; Infection

### 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 (1). Pilonidal disease represents a spectrum of clinical conditions that result from a popular etiological

agent (hair) causing varying degrees of inflammatory reaction in the host tissue which may or may not be complicated by secondary infection (2). This results from chronic infection of hair follicles and subsequent formation of a subcutaneous abscess. Hair then enters the abscess cavity and provokes a foreign body tissue reaction with chronic suppuration and discharge (3).

The prevalence of pilonidal disease is around 26 for every 100,000 population. Patient visits are split evenly between acute and chronic disease although few patients with asymptomatic disease are present (4).

Despite researchers' studies and efforts, the gold standard technique for treating pilonidal sinus disease has yet to be identified. The development of a pilonidal sinus disease staging system is therefore important for decision-making processes to manage this disease (2).

The chief aspect of treatment is surgical. Antibiotics may be indicated before surgery in purulent stages, or in extreme cases of systemic infection. Prophylactic use of antibiotics remains unproven in the surgical treatment of pilonidal disease (4).

If symptoms resolve, 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 operative intervention. When pain is severe or cellulitis is present, attempts at conservative treatment are likely to be futile and only prolong the patient's discomfort, chronic disease can be successfully treated by meticulous hygiene, but recurrence rates are unknown (5).

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 (Karydakis, Bascom or Rhomboid flaps). However, there is not yet a consensus on the optimal treatment (6).

The present study aimed to determine the better procedure in treatment of pilonidal sinus disease, compare the efficiency and short-term results of conservative treatment, open excision, Karydakis flap and Rhomboid flap in treatment of pilonidal sinus disease.

## **PATIENTS AND METHODS**

A randomized controlled study included 56 patients with pilonidal sinus disease were admitted to General Surgery Department, Zagazig University Hospitals. The patients were allocated equally into: group (1) were treated with conservative method with medical treatment and drainage if needed; group (2) were operated by open technique; group (3) were operated by Limberg flap technique and group (4) were operated by Karydakis technique.

Informed consent was obtained from every patient and after an approval from the research ethics committee.

### **Inclusion and exclusion criteria:**

Patients with pilonidal sinus disease above the age of 18 years old and below 45 years old. All patients with uncomplicated sacrococcygeal pilonidal sinus. While,

patients under the age of 18 years old and above 45 years old, patients with recurrent pilonidal sinus, patients with complicated pilonidal abscess infection, branching and patients unfit for surgery such as bleeding tendency.

**Preoperative Assessment:**

Full history was taken from all patients regarding duration of symptoms and history of abscess. Patients were evaluated clinically to assess the number and site of pits and the extent of the disease. The laboratory investigations including CBC, LFT, KFT, random blood glucose level, coagulation profile, hepatitis markers. ECG and ECHO were done for cardiac patients or for patients above 40 years old. A dose of preoperative antibiotic intravenous was given (1gm 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:**

**(1) Conservative treatment group:**

Patients admitted with early inflammatory, proper hair shaving and patients were instructed to avoid prolonged sitting. Abscess drainage was done for some patients with abscess collection.

**(2) Open technique group:**

Patients given spinal anesthesia and prophylactic antibiotic (1gm ceftriaxone IV) and placed in prone position, buttocks were separated with strips of adhesive tape. The skin was disinfected and 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 for fully excised without inadvertent contamination of the wound by opening the track. Ellipse incision was done to excise all diseased tissue, careful dissection to avoid leakage of methylene blue down to presacral fascia. Good hemostasis was achieved and packing the cavity with gauze soaked with povidone iodine solution.

**(3) Limberg technique group:**

Patients given spinal anesthesia and antibiotic; and placed in prone position was done as before. 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. The line was drawn and its length was measured. The wound was temporarily packed, The flap was raised so that it included the skin, subcutaneous fat and the fascia overlying gluteus Maximus muscle then rotated on a pedicle 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 and then finally, the skin was closed with interrupted sutures.

**(4) Karydakis technique group:**

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 for any secondary opening or fluctuation of the sinus after methylene blue injection. The ellipse was then excised down to the sacral fascia, removing a

boat-shaped wedge of tissue including the whole sinus. 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. 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. Following these steps, the patient would now have a new shallow natal cleft with healthy unscarred skin.

#### **Postoperative care and follow up:**

Suture were removed after 12-14 post-operative days. All patients were followed up weekly for the first 4 postoperative weeks to evaluate wound healing.

Postoperative complications were reported based on clinical findings with emphasis on wound infection, adhesions, subcutaneous fluid collections, edema and bleeding.

#### **Statistical analysis:**

The collected data were analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM, SPSS Inc, Chicago, IL, USA). Data were tested using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ( $\chi^2$ ) and Fisher exact was used to calculate difference between qualitative variables as indicated. Quantitative data were expressed as mean  $\pm$  SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data) while Mann Whitney U test was used for non-normally distributed Data (non-parametric data). The results considered significant if the p value is  $\leq 0.05$ .

## **RESULTS**

The present study showed no significant difference regard age distribution as age was distributed as  $30.71 \pm 5.73$ ,  $32.21 \pm 6.58$ ,  $32.57 \pm 6.47$  and  $32.42 \pm 8.2$  respectively among groups (**Figure 1**). Regarding the duration of symptoms, conservative group was significantly shorter duration than other groups with no significant difference among them by LSD (**Figure 2**). Operative time was significantly longer among Limberg group than Karydakis group and finally open group as it was significantly shorter than other group (**Figure 3**).

Regarding hospital stay duration in open group was significantly higher than Limberg and finally Karydakis Group (**Figure 4**). Regarding visual analog scale (VAS) was significantly higher among open cases (**Figure 5**).

Regarding healing and return work were significantly higher among open group compared to other groups (**Figure 6**). Recurrence was significantly associated with open and conservative groups while there was only one case in Limberg Group and no case in Karydakis Group (**Table 1**). Bad and good satisfaction were

significantly associated with open and conservative groups while excellent was significantly associated with Limberg Group & Karydakis Group (Table 2).

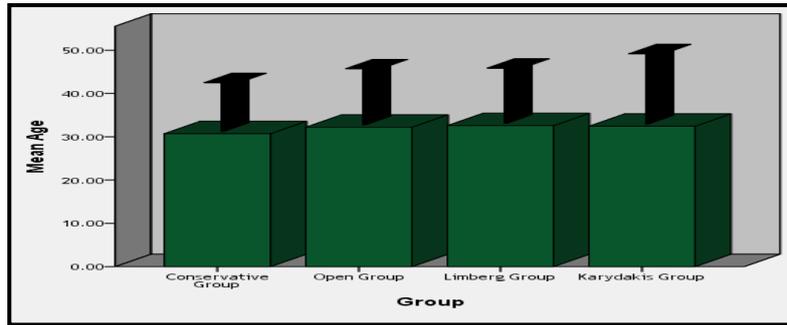


Figure (1): Age distribution among studied groups

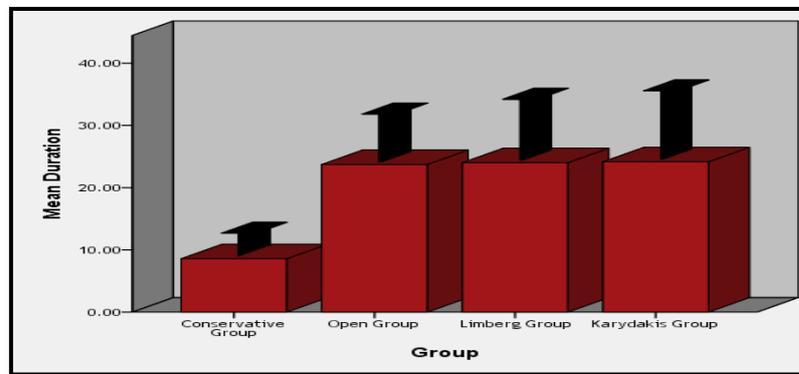


Figure (2): Duration of symptoms among studied groups

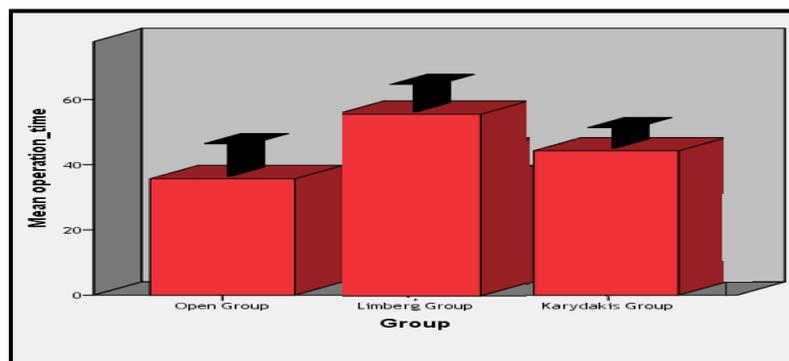


Figure (3): Operative time among studied groups

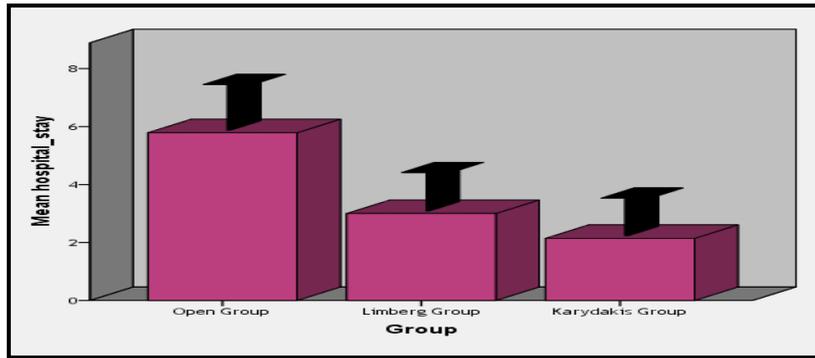


Figure (4): Mean hospital stay among studied groups

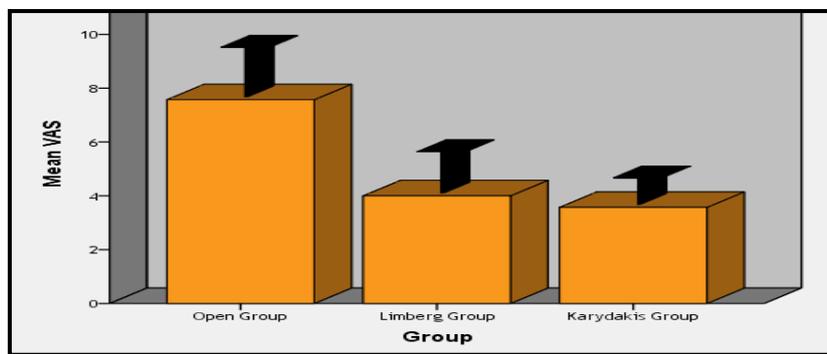


Figure (5): Visual analog scale among studied groups

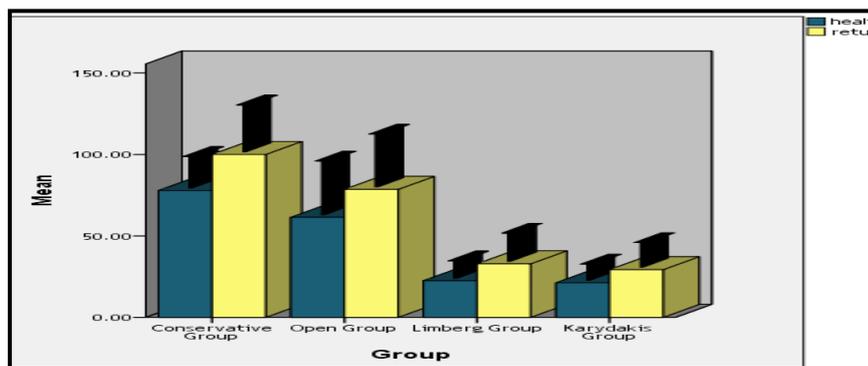


Figure (6): Healing and Return work among studied groups.

**Table (1): Recurrence distribution among all studied groups**

			Conservative Group	Open Group	Limberg Group	Karydakias Group	X <sup>2</sup>	P
Recurrence	-VE	N	10	8	13	14		
		%	71.4%	57.1%	92.9%	100.0%		
	+VE	N	4	6	1	0	10.29	0.016*
		%	28.6%	42.9%	7.1%	0.0%		
Total	N	14	14	14	14			
	%	100.0%	100.0%	100.0%	100.0%			

**Table (2): Patient satisfaction distribution among all studied groups**

			Conservative Group	Open Group	Limberg Group	Karydakias Group	X <sup>2</sup>	P
Satisfaction	Bad	N	4	6	1	0		
		%	28.6%	42.9%	7.1%	0.0%		
	Good	N	8	6	4	4	20.14	0.003*
		%	57.1%	42.9%	28.6%	28.6%		
	Excellent	N	2	2	9	10		
		%	14.3%	14.3%	64.3%	71.4%		
Total	N	14	14	14	14			
	%	100.0%	100.0%	100.0%	100.0%			

## DISCUSSION

Pilonidal disease affects adults usually in the second to third decade of life. Pilonidal cysts after 40 years of age are exceedingly rare, and the occurrence typically declines by the age of 25 years. Presentation average age is 21 years for men, and 19 years for women (7).

Various studies regarding different techniques have been conducted and the results have been compared. The purpose of these flap techniques is to prevent recurrence on the midline by removing the cavity in the natal cleft (8).

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%) (9).

Along with these lines, the aim of this study was to select of best method of treatment of pilonidal sinus and compare them regarding their short-term and long-term results in Zagazig University Hospitals.

Our study showed no significant difference regard age distribution. These incoordance with **Bahar et al. (10)** reported 74 patients with pilonidal disease with an age mean of (24.7) with no significant difference between the studied groups.

Our study showed the duration of preoperative complaints in conservative group was significantly shorter regard duration than other groups with no significant among them by LSD. These results was in agree with **Bostanoglu et al. (11)** studied 73 patients were operated with Karydakis technique with long duration of symptoms(2.1±1.2years) compared to 60 patients were operated with Limberg flap.

Our study showed operative time was significantly longer among Limberg group than Karydakis group and finally open group as it was significantly shorter than other group. These agree with **Borel et al. (12)** revealed short duration time of Open technique compared to Karydakis group.

Our study showed hospital stay duration in open group was significantly higher than Limberg and finally Karydakis Group. These agree with **Jamal et al.(13)** studied a total of 49 patients who subjected to rhomboid excision and Limberg transposition flap. the duration of hospital stay was shorter in patients who underwent Limberg flap technique as compared to other group. The mean hospital stay of 4.1 days for Open group and 3.7 days for Limberg group.

Regarding time to return to work in our study it was significantly higher in open group than other group. Theses agrees with study of **Bostanoglu et al. (11)** revealed mean operation time was 14.6for Karydakis and 17.7 for Limberg group, assuming th same short time to return to work for Karydakis technique.

Regarding defecation in our study for Open group (2 patints had easy defecation with percentage of 14.3%, 6 patients had moderate defecation with percentage of 42.9% and 6 patients had difficult defecation with percentage of 42.9%) while for Limberg group (9 patients had easy defecation with percentage of 64.3%, 4 patients had moderate defecation 28.6% and 1 had difficult defecation 7.1%) and for Karydakis group (8 patients had easy defecation with percentage of 57.1%, 4 patients had moderate defecation 28.6% and 2 patients had difficult defecation 14.3%) so difficult defecation was significantly associated with open group with no significant difference between other two groups.

This agrees with **Ersoy et al. (14)** studied One hundred patients with pilonidal disease underwent whether Karydakis or Limberg procedures in their clinic All patients had primary sinus orifices. If there were secondary orifices; the acceptance criterion was having a maximum 2 cm between the primary and secondary orifices. Those who had infections and those who declined to be in the study were excluded. The length of symptoms ranged 2 months–8 years. The primary outcome of the study was set as the early postoperative results and the effect of the procedure on the patients' well being, so the follow-up period for the study was 30 days, their study showed defecation was performed more easily after the Limberg procedure when compared with the Karydakis.

The significant difficulty with defecation in the Karydakis group may be explained in two ways: first, although we could not find any studies concerning the tension of the flaps, the tension of the Karydakis flap seems higher for geometrical

reasons. The tension is shared by three edges in the Limberg flap where as there is one edge in the Karydakis flap. Second, the questioning concerned only the first defecation in all patients . The higher incidence of infection could be a probable reason for the higher rate of difficulty in defecation in the Karydakis group (15).

Regarding recurrence rate in our study recurrence was significantly associated with open and conservative groups while there was only one case in Limberg group and no case in Karydakis Group with recurrence rate of (28.6%) in Conservative group, (42.9%) in Open group, (7.1%) in Limberg group and (0%) in Karydakis group, the recurrent case in limberg group had post operative complications as infection seroma and edema. This agrees with **Madhusudhan et al. (17)** followed up the patients in both of their study groups for a period of one year. During this period, one patient in the limberg flap group had recurrent disease and was treated with wide excision and healing by secondary intention. Meanwhile, no recurrence was reported in the karydakis flap group.

Simillary, **Bali et al. (8)** revealed that no recurrence occurred in any of the patients during the follow-up period (zero out of 71 patients) which furthermore cements the effectiveness of both flap techniques in the treatment of pilonidal sinus disease, yet they achieved better results than we did in that aspect.

And agrees with three study by **Ates et al.(17)** mentioned comparing Open technique in 25 patients and Limberg in 24 patients The average period of follow up was 18 months (12- 24 months). During this period, 7 patients in group-A (Open) reported recurrence, 4 were lost to follow up whereas in group B only one patient came back with recurrence.

Finally, regarding patient satisfaction in our study bad and good satisfaction were significantly associated with open and conservative groups while excellent was significantly associated with Limberg Group & Karydakis Group presented as follow, regarding Conservative group {4 patients (28.6%) had bad satisfaction, 8 patients (57.1%) had good satisfaction and 2 patients (14.3%) had excellent one} while for Open group {6 patients (42.9%) had bad satisfaction, another 6 patients (42.9%) had good satisfaction, 2 of them (14.3%) had excellent satisfaction} and for Limberg group P patients {1 patient (7.1%) had bad satisfaction the one who had recurrence, 4 patients (28.6%) had good satisfaction and 9 patients (64.3%) had excellent satisfaction} finally for Karydakis group {none of them had bad satisfaction, 4 patients had good satisfaction and 10 patients ha excellent satisfacion}

Our results are in line with **Karaca et al. (18)** reported the same observation of our research, where 46 out of 46 patients who were operated with karydakis flap recommended the operation unlike the 8 out of 31 patients operated with limberg flap who dismissed recommending the operation.

A Cochrane overview has been performed by **AL-Khamis et al. (19)** provided evidence-based guidance for surgical treatment. They concluded that off-midline closure (including rhomboid and karydakis flaps) is the best choice if the sinus is to be excised and sutured, and this closure is associated with shorter hospital stay and the lowest recurrence rates.

## CONCLUSION

The four techniques are effective in treatment of pilonidal sinus while Conservative is preferred at early stage of the disease and flap techniques has better results and satisfaction than Open one. The Karydakis flap is preferred the Limberg flap for treating uncomplicated Sacrococcygeal pilonidal disease due to shorter operative and healing time with superior patient satisfaction.

**NO conflict of interest**

## REFERENCES

- 1- **Nivatvongs S (2007):** Pilonidal disease. In: Gordon PH, Nivatvongs S (eds) Principles and practice for surgery of the colon, rectum and anus, 3<sup>rd</sup> edn. Informa Healthcare, New York, pp 235–246.
- 2- **Erdem H, İrkörücü O and Reyhan E (2012):** The best therapy for pilonidal disease: which management for which type?". World Journal of Surgery; 36(3): 691-692.
- 3- **Steele S, Perry B, Mills S and Buie W (2013):** "Practice parameters for the management of pilonidal disease." Dis Colon Rectum; 56:1021– 1027.
- 4- **Khanna A and Rombeau J (2011):** Pilonidal disease. Clin Colon Rectal Surg; 24: 46–53.
- 5- **Hodgkin W.** Pilonidal sinus disease. J Wound Care 1998; 7(9): 481-83.
- 6- **Ahmed Z, Shahid M, Malik M and Hussain S (2017):** Comparison of karydakis technique with limberg flap procedure for sacrococcygeal pilonidal sinus disease in terms of hospital stay and work loss, 67(1): 141–144.
- 7- **Hull T and Wu J (2002):** "Pilonidal disease." Surgical Clinics; 82(6): 1169-1185.
- 8- **Tokac M, Dumlu E, Aydin M and Yalc A (2015):** Comparison of Modified Limberg Flap and Karydakis Flap Operations in Pilonidal Sinus Surgery: Prospective Randomized Study, 870–877.
- 9- **Bali İ, Aziret M, Sözen S, Emir S, Erdem H, Çetinkünar S and İrkörücü O (2015):** Effectiveness of Limberg and Karydakis flap in recurrent pilonidal sinus disease. Clinics; 70(5): 350-555.
- 10- **Bahar M, A kbarian M and Azadmand A (2013):** "Investigating the effect of autologous platelet-rich plasma on pain in patients with pilonidal abscess treated with surgical removal of extensive tissue". Iranian Red Crescent Medical Journal; 15(11):10-13.
- 11- **Bostanoglu S, Sakcak I, Avsar F, Cosgun E, Hamamci E (2010):** Comparison of Karydakis technique with Limberg Flap Procedure in Pilonidal Sinus Disease: Advantages of Karydakis technique. Pak J Med Sci; 26(4):773-777.
- 12- **Borel F, Gaudin C, Duchalais E, Lehur P, Meurette G (2017):** Wound closure with Karydakis flap is decreasing the perioperative costs after pilonidal sinus excision as compared to lay-open approach. J Visc Surg.; 154(6):407-412.
- 13- **Jamal A, Shamim M, Hashmi F, Qureshi M (2009):** Open excision with secondary healing versus rhomboid excision with Limberg transposition flap in the management of sacrococcygeal pilonidal disease. J Pak Med Assoc.; 59(3):157-160.
- 14- **Ersoy E, Devay A, Aktimur R, Doganay B, Ozdo an M and Gündo du R (2009):** Comparison of the short-term results after Limberg and Karydakis procedures for pilonidal disease:randomized prospective analysis of 100 patients. Colorectal Dis; 11(7):705–10.

- 15- Gul V, Destek S and Ahoglu S (2017):** Minimally Invasive Surgical Approach to Complicated Recurrent Pilonidal Sinus. In: Recent Clinical Techniques, Results, and Research in Wounds. Springer, Cham.
- 16- Madhusudhan A, Swamy M and Arif M (2017):** ‘Pilonidal sinus- limberg versus karidakis flap our experience at SIMS , Shivamogga’, 4(11): 3641–3645.
- 17- Ates M, Dirican A, Sarac M, Aslan A and Colak C (2011):** Short and long-term results of the Karydakis flap versus the Limberg flap for treating pilonidal sinus disease: A prospective randomized study. Am J Surg [Internet]. Elsevier Inc; 202(5):568–573.
- 18- Karaca T, Yolda’s O, Bilgin BC, Ozer S, Yolda’s S and Karaca N (2012):** Comparison of short-term results of modified Karydakis flap and modified Limberg flap for pilonidal sinus surgery. Int J Surg; 10(10): 601–606.
- 19- Al-Khamis A, McCallum I, King P and Bruce J (2010):** Healing by primary versus secondary intention after surgical treatment for pi- lonidal sinus. Cochrane Database of Systematic Reviews 2010, Issue 1. Art. No.: CD006213.