

## Surgical Reconstruction after Excision of Pilonidal Sinus with Modified Limberg Transposition Flap

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### ABSTRACT

**Background:** Pilonidal sinus is a common infectious process which occurs in buttocks and sacral area which involves a wide range of symptoms that are different from an asymptomatic sinus to acute and chronic sinus track.

**Aim of the work:** The aim of the study was to evaluate the outcome of modified Limberg transposition flap in surgical reconstruction after excision of pilonidal sinus.

**Patients and Methods:** This prospective study was conducted at the Department of General Surgery, Al-Azhar University Hospitals (Al-Hussin & Sayed Galal hospitals). This study was carried out on 30 consecutive patients with primary non recurrent sacrococcygeal pilonidal sinus from 11/2018 to 6/2019 to allow a minimum follow-up period of at least 5 months for the last case operated upon.

**Results:** Operative time and postoperative pain with mean operative time  $47.37 \pm 5.67$ , postoperative pain: 18 patients (60%) with mid pain, 10 patients (33.3%) with moderate pain, only 2 (6.7%) with severe pain. The complications among study group were 4 patients (13.3%) with wound seroma, 3 patients (10%) with wound hematoma, 3 patients (10%) with wound infection, 2 patients (6.7%) with wound gapping, only one patient (3.3%) with flap necrosis. The mean time for wound healing is  $20.57 \pm 5.72$ , 17 patients (56.7%) less than 20 days and 13 patients (43.3 %) more than 20 days, mean hospital stay is  $3.63 \pm 0.85$ , 17 patients (56.7%) = 3 days hospital stay and 13 patients (43.3%) more than 3 days hospital stay.

**Conclusion:** Surgical reconstruction after excision of pilonidal sinus with modified Limberg transposition flap is an effective method for the management of pilonidal disease, especially when dealing with recurrent pilonidal sinus.

**Keywords:** Surgical Reconstruction, Excision, Pilonidal Sinus, Limberg Transposition Flap.

### INTRODUCTION

Pilonidal sinus is a common infectious process which occurs in buttocks and sacral area which involves a wide range of symptoms that are different from an asymptomatic sinus to acute and chronic sinus track <sup>(1)</sup>.

The disease was first described in 1833 by Mayo. It occurs mostly in young adults and its incidence is 26 cases per 100,000 and in men is twice women. the peak incidence ranged between 15-24 years of age and rarely occurs after age 40 <sup>(2)</sup>.

The etiology of this disease is not fully understood, some are believed to be congenital in origin, and some consider it an acquired disease and the reason to this is that this condition can be seen in folds between the fingers of hairdressers and shepherds and dog trainers which can be due to the penetration of the hair as a foreign body and cause reactions in the subcutaneous tissue <sup>(3)</sup>.

Hull and Wu <sup>(4)</sup> suggested that hair in this area come in clusters and like a drill bit into the skin and gradually in-depth down.

Sondenna *et al.* <sup>(5)</sup> proposed that during puberty and due to the rapid growth of gluteus muscles, the distance of hair follicles, sebaceous glands and apocrine glands increases leading to increase the probability of foreign body entrance into the skin and cause holes, which is the precursor of the formation of pilonidal sinus.

The sinuses are asymptomatic until infected where the symptoms of intermittent pain, tenderness, and intermittent serous-purulent fluids manifest. Other manifestations include sinus abscess that is acute and is at the upper and outer left position than vents <sup>(6)</sup>.

Primarily non-surgical treatment for this disease is not recommended and is only recommended for patients who have the least symptoms such as hygiene sacrococcygeal region and shaving regional hair weekly. There are several methods for surgical treatment, but the method should be appropriate for everyone with clinical features of the disease <sup>(7)</sup>.

The ideal treatment should be the minimum required hospitalization after surgery, be simple, with minimal pain, the patient soon returned to his work, minimal risk of complications and should be treated easily in case of the recurrence. Various therapeutic approaches, each with advantages and disadvantages are presented in recent years <sup>(8)</sup>.

Skin flaps have been described to cover a sacral defect after wide excision. Similarly, this keeps the scar off the midline and flattens the natal cleft. The techniques available include the (1) cleft closure, (2) advancement flap (Karydakis procedure), (3) local advancement flap (3-plasty rhomboid flap or V-Y advancement flap), and (4) rotational flap

(Limberg flap, Gluteus maximus myocutaneous flap)<sup>(9)</sup>.

The advantages of rhomboid tissue excision with Limberg rotational flap repair include the ability to aggressively excise diseased tissue and accomplish tensionless wound coverage using a skin and soft tissue rotational flap from the gluteal region. In addition, the bulky flap flattens the gluteal cleft<sup>(10)</sup>.

### AIM OF THE WORK

The aim of the work was to evaluate the outcome of modified Limberg transposition flap in surgical reconstruction after excision of pilonidal sinus.

### PATIENTS AND METHODS

This prospective study was conducted at Department of General Surgery, Al-Azhar University Hospitals (Al-Hussin & Sayed Galal hospitals) on 30 consecutive patients with primary non recurrent sacrococcygeal pilonidal sinus from 11/2018 to 6/2019 to allow a minimum follow-up period of at least 5 months for the last case operated upon. Age, sex, presentation, number of sinus pits, midline or lateral pits, treatment, complications, inpatient stay, and postoperative outcome were recorded.

Mean age at presentation was 16–46 years. There were 20 males and 10 female patients. All patients had midline pits, and only three patients had an additional lateral sinus opening due to a branched tract. All patients underwent surgical excision and reconstruction with the modified Limberg transposition flap.

### Ethical consideration and written informed consent:

The study was approved by the medical ethics committee of Al-Azhar University Hospitals and a written informed consent was obtained from all patients.

### Prospectively enrolled patients had:

- Understand proposed investigations and treatment and signed a detailed informed consent document, as well as, latest patient information leaflet.

### Inclusion criteria:

- Patients presented by primary pilonidal sinus and patients presented by recurrent pilonidal sinus.

### Exclusion criteria:

- Patients with infected pilonidal sinus.
- Extensively branching pilonidal sinus.

Patients who presented with infected pilonidal sinus were treated with 7 – 10 days of systemic oral antibiotic after drainage if necessary. These patients will be followed up for signs of persistent infection. The criteria for the resolution of infection are the absence of cellulitis and cessation of purulent discharge. Definitive surgery will be delayed until all signs of infection had resolved.

### Preoperative work up:

#### All Patients subjected to:

- ❖ History Taking
- ❖ Clinical Examination
- ❖ Investigations
- Laboratory investigations:
  - Complete blood count.
  - Liver and kidney functions.
  - Coagulation profile.

### Preoperative care

A patient record form was prepared, and patients' age, sex, duration of symptoms, preoperative antibiotic use, previous treatments, length of hospital stay, return to work, and complications such as wound breakdown and infection and wound care time were recorded. All patients were subjected to full necessary laboratory tests before surgery. All patients were admitted to hospital the day before surgery and operated under spinal anesthesia. Patients were asked to use the numerical rating pain scale for pain and effect of analgesia after surgery. Patients also had the option to verbally rate their scale from 0 to 10 to be recorded.

### Surgical techniques

Patients were made to lie in the prone position with the legs slightly abducted and the buttocks strapped apart with adhesive tapes on the table sides. Methylene blue mixed with 10% hydrogen peroxide was injected into the sinus orifice(s) just before the incision. All patients received a single intravenous dose of cefoperazone at the time of anesthesia.

### Postoperative care

Patients were seen routinely on postoperative days 5, 10, and 14 for wound inspection and removal of sutures. The drain will be removed when a daily drainage below 20 mL are obtained. In case of wound infection or hematoma, the wound will be drained by the removal of a few sutures and covered with daily dressings. Patients were discharged after removal of the drain and advised to keep the sacrococcygeal area clean and shaved. Skin sutures were removed alternatively on the 10th and 12th postoperative day. Follow-up examination made at the end of the first, third, and sixth months after surgery. The results were evaluated regarding to duration of wound healing, postoperative morbidity, length of hospital stay, and recurrence rate. The patients with delayed healing were continued to be seen until complete healing was achieved. Any wound complications were recorded. Time to return to work and time until complete healing was recorded. Patients were advised to shave intergluteal cleft and adjacent buttocks, or use epilation creams, and always keep the operative area clean and dry. Patients were informed to follow-up every month for 6 months.

**Statistical analysis**

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

**The following tests were done:**

- Independent-samples t-test of significance was used when comparing between two means.

- Chi-square ( $\chi^2$ ) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
  - Probability (P-value)
    - P-value <0.05 was considered significant.
    - P-value <0.001 was considered as highly significant.
    - P-value >0.05 was considered insignificant.

**RESULTS**

**Table (1):** Shows the relation between (patient characteristics, presentation of sinus, wound healing and hospital stay) and the postoperative pain.

		Mild pain	Moderate to severe pain	Test value	P-value	Sig.
		No. = 18	No. = 12			
Age	Mean ± SD Range	29.39 ± 9.15 16 – 46	28.42 ± 5.65 18 – 37	0.328•	0.745	NS
Sex	Female Male	3 (16.7%) 15 (83.3%)	2 (16.7%) 10 (83.3%)	0.000*	1.000	NS
DM	No Yes	15 (83.3%) 3 (16.7%)	10 (83.3%) 2 (16.7%)	0.000*	1.000	NS
Occupation	Student House wife Manual Worker Employee Driver Teacher Computer Operator	3 (16.7%) 2 (11.1%) 3 (16.7%) 2 (11.1%) 5 (27.8%) 3 (16.7%) 0 (0.0%)	0 (0.0%) 0 (0.0%) 2 (16.7%) 4 (33.3%) 3 (25.0%) 1 (8.3%) 2 (16.7%)	8.507*	0.203	NS
Single or multiple	Single Multiple	8 (44.4%) 10 (55.6%)	4 (33.3%) 8 (66.7%)	0.370*	0.543	NS
Recurrent	Non recurrent Recurrent	10 (55.6%) 8 (44.4%)	10 (83.3%) 2 (16.7%)	2.500*	0.114	NS
Midline or Lateral	Midline Lateral	15 (83.3%) 3 (16.7%)	10 (83.3%) 2 (16.7%)	0.000*	1.000	NS
Associated Hirsutism	No Yes	7 (38.9%) 11 (61.1%)	7 (58.3%) 5 (41.7%)	1.094*	0.296	NS
Operative Time/ min	Mean ± SD Range	49.17 ± 5.91 41 – 60	44.67 ± 4.19 40 – 55	2.277•	0.031	S
Post-operative complications	No Yes	13 (72.2%) 5 (27.8%)	8 (66.7%) 4 (33.3%)	0.106*	0.745	NS
Wound Seroma	No Yes	16 (88.9%) 2 (11.1%)	10 (83.3%) 2 (16.7%)	0.192*	0.661	NS
Wound Hematoma	No Yes	17 (94.4%) 1 (5.6%)	10 (83.3%) 2 (16.7%)	0.988*	0.320	NS
Wound infection	No Yes	16 (88.9%) 2 (11.1%)	11 (91.7%) 1 (8.3%)	0.062*	0.804	NS
Wound Gapping	No Yes	16 (88.9%) 2 (11.1%)	12 (100.0%) 0 (0.0%)	1.429*	0.232	NS
Flap Necrosis	No Yes	17 (94.4%) 1 (5.6%)	12 (100.0%) 0 (0.0%)	0.690*	0.406	NS
Duration of wound healing	Mean ± SD Range	21.83 ± 6.83 14 – 40	18.67 ± 2.77 15 – 24	1.518•	0.140	NS
Hospital stay	Mean ± SD Range	3.83 ± 0.99 3 – 6	3.33 ± 0.49 3 – 4	1.622•	0.116	NS

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\* Chi-square test; •: Independent t-test

**Table 2:** Shows the relation between (patient characteristics, presentation of sinus, wound healing and postoperative pain) and postoperative complication.

		No Complicated No. = 21	Complicated No. = 9	Test value	P-value	Sig.
Age	Mean $\pm$ SD	27.71 $\pm$ 6.50	32.00 $\pm$ 10.11	-1.395	0.174	NS
	Range	16 – 39	19 – 46			
Sex	Female	3 (14.3%)	2 (22.2%)	0.286	0.593	NS
	Male	18 (85.7%)	7 (77.8%)			
DM	No	18 (85.7%)	7 (77.8%)	0.286	0.593	NS
	Yes	3 (14.3%)	2 (22.2%)			
Occupation	Student	2 (9.5%)	1 (11.1%)	2.778	0.836	NS
	Housewife	1 (4.8%)	1 (11.1%)			
	Manual Worker	4 (19.0%)	1 (11.1%)			
	Employee	3 (14.3%)	3 (33.3%)			
	Driver	6 (28.6%)	2 (22.2%)			
	Teacher	3 (14.3%)	1 (11.1%)			
	Computer Operator	2 (9.5%)	0 (0.0%)			
Single or multiple	Single	8 (38.1%)	4 (44.4%)	0.106	0.745	NS
	Multiple	13 (61.9%)	5 (55.6%)			
Recurrent	Non recurrent	15 (71.4%)	5 (55.6%)	0.714	0.398	NS
	Recurrent	6 (28.6%)	4 (44.4%)			
Midline or Lateral	Midline	18 (85.7%)	7 (77.8%)	0.286	0.593	NS
	Lateral	3 (14.3%)	2 (22.2%)			
Associated Hirsutism	No	9 (42.9%)	5 (55.6%)	0.408	0.523	NS
	Yes	12 (57.1%)	4 (44.4%)			
Post operative pain	Mild	13 (61.9%)	5 (55.6%)	0.423	0.809	NS
	Moderate	7 (33.3%)	3 (33.3%)			
	Severe	1 (4.8%)	1 (11.1%)			
Operative Time/ min	Mean $\pm$ SD	47.14 $\pm$ 5.01	47.89 $\pm$ 7.30	-0.325	0.748	NS
	Range	40 – 57	40 – 60			
Duration of wound Healing	Mean $\pm$ SD	19.00 $\pm$ 3.15	24.22 $\pm$ 8.51	-2.487	0.019	S
	Range	14 – 27	16 – 40			
Hospital stay	Mean $\pm$ SD	3.62 $\pm$ 0.74	3.67 $\pm$ 1.12	-0.138	0.891	NS
	Range	3 – 5	3 – 6			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value < 0.01: highly significant (HS)

\*Chi-square test; •: Independent t-test

**Table 3:** Shows the relation between (patient characteristics, presentation of sinus, complications and hospital stay) and duration of wound healing.

		Duration of wound healing <20	Duration of wound healing >=20	Test value	P-value	Sig.
		No. = 17	No. = 13			
Age	Mean ± SD Range	26.76 ± 6.66 16 – 38	31.92 ± 8.54 21 – 46	-1.861	0.073	NS
Sex	Female Male	3 (17.6%) 14 (82.4%)	2 (15.4%) 11 (84.6%)	0.027	0.869	NS
DM	No Yes	16 (94.1%) 1 (5.9%)	9 (69.2%) 4 (30.8%)	3.285	0.070	NS
Occupation	Student Housewife Manual Worker Employee Driver Teacher Computer Operator	3 (17.6%) 1 (5.9%) 3 (17.6%) 3 (17.6%) 4 (23.5%) 2 (11.8%) 1 (5.9%)	0 (0.0%) 1 (7.7%) 2 (15.4%) 3 (23.1%) 4 (30.8%) 2 (15.4%) 1 (7.7%)	2.715	0.844	NS
Single or multiple	Single Multiple	5 (29.4%) 12 (70.6%)	7 (53.8%) 6 (46.2%)	1.833	0.176	NS
Recurrent	Non recurrent Recurrent	12 (70.6%) 5 (29.4%)	8 (61.5%) 5 (38.5%)	0.271	0.602	NS
Midline or Lateral	Midline Lateral	14 (82.4%) 3 (17.6%)	11 (84.6%) 2 (15.4%)	0.027	0.869	NS
Associated Hirsutism	No Yes	9 (52.9%) 8 (47.1%)	5 (38.5%) 8 (61.5%)	0.621	0.431	NS
Post operative pain	Mild Moderate Severe	8 (47.1%) 7 (41.2%) 2 (11.8%)	10 (76.9%) 3 (23.1%) 0 (0.0%)	3.348	0.187	NS
Operative Time/ min	Mean ± SD Range	47.18 ± 5.51 40 – 60	47.62 ± 6.09 40 – 57	-0.207	0.838	NS
Post operative complications	No Yes	13 (76.5%) 4 (23.5%)	8 (61.5%) 5 (38.5%)	0.782	0.376	NS
Wound Seroma	No Yes	15 (88.2%) 2 (11.8%)	11 (84.6%) 2 (15.4%)	0.084	0.773	NS
Wound Hematoma	No Yes	15 (88.2%) 2 (11.8%)	12 (92.3%) 1 (7.7%)	0.136	0.713	NS
Wound infection	No Yes	16 (94.1%) 1 (5.9%)	11 (84.6%) 2 (15.4%)	0.739	0.390	NS
Wound Gapping	No Yes	17 (100.0%) 0 (0.0%)	11 (84.6%) 2 (15.4%)	2.802	0.094	NS
Flap Necrosis	No Yes	17 (100.0%) 0 (0.0%)	12 (92.3%) 1 (7.7%)	1.353	0.245	NS
HOSPITAL STAY	Mean ± SD Range	3.47 ± 0.62 3 – 5	3.85 ± 1.07 3 – 6	-1.208	0.237	NS

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\*:Chi-square test; •: Independent t-test

**Table 4:** Shows the relation between (patient characteristics, presentation of sinus, wound healing and complications) and hospital stay.

		Hospital stay =3	Hospital stay >3	Test value	P-value	Sig.
		No. = 17	No. = 13			
Age	Mean ± SD Range	27.94 ± 7.37 16 – 44	30.38 ± 8.50 18 – 46	-0.842	0.407	NS
Sex	Female Male	2 (11.8%) 15 (88.2%)	3 (23.1%) 10 (76.9%)	0.679	0.410	NS
DM	No Yes	14 (82.4%) 3 (17.6%)	11 (84.6%) 2 (15.4%)	0.027	0.869	NS
Occupation	Student Housewife Manual Worker Employee Driver Teacher Computer Operator	2 (11.8%) 0 (0.0%) 3 (17.6%) 3 (17.6%) 3 (17.6%) 4 (23.5%) 2 (11.8%)	1 (7.7%) 2 (15.4%) 2 (15.4%) 3 (23.1%) 5 (38.5%) 0 (0.0%) 0 (0.0%)	8.654	0.194	NS
Single or multiple	Single Multiple	7 (41.2%) 10 (58.8%)	5 (38.5%) 8 (61.5%)	0.023	0.880	NS
Recurrent	Non recurrent Recurrent	13 (76.5%) 4 (23.5%)	7 (53.8%) 6 (46.2%)	1.697	0.193	NS
Midline or Lateral	Midline Lateral	13 (76.5%) 4 (23.5%)	12 (92.3%) 1 (7.7%)	1.330	0.249	NS
Associated Hirsutism	No Yes	10 (58.8%) 7 (41.2%)	4 (30.8%) 9 (69.2%)	2.330	0.127	NS
Post operative pain	Mild Moderate Severe	9 (52.9%) 7 (41.2%) 1 (5.9%)	9 (69.2%) 3 (23.1%) 1 (7.7%)	1.086	0.581	NS
Operative Time/ min	Mean ± SD Range	46.59 ± 6.11 40 – 60	48.38 ± 5.09 41 – 55	-0.856	0.399	NS
Post operative complications	No Yes	11 (64.7%) 6 (35.3%)	10 (76.9%) 3 (23.1%)	0.524	0.469	NS
Wound Seroma	No Yes	14 (82.4%) 3 (17.6%)	12 (92.3%) 1 (7.7%)	0.632	0.427	NS
Wound Hematoma	No Yes	14 (82.4%) 3 (17.6%)	13 (100.0%) 0 (0.0%)	2.549	0.110	NS
Wound infection	No Yes	15 (88.2%) 2 (11.8%)	12 (92.3%) 1 (7.7%)	0.136	0.713	NS
Wound Gapping	No Yes	16 (94.1%) 1 (5.9%)	12 (92.3%) 1 (7.7%)	0.039	0.844	NS
Flap Necrosis	No Yes	17 (100.0%) 0 (0.0%)	12 (92.3%) 1 (7.7%)	1.353	0.245	NS
Duration of wound healing	Mean ± SD Range	19.29 ± 4.19 14 – 31	22.23 ± 7.10 15 – 40	-1.417	0.167	NS

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\*Chi-square test; •: Independent t-test

**DISCUSSION**

Many treatment modalities have been tried for the treatment of pilonidal disease, including phenol application, cryosurgery, shaving, incision and curettage, excision with marsupialization, excision with skin grafting, and most recently flap surgery. When excisional surgery is needed, management of the resultant defect on the tense

sacral region appears to be the most important issue because this step is closely related to postoperative morbidity and recurrence (11).

The main problems associated with the primary closure technique are the high rates of recurrence and infection, and the long hospitalization required. On the other hand, the open packing and marsupialization methods required painful wound

management, prolonged hospitalization, and frequent dressing changes, although these methods have been reported to result in lower recurrence rates than primary closure. To overcome the disadvantages of all these methods, various flap reconstruction has been reported<sup>(12)</sup>.

The introduction of excision with flap repair techniques, such as asymmetric excision with advancement flap coverage (Karydakis flap), V-Y advancement flaps, and the Z-plasty techniques, have had a significant impact on decreasing recurrence rates. These procedures, however, are not without shortcomings. The Karydakis flap is an effective technique when dealing with limited disease. It relies on a relatively restricted incision that may not be as effective when dealing with more complex disease<sup>(13)</sup>.

The disadvantage of the V-Y advancement flap is that it results in a midline scar, which in theory places the patients at increased risk for recurrence. The Z-plasty technique is associated with a 20% rate of flap tip necrosis at the delicate ends of the transposed flaps<sup>(10)</sup>.

Surgical treatment of pilonidal disease is challenging because of the high rates of wound infection, impaired healing, and recurrence<sup>(4)</sup>.

The rhomboid flap of Limberg is a transposition flap that is advocated for the treatment of this condition and this procedure has recently gained more popularity. Rapid healing, short hospital stays, early return to daily life, and low complication and recurrence rates are the important advantages of the Limberg flap procedure<sup>(11)</sup>.

Skin flaps have been described to cover a sacral defect after wide excision. The Limberg flap technique involves a flap procedure to achieve primary closure and to obliterate the deep natal cleft. This relocates hair follicles away from the midline and prevents the frictional forces associated with the principal etiological factors for the development of pilonidal disease. Initially it was reserved for complex or recurrent pilonidal disease that has failed to respond to the simple conservative operative techniques but now it has been recommended as a first line management for all types of chronic sacrococcygeal pilonidal sinuses<sup>(9)</sup>.

Comparison of our study against other studies as regard number of cases, follow up period, length of hospital stays, and recurrence rate were tabulated. In our study the modified Limberg transposition flap shows; a low complication rate, less postoperative pain, short hospitalization, early return to normal activity, and no recurrence rate.

Surgical reconstruction after excision of pilonidal sinus with modified Limberg transposition

flap is an effective method for the management of pilonidal disease, especially when dealing with recurrent pilonidal sinus. It is easily learned and is a valuable technique available to the general surgeon. It fulfilled the principle for surgical treatment of pilonidal sinus: (1) complete excision of the pathologic area, (2) a tension-free wound closure that heals primarily and away from midline, and (3) a gentle flattening of the natal cleft.

## CONCLUSION

Modified Limberg flap which used in treatment of pilonidal sinus showed a short hospital stay, early wound healing, short duration of work-off, low rate of complications and low rate of recurrence for both non recurrent and recurrent pilonidal sinus.

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