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COMPARATIVE STUDY OF LIMBERG FLAP AND DE-EPITHELIALISATION TECHNIQUE FOR PATIENTS WITH PILONIDAL SINUS DISEASE

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Abstract

Background: In 2018, Dandin et al. described a new method called the De-epithelialization technique (DT) for treating patients with pilonidal sinus disease. In our study, we compared DT to the conventional Limberg flap (LF) procedure. **Patients and Methods:** The LF and DT groups each had 20 patients. Patients from the DT group underwent surgery under local anesthesia and were discharged on the same day. Patients from the LF group were operated under subarachnoid block and managed as indoor patients. All 40 patients were analyzed for patients age, sex, weight, body mass index, operative time, and early complications. **Results:** The mean age of all patients was 28 years, with a standard deviation of 5.6 years. Moreover, the mean body mass index was 25.5, with a standard deviation of 3.45. The mean operative time was significantly shorter for the DT group (45.65 minutes) than for the L.F group (58.5 minutes; p < .001). The DT group had a significantly higher incidence of wound dehiscence (8/20, 40%) than the LF group did (1/20, 5%; p = .020). **Conclusion:** Our study determined that the LF method has a lower complication rate compared to DT, though the latter provides shorter operative time and hospital stay.

Keywords: Limberg flap, De-epithelialization Technique, Pilonidal Sinus, Comparison

Introduction:

Pilonidal sinus disease (PSD) is a chronic inflammatory disease commonly affecting men more than women. The incidence of the disease is less than 26 among 100000 people .¹ The literature presents theories on congenital and acquired causes, with the latter being more widely accepted.²⁻⁴ Risk factors for acquired PSD include higher body mass index, hairy back, thick skin, and deep gluteal folds.⁴ Postures such as prolonged sitting and increasing friction between hairs can cause crypt formation underneath the skin. Over time, hair fragments migrate beneath these crypts, accumulating debris and pus formation (4)-(7).⁴⁻⁷ To date, numerous methods have been used to manage this disease, including surgical procedures, phenol treatment, and lasers, but the gold standard treatment is yet to be decided (8). Surgical for PSD come with procedures complications because of the anatomy of the natal cleft region. Various surgical procedures have been studied in detail, such as excision with primary closure, Limberg flap (LF) method, Karydakis flap method. Despite being a simple process, excision with primary closure has a high incidence of wound dehiscence, infection, and healing by secondary intention. Meanwhile, the LF method carries risks like flap necrosis, seroma or hematoma wound formation. infection. wound dehiscence, etc.

The ideal treatment of PSD must include less operative time, shorter hospital stay and complication rate, lesser post-operative pain, and good cosmesis. In 2018, Dandin et al. described a new deepithelialization technique (DT) for treating PSD (9). They concluded that the technique provides a shorter operation time and hospital stay, and less postoperative morbidity. We assessed the

technique's effectiveness and compared it with the (LF) procedure in treating PSD.

Methodology- The study was carried out between (February 2021 and August 2023) in the Department of General Surgery at the Government Institute of Medical Sciences a tertiary care hospital in Northern. PSD patients with single sinus tract of any age and sex were included in the study after explaining the procedure to them and obtaining informed consent. Patients with multiple sinus tract; systemic comorbidities like diabetes, hypertension, or tuberculosis; recurrent disease; and previous operations for some other pathologies were excluded from the study. Magnetic Resonance Imaging was performed for all patients to establish a single tract, length direction, and extent of the tract. In addition to clinical history taking and clinical examination, basic laboratory investigations including blood tests (CBC, LFT, KFT), radiological investigation (Xray chest), ECG were done for all patients and it was followed by assessment by anaesthetist to determine according to protocol to determine surgical fitness.

A total of 40 patients were selected for the study. Patients were allowed to choose which procedure they wanted to undergo and were distributed equally between the two groups (LF and DT), resulting in 20 patients each. As the study was planned to include patients from February 2021 to January 2023, all eligible patients were included in the study if they met inclusion and exclusion criteria. Patient follow-up of 90 days from the date of the procedure was done and has been reported in the study. The study was conducted after taking institutional research committee and institutional ethics committee approval. The reference number of the institutional ethics committee approval letter is GIMS/IEC/HR/2021/10 dated 22/01/2021. All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975. The confidentiality and anonymity of the study participants was maintained throughout the study.

All DT cases were performed under local anesthesia after completing a lignocaine sensitivity test. 10 ml 2% lignocaine with adrenalin was diluted with 10 ml of normal saline and was infiltrated around the lesion. An elliptical incision was made around the sinus opening, and the whole tract was excised along with soft tissue, resulting in a defect in the natal cleft. Another ellipsoid marking was drawn around the cut margins. Deepithelialization of the crescent-shaped skin on both sides was done using a 15numbered surgical blade by partially peeling the epidermis over the dermis. Initial sutures were taken using a polypropylene no-1 between the deepithelialized surface, the presacral fascia, and the de-epithelialized surface of the contralateral side. The whole wound was sutured using this technique, resulting in approximation and inversion of soft tissue and de-epithelialized segments. Later the free edges of the wound were sutured again with polypropylene 2-0 further inverting the de-epithelialized segment (Figure 1).



Figure 1- Steps of the De-epithelialisation technique

A) Marking of ellipsoid to be excised containing sinus tract, (B) Defect created after excision of sinus tract, (C) De-epithelialisation of skin around the ellipsoid, (D) Prolene sutures taken including bilateral de-epithelialized surface and presacral fascia, (E) Approximation of de-epithelialized surface, (F) Approximation of skin

Dressing was done, and the patient was discharged on the same day. The patient was given 200 mg cefixime for 5 days in the post-operative period.

For the LF method, all cases were performed under subarachnoid block. A rhomboid flap was drawn around the sinus opening and a whole chunk of tissue was excised including the sinus tract to the presacral fascia. The flap was raised from the left gluteal region with limbs equivalent to the rhomboid, preferably from the right side. Haemostasis was achieved. A drain was placed underneath the flap and the flap was used to fill up the formed defect. The flap was sutured with the presacral fascia using polyglycolide 3-0 suture. The skin was closed using a Polypropylene 3-0 suture (Figure 2).





Figure 2- Steps in Limberg flap procedure

A) Marking of incisions, B) Excision of the sinus tract and dissection of the flap, C) Transposition of flap covering defect, D) Healed limber flap on follow-up.

Follow-ups of all cases were done on the third, seventh, and 14th day. Data were collected from all patients and analyzed for patients' age, sex, weight, body mass index, operative time, and complications. Data analysis was done using IBM SPSS software version 27 [10] and the results are presented in percentages. Chi-square test or Fisher exact test was applied for dichotomous variables. For continuous variables, t test was used for normally distributed variables. P value of less than 0.05 was considered statistically significant.

Results:

All 40 patients included in the study were men. The mean age of all 40 patients was 28 years with a mean deviation of 5.6 years, and was distributed evenly between both groups. Also, the mean body mass index of all 40 patients was 25.5, with a mean deviation of 3.45. The mean operative time for the DT group (45.65 minutes) was determined to be less than the LF group (58.5 minutes), and this difference was found to be significant (p < .001; Table I).

S. no	Variable	Overall mean	DT mean (SD)	LF mean (SD)
		(SD)		
1	Age (in years)	28.25 (5.61)	28.65 (6.16)	27.85 (5.12)
2	Height (in cm)	165.72 (4.62)	166.55 (4.46)	164.90 (4.74)
3	Weight (in Kg)	70.15 (10.43)	70.55 (8.66)	69.75 (12.17)
4	Body mass index	25.50 (3.45)	25.33 (2.30)	25.68 (4.37)
5	Operative time (in min)	52.1 (9.2)	45.65 (5.62)	58.55 (7.41)

 Table I (Demographic findings and characteristic of the patients)

Because the patients from the DT group were treated on a daycare basis and were discharged on the same day, the mean duration of hospital stay was one day, while it was 3.35 days in the LF group. All these patients were followed up with on the third, seventh, and 14th postoperative days. Three patients (15%) from the DT group and two (10%) from the LF group developed wound infection and were managed conservatively using antibiotics as per culture sensitivity test and regular dressing. Out of the 20 patients in each group, eight patients (40%) from the DT group and one patient (5%) from the LF group developed wound dehiscence, and the difference was found to be significant (p= .020; Table 2). From the DT group, Seven out of eight patients developed wound dehiscence on the seventh postoperative day, and one developed it on the 14th day. All patients were followed for three months and there was no evidence of any recurrence.

S. no	Variable	DT n=20	LF n=20	<i>p</i> value
1	Wound infection	3 (15%)	2 (10%)	1.000
2	Wound Dehiscence	8 (40%)	1 (5%)	0.020
3	Operative time (in min)	45.65 (5.62)	58.55 (7.41)	< 0.001
	Mean (SD)			
4	Hospital stays duration (days)	1 (0)	3.35 (1.46)	< 0.001
	mean (SD)			

Table II (Comparison of variables like complications, operative time and hospital stay)

Discussion-Treatment of PSD depends upon the complexity of the tract. Simple single tracts can be managed through minimally invasive techniques, such as laser or video-assisted ablation and the Bascom or Mosh Gibs procedure. Meanwhile, for complex sinuses procedures like Karydaki, Limberg or V-Y advancement flaps can be used. ¹¹Different surgical and non-surgical procedures have been described for PSD management in literature, but most of these studies were underpowered and lacked robustness.¹²

The technique of de-epithelialization has been used in the past for various plastic and reconstructive procedures, such as covering defects post-resection in oral cancers and exposed tendons.¹³⁻¹⁵ In their technique of De-epithelialization, Dandin et al. (2018) intended to flatten the natal cleft, thereby reducing the chances of recurrence.⁹ They inferred no recurrence after a median follow-up period of 9 months. Also, there was only one case of partial dehiscence in an overweight patient with a history of hypertension. In our study, 40% of patients from the DT group developed wound dehiscence compared to only 5% of the patients from the LF group, which was significant (p=0.020). This corroborates the fact that midline closures lead to an increased likelihood of wound dehiscence and infection.⁸ In a randomized controlled trial, Rashidian et al. (2014) compared three surgical methods: lay open technique, simple primary closure, and procedure.¹⁶ flap They rhomboid concluded that wound healing had a shorter course in primary closure and

rhomboid flap procedure than the lay open method. Recurrence rates were also less in the previous two groups in comparison to the lay-open method. Infection and hemorrhage were more common in lay layopen. Horwood et al. (2012) in their metaanalysis compared the Karydakis midline primary closure and the rhomboid flap procedure. They concluded lower rates of recurrences and dehiscence with rhomboid flap however no significant difference was found for pain scores, hospital stay, or return to work timelines.¹⁷

Midline closure results in more tissue tension leading to more complications.^{18,19} To avoid these complications alternative procedures were adopted with lateral, oblique, or incisions in the buttock which led to ugly scars and asymmetrical buttocks.^{20,21} Good cosmetic results and fewer surgical scars are factors to be considered while determining surgical options. Early discharge from the hospital and early mobilization could be other factors for wound dehiscence. Wound dehiscence and infection also affect the quality of life. Conversely, other methods like LF and endoscopic procedures reduce hospital stay duration and pain and improve quality of life.^{22,23} The mean operative time for the DT group was approximately 15 minutes less than the LF group and was found to be significant, but

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it did not contribute to patient recovery and final healing. A systematic review conducted by Huurman et al. (2023) observed that the non-excisional technique has a good recovery rate and less morbidity, but recurrence rates are high and range from 0-29%.²⁴ Also, early complications like dehiscence and wound infection cater as risk factors for the recurrence of disease.²⁵ Milone et al. (2016) in their multivariate analysis concluded that distance of sinus opening from midline and previous history of pilonidal sinus surgery present as independent predictors of postoperative complications.²⁶ Most of our observations were comparable with those obtained by Dandin et al. (2018; median age 28 years versus 25 years, body mass index 25.5 versus 26.6, operative time 45.65 min versus 43 min for the DT group) except for the complication rate in the form of infection and dehiscence. They had only one case of wound dehiscence (2.5%) in comparison to eight in our study (40%; Figure-3).¹⁰



Figure 3- Complications seen in both the procedures

 A) Post-operative infection in De-epithelialization technique, B) Post-operative infection in Limberg flap procedure, C, D) Dehiscence in Deepithelialization technique.

In their meta-analysis, Bi et al. (2020) concluded that the LF has more incidences of dehiscence and seroma formation than the Karydakis flap method, but these complications are reduced in the modified LF technique .²⁷ Though the LF technique has limitations concerning complications in previous studies, when compared with the DT in our study, the LF procedure had fewer complications.

Limitation of the study- A larger sample size should be considered to compare both techniques in detail. Also, only the shortterm complications were taken into account in this study. Long-term complications like recurrence need longer follow-ups. Only cases with simple solitary sinus tracts were considered in this study. These techniques need to be implemented on complex sinus tract and recurrent cases as well.

Conclusion- Though DT is a daycare surgical excision procedure based on the principle of flattening out the natal cleft, it is still based on the midline closure of the

defect resulting in wound dehiscence in a significant number of cases. The conclusion that we arrived at is that complication rates are lower in the LF method than in the DT, though the latter provides shorter operative time and hospital stay.

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6.Mathur Mohit Kumar, 7.Kumar Satendra
Work concept and design 1,2, 4
Data collection and analysis 1,2,3
Responsibility for statistical analysis 1,5
Writing the article 1,2,3,4
Critical review, 1, 2, 3, 4, 5, 6, 7
Final approval of the article 1, 2, 3, 4, 5, 6, 7
Data validation and confirmation with other hospital resources 3

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.

Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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