Limberg versus modified Limberg flap in the management of pilonidal sinus

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Received: 6 August 2021
Revised: 4 September 2021
Accepted: 9 September 2021
Published: xx Month 2021

The Egyptian Journal of Surgery 2021, 40:1379–1383

Background
Sacrococcygeal pilonidal sinus is a common disease in young adults with male predominance causing significant morbidity. There is no ideal method for the management of pilonidal sinus. Limberg flap is a technique for managing pilonidal sinus that provides eradication of the sinus and tension-free wound closure; however, the lower end of the wound is found at the midline near the anus getting liable for maceration, infection, and acts as an entry for loose hair predisposing recurrence risk.
Patients and methods
In all, 92 patients with primary pilonidal sinus disease were subdivided into two groups. Group 1 patients were managed by the classic Limberg flap, while, group 2 patients were managed by a modified Limberg flap.
Results
Group 1 included 46 patients with a mean age of 25.48±5.403 years and 46 patients in group 2 with a mean age of 24.15±4.789 years. The disease duration was 14.2174±5.8686 months in group 1 versus 15.6739± 5.812 months in group 2; *P* values were 0.216 and 0.235, respectively. Wound maceration was higher in group 1 than in group 2, *P* value of 0.014. There was disease recurrence in two patients in group 1 while there was no recurrence in group 2 (*P*=0.495).
Conclusion
The modified rhomboid flap technique is a good option for the management of pilonidal sinus disease. It shifts the lower end of the wound away from the midline that decreases wound maceration and may decrease the possibility of disease recurrence.

Keywords:
Limberg flap, natal cleft, pilonidal sinus

Egyptian J Surgery 40:1379–1383
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1110-1121

Introduction

Sacrococcygeal pilonidal sinus is a common disease in young adults with male predominance causing significant morbidity. The incidence is ~26 per 1 00 000 people [1,2]. Pilonidal sinus disease is rare both before puberty and after the age of 40 years. It can be presented with a variety of symptoms. It may be asymptomatic or may be presented with acute abscess formation. In its chronic phase, there is intermittent or continuous purulent or serous discharge from the sinus openings, either the midline (primary) opening or from an eccentric (secondary) opening [3].

The etiology of the pilonidal sinus is a matter of controversy. This condition was suggested to be congenital in origin. Now it is generally considered an acquired pathology. A widely accepted view is that the disease is caused by local trauma, poor hygiene, excessive hairiness, and the presence of a deep natal cleft [4,5].

Till now there is no ideal method for the management of pilonidal sinus. Limberg flap is a technique for managing the pilonidal sinus that provides eradication of the sinus and tension-free wound closure. Moreover, it eliminates the predisposing factors for pilonidal sinus formation by reducing the depth of the natal cleft [6,7].

The lower end of the wound after its closure using the Limberg flap is found at the midline near the anus. This wound site is liable to maceration, infection, and acts as an entry for loose hair.

In this study, we aimed to compare the classic Limberg flap with the modified Limberg flap technique where

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the lower end of the excised rhomboid is shifted 2 cm paramedian.

Patients and methods

This is a prospective randomized controlled trial study from February 2018 to March 2021. This study was approved by the local ethics committee of the Faculty of Medicine, Zagazig University. Informed written consent was obtained from all patients.

Inclusion criteria: male patients with primary pilonidal sinus disease.

Exclusion criteria: recurrent pilonidal sinus, acute exacerbation of the disease, diabetic patients, obese patients with BMI more than 35, and female patients. We did not adopt the Limberg flap for primary pilonidal sinus in females due to cosmetic considerations.

Ninety-two male patients with nonrecurrent pilonidal sinus in the chronic stage without active infection were identified. The patients were randomly subdivided into two groups using the closed envelop method of randomization.

Group 1: the patients in this group were managed by the classic Limberg flap. Methylene blue was injected through the sinus openings to mark all branches of the sinus. All tracts were resected en bloc with a rhomboid-shaped excision. A Limberg flap, a fasciocutaneous flap, included skin, the subcutaneous fat, and fascia over the gluteal muscle. The flap was prepared from the right or left gluteal region. After careful hemostasis, a suction drain was inserted and placed over the presacral fascia. The subcutaneous layer was approximated using 3-0 polyglactin interrupted sutures. The skin was closed by 3-0 polypropylene subcuticular stitches that were reinforced by interrupted polypropylene stitches or staples.

Group 2: the patients of this group were managed by a modified Limberg flap, where the lower angle excised rhomboid was shifted paramedian for 2 cm (Fig. 1). The anatomic bands between the dermis and the underlying fascia of the midline sulcus were fully mobilized to allow free transposition of the Limberg flap to cover the rhomboid defect. The Limberg flap was taken from the contralateral side of the shifted lower angle of the excised rhomboid (Figs 1 and 2). By this technique, there was no wound in the midline and the lower part of the sutured final wound was shifted away from the midline (Figs 2 and 3).

Figure 1

Preoperative marking for the modified Limberg flap. Notice the lower angle of the rhomboid was shifted off the midline, 2 cm to the right.

Figure 2

Modified Limberg flap before skin closure.

All patients received postoperative oral 1 g sulbactam–ampicillin twice daily and oral metronidazole 500 mg three times per day for 10 days. Wound dressing was done every other day till the removal of stitches. The suction drain was removed when it drained 30 ml or less serous fluid.

Patients were followed up at the outpatient clinic weekly during the first month postoperatively, then every 2 months for at least 6 months postoperatively.

Statistical analysis

The collected data were analyzed by a computer using the Statistical Package of Social Services, version 25 (SPSS). Data were represented in tables. The results were considered statistically significant when the significant probability was less than 0.05 ($P<0.05$) and a P value more than or equal to 0.05 was considered statistically insignificant.

Results

Group 1 included 46 patients with a mean age of 25.48 ±5.403 years, and group 2 had 46 male patients with a mean age of 24.15±4.789 years. The disease duration was 14.2174±5.8686 months in group 1 versus 15.6739 ±5.812 months in group 2. There was no statistical difference between the two groups regarding age and preoperative disease duration; P values were 0.216 and 0.235, respectively (Table 1).

Wound maceration was higher in group 1 (11/46 patients) than in group 2 (2/46 patients), and this was statistically significant with a P value of 0.014.

Figure 3

The final picture of the modified Limberg flap after skin closure. Note the lower end of the wound was shifted away from the midline.

Wound macerations were found at the lower end of the wound, where it was located in the intergluteal sulcus (Fig. 4). Only one patient developed wound infection in group 1, while there was no wound infection in group 2, P value more than 0.05. There was a recurrence of the disease in two patients in group 1 while there was no recurrence in group 2, but this was statistically insignificant (P=0.495) (Table 2). The recurrence was found at the lower end of the suture line (Fig. 5). The recurrence was noticed within the postoperative follow-up at the second and fourth months postoperatively in the two patients.

The time taken to sit on the toilet postoperatively without pain was 4.2174±0.94 days in group 1 versus 4.54±1.26 days in group 2. There was no statistically significant difference between the two groups of patients regarding the time taken to sit on the toilet without pain postoperatively (P=0.163) (Table 1).

There was no flap ischemia or wound dehiscence in both groups of patients.

Figure 4

Maceration at the lower end of the wound in the classic Limberg flap.

Table 1 The patient age, preoperative disease duration, and the time to sit on the toilet without pain after surgery

	Groups	Mean	SD	P value
Age	Group 1	25.48	5.403	0.216
	Group 2	24.15	4.789	
Disease duration in months	Group 1	14.2174	5.86861	0.235
	Group 2	15.6739	5.81207	
Time to sit freely on the toilet after surgery	Group 1	4.2174	0.94076	0.163
	Group 2	4.5435	1.25974	

Table 2 Postoperative complications

	Groups [*n* (%)]		*P* value
	Group 1	Group 2	
Maceration			
No	35 (76.1)	44 (95.65)	0.014
Yes	11 (23.9)	2 (4.35)	
Infection			
No	45 (97.83)	46 (100)	1.000
Yes	1 (2.17)	0	
Recurrence			
No	44 (95.65)	46 (100)	0.495
Yes	2 (4.35)	0	

Figure 5

Recurrence after classic Limberg flap.

Discussion

Pilonidal disease is a common disorder affecting young adults with male predominance. It is a benign disease that causes morbidity and socioeconomic burden. Several methods have been used for the management of the disease including conservative treatment, excisional methods, and flaps. Many authors claimed that flap techniques are superior to primary closure and lay-open techniques. However, no optimal approach with low complications and recurrence rates has been achieved yet [8,9].

The lay-open technique allows the wound to heal by secondary intention. This technique has a shorter length of hospital stay and a lower rate of recurrence. The disadvantages of this method include prolonged wound healing and the requirement of wound dressing for a longer period. However, some studies have reported that postoperative infection is observed more frequently in the lay-open technique than in the primary closure or methods involving flap transposition [3,9,10].

Excision and primary closure technique is a simple procedure. The tension on the suture line and hair accumulation in the deep midline cleft can limit the overall success of the procedure and lead to high recurrence rates [8,11].

Simple procedures that include excision and packing, excision and partial closure, excision with primary closure, and marsupialization are often associated with high recurrence rates [7]. These simple techniques did not eliminate the predisposing factors for pilonidal sinus. Hodgson and Greenstein [12] reported that 60% of their patients treated by incision and drainage or excision with marsupialization had recurrence. Edwards [13] reported a 5-year evaluation of local excision and found an overall recurrence rate of 46%.

Flap techniques not only close the wound after the excision of the sinus area but also offer a tension-free closure and eradicate the etiology of the disease by flattening the natal cleft with much less hairy fasciocutaneous flaps and less sweating [6,14–16].

Limberg flap flattens the intergluteal cleft. One of the most distressing disadvantages of the Limberg flap is the relatively poor wound healing at the lower pole of the flap, which is found in the midline near the anal canal where serious maceration and wound dehiscence can be seen [17]. This may contribute to the recurrence after the Limberg flap surgery. Recurrence may be contributed to the presence of a midline wound that acts as a portal for hair entry [18].

The Limberg flap was modified by performing asymmetric rhomboid excision by placing the lower angle of the rhomboid 1–2 cm lateral to the natal cleft. This modification was assumed to decrease the maceration and recurrence rate at the suture line [17].

In this study, there was a significantly higher rate of wound maceration at the lower end of the suture line in group 1 and 11 (23.9%) versus two (4.35%) in group 2. This was in agreement with a study conducted by Akin *et al.* [19] on 416 patients comparing the classic Limberg flap and its modification. They found the maceration rate to be higher in the classic Limberg flap (9.04%) than the modified Limberg (1.95%). But the

rate of wound maceration was higher in both groups in our study than that in the study of Akin *et al.* [19].

In this work, there was no hematoma or wound dehiscence among patients of both groups. Only one patient developed wound infection in group 1 that was managed conservatively by repeated wound dressing. There was no recurrence in group 2, while there was recurrence in two (4.35%) patients in group 1. Although the recurrence rate was higher among patients treated by the classic Limberg flap,this was statistically insignificant.

Hussain *et al.* [20] conducted a study on 21 patients with primary pilonidal sinus treated by the modified Limberg flap, They found that 2/21 (9.5%) patients had wound dehiscence that required surgical closure under local anesthesia. Also, the incidence of wound hematoma in their study was 1/21 (4.8%) and the recurrence rate was 1/21 (4.8%).A study carried out by Heggy *et al.* [21] showed that there was no recurrence among 18 patients treated by the modified Limberg flap.

In a study conducted by Akin *et al.* [19], the recurrence rate was 4.7% (10/211 patients) among patients with classic Limberg flap versus 0.97% (2/205 patients) among patients treated by the modified Limberg flap; this was statistically significant with a *P* value less than 0.05.

In this study, the time taken to sit on the toilet postoperatively without pain was 4.2174±0.94 days in group 1 versus 4.54±1.26 days in group 2 (P=0.163). There was no significant difference between both groups.

Tavassoli *et al.* [22] reported a shorter period to sit on the toilet without pain, 6.9 days in the Limberg flap group. This was significantly shorter than the primary repair group.

Conclusions

The modified rhomboid flap technique is a good option for the management of pilonidal sinus disease. It shifts the lower end of the wound away from the midline that decreases wound maceration and may decrease the possibility of disease recurrence.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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