



Comparison between Limberg Flap and Simple Closure Methods for the Treatment of Sacrococcygeal Pilonidal Sinus

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Authors' contributions

This work was carried out in collaboration among all authors. Author HKA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MAS managed the analyses of the study. Authors SMJ and ABA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background and Aim: Pilonidal sinus is a common disease in young adults that accounts for high postoperative morbidity and patient discomfort. Implementation of comparative studies on the effectiveness of different techniques for the treatment of sacrococcygeal pilonidal disease can help resolve the ongoing controversies regarding the standard surgical approaches for the disease. Regarding this, the present study aimed to compare Limberg flap and simple closure methods in the treatment of patients with sacrococcygeal pilonidal disease.

Materials and Methods: This randomized clinical trial was performed on 148 patients with pilonidal sinus referring to Besat Hospital, Hamadan, Iran, during 2015-2017. The study population was divided into two groups of simple closure and Limberg flap (n=74 in each group). The pain severity was measured by means of visual analogue scale (VAS) in two stages, namely 1, 7 days after the

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surgery. The two groups were compared in terms of infection and recurrence rates, length of hospital stay and time to return to work.

Results: The mean age of the participants was obtained at 23.8 ± 8.1 years and 70.3% of them were male. The mean length of hospital stay was 40.18 ± 15.62 h (range: 10.75-80.75 h). The results revealed no significant difference between the two groups considering the length of hospital stay ($P=0.105$). The comparison of two groups in terms of VAS score ($P=0.001$) and time to return to work ($P=0.007$) showed a significant difference between them a day after the operation. Recurrence was observed in 8.1% and 5.4% of the patients undergoing simple closure and Limberg flap, respectively. There was no significant difference between the two groups in terms of the rates of recurrence ($P=0.79$) and postoperative infection ($P=0.42$).

Conclusion: As the findings indicated, the patients undergoing the Limberg flap approach had a shorter length of hospital stay and time to return to work in comparison to those managed with the simple closure technique. Consequently, Limberg flap method can be preferred over the simple closure, especially with regard to its fewer complications.

Keywords: Pilonidal sinus; simple closure, limberg flap; recurrence rate.

1. INTRODUCTION

Sacrococcygeal pilonidal disease (SPD) is a complex condition with different symptoms and manifestations ranging from asymptomatic pits to painful draining lesions [1,2]. This condition refers to the chronic inflammation and infection of the sacrococcygeal region in which the pilonidal sinus is extended from the skin of the natal cleft up to the presacral fascia. The presence of tufts of hair is the unique feature of the sinus, which is observed in 60% of the cases [3]. Sacrococcygeal pilonidal sinus is a disabling disorder that can lead to remarkable morbidity and loss of work days [4]. The main complaints of patients with sacrococcygeal pilonidal include pain, intermittent discharge, and intermittent abscess formation [5,6].

The treatment of sacrococcygeal pilonidal requires a wide excision of the sinus and the underlying hair nests [5]. There are many surgical and nonsurgical approaches for the treatment of SPD, ranging from phenol use to complex advancement flap. However, given the high complication and recurrence rates of this condition, the introduction of an optimal treatment is very difficult [7]. Lateralizing surgical flap techniques are designed based on the principles of Karydakias flap, Limberg flap, and modified Limberg flap [7-10]. Today, the use of flap techniques has been increased at many centers given their high success rates.

The complications and recurrence rate of this disease are not fully predictable. It seems that the Limberg flap techniques result in lower recurrence and complication rates than the simple closure and other flap approaches [8].

One of the main limitations of primary repair is the creation of dead space under the wound, which may lead to blood accumulation and trauma [11]. Primary repair is accompanied by high morbidity. The recurrence rate of SPD following the use of this approach has been reported as 7-42%, while it was estimated at 0-3% in the Limberg flap approach [12].

In the previous study limberg flap is mostly used for patients with relapse, but in this study, the present study was conducted to compare the efficiency of two surgical therapeutic techniques, namely Limberg flap and simple closure, in the treatment of patients with SPD without relapse.

2. MATERIALS AND METHODS

This randomized clinical trial was performed on 148 patients with pilonidal sinus referring to Besat Hospital in Hamadan, Iran, during 2015-2017. Patients with symptoms of pylonidal sinus are referred to a general surgery clinic, and selected who diagnosis of pylonidal sinus was confirmed for them. The inclusion criteria were: 1) presence of an underlying disease, 2) previous surgery, 3) infection of pilonidal sinus, and 4) emergence of acute pilonidal abscess. Exclusion criteria were: 1) presence of an underlying disease, 2) previous surgery for pilonidal Dx, 3) infection of pilonidal sinus, and 4) emergence of acute pilonidal abscess. 5) Recurrent pilonidal Dx.

After the identification of the patients meeting the inclusion criteria, the study population was divided into two groups ($n=74$ in each group). Randomization was initially done before surgery using a sequentially numbered series of cards.

Before the surgery, all patients received single-dose antibiotic prophylaxis. After shaving the affected site, the patients were placed in the prone position, and the site of surgery was washed by betadine. Both groups were subjected to a similar anesthetic approach. Simple closure and Limberg flap techniques were applied in the first and second groups, respectively.

2.1 Surgical Technique

1. Simple closure group: In the simple closure group, two lunate cuts were made on the skin of the affected area up to the subcutaneous fat. Subsequently, the cysts were removed completely up to the aponeurosis, along with a small amount of the surrounding fat.
2. Limberg flap group: In the Limberg flap group A rhombic-shaped excision of the sinus-bearing skin and subcutaneous tissue up to the pre-sacral fascia was done by electrocautery (Fig. 1A) (Fig. 1B). Then elevation of perforator-based Limberg flap (Fig. 1C) in the same manner and the level of dissection was pre muscular fascia, good haemostasis was achieved and the adhesive tapes which retracted the buttocks were released to allow suturing of the flap without tension A right or left sided fasciocutaneous Limberg transposition flap, incorporating the gluteal fascia, was fully mobilized on its inferior edge and transposed medially to fulfil the Limberg defect (Fig. 1D). The defect thus created was closed in linear fashion (Fig. 1E). Interrupted Vicryl 2-0 sutures to include fascia and fat were placed over a vacuum drain, and then the skin was closed with nylon 3-0 sutures or skin staples. The operation produces a tension-free flap of unscarred skin in the midline (Fig. 1F). Antibiotics were given for 7 days initially intravenously, then orally, suction drain removed after 2 days, sutures or staples removed around 8th day.

The pain severity was measured by visual analogue scale (VAS) in two stages, namely one and seven days after the surgery. The patients were discharged based on the amount of wound drainage and the need for opiate. All patients were suggested to continue visiting the physician and followed up for 3 months.

2.2 Statistical Analysis

The data were analyzed in SPSS software (version 17) using the t-test and Chi-square test.

P-value less than 0.05 was considered statistically significant.

3. RESULTS

The study population consisted of 104 (70.3%) males and 44 (29.7%) females. According to the results, the mean age of the participants was 23.8 ± 8.1 years (range: 16-45 years). Table 1 presents the demographic information in each of the treatment groups. The mean length of hospital stay was 40.18 ± 15.62 h (range: 10.75-80.75 h). Furthermore, the mean time to return to work was obtained at 16.27 ± 10.1 days (ranged: 6-34 days) after discharge. Table 2 demonstrates the mean length of hospital stay, VAS score, and time to return to work 1 and 7 days postoperation.

The obtained results revealed no significant difference between the two groups in terms of the mean length of hospital stay ($P=0.105$). However, the comparison of the two groups in terms of VAS score showed a significant difference between them a day after the operation ($P=0.001$). Nonetheless, there was no significant difference between the two groups in this regard 7 days postoperation ($P=0.49$). Additionally, the two groups were significantly different considering the mean time to return to work ($P=0.007$).

Recurrence was observed in 7.6% ($n=10$) of the cases after 90 days. In this regard, 8.1% ($n=6$) and 5.4% ($n=4$) of the patients in the simple closure and Limberg flap groups showed recurrence, respectively. In the Limberg flap group, recurrence did not lead to flap failure, and it was managed with reoperation. There was no significant difference between the two groups in terms of the recurrence rate ($P=0.79$).

Based on the data, postoperative infection at the surgical site was observed in 9.5% ($n=14$) of the patients, the severity of which ranged from mild to severe. The frequencies of postoperative infection were obtained at 5.4% ($n=4$) and 13.5% ($n=10$) in the Limberg flap and simple closure groups, respectively. The results demonstrated no significant difference between the two groups regarding the infection rate ($P=0.42$).

4. DISCUSSION

In the present study, the mean length of hospital stay was 40 h. As the findings indicated, this variable was not significantly different between



Fig. 1. A-F Stages of surgery in the group of Limberg flap patients

Table 1. Demographic information of the research groups

Variable			Simple closure	Limberg Flap	P-value
Age (year)	Mean		23.87	23.81	0.9
	SD		9.15	7.03	
Gender	Female	Number	28	16	0.27
		Percent	37.5	21.8	
	Male	Number	46	58	
		Percent	63.5	78.2	

Table 2. Mean length of hospit stay and visual analogue score one and seven days after operation in the research groups

Variable	Limberg flap		Simple closure		P-value
	Mean	SD	Mean	SD	
Length of hospital stay (hour)	43.35	16.38	37	14.37	0.105
Time to return to work	11.61	8.62	18.67	11.5	0.007
One day after operation	28.4	99	28.3	37.1	0.001
Seven days after operation	84.1	87	3.2	37.1	0.49

the patients undergoing the Limberg flap technique and those subjected to the simple closure method. However, the two groups were significantly different in terms of postoperative VAS score and time to return to work. Overall, the patients had a recurrence rate of 7.6%. In line with the literature, in the current study, SPD was more common among the young male. The mean age of our patients was 23.8 years, which is slightly lower than the values reported in other studies [6,13,14].

There are a number of nonsurgical options for the treatment of SPD; however, the surgical approach is the treatment of choice. So far,

various techniques, ranging from simple closure to wide flap methods, have been proposed for the treatment of this medical condition. The elimination of the natal cleft to take off the anatomical predisposition to the sinus recurrence is the main purpose of the therapies addressing SPD. However, no specified technique has been introduced to be superior to other methods in all aspects. There are a number of comparative studies targetted toward the determination of the relatively superior therapeutic procedures for this medical condition [3].

Based on the evidence, the Limberg flap method has a recurrence rate of 0-3%, while the primary

closure technique has a rate of 7-42%. Given the facilitation of the extensive dissection of the sinus tracts and provision of shallower cleft by flap procedures, it seems that this approach is better than the other techniques in controlling the disease recurrence [3,9,15,16]. The ability of a procedure to decrease the depth of the natal cleft is determinative of the recurrence of the SPD.

In the aforementioned studies, true recurrence is considered as the opening of the previous operative scar; however, the recurrence and the second recurrence are not well defined in the majority of these studies. In a performed by study Dass et al. the recurrence rate was slightly higher than the value reported in the other studies [3]. In our study, the total 3-month recurrence rate was obtained at 7.6%. In this regard, 8.1% and 5.4% of the patients subjected to the simple closure and Limberg flap techniques experienced the recurrence of the disease, respectively. However, in the Limberg flap group, recurrence did not lead to flap failure, and it was managed with reoperation.

In a study, Cihan et al. investigated three surgical approaches, namely primary closure, Limberg flap, and modified Limberg flap, for the treatment of SPD. They reported a lower recurrence rate in the patients undergoing modified Limberg flap in comparison to those subjected to primary closure after a 4-year follow-up. However, they observed no significant difference between the primary closure and Limberg flap groups in terms of recurrence rate [17]. Similarly, in the current study, there was no difference between the primary closure and Limberg flap groups in this regard.

Secondary repair using Limberg flap as a proper method with few complications and favorable long-term outcomes has been suggested in some studies [18]. In a prospective study conducted by Abdelraheem et al. the patients in the Limberg flap group had lower postoperative pain in comparison to those subjected to the simple closure method. Moreover, postoperative infection and recurrence rates were lower in the patients receiving Limberg flap than in those undergoing the excision of the sinus through the primary closure technique [5].

In the current research, the patients receiving the Limberg flap surgical technique had fewer late and early complications, compared to those subjected to the simple closure method. This approach is applicable in pilonidal cyst after

controlling the infection. In the same vein, in a study performed by Cihan et al. the postoperative infection rate was lower in the Limberg flap and modified Limberg flap groups in comparison to that in the primary closure group [17]. However, in our study, there was no difference between the two groups in terms of postoperative infection rate.

The study of the complications of primary closure and Limberg flap showed that the hematoma or seroma is more frequently observed in the patients undergoing the Limberg flap technique. On the other hand, the primary closure procedure was accompanied by more frequent pain, wound infection, and wound disruption. The difference between these methods may be due to the wide dissection in the flap technique and strained wound at the basin of the natal cleft for the primary midline closure.

The rate of wound infection for the simple closure method has been estimated at 5-12.4% [8,19,20]. However, this rate has been reported as 1.5- and 0.9-6.5% for the Limberg flap technique [9,16,19,21]. In our study, primary closure and Limberg flap methods were accompanied by the wound infection rates of 13.5% and 5.4%, respectively. In a study performed by Dass et al. the immediate complication rates for the primary midline closure and Limberg flap groups were reported as 20% and 12%, respectively [3]. Based on these data, it can be concluded that the primary closure technique is accompanied by more immediate postoperative complications than the Limberg flap method.

Similar to our findings, in a study carried out by Eryilmaz et al. the mean length of hospital stay was 3 days and time to return to work was reported as 15 days [9]. Based on various studies, the length of hospital stays after undergoing one of these two procedures is between 1 and 5 days. Our results showed no difference between the simple closure and Limberg flap groups, which is in line with the results reported in the literature [3]. However, the results of the present study showed a difference in time to return to work between the Limberg flap and simple closure groups.

Financial burden is the main issue that should be considered in the surgical management of SPD. According to the literature, time off from work for the Limberg flap was estimated to range from 7 to 17.5 days [16,22]; however, it was between

21-23 days for the primary closure technique [23,24]. Dass et al. showed shorter time off from work for the Limberg flap group than for the primary closure group [3]. Similarly, in a prospective study performed by Abdelraheem et al. the patients in the Limberg flap group returned to work earlier than the simple closure group [5]. In addition, Cihan et al. reported better results for both Limberg flap and modified Limberg flap methods than for the primary closure technique regarding mobilization time, discharge, and time off from work [17].

Some studies have targeted the operative period for the Limberg flap and simple closure techniques. While a couple of studies have indicated no difference between the two approaches in this regard [3,23], there is a study demonstrating a significant difference between the groups [19]. There are a limited number of studies comparing operative period between the primary closure and Limberg flap techniques. Based on Akca et al. there was a significant difference between primary closure (45 min) and Limberg flap (60 min) techniques in terms of the operative period [19].

5. CONCLUSION

Our findings demonstrated that the patients undergoing the Limberg flap surgical approach had a shorter length of hospital stay and earlier return to work, compared to those subjected to the simple closure technique. Given the fewer complications of Limberg flap method despite its long duration, this approach can be preferred to the simple closure technique for the treatment of SPD.

CONSENT

It is not applicable.

ETHICAL APPROVAL

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran. In line with the research ethics, the participants were assured about the confidentiality of the data. In addition, informed consent was obtained from all patients. This study has been accepted by Iranian Registry of Clinical Trials (IRCTID: IRCT201710109014N195).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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