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ORIGINAL ARTICLE

How Effective and Safe is Limberg Flap in the Treatment of Pilonidal Sinus

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Abstract

Introduction: A pilonidal sinus (PS) is a disease that arises from chronic irritation and secondary inflammation of hair follicles located in the sacrococcygeal and natal region. The purpose of this study was to determine the results of patients who underwent Limberg flap with the diagnosis of PS and the effectiveness of Limberg flap.

Methods: The files of patients who were operated in our clinic between January 2015 and October 2019 with the diagnosis of PS were examined retrospectively. In addition to the demographical features of patients who have applied Limberg flap, type of the disease, the duration of the surgery, the hospitalization duration, the existence of complications after the surgery, and recurrence of the disease were analyzed.

Results: Of 212 patients included in the study, 158 (74.5%) were male and 54 (25.4%) were female. The average age of the patients was 26.3 (18–44). 8 (3.73%) of the patients had Type-1, 48 (22.6%) had Type-3, 101 (47.6%) had Type-4, and 29 (13.6%) had Type-5 diseases. Patients who had Type-5 disease were found to recur after different surgical techniques. Due to the Type-2 disease, 26 (12.2%) patients underwent abscess drainage and Limberg flap approximately 3 weeks later. The average surgery period was 42.5 (32–78) min. Wound infection has been seen in 12 (5.6%) patients and wound dehiscence has been seen in 7 (3.3%) patients. Wet dressing and primary repair were performed at the lower edge of the flap because of the local recurrence to 5 (2.3%) patients.

Discussion and Conclusion: Nowadays, though it is stated that minimal invasive methods are effective for the treatment of the disease, we believe that surgical methods are more appropriate for the treatment. Furthermore, the surgical method to be chosen should be Limberg flap that is a reliable and effective procedure with its low recurrence rates, short hospitalization period, and low rate of complications.

Keywords: Limberg flep; pilonidal sinus; surgical therapy.

A pilonidal sinus (PS) was first described by Herbert Mayo in 1833,[1,2] although it was thought to be congenital in the past, the idea of it is acquiring/acquiring is getting stronger today[3]. Kardydakis has defined three factors that set the stage for hair roots to turn in the development of the disease: (1) hair in area, (2) adequate power for hair roots to turn, and (3) the sensitiveness of the skin[4].

There are factors in the etiology such as deep intergluteal trough, hairy young adults, long time pressure or rubbing, inadequate self-care, long-term sitting work, excessive sweating, and humidity. It is often seen in the 2nd and 3rd decades of life. The incidence is three times more in males. Approximately 10% of males have PS disease in Turkey, although the frequency of females is unknown, it is estimated to be approximately 1% of the population[5]. Around

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40% of patients have a family history. The rate ratio of its association with hidradenitis suppurativa is approximately 20%[6]. Sedentary life, having a firm, and cerebriform hairs deep gaps between hips and doing a lot of work by sitting are other risk factors[7,8].

Even though a lot of methods have described for the treatment of the disease such as medical, minimal invasive, and surgical, there is no determined gold standard treatment method so far[9]. The ideal method should have a high success rate, low pain, complication, and recurrence risk and it should allow a patient to return to normal life as soon as possible[10]. The choice of the patient and the experience of the surgeon stand out as the most significant factors for the treatment of disease[11].

The disease of PS is separated into five groups in a study that is done by Tezel[12,13]:

- Type 1 - Asymptomatic sinus opening (without an abscess/drainage history)
- Type 2 - Acute pilonidal abscess
- Type 3 - Sinus opening that is limited to the navicular region that has abscess/drainage or flix history (chronic-symptomatic)
- Type 4 - One or more sinus openings outside the navicular region (chronic-symptomatic)
- Type 5 - Recurrence after any surgical treatment (Recurrence PS).

Chronic PS disease is composed of Type-3 and Type-4 disease and Recurrence PS disease is composed of Type-5 disease. The disease is generally get diagnosed based on the clinical history and physical examination findings. Physical examination findings involve sinus orifice(s) in the intergluteal trough, abscess, painful lesion(s), purulent flix, and pyogenic granuloma-like sinus openings on the gluteus. Hairs can be seen inside the sinus orifices. Acute disease is characterized by an abscess accompanied by a cellulite and fluctuant bulk. Chronical disease, on the other hand, shows indications with chronic drain sinus(s) or repeatable acute attacks[14].

The surgical treatment of chronic PS disease is divided into four groups:[14]

1. İncision and debridement
2. Excision and leave open/marsupialization
3. Excision and primary closure
4. Excision and closing with flap.

The surgical treatment is still considered the most effective treatment method for PS disease and there have been a lot of methods identified in surgical treatment until today. Considering the deep intergluteal trough, which is one of the factors in the etiopathogenesis of the disease, fixing the intergluteal trough by flap surgeries seems to be a rational approach. The most important advantage of the flap surgeries is to close the defect that occurs after removing the diseased area without any tension in the tissue and to flat the natal trough. Thus, recurrence is decreased to an acceptable rate ratio. All flap methods have their own challenges, complications, and learning periods. The most commonly used techniques are The Karydakis and Limberg (rhomboid) flaps.

Materials and Methods

The files of patients who were operated in our clinic between January 2015 and October 2019 with the diagnosis of PS were examined retrospectively. In addition to the demographical features of patients who have applied Limberg flap, type of the disease, the duration of the surgery, the hospitalization duration, the existence of complications after the surgery, and recurrence of the disease were analyzed. Necessary permissions were obtained for this scientific study.

Surgical Procedure

In the technique of Limberg Flap, a rhomboid skin incision is made by putting the sine orifices in the center and all tissues are removed as a total by descending to the presacral fascia. After the excision, a line which has equal length to the length of the rhombus is drawn that passes through the bisector of the lateral corner of the rhomboid. At the end of this line, the flap is organized by drawing another line that is parallel to the top and lower lateral edges. The bottom of the flap is raised including the fascia on the gluteal muscle, is rotated to fill the excised area, and is sutured to edges of this area. Wound lips that remain in the gluteal area are closed as primarily[15]. It should be known that if too much adipose tissue is laterally excised instead of removing the derma, the rate of seroma and hematoma may increase, deep sutures can enhance the wound complications and the pain. Hence, it is significant to be careful.

After the patient is placed on the table and post the general or spinal anesthesia[16];

- Antibiotic prophylaxis is applied
- The hips are tied and the patient is given the jackknife osition
- The hips are shaved and painted with povidone-iodine
- The sines are found and methylene blue is injected

- The tissue that is going to be excised is marked as a shape of rhomboid
- All the diseased tissues are excised till to the presacral and gluteal fascia
- Flap is formed by going down, along the gluteus maximus fascia
- Homeostasis is ensured carefully, gauze patch that impregnated hot water can be chosen
- Flap is got through and brought closer to the deep fascia with absorbable suture
- The vacuumed drain is placed under the flap
- Adipose tissue is closed with absorbable sutures
- The skin is closed with non-absorbable suture
- The oral antibiotherapy continues for 7 days
- The drain is drawn when the drain fluid reaches <20 ml/day (Fig. 1).

Results

Two hundred and twenty-three patients have undergone the Limberg Flap. Eleven patients who could not be followed up were excluded from the study. Of 212 patients included in the study, 158 (74.5%) were male and 54 (25.4%) were female. The average age of the patients was 26.3 (18–44). Eight (3.73%) of the patients had Type-1, 48 (22.6%) had Type-3, 101 (47.6%) had Type-4, and 29 (13.6%) had Type-5 diseases. Patients who had Type-5 disease were found to recur after different surgical techniques (Table 1). Due to the Type-2 disease, 26 (12.2%) patients underwent abscess drainage and Limberg flap approximately 3 weeks later. The average surgery period was 42.5 (32–78) min. The duration of hospitalization was 1.3 (1–2) days. Wound infection has been seen in 12 (5.6%) patients and wound dehiscence has been seen in 7 (3.3%) patients. Wet dressing and primary repair were performed at the lower edge of the flap because of the local recurrence to 5 (2.3%) patients. All of the local recurrences have seen in the patients who had a Type-4 and Type-5 disease.

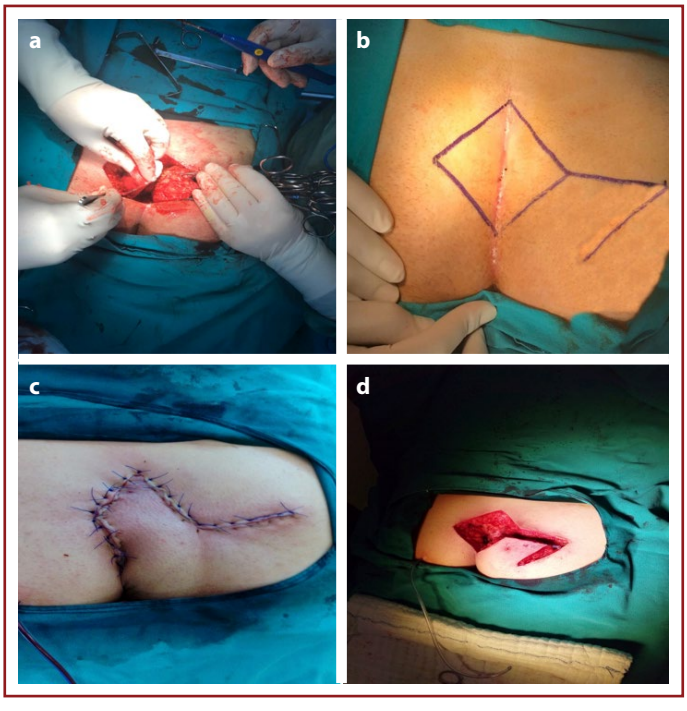

Figure 1. The Limberg technique **(a)** pre-surgical anatomical drawing of the flap with the help of a ruler and pen **(b)** Excision of the diseased tissue **(c)** Removing the flap **(d)** Closing the defect with flap.

The most common complication after surgery was wound site infection which happened to 12 patients. It all improved with the local dressing with furacin and the oral antibiotherapy. Patients, who had disintegration at the wound site, were followed up with wet dressing and the got primary sutured under local anesthesia. The surgery areas of the patients with local recurrence at the lower edge of the flap were closed by primary sutured under local anesthesia after debridement and wet dressings. Seroma, hematoma, and flap necrosis were not observed in any patients. None of the patients who developed a complication had to be hospitalized again. They all got followed up and treated in the outpatient circumstances. For a long period of time, wound site pain or paresthesia were not detected in the patients (Table 2).

Table 1. The distribution of the cases by disease type

Tip 1- Asemptomatic sinüs opening (No history of abscess/drainage)	8 (3.73%)
Tip 2- Acute pilonidal abscess	26 (12.2%)
Tip 3- The sinus openings, that are limited to the navicular region, with the history of abscess/drainage (chronic-symptomatic)	48 (22.6%)
Tip 4- One or more sinus openings outside the navicular region (chronic- symptomatic	101 (47.6%)
Tip 5- Recurrence after any surgical treatment (Relapse PS)	29 (13.6%)

Table 2. Postoperative complication rates

Wound site infection	14 (5.6%)
Hematoma	0%
Local recurrence at the lower edge of the flap	7 (2.3%)
Seroma	0%
Disintegration at the wound site	9 (3.3%)
Flap Necrosis	%0
Long time paesthaesia	%0
Long time pain	%0

In our study, all the patients have drained and have mobilized on the 1st day after the surgery. All the patients were discharged on the 1st and 2nd days, the drains were removed on the 3rd–4th days after the surgery and dressings were applied with furacin, sutures are removed between the 12th and 14th days.

Discussion

The surgical treatment of PS disease is examined into two titles as surgical and non-surgical methods. The phenols treatment (80% phenols) is one of the most preferred methods among non-surgical treatments. It helps sinus to be scleroses and to close by injecting into the sinus under the local anesthesia. Even though it has been indicated that it can be used in all types of diseases, it has been determined that the success rate is between 60% and 100% and the best result is obtained for the cases that the number of sinus orifices are between 1 and 3[17]. In a study, it has been stated that while phenols treatment is more suitable for the uncomplicated patients with 1 or 2 sinus orifices, surgical methods are more appropriate for the patients with 3 or more sinus orifices[18]. The biggest disadvantage (of phenols treatment) is that it requires repetitive sessions. Doğru et al.[19] have reported the success rate is 95% in primary cases and 91% in recurrence cases in their study. Bayhan et al.[20] have compared the technics of modified Limberg and crystallized phenols and they could not find any difference between those methods.

There are studies suggesting that the method of crystallized phenols increases the quality of life compared to the primary closure and is as effective as the technique of excision (open technique). We could not present any information about the topic since we did not have an experience of using phenols methods in our clinic during this study. However, if a surgical method is planned for the patient, we believe that the method to be chosen is Limberg flap and the technique of phenols/crystallized can be used in selected patients[21-23].

Silver nitrate has the effects of epithelium cell damage, anti-inflammatory and neovascularized with its lytic effect. It can be placed into the tract as crystal or stick. The recurrence rate is not known completely and it is recommended as an initial treatment for eligible patients[24]. It has been stated that phenols, silver nitrate, endoscopic PS treatment, cryosurgery, radiofrequency ablation treatment and fibrin glue methods can be used as an alternative to conventional surgical methods or as initial therapy in the treatment of uncomplicated patients. There are advantages and disadvantages of all the methods as well as there have not studies involving a sufficient number of patients been available yet for those methods mentioned.

Platelet-rich plasma and Negative-Pressure Wound Therapy can be applied in wide-complicated PS patients by combining surgical methods for selected patients[25,26]. However, broad research is required for both of those methods. Type-1 disease is generally not required treatment. Good personal hygiene and local hair cleaning are recommended for those patients. There is no consensus on the period of mechanical hair cleaning is performed[27]. In our clinic, we suggest for Type-1 patients to perform mechanical hair cleaning up to 6 months. In our study, although these suggestions were made and followed up, 3.7% of Type-1 patients desired to have surgery due to the current disease anxiety and the worry of getting worse in the future. Therefore, their operations were performed.

It is indicated that in Type-2 disease, abscess drainage and if it is possible cleaning the hair inside, wet dressing, oral antibiotic treatment and after the abscess has healed definitive surgical treatment are required[13]. In our study, 8.9% (26) of Type-2 patients are treated first drainage and oral antibiotics, then they are treated with the method of Limberg flap and successful results have taken. Even though the methods of incision and debridement, excision and open/marsupialization, excision and primary closing, excision and flap closing are recommended for the surgical treatment of chronic PS disease, the most important advantage of flap surgeries is that closing the defect that occurs after removing the diseased area, without any tension in the tissue and flatting the natal trough.

Studies have argued that primary closure can be used in uncomplicated disease while flap should be used in complicated and recurrent disease[28]. When compared with the open procedure and the Limberg flap, it was indicated that there was no difference in terms of post-operative infection[29] and wound healing was better in the method of Limberg flap[30]. In a study comparing the primary closure and the method of Limberg flap when the wound infection is considered, it is pointed out that the possibility to develop an infection is almost ten times lower in patients who are treated with flap method[31].

The method of Limberg flap is associated with less formation of seroma and less recurrence compared to the method of Karydakis flap[32]. Furthermore, it is specified that Limberg flap is more reliable and feasible than the method of Karydakis flap in ways of short hospitalization period (1.4–3 days), early return to work, and determining

long-term relapse rates[33].

Flap operations are, especially, recommended for the treatment of complicated (Type-4) and recurrence (Type-5) PS disease[34]. Limberg flap is one of the most commonly used methods in the surgical treatment of refractory disease. The results of this technique in terms of the recurrence of the disease (0–6%) and the tolerance of the patient are pleasing[35]. In our study, wound site infection was observed in 14 (6.6%) patients and wound disintegration was seen in 9 (4.2%) patients. Moreover, at the lower edge of the flap, local recurrence was observed in 7 (3.3%) patients. Seroma, hematoma, and flap necrosis were not seen in any patients. In the long term, wound pain and paresthesia were not observed in patients. Almost 61.2% of patients who underwent Limberg flap consisted of Type-4 and Type-5 patients. Once we added Type-3 patients who are chronic symptomatic, this rate became approximately 83.8%. Our low complication and our recurrence rates are important in the way of demonstrating that the Limberg flap has successfully applied by us and preferred in accordance with its true indication.

In a randomized study comparing the Limberg flap and the primary closure, it was found out that after Limberg flap while there was less pain, short mobilization period (1–2 days), less complication (3% and 24%), earlier return to work (9.5 and 19 days), and less recurrence rates, the duration of the operation was longer (45 and 60 min)[36]. In this study, the duration of the operation, hospitalization period and complication rates are similar to the current studies and these results prove the effectiveness and reliability of the Limberg flap.

Compared to the V-Y advancement flap, there was no difference between wound complications and hospitalization periods, while the recurrence rate was found to be low after Limberg flap[37]. Considering the deep intergluteal trough which is one of the factors in the etiopathogenesis of PS disease, fixing the intergluteal trough by flap surgeries seems to be a more rational approach. Post-operative drains reduce the incidence of fluid retention in the wound. However, it makes no difference in terms of wound infection and recurrence[38,39]. In a study involving 353 patients, the infection rate was reported as 6.5% and the seroma rate was 2.2% without the use of a drain[40]. In our study, we carefully controlled bleedings, applied a hot compress to the defect area and placed drain for all of our patients. Moreover, none of our patients has developed seroma or hematoma. Our infection rate has been determined as 6.6% in acceptable limits. Limberg and Karydakis flap methods are compared in two randomized studies and it was obtained that both of the methods produce similar clinical results. However, in a research, infectious complications were found to be higher after Karydakis flap[41,42].

Güner et al.[43] found out that the cleft lift procedure was more preferable due to the short operation span and better life quality score in a study comparing cleft lift and Limberg flap. They also, noted that there were more slightly excised tissue weight, better pain score and less physical limitation. The purpose of the treatment procedure to be chosen should be to achieve low complication and recurrence rate, to choose the method that will disrupt the patient's comfort the least, to provide short recovery and dismissal time and good cosmetic results.

Conclusion

Even though PS disease seems to be an ordinary disease, it still retains its importance because it can recur and none of the treatment methods has zero recurrence rate. Nowadays, though it is stated that minimal invasive methods are effective for the treatment of the disease, we believe that surgical methods are more appropriate for the treatment. In addition, the surgical method to be chosen should be Limberg flap that is a reliable and effective procedure with its low recurrence rates, short hospitalization period, and low rate of complications.

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