

# Plastic Repair with Limberg Flap for Sacrococcygeal Pilonidal Sinus

Diana Judith Palacios Baldoce da  
Clínica Ciudad, OSPERYH. C.A.B.A.

## FOREWORD

In this monograph the described Limberg flap technique for plastic repair is presented, specifically for the treatment of the SPS (SPS), with its results, success rates, complications and relapses. With this purpose a bibliographic search was carried out and the results were analyzed to determine conclusions.

The choice of subject is made based on my interest in this condition. It arises from my observation in the clinical practice of patients undergoing non-resective open techniques, with a high rate of delayed healing wounds and relapses which could benefit of the principles that Limberg's repair offers.

The technique is described as simple and easily reproducible as long as its principles are respected, which makes it a viable and attractive option. The above mentioned added to the bibliographic support have led to the current research.

## 1. INTRODUCTION

The pilonidal disease, also called pilonidal cyst or sinus is an acute or chronic infection that usually affects the sacrococcygeal region. It is a frequent condition to be suspected with any suppuration of the intergluteal fold.<sup>1,2</sup> It was first described by May, in 1833.<sup>1</sup> Later Anderson in 1847 call this condition "hair extracted from an ulcer".<sup>2,3</sup> In 1880 Hodges coined the term "pilonidal disease", since hairs are usually found in the cystic cavity.

The magnitude of the problem came to light for the first time during World War II when from 1941 to 1944, 78,924 soldiers were treated for this condition.

Because those who suffered from it as a common denominator had traveled for many hours in a jeep, it was called "Illness of the jeep".<sup>1</sup> Its benignity contrasts with the magnitude of their morbidity and risk of recurrence.<sup>3,4</sup>

There are various treatment modalities for the SPS, from non-resective techniques, where the sinus is unroofed and allow to healing by secondary intention, up to

the complete resection and the repair of the defect with a plastic closure. Cutaneous flaps used to cover the defect after resection decrease healing time and recurrences.<sup>5</sup> The Limberg flap is a rhomboid transposition flap. Although it has been used for other defects, its utilization has been expanded to address SPS.<sup>1,5</sup>

The objective of this monograph is to evaluate the functional results, relapse rate, and complications of this technique. To fulfill this purpose, we conducted a bibliographic search.

## 2. CONTENT

### 2.1. Definition of SPS

SPS is an acute or chronic abscess that occurs when hair gets into the subcutaneous cellular tissue favored by repeated micro-trauma on the intergluteal cleft. This cause the formation of a pseudo cystic cavity surrounded by granulation tissue and containing hairs without bulbs and with distal ends directed into the cavity depth.<sup>2,4</sup> This generates a foreign body response, and with the entry of new hairs forms the abscessed cavity that can drain through one or multiple holes.<sup>1,3</sup>

### 2.2. Epidemiology

SPS is more common in teens and young adults with an age range of 19-29 years. It is infrequent after 40 years of age. It predominates in the male gender with a 4:1 ratio and is more common in obese and sedentary patients.<sup>3,6</sup>

In France an incidence of 7,000 patients per year has been described, affecting 1% of male population and 0.1% of female population. In this same country, according to the data of the Programme de Medicalisation des Systemes d'Information (PMSI) accounts for 2,000 of the 18,000 non-ambulatory surgical procedures.<sup>2</sup> In Argentina no official data was found.

The incidence worldwide is 25 per 100,000 individuals.<sup>1-5</sup> Erkent et al. 6, in 2018 reported an incidence of 49 per 100,000 individuals.

### 2.3. Risk factors

The risk factors for this disease have been widely described.<sup>8</sup> Obesity is one of the most recognized risk factors.

Diana Judith Palacios Baldoce da  
dipabal@hotmail.com

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Increased thickness of the subcutaneous fat of the gluteal and sacrococcygeal region, and a high body mass index increase the risk. The fact that this disease affects young adults suggests an intervention of sex hormones on pilosebaceous glands. Other factors favoring the condition are hirsutism, deep intergluteal cleft which predisposes maceration and local humidity, lack of hygiene, and especially repeated micro-trauma.<sup>2-4</sup> Family history and sedentary lifestyle are other risk factors.<sup>3,7</sup>

**2.4. Symptoms**

Pilonidal disease rarely presents symptoms without an infection. Usually occurs as an inflammatory painful swelling that drains through one or multiple secondary holes that communicate with at least one of the medial holes.<sup>1,7</sup> It can also be asymptomatic or manifest in form of one or more chronic fistulas with suppurative and non-suppurative periods. Asymptomatic forms are characterized for one or more paths at the intergluteal cleft, located 4-8 cm above the anal margin, from which sometimes one or more hairs come out.

Acute abscess is usually the initial manifestation, but it can also appear in the evolution of a chronic fistula.<sup>3,7</sup> The disease may present in the form of intermittent chronic suppuration of the intergluteal fold, either as an initial presentation or after an acute abscess. Pain and suppuration appear in 84 and 78% of cases, respectively.<sup>2,4</sup> This limits daily life activity.

**2.5. Diagnosis**

The diagnosis is mainly clinical. Fistulous orifices are usually seen in the midline of the intergluteal fold as well as secondary lateral holes. In 7% of cases, exploration of the paths presents a direction to the anal canal so it can be confused with complex anal fistulas.<sup>1-7</sup> The use of complementary diagnostic methods it is only useful to rule out the anal origin of the fistulous tracts being the 360° endoanal ultrasound and the pelvic MRI of choice.<sup>8-10</sup>

**2.6. Treatment**

The ideal treatment for pilonidal disease should involve a simple technique, hospital stay and interruption of the socio-labor activities as short as possible, as well as a minimal risk of recurrence.<sup>2-4</sup> In case of an acute abscess, after spontaneous or surgical drainage it is convenient to wait for the reduction of local inflammation before radical treatment of the pilonidal sinus.

There are multiple techniques to treat this disease. Non-resective and resective techniques are described in the literature.

Non-resective techniques:

- Simple incision for drainage.

- Unroofing and curettage: Zimmerman operation.
- Unroofing and marsupialization: Well operation.

Resective techniques:

- Resection and closure by granulation.
- Resection with semi-open closure (Mc Fee technique).
- Resection and simple primary closure.
- Resection and primary closure with dermocutaneous or myocutaneous flap.<sup>4</sup>

This work describes one of the resective variants and plastic repair, the Limberg flap technique.

**2.6.1 Surgical treatment: Limberg flap technique**

This technique was described in 1946 by the Russian surgeon Alexander Limberg, and in 1966 was published in English. The author reported the resection of a dermocutaneous lesion through a rhomboidal incision and the re-

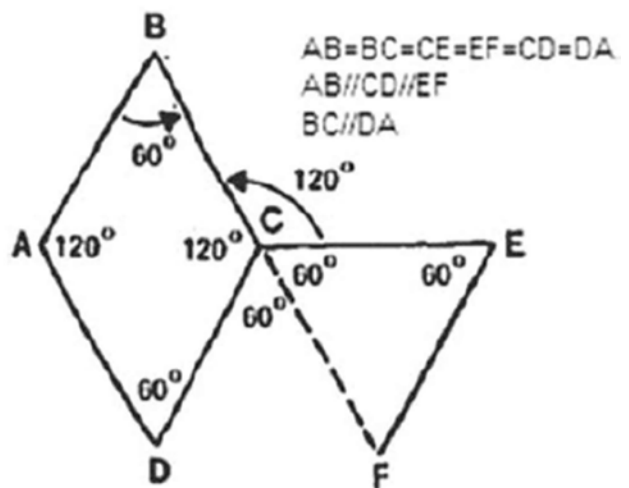


Figure 1: Geometrical image of rhomboid excision and marking of donor flap.

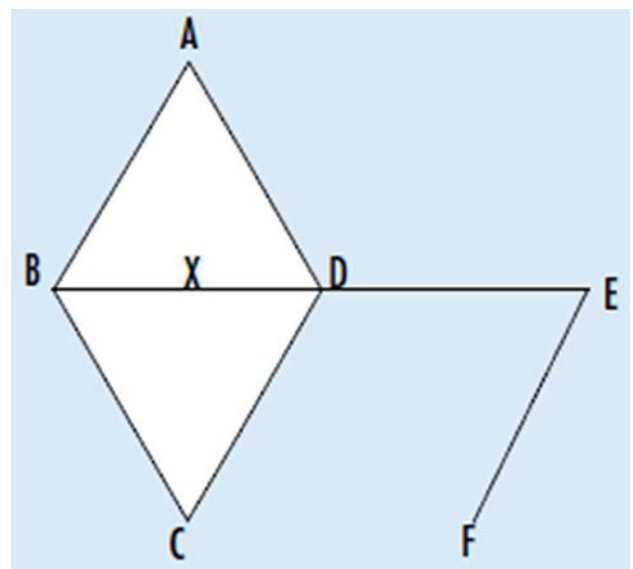


Figure 2: Line X is formed from the union of angles B and D (From Shetty et al).<sup>1</sup>

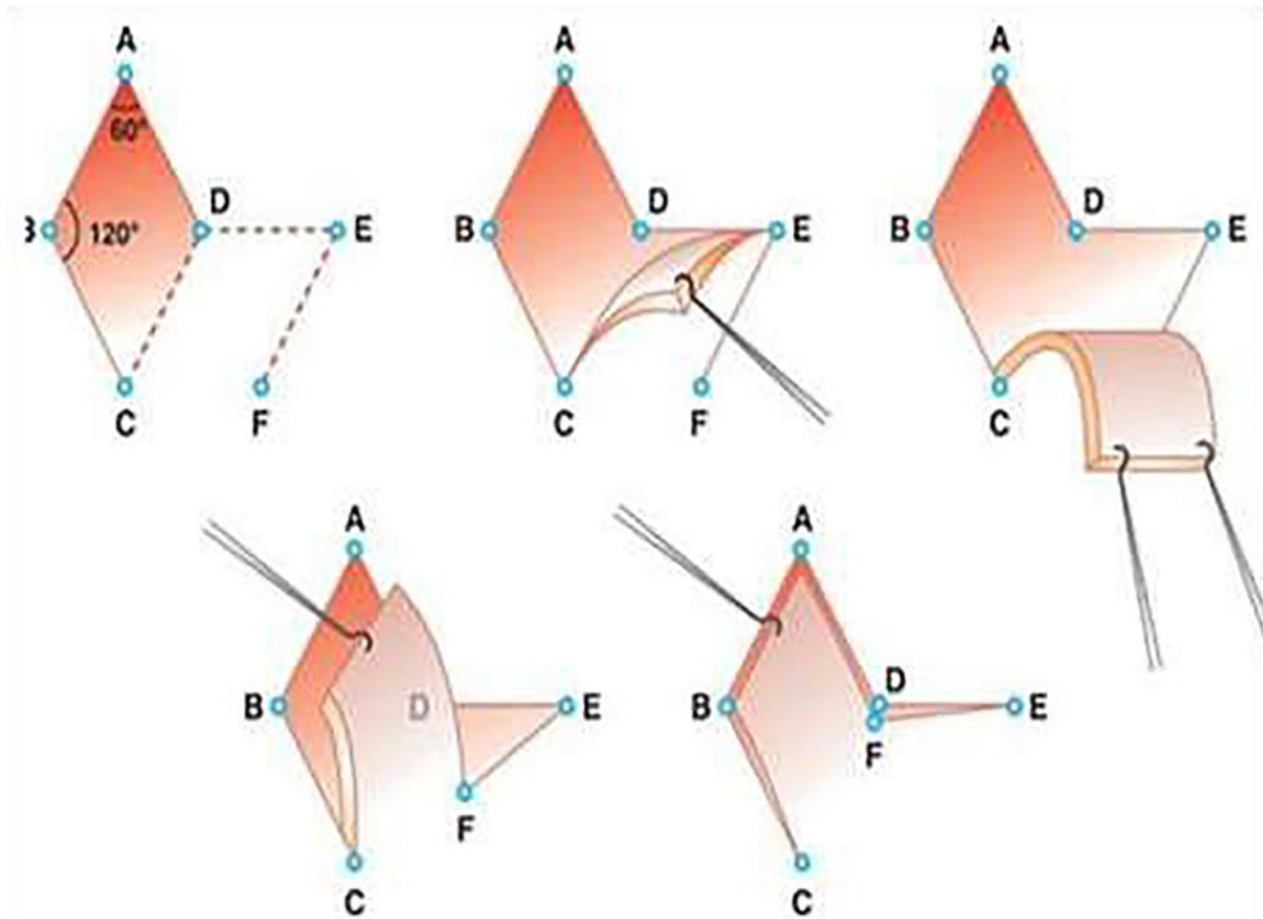


Figure 3: Resection and Limberg flap.

pair of the defect by means of an obliquely displaced rotatory dermocutaneous flap.

The making of the rhombus must respect two 60° opposite angles and the two remaining 120° angles. Since the shape of the rhombus consists of the union of two equilateral triangles, the Limberg flap design consists of prolongation of an imaginary line that divides the rhombus from the defect in the two triangles (line X) (Fig. 1 and 2). The flap is carved from one of the 120° angles and continues into a straight line as continuity of the line X and with the same extension. Subsequently the incision runs parallel to one of the sides of the rhombus forming the flap to be rotated (Fig. 3). It is important a wide dissection of the subcutaneous cellular tissue, releasing both the flap and the sides of the rhombus, so that the skin can reach without tension and in well vascularized way. The flap is transposed by rotating the flap so that the angle B of the defect coincides with the vertex D of the flap, the angle A of the rhombus coincides with the vertex E of the flap, and the direct closure of angles D and F is performed (Fig. 3).

The flap is fixed with reabsorbable suture material starting from the deep plane and performing a number of



Figure 4: Marking of the surgical field.

planes according to the thickness of the dermis, reducing the dead space as much as possible. Finally, the skin is closed and a drain is placed. This procedure allows the sutures not being in the midline, and that little tension exists to facilitate scarring. It avoids maceration, erosion and formation of medially located scars.<sup>11</sup>

It is one of the most widespread techniques for treatment of the SPS. It is simple to do, reliable, and cos-

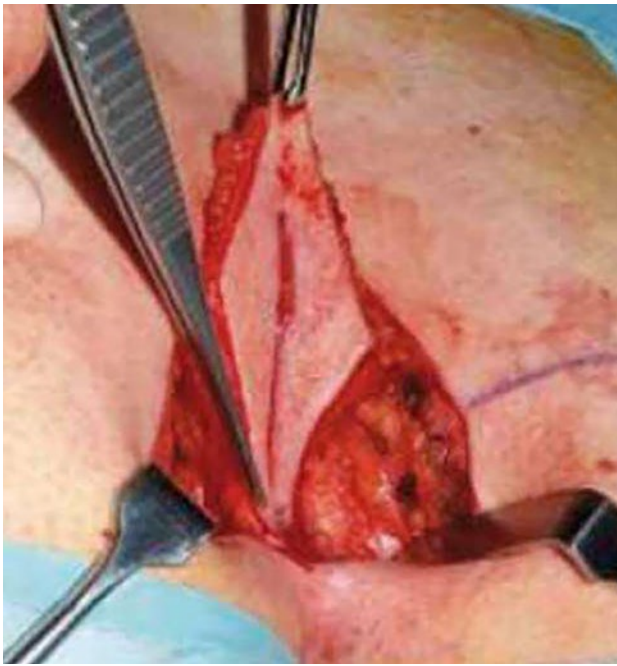


Figure 5: Resection.

metically acceptable. It is reproducible, even for surgeons with little experience in plastic surgery (Fig. 4 to 7).

### 2.6.2 Results of Limberg flap technique

According to different papers, the Limberg flap technique for the SPS has a short surgical time, a shorter healing time period, little postoperative pain, and lower rate of complications in comparison with open techniques. Additionally, the hospital stay is reduced and the recovery of daily activities precocious.<sup>1-7</sup>

#### 2.6.2.1 Duration of surgery

The surgical time is an important variable to keep in mind; there are several papers that collect data in this regard. Can et al. (2010)<sup>12</sup> reported 77 patients treated with this technique. They concluded that the average duration of the surgical procedure was  $52.8 \pm 16$  minutes. This is similar to the study by Bali et al. (2015),<sup>13</sup> with a series of 37 cases and a surgical time of 54 (50-70) minutes. Iribarren et al. (2015),<sup>14</sup> described an average duration of surgery of  $57 \pm 12$  minutes out of 24 treated patients.

#### 2.6.2.2 Length of hospital stay

Regarding the average length of hospital stay after the procedure, Urhan et al. and Kapan reported an average of 3.7 and 5.3 days, respectively.<sup>12</sup> Horwood 3.1 days.<sup>7</sup> Iribarren et al.,<sup>14</sup> 1.1 days.

#### 2.6.2.3 Postoperative pain

Another important factor to consider is postoperative pain, since in many occasions, it determines the time



Figure 6: Flap transposition.



Figure 7: Sutured flap and drain.

of patients return to their daily activities. Despite being a frequently collected variable, there is not standardization on how it should be measured. Not all papers allude to it. We find studies using the Visual Analog Pain Scale (VAS). Ersoy et al.,<sup>15</sup> observed an average overall score of 4 (range 0-9) with this technique. In the same study, the average number of days that the patients needed to use oral analgesics was 2 days (0-14 days).<sup>15</sup> Karaca et al.,<sup>16</sup> evaluated pain along the immediate postoperative period reporting a VAS of  $3.4 \pm 1.6$  on the first day,  $1.8 \pm 1.1$  on the third day, and  $0.5 \pm 0.6$  on the fifth day. On the other hand, Bali et al.,<sup>13</sup> reported in 37 patients a mean score of 2 (range: 1-3).

#### 2.6.2.4 Healing time

One of the facts that have promoted the use of plastic repairs for this condition is the delayed wound closure in



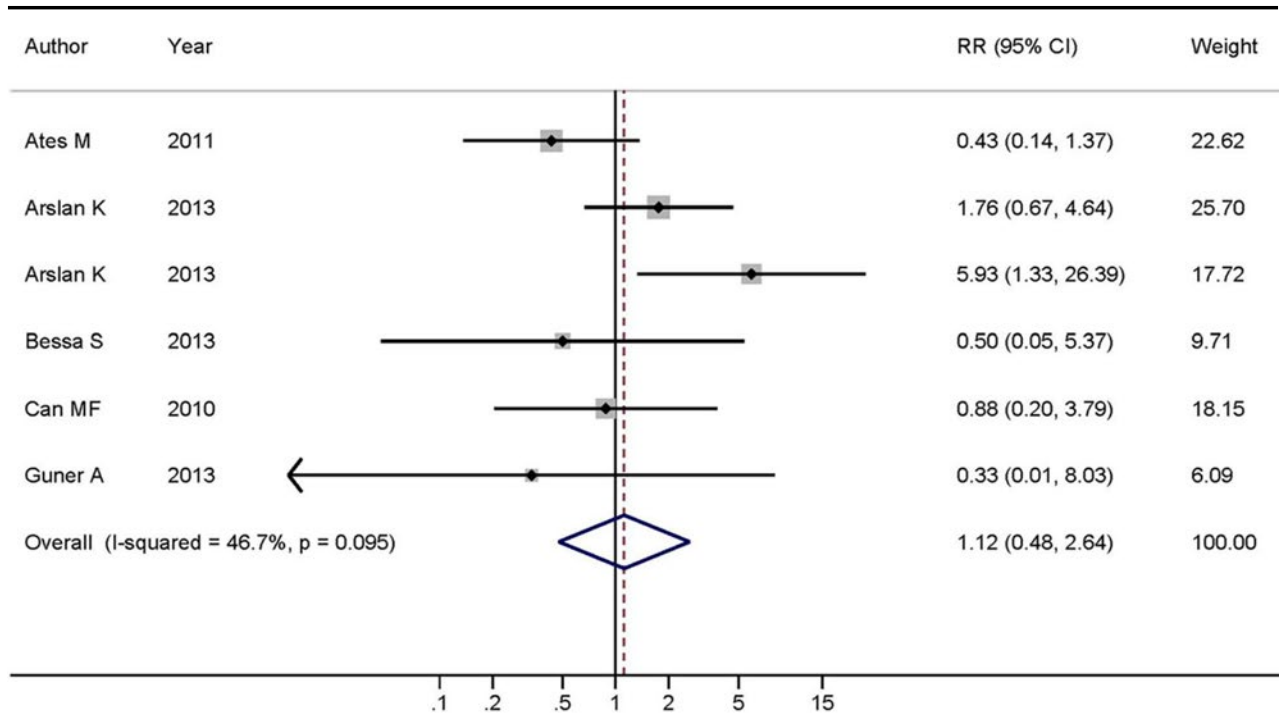


Figure 8: Forest plot. Relative risk (RR) of pilonidal disease recurrence. Comparison of Karydakis vs. Limberg flap techniques.

TABLE 1: PUBLISHED STUDIES OF LIMBERG FLAP TECHNIQUE FOR SPS, AND COMPLICATIONS OBSERVED.

Reference	Year	No of patients	Complications	%	Follow-up (months)
Kartal (22)	2018	300	Recurrence	8	24
			Infection	2.6	
			Dehiscence	7.6	
			Seroma	9.3	
Bali (13)	2015	37	Fluid collection	4.2	28
			Infection	5.6	
			Hematoma	11	
Arslan (23)	2013	96	Seroma	5.2	33
			Dehiscence	2.1	
			Maceration	1	
			Recurrence	6.3	
Kirkil (24)	2011	55	Seroma	8	1
			Hematoma	1	
			Dehiscence	4	
			Recurrence	5	
Can (12)	2010	77	Infection	3.9	17
			Fluid collection	1.3	
			Dehiscence	2.6	
			Recurrence	5.4	
Muzi (25)	2010	130	Dehiscence	8	1
			Infection	3.8	
Ersoy (19)	2009	50	Infection	8	1
Aithal (26)	2005	100	Infection	2	1
			Edema	1	

some cases operated on with open techniques. The time to healing of the surgical wound is a measure of the therapeutic efficacy of the technique. The papers by Bali et al. (2015, n: 37)<sup>13</sup> and Iribarren et al. (2015, n: 24)<sup>14</sup> reported a mean healing time of 22.12±8.69 and 15±5 days, respectively.

#### 2.6.2.5 Complications

The complications described in the bibliography with this technique are infections, wound dehiscence, flap necrosis, and recurrence. Some studies propose that this technique could be superior to others, with a low rate of complications and recurrence.<sup>17-19</sup> The overall recurrence rate is 0 to 3%.<sup>1</sup>

In their study, Daphan et al.,<sup>18</sup> reported a recurrence of 5% in 147 patients after 13 months of follow-up. A comparative meta-analysis made by Enriquez et al.,<sup>11</sup> evaluating this repair vs. that described by Karydakakis determined a similar risk of recurrence. These results are shown in Fig. 8.

According to the study by Milito et al.<sup>19</sup> in 67 patients no case of recurrence was found after an average follow-up of 74 months. Regarding complications the authors report that two patients developed seromas and one patient a hematoma.

Topgul et al.,<sup>20</sup> in a study of 200 patients observed 3% of minimal flap necrosis, 2% seroma, 1.5% wound infection, and 0.5% recurrence in a five-year follow-up.

In a meta-analysis Horwood et al.,<sup>7</sup> reported recurrence in 0.79% of patients, wound dehiscence in 0.9%, and wound infection in 4.5%.

According to the study by Bali et al.,<sup>13</sup> fluid collection, wound infection, flap edema, hematoma, and partial separation of the wound were 9.8%, 16%, 7%, 15% and 4.2%, respectively. They found no complete flap necrosis in any patient. Table 1 presents some results reported in the literature.

#### 2.6.2.6 Return to daily activities

In recent years, there is a growing concern for considering the time to return to daily social and labor activities, however, there is no one way to measure it.

Some authors report about the time in returning to daily activities, work, university, or school. On the other hand the time of cessation of patients' daily activities will be influenced by the appearance of complications, the type of work activity, and the need for analgesic medication. So the ideal time of returning to them will not depend

only on medical factors, and it will be necessary to individualize it in each case.

Karakayali et al.,<sup>21</sup> reported a mean of 17.9±9.3 (2-46) days of time to return to school. Iribarren et al.,<sup>14</sup> communicate mean inactivity of 20.8±6.9 days, similar to that noted by Can et al.<sup>12</sup> of 21.5±8.5 (3-40) days. While for Bali et al.,<sup>13</sup> it was 8 (6-12) days.

#### 2.6.2.7 Subjective patient well-being

The impact that surgery has on the quality of life of patients is an important parameter that has also aroused growing interest in recent years.<sup>21</sup> However, there are scarce studies evaluating this variable. In general, questionnaires on patient satisfaction are used. Can et al.,<sup>12</sup> treated 72 patients who received a telephone questionnaire which included the degree of satisfaction with the results of surgery. They found that 95.6% of patients would recommend the procedure to others. In the study by Bali et al.<sup>13</sup> the patients who underwent the Limberg flap also reported great satisfaction with the results of surgery, mainly in the aesthetic aspect.

### 3. CONCLUSION

SPS is a benign disease although in many cases its evolution can be torpid and recurrent, to the detriment of patient's quality of life. Throughout history numerous treatments have been described for it, and currently there is no consensus on a unique alternative applicable in all cases.

The plastic repair with the described Limberg flap is an effective procedure, easy to apply and reproducible. It has low recurrence rate, acceptable cosmetic results, and an index of similar complications to other techniques. In turn, compared to open techniques it has a lower healing time and an earlier time to return to work.

Although it has many benefits, compared to other variants is a more complex technique that requires a higher length of hospital stay and has potential complications inherent to the more extensive dissection and the use of a dermocutaneous flap. As conclusions it can be determined that it is a useful procedure for the treatment of SPS, which must be known and managed by the specialist in Coloproctology. However, it should not be used in all cases, the best therapeutic option should be evaluated for each patient.

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