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RESEARCH ARTICLE

## A New Laser-Assisted Pilonidal Sinus Excision Surgical Technique. Presentation of First 368 Cases: Short- and Mid-Term Results

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**ABSTRACT:**

Pilonidal sinus disease (PSD) is a common skin and soft tissue infection of the gluteal area. Numerous surgical and other less invasive techniques in the treatment of this condition have been proposed over the years. Management of PSD though, remains a challenge for modern surgery due to high rates of recurrence and treatment-associated morbidity. In this study, we present the short and mid-term results of our novel method, Laser assisted Pilonidal Sinus excision (LaPSe method). A total cohort of 368 patients, 310 males and 58 females, median age 21 years, underwent LaPSe surgery for PSD, from January 2018 to January 2024. Follow up was obtained by clinical examination and phone call interview over a six-month period. All patients underwent the operation uneventfully. Short term complications were recorded in 9 patients (5 cases bleeding, 4 cases site infection) all treated conservatively. Delayed healing was documented in 12 patients and 5 of them required re-operation (1,4% recurrence rate). These highly promising results in a large cohort are making LaPSe method a potential treatment of choice for pilonidal disease.

## Introduction:

Pilonidal sinus disease (PSD) is a rather common skin and soft tissue chronic infection of the coccygeal region<sup>1</sup>. Clinical presentation of PSD can be divided

in three distinct conditions,<sup>2</sup> asymptomatic, chronic disease which in most cases includes a bad odor discharge through hair-containing sinus skin openings and acute abscess formation (image 1).

**Image 1.** Pilonidal sinus disease with acute abscess formation.



There is no clear mechanism regarding the formation of PSD. At present, and though many theories have been proposed, PSD is considered an acquired rather than a congenital condition<sup>3</sup>. Incidence of PSD varies from 10 to 25 / 100.000 people<sup>4</sup>. It is most common in young male patients between 15 and 25 years old. Male to female ratio is approximately 4:1. Common predisposing factors are Caucasian race, obesity, and deep natal cleft with excessive hair growth. New reports show a steady increase of PSD over the last years<sup>5</sup>.

Management of PSD continues to be a challenge due to high rates of recurrence and treatment-associated morbidity<sup>6</sup>. Traditional surgical methods such as wide-open surgical excision and semi-closure or secondary intention healing were the most popular amongst surgeons during previous decades<sup>7</sup>. Main disadvantage of these methods is the prolonged healing period of up to two-three months with late return to daily activities and discomfort related to daily change of dressings<sup>8</sup>. Skin-flap techniques such as Karydakis and Limberg flap with primary closure have been proposed in order to overcome the extended healing period but are associated with high morbidity rates often higher than the disease's symptoms<sup>9,10</sup>.

During the last years a swift has been made towards less invasive therapies<sup>11,12</sup>. Most common are phenol treatment, laser applications, pit picking with or without diode laser apply, endoscopic techniques and thrombin gelatin matrix application<sup>13-17</sup>. The above therapies offer fast recovery with very low morbidity but seem to score high recurrence rates<sup>12,18</sup>.

Within this frame our team developed and published in 2019 a novel methodology in diode laser PSD treatment, Laser-assisted Pilonidal Sinus excision method (LaPSe)<sup>19</sup>. **The purpose of this study is to present the short and mid-term results of our method.**

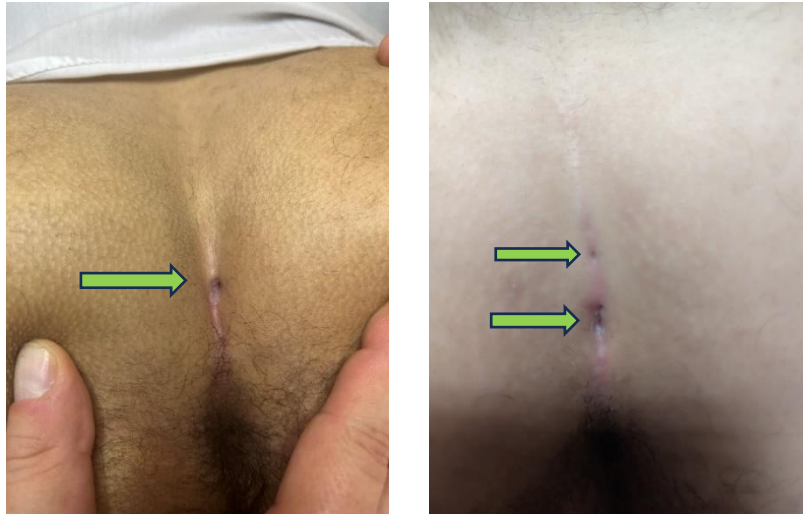
### **LaPSe Method description:**

LaPSe method is performed on an outpatient basis, as a one-day surgery. Local anesthesia and mild sedation are applied, with the presence of an anesthesiologist in all cases.

### **Surgical terms:**

Primary pit (PP) is a skin lesion on the midline of the natal cleft. It is an early stage of PSD and usually the beginning of the process (image 2).

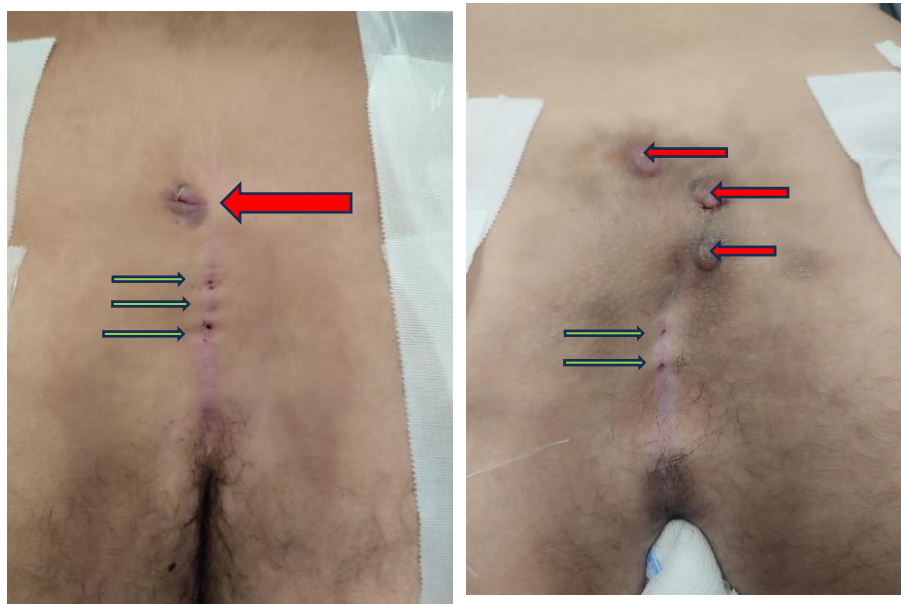
**Image 2.** Single and double primary pits (green arrows).



Secondary pit (SP) is a skin lesion outside the midline, to the left, right or above the natal cleft (image 3). It is a later stage of SPD and a sign of progression of the disease.

Iatrogenic secondary pit (ISP) is a small circular skin incision performed by the surgeon. It is usually placed at the far most end of a blind sinus or subcutaneous cavity.

**Image 3.** Delayed pilonidal disease. Multiple primary pits (green arrows) and secondary pits (red arrows) present.



**Surgical technique:** The patient is placed in the prone position. The gluteal regions are tacked apart exposing the natal cleft. After skin disinfection with povidone iodine 10% solution, a thorough examination of the coccygeal region is performed. Local anesthesia is applied in the area

with a solution of 1:1 lidocaine 2% / ropivocaine 0,75% 20ml (image 4).

The first step is, starting from the lowest, to identify all the PP's on the midline of the natal cleft and SP's outside the natal cleft. (image 5)

**Image 4.** Local anesthesia is applied to the coccygeal area.



**Image 5.** Recognition and marking of primary pits.



Next, by using a proper metal probe through the existent PP's and SP's, with or without instillation of hydrogen peroxide, a thorough identification of pilonidal sinus network is performed. Then, a thin laser fiber with a circumferential laser beam of 360 degrees is inserted in the sinus network and energy is delivered at 1470 nm wavelength. Next, we

perform a circular incision with a few millimeters' diameter around every PP and SP if present. If a sinus has a blunt tip outside the natal cleft, an ISP is opened over the far most end. Complete en block excision of the sinus network is performed through the skin openings. (image 6).

**Image 6.** Complete resection of the sinus track en block with the PPs and SPs.



Finally, the laser fiber is inserted, and laser energy is delivered throughout the surgical site. Sterile gauze dressings are applied. (Image 7)

Image 7. Radial laser 1470 nm fiber delivers energy symmetrically throughout the surgical site.



### Methods:

This is a retrospective study. A total cohort of 368 patients, 310 males and 58 females, median age 21 years, underwent LaPSe surgery for PSD, from January 2018 to January 2024. Follow up was obtained by clinical examination on the 3<sup>rd</sup>, 10<sup>th</sup>

and 17<sup>th</sup> post operative day, and at 30 days and 6 months with phone call interview.

### Results:

In the first table we present the demographics of the cohort and important operation-related parameters.

**Table 1:** Overview of LaPSe Method cohort.

No of patients	368
Male / female	310 / 58
Age	14-52 (median 21 years old)
Operation time	Median 27 minutes
Type of anesthesia	Local + mild sedation
Energy delivered radial laser 1470 nm	Median 642 joules
Total duration of admission	4-6 hours, all patients discharged same day

In the second table we present the short and mid-term results of our study.

**Table 2:** Short and mid-term results.

Short-term results 30 days post-op	
Post operative pain	Mild discomfort for 2-3 days in all cases
Bleeding	5 cases of persistent arterial bleeding after the first change of dressings, all treated conservatively with tamponade technique
Infection	4 cases needed oral antibiotics at the 4 <sup>th</sup> -5 <sup>th</sup> post-operative day
Complete healing	Skin closure was complete in approximately 30 <sup>th</sup> to 45 <sup>th</sup> post-operative day
Mid-term results 6 months post-op	
Incomplete healing	12 patients had incomplete healing and open surgical wounds at 6 months post-op
Non-operative treatment	7/12 patients had delayed healing of the wounds. Hair removal and periodical change of dressings by the surgical team were applied. Complete healing was achieved after 4-5 weeks.
Re-operation	5/12 patients required re-operation due to persistent PSD, despite the conservative treatment.

## Discussion:

Since the first report of pilonidal disease in 1833, PSD has been considered a surgical condition<sup>20</sup>. For decades the applied method was wide surgical excision of the skin and soft tissue of the sacrococcygeal region down to the presacral fascia following by healing at a second intention<sup>21</sup>. Over the years, numerous new articles have been published regarding different surgical approaches to pilonidal disease<sup>22</sup>.

Main reasons for that were two. The first reason was the high recurrence rates. In a recent meta-analysis, a total of 89583 patients were included, and the overall recurrence rate was 10,8 % at 60 months<sup>23</sup>. The second reason was the extremely elongated post-operative period associated with high discomfort and late return to normal activities<sup>24</sup>. Under this view, different surgical approaches have been proposed over the years. Primary asymmetric closure of the surgical wound, such as Karydakis / Bascom and other flap techniques have been reported with low recurrence rates<sup>25,26</sup>. Common ground in all these techniques is the highly invasive surgical approach with an elongated postoperative healing period. Therefore, surgeons usually choose to perform these techniques in complicated cases with multiple recurrences<sup>27</sup>.

During the last decade, laser applications have become popular in the treatment of PSD, offering a rapid and symptom free post-operative period but with debatable results in terms of recurrence<sup>28</sup>. In 2019, we proposed a novel laser assisted surgical technique that combined the benefits of advanced laser technology along with minimally invasive surgical technique. Until then, published laser treatments, used laser energy only to destroy the sinus track and the associated skin pits,<sup>29</sup> a technique that to our experience led to high recurrence rates. Our deeper understanding of PSD resulted in the following principles:

*The sinus track starts from the lowest primary pit in the midline.*

*The sinus track is randomly expanding as the disease progresses, cephalad in most cases but caudal expansion can be present.*

*Sinus track width varies with narrow sections and cavities, that can't be reached and adequately burned by the laser probe, thus leading to high recurrence rates.*

*Primary pits in the midline may appear inactive at a given time but remain connected with the sinus network and usually have an epithelial lining.*

*The late stage of the disease is the formation of secondary pits, off the midline that usually connect with cavities and the main sinus network.*

LaPSe method was designed to overcome these potential pitfalls. We thoroughly recognize and completely remove all the primary pits on the midline through circular incisions. Then we proceed to an en-block removal of the associated sinus track. If there is a blunt sinus end, outside the natal cleft, we perform iatrogenic secondary pit entrance, in order to remove and burn more adequately the area. Furthermore, LaPSe method fulfils two basic technical parameters as stated by Karydakis and Bascom<sup>30</sup>. The first is the avoidance of extensive incisions in the midline and the second parameter is the rise of the natal cleft as we remove the compacted sinus network underneath it. Additionally, the use of the radial laser probe after sinus excision adequately destroys all the remnant sinus wall fragments that could be causes of possible recurrence.

LaPSe method incorporates another important step. The recognition and meticulous removal of all the primary pits in the midline, active or inactive, is a key step to our opinion in reducing future recurrences<sup>31</sup>. We therefore intensely advise the removal of primary pits whenever we recognize them, even in the case of acute abscess no matter how far they are from the infection site, despite recommendations to just perform unroofing of the abscess<sup>2</sup>.

Finally, the procedure is very well tolerated by patients, with minimal discomfort. Our post-operative protocol includes first change of dressings at the 3<sup>rd</sup> post-operative day, and afterwards, we encourage our patients to have a daily shower with antiseptic shower gel, and new dressing at the area. The use of pressured water causes mechanical debridement of the wound, through the skin holes and there is no need for painful surgical wound change of dressings. Also, the use of radial laser at the whole extent of the surgical site seems to decrease the exudate associated with common second intention healing wounds.

The results of this follow-up study are very promising. LaPSe method in our series scores an overall 1,4 % (5/368) recurrence rate. The complete removal of the sinus tracts and the additional cauterization of the radial laser seems to work synergically thus achieving very low recurrence rates. In addition, out of the 12 cases of delayed healing, 7 cases (58%) were treated effectively by conservative means, a fact that to our knowledge emphasizes the importance of complete network excision. LaPSe method is very well tolerated with rapid recovery time and immediate return to daily activities. Another important advantage is that there is no need for a visit to the

doctor's office every two-three days for surgical evaluation and change of bandages.

### **Conclusions:**

This follow-up study of 368 cases shows that LaPSe method is a safe and efficient surgical procedure for the treatment of PSD. All cases were completed uneventfully, and the operation was very well tolerated. LaPSe method is performed under local anesthesia and mild sedation. Early post-operative complications were rare and successfully treated. The recurrence rate in terms of re-operation in our series was 1,4%. In conclusion, LaPSe method combines surgical excision principles and applied radial laser techniques and we believe is a method of choice in the treatment of PSD.

### **Conflict of interest statement:**

We declare that there is no conflict of interest.

### **Funding statement:**

We declare that there is no funding for our study.

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