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Muhammad Fathy Sharaf

General Surgery Department, Faculty of Medicine - Al Azhar University

Ibrahim Aboufotouh Muhammad

General Surgery Department, Faculty of Medicine - Al Azhar University

Bilal Muhammad Mansour

General Surgery Department, Faculty of Medicine - Al Azhar University,

bilal.muhammad.mansour@gmail.com

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Evaluation of Laser Ablation in Treatment of Pilonidal Sinus

Muhammad Fathy Sharaf, Ibrahim Aboufotouh Muhammad, Bilal Muhammad Mansour*

General Surgery Department, Faculty of Medicine, Al Azhar University, Cairo, Egypt

Abstract

Background: Pilonidal sinus (PNS) is defined as a tract or cavity in the subcutaneous tissue of the natal cleft of the sacrococcygeal area. PNS is usually complicated by repeated infection and chronic inflammation. It is a widespread condition with a reported incidence of 26/100 000. Despite being a benign illness, it limits patients' everyday activities due to discomfort, discharge, and occasionally unpleasant odor.

Aim: The purpose of this research is to assess the efficacy of laser ablation as a less invasive method for treating PNS.

Patients and methods: This case series study was performed on 30 patients collectively who exhibited persistent PNS symptoms using a 1470 diode laser from March 2022 to June 2022 at El-Sayed Galal University Hospital and Nasr City Insurance Hospital.

Results: The operative time was 14.6 ± 3.4 min and common operation duration was less than or equal to 15.0 min (63.3 %) with a hospital stay duration was 11.7 ± 4.1 h. Postoperative pain visual analogue scale (VAS) score was 3.1 ± 1.0 with the majority of cases being less than or equal to 3.0 (66.7 %). Infection was the most frequent postoperative complication (13.3 %), followed by seroma (6.7 %), then hematoma (3.3 %).

Conclusion: Laser ablation of the PNS is a straightforward, less invasive operation that is simple to carry out under spinal anesthesia and is successful in achieving rapid wound healing with little chance of complications. Additional advantages include a brief hospital stay and an early return to regular daily routine.

Keywords: Laser ablation, Pilonidal sinus, Treatment

1. Introduction

Pilonidal sinus (PNS) is defined as a tract or cavity in subcutaneous tissue of the natal cleft of the sacrococcygeal area. PNS is usually complicated by repeated infection and chronic inflammation. It is a widespread condition with a reported incidence of 26/100 000 that affects men 2.2 to 1 times more frequently than women. Despite being a benign illness, it limits patients' everyday activities due to discomfort, discharge, and occasionally unpleasant odor.¹ Obesity, hairiness, poor cleanliness, and prolonged sitting are risk factors, but the cause is unknown.²

There is significant disagreement over the cause of PNS. Theories up until the 20th century emphasize a primary congenital cause. However, current

theories describe PNS to be an acquired illness. For instance, it has been proposed that trauma, such as what can happen from extended sitting, pushes the hair into the subcutaneous tissue, causing keratin to build up. Then, hair is forced downward through the floor of the deformed follicles. This causes a sinus to form, which is vulnerable to infection, the development of an abscess, and subsequent chronic discharge.³

To attain the best management, it is helpful to comprehend PNS pathophysiology. PNS typically has a principal track opening on the center line. This opening is frequently a very small one that is difficult to detect before being probed. Sometimes there are multiple principle openings of this kind for a distance of up to 1 inch. The major tract rarely extends more than 2 inches into the fat over the

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* Corresponding author. Postal code: 11884.
E-mail address: bilal.muhammad.mansour@gmail.com (B.M. Mansour).

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sacrum. It may end in an expanded cavity. There might be a secondary track or more in some cases. They begin from the deep part of the primary track and emerge on the skin to one side of the midline by an opening. The track is lined with granulation tissue and frequently contains hair.⁴

Incision and drainage are typically used to treat acute pilonidal abscesses. Previously, the PNS was treated with extensive excision using diathermy. The wound was left open, and it took two months for it to fully heal. According to the surgeon's preferences, subsequent big wounds are either left open or sutured. Different methods of plastic reconstruction have been employed, for example applying skin flaps, Z-plasty, and Limberg flap. These complicated procedures frequently result in higher complications and a high likelihood of being recurrent.⁵

Laser therapy for PNS is seen to have promise in the era of less invasive procedures because it contributes to patient comfort, quick wound healing, and a quicker return to work.⁵

The purpose of this study is to assess the effectiveness of laser ablation as a less invasive procedure for treating PNS patients in terms of patient satisfaction, operating time, early return to work, and postoperative problems.

The study aims to evaluate the efficacy of laser ablation as a minimally invasive technique in the treatment of patients with PNS in terms of patient satisfaction, operative time, early return to work and postoperative complications including recurrence.

2. Patients and methods

This case series study was carried out with the agreement of the patients and with the approval of the ethics committee. This study was performed at El-Sayed Galal University Hospital and Nasr City Insurance Hospital from Mars 2022 till June 2022 and performed on 30 patients collectively who exhibited persistent pilonidal sinus symptoms using 1470 diode laser with the following:

Inclusion criteria: Both genders male and female from 18 to 40 years old.

Exclusion criteria: Pilonidal abscess and PNS on other sites of the body.

Study Procedures and Interventions: All participants were submitted to Laser ablation of PNS.

Data Collection: Were represented by:

Preoperative data including history sheet, general and local examination sheet.

Operative data which including operation time.

Postoperative data which including Hospital Stay, return to work and complication.

2.1. Ethical considerations

Approval of research by Ethics Committee of Faculty of Medicine, AL-Azhar University. The patient information was private. Patient privacy was maintained by not presenting data by the patient's name but rather by diagnosis. All participants were asked to give their informed permission, which was validated with a date and time and was written in Arabic. The patient's initials were given a number, only the researcher was aware of it to ensure confidentiality.

2.2. Statistical analysis

SPSS for Windows 20.0 has to be used for analysis. For numerical parametric variables, data should be given as range, mean, and standard deviation; for numerical nonparametric variables, range, median, and interquartile range; or for categorical variables, number and percentage. Receiver operating characteristic (ROC) curves must be constructed in order to assess if measured variables are reliable predictors of a suitable or incorrect response. Validity should be shown using sensitivity, specificity, positive and negative predictive values, and their associated 95 % confidence intervals. The 0.05 CIs significance threshold is used. Binary logistic regression analysis must be performed to ascertain the link between a good or bad response and the measured variables. Receiver operating characteristic curves must be constructed in order to assess if measured variables are reliable predictors of a suitable or incorrect response. Validity should be shown using sensitivity, specificity, positive and negative predictive values, and their associated 95 % confidence intervals. The significance level is set at 0.05 CIs.

2.3. Results

Thirty individuals were enrolled in the trial out of 50 who were evaluated for eligibility. Twelve of the eligible patients declined to participate in the trial, and eight were disqualified based on the exclusion criteria.

In the end, the research was based on the data of 30 individuals who had chronic pilonidal sinuses (Tables 1–4).

Table 1. Shows that Mean \pm SD of Sinus size was 2.7 ± 1.2 with range 0.9–4.6 cm. Main size was less than 3.0 cm (56.7 %), the remaining (43.3 %) were greater than or equal to 3.0 years.

Variables	Mean \pm SD	Range
Size (cm)	2.7 ± 1.2	0.9–4.6
	N (%)	
Size grades		
< 3.0 cm	17 (56.7 %)	
≥ 3.0 cm	13 (43.3 %)	

Table 2. Shows that Infection was the most frequent postoperative complications (13.3 %), followed by seroma (6.7 %), then hematoma (3.3 %), while ischemia was not recorded.

Openings	N (%)
Infection	4 (13.3 %)
Seroma	2 (6.7 %)
Hematoma	1 (3.3 %)
Ischemia	0 (0.0 %)

Mean \pm SD of time to return to work was 9.8 ± 3.6 with range 6.0–17.0 days. Majority of cases were less than or equal to 10.0 days (66.7 %), the remaining (33.3 %) were greater than 10.0 days. Mean \pm SD of time to complete healing was 26.6 ± 4.6 with range 19.0–36.0 days. Majority of cases were less than or equal to 4 weeks (56.7 %), the remaining (43.3 %) were greater than 4 weeks.

Table 3. Shows month-3 recurrence was uncommon (6.7 %), while nonrecurrence was in (93.3 %).

Findings	N (%)
Recurrence	2 (6.7 %)
No recurrence	28 (93.3 %)

Table 4. Shows that Mean \pm SD of satisfaction score was 7.9 ± 1.7 with range 5.0–10.0. Majority of cases were 9.0–10.0 (43.3 %), followed by 7.0–8.0 (36.7 %), the remaining (20.0 %) were 5.0–6.0

Variables	Mean \pm SD	Range
Satisfaction score	7.9 ± 1.7	5.0–10.0
	N (%)	
Satisfaction grades		
5.0–6.0	6 (20.0 %)	
7.0–8.0	11 (36.7 %)	
9.0–10.0	13 (43.3 %)	

3. Discussion

With an estimated prevalence of roughly 26 patients/100 000 individuals, PNS is a common pathologic disease, particularly in young adults. Male patients are particularly at double the risk of being affected.⁶

Many surgical alternatives have been recommended. Complete PNS excision is unpleasant, leading to big wounds that necessitate repeated postoperative clinic visits for dressing and lowering quality of life. Secondary intention healing is also painful. Excision of the PNS and primary closure using off-midline closure or flap-based procedures appear to be a more popular strategy.⁷

Laser ablation on PNS is a new method at which the sinus tract is ablated using radial laser. To prevent fluid accumulation and improve drainage, one, two, or three 1 cm incisions are performed. This method achieves rapid subsequent wound healing with at its lowest incidence of recurrence and minimal discomfort.⁸

The assessment of the effectiveness and safety of a new less invasive procedure employing a diode laser for the treatment of pilonidal sinus in a

prospective series of patients with pilonidal sinus of variable severity was emphasized as the primary topic of interest. This is because different surgical approaches for the management of pilonidal sinus represent major conflict and are frequently associated with larger morbidity and a high rate of recurrent.⁹

In this study, our goal was to assess the effectiveness of laser ablation as a less invasive treatment for pilonidal sinus patients in terms of patient satisfaction, operating time, early return to work, and postoperative problems.

This Case series study was conducted at at El-Sayed Galal University Hospital and Nasr City Insurance Hospital from Mars 2022 till June 2022 and performed on total 30 patients who presented with chronic pilonidal sinus.

Thirty individuals were enrolled in the research out of 50 who were evaluated for eligibility. Twelve of the eligible patients declined to participate in the trial, and eight were disqualified based on the inclusion criteria.

In the end, the research was based on the data of 30 individuals who had chronic pilonidal sinus.

The current study revealed that the mean age of patients was 25.8 ± 5.1 , majority of cases were males (83.3 %) with mean BMI of 28.2. Single opening of the sinus was the most frequent (63.3 %), while multiple was in (36.7 %) with mean sinus size of 2.7 cm.

Our study results revealed that the operative time was 14.6 ± 3.4 min and common operation duration was less than or equal to 15.0 min (63.3 %) with hospital stay duration was 11.7 ± 4.1 h. Majority of cases were 6.0 h (53.3 %), followed by 12.0 h (36.7 %).

A measure for evaluating pain is called the visual analogue scale (VAS). Scores are based on measurements that are described by patients and are recorded with one mark positioned along a 10 cm line that represents a range between the two ends of the scale: 'no pain' on the start (0 cm) and 'worst pain' on the end (10 cm).¹⁰

As regards postoperative pain, our study results revealed that postoperative pain VAS score was 3.1 ± 1.0 with majority of cases were less than or equal to 3.0 (66.7 %).

According to the findings of our study, infections were the most common postoperative complications (13.3 %), followed by seroma (6.7 %) and hematoma (3.3 %). As regards time to return to work, our study results revealed that majority of cases (66.7 %) took times of less than or equal to 10.0 days to return to work with mean time of 9.8 ± 3.6 days in overall cases and 56.7 % of cases took times of less than or equal to 4 weeks to complete healing with mean time of 26.6 days in overall cases.

The VAS scale has been used to assess mood, satisfaction, hunger, asthma, dyspepsia, and ambulation in addition to pain.¹⁰

As regards patient satisfaction, our study results revealed that mean \pm SD of satisfaction score was 7.9 ± 1.7 and majority of cases were 9.0–10.0 (43.3 %), followed by 7.0–8.0 (36.7 %), the remaining (20.0 %) were 5.0–6.0.

During the last decade, many studies have aimed to evaluate minimally invasive techniques, like laser ablation in treatment of PNS since it is associated with less pain, faster wound healing. However, their results have been contradictory concerning the optimal surgical approach.⁹

In 2021¹¹ carried out a research to evaluate the efficiency and security of PNS management with a laser using a systematic review and showed that the median age was 26 (range 13–68), and the median duration of operation was 26 (range 6–65) min. With a median follow-up of 12 (range 7–25) months, 917 (94.4 %) patients achieved initial healing with an estimated mean recurrence rate of 3.8 %. Approximately, the mean rate of complications was 10 % (95 % CI 5.7–14.3 %, I² = 82.28, $P < 0.001$), and all were minor. The median pooled VAS score in the studies was 2.2 which is in harmony with our findings.

While⁸ conducted an exploratory prospective study that involved 228 patients to investigate efficacy of laser ablation of pilonidal sinus in terms of duration of operation, healing time, and the duration of hospitalization, the degree of postoperative complications and rate of recurrence and reported that majority (87.72 %) were male with mean age group of 18–35 years and 75.44 % patients had BMI greater than 25.

Also⁸ concluded that the mean surgery time was 33.32 min (SD = 6.49), hospital stay time was 12.25 h (SD = 3.61), return to work is 2.26 days (SD = 0.62), mean time till complete healing by secondary intention was 6.44 weeks (SD = 1.25). In terms of morbidity, infection (0.88 %), collection (6.58 %) and recurrence was seen in 2.63% of patients. It is clear that pain and patient satisfaction have improved because there was a statistically highly significant difference between the mean preoperative VAS score and the VAS scores on days 1, 3, and 7.

There is a definite trend towards less invasive treatments for PNS, with results that are comparable to or superior to those of traditional excision. One of the successful procedures is laser ablation of PNS, in which the energy from the laser destroys the sinus epithelium while also obliterating the tract.⁵

Also⁶ conducted a review of the short-term surgical outcomes of combining the EPSiT approach with the laser in the treatment of pilonidal sinus that involved 10 consecutive EPSiT-Laser procedures and revealed

that the most of patients were male ($n = 8$) with a mean age of 23 years (range: 18–30). There were no intra-operative difficulties during the 30- to 1-h-long operations. Pain at surgical site and swelling ($n = 2$) treated conservatively, and partial recovery and ongoing serous drainage ($n = 1$) which was re-scheduled for a second EPSiT-Laser procedure.

Pain assessment was achieved by the numerical rating scale (NRS). Mean NRS value at hospital discharge was 2.8 (range 2–5). After five days, all patients were able to resume their regular activities after being discharged from the hospital on the same day as their surgery.⁶

Moreover⁹ investigated 237 patients in a prospective study complaining of PNS which were underwent the SiLaT laser procedure to assess the safety, efficiency and results of a laser ablation for the treatment of PNS and reported that 183 were male (77.2 %) and 54 were female (22.8 %). The median hospital stay time was 3 h (range 2–4 h). The median time of operation was 24 min. Of the 237 patients, 143 (92.8 %) started their normal routines right away after being discharged from the hospital. In 17 out of 237 patients (7.2 %), the return to work time was 1–2 days.

After the first session, a quick recovery was observed (90.3 %, 214 of 237) with a median healing time of 47 days (range 30–70 days). Minor post-operative discomfort (VAS score >4) was seen in 45 (19.8 %) individuals with little morbidity as surgical site infection with minor inflammation around the wound was seen in 17 (7.2 %) patients.⁹

In 2017¹² investigated 40 cases in a retrospective study who were underwent the FILAC™ radial-laser probe from 2014 to 2015 and reported that 87.5 % of patient was successfully treated without recurrence for 234 days. Two hematomas (5 %) and two abscesses (5 %) that affected four individuals each required treatment.

The study's advantages include that it is prospective study and having no cases lost to follow-up during the study period. Secondly, it provided benefits of minimally invasive procedure which can be offered as an effective treatment of PNS. Thirdly, analysis of pain and satisfaction was carried out using the standard VAS, which is accurate method for measuring pain.

The Likert-scaled items were highly susceptible to bias from confounding variables than the VAS items. Likert experienced the ceiling effect more than the VAS did.¹³

The study has certain drawbacks that need to be mentioned, such as a small sample size compared with other studies and the lack of being a multi-centric study, which significantly increases the

publishing bias concern. Another drawback is absence of a control group receiving conventional surgical care and the variety of patients actually treated, which was brought on by the vast spectrum of PNS symptoms.

3.1. Conclusion

The outcomes of this work demonstrate that laser ablation of the PNS is a simple, less invasive procedure that is easy to perform under spinal anesthesia. And is successful in achieving rapid wound healing with little chance of complications. Additional advantages include a brief hospital stay and an early return to regular daily routine. Overall, laser ablation has a decent success rate and patient satisfaction.

Conflicts of interest

It is confirmed that there is no conflict of interest and that the expense of the research was covered.

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