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CLINICAL OUTCOMES OF LASER-ASSISTED TREATMENT FOR PILONIDAL SINUS DISEASE

General Surgery

Dr Vayalapalli Syama Chinmayi* Department of General Surgery, F H Medical College & Hospital, Agra *Corresponding Author
Dr. Puneet Agrawal Department of General Surgery, F H Medical College & Hospital, Agra
Dr Shaila Naaz Department of General Surgery, F H Medical College & Hospital, Agra

ABSTRACT

Background: Pilonidal sinus disease (PSD) is a chronic inflammatory condition of the sacrococcygeal region with significant morbidity in young adults. Conventional surgical approaches are often associated with prolonged wound healing, postoperative pain, and delayed return to work. Laser-assisted sinus ablation has emerged as a minimally invasive alternative with promising outcomes. **Aim:** To evaluate the clinical outcomes of laser-assisted treatment in patients with pilonidal sinus disease in a tertiary care center in Agra. **Materials and Methods:** This prospective observational study included 60 patients with primary or recurrent PSD treated with 1470-nm diode laser-assisted sinus ablation between January 2025 and December 2025. Parameters assessed included operative time, hospital stay, postoperative pain (VAS score), time to return to work, wound healing, complications, and recurrence over a 12-month follow-up period. **Results:** The mean age was 27.8±6.4 years, with 85.0% males. Mean operative time was 28.6±7.2 minutes and hospital stay was 1.2±0.5 days. Mean VAS score reduced from 4.2±1.1 on day 1 to 1.3±0.6 at 1 week. Mean return-to-work time was 5.8±2.1 days. Complete healing was achieved in 56 patients (93.3%). Wound infection occurred in 5.0% and seroma in 3.3% of cases. Recurrence was observed in 4 patients (6.7%) during follow-up. **Conclusion:** Laser-assisted treatment for pilonidal sinus disease is a safe and effective minimally invasive technique associated with short operative time, minimal postoperative pain, early recovery, high healing rates, and low recurrence, making it a promising alternative to conventional surgical methods.

KEYWORDS

Pilonidal Sinus, Laser Ablation, Silac, Minimally Invasive Surgery, Recurrence, Wound Healing

INTRODUCTION

Pilonidal sinus disease (PSD) is a chronic inflammatory condition involving the sacrococcygeal region, commonly affecting young adults and imposing a substantial socioeconomic burden due to work absenteeism and recurrent disease. The incidence has been estimated at approximately 26 per 100,000 population, with a male predominance of nearly 3:1. Risk factors include obesity, excessive body hair, prolonged sitting, local trauma, and poor hygiene practices[1,2].

Traditional surgical techniques such as incision and drainage, wide excision with secondary healing, Karydakis flap, and Limberg flap remain widely practiced. However, these procedures may be associated with significant postoperative pain, prolonged wound care requirements, delayed return to work, and recurrence rates ranging from 5–20%[3,4].

Recent advances in minimally invasive surgery have led to the introduction of laser-assisted techniques, particularly Sinus Laser-Assisted Closure (SiLaC). The procedure utilizes radial laser energy to destroy the sinus epithelium while preserving surrounding tissue integrity. Studies have demonstrated reduced postoperative pain, shorter hospital stay, faster healing, and improved patient satisfaction compared with conventional approaches[5–8].

The present study aimed to evaluate the clinical outcomes of laser-assisted treatment for PSD in a tertiary care setting.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital in Agra, Uttar Pradesh, over a period of one year from January 2025 to December 2025. The study included 60 consecutive patients diagnosed with primary or recurrent pilonidal sinus disease who presented to the surgical outpatient department and fulfilled the predefined eligibility criteria. Prior to enrolment, informed written consent was obtained from all participants, and the study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Inclusion and Exclusion Criteria

Patients aged between 16 and 50 years with clinically diagnosed pilonidal sinus disease and deemed suitable for laser-assisted treatment were included in the study. Patients presenting with acute pilonidal abscess requiring emergency incision and drainage, extensive branching sinus tracts, active local infection requiring staged treatment, uncontrolled systemic illness, coagulation disorders, or those unwilling to participate in follow-up were excluded.

Procedure

A detailed clinical history was obtained from all patients, including demographic characteristics, duration of symptoms, previous interventions, smoking status, and associated comorbidities. Baseline clinical examination was performed to assess the number of sinus openings, extent of disease, and presence of recurrent pathology. Routine preoperative investigations were carried out according to institutional protocols.

All procedures were performed under spinal or local anesthesia by experienced surgeons trained in laser-assisted management of pilonidal sinus disease. Following adequate preparation and positioning of the patient in the prone jackknife position, the sinus tract was thoroughly explored using a probe. Hair nests, debris, and granulation tissue were removed through curettage and irrigation with normal saline. A 1470-nm radial laser fiber was then introduced into the sinus tract up to its terminal extent. Laser energy was delivered circumferentially while gradually withdrawing the fiber, resulting in controlled destruction and shrinkage of the sinus epithelium. No wide tissue excision was performed. The treated tract was left open for drainage, and a sterile dressing was applied.

Postoperatively, patients were encouraged to mobilize early and were discharged once clinically stable. Standard analgesics and wound care instructions were provided. Follow-up evaluations were scheduled at 1 week, 2 weeks, 6 weeks, 3 months, 6 months, and 12 months after surgery. During each visit, wound healing status, postoperative pain, complications, and recurrence were assessed and documented.

Outcome Measures

The primary outcome measures were complete wound healing and disease recurrence. Secondary outcome measures included operative duration, postoperative pain assessed using the Visual Analogue Scale (VAS), length of hospital stay, time required to return to normal daily activities, and procedure-related complications such as wound infection, seroma formation, or delayed healing.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Statistical significance was considered at a p-value of less than 0.05.

RESULTS

Baseline Characteristics of the Study Population

A total of 60 patients (table 1) underwent laser-assisted treatment for pilonidal sinus disease. The mean age was 27.8±6.4 years (range:

18–45 years), with the majority of patients belonging to the 21–30 years age group. Males constituted 85.0% (n=51) of the study population, while females accounted for 15.0% (n=9), yielding a male-to-female ratio of 5.7:1.

The mean BMI was 27.1±3.8 kg/m², indicating that most patients were overweight. Primary pilonidal sinus disease was observed in 48 patients (80.0%), whereas 12 patients (20.0%) presented with recurrent disease following previous treatment. Smoking history was present in 19 patients (31.7%), while 41 patients (68.3%) were non-smokers. Overall, the study population predominantly comprised young overweight males with primary disease, reflecting the characteristic demographic profile of pilonidal sinus disease.

Table 1 Baseline Characteristics Of Study Population

Variable	Value
Total patients	60
Mean age (years)	27.8±6.4
Male	51 (85.0%)
Female	9 (15.0%)
BMI (kg/m²)	27.1±3.8
Primary disease	48 (80.0%)
Recurrent disease	12 (20.0%)
Smokers	19 (31.7%)

Operative and Early Postoperative Outcomes

Laser-assisted treatment was associated with favorable perioperative outcomes. The mean operative time was 28.6±7.2 minutes, demonstrating the feasibility of the procedure as a short-duration intervention. The average hospital stay was 1.2±0.5 days, with the majority of patients discharged within 24 hours of surgery.

Postoperative pain was minimal, with a mean VAS score of 4.2±1.1 on postoperative day 1, which decreased significantly to 1.3±0.6 by the end of the first postoperative week, reflecting rapid symptomatic improvement. Patients resumed routine daily activities early, with a mean return-to-work interval of 5.8±2.1 days.

These findings indicate that laser-assisted management of pilonidal sinus disease is associated with reduced postoperative discomfort, shorter hospitalization, and faster functional recovery.

Table 2 Operative And Early Postoperative Outcomes

Parameter	Value
Operative time (minutes)	28.6±7.2
Hospital stay (days)	1.2±0.5
VAS Day 1	4.2±1.1
VAS Week 1	1.3±0.6
Return to work (days)	5.8±2.1

Postoperative Outcomes and Complications

Out of 60 patients treated with laser-assisted sinus ablation, complete wound healing was achieved in 56 cases, yielding a success rate of 93.3%. Delayed wound healing was observed in 4 patients (6.7%), all of whom responded to conservative dressings and regular follow-up care.

Postoperative complications were minimal. Wound infection occurred in 3 patients (5.0%), while seroma formation was noted in 2 patients (3.3%). These complications were managed conservatively without the need for re-intervention or hospital readmission.

During a mean follow-up period of 12 months, recurrence of pilonidal sinus disease was observed in 4 patients (6.7%). Overall, the recurrence rate remained low and comparable to other minimally invasive techniques reported in contemporary literature.

The findings demonstrate that laser-assisted treatment is associated with high healing rates and a low incidence of postoperative complications and recurrence.

Table 3 Healing And Complications

Outcome	Number (%)
Complete healing	56 (93.3%)
Delayed healing	4 (6.7%)
Wound infection	3 (5.0%)
Seroma	2 (3.3%)
Recurrence	4 (6.7%)

DISCUSSION

The management of pilonidal sinus disease has evolved significantly over the past decade, with increasing emphasis on minimally invasive approaches aimed at reducing postoperative morbidity and improving patient satisfaction. Laser-assisted treatment represents one such advancement and has gained popularity due to its tissue-preserving nature[5].

The mean age of 27.8 years in the present study corresponds closely with previous reports indicating that PSD primarily affects young adults during their most productive years. Dessily et al. reported a mean age of approximately 26 years among patients undergoing SiLaC treatment[6]. Similar demographic patterns have been documented by Gola and colleagues[7].

The mean operative duration of 28.6 minutes observed in our study was comparable to findings from contemporary laser series reporting procedure times between 20 and 35 minutes[8]. Reduced operative duration contributes to improved operating room efficiency and lower healthcare costs.

Postoperative pain was considerably low in our study, with mean VAS scores decreasing from 4.2 on day one to 1.3 at one week. Conventional excisional procedures frequently report higher pain scores due to extensive tissue dissection and larger wound surfaces[9]. Reduced postoperative discomfort facilitates earlier mobilization and enhances patient satisfaction.

Complete healing was achieved in 93.3% of patients. A systematic review by Giarratano et al. reported healing rates ranging from 85% to 95% following laser treatment, supporting the findings of the present study[10]. Similarly, long-term analyses of SiLaC have demonstrated favorable healing outcomes with minimal wound care requirements[11].

The recurrence rate of 6.7% in our study compares favorably with recurrence rates reported for conventional surgery, which range from 5–20% depending upon technique and duration of follow-up[3,4]. Laser therapy may reduce recurrence by promoting uniform obliteration of the sinus tract while minimizing tissue trauma.

The average return-to-work interval of 5.8 days observed in this study highlights one of the most important advantages of laser treatment. Traditional open procedures frequently require several weeks before patients can resume normal activities[12]. Early recovery is particularly beneficial in younger populations, where prolonged absence from work or education carries substantial socioeconomic consequences.

The study is limited by its single-center design, relatively small sample size, and moderate follow-up duration. Larger multicentric randomized controlled trials are necessary to establish long-term comparative effectiveness.

CONCLUSION

Laser-assisted treatment for pilonidal sinus disease demonstrated high healing rates, low postoperative pain, minimal complications, short hospital stay, rapid return to routine activities, and acceptable recurrence rates. The procedure appears to be a safe and effective minimally invasive alternative to conventional surgery. Wider adoption of laser-assisted techniques may improve patient outcomes while reducing the burden associated with postoperative wound care and prolonged recovery.

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