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Early results of diode laser ablation method combined with pit excision in the treatment of adolescent pilonidal sinuses

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Abstract

Objectives: In this study, we aimed to evaluate the results of the diode laser ablation combined with pit excision in adolescent pilonidal sinus disease (PSD).

Patients and methods: Between January 2023 and July 2023, a total of 26 patients (16 males, 10 females; mean age: 15.2±1.4 years; range, 12 to 17 years) who underwent diode laser ablation combined with pit excision were retrospectively analyzed. Data including age, sex, number of sinuses, sinus length, postoperative pain, complications such as wound infection, wound bleeding, or recurrence, and time to return to the daily living activities were recorded. The NeoV V1470 diode laser was used in this method. Diode laser ablation was applied with a 2-mm radial probe with multiple pulses of 10 Watts for 3 sec.

Results: The median sinus length was 2.00 (range, 1 to 10) cm, and the median number of pits was 2.00 (range, 1 to 6). Three patients were relapsed patients who were previously treated for PSD. Laser ablation was successful in these patients. No postoperative pain or bleeding was observed postoperatively. All patients returned to their daily living activities the next day. The success rate of diode laser ablation combined with pit excision in adolescent PSD was 92.3%.

Conclusion: The diode laser ablation combined with pit excision is effective and minimally invasive treatment in uncomplicated adolescent PSD.

Keywords: Adolescent, diode laser, pilonidal sinuses.

Pilonidal sinus disease (PSD) is a clinical condition due to inflammation of the subcutaneous tissue in the intergluteal cleft and has a high risk of recurrence. Pilonidal means hair nest (in Latin: *pilus*= hair and nidus= nest).[1] The incidence is 26/100,000 and is shared between the ages of 15 and 30 years. It is three to four times more common in boys than girls.[2-5]

It is thought to be acquired, and obesity, hair growth, deep intergluteal cleft, and prolonged sitting periods are the factors which facilitate the formation of PSD. In this context, hair shed from another part of the body accumulates in this cleft, penetrates, and creates a nest, causing the formation of sinus, cyst, and fistula here.[2-4] With the infection of this region, an abscess is formed and then drains in the form of a sinus or fistula mouth. The sinus is lined with stratified squamous epithelium.[1,4] Additional sinuses are frequent and have lateral sinus orifices. The histopathological findings include inflammation, granulation tissue, hair shafts, epithelial remnants, and giant foreign body cells.[1]

Pilonidal sinus disease presents symptoms and clinical findings with various combinations of asymptomatic pitting or pain, swelling, and discharge in the sacrococcygeal region.[1,5,6] Many surgical and nonsurgical methods have been described in treating PSD. Antibiotic therapy and

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abscess drainage are applied for acute infection with discharge and abscess formation. In the chronic stage, it is treated with sinus tract excision, leaving it open for secondary healing, primary closure after tract excision, or surgical flap techniques.[7-9] In recent years, minimally invasive methods have been described. Minimally invasive methods are crystallized phenol application, endoscopic pilonidal sinus treatment, tissue adhesive, and laser treatment.[4,10-12] Laser ablation using a 1,470 nm radial diode laser fiber in the treatment of PSD was first performed by Dessily et al.[4] in patients aged between 15 and 46 years. Due to its ease of application, early return to social life, no need for dressing, and low recurrence, it has been applied in many centers.[13-16]

In the present study, we aimed to evaluate the results of the diode laser ablation combined with pit excision in adolescent PSD patients.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at University of Health Sciences, Bursa City Hospital, Department of Pediatric Surgery between January 2023 and July 2023. Adolescent patients diagnosed with PSD and who underwent diode laser ablation were screened. A total of 26 patients (16 males, 10 females; mean age: 15.2±1.4 years; range, 12 to 17 years) who met the inclusion criteria were recruited. The study protocol was approved by the Bursa City Hospital Clinical Research Ethics Committee (Date: 12.12.2019, No: 2019-KAEK-140). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data including age, sex, number of sinuses, sinus length, postoperative pain, complications such as wound infection, wound bleeding, or recurrence, and time to return to the daily living activities were retrieved from the hospital database.

Diode laser ablation combined with pit excision

Firstly, if there was a pilonidal abscess or acute infection or discharge, it was treated with oral antibiotics on an outpatient basis. Diode laser treatment was planned as a minimally invasive surgical treatment one month after the acute complaints were treated and the infection was resolved.

After the sinus tract discharge and abscess healed, cleaning the gluteal region with a depilatory or shave before the procedure was recommended. Patients were placed in the prone position with spinal or sedoanalgesia + local anesthesia, and any remaining hair in the gluteal region was shaved and stained with povidone-iodine. The largest sinus orifice was excised 1 to 2 mm with No. 11 scalpels. Hair, epithelial debris, and debris in the sinus were cleaned with clamps and forceps. Then, the sinus tract was brushed with a special brush to clean the debris and tract epithelium. In this method, NeoV V1470, a 2-mm radial diode laser, was used. The radial diode laser probe was advanced from the sinus orifice along the tract. The device was set to 10 Watts at a wavelength of 1,470 nm. Approximately four shots were made until induration occurred in each area by pulling back 3 to 5 mm each time until the sinus ablation was completed. After ablation, the tract was felt to be adhered during palpation (Figure 1). After the sinus tract ablation was completed, it was closed with a dry, simple dressing.

The procedure was performed as a day surgery. Postoperative dressing was not recommended. Oral antibiotics (ampicillin-sulbactam) for one week and paracetamol in case of pain were prescribed. The patients were informed that they could take a bath on the third day. Postoperative follow-ups were performed at one week, one month, six months, and one year. Treatment success was defined as complete epithelial closure of the sinus opening, absence of discharge, infection, or recurrence during follow-up.

RESULTS

The median sinus length was 2.00 (range, 1 to 10) cm, and the median number of pits was 2.00 (range, 1 to 6). Three (11.5%) patients previously underwent open surgical intervention for pilonidal sinus and presented with recurrence, while diode laser ablation was successful in all three patients.

The procedure was performed with spinal and local anesthesia in 16 (61.5%) patients and sedoanalgesia and local anesthesia in 10 (38.5%) patients. The mean operation time was 18.23±3.40 (range, 14 to 25) min. No postoperative pain or wound bleeding developed in our patients.

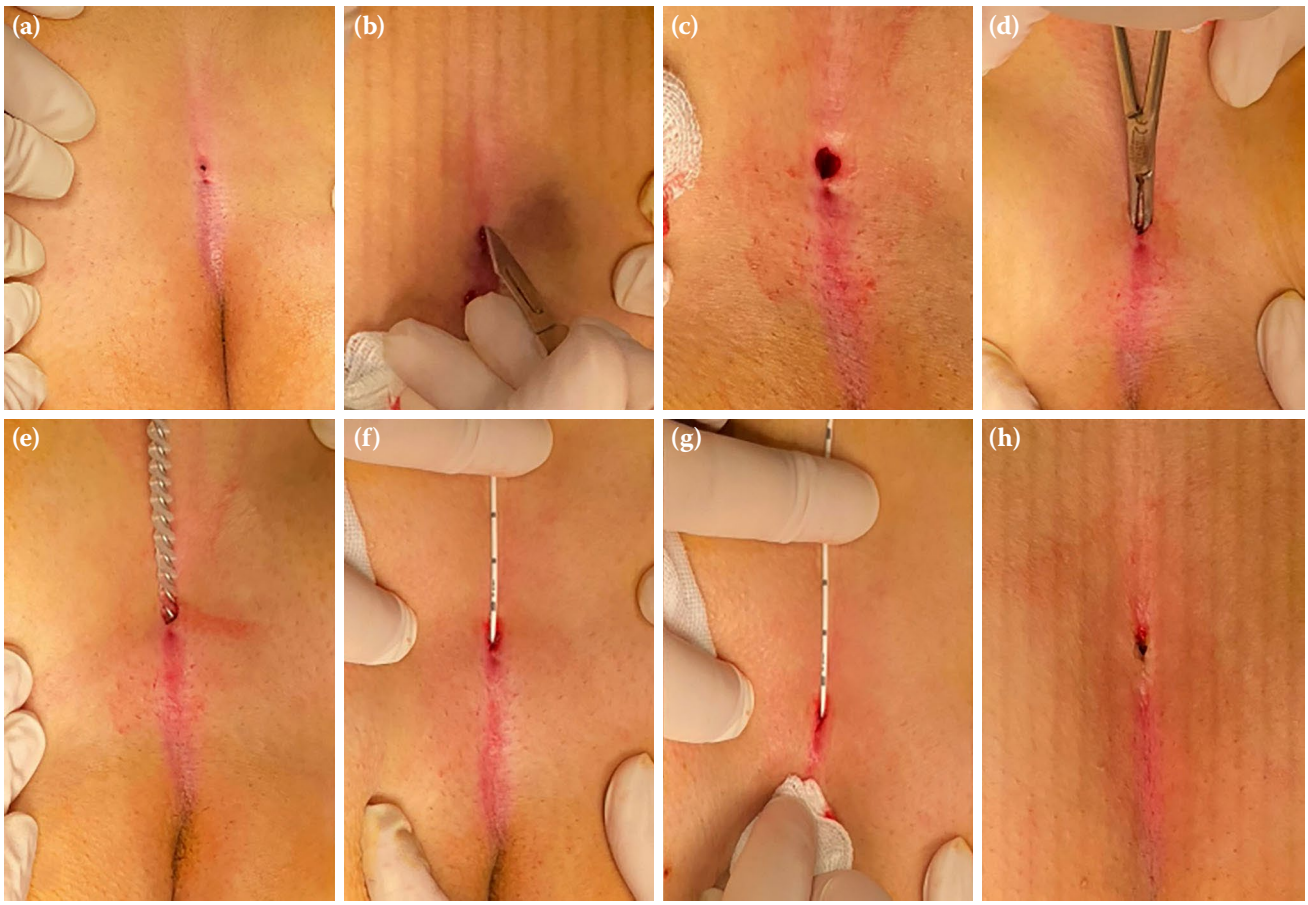

Figure 1. Diode laser ablation with pit excision in the treatment of pilonidal sinus **(a)** Pilonidal sinus. **(b)** Pit excision. **(c)** Appearance after pit excision. **(d)** Hair and content removal with clamp. **(e)** Brushing. **(f)** Placement of diode laser tip in the sinus. **(g)** Ablation with diode laser. **(h)** Appearance after diode laser.

TABLE 1
Diode laser ablation combined with pit excision study results in the treatment of adolescent PSD (n=26)

Characteristics	n	%	Mean±SD	Median	Range
Age (year)			15.2±1.4		12-17
Sex Male Female	 16 10				
Median number of pits				2.00	1-6
Median length of sinuses (mm)				2.00	1-10
Mean operation time (min)			18.23±3.40		14-25
Anesthesia method Spinal and local anesthesia Sedoanalgesia and local anesthesia	 16 10	 61.5 38.5			
Mean follow-up (mo)				10	6-12
Success of the method	24	92.3			

PSD: Pilonidal sinus disease; SD: Standard deviation.

They returned to their daily living activities the next day. In two (7%) patients, adequate recovery was not achieved after laser ablation. These two patients had advanced sinus lengths of 8 and 10 cm and had a vast sinus tract and lateral opening, and the infection could not be controlled entirely with dressings. Phenol was later applied to these two patients, and early results were successful. Inflammatory cells, necrotic tissue, hair, and hair samples were observed, and no evidence of malignancy was observed. The median follow-up was 10 months (range, 6 month to 1 year). In our study group, the success in adolescent PSD was 92.3%. rate of diode laser treatment combined with pit excision (Table 1).

DISCUSSION

Pilonidal sinus disease causes symptoms and findings ranging from asymptomatic sinus openings to painful drainage lesions in the sacrococcygeal region.[1] The prevailing view is that PSD is an acquired disease that develops with the penetration of hair and hairs under the skin through the natal cleft in the sacrococcygeal region and the formation of an abscess and sinus cavity.[2-4] In the acute phase, the complaint and clinical findings are infection and abscess formation with pain, swelling, and discharge, which are resolved with outpatient antibiotic drainage and local wound care. It heals, leaving behind the sinus mouth and cavity space. This cavity wall is covered with multi-layered squamous epithelium and contains hair, epithelial debris, and granulation tissue.[4,17,18] This chronic stage is treated with minimally invasive or open surgical methods. In the present study, all our patients applied to our clinic with discharge and/or abscess in the acute stage. Antibiotics, local wound care dressings, drainage, and/or debridement were used in acute treatment. Approximately one month after the signs of infection resolved, laser ablation was planned for patients with sinus orifice and sinus tract.

The ideal surgical treatment for PSD is cleaning the sinus tract and cavity hair, epithelial tissues, and granulation tissue, eliminating the epithelium on the wall of this tract, and healing the skin. In recent years, effective and safe minimally invasive methods have begun to be widely used, considering short surgery time, short recovery time, and cosmetic outcomes.[4,10-12] One of the minimally invasive methods is the use of lasers.

In the clinical practice, there are various types and applications of lasers in PSD treatment. These are CO_2 laser, Nd: YAG laser, and radial diode laser. The CO_2 laser is used for cutting or excision of tissue, Nd: YAG laser treatment for laser epilation, including hair removal to reduce PSD recurrence rates, and radial diode laser for (PS) ablation are different laser applications.[4,19-22] Ablation treatment with radial diode laser probe for pilonidal sinus ablation was published by Dessily et al.[4] The authors treated 40 patients with an 87.5% cure rate. It has been reported that the success of laser treatment is increased by combining the pit-picking method defined by Bascom[23] in 1980 with the diode laser treatment of Yardimci.[24] In our study, diode laser combined with pit excision was applied to 26 patients with PSD with a mean age of 15.2±1.4 years and was successful in 24 (92.3%) patients. All the patients returned to their daily living activities the next day. We believe that combined pit excision to diode laser treatment increases the success of laser treatment. In our study, laser ablation was successful in three cases, one of whom previously underwent a flap, and two had surgical excision and had recurrence. It was also effective in patients who previously underwent surgery and had recurrence.

Diode laser treatment was unsuccessful in two cases in our study. These two cases were patients treated for abscess and discharge before laser surgery, one with a sinus length of 8, the other with a lateral sinus orifice outside the midline, and the other with a sinus length of 10 cm. In addition, these were patients whose discharge did not fully resolve despite antibiotics and local wound care. In these patients, discharge continued after laser surgery, and a larger cavity formed in this area. It was thought that effectiveness of laser treatment was insufficient in complicated PSD with incompletely resolved infection and lateral orifice opening. In the study of Harju et al.,[15] possible factors for successful healing after PILAT were analyzed including sex, body mass index, alcohol consumption, smoking, pus discharge during the procedure, number of sinus openings, and surgeon's experience. A statistically significant difference regarding the two-month healing rate was observed only in patients with pus discharge during the procedure.[15] Similar results

were obtained in our study. The presence of lateral orifice openings, long sinuses, and wide cavities in these patients were evaluated as other factors in failure. Although inferential statistical analysis to assess the relationship between sinus length and treatment failure could not be performed due to the limited sample size, clinical observations suggest that complex sinus anatomy may negatively affect treatment success. Future studies with larger cohorts are needed to confirm these associations. In addition, the disadvantage of minimally invasive laser treatment is that deep pathways and abscesses can be overlooked. Therefore, checking the sinus depth with a stylet before the study may be practical in choosing the method.

The procedure can be performed under general, local, or spinal anesthesia. In a review conducted by Romic et al.,[19] 10 studies were evaluated for diode laser treatment applied in the treatment of PSD; local anesthesia was used in five studies, spinal anesthesia was used in three patients, general or spinal anesthesia was used in one study, general or local anesthesia used in one patient. Our study applied spinal and local anesthesia to 16 (61.5%) patients and sedoanalgesia and local anesthesia to 10 (38.5%) patients. The anesthesiologist tailored the selected anesthesia method by considering the patient's preference. Five (31.2%) of 16 patients who underwent spinal anesthesia had postoperative headache complaints. There were no perioperative and postoperative anesthesia complications in patients who underwent sedoanalgesia. In our recent applications in our clinic, our preference as a surgeon is sedoanalgesia. This preference was based on the patients' concerns perioperatively and our postoperative clinical observation.

Although malignant degeneration is extremely rare for PSD, there is a risk of malignancy.[25] Although malignant degeneration of PSD is extremely rare, sufficient samples cannot be obtained for histopathological analysis in standard laser treatment.[19] While pit excision primarily aimed to obtain tissue for histopathological examination, its possible role in promoting wound healing should be further evaluated. In diode laser treatment, pit excision, which we perform by excising approximately 1 mm around the orifice, creates a deep-epithelialized area for wound healing, and both this tissue piece and the debrided tissues are sent to pathology. In our study, inflammatory cells, granulation tissue, hair, and hair samples were observed in the tissue samples, and no malignancy was observed. We recommend taking a small tissue biopsy to deep-epithelialize the PS orifice, both to avoid pitting and for pathology evaluation.

In PSD laser treatment, the median operation time was 26 min in a review study evaluating the results of eight studies.[19] In our study, the mean operation time was 18.23±3.40 min. Our patients had no postoperative pain or wound bleeding. They returned to daily living activities the next day. However, standardized pain assessment tools such as the Visual Analog Scale (VAS) were not applied due to the retrospective design of the study. This limitation should be addressed in future prospective studies. In our two cases in whom the treatment was unsuccessful, there was no pain or bleeding, and they returned to their daily living activities the next day. In the cases where the laser treatment was successful, there was no need for additional dressing. In the two cases in whom the treatment was unsuccessful, sinus ablation was insufficient, and the discharge continued. Laser treatment was evaluated as a comfortable treatment in terms of short surgical time, absence of complications such as postoperative pain and bleeding, and return to everyday life the next day.

Recurrence is the main concern in the treatment of PSD. No recurrence was observed in our study. The median follow-up was 10 months. However, this period is not sufficient for the evaluation of PS recurrence. We acknowledge that the six- to 12-month follow-up period may be insufficient to fully evaluate recurrence rates, as previous studies reported peak recurrence beyond 12 months. Therefore, long-term follow-up is required to confirm these results. Dessily et al.,[4] who first applied diode laser treatment in the treatment of PS, observed recurrence as 2.9% in their first study in 2017 with a median follow-up period of 7.8 months and then found recurrence as 14.9% with a more significant number of patients and a long-term follow-up period of 17.4 months in 2019.[13] Similarly, our study needs a more significant number of patients and more extended follow-up periods. The small sample size and relatively short follow-up period are the main limitations to our study, and further prospective research is required to validate our findings. Early results in

the treatment of PSD are promising in terms of recurrence after successful diode laser application. All our patients are advised to clean the buttock area of their hair and pay attention to hygiene to prevent new PSD formation.

No formal cost analysis has been performed in this study. However, the method appears resource-efficient due to short operation times and outpatient feasibility. Future prospective studies with larger cohorts and longer follow-up periods are needed to assess long-term recurrence and cost-effectiveness.

In conclusion, diode laser ablation combined with pit excision is a safe and effective minimally invasive method for the treatment of uncomplicated adolescent PSD. The main advantages of this technique include short operative times, low complication rates, and rapid recovery. Further long-term studies are needed to confirm recurrence rates.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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