ORIGINAL ARTICLE

# Comparison of the effectiveness of laser and crystallized phenol in the treatment of sacrococcygeal pilonidal sinus

## *Comparación de la efectividad del láser y el fenol cristalizado en el tratamiento del seno pilonidal sacrococcígea*

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## Abstract

**Background:** *The aim of this study was to compare the effectiveness of crystallized phenol and laser in the treatment of sacrococcygeal pilonidal sinus (SPS) disease.* **Results:** *A total of 80 patients (40 crystallized phenol, 40 laser) were included in the study. The procedure time was significantly shorter in the crystallized phenol group than in the laser group (543 and 837 s, $p < 0.001$). While there was no significant difference in recurrence and patient satisfaction between the groups ($p > 0.05$), the visual pain scale pain score and post-procedural complications were significantly lower in the laser group ($p < 0.05$). There was no significant difference between the number of sinuses and recurrence, bleeding, pain, and patient satisfaction ($p > 0.05$).* **Conclusions:** *Crystallized phenol and laser used in the treatment of SPS disease have a low recurrence and similar long-term patient satisfaction. However, laser treatment has fewer intraoperative complications and post-operative pain severity than crystallized phenol.*

***Keywords:*** *Sacrococcygeal pilonidal sinus. Laser. Crystallized phenol. Visual Analog Scale. Likert measurement system.*

## Resumen

**Antecedentes:** *El objetivo de este estudio fue comparar la efectividad del fenol cristalizado y el láser en el tratamiento de la enfermedad del seno pilonidal sacrococcígeo (SPS).* **Resultados:** *Se incluyeron en el estudio un total de 80 pacientes (40 con fenol cristalizado, 40 con láser). El tiempo del procedimiento fue significativamente más corto en el grupo de fenol cristalizado que en el grupo de láser (543 y 837 segundos, $p < 0.001$). Si bien no hubo diferencias significativas en la recurrencia y la satisfacción del paciente entre los grupos ($p > 0.05$), la puntuación de dolor VAS y las complicaciones posteriores al procedimiento fueron significativamente más bajas en el grupo de láser ($p < 0.05$). No hubo diferencia significativa entre el número de senos paranasales y recurrencia, sangrado, dolor y satisfacción del paciente ($p > 0.05$).* **Conclusiones:** *El fenol cristalizado y el láser utilizados en el tratamiento de la enfermedad del SPS tienen una baja recurrencia y una satisfacción del paciente similar a largo plazo. Sin embargo, el tratamiento con láser tiene menos complicaciones intraoperatorias y severidad del dolor postoperatorio que el fenol cristalizado.*

***Palabras clave:*** *Seno pilonidal sacrococcígeo. Láser. Fenol cristalizado. Escala analógica visual. Sistema de medición tipo Likert.*

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# Introduction

Sacrococcygeal pilonidal sinus (SPS) disease is a common disease that occurs in the presacral area due to excessive hair growth in the intergluteal region, poor hygiene, and prolonged sitting[1]. SPS disease is more common in young and male individuals, and this rate is 3–4 times higher than in women[2,3].

Surgical intervention is the most commonly used treatment for SPS disease. However, in recent years, the trend toward minimally invasive treatment methods has increased due to the length of hospital stay after surgery, delay in returning to normal daily activities, post-operative complications, post-operative disturbing pain, extensive scar tissue after surgery, and high recurrence rate[4-6].

Crystallized phenol ($C_6H_6O$) is a sclerozing agent that is antiseptic in chemical structure and destroys the epithelium and granulation tissue in the sinus cavity by turning into liquid form at the body temperature. The crystalline form of phenol is widely used in the treatment of SPS disease[7-9].

Another minimally invasive method used in the treatment of SPS disease is radial laser therapy. In SPS treatment, radial laser damages and obliterates the sinus cavity and tracts with thermal energy and accelerates the formation of new granulation tissue[10].

The aim of this study was to compare the effectiveness and post-operative complications of crystallized phenol and radial laser treatment, which have recently been used in the treatment of SPS disease.

## Materials and methods

In this retrospective study, a total of 80 patients underwent laser and crystallized phenol treatment for SPS disease at the General Surgery Clinic of Bursa Yüksek İhtisas Training and Research Hospital between June 2021 and January 2022 were included. The 40 patients included in the study were treated with a radial 1.470-nm diode laser and 40 patients were treated with crystallized phenol (99.9%). Demographic, clinical, and post-operative complications were recorded from the patient files. In addition, pain intensity measurement with a Visual Pain Scale (VAS) at 6, 12, and 24 h post-operatively was recorded in all of the patients (Table 1). The VAS was numbered from 0 to 10. 0 was defined as no pain, while 10 was defined as the most severe and unbearable pain[11]. In addition, the patients of both groups were contacted by phone 6 months after the treatment, and information was obtained about the satisfaction status with the 5-choice measurement system

**Table 1. Visual analog scale**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

0: No pain at all, 10: Unbearable pain

**Table 2. Likert's 5-choice measurement system**

| | | | | |
|---|---|---|---|---|
| I absolutely approve | I approve | I am undecided | I disapprove | I absolutely do not approve |

used by Likert in his thesis. Likert's 5-choice measurement system used in his thesis included questions with 5 options: strongly approve, approve, neutral, disapprove, and strongly disapprove (Table 2)[12]. The patients were divided into two groups according to the number of sinuses. Those with 1-3 sinuses were defined as group 1 and those with 4 or more sinuses were defined as group 2.

Patients between the ages of 18-70 years who had not received any previous surgical treatment for SPS disease, had an *American Society of Anesthesiologists* score of I-II, and did not have an abscess at the lesion area were included in the study. Patients who received SPS treatment while receiving steroid therapy, patients who were being treated for recurrent SPS, patients with diabetes mellitus, and patients with any malignancy were excluded from the study.

Local anesthesia was applied to all of the SPS patients treated with crystallized phenol (Fig. 1A). All sinus orifices were cannulated with a stylet. The skin tissue surrounding the sinus opening was protected against the caustic and irritating effects of pure crystallized phenol by applying nitrofurantoin ointment. Then, the mouth of the sinus orifice on the midline and closest to the pilonidal cyst was excised and enlarged with a rhomboid incision approximately 0.5-1 cm in diameter. The hairs inside the cyst were removed using forceps and the inner wall of the cyst was curetted. The cyst cavity was filled with millimetric pieces of crystallized phenol (3-5 g) (Fig. 1B). If there was a sinus orifice outside of the midline, the outer mouth of this orifice was also excised and enlarged with a 5-10-mm rhomboid incision. Crystallized phenol was placed through this opening to fill the cavity. The crystallized phenol was kept in the cavity for 3-5 min. The dressing was pressed with a sponge for 1 min. The patients who received crystallized phenol were discharged after the procedure. The patients were advised to return to their daily activities 1 day later.

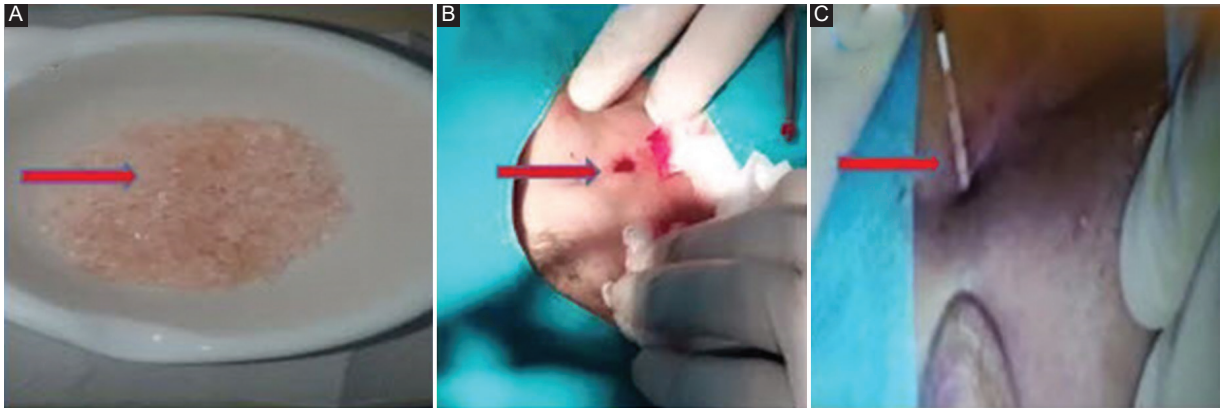


**Figure 1. A:** *crystallized phenol,* **B:** *phenol application,* **C:** *laser application.*

All of the patients were told that they could take a bath after 2 days.

All of the patients underwent spinal anesthesia. All of the sinus orifices were cannulated with a thin stylet (Fig. 1C). The granulation tissue and cyst interior were curetted with a brush before the laser procedure was started. The cavity was washed with 20 mL of 0.9% saline. Then, the tractus was obliterated with a radial 1470-mm diode laser probe (Filac) by applying an average of 100 joules of energy (10 watts for 10 s for each 10 mm, 100 joules of energy was applied for each 10 mm in total). All of the patients were followed up in the clinic for 1 day after the procedure and then discharged. All of the patients received nonsteroidal antiinflammatory drugs (dexketoprofen 2 × 50 mg orally) and antibiotherapy (amoxicillin + clavulanic acid 2 × 1 g orally) for 5 days after the procedure.

### *Statistical analysis*

IBM SPSS Statistics for Windows 21.0 (IBM Corp., Armonk, NY, USA) was used for the statistical evaluations of the study. Compliance with normal distribution was evaluated using the Kolmogorov–Smirnov test. Measurable data and data fulfilling the parametric condition were given as the mean ± standard deviation. For measurable data and data that did not fulfill the parametric condition, the distribution was defined as the median (min-max). The categorical variables were expressed as numbers and percentages (%). In the comparison of data between two groups, the independent samples t-test was used for the data that fulfilled the parametric condition and the Mann–Whitney U-test was used for the data that fulfilled the nonparametric condition. The Chi-square test was used for the comparison of categorical variables. In all of the statistical evaluations, $p < 0.05$ was considered statistically significant.

### *Ethics approval*

Ethics committee approval for the study was obtained from the Ethics Committee of Bursa University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital with the decision number 2011-KAEK-25 2022/01-07 on January 12th, 2022. The study was conducted in accordance with the Declaration of Helsinki.

## Results

The mean age of the patients operated on for SPS disease was 28 ± 10 (18-69) years. Moreover, 74 (92.5%) of the patients were male. The mean body mass index (BMI) was 27 ± 4 and the mean number of sinuses was 2.6 ± 1.7 (1-12). In addition, the number of sinuses was between 1 and 3 in 65 (81%) of the patients. In addition, 39 (49%) patients had bleeding during the procedure and 3 patients developed a postoperative hematoma. The recurrence of SPS disease was detected in 13 (16%) patients (Table 3).

The mean age of the patients who underwent crystallized phenol treatment for SPS disease was 29 ± 10 (18-52) and the mean age of the patients who underwent laser treatment was 27 ± 11 (18-69). There was no significant difference in the mean age between the two groups ($p = 0.5$). While 38 (95%) of the patients treated with crystallized phenol were male, 36 (90%) of the patients treated with laser were male. There was no significant difference between the

**Table 3. Demographic and clinical data of patients (n = 80)**

| Variables | Value |
|---|---|
| Age, year* | 28 ± 10 (range: 18-69) |
| Gender, F/M, n (%) | 6/74 (7.5/92.5) |
| Height, centimeters* | 175 ± 8 |
| Kilo, kilogram* | 82 ± 14 |
| BMI* | 27 ± 4 |
| Processing time, s* | 689 ± 274 (range: 310-1500) |
| Number of sinuses* | 2.6 ± 1.7 (range: 1-12) |
| Sinus number group, n (%) | |
| Group 1 (Number of sinuses: 1-3) | 65 (81) |
| Group 2 (Number of sinuses: > 3) | 15 (19) |
| VAS**, Post-operative | |
| 1. h | 1 (0-5) |
| 6. h | 1 (0-5) |
| 24. h | 0 (0-6) |
| Smoking, n (%) | 45 (56) |
| DM, n (%) | 0 |
| Treatment protocol | |
| Laser | 40 (50) |
| Phenol | 40 (50) |
| Anesthesia status, n (%) | |
| Local | 40 (50) |
| Spinal | 40 (50) |
| Complication, n (%) | |
| Bleeding | 39 (49) |
| Hematoma | 3 (4) |
| Complication after 6 month, n (%) | |
| Relapse | 13 (16) |
| Likert | |
| I absolutely approve | 27 (34) |
| I approve | 40 (50) |
| I disapprove | 13 (16) |

*Mean ± standard deviation.
**Median (min-max.).
h: hour, F: female, M: male, BMI: body mass index, DM: diabetes mellitus.

treatment protocols in terms of gender distribution (p = 0.4). There was no significant difference in the body mass index (BMI) in either patient group (p = 0.9). The number of sinus orifices was between 1 and 12 in the crystallized phenol patients and between 1 and 5 in the laser patients. However, there was no significant difference between the groups in terms of the mean sinus numbers of either group (p = 0.9). In addition, although the proportion of patients with a sinus number >3 was higher in the phenol group (25% and 12.5%), this difference was not statistically significant (p = 0.1). The mean procedure times of the patients treated with crystallized phenol and laser treatment were 543 ± 173 and 836 ± 279 s, respectively. The procedure times of the patients treated with phenol were significantly shorter (p < 0.001). In the VAS performed at 1, 6, and 24 h postoperatively, it was determined that there was a significant difference between the two groups in terms of pain intensity, and the pain of the patients treated with crystallized phenol was higher than in the patients treated with laser (p < 0.05). Intra-operative bleeding was observed in 39 patients treated with crystallized phenol, whereas no bleeding was observed in any of the patients treated with laser. This difference was statistically significant (p < 0.001). The post-operative hematoma was seen only in 3 patients treated with crystallized phenol. After 6 months of follow-up, recurrence of the disease was detected in 7 (18%) patients treated with crystallized phenol and 6 (15%) patients treated with laser. There was no significant difference between the two groups in terms of recurrence (p = 0.8). According to Likert's satisfaction measurement system of the patients in both groups after 6 months, 16 (40%) of the patients who underwent crystallized phenol treatment stated that they strongly approved, 17 (43%) approved, and 7 (18%) disapproved of the procedure. Among the patients who underwent laser treatment, 11 (28%) strongly approved, 23 (58%) approved, and 6 (15%) disapproved. According to Likert's satisfaction measurement, there was no significant difference between the two groups (p = 0.4) (Table 4).

There was no significant difference between the number of sinuses and recurrence, bleeding, pain, and patient satisfaction (p > 0.05) (Table 5). Among the patients who underwent crystallized phenol treatment, 37 underwent only 1 procedure and 3 underwent a 2nd crystallized phenol treatment procedure 1 month after the procedure due to continuous discharge.

## Discussion

Although the prevalence of SPS disease is high, there is still no standard treatment[13]. The ideal treatment for SPS disease should include the following parameters: it should be painless and cost-effective, recurrence and complication rates should be low, and hospitalization and return to daily activities should be short[9,14]. Crystallized phenol and radial laser applications, which are minimally invasive treatment methods applied in the treatment of SPS disease, have been used as an alternative to the classical surgical method in recent years[3,6,15]. According to our current knowledge,

**Table 4. Demographic and clinical data across treatment protocols**

| Variables | Phenol group (n = 40) | Laser group (n = 40) | p |
|---|---|---|---|
| Age, year* | 29 ± 10 | 27 ± 11 | 0.5 |
| Gender, F/M, n (%) | 2/38 (5/95) | 4/36 (10/90) | 0.4 |
| Height, cm* | 175 ± 8 | 174 ± 9 | 0.9 |
| Kilo, kg* | 81 ± 14 | 83 ± 14 | 0.6 |
| BMI* | 27 ± 4 | 26 ± 4 | 0.9 |
| Processing time, s* | 543 ± 173 | 836 ± 279 | < 0.001 |
| Number of sinuses* | 2.6 ± 2.1 | 2.6 ± 1.0 | 0.8 |
| Sinüs sayısı grubu, n (%) | | | |
| Group 1 (Number of sinuses: 1-3) | 30 (75) | 35 (87.5) | 0.1 |
| Group 2 (Number of sinuses: > 3) | 10 (25) | 5 (12.5) | |
| VAS**, postoperative | | | |
| 1. h | 2 (0-5) | 0 (0-2) | < 0.001 |
| 6. h | 1 (0-5) | 1 (0-4) | 0.03 |
| 24. h | 0 (0-6) | 0 (0-2) | 0.01 |
| Smoking, n (%) | 26 (58) | 19 (42) | 0.1 |
| Anesthesia status, n (%) | | | |
| Local | 40 (100) | - | < 0.001 |
| Spinal | - | 40 (100) | < 0.001 |
| Complication, n (%) | 39 (97.5) | - | < 0.001 |
| Bleeding | 3 (7.5) | - | |
| Hematoma | | | |
| Complication after 6 months, n (%) | | | |
| Relapse | 7 (18) | 6 (15) | 0.8 |
| Likert | | | 0.4 |
| I absolutely approve | 16 (40) | 11 (28) | |
| I approve | 17 (43) | 23 (58) | |
| I disapprove | 7 (18) | 6 (15) | |

*Mean ± standard deviation,
**Median (min-max.).
F: female, M: male, BMI: body mass index, DM: diabetes mellitus, h: hour

**Table 5. Relapse, bleeding, pain, and patient satisfaction status according to sinus number groups**

| Variables | Grup 1 Number of sinuses: 1-3 (n = 65) | Grup 2 Number of sinuses: > 3 (n = 15) | p |
|---|---|---|---|
| Relaps, n (%) | 10 (15.4) | 3 (20) | 0.6 |
| Bleeding, n (%) | 30 (46) | 9 (60) | 0.3 |
| VAS*, Post-operative | | | |
| 1. h | 1 (0-4) | 2 (0-5) | 0.2 |
| 6. h | 1 (0-4) | 1 (0-5) | 0.3 |
| 24. h | 0 (0-5) | 0 (0-6) | 0.3 |
| Likert, n (%) | | | |
| I absolutely approve | 24 (37) | 3 (20) | 0.4 |
| I approve | 31 (48) | 9 (60) | |
| I disapprove | 10 (15) | 3 (20) | |

*Median (min-max.).
h: hour.

there are no studies comparing this minimally invasive method. In this regard, this study is a first in the literature.

It has been reported that SPS disease usually affects the male and young population[16]. In this study, similar to the literature, the majority of the patients were young and male.

Radial laser therapy, a minimally invasive method, was first applied in 2017[17]. Studies have shown that recurrence rates are between 10% and 14% in the use of laser in the treatment of SPS[16,18]. Herein, the recurrence rate was similar to those in the literature. In addition, bleeding after laser treatment was reported as 0% and hematoma as 0-5% in previous studies[1,17]. In the current study, similar to the literature, no bleeding or hematoma was observed after the laser procedure.

Crystallized phenol, a minimally invasive treatment method in SPS disease, is the method of phenol application through the sinus orifice[15]. It has been determined that the recurrence rate of crystallized phenol applied in the treatment of SPS disease is between 5% and 40%[19,20]. In this study, this rate was similar to the rates reported in the literature. The hematoma rate after crystallized phenol treatment has been reported as between 0 and 6[15,21]. In the cohort herein, this rate was consistent with the literature. However, no studies were found in the literature in which intraoperative bleeding was mentioned. In this study, intraoperative bleeding was found in almost all of the patients (97.5%) who underwent crystallized phenol.

In studies, recurrence rates in SPS disease patients with a sinus orifice number below 3 were reported to be lower than those with a sinus orifice number above 3 (4.7% and 37.5%)[7,22]. However, in this study, the recurrence rate was 15.4% in the group with 1-3 sinuses and 20% in the group with more than 3 sinuses. There was no significant difference between the 2 groups in terms of recurrence, bleeding, pain, or patient satisfaction.

In studies, the mean VAS scoring was 2.2 in laser treatment and 1.4 in crystallized phenol[3,6]. In the current study, the 1, 6, and 24 h median VAS scores in the laser and crystallized phenol groups were 0, 1, and 0, and 2, 1, and 0, respectively. These rates in pain assessment were close to the rates reported in the literature.

In this study, the fact that the pain intensity according to the VAS scoring was lower in the laser group at 1, 6, and 24 h and intra-operative bleeding/hematoma was not observed in the laser group suggested that radial laser treatment is superior to the phenol application. On the other hand, crystallized phenol treatment is easy to administer and has a shorter treatment time.

In previous studies, the rate of those who did not approve the laser treatment in the Likert satisfaction questionnaire 6 months postoperatively was reported as 2%[1], and the rate of those who did not approve the crystallized phenol treatment was reported as 2-6%[23]. In this study, these rates were 15% for laser treatment and 18% for crystallized phenol treatment. The dissatisfaction rates in the current cohort were higher than in the literature. The reason for this difference may have been the demographic/clinical differences of the patients in the studies and the fact that the procedure was performed by different operators.

Smoking and obesity are generally considered risk factors for surgical patients in the postoperative period, but this is still controversial in SPS disease surgery[24]. While some studies have highlighted that smoking and obesity are important risk factors for postoperative wound healing in SPS disease[25], some studies have highlighted that they are not risk factors[26]. In this study, there was no significant difference between the patients treated with crystallized phenol and laser treatment in terms of the BMI and smoking status. In addition, postoperative complications, such as infection, abscess, and fat necrosis, were not observed in either group.

In previous studies, it was determined that laser and crystallized phenol treatments can be applied consecutively at a certain time interval in SPS disease[17,27]. In the current study, it was determined that three patients who received crystallized phenol treatment received 2 sessions, 37 patients received only 1 session, and all of the patients who received laser treatment received only 1 session.

### *Limitations*

The limitations of this study were that it was retrospective, the number of patients was limited, and the follow-up period was short.

## Conclusion

Laser and crystallized phenol for the treatment of SPS disease is minimally invasive procedures with low recurrence rates. Laser treatment has fewer complications (bleeding/hematoma) and less pain intensity after the procedure compared to crystallized phenol. However, phenol treatment is easier and can be applied in a short time. There was no significant difference between the two methods in terms of long-term recurrence and patient satisfaction. It is thought that prospective studies with large patient groups are needed to clarify the advantages and disadvantages of both methods.

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## Conflicts of interest

The authors declare that they have no conflicts of interest.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.** Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for the analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

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