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The Effect of Phenol Concentration on the Treatment of Pilonidal Sinus Disease: Early Results of a Prospective Randomized Study

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Our hypothesis was that a low concentration (30%) of phenol would be more effective than a high concentration (80%) in the treatment of pilonidal disease. The purpose of our study was to compare the effects of high and low doses of liquid phenol in the treatment of pilonidal disease, since the phenolization technique and concentration of the phenol solution is not well defined. Consecutive patients being treated for pilonidal disease with high and low concentrations of phenol were included in this randomized prospective study. The demographic data, pilonidal disease characteristics, and results of phenol application were examined. Of 101 subjects, 52 were treated with 80% phenol while 49 were treated with 30% phenol. The mean observation period was approximately 1 year. The total recovery rate was higher among the 80% phenol group ($P = 0.046$). The recovery period, the period of leave from work, and complication rates were similar in both groups ($P = 0.414$, 0.328, 0.256). Also, in the Likert-type survey administered by validated methods, there was no difference in the degree of satisfaction ($P = 0.494$). The low concentrations of phenol did not achieve faster recovery, faster return to work, or fewer complications in the treatment of pilonidal disease. An 80% concentration of phenol should be used for a higher rate of recovery.

Key words: Pilonidal disease – Phenol – Phenol technique – Satisfaction – Pilonidal sinus – Phenol concentration – Early results

The incidence of pilonidal disease (PD), a chronic painful condition, among young males in Turkey is 1/1000.[1] The gold standard treatment for this disease is controversial. The recovery period following surgical treatment of microbial inflammation in PD is prolonged, and the cosmetic outcome is often poor.

Phenol, an aromatic hydrocarbon, has antiseptic, anesthetic, caustic, and mild sclerosing effects.[2] Due

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to these properties, it is used in orthopedics, dentistry, and dermatology. The current hypothesis is that hair contacts subcutaneous tissue in the anal cleft, forming a bridge for microorganisms and leading to the development of subcutaneous pilonidal disease.[3] Treatment with various phenol concentrations has been used to treat chronic inflammatory conditions, including those caused by hair[4–8]; 80% phenol was the concentration used most commonly. At concentrations greater than 5%, phenol denatures cell membrane proteins and causes a white, painless burning in the tissue.[2] The polypeptide structure of hair contains carotene, which is quickly denatured by phenol. Although the phenol concentration in the sinus in PD changes due to serous flow, debris, and seepage following debridement and curettage, it does not go below 5%, ensuring chemical cauterization of the chronic inflammation of the inner sinus walls and the embedded pillars. Fewer side effects and a lower rate of morbidity have been reported when treating PD with 40% compared with 80% phenol.[5]

Our hypothesis was that a lower liquid phenol concentration (30%) would show efficacy similar to a higher concentration (80%), but with fewer complications, and would result in more rapid recovery and return to work, less recurrence, and greater patient satisfaction. Therefore, the main objective of our study was to examine the recovery time, time of return to work, and complication/recurrence rates after 1 year in PD patients administered 30% or 80% phenol. Our secondary objective was to assess the patient satisfaction rates. The third objective was to identify effective phenol application techniques.

Materials and Methods

Permission for this study was obtained from the local ethics board. The surgical team gained experience in the technique with 10 cases that were not included in the study. Successive patients who presented to the Tepecik Training Hospital between November 2012 and August 2014 due to PD were included prospectively and randomly. The benefits and risks of this and other treatment methods were explained to the patients. We performed the procedure on those patients who provided written consent. Randomization was achieved by a coin toss by a nonmedical party outside of the surgical team. Group A was designated as 80% phenol and group B as 30% phenol. The registration and tracking protocol forms for all patients were prepared and recorded using spreadsheet software (Excel; Microsoft Corp, Redmond, WA).

Chronic primary and recurring PD patients were included in the study. PD patients with acute inflammation or acute abscess formation, psychiatry patients, and immobile patients were excluded.

Five cases of acute or abscessed forms showed signs of infection. We performed the procedure on patients with acute and abscessed forms of PD 4 to 6 weeks after treatment. Prophylactic antibiotics and laboratory tests were not performed in patients, with the exception of those with diabetes mellitus.

Phenol and hair denaturation

Although phenol is known to denature the carotene in hair, we were unable to access information about which types of hair are broken down at which concentrations and for which periods of time. Before starting the study, we addressed this lack of information by conducting an experiment at the Ege University Chemical Faculty Biochemistry Department. Following provision of written consent, bristly hair was removed from the back and presacral regions of several male PD patients who were not included in the study. The times to full denaturation of the hairs in 5%, 30%, and 80% phenol were 9.32, 9.05, and 8.46 minutes, respectively. Full breakdown of the hairs took 9 to 10 minutes, regardless of the phenol concentration. When treating PD, the phenol must be present in the cavity for at least 10 minutes to fully denature all hairs. The importance of complete eradication of the sinus hairs in terms of treatment and recurrence is clear. In this context, it may be necessary to reevaluate the literature regarding treatment of this condition using phenol.

Technique

The hair was removed preoperatively from the presacral region of patients in the jackknife position at the outpatient hospital. Local anesthesia was administered at the pit and sinus orifice areas. The anal region was protected with both petroleum jelly (Vaseline; Unilever, London, UK) and wet packing. Also, in cases with extension of the sinus tract toward the anal canal, the presence of a connection with the anal canal was evaluated by injecting methylene blue into the sinus. No connection with the anal canal was detected in any of the cases. The mouths of the sinuses and pits were expanded using a clamp. The hair, chronic inflammation, and debris

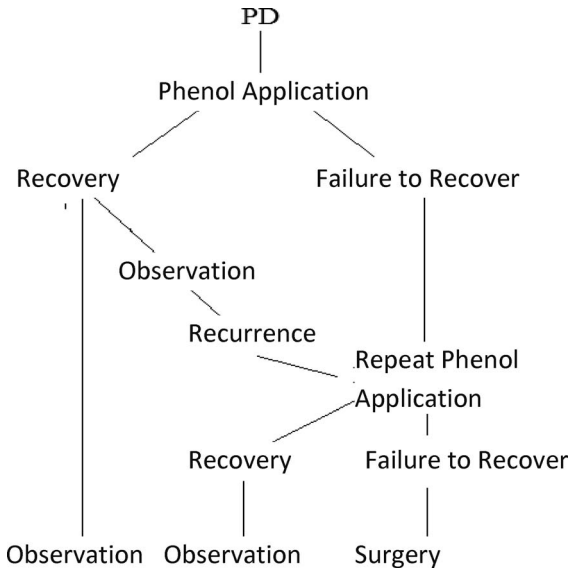

Fig. 1 Phenol 30% and 80% application protocol.

in the sinus and tracts were cleaned out first using a clamp and then a curette. All related sinuses, tracts, and pits were connected at suitable gaps. Electrolysis was used to disintegrate any skin epithelium in the pit area. A sample was taken for a culture antibiogram. Bleeding of the pit, sinus interior, and mouth was stopped using electrocautery and/or pressurized packing. The skin of the orifice was coated with petroleum jelly (Unilever). Cotton tampons soaked in liquid phenol were packed into the sinus and pressed gently for a period of 2 to 2.5 minutes. This process was repeated 5 to 7 times to ensure that phenol remained within the cavity for at least 10 minutes. Excess phenol and gray debris seeping from the sinus and pit mouth were carefully cleaned. The area was then closed with antibiotic pomade and a sterile dressing was applied. The patients returned to daily activities on the day of procedure. The patients were instructed to have the dressing replaced on the first and third postoperative days. An oral analgesic tablet was provided for pain as needed.

The closure of all orifices and ceasing of seepage was accepted as indicative of recovery. Failure of the procedure was accepted as failure to recover in 8 weeks. Cases with pits and sinuses that closed and then reopened and continued to seep were defined as recurrences. Our phenol application algorithm is summarized in Fig. 1. The complications were recorded. After the procedure, patients were observed by members of the surgical team weekly for the first 8 weeks, then at 3, 6, 9, and 12 months, and every 6 months thereafter. The patients were advised to remove hair from the affected area regularly following the procedure, to bathe at least 3 times per week, and to avoid sitting for more than 6 hours daily. As part of the patients' final check-up, a Likert-type satisfaction survey (tolerance of the procedure, postoperative pain, complications, time to return to normal daily activities, and cosmetic results) was conducted (0–2, bad; 3–4, poor; 5–6, fair; 7–8, good; 9–10, very good). The demographic characteristics of the patients, the details of their PD and presacral regions, and the peri- and postoperative observations following treatment with liquid phenol were examined.

Statistics

All data were analyzed with statistical software (SPSS for windows, version 15.0; SPSS, Chicago, Illinois). Statistical analysis was performed by using the Kruskal-Wallis test. Chi-square test was used for comparison of the groups. A value of $P < 0.05$ was considered statistically significant.

Results

Two patients who relocated to another city and 3 patients who were lost to follow-up were excluded from the study, leaving 101 cases for analysis. Eighty-three cases (82.2%) were male. The demographic characteristics of the patients, the state of their PD, and phenol application results are summarized in Table 1. Table 2 shows the data for the 2 groups after phenol application. A case of recurrence in group A after phenol application and a case that failed to recover after 8 weeks both recovered after a second application of 80% phenol. Two cases in group B that failed to recover after 8 weeks recovered after a second 30% phenol application. In group A, 2 cases developed a surface skin infection, 1 case developed an abscess, and 1 case had bleeding complications following the procedure. The bleeding was stopped with pressurized packing and the abscess that developed on postoperative day 5 was drained and oral antibiotics were given. The mild cellulitis that developed on the skin surface improved with oral antibiotics. The surface skin infections in 2 group B cases were treated with oral antibiotics. The skin damage (maceration) that developed in the same group was treated with a dressing. According to the Likert-type survey conducted on group A patients, the total satisfaction

Table 1 Patient, PD, and liquid phenol application characteristics

Characteristics	Phenol 80%	Phenol 30%	*P* value
Patients, n	52	49	0.240
Average age, n (%)	24 (17–48)	25 (18–54)	0.241
BMI, n (median)	26 (22–32)	25 (22–31)	0.132
Previous abscess, n (%)	13 (25)	9 (18.4)	**0.043**
Additional morbidity, n (%)	9 (17.3)	11 (22.5)	0.135
Median symptom duration, y (median)	1.7 (0.4–6)	1.9 (0.3–4)	0.302
Recurring cases, n (%)	7 (13.5)	8 (16.3)	0.201
Chronic abscess forms, n (%)	15 (28.9)	12 (24.5)	0.079
Chronic PD, n (%)	27 (51.9)	29 (59.2)	**0.044**
Number of sinus orifices, n (median)	2.7 (2–6)	2.9 (2–5)	0.359
Located outside the sinus orifice, n (%)	11 (21.6)	13 (26.5)	0.130
Anal cleft depth, mm (median)	38 (22–48)	35 (26–46)	0.266
IO phenol applications, n (median)	6.0 (5–7)	5.7 (5–8)	0.351
Duration of IO phenol applications, min (median)	11.5 (10–18)	12.1 (10–17)	0.410
Total application period, min (median)	29 (23–34)	27 (19–32)	0.160
Number of phenol application sessions			
1, *n*	42	38	–
2, *n*	8	10	–
3, *n*	2	1	–

BMI, body mass index; IO, intraoperative.

Additional morbidities included diabetes, hypertension, and smoking.

Bold numbers indicate statistical significance.

rate (good and very good) was 94%; for group B, it was 98% ($P = 0.138$).

Discussion

According to this prospective randomized study of PD patients, application of a low (30%) or high (80%) liquid phenol concentration results in similar outcomes in terms of recovery time, time to return to work, and complications. Also, the rate of recovery was higher for 80% phenol. The rate of satisfaction was similar for the 2 concentrations. In conclusion, treatment with a lower concentration of liquid phenol does not achieve a faster recovery/return to work or reduce complication rates.

Our study demonstrated that the rate of recovery in PD patients was considerably greater following use of higher than lower liquid phenol concentrations. A study that compared the use of 80% and 40% liquid phenol to treat PD patients found that the rates of recovery after a single dose were 77.7% and 88.9%, respectively.[5] Dogru *et al*[6] reported that more than 1 administration of crystallized 80% phenol achieves a 95.1% recovery rate. In our series,

Table 2 Data after phenol application

Data	Phenol 80%	Phenol 30%	*P* value
Observation, mo (median)	12.1 (4–20)	11.9 (4–20)	0.240
Need for analgesics, d (median)	1.7 (1–4)	1.5 (1–5)	0.253
Return to work time, d (median)	2.7 (0–4)	2.2 (0–4)	0.328
Recovery time, wk (median)	3.7 (2–7)	3.9 (2–6)	0.414
Total recovery rate, n (%)	45 (86.5)	39 (79.6)	**0.046**
Recovery rate after one application, n (%)	43 (82.7)	37 (75.5)	**0.048**
Recurrence, n (%)	2 (3.9)	1 (2)	–
Total complications, n (%)	4 (7.7)	3 (6.1)	0.256
Total satisfaction points (average)	9.4 ± 0.8	9.2 ± 1.0	0.494
Very good (9–10), n (%)	48 (92)	47 (96)	0.140
Good (7–8), n (%)	1 (2)	1 (2)	–
Fair (5–6), n (%)	2 (4)	1 (2)	–
Poor (3–4), n (%)	–	–	–
Bad (1–2), n (%)	–	–	–

Bold numbers indicate statistical significance.

the recovery rate following administration of a high concentration of phenol in PD patients was slightly higher after either 1 or multiple applications ($P = 0.046$, 0.048). To achieve recovery in PD, the sinuses must be completely cleared of debris, reactional tissue, and especially hairs.[7–9] Chemical cauterization of the debris and reactional tissue occurs in seconds.[3] However, to ensure that any hairs embedded in the sinus walls are denatured, a phenol concentration higher than 5% and a retention time of about 10 minutes is necessary. Phenol concentrations of 80% and 30% may reduce the debris in the small cavity of the sinus, decrease serous seepage into the cavity, and stop mild, invisible bleeding. Therefore, the success rate of low concentration phenol following mechanical debridement is lower. We are of the opinion that 80% phenol is associated with a higher success rate.

In this study, the time to return to work, recovery time, and complication rates were similar following treatment of PD patients with 30% and 80% phenol. Sakçak reported that the success rate for a low phenol concentration (40%) was lower than that of 80% phenol.[5] These results were interpreted as being due to deeper chemical cauterization of the sinus with higher concentrations. However, this also extends the recovery period and increases complication rates. In our study, the recovery time, time to return to work, and complication rates did not differ between the 2 groups ($P = 0.253$, 0.423, and 0.414, respectively). Thus, a phenol concentration higher than 5% (30%, 40%, or 80% in liquid or crystallized form) achieves identical cauterization of all tissue.[3,8] A study of 80% phenol application reported an average complication rate of 8.9%.[7] In 2 other studies in which more than 1 application of 80% phenol was administered, the rates of complications were 10.1% and 16.1%.[8,10] The lower rate of complications in our series was due to the technique being performed patiently by an experienced team and the close monitoring of the patients. The patients were also advised to press gently on the PD region (to drain any fluids accumulated in the sinus) 3 to 5 times per day to prevent the development of post-phenol application abscesses. This may have contributed to the reduced rate of abscesses and skin infections in our series.

This unique study found that either concentration of phenol leads to a high rate of satisfaction in PD patients. Due to the minimal need for analgesics, low rate of complications, and rapid return to work, this treatment was well tolerated by the patients. Moreover, not changing the aesthetic anatomy of the presacral region was thought to be associated with the good outcomes. Phenolization, which is a conservative treatment method for PD, achieves higher patient satisfaction than surgical intervention,[1,7,11] and thus should be the gold standard treatment for this condition.

What is the best method of phenol application? This question is not addressed in the literature. Various liquid and crystallized forms of phenol at 2 concentrations (40% and 80%) have been used[4,5,12–14] and many studies have explored their use,[7,8,10,15] often with conflicting results.[5,6,8] Our operation team recommends the technique defined in the "Materials and Methods" section, which addresses the etiology of the problem in PD patients. This method involves first mechanically emptying the sinuses, then applying at least 5% phenol for a minimum of 10 minutes to eliminate the remaining debris and hairs. Excess debris, seromas, and hemorrhage inside the sinus should be avoided. The patients should be monitored closely during the postoperative period to ensure compliance with the recommendations. The success rate of phenol treatment in PD can be increased by use of a suitable technique.

Our study had several limitations. First, the findings for only 1 year are provided. Longer-term data are required to determine recurrence rates. Second, no comparisons between groups or subgroup analyses were performed.

Conclusion

According to our findings, use of 80% phenol for treatment of PD will yield higher success rates. The rates of incision recovery, time to return to work, and complications are similar with low and high phenol concentrations. Also, phenolization treatment has a high rate of satisfaction among PD patients. Larger, multicenter studies should be conducted to verify these results.

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