The effect of different irrigants and intra canal dressing on sinus tract closure

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Abstract

Introduction: Antimicrobial activity of irrigants and interappointment intracanal dressing is an important consideration in endodontics. The aim of this study was to evaluate the clinical efficacy of chemomechanical preparation of the necrotic canals with different irrigants and intra canal dressing in the control of root canal infection and sinus tract closure.

Materials & Methods: In this study, 65 patients with sinus tract were treated. They were randomly divided into 4 groups. Sodium hypochlorite (NaOCl) and chlorhexidine (CHX) was used as the irrigation solutions in the group one and two, then the canals were filled. In group three, after irrigation with NaOCl, Ca (OH) 2/sterile Saline was used as intra canal medicament, and similar to group three Ca (OH) 2/CHX was used in group four after irrigating by CHX. After 7 days, the intra canal paste was removed and the canals were filled. The sinus tract closure was followed up within 7, 14, and 21-day intervals. The data were analyzed using Chi Square and Kruskal-Wallis statistical tests.

Results: The highest mean time of sinus tract closure was for Ca (OH)²/sterile Saline and the lowest was for Ca(OH)²/CHX . The differences of sinus tract closure between group 2&4 (p=0.04), group 3&4 (p=0.004). Groups were statistically significant.

Conclusion: It was concluded that Ca (OH)²/CHX paste as intra canal dressing has good clinical efficacy in the control of root canal infection and sinus tract closure.

Keywords: Calcium hydroxide, Chlorhexidine, Sodium hypochlorite, Root canal irrigants

تاثیر شوینده‌ها و پانسمانه‌های مختلف داخل کانال ریشه بر زمان بسته شذن سینوس ترکت

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چکیده
هدف: از این مطالعه، ارزیابی آمکنامه‌ای کومک‌کانالیک کانالهای نکرودیتیک با شوینده‌ها و پانسمانه‌های مختلف داخل کانال در کنترل عفونت و زمان بسته شدن سینوس ترکت بود.

مواد و روش‌ها: در این مطالعه، 65 تیمار دارای سینوس ترکت تحت درمان قرار گرفتند. بیماران بطور تصادفی به 4 گروه تقسیم شدند. گروه 1 و 2 از سدیم هیپوکلریت و کلسیم هیدروکسید در کنار یکدیگر در جلساتی که افتاده شده بودند در کلیه دو گروه در روز دومی کلزیت، در گروه 3 پس از شستشو با هیپوکلریت، کلسیم هیدروکسید/سالیسین استر و کلسیم هیدروکسید/سالیسین استر از خشکیه شده کانال و در گروه 4 پس از شستشو با هیپوکلریت دوباره کلسیم هیدروکسید/سالیسین استر از خشکیه شده کانال و در گروه 4 پس از شستشو با هیپوکلریت دوباره کلسیم هیدروکسید/سالیسین استر و کلسیم هیدروکسید/سالیسین استر در روز دومی کلزیت شدند. پس از آن کانال‌ها پر شدند و سپس سینوس ترکت به فاصله 7 و 14 روز مورد ارزیابی قرار گرفتند.

یافته‌ها: تیشتی زیادی سینوس ترکت مزدیت‌تر شده است (پس از کلسیم هیدروکسید/سالیسین استر) و کمتری مزدیت‌تر شده است (پس از کلسیم هیدروکسید/سالیسین استر). تفاوت سینوس ترکت در جلسات یک و دو (p=0.04) و جلسات 3 و 4 (p=0.004) نتیجه‌گیری کرد. کلسیم هیدروکسید/سالیسین استر از همان گروه کنترل در 5 تا 14 روز مورد ارزیابی قرار گرفت و نتیجه گیری کرد. میزان داخل کانال ریشه بود.

نتیجه‌گیری: کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر کلسیم هیدروکسید/سالیسین استر
The results from these studies are inconclusive, but in general, no significant differences have been reported between the two solutions. Considering the importance of treating sinus tract, the aim of this study was to evaluate the clinical efficacy of chemomechanical preparation of the necrotic canals with different irrigants and intra canal dressing in the control of root canal infection and sinus tract closure.

Materials & Methods

The Ethics Committee in Zahedan Medical University approved the protocol of the study (code: 93-1001). Sixty five systematically healthy patients were selected according to the following criteria. In the clinical evaluation, all teeth were asymptomatic and did not respond to vitality tests and with intraoral sinus tract. In radiographic evaluation, teeth had obvious periapical lesion with no previous endodontic treatment. Exclusion criteria were the presence of developmental groove, crack, periodontal abscess or true combined disease, pregnancy, nursing mothers and any systemic condition that could affect the progression of infectious disease or require antibiotic cover for routine dental therapy. Each patient was given written information about the study protocol and informed consent to participate in the study. All sinus tracts had been traced with gutta percha points and periapical intraoral radiographs were obtained from each tooth. The treatment was performed by one person. The time of sinus tract closure was evaluated by another person who was unaware of the treatment type.

After anesthesia (2% Lidocaine with epinephrine 1/80,000), the tooth was isolated with rubber dam. The crown and surrounding rubber dam were disinfected. An access cavity was prepared with sterile high speed diamond burs with coolant. Pulp chamber was rinsed by 2.5% sodium hypochlorite (NaOCL) (Home Plus Tehran, Iran) and the working length was estimated and confirmed by radiography. Then, the studied subjects were divided into four groups, using a simple randomization procedure. The groups were matched in terms of tooth type (anterior, premolar, and molar), location (maxilla, mandible), age, and gender.

Group 1: The canal was enlarged using the Crown Down technique with K-file (Dentsply Maillefer, Ballaigues, Switzerland), between each instrument the canal was irrigated by 2.5%NaOCL (Home Plus, Tehran, Iran), EDTA (META BIOMED CO LTD, Cheongwon-gun, South Korea), and 2.5%NaOCL. Sterile saline was used as the final irrigating solution. The canals were dried by paper points and filled with Gutta-percha (SureDent Co, Gyeonggi-do, Korea) and AH26 sealer (Dentsply, Konstanz, Germany) using lateral condensation technique. Periapical radiograph was taken at the end and the accuracy of treatment was approved.

Group 2: The canal was enlarged using the Crown Down technique with K-file during instrumentation, the canals were irrigated by using 0.12%CHX (Shahre Daru, Tehran, Iran) sterile saline was used as the final irrigant, and the canals were dried by paper points and filled with Gutta-percha and sealer AH26.

Group 3: Similar to Group 1, the canal was prepared. After drying the canal, it was dressed with a thick mix of Ca(OH)2 (Merck, Darmstadt, Germany) in sterile saline, which was applied to the root canal by means of a spiral paste filler followed by coronal sealing with a zinc oxide eugenol cement. The patients were recalled after 7 days, the intra canal paste was removed and the canal was obturated with Gutta Percha and AH26 sealer using the lateral compaction technique.

Group 4: Similar to Group 2, the canal was prepared and dressed with a thick mix of Ca(OH)2/CHX paste followed by coronal sealing. After 7 days, the intra canal paste was removed and obturated with Gutta Percha and AH26 sealer using the lateral compaction technique. A final radiograph was taken and the tooth was restored. The patient was followed up within 7, 14, and 21 day intervals after the treatment. It should be noted that the criterion of sinus tract closure is the clinical appearance of normal gingiva at the location of sinus tract, which is not differentiable with the adjacent gingiva. The data were analyzed using Chi Square and Kruskal-Wallis statistical tests.

Results

The distribution of tooth type and location, age, and gender has been homogenized in studied groups, and the results are presented in table 1. According to the Kolmogorov-Smirnov test, the data obtained from the time of sinus tract closure in the studied groups had no normal distribution (p<0.05), therefore they were compared using non-parametric tests. There was a significant difference between study groups in the periods up to 7 days, and the forth group had the highest frequency (52.9%) in this period (p <0.05).
In the 8-14-day periods, group 4 had significantly lower frequency (41.2%) (p<0.05). The frequency of samples without sinus tract closure (17.6%) was also significantly higher than the other groups (p<0.05). Table 2 shows the frequency of closing times of sinus tract in 4 intervals. Table 3 shows the mean time of sinus tract closure in the studied groups. The Kruskal-Wallis test shows that there was a significant difference in the duration of the treatment of groups (p<0.05). As shown in the Kruskal-Wallis test ranking, the group4 with the lowest rank (10.71±4.37) had significantly less closure time, and the Group3 with the highest rank (13.50±3.32) had the maximum time of closure. Groups1 and 2 were the same in terms of duration of treatment.

**Discussion**

According to the results of the present research, it can be concluded that mechanical preparation of a canal, the use of different irrigating solutions and intracanal dressing lead to sinus tract closure within 14 days. In this study, sinus tract of 4 patients of 65 were not closed; these limited number of patients were excluded from the study. In most cases, sinus tract was closed within 14 days. Since the studied groups were matched...
in terms of tooth type (anterior, premolar, and molar), age, and gender, the effect of these variables was eliminated in the treatment outcomes. Many texts have reported the presence of sinus tracts, but no study was performed on sinus tract closure; however, it can be concluded that following reduction of bacteria in the infectious root canal and its adjacent area, the sinus tract would be closed with the mechanical preparation and the use of different irrigating solutions and intra canal dressing. Different studies discussed the effect of antibacterial irrigating solutions on reduction of bacteria in an infectious root canal system. Most of these studies concluded that the use of different irrigating solutions causes a significant reduction in number of microorganisms of root canal. For instance, Stewart, in a clinical study, reported negative culture in more than 70 percent of the infectious root canals after chemomechanical preparation using anti-bacterial irrigating solutions\(^\text{[13]}\) and the studies carried out by Ercan, Siqueira also showed that chlorhexidine, sodium hypochlorite and EDTA can successfully be used as irrigating solutions\(^\text{[14,15]}\). However, one study indicated that 7-day medicant of canal with calcium hydroxide, 2%CHX gel or a mixture of Ca(OH)\(_2\)/CHX could not reduce bacterial concentration better than chemomechanical preparation of the root canal with 1% NaOCl\(^\text{[9]}\).

The present study indicates clinical efficacy of Ca(OH)\(_2\)/CHX dressing in the control of root canal infection. Canal dressing for 7 days with Ca(OH)\(_2\)/Sterile saline did not show the expected effect in disinfection the root canal system, indicating the need to develop more efficient inter appointment dressing.

Calcium hydroxide pH is about 12.5 and quickly eliminates most of the root canal bacterial species\(^\text{[6]}\). However, in parts of the canal space, the hydroxyl ions concentration and the PH value are considerably lower than that.\(^\text{[16]}\) Different species of bacteria have different ability to tolerate pH and often grow well at pH between 6 and 9. Prevotella Intermedia, Fusobacterium Nucleatum and Porphyromonas Gingivalis can survive and grow at PH levels between 8.0 and 8.3.\(^\text{[17]}\)

Several different species of bacteria are located in the tubules of root dentine.\(^\text{[18]}\) It is difficult to predict the effectiveness of a Ca(OH)\(_2\) dressing between visits and its ability to destroy the bacterial species located in this areas. It is possible that the present bacteria in the dentinal tubules escape the direct action of calcium hydroxide and are able to reinfect the canal space.\(^\text{[16,19]}\) This may explain why Ca(OH)\(_2\) alone was totally ineffective. In the present study, the use of Ca(OH)\(_2\)/CHX caused sinus tract closure within 10 days and the use of Ca(OH)\(_2\)/sterile saline caused sinus tract closure within 14 days. This can indicate further effect of calcium hydroxide/sterile saline dressing, which is consistent with the study of Bulacio, Mohammadi, Manzur and, Ercan. They concluded that anti-microbial activity of Ca(OH)\(_2\)/CHX as dressing material increases with time.\(^\text{[20,21,9,22]}\) In addition, Orstavik et al. indicated that calcium hydroxide is unable to remove live bacteria in depth of dentinal tubules due to its low penetration whereas a mixture of calcium hydroxyl/chlorhexidine disinfects the tubules to the depth of 600 micrometers within a week.\(^\text{[19]}\)

However, the present study is inconsistent with the study carried out by Mohammadi, They found that the activity of anti-microbial is achieved at a PH between 5.5 to 7. Therefore, it seems that alkalinization of PH by adding calcium hydroxide to chlorhexidine precipitates chlorhexidine molecules and reduces its effects. However, it does not change basic properties of calcium hydroxide.\(^\text{[21,25]}\)

In this study, we used Ca(OH)\(_2\) for 7 days in canal, which is not similar to the study of Leonardo et al. in which they determined 15 to 30 days for lining a canal.\(^\text{[20]}\) Therefore, with respect to the present research, simultaneous use of Ca(OH)\(_2\)/CHX for 7 days was effective in sinus tract closure.

Since the clinical, radiographic and histologic success of endodontic treatment of teeth with necrotic pulp and radiolucent periapical areas are strongly influenced by the level of reduction or elimination of intra canal and extra radicular infection, it may be concluded that the adequate biomechanical preparation associated with the application of calcium hydroxide/Chlorhexidine paste for 7 days represents a good clinical efficacy in the control of root canal infection and sinus tract closure. Finally, it is proposed to examine the effect of the other newer irrigating solutions and intra canal medicaments on sinus tract closure.

**Conclusion**

It was concluded that the combination of Ca(OH)\(_2\)/CHX has good clinical efficacy in the control of root canal infection and sinus tract closure.
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Conflict of interest: We declare that there is no conflict of interest.

References

