

Clinical Value of Endodontic Patients Treated with Calcium Hydroxide Preparations

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Abstract: *Objective:* To investigate the clinical value of endodontics patients treated with calcium hydroxide preparation. *Methods:* The study cases were selected from the endodontics patients who visited our hospital during the period from January 2022 to December 2023, and 97 cases were randomly selected according to the numerical table method and divided into two groups. There were 49 cases in the control group and 48 cases in the experimental group. The control group received conventional therapy, while the experimental group received treatment with calcium hydroxide preparation, and the clinical value of the two different treatment modalities was observed and analyzed. *Results:* In the experimental group, 45 out of 48 patients (93.75%) showed effectiveness, compared to 39 out of 49 patients (79.59%) in the control group. The effectiveness rate was significantly higher in the experimental group ($P < 0.05$). Initially, the VAS scores between the two groups were similar ($P > 0.05$), but after 1 and 3 months of treatment, the scores decreased in both groups. However, the experimental group had a greater decrease, indicating lower pain levels ($P < 0.05$). The experimental group had fewer complications (8.33%) compared to the control group (24.49%), with a significant difference ($P < 0.05$). Satisfaction with treatment was higher in the experimental group (95.83%) compared to the control group (95.83%), resulting in an overall higher satisfaction rate in the experimental group (83.67%; $P < 0.05$). *Conclusion:* The treatment effect of endodontics with calcium hydroxide preparation is remarkable, which not only can effectively help patients to relieve their pain and reduce the incidence of complications but also plays an important role in improving patients' satisfaction with treatment, which is worthwhile to be vigorously promoted in the clinic and learn from it.

Keywords: Endodontics; Calcium hydroxide preparations; Clinical value

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1. Introduction

Dental diseases encompass disorders affecting the hard tissues of the teeth, including caries, non-caries conditions, and periapical diseases of the dental pulp. Caries, characterized by progressive destruction of dental hard tissues due to various factors, primarily bacteria, lead to demineralization and organic matter decomposition, resulting in color changes and substantial lesions. Recognized by the World Health Organization as a top priority for prevention and treatment, caries, along with cancer and cardiovascular disease, demands attention^[1]. Non-caries conditions involve abnormal tooth development, dental trauma, chronic injury,

and dentin hypersensitivity [2,3]. Endodontics encompasses diseases affecting dental pulp tissues, such as inflammation, necrosis, and degeneration. The enclosed nature of the pulp within the dentin, connected only through apical foramina and lateral root canals, leads to increased pulp pressure during acute inflammation due to vascular congestion and exudate accumulation, resulting in severe pain [4,5]. Endodontic issues are common in dentistry, often causing significant pain and inconvenience, with prolonged treatment cycles and high recurrence rates, negatively impacting patients' physical and mental well-being [2,6]. Timely and effective treatment is crucial, motivating this study to investigate the clinical efficacy of calcium hydroxide preparation in endodontic patients.

2. Materials and methods

2.1. General information

The study included endodontic patients who visited our hospital from January 2022 to December 2023. Ninety-seven cases were randomly selected using the numerical table method and divided into two groups. Forty-nine cases were allocated to the control group for odd case numbers and forty-eight cases to the experimental group for even case numbers. The control group comprised 28 males and 21 females, aged 28 to 70 years (mean age: 46.54 ± 3.72 years), with disease duration ranging from 3 months to 2 years (mean duration: 1.04 ± 0.32 years). Conditions included 13 cases of deep caries, 11 cases of acute odontitis, 10 cases of chronic endodontic issues, and 8 cases each of acute and chronic periapical conditions. The experimental group consisted of 26 males and 22 females, aged 26 to 72 years (mean age: 47.16 ± 3.53 years), with disease duration ranging from 2 months to 1.8 years (mean duration: 1.12 ± 0.24 years). Conditions included 14 cases of deep caries, 12 cases of acute odontitis, and 10 cases of chronic endodontitis, as well as other conditions. Basic information between groups showed no significant differences ($P > 0.05$) after systematic correlation and statistical comparison. Inclusion criteria required patients to meet endodontic diagnostic criteria after clinical examination, report to our hospital for study approval, and provide informed consent. Exclusion criteria encompassed patients with serious diseases, vital organ insufficiency, psychiatric history, or cognitive disorders.

2.2. Methods

The control group underwent treatment with conventional pulp scaling agents and other modalities. In contrast, the experimental group received calcium oxide preparations. Initially, patients' oral hygiene was cleaned and sterilized, followed by the application of calcium oxide preparations tailored to their specific conditions. This included procedures such as apical induction molding, pulp capping, live pulp cutting, root canal disinfection, and filling. Throughout the treatment, observations were made regarding the patients' periapical diseases, tooth wear, and caries. If the desired effect was not evident, adjustments were made to the dosage for secondary treatment [7,8].

2.3. Observation index

- (1) The therapeutic effect of both patient groups was observed and analyzed based on four evaluation criteria: cure, obvious effect, effective, and ineffective. Cure is defined as normal findings on X-ray films, elimination of clinical symptoms and periodontal pockets, pain relief, and restoration of normal occlusal function. The obvious effect indicates normal X-ray findings, significant reduction in clinical symptoms, shallow or disappearance of periodontal pockets, significant pain relief, and remarkable improvement in occlusal function. Effective refers to more noticeable clinical symptoms, relatively shallow periodontal pockets, mild pain without the need for painkillers, and obvious improvement in

occlusal function. Ineffective means failure to meet the aforementioned criteria or even deterioration.

- (2) The VAS visual system assessed the pain level of both patient groups before and after treatment, with scores ranging from 0 to 10, where higher scores indicate more intense pain.
- (3) Occurrence of gingival bleeding, apical inflammation, pulpitis, and other complications in both patient groups was observed and recorded, with the percentage of occurrence calculated.
- (4) Patient satisfaction with treatment was assessed using a questionnaire, with a total score of 100 points and three evaluation criteria: satisfied (80–100 points), basically satisfied (60–79 points), and dissatisfied (0–59 points). Total satisfaction was calculated as the sum of the first two categories, expressed as a percentage of the total number of respondents. A total of 97 questionnaires were distributed, all of which were voluntarily completed by patients to ensure data validity.

2.4. Data processing

Data were processed using SPSS 22.0. Measurement data, expressed as mean \pm standard deviation (SD), were processed using *t*-tests, while counting data, expressed as [*n* (%)], were processed using chi-squared tests. A *P* value of less than 0.05 indicated a statistically significant difference.

3. Results

3.1. Treatment effects

Table 1 shows that the total effective rate of the treatment in the experimental group (93.75%) is significantly higher than the control group (79.59%; *P* < 0.05).

Table 1. Comparison of the treatment effect of the two groups [*n* (%)]

Group	Cured	Obvious effective	Effective	Ineffective	Overall effective rate
Control group (<i>n</i> = 49)	11 (22.45%)	13 (26.53%)	15 (30.61%)	10 (20.41%)	39 (79.59%)
Experimental group (<i>n</i> = 48)	12 (25.00%)	17 (35.42%)	16 (33.33%)	3 (6.25%)	45 (93.75%)
χ^2	-	-	-	-	4.188
<i>P</i>	-	-	-	-	0.041

3.2. Pain level

Table 2 shows that the VAS scores before treatment were comparable (*P* > 0.05), but after 1 and 3 months of treatment, the VAS scores of both groups decreased significantly, with the experimental group showing a greater decrease compared to the control group (*P* < 0.05).

Table 2. Comparison of pain degree between two groups of patients ($\bar{x} \pm s$)

Group	Before treatment	After 1 month of treatment	After 3 months of treatment
Control group (<i>n</i> = 49)	5.83 \pm 1.26	3.74 \pm 1.02	2.45 \pm 0.73
Experimental group (<i>n</i> = 48)	5.75 \pm 1.30	3.15 \pm 0.87	1.37 \pm 0.54
<i>t</i>	0.308	3.062	8.270
<i>P</i>	0.759	0.003	0.000

3.3. Complications

Table 3 shows that the experimental group had 4 cases of complication, accounting for 8.33%, which is significantly lower than the 12 cases of complications in the control group (24.49%; $P < 0.05$).

Table 3. Comparison of complications between the two groups [n (%)]

Group	Gum bleeding	Radiculitis	Pulpitis	Other	Effective rate
Control group ($n = 49$)	4 (8.16%)	3 (6.12%)	3 (6.12%)	2 (4.08%)	12 (24.49%)
Experimental group ($n = 48$)	2 (4.17%)	1 (2.08%)	1 (2.08%)	0 (0%)	4 (8.33%)
χ^2	-	-	-	-	4.595
P	-	-	-	-	0.032

3.4. Patient satisfaction

Table 4 shows that the experimental group had a significantly higher total satisfaction rate (95.83%) as compared to the control group (83.67%; $P < 0.05$).

Table 4. Comparison of patient satisfaction between the two groups [n (%)]

Group	Satisfied	Basic Satisfied	Dissatisfied	Total satisfaction
Control group ($n = 49$)	18 (36.73%)	23 (46.94%)	8 (16.33%)	41 (83.67%)
Experimental group ($n = 48$)	20 (41.67%)	26 (54.17%)	2 (4.17%)	46 (95.83%)
χ^2	-	-	-	3.878
P	-	-	-	0.049

4. Discussion

Calcium hydroxide preparation is currently the most commonly used intracanal sealing drug. It typically consists of calcium hydroxide powder mixed with distilled water or glycerol to form a paste. Alternatively, a specialized intracanal calcium hydroxide sealing paste can be mixed with dental cement to create a dental cement tip^[9]. The dissolved calcium hydroxide has a pH of 12 or higher, exhibiting a significant bactericidal effect on various bacteria such as *Streptococcus pyogenes* and *Streptococcus gingivalis*. It can also degrade bacterial endotoxins and penetrate dentin tubules to eliminate bacteria. Additionally, calcium ions can enhance local capillary permeability and stimulate cell division, promoting the repair of pulpal and periapical tissues^[10]. Therefore, calcium hydroxide is widely utilized in endodontic treatment to promote alkaline phosphatase activity and mineralization of periapical tissues^[11].

This study retrospectively analyzed endodontic cases treated at our hospital, dividing them into two groups to undergo different treatment modalities. The results revealed that the experimental group had a higher total effective treatment rate (93.75%) compared to the control group (79.59%), with a statistically significant difference ($P < 0.05$). Initially, the Visual Analog Scale (VAS) scores of both groups were comparable ($P > 0.05$). However, after 1 month and 3 months of treatment, the VAS scores decreased in both groups, with a greater decrease observed in the experimental group, indicating lower pain levels ($P < 0.05$). Complication rates were also lower in the experimental group (8.33%) compared to the control group (24.49%), with a significant difference ($P < 0.05$). Moreover, the total satisfaction rate was higher in the experimental group (95.83%) than in the control group (83.67%), with a statistically significant difference ($P < 0.05$).

In conclusion, the use of calcium hydroxide preparation in treating endodontic patients demonstrates remarkable treatment efficacy. It effectively alleviates pain, reduces complication rates, and improves patient satisfaction. Therefore, its widespread adoption in clinical practice is highly recommended.

Disclosure statement

The author declares no conflict of interest.

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