

# Effect of Honey Dressing on Inflammatory Response of Human Dental Pulp after Pulpotomy

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## ABSTRACT

**Background:** Honey has been used as a medicine since ages. In different studies it has been rediscovered by medical professionals in recent times for treatment of burns, infected wounds, and ulcers because of its high antibacterial, anti-inflammatory antiseptic and antioxidant qualities. The purpose of this study was to evaluate the inflammatory cell response of human dental pulp with honey dressings after pulpotomy.

**Materials and Methods:** Twenty four teeth from twelve patients to be extracted due to orthodontic reasons were selected. These teeth were divided into two groups and treated with honey and calcium hydro-oxide (Control group) dressings after pulpotomy. Honey was used for 12 teeth and other 12 teeth were given calcium hydro-oxide after pulpotomy. Teeth of six patients were extracted after one week and the other six after four weeks. They were prepared for histological evaluation.

**Results:** In control group 3 teeth showed inflammatory cell response in grade 1, but 9 (calcium hydro-oxide) teeth showed inflammatory cell response in grade 2. In honey group 5 teeth showed inflammatory cell response in grade 1, and 7 teeth in grade 2.

**Conclusion:** Honey can be used as alternative to conventional dressing material such as calcium hydroxide dressing after pulpotomy of human dental pulp.

**Keywords:** Pulpotomy, Honey, Pulp Vitality

## INTRODUCTION

The vitality of the dentin-pulp complex is fundamental to the functional life of the tooth and is a priority for targeting clinical management strategies. Not only do the cells of the pulp maintain tissue homeostasis after tooth development, but they also underpin the defense reactions taking place in response to injury, such as caries, and the reparative events leading to tissue regeneration. Signaling of cells to control their behavior and activity is of critical importance to maintaining pulp vitality. Based on these issues and concerns, the ability to maintain or renew dental pulp vitality would be preferable to current endodontic treatments.<sup>1,2</sup>

When dental pulp exposure is large, or the pulp is infected, all of the coronal pulp must be removed, and direct pulp capping will subsequently be performed adjacent to the root pulp. This method is called pulpotomy.<sup>3</sup> After pulpotomy treatment, the dental pulp within the root canal can be preserved. There are two main strategies to achieve a success-

ful vital pulp therapy, to reduce further damage of existing odontoblasts, and to induce the differentiation of new odontoblasts. A successful vital pulp treatment requires a good sealant against bacteria, no severe inflammatory reactions, and stable hemodynamics within the pulp.<sup>4</sup>

Numerous materials have been used as dressings in vital pulp therapy including calcium hydroxide (CH), ZOE cement, formocresol, polycarboxylate cements, inert materials, adhesives, enamel matrix derivative (EMD), beta-tricalcium phosphate and mineral trioxide aggregate.<sup>5</sup>

Honey has been used as a medicine since ages. But it has been rediscovered by medical professionals in recent times for treatment of burns, infected wounds, and ulcers because of its high antibacterial, anti-inflammatory antiseptic and antioxidant qualities.<sup>6,7</sup> Potential of honey for therapeutic usage in dentistry had been tested for the treatment of infections in wounds following tooth surgery, gingivitis, ulcers, halitosis and periodontal disease.<sup>8</sup> Even in radiation therapy for oral carcinoma, it is helpful to limit the severity of radiation induced oral mucositis because of its anti-inflammatory properties.<sup>9</sup> Study conducted for the evaluation of honey as a root canal disinfectant indicates that honey has an antibacterial property when used as an intracanal medicament. The result of clinical evaluation of post-operative pain on 3<sup>rd</sup> and 7<sup>th</sup> day shows that honey has an analgesic as well as antibacterial actions and also gives good result to eliminate the apical exudation.<sup>10,11</sup>

Keeping in view the therapeutic properties of honey, its easy availability and low cost, honey can be used as a dressing material after pulpotomy. Based on clinical observations and literature aim of this study was to describe and compare inflammatory response of human dental pulp tissue on applica-

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tion of dressings of calcium hydroxide and honey.

## MATERIAL AND METHODS

This study was conducted at 'Operative Dentistry Department of de'Montmorency College of Dentistry, Punjab Dental Hospital, Lahore, Pakistan. Twenty four human first premolar teeth, scheduled to be extracted for orthodontic reasons, were selected from patients of age ranging between 15-25 years. Patients were selected by convenient non-probability basis. After getting informed consent, two first premolar teeth in every patient were filled after pulpotomy, with materials of each group, so that these materials were evaluated in same oral environment.

Group 1: Pulpotomy with Ca(OH)<sup>2</sup> dressing (control group)

Group 2: Pulpotomy with honey dressing

All teeth were examined clinically, radiographically and also by electric pulp tester to assure the absence of proximal caries, periapical lesions and tooth vitality.

Coronal pulp was removed, after getting access to dental pulp via cavity preparation, with long shank spoon excavator and irrigated the cavity with anesthetic solution and then dried it with sterile dry cotton pledget. After haemostasis dressings were placed on amputated pulps. After the placement of these dressing materials, teeth were restored with composite resin using glass ionomer cement as a liner. Teeth of six patients were extracted after one week and the other six after four weeks for the subsequent procedure. Teeth were decalcified in 20% formic acid for six to eight weeks, and were prepared in according to normal histological techniques and embedded in paraffin. Six micron sections were cut with microtome parallel to the vertical axis of tooth. The sections were mounted on glass slides and were stained with haematoxylin and eosin. The stained sections were seen microscopically to observe any kind of pulpal cell response. The sections were evaluated in assistance with experienced pathologists and calibrated according to the criteria described as follows:

### Inflammatory cell score

Grade 1. Absent or very few inflammatory cells

Grade 2. Mild or average number less than ten inflammatory cells

Grade 3. Severe inflammatory lesion appearing as an abscess or dense infiltrate involving one third or more of the pulp

Grade 4. Completely necrotic pulp

Data was then entered and analysed using SPSS 20.0. This study was approved by Institutional Ethical Review Committee and Board of Advanced Studies.

## RESULTS

### Descriptive statistics after 7 days

As described in the previous section, a total of 24 teeth were selected from 12 patients, 12 teeth were extracted at day 7

of intervention to see the effects on grade of inflammatory reaction. The 6 control group teeth which had been extracted at day 7, only one teeth showed grade 1 inflammatory reaction while five teeth showed grade 2 inflammatory reaction. As compared to control group, "the Honey" group showed 3 teeth in grade 1 and 3 teeth in grade 2 inflammatory reaction (Table 1). None of the teeth in both groups were fallen in grade grade 3 or 4 at day 7 of the the intervention. When we applied Fisher's Exact Test to see the statistical significance among different types of treatment interventions and inflammatory grades, we found an insignificant p value.

### Descriptive statistics after 28 days

After 28 days, in control group, 4 (66.7%) in grade 2 and 2 (33.3%) in grade 1 and in honey group 4 (66.7%) in grade 2 and 2 (33.3%) also in grade 1 which indicates that both groups showed similar in reduction of inflammatory cell score (Table 2). This result shows us that there is no statistically significant association among groups and inflammatory cell score ( $p > 0.05$ ).

## DISCUSSION

In the present study, the inflammatory response of human dental pulp with Honey in comparison to Calcium Hydroxide dressings, after pulpotomy was investigated.

In order to cover the shortcomings of calcium hydroxide, a number of materials have been tried, and a continuous research is being done. Few materials have been found to be even better than calcium hydroxide as MTA and New endodontic cement. But they are not used in routine clinical practices, because they are quiet expensive. This would definitely increase the cost of dental treatment. For this reason dentist prefer to use calcium hydroxide for vital pulp therapy. It is needed to search a material that should have better biological properties as well as cheap as calcium hydroxide. Honey is considered to be ideal in this regard, as it has best and proven biological properties, easy to find and of low cost. This study was carried out in an ideal situation because of mechanical exposure and removal of healthy coronal pulp, leaving behind healthy radicular pulp, hence offered more favourable prognosis.<sup>12,13</sup>

Group		Score				Total
		Grade 1	Grade 2	Grade 3	Grade 4	
1	Control	1	5	0	0	6
2	Honey	3	3	0	0	6

Table-1: Inflammatory cell score among groups

Group		Score				Total
		Grade 1	Grade 2	Grade 3	Grade 4	
1	Control	2	4	0	0	6
2	Honey	2	4	0	0	6

Table-2: Inflammatory cell score among groups

In the present study calcium Hydroxide powder mixed in distilled water was used as a conventional dressing material after pulpotomy. Researches about induction of tissue repair in vital dental pulp therapy and antimicrobial effectiveness in endodontic infections have shown calcium hydroxide as the best option. Two important enzymatic properties of calcium hydroxide are the activation of tissue enzymes, such as alkaline phosphatase, causing a mineralizing effect and the inhibition of bacterial enzymes causing an antimicrobial effect. Its high pH inhibits essential enzyme activities: metabolism, growth and cellular division. The influence of pH alters the integrity of the cytoplasmic membrane by biochemical injury to organic components (proteins, phospholipids) and transport of nutrients.<sup>14,15</sup>

But many of the samples in this study showed slightly higher inflammatory response with Calcium hydroxide dressings as compared to honey dressings. Calcium Hydroxide has number of shortcomings such as its early dissolution, lack of adhesion, degradation after acid etching, mild to severe pulpal inflammatory reactions, formation of odontoclasts, necrosis of pulp and internal resorption. Honey provided better adhesion due to its viscosity, reduced inflammation or even stopped inflammation and degenerative changes by enhancing regenerative and immune response.<sup>16</sup>

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## CONCLUSION

Honey shows almost equal or slightly better results in reducing the pulpal inflammation. It can be used as dressing alternative to calcium hydro-oxide in root canal treatment because of its anti inflammatory and antibacterial actions.

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