COMPARISON OF PROPOLIS VARNISH, FLUORIDE VARNISH AND CALCIUM HYDROXIDE ON INFLAMMATORY RESPONSE OF HUMAN DENTAL PULP AS DIRECT PULP CAPPING AGENT

Rabia Ejaz Yousaf1, Mubasher Rasheed2, Mohammad Moazzam3, Babra Marium Anwari4, Asdaq Hussain5, Sohail Abbas Khan6

1 Department of Operative Dentistry, Azra Naheed Medical and Dental College, Lahore
2 Department of Operative Dentistry, Sharif Medical and Dental College, Lahore
3 Department of Operative Dentistry, Sharif Medical And Dental College, Lahore
4 Incharge Crown and Bridge Department, Punjab Dental Hospital, Lahore
5 Department of Conservative Dentistry and Endodontics, Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal
6 Principal, Avicenna Medical and Dental College, Lahore

Abstract

Objective: The objective of this study is to compare calcium hydroxide, fluoride varnish & propolis varnish as direct pulp capping agent by histological examination under light microscope, observing their inflammatory response.

Materials and Methods: This study was carried out by using calcium hydroxide, fluoride varnish and propolis varnish as therapeutic lining materials after pulp exposure in healthy and vital premolar teeth planned to be extracted for orthodontic treatment. Sixty first premolar were selected from patients at de, Montmorency College of Dentistry, Lahore. The teeth were divided into three groups of twenty each. The teeth were then filled after direct pulp exposure with the regarding materials. Inflammatory cell response is seen by doing histological examination of pulp after one week and twelve weeks. Data was entered and analyzed by using SPSS version 20. Chi square test was used to determine the inflammatory cell response.

Results: After one week calcium hydroxide grades were statistically significantly comparable to propolis varnish (p-value 0.168) but lower than fluoride varnish (p-value 0.005). After twelve weeks result showed that calcium hydroxide grades were comparable to propolis varnish (p-value 0.052) but fluoride varnish showed significantly lower results (p-value 0.015).

Conclusion: Propolis varnish as a pulp capping material can play an important role in reducing inflammatory response of the pulp.

Keywords: Propolis, Varnish, Fluoride, Calcium Hydroxide, Human Dental Pulp, Pulp Capping

INTRODUCTION

The rationale of the study is to suggest the pulp capping agent with less inflammatory response. As pulp is the most vital part of tooth. The pulp has sev-

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eral functions such as sensory response, formation of dentine and nourishment of the pulp. Inflammation of the pulp from tooth decay, infection, trauma and various related causes can compromise the vitality of tooth (Shawn Watson et al 2009). Different procedures are done in order to preserve the vitality of tooth such as pulp capping (Direct and Indirect) and pulpotomy. Direct pulp capping is a vital pulp therapy technique which aims at maintaining pulpal tissues vitality by protecting the pulpal system from bacterial ingress and hence enhancing the reparative capacity (Hana M. Jamjoom at el 2008).

Number of materials are used for this purpose such as calcium hydroxide, hydrophilic resins, resin modified glass inomer cements, tri-calcium phosphate & mineral trioxide aggregate (George Bogen et al 2008). Calcium hydroxide has been used as a pulp capping agent for several decades, however the inability of calcium hydroxide to provide permanent seal and the porous nature of the bridge allows the ingress of bacteria and inflammatory bacterial products. The researchers are still searching for an ideal material for pulp capping.

Dental varnishes are used to coat the freshly cut tooth structure to reduce microleakage and hypersensitivity (Lamia T Rejab et al 2003) but varnish alone cannot form an isolated layer, we need other materials to add in varnish so we used fluoride and propolis. Fluoride acts by decreasing enamel solubility, bacterial enzyme inhibition and enhance re-mineralization. Fluoride inhibits the formation of glucans by the cariogenic bacteria streptococci which aids bacteria to adhere to the tooth structure (Lamia T Rejab et al 2003). Keeping in view the properties of fluoride, fluoride varnish can be used as direct pulp capping agent. Propolis is known as Russian pencillin. It has antibacterial, antiviral, anti-inflammatory, immunostimulating, hypotensive and cytostatic activity mainly due to the presence of flavonoids, aromatic acid and esters (A Parolia et al 2010). Keeping in view all these properties these materials can be mixed with varnishes.

The hypothesis of this study is to suggest a material with a better inflammatory response as direct pulp capping agent then calcium hydroxide.

**MATERIALS AND METHODS**

It was a randomized control trial study. The study was conducted at Operative Department of de’Montmorency College of Dentistry/Punjab Dental Hospital, Lahore. The duration of the study was twenty four months. Human first premolar teeth from patients of age ranging between fifteen-twenty-five years were selected referred by the orthodontic department of de’Montmorency College of Dentistry/ Punjab Dental Hospital, Lahore.

Three groups comprising twenty teeth in each as calculated by two proportion formula were studied to meet our objectives. The sample size was calculated by the following formula keeping the power of study equal to ninety% and level of significance equal to five%. The sample size comprised of twenty patients in each group.

\[
n = \left( \frac{Z_{1-\alpha/2} \sqrt{2p(1-p)} + Z_{1-\beta} \sqrt{p_1(1-p_1)p_2(1-p_2)}}{p_1 - p_2} \right)^2 \Rightarrow \frac{1}{2p(1-p)}
\]

Where \( \overline{p} = \left( \frac{p_1 + p_2}{2} \right) \)

(A Parolia et al., 2010)

P1 and P2 are the anticipated proportions in both groups = 50% & 17%. \( p_1 - p_2 \) is the difference between proportions = 23%. \( Z_{1-\alpha/2} \) is the desired level of significance = 5% (1.96). First premolar teeth in same patient after pulp exposure were capped with the following materials and subsequently filled with amalgam. Group A-Pulp capping with Calcium Hydroxide (control group), Group B-Pulp capping with Fluoride Varnish, Group C-Pulp capping with Propolis varnish.

Inclusion criteria: a) Patients with good oral and physical health were selected. b) All teeth were clinically and radiographically examined for no evidence of trauma, caries, periapical and periodontal lesions. c) All vital teeth assessed by electrical pulp testing method.

Exclusion criteria: a) Teeth with abnormal sensitivity to hot and cold, tenderness to percussion and with any signs of pulpal diseases. b) Teeth with periapical infection. c) Teeth with grade 2 and 3 mobility.

Diagnostic periapical radiographs were taken. Test for vitality to heat/cold and electrical test were
Comparison of propolis varnish, fluoride varnish and calcium hydroxide performed. Each tooth was given local anesthesia and then cleaned using 0.2% chlorhexidine solution. After rubber dam application, occlusal cavities were prepared by means of sterile diamond bur No. 330 at high speed under air water spray coolant. The prepared occlusal cavities were 3.5 mm in occlusal depth, 4.0 mm in mesiodistal width and 3.0 mm in buccolingual width. Pulp exposure was performed in the centre of the pulp floor by means of a sterilized round diamond bur under water cooling. The exposure was not more than 1 mm. Complete hemostasis was achieved by applying gentle pressure on the exposed site with cotton pellet moistened with sterile saline. The exposed site was dried with sterile dry cotton pellet. After hemostasis the exposed sites were dressed with pulp capping agent directly in contact with the pulpal tissue. In group A calcium hydroxide dressing was applied (control group). In group B fluoride varnish was applied and in group C Propolis varnish was applied. Amalgam restoration was done over these materials. The whole procedure was done in aseptic environment.

Each patient was recalled for follow up after one day, one week and twelve weeks. Teeth of ten patients of each group were extracted after one week and other ten after twelve weeks.

After extraction the apical third of all teeth were sectioned to facilitate fixation in 10% formaline. The teeth were then de-mineralized in formalin formic acid, later washed in distilled water and then dehydrated in ascending grades of N-butyl alcohol & embedded paraffin. Serial section of 6 um were cut using soft tissue microtome in buccolingual plane. It was then placed on gelatin coated slides and stained with haematoxylin and eosin. The section was evaluated and calibrated according to the criteria described as follows:

Grade 1. Absent or very few inflammatory cells.
Grade 2. Mild or average number less than 10 inflammatory cells.
Grade 3. Severe inflammatory lesions appearing as a dense infiltrate involving one third or more of the pulp.
Grade 4. Completely necrotic pulp. Grade 1 & 2 were considered satisfactory while Grade 3 & 4 were considered unsatisfactory.

RESULTS

The data was entered and analyzed by using SPSS statistical version 20. Frequency and percentage was calculated and then chi square test was used to compare the proportions of pulpal cell response to three type of capping material. P value of 0.05 was considered as significant.

After 1 week, calcium hydroxide results showed 2 teeth (20.0%) in grade 1, 8 teeth (80.0%) in grade 2. Propolis varnish showed 4 teeth (40.0%) in grade 1 and 6 teeth (60.0%) in grade 2 while fluoride varnish showed 2 teeth (20.0%) in grade 1, 4 teeth (40.0%) in grade 3 and 4 teeth (40.0%) in grade 4. After 12 weeks calcium hydroxide showed 3 teeth (30.0%) in grade 1 and 7 teeth (70.0%) in grade 2. Propolis varnish showed 8 teeth (80.0%) in grade 1 and 2 teeth (20.0%) in grade 2. Fluoride varnish showed 3 teeth (30.0%) in grade 1, 3 teeth (30.0%) in grade 3 and 4 teeth (40.0%) in grade 4.

Comparison of treatment according to grades after 1 week showed calcium hydroxide grades were statistically significantly lower than Fluoride varnish (p-value 0.005) but the grade difference was same as compared to Propolis varnish (p-value 0.168). Fluoride Varnish grade was statistically significantly higher than Propolis varnish (p-value 0.001).

After 12 weeks, comparison of grades showed that Calcium hydroxide grades were statistically significantly lower than Fluoride varnish (p-value 0.015) but the grade difference was same as compared to Propolis varnish (p-value 0.052). Fluoride Varnish grade were statistically significantly higher than Propolis varnish (p-value 0.007).

Pulp response towards propolis varnish and calcium hydroxide under amalgam restoration is comparable to each other, while fluoride varnish did not show the desired effects. Propolis varnish is cost effective and easily available material, their easy handling and application on pulp will help dentist to use them as direct pulp capping materials specially in children. Hypothesis is accepted as propolis varnish is producing the desired results.

DISCUSSION

The pulp at first reacts to any kind of irritation by becoming inflamed and if the treatment is not done, this will advance to pulp infection and necrosis. (C. Yu et al 2007).6

Generally it is accepted that pulp capping is clinically successful if the tooth is free of symptoms, reacts adequately to hot, cold and other vitality test
Comparison of propolis varnish, fluoride varnish and calcium hydroxide

Table 1:

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<th>Std. Error Mean</th>
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Figure No. 1: Inflammatory response of human dental pulp with Propolis varnish after one week. (A=Dentine, B=Odontoblastic Layer, C=Venule, D=Mild Inflammation)

Figure No. 2: Inflammatory response of human Dental pulp with calcium hydroxide after one week. (A=Dentine, B=Odontoblastic Layer, C=Venule, D=Mild Inflammation)

and appear normal in radiographs. However, clinical criteria is not enough to assess long term prognosis for teeth, basic assessment of the aftereffects of pulp capping must be made histologically (Porolia et al 2010). In 1998, Bretz from USA did a comparative study (Bretz et al 1998). He experimented on the effects of propolis on wound healing on dental pulp. He compared propolis with calcium hydroxide. According to him these both material are equally effective in maintains of low inflammation and microbial cell population.

In 2005 Ardo Sabir of Indonesia published his article about histological analysis of rat pulp tissue capped with propolis. (Ardo Sabir et al 2005). It was concluded that propolis flavonoids delay pulpal inflammation and stimulate dentinal bridge formation.

In 2010, Parolia did his comparative histo analysis. He used propolis, mineral trioxide and dycal.
According to him, propolis and mineral trioxide give better results as compared to dycal.

In 2011, Zohreh Ahangri studied the effect of propolis on dentine regeneration. (Zohreh Ahangari et al 2011). His study was the first one to provide evidence that propolis has advantage over Calcium Hydroxide as a pulp capping agent in vital pulp therapy. It was also proved that there was no pulpal inflammation or infection caused by propolis.

In the past there was no experiment on the effectiveness of fluoride varnish. It was tried for the first time as direct pulp capping agent. This research proved that it is not as good as propolis varnish or calcium hydroxide.

The consequences of the present study affirmed the great result of propolis varnish when contrasted with calcium hydroxide as far as absence of inflammation. Propolis varnish showed no statistically significant difference in pulp response when compared to calcium hydroxide. This could be because of the formation of good seal, which is a basic component for achievement of pulp capping procedures. However, the successful outcome is possibly being a combination of multiple factors. It was generally accepted that iatrogenic exposure offers more favorable...
Comparison of propolis varnish, fluoride varnish and calci-
prognosis in comparison to pulp exposure because of dental caries (Barthel et al 2000).\textsuperscript{10} Having all these properties, easy availability and low cost, propolis varnish can be used as direct pulp capping agent.

CONCLUSION

Propolis varnish as a pulp capping material can play important role in reducing inflammatory response of the pulp.

1. Results of calcium hydroxide (control group) and propolis varnish after one week (p-value 0.082) and after 12 weeks (p-value 0.104) are comparable.

2. Fluoride varnish did not show the desired effects on pulp.

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