

## DIRECT PULP CAPPING: DEGREE OF BLEEDING IS A STRONG CANDIDATE AS PROGNOSIS INDEX, IN-VIVO STUDY

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### ABSTRACT

*The study was carried out to document the clinical prognosis of direct pulp capping, and analyzing the clinical effects of degree of bleeding on prognosis. Sixty asymptomatic permanent carious molar teeth revealing accidental pulp exposures during removal of deep dentinal caries were selected. This study was done from April 2003 till September 2004. All the teeth were capped with dentine adhesives (total-etch system). The cavities were restored with composite resins. The patients were examined through six months. The patients with severe pain or facial swelling or teeth which exhibited peri-apical lesions were considered failure.*

*From the total 60 Molar teeth selected, 51 cases were found successful at the last day of the study, while 09 cases failed during the course of the study. The number of successful cases found with significant statistical p-value <0.05. Cases were divided into three categories according to the degree of bleeding from exposed pulp. Table 1. The cases with less bleeding tendency (+) exhibited significant success rate of 97% than cases with profuse bleeding (++,+++) 84% and 33% respectively.*

**Key words:** Direct Pulp Capping, Degree of Bleeding, Prognosis, Pulp healing, Dentine Adhesive System.

### INTRODUCTION

Dental pulp is a highly vascularized tissue of the tooth and has the potential to heal.<sup>1,2</sup> It performs many functions through out the life of tooth therefore, every effort should be made to maintain its integrity and vitality.

Direct pulp capping procedure is the dressing of an exposed pulp with the aim of maintaining pulp vitality.<sup>2,3</sup> Preserving vitality of the pulp becomes an essential step in today's operative dentistry. For vital pulp capping to be successful, the tooth should be asymptomatic or have minimal symptoms and the bleeding must be controlled.<sup>3-5</sup>

There are so many factors involved in the prognosis of direct pulp capping for instance: dressing materials, micro-leakage, size of pulp exposure, contamination of cavity prior to direct pulp capping and so on.<sup>3-7</sup>

But the degree of bleeding has been found a strong candidate as index of the prognosis of vital pulp therapy

procedures especially in cases of direct pulp capping. Increased bleeding at the site of exposure is associated with an increased likelihood of failure.<sup>5-8</sup> The possible reason behind this occurrence is that the degree of bleeding from the exposure site may reflect the inflammatory status of pulp. The severely inflamed pulp is always associated with higher degree of bleeding upon exposure<sup>7</sup>.

Another possible reason is the presence of an extra-pulpal blood clot between the wound surface and the pulp-capping agent<sup>7-9</sup>.

A blood clot prevents the close contact between the capping material and the pulp and may serve as a potential substrate for bacteria growth, resulting in chronic inflammation with internal resorption or necrosis of the pulp.<sup>8-10</sup>

Control of bleeding with simple measures is a clinically reliable method to assess whether the pulp is hyperemic or inflamed and whether pulp capping is indicated.

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Present study was performed to determine this possible effect of bleeding from accidentally exposed pulp on the prognosis of direct pulp capping on permanent molar teeth.

## METHODOLOGY

This was an experimental study conducted from April 2003 till September 2004 at the Department of Operative Dentistry, Punjab Dental Hospital, Lahore (teaching hospital) and at a Private Maxillofacial and General Dental clinic in Karachi. From the total study cases, 42 cases were selected and treated at Lahore and 18 cases were respectively selected and treated at Karachi. Sixty carious permanent molars, with accidental pulp exposure during deep caries removal were selected for the present study.

### Inclusion criteria

- Clinically and radiologically diagnosed carious permanent molar teeth without having any periapical pathology
- Teeth with accidental pulp exposure
- Asymptomatic teeth (having no clinical sign and symptoms of irreversible pulpitis)
- Patient's maximum age upto 30 years.
- Molar teeth from both jaws
- Both sexes

### Exclusion criteria

- Teeth revealing clinical exposure size >1mm
- Teeth abnormally responding to thermal or electrical stimuli
- Teeth tender to percussion on clinical examination
- Teeth having positive periapical radiolucency on radiographs
- Teeth not restorable with direct composite restoration
- Patients having any diagnosed odontogenic and non odontogenic oral pathology.

An informed consent form was filled by each patient before starting the procedure. All the relevant objective tests (thermal and electrical tests and radiographs) were performed preoperatively at each visit of the patient. 2% local anesthesia, xylocaine with adrenaline 1:80,000 was administered prior to operative procedures.

Rubber dam was used to isolate the operating field during the removal of deep carious dentine and saliva ejector was used to control moisture contamination. The clinical exposure cases were observed with bleeding present at the floor of tooth cavities. The cavities were toileted with normal saline using 1cc disposable

syringes. Bleeding at the site of exposures was arrested by the application of small disposable sterile cotton pellets, moistened with normal saline.

The degree of bleeding from the pulp exposure site was categorized as below;

- + Slight bleeding but apparent from pulp exposure site
- + + Profuse bleeding from the pulp exposure site but arrested and controlled within 30 seconds.
- + + + Over profuse from the pulp exposure site but not arrested within 30 seconds.

Subsequently, 37% phosphoric acid was used to etch the cavity for 20 seconds followed by a gentle rinse with water spray and air-drying for 2-3 seconds.

The two-step one-bottle adhesive system (5<sup>th</sup> generation brand name) was applied on the exposure site and remaining walls of the cavities. It was then cured with halogen light for 20 seconds. Finally, all the cavities were restored by an incremental technique in which each layer of composite resins was light-cured for 40 seconds. Follow up period for each case was twenty-four weeks. Recall appointments were made after 1<sup>st</sup> day, 3 weeks, 6 weeks, 12 weeks and 24 weeks accordingly.

All the cases were examined clinically at each visit with prescribed objective tests and questions relevant to pain and discomfort.

### Successful Cases Criteria

Teeth found vital by electrical testing and/or thermal test and did not show clinical signs or symptoms of irreversible pulpitis (such as spontaneous pain, lingering pain after removal of stimuli, and percussion sensitivity) were considered successful.

### Failure Cases Criteria

Cases which did not show the clinical signs of pulp vitality on thermal or electrical testing, patients complaining of severe pain and clinically tender to percussion or facial swelling and or showing any periapical radiolucency on periapical radiographs were considered as failure.

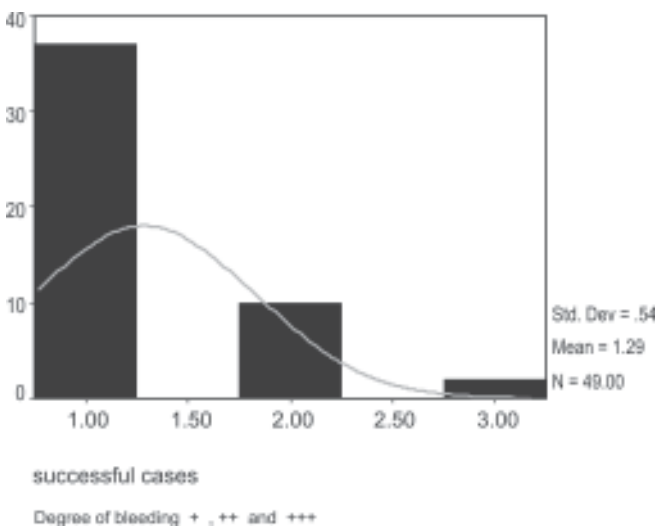
## RESULTS

The results were analyzed by descriptive statistics and significance of (p-values) obtained by applying chi-square test. The data was computed by SPSS version 10.

From the total 60 cases, 51 were found successful at the last day of study while, 09 cases failed during course of study. The number of successful cases found significant statistically (p-value < 0.05).

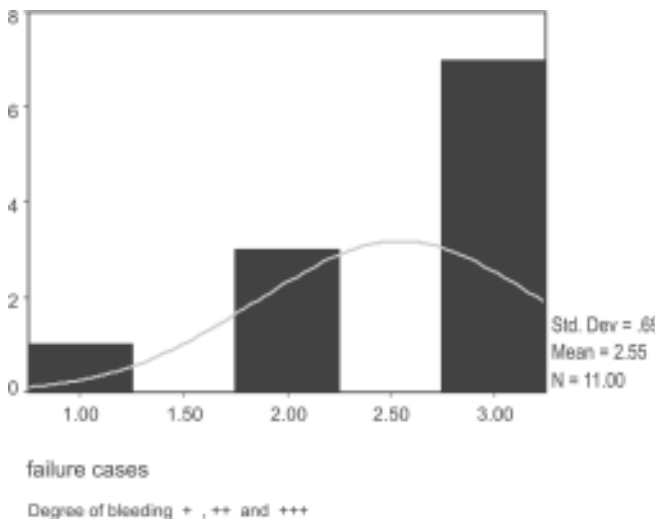
TABLE 1: SUMMARY OF OUTCOME OF STUDY CASES

Degree of bleeding	No. of cases & percentage	Cases outcome	
		Successful	Failure
+	38 63.33%	37 97.36%	01 2.63%
++	13 21.66%	11 84.61%	02 15.38
+++	09 15%	03 33.33%	06 66.66
Total	60 100%	51 85%	09 15%



Summary of successful cases

Fig. 1



Summary of failure cases

Fig. 2

The study cases were divided into three categories, according to the degree of bleeding from exposed Pulp Table 1. The cases with less bleeding tendency (+) exhibited significant success rate 97%, than cases with profuse bleeding (++,+ +++) 84% and 33% respectively (Table 1). There was significant difference found statistically between the groups with p-value <0.05 in (+) and >0.05 (+,++) respectively.

**DISCUSSION**

Pulp exposures are more difficult to treat successfully than are non-exposures for following; One, during exposure, it is necessary to get the proper haemostasis and prevent clot formation.<sup>5,6</sup> Two, the loss of buffering activity of dentine beneath the restorative material causes the pulpal tissues to be more sensitive to the possible cytotoxic and irritating activity of capping agent.<sup>10,11</sup> Three, pulp healing becomes compromised due to trauma or injury. Four, operative debris, including dentine chip fragments (chipitis) and particles of capping materials, may infiltrate the pulp, causing injury and inflammatory reaction<sup>7,10</sup>, and finally, the compromised prognosis due to introduction of bacteria during the exposure.<sup>6</sup>

All the teeth selected in this study were permanent carious molar teeth and were asymptomatic but not exposed preoperatively, and if the tooth is asymptomatic before a carious exposure is discovered, the chances are that the pulp has enough tissues to deal with a pulp capping procedure successfully.<sup>5</sup>

Haskell et al<sup>13</sup> supported this with a clinical study, which proved that asymptomatic carious exposures could survive an average of 12 years after pulp capping. Matsuo et al<sup>16</sup> performed the pulp capping even in pre-operative symptomatic teeth and surprisingly, they recorded 81.8% successful rate.

Consequently, although leading attention must be focused on issues of technique sensitivity and clinical skills, which influence the outcome of pulp capping treatment, the question still remains, regarding the importance of selection between the pulp capping materials and its comparative effects to influence the treatment outcome.

In present study current dentine adhesive system was used to cap the pulp exposure. However, calcium hydroxide has been considered as a material of choice for the treatment of pulp exposure since decades. But the philosophy behind the pulp healing and pulpal damage has been changed since the classical study of kakeshahi et al.<sup>9</sup> Currently it has been advocated that, exposed pulp can heal in bacterial sealed environment regardless of the material used.<sup>8</sup>

On the basis of this philosophy the dentine bonding agents have been proposed for the treatment of pulp exposure and it has been demonstrated that they provide promising results.<sup>10-16</sup>

Present study was performed as a clinical trial on the prognosis of direct pulp capping with dentine adhesive system. Purely clinical methods were used to evaluate individual cases for this study. Results of this study are almost similar to other international studies performed on the subject with the same methodology.<sup>3,11,12,13,16</sup> On the other hand, some histopathological studies have shown some concerns on the use of dentine adhesives as direct pulp capping agent.<sup>14,15</sup> Since it has been observed that clinical conditions do not exactly reflect the histopathological changes in the pulp.<sup>14&15</sup> However, this study was not histopathologically conducted. Surprisingly, one thing has been commonly observed in all type of histopathological studies that treated teeth have remained sound clinically in their entire course of experiment and their clinical findings are supporting this study.<sup>14,15</sup> Unfortunately we have not been able to find relevant national studies on this topic and we also feel that there is a vast area that needs to be explored.

## CONCLUSION

Though, the results of present study exhibit significant success rate of direct pulp capping with dentine adhesive system, the toxicity of the adhesives still remains the subject of research. Moreover, it has shown by present study that degree of bleeding has detrimental effect on the prognosis of direct pulp capping and indeed more research and similar studies should be encouraged on this topic.

## Disclaimer

Certified that authors do not have any commercial interest in the products used in this study.

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