

# Review on Pulp Capping

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## 1. Introduction

### 1.1 What is Pulp Capping?

Pulp capping is an operative technique designed to preserve the vitality of a potentially infected pulp. There are two broad types of pulp capping - the direct and the indirect pulp caps. They are only successful if the pulpal infection is very mild. The consequences of pulp exposure from caries, trauma or due to any mishap during tooth preparation with pain and infection as the result. Pulp capping is of two types: when a medicament is placed directly over the exposed pulp is called **Direct Pulp Capping** and when a cavity liner or sealer is placed over the remaining residual caries it is called **Indirect Pulp Capping**.

### 1.2 Need For Pulp Capping

The most common clinical indications for pulp capping are cases demonstrating signs of typical reversible pulpitis, or if the pulp is simply exposed by fracture due to trauma or by caries removal. In principle, immature teeth should be treated conservatively as practical to allow apexogenesis to occur. Pulp capping is the first treatment option if the pulp is considered largely removed. The morbidity associated with treating pulp exposures is consequential, often requiring either extraction or root canal therapy. Both the loss of tooth and its replacement, or endodontic treatment and tooth restoration, involve multiple appointments and considerable expense. An alternative procedure to extraction or endodontic therapy is pulp capping [1]

### 1.3 Direct Pulp Capping

The concept of direct pulp capping involves covering an exposed pulp with a wound dressing that protects the pulpal tissue from additional injury. An inflammation-free pulp that is inadvertently exposed during tooth preparation will exhibit a high degree of regenerative potential. It thereby promotes pulp healing and generative reparative dentine formation.

### 1.4 Indirect Pulp Capping

It is a procedure, where caries is allowed to remain adjacent to the vital pulp rather than risk pulpal exposure covered with a cavity liner/sealer and restored, and then it is termed as **INDIRECT PULP CAPPING**. It has been shown that this demineralized if placed under suitable dental material undergoes remineralization. Two important criteria here are bacteria free dentine (caries disclosing solution) and pulp without any pathological changes. Also required in this procedure is tight scaled restoration.

### 1.5 Vital Pulp Capping Techniques

Two techniques have demonstrated success with vital pulp capping: 1) Calcium Hydroxide Technique 2) Total Etch Technique

For vital pulp capping technique, the tooth should be asymptomatic or have minimal symptoms and the bleeding must be controlled. Bleeding is normally controlled by placing cotton pellets soaked in hydrogen peroxide or 5.25% sodium hypochlorite. [2]

## 2. Pulp Exposure

- Calcium Hydroxide technique
- Haemostasis is first achieved
- Then the cavity is disinfected with a disinfectant (eg. Cavity cleanser, Bisco Dental Products) on the cavity floor [3]
- The area is then air dried and calcium hydroxide as Dycal is placed directly in contact with the pulpal tissue
- Calcium Hydroxide is then covered with resin modified GIC onto the dentine [4]
- Dentine bonding agent or an IRM is placed over the calcium hydroxide cap and then a permanent restoration is done.
- In case of total etch procedure as with calcium hydroxide, haemostasis is obtained, disinfection of the cavity is done, surface of the enamel and dentine are etched with 32% phosphoric acid for 15 seconds. Then it is rinsed, dentine bonding agent is applied. A thin layer of adhesive resin is applied onto the enamel, dentine, pulpal tissue and light cured. A thin layer of resin modified-GIC is applied. Final restoration is done with a permanent material

## 3. Newer Materials for Pulp Capping Biodentine

Biodentine is a new bioactive cement that is similar to the widely used mineral trioxide aggregate (MTA). It has dentin-like mechanical properties, which may be considered a suitable material for clinical indications of dentin-pulp complex regeneration such as direct pulp capping. A study was conducted to compare the response of the pulp-dentin complex in human teeth after direct capping with this new tricalcium silicate-based cement with that of MTA.

Results showed that pulps in 28 caries-free maxillary and mandibular permanent intact human molars scheduled for extraction for orthodontic reasons were mechanically exposed and assigned to 1 of 2 experimental groups, Biodentine or MTA, and 1 control group. Assay of periapical response and clinical examination were performed. After 6 weeks, the teeth were extracted, stained with hematoxylin-eosin, and categorized by using a histologic scoring system

There is complete dentinal bridge formation and an absence of inflammatory pulp response. Layers of well-arranged odontoblast and odontoblast-like cells were found to form tubular dentin under the osteodentin. Statistical analysis have showed no significant differences between the Biodentine and MTA experimental groups during a study.

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Within the limitations of this study, Biodentine has a similar efficacy in the clinical setting and may be considered an interesting alternative to MTA in pulp-capping treatment during vital pulp therapy [5]

A study was conducted to collect quantitative information about the numbers of odontoblast-like cells and reparative dentine thickness after direct pulp capping with platelet-rich plasma (PRP), Enamel Matrix Derivative (EMD)

#### 4. Methodology

The experiment was conducted on 36 Wistar albino rats and a total of 144 incisor teeth. Calcium hydroxide, mineral trioxide aggregate, PRP were applied as direct capping agents on the pulps of 96 incisors (n = 24). Positive and negative control groups were created on the remaining 48 incisors. The teeth were extracted on the 7th and 28th days. After routine histological preparation, cross-sections were stained with haematoxylin and eosin. The numbers of the odontoblast-like cells were measured histomorphometrically on day 7 and day 28. The thickness of the reparative dentine was also measured. The number of odontoblast-like cells was also measured beneath the dentine bridge. The normal distribution of all data was tested with the Mann-Whitney U test. The statistical differences between groups were analysed using the Kruskal-Wallis test.

#### 5. Results

The mean number of odontoblast-like cells increased between day 7 and 28 following pulp exposure ( $P > 0.01$ ) in all groups except for the EMD group ( $P < 0.01$ ), when compared with both the experimental and negative control groups ( $P < 0.01$ ). Reparative dentine formation was observed in all groups of teeth ( $P > 0.01$ ).

#### 6. Conclusions

Reparative dentine formation was observed, but with no significant difference between the groups. Odontoblast-like cells were observed in association with the outcome of pulps capped with PRP and EMD. PRP and EMD are possible capping agents that influence the thickness of reparative dentine formation [6]

#### Bone Morphogenetic Proteins in Pulp Capping:

Bone morphogenetic proteins (BMPs) are a group of growth factors also known as cytokines and as metabologens. Originally discovered by their ability to induce the formation of bone and cartilage, BMPs are now considered to constitute a group of pivotal morphogenetic signals. The great potential in applying this technique is treating teeth with pulpal injury. Grafting enamel matrix derivate has also been evaluated for direct pulp capping suggesting that its use increases the formation of reparatory dentin and effectively producing the dentin bridge. There are evidences suggesting that, if the odontoblasts are lost due cavities, the formation of new pulp cells can be stimulated by the presence of BMPs (Kaigler et al., 2001). These proteins exist in odontoblasts, ameloblasts and in the dentin matrix, being capable to induce undifferentiated pulp cells into odontoblast-like cells

Pulp acts as a security and alarm system for a tooth. Slight decay in tooth structure not extending to the dentin may not alarm the pulp but as the dentin gets exposed, either due to dental caries or trauma, sensitivity starts. The dentinal tubules pass the stimulus to odontoblastic layer of the pulp which in turns triggers the response. This mainly responds to cold. At this stage simple restorations can be performed for treatment. As the decay progresses near the pulp the response also magnifies and sensation to a hot diet as well as cold gets louder. At this stage indirect pulp capping might work for treatment but at times it is impossible to clinically diagnose the extent of decay, pulpitis may elicit at this stage. So a proper diagnosis has to be made in order to achieve the right treatment satisfying the patient's needs and establishing a better standards of treatment.

#### References

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