

Identifying Traumatic Pulp: A Review

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Abstract

Techniques for Vital Pulp Therapy (VPT) are ways to keep the dental pulp alive and functioning following damage from trauma, caries, or restorative operations. Indirect or direct pulp capping, as well as partial or complete pulpotomy, have historically been used in VPT procedures. Part of the pulp is removed during VPT, leaving the remaining portion intact and functional. We assume that the remaining pulp is healthy once a tiny amount of the superficially irritated pulp is removed.

Keywords: Vital pulp therapy; Pulpotomy; Direct pulp capping

Introduction

When the pulp is exposed, the patient's immune system, which is present in the pulp, as well as the patient's saliva soaking the area, which prevents impaction of contaminated debris/bacteria, can fend against bacterial invasion [1]. The pulp has the capacity to mend itself even if its poor compliance environment makes it more prone to harm. This crucial principle serves as the foundation for vital pulpal therapy. The success rate of VPT has been demonstrated to be extremely high overall [2].

Objectives

The degree of pulpal amputation is significant because it affects two crucial goals for the treatment of the critical pulp: On non-inflamed tissue, a wound dressing should be applied, and there shouldn't be much tooth structure lost. Not more than 2 mm of the pulp underneath the exposure must be removed in crown-fractured teeth displaying viable pulp tissue following exposure [3].

Discussion

Cvek pulpotomy

Partial pulpotomy, also known as a cvek pulpotomy, is a procedure in which a tiny amount of the pulp tissue (about 2 mm) is removed beneath an exposure. It is most commonly used to treat adolescents and young adults whose teeth have the pulp exposed by a crown fracture. The fundamental advantage of keeping healthy pulp in developing teeth is that it promotes continuous root development (apexogenesis). The exposure size that can be treated by partial pulpotomy typically ranges in size from 0.5 to 4 mm [4].

Not just on young permanent teeth, but also on older permanent teeth, this procedure is possible. When compared to a mature permanent tooth with a closed apex, some studies indicate a better success rate using vpts on an immature permanent tooth. This is because the pulp in older patients is less cellular, more fibrotic, has a smaller blood supply, and is less able to cure itself [5]. Furthermore, while doing critical pulpal therapy may make future entry into the root canal more challenging; it is not practicable to do so on a fully developed tooth that you think will require full root canal therapy. In a clinical report on 60 juvenile teeth treated with partial pulpotomy, Cvek 5 observed a 96.7 percent success rate, with the bulk of these teeth being treated within 4 days of traumatic exposure. In a different well-known work by cvek, 178 teeth with traumatic pulpal exposures underwent partial pulpotomy. Both clinically and radiographically, patients were monitored for 3 to 15 years. In 95% of instances, healing with hard-

tissue barriers and the preservation of pulp vitality were seen [6]. Most of these instances were handled three days or less after the event.

Partial pulpotomy vs Direct pulp cap

Better management of the surgical incision and sealing material retention are the benefits of partial pulpotomy (2 mm of coronal pulp removed) over pulp capping. Only tiny exposures (less than 1 mm in size) that may be addressed quickly after an accident are those for which pulp capping is advised [7]. Only a small number of teeth have these criteria, hence a partial pulpotomy is typically done in those instances. In addition, the majority of studies suggest that partial pulpotomy has a substantially higher success rate than pulp capping following a traumatic pulpal exposure [11-13] due to the superior control of subacute inflammation below the exposure. It has been demonstrably demonstrated that the efficacy of pulp capping considerably declines as time passes (from one hour to seven days following injury) (from 93% to 56%). For mature and immature permanent teeth with severe crown fractures, vital pulpal treatments can be employed as a permanent treatment option. As long as the pulp is still vital, re-entering the pulp is not required [8].

Hemostasis

An antibacterial solution called Sodium Hypochlorite is used to disinfect the dentin pulp interface, remove biofilms, chemically dissolve blood clots and fibrin, and clear dentinal chips and damaged cells from the site of mechanical exposure. It also helps to stop bleeding. As a result, prior to healing the pulpal wound after a pulpotomy, the exposed site can be cleaned with sodium hypochlorite (Saline or Chlorhexidine can be used as well). This is accomplished by pressing a cotton-soaked pellet onto the pulpal wound [9].

An essential part of pulp assessment is looking at the pulp tissues following exposure. A successful partial pulpotomy requires controlled bleeding (full Hemostasis). The pulp should not be "topped" if Hemostasis cannot be accomplished because this indicates that the pulp

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is inflamed. Sometimes, a partial pulpotomy that was initially intended to be partial may end up being a full pulpotomy because more pulp tissue needs to be removed in order to achieve Hemostasis. Evidently, vital pulpal procedures like a pulp cap or pulpotomy are not possible with a pulp diagnostic of necrosis (non-vital pulp) or the inability to produce Hemostasis [10].

Calcium silicate cements

Mineral trioxide aggregate is one of the most innovative endodontic materials ever (MTA). The first of the Calcium Silicate Cements (CSCs), this substance was created in 1993 and was initially launched to seal root holes. They were discovered to be so biocompatible and effective in their applications throughout time that they have now been widely accepted for use in apicoectomies, apexogenesis, and sealing root perforations [11].

Tricalcium silicates, Dicalcium silicates, hydraulic calcium silicate cements, and “bioceramics” are all members of the CSCs class of materials (MTA [angelus], TheraCal [Bisco Dental Products], Endosequence BC RRM [Brasseler USA], Endosequence BC Sealer [Brasseler USA], and Biodentine [Septodont] are some examples). The use of Cscs in vpt operations has become more widespread [12]. The pulpal wound is covered with these materials. While calcium hydroxide (CH) has traditionally been utilised for essential pulpal treatments, the majority of recent research have shown conclusively that cscs have superior healing and success rates and are the preferable materials to use on a pulpal exposure (once Hemostasis is achieved). The first of these materials introduced for this purpose was mta, but the market has recently been inundated with newer materials. The fact that the newer materials don't significantly discolour teeth is one of their benefits, which can be advantageous, especially when utilised in the aesthetic zone [13].

The way CH works is by causing the development of a dentinal bridge directly beneath the capping material. These substances generate superficial coagulation necrosis (1 to 1.5 mm in depth), which causes a low-grade irritation and causes the pulp's undifferentiated cells to undergo differentiation. The coagulated tissue is calcified as these cells produce predentin, which is subsequently mineralized. Finally, further mineralization converts predentin into dentin [14]. The hard-tissue barrier develops directly beneath the capping material as a result of the low-grade irritation brought on by coagulation necrosis. The pulp is not enough harmed by this mild discomfort. Even so, it is enough to start an immune response that causes a dentin bridge to form, shielding the pulp beneath. As opposed to CH, which has the drawback of causing a zone of necrosis, cscs like mta have the advantage of building a stronger dentin bridge. Pitt Ford et colleagues compared CH and mta and discovered that after 5 months, all of the calcified bridge structures in the mta-capped pulps were devoid of inflammation [15-17]. The pulp of teeth with CH caps, in contrast, exhibited inflammation and considerably less calcified bridge development. An osteodentin matrix forms directly beneath the mta during the first two weeks, and at the capping site, a full layer of reparative dentin (Tertiary Dentin) forms after three weeks. As a result, when mta is applied to pulp tissue, odontoblast-like cells multiply, migrate, and differentiate in order to build a collagen matrix, which is then mineralized to produce osteodentin. A few weeks after pulp capping, this is then changed out with a tertiary dentinal bridge [18].

As agents for pulpotomy, cscs have various benefits. They appear to be linked to extremely favourable clinical outcomes, are biocompatible, offer excellent resistance to micro leakage, allow for dentin bridging at

the location of pulp exposure, are dimensionally stable over time, and are biocompatible [19]. The primary distinction between cscs and CH may be that the former offers a good barrier of defence against micro leakage and does not wear out, necessitating replacement, as does the latter. Compared to CH, cscs create a dentin bridge of substantially superior quality. In the event that micro leakage takes place in the case of CH, bacteria may be able to enter the pulp through the dentin bridge, which frequently has multiple tunnelling flaws. Since the dentin bridge created by cscs does not contain tunnelling flaws, this is not a severe issue [20].

Conclusion

Vital pulpal procedures, like a partial pulpotomy, can be a worthwhile choice with a high success rate when care is properly planned. They can also be used effectively for carious pulpal exposures in addition to traumatic pulpal exposures. 36-38 A correct diagnosis and a well-sealed restoration atop the capping material are the keys to this high success rate. Any crucial pulpal treatment can ultimately fail due to bacterial leaking.

Dentin bridge development, on-going root growth, a good response to pulp vitality testing, the absence of symptoms, and the absence of radiographic signs of apical periodontitis or root resorption would all indicate a successful follow-up after vpt.

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