Critical Review on Glass Ionomer Seal under Composite Resin of Obturated Root Canals

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ABSTRACT

Introduction: The root canal treated teeth need an adhesive seal for coronal leakage prevention. Glass ionomer sealant is the usual interface used between the coronal restoration and dental hard tissue however when composite resin material is used as a coronal restoration, some dental clinician prefer not to use it. The aim of this review is to determine the need to seal the orifice of an obturated root canal with glass ionomer under composite resin to prevent microleakage.

Material and methods: Electronic searches were performed in the Pubmed and Scopus databases using relevant keywords. Textbook searching was also applied. Following selection, articles were fully reviewed to ensure that they met inclusion/exclusion criteria.

Results: The intracoronal sealing abilities of a wide variety of restorative materials have been investigated, assessed and compared within the dental literature.

Conclusion: No definitive guidelines were found regarding the use of orifice sealing materials following endodontic treatment. This review was not able to answer the research question, and further investigation is required to achieve this goal.

Keywords: Intra-orifice barriers, Composite resin, Glass ionomer, Micro leakage.

INTRODUCTION

Microbial infection via an inadequate coronal seal is one of the major factors associated with endodontic failure,[1] and the literature suggests that coronal leakage is more likely to determine clinical success or failure than apical leakage.[2]

Placement of a material over the coronal gutta-percha to act as a barrier to coronal microleakage would be advantageous in reducing leakage and increasing the possibility of treatment success.[3] The sealant material is placed into the canal orifice following removal of the coronal portion of gutta-percha and sealer. Many materials have been investigated for use as an intra-coronal seal to prevent microleakage, including Cavit, amalgam, intermediate restorative material (IRM), Super-EBA, composite resin, glass-ionomer cement (GIC), and mineral trioxide aggregate (MTA).[1]

Glass ionomer cement has been advocated for use as an intracanal barrier when microleakage or recurrent caries are likely because of its cariostatic and adhesive properties.[4] Resin-modified glass ionomer material is one of the barrier materials used routinely to close the canal orifice after root canal obturation.[5] It consists of glass ionomer and composite resin, having properties of both materials. Composite resin has excellent adhesive properties and is used commonly as a core in endodontically treated teeth.[6]

The aim of this review is to determine if there is a need, following endodontic treatment, to seal the root canal orifice with glass ionomer beneath composite resin to prevent microleakage.

MATERIAL AND METHODS

Electronic searches were performed in the Pubmed and Scopus databases using the keywords: intraorifice barriers, composite resin, glass-ionomer, microleakage. Textbook searching was also applied for relevant information. Articles were first selected according to titles and abstracts, and they were then fully reviewed to ensure that they met the inclusion/exclusion criteria.

Inclusion criteria

Studies with all designs that used different materials and or techniques included. The study should refer to intracoronal orifice and micro leakage significance. Searches were limited to papers written in English and published between 2002 and 2014.

The exclusion criteria

All studies that failed to meet the inclusion criteria. If a study did not refer to the intraorifice barrier or explain its relation with microleakage, it was discarded. Studies that discussed a coronal barrier were also rejected.

RESULTS

Definition of an intraorifice sealing material and their importance

The intra-orifice barrier is an effective treatment used in endodontically treated teeth by introducing an additional material into the canal orifice immediately after removal of the coronal portion of gutta-percha and sealer.[7]

Coronal leakage is a primary cause of endodontic failure.[8] Sealing of the coronal part of the root canal is therefore indicated to reduce the chance of treatment deterioration.[1] Sealing is of particular importance when the coronal restoration is lost or inadequately placed,[9] or when there is delay in placing the final restoration.[10] This is important for

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both anterior and posterior teeth.[11]

Cavit®, amalgam, intermediate restorative material (IRM®), super-EBA, composite resin, glass ionomer cement and mineral trioxide aggregate (MTA) are commonly used materials.[12,13] The use of colored materials is recommended so they can be easily identified in cases of retreatment or post restoration.[11] Examples include the flowable composite resins PermaFlo® Pink or Purple (Ultradent), Flow-It® dark red (Pentron) or dark blue (DenMat).

The use of a resin-modified glass-ionomer material over the gutta-percha followed by provision of a well-sealed temporary or permanent filling is suggested.[11]

The sealing abilities of a variety of intraorifice restorative materials and their capacity to prevent coronal micro leakage have been investigated, assessed and compared.

MTA had the lowest rate of microleakage compared with composite resin or light-cured glass ionomer[1] following completion of root canal treatment without coronal restoration. Sealing with Cavit® gave better results than Vitremer® (glass-ionomer cement), and the flowable composite Flow-It®.[14] Composite resin used alone or combined with Coltosol® showed a significant reduction in microleakage, whereas glass ionomer combined with Coltosol® resulted in less microleakage than the glass ionomer used alone.[15]

In an evaluation of the necessity to use an intraorifice seal in teeth with post space, a glass ionomer barrier over the gutta-percha coulSd reduce the risk of recontamination of the apical gutta-percha compared to those without glass ionomer but sealed with Vitrabond®.[16] IRM® and Coltosol® were significantly better in preventing microleakage than chemically cured glass ionomer and dentinal adhesive.[17] In a recent study the adhesive system CoroSeal® reduced coronal leakages more effectively than a flowable composite resin, fissure sealant or polycarboxylate cement[18] Figure 1.

DISCUSSION

Conventional root filling materials such as gutta-percha and sealer do not provide adequate resistance to bacterial microleakage.[21,22] Therefore, the coronal part of the root canal should be sealed to minimize the endodontic treatment failure rate.[3] Previous research support the use of intra-orifice sealants, but there is little agreement on a standardized protocol or material to be used as a coronal barrier.[23,24] Different studies have shown highly conflicting results regarding the sealing ability of different materials.[1]

The following criteria have been proposed by Wolcott et al. for an intracoronal barrier: (a) Easily placed by the specialist,
(b) Bonds to tooth structure (retentiveness),
(c) Effectively seals against microleakage,
(d) Easily distinguishable from natural tooth structure and
(e) Does not interfere with the final restoration of the access preparation.

GIC is used commonly as an intraorifice barrier, and according to Mavec et al.,[25] the literature supports the use of an intraorifice glass ionomer barrier to protect the root canal filling as a second line of defense for the temporary coronal seal.

In their study, Parekh et al.[3] found that microleakage was less beneath a seal of GIC plus composite resin as opposed to composite resin alone, and concluded that "LCGIC + Tetric N-Flow was found to be superior over other experimental materials as intraorifice barriers." They suggested that the enhanced sealing ability of LCGIC may be attributed to:

1. Adhesion of LCGIC by development of an ion-exchange layer adjacent to dentin and
2. Shear bond strength of LCGIC which is higher than conventional GIC.

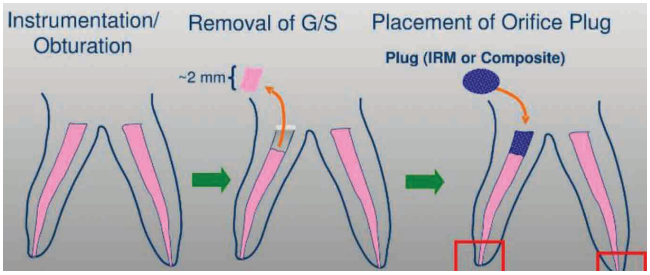

Figure-1: Placement of Sealing Materials.[19,20]

Divya et al.[26] also concluded that a GIC and composite combination can be recommended as coronal sealants, as did Deepali et al.[27] who stated they had the "highest probability for achieving a maximal coronal seal."

Other studies have recommended other sealing agents: Slutzky- Goldberg et al.[6] found GIC or MTA to be equivalent in their sealing abilities, and the results of Jiang et al.[28] suggest that flowable composites can serve as ideal intra-orifice seals.

Mineral trioxide aggregate and flowable composite was found to be preferred over glass ionomer as a coronal barrier by Sagar et al.,[5] while El-Kady[29] concluded that the use of a silorane based composite without the traditional glass ionomer base was best to decrease leakage to the root canal system.

CONCLUSION

The literature does not state clearly whether to use intra orifice sealant materials beneath final and temporary restorations. Although the routine is to place them under final restorations, no study has supported a single protocol. Consequently this review didn't answer the research question, and a well-designed investigation is required to achieve this goal.

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