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RESEARCH ARTICLE

A NOVEL APPROACH FOR MANAGEMENT OF DEEP CARIOUS LESION WITH BIODENTINE: CASE REPORT.

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Abstract

Biodentine™ is a new bioactive cement with dentin-like mechanical properties, which can be used as a dentin substitute on crowns and roots. It has a positive effect on vital pulp cells and stimulates tertiary dentin formation. In direct contact with vital pulp tissue it also promotes the formation of reparative dentin. This prompted its use for direct pulp capping after iatrogenic pulp exposure at tooth 15 in a 22-year-old male patient. First the entire cavity was filled with Biodentine™. Three months later the cement was reduced to a base to replace the dentin layer and a composite filling was placed to replace the enamel layer. At the follow-up visit at 6 months the tooth was clinically normal and tested positive for sensitivity and negative for percussion. The dental film showed the apical region without any pathological findings. Due to its improved material properties, Biodentine™ is an interesting alternative to conventional calcium hydroxide-based materials. It offers advantages for direct pulp capping and, in properly selected cases, may contribute to the long-term maintenance of tooth vitality.

Introduction:-

Loss of dentin is perhaps one of the major losses which hamper the integrity of the tooth structure to a significant extent. Whether be in the coronal portion or the radicular one, the dentin loss must be substituted with an artificial material, which can restore the physiological integrity of the tooth structure.[1] For many decades calcium hydroxide has been the standard material for maintaining pulp vitality. In contact with vital pulp tissue it contributes to the formation of reparative dentin, a special variant of tertiary dentin, which seals exposures by newly formed hard tissue.[2]

But nevertheless, calcium hydroxide has some drawbacks. Poor bonding to dentin, material resorption and mechanical instability are among them. As a result, calcium hydroxide does not prevent microleakage in the long run. The porosities (‘tunnel defects’) of the newly formed hard tissue may act as a portal of entry for microorganisms. These may cause secondary inflammation of the pulp tissue.[2] Therefore, new calcium silicate

cements have recently been introduced Biodentine® is a calcium silicate-based material introduced by (Septodont, http://www.septodontusa.com/).[3]

The material is characterized by the release of calcium when in solution. Tricalcium silicate based materials are also defined as a source of hydroxyapatite when they are in contact with synthetic tissue fluid. Appreciable properties of biodentine include good physical properties and its ability to stimulate tissue regeneration as well as good pulp response. Biodentine is new Bio active cement with dentin like mechanical properties which has beneficial effect on living cells & acts in a bio compatible manner. Biodentine is available as powder in a capsule and liquid in a pipette.

Mechanism of action of biodentine induces mineralization after its application. Mineralization occurs in the form of osteodentine by expressing markers of odontoblasts & increases TGF-Beta1 secretion from pulpal cells enabling early mineralization.[4,5]

In summary, Biodentine™ is both a dentin substitute base and a cement for maintaining pulp vitality and stimulating hard tissue formation, i.e. the formation of reactive or reparative (tertiary) dentin. The following case report illustrates the use of Biodentine™ for direct and indirect pulp capping.

Case report:-

20-years old female patient was reported to the Department of Conservative Dentistry and Endodontics, in our college with a chief complaint of discomfort of tooth on contact with cold food, drinks and air apparently in lower left back tooth region since one month. On examination, a deep carious lesion was found occlusally on tooth 36. RVG recorded during the diagnostic assessment showed signs of a deep carious lesion occlusally on tooth. (Figure 1). The tooth was tested positive on electric pulp tester and heat test sensitivity.
The patient was informed about the need to have the carious lesion treated.
An anesthetic was injected for terminal anesthesia and a rubber dam was applied. Following cavity preparation the carious dentin was completely excavated. In the process the pulp cavity was exposed iatrogenically at one site Clinically the pulp tissue was vital without any major bleeding (Figure 2). Maintenance of tooth vitality by direct pulp capping upon NaOCl (2.5%) was applied for hemostasis, cleaning and disinfecting the cavity.

Biodentine™(Septodont, http://www.septodontusa.com/) was applied to the exposed pulp tissue for direct pulp capping about twelve minutes after mixing, the Biodentine™ had set (Figure 3). Cavity was covered by a composite restoration. One week after direct capping she returned, the symptoms she had originally reported had completely disappeared within a very short time. Tooth 36 was clinically normal and tested positive for sensitivity and negative for percussion.

At the follow-up visit 6 months after direct capping, tooth 36 was clinically normal and again tested positive for sensitivity and negative for percussion.
The RVG recorded at that time did not show any pathological findings apically.

Figure 1 : - RVG recorded during the diagnostic assessment showed signs of a deep carious lesion occlusally on tooth.

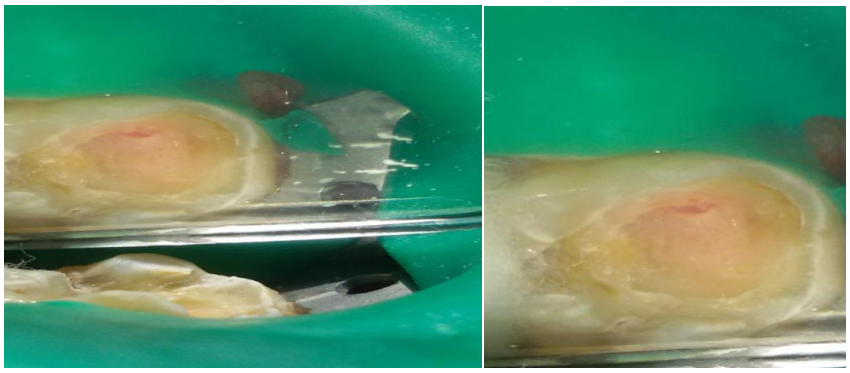

Figure 2 : Clinically the pulp tissue was vital without any major bleeding

Figure 3 : Biodentine was applied to the exposed pulp tissue for direct pulp capping

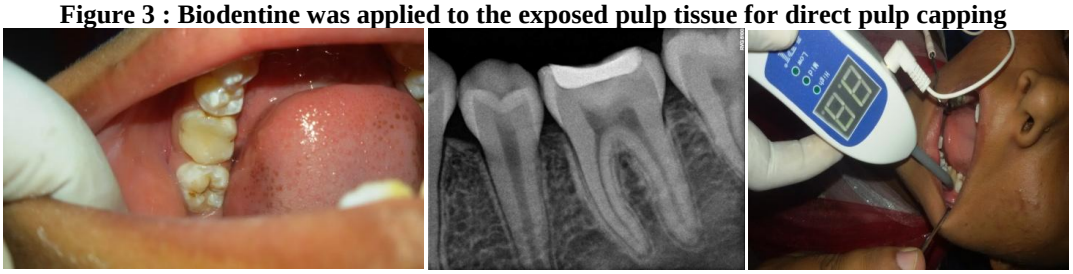

Figure 4 : follow-up visit 6 months after direct capping, tooth 36 was clinically normal and again tested positive for sensitivity and negative for percussion.

Discussion:-

Biodentine™ was shown to be biocompatible, in that it does not damage pulpal cells in vitro or in vivo, and is capable of stimulating tertiary dentin formation. Hard tissue formation is seen both after indirect and direct capping with Biodentine™.[2] Compared to other materials such as Mineral Trioxide Aggregate, Biodentine is less technique sensitive5. Setting time of biodentine is 12-15 mins, compared to MTA which has a setting time > 24 hrs. Unlike other Portland cement-based products, it is sufficiently stable to be used for pulp protection.[6]

Used for pulp capping, the material offers certain advantages over calcium hydroxide: It is stronger mechanically, less soluble and produces tighter seals. Three major disadvantages of calcium hydroxide, notably material resorption, mechanical instability and the resultant failure of preventing microleakages are therefore avoided.[2]

It is interesting to note that Biodentine has the capacity to develop watertight interfaces both with dental structures and with adhesive systems. Déjou et. al. 25 concluded that the marginal sealing of Biodentine without any surface treatment or adhesive system was equivalent to that of the Z250- Optibond solo plus adhesive restorative system.[4] In spite of the acidic pH of the artificial saliva, the new material showed no erosion and an increase in the compressive strength. Biodentine shows apatite formation after immersion in phosphate solution indicative of its bioactivity. The deposition of apatitic structures might increase the marginal sealing of the material. These physico-chemical properties associated with the biological behaviour suggest that it may be used as a permanent dentine substitute.[7]

Of note, Biodentine™ fillings were found to show marginal material loss at the follow-up visit after 6 months. This may be attributable to incorrect handling. During occlusal adjustment, Biodentine™ should not be prepared with rotating instruments and should not come into contact with water. It should rather be applied into the cavity with cement pluggers using light pressure, and carving instruments should be used for occlusal adjustment. Subsequent polishing of the Biodentine™ filling should be omitted. Excessive pressure or exaggerated trimming and polishing may disrupt the crystalline structure of Biodentine™ with resultant loss of material strength.[2]

The tolerance of Biodentine covered with a composite resin demonstrated that when subsequently covered with a composite, Biodentine is a convenient, efficient and well tolerated dentine substitute. Thus Biodentine as a dentine substitute can be used under a composite for posterior restorations. In addition it has also been reported that Biodentine performs as well as the resin modified glass ionomer cement in open-sandwich restorations. This is contrary to the results of the current study where Biodentine demonstrated leakage when used in a sandwich restoration overlayed with composite resin both when the material was etched and also when left unprepared. It was reported that morphological differences between the intact and the etched MTA surfaces existed. The etching created surface changes that might have the potential to enhance bonding of resinous materials. The surface morphological changes created by etching were evident even for Biodentine however whether these enhance the bonding of resins needs to be investigated.[6]

It goes without saying that a follow-up time of 6 months is much too short for evaluating the long-term success of a capping material. Problems associated with direct capping tend to occur up to 5 years post treatment. In more than 50% of problem cases direct capping fails within the first two years. Teeth still vital five years after direct capping stand a good chance of retaining their vitality. More long-term clinical studies are, therefore, needed for a definitive evaluation of Biodentine™.[2]

Conclusion:-

Biodentine is a fast-setting tricalcium silicate-based material having extended alkalinizing properties principally able to release ions involved in mineralization processes. with the potential of making a major contribution to formation of reparative dentine and maintaining pulp vitality in patients judiciously selected for direct pulp capping.

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