ABSTRACT

Biodentine is a calcium silicate primarily based material that has drawn attention in recent years and has been advocated to be employed in varied clinical applications such as root perforations, apexification, resorptions, retrograde fillings, pulp capping procedures, and dentin replacement. There has been sizeable analysis performed on this material since it is launching; but, there is scarce range of review articles that collate info and knowledge obtained from these studies. The aim of this text was to review the clinical applications and blessings of biodentine within the medical specialty practice. Electronic search of English scientific papers from 1992 to 2015 was accomplished exploitation saloon master’s degree program. The subsequent search terms used were clinical applications, biodentine, medical specialty dental medicine, children, advantages, dentin substitute, pulp medical care, root filling, and tooth repair. Due to its major blessings and distinctive options additionally as its ability to beat the disadvantages of alternative materials, biodentine has nice potential to revolutionize the various aspects of managing each primary and permanent in odontology additionally as operative dental medicine. The purpose of this text was to review the clinical applications of biodentine as a pulpotomy agent within the medical specialty practice.

KEY WORDS: Biodentine, Clinical applications, Infections, Medical specialty dental medicine, Pulpotomy

INTRODUCTION

Biodentine is a calcium silicate primarily based material that has drawn attention in recent years and has been advocated to be employed in varied clinical applications such as root perforations, apexification, resorptions, retrograde fillings, pulp capping procedures, and dentin replacement. There has been sizeable analysis performed on this material since it is launching; but, there is scarce range of review articles that collate info and knowledge obtained from these studies. The aim of this text was to review the clinical applications and blessings of biodentine within the medical specialty practice. Electronic search of English scientific papers from 1992 to 2015 was accomplished exploitation saloon master’s degree program. The subsequent search terms used were clinical applications, biodentine, medical specialty dental medicine, children, advantages, dentin substitute, pulp medical care, root filling, and tooth repair. Due to its major blessings and distinctive options additionally as its ability to beat the disadvantages of alternative materials, biodentine has nice potential to revolutionize the various aspects of managing each primary and permanent in odontology additionally as operative dental medicine. The purpose of this text was to review the clinical applications of biodentine as a pulpotomy agent within the medical specialty practice.

PULPOTOMY

Pulpotomy may be a technique that has been accustomed treat primary teeth of that the requirement for additional and additional new materials is not ending, particularly within the field of dental medicine. Varied materials are developed, tested, and standardized to get most profit permanently clinical performance. One such new material is that the latest bioactive calcium silicate primarily based material (biodentine) that was recently introduced by Septodont Company and will conciliate high mechanical properties with glorious biocompatibility, additionally as a bioactive behavior. (1)

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and has been advocated to be employed in varied clinical applications such as resorptions, retrograde fillings, root perforations, apexitification, pulp capping procedures, and dentine replacement. Biodentine may be a new bioactive cement, kind of like the wide used MTA. Biodentine has many blessings that embody smart protection ability, adequate compressive strength, and short setting time, which offer a major clinical advantage over alternative comparable materials. It is biocompatible and conjointly shows bioactivity.

The commercialized tricalcium salt of biodentine is totally different from the same old dental atomic number 20 salt “Portland Cement” materials. The producing method of the active biosilicate technology eliminates the metal impurities (such as alumina and alternative impurities) seen within the “Portland Cement” atomic number 20 silicates. Therefore, the mechanical properties area unit improved in biodentine by dominant the purity of the atomic number 20 salt through this Active Biosilicate Technology. Therefore, it is been developed and made with the aim of transferral along the high biocompatibility and bioactivity of atomic number 20 silicates, with increased properties, that build it additional distinctive than the other atomic number 20 silicate-based materials.

Biodentine is out there as powder in an exceedingly capsule and liquid in an exceedingly measuring instrument. There are two sorts of boxes out there within the market. Box is containing 15 capsules and 15 single-dose containers and another smaller box that contains solely five capsules and five single-dose containers. The powder is principally composed of tricalcium salt (main core), dicalcium salt, carbonate, and iron chemical compound additionally as zirconia due to the radiopacifier. The liquid contains water, salt (as setting accelerator), and a changed polycarboxylate (as superplasticizing or water reducing agent).

Biodentine was developed supported the foremost biocompatible chemistry out there for dental materials: atomic number 20 salt, which might set within the presence of water. The atomic number 20 salt can act with water resulting in the setting and hardening of the cement. This association method can turn out hydrous atomic number 20 salt (calcium silicate hydrate [CSH]) gel. As a part of its chemical setting reaction, hydroxide is additionally shaped in contact with phosphate ions, it creates precipitates that match hydroxyapatite.

This dissolution method happens at the surface of every grain of the atomic number 20 salt. The non-reacted tricalcium salt grains area unit enclosed by the layers of CSH gel, that area unit comparatively impervious to water, thereby retardation down the results of any reactions. Gradually, the CSH gel fills within the areas between the tricalcium salt grains. Later on, the hardening method results from the formation of crystals that area unit deposited in an exceedingly concentrated resolution.

Biodentine attracted attention within the field of dental medicine due to its quick setting time, high biocompatibility, high compressive strength, glorious protection ability, and simple handling additionally as its versatile usage in each dental medicine repair and restorative procedures while not inflicting any staining of the treated teeth. However, it is conjointly been well tried that biodentine has a superb antimicrobial properties due to its terribly high hydrogen ion concentration (pH = 12). In addition to it, it is rather more value effective as compared to similar materials.

Many in vivo and in vitro studies support its bioactivity additionally as its triple crown performance in several clinical applications. On the other hand, all the clinical studies and case reports have unconcealed results for its use in human primary teeth.

Due to its improved material properties (short setting time, higher mechanical properties, and straightforward and technology use) additionally as its ability to beat the drawbacks of the many alternative materials, biodentine could be a stimulating and promising various to the present materials for dentin-pulp advanced regeneration. Biodentine has the potential of creating major contributions within the field of dental medicine by maintaining the teeth in an exceedingly healthy state through various exciting clinical applications. Therefore, biodentine guarantees to be one in every of the foremost versatile materials of this century within the field of dental medicine.

The purpose of this text was to review the clinical applications and blessings of biodentine within the medical specialty practice. The garland pulp has been affected or infected by dental caries or traumatized, whereas the radicular pulp remains healthy.

**CLINICAL APPLICATIONS OF BIODENTINE**

Biodentine individuation not solely lies in its innovative bioactive and “pulp-protective” chemistry, however, conjointly in its universal application on each crown and root. In the space of the dental crown, it is indicated for pulp capping, treatment of deep unhealthy lesions exploitation the sandwich technique, pulpotomy, and conjointly as temporary enamel restoration or permanent dentine replacement. Its use in root includes managing perforations of forking, external and internal reabsorption, apexitification, and retrograde
Biodentine as a Pulpotomy Agent

Pulpotomy is another widely used important pulp medical care methodology within which biodentine is advocated to be used. This treatment methodology is that the most often accepted clinical procedure in medical specialty dental medicine once the garland pulp tissue is inflamed and a right away pulp capping is not an appropriate possibility.[14]

In comparison to formocresol in primary teeth pulpotomy, biodentine may be a regenerative material that maintains pulp vitality, whereas formocresol may be a devitalizing agent. However, biodentine needed less time for the pulpotomy procedure. Whereas formocresol acts solely as dressing material that desires a restorative material to seal the pulp chamber, biodentine acts at the same time as each dressing and filling material. Thus, biodentine eliminates the requirement for a filling material within the pulp chamber of pulpotomized teeth. Whereas formocresol needs 3–5 min application before the cotton pellet is removed, with biodentine the pulp chamber is crammed right away. Moreover, throughout the removal of formocresol-soaked cotton pellet, there is a clear stage of the cotton fibers adhering to clot, leading to reoccurrence of hemorrhage. This does not occur with biodentine because it is applied directly while not cotton pellet.[15]

In 2012, Shayegan investigated the inflammatory cell response and arduous tissue formation when biodentine pulpotomy in primary pig teeth. When 90 days, they found that the pulp tissue was traditional with none signs of inflammation and nine of 10 teeth showed thick calcification beneath the pulpotomy website. They all over that biodentine has bioactive properties, encourages arduous tissue regeneration, and provokes no signs of moderate or severe pulp inflammation response.

Biodentine has the potential of creating major contributions to maintaining pulp vitality in patients judiciously chosen for pulpotomy treatment. Therefore, this distinctive material could be a stimulating various to the present materials for dentin-pulp advanced regeneration.

A survey of the out there literature shows that there area unit nonetheless few revealed case reports and clinical trials with several non-published in progress clinical trials that embody the usage of biodentine in pulpotomy. All these studies showed biodentine as a good and promising various for the present pulpotomy medicaments.

In multiple case reports, Lavaud showed a triple crown results of biodentine with none clinical or imaging symptoms once it is used for primary teeth pulpotomy (9 months of follow-up), indirect capping on a hypomineralized molar (12 months of follow-up), and apexogenesis (14 months of follow-up). In another revealed case report, Villat et al. performed a partial pulpotomy in an immature second right tooth of a 12-year-old patient. After 6 months, the patient did not report any pain or complains on the observation amount. Moreover, the authors detected homogenous dentin bridge formation additionally as continuation of root development. Accordingly, they commented that quick favorable pulpal response renders this material an appropriate alternative compared to alternative materials.

Recently, at the 12th Congress of European Academy of medical specialty dental medicine (EAPD) in Polska, Rubanenko, given their preliminary results of comparison biodentine versus formocresol as dressing agents in pulpotomized primary molars. They incontestable a hit rate of 100% for biodentine, whereas that of formocresol was 94. In addition, Cuadros confirmed these attention-grabbing preliminary results of biodentine in humans and stressed that biodentine appears to be a promising various to be used in pulpotomies of primary molars with 100% clinical and photography success when 6 months of follow-up. On the opposite hand, Rajasekharan given the results of their randomized management run and showed clinical additionally as photography success in 94, 73% of biodentine treated teeth. They all over, “there was no vital distinction between the new product biodentine as compared to the well-known merchandise. In evaluating this preference dental medicine material in kids among Flemish medical specialty dentists, Vandenbulcke found that biodentine appears to be a promising various to be used in pulpotomies of primary molars with 100% clinical and photography success when 6 months of follow-up. On the opposite hand, Rajasekharan given the results of their randomized management run and showed clinical additionally as photography success in 94, 73% of biodentine treated teeth. They all over, “there was no vital distinction between the new product biodentine as compared to the well-known merchandise. In evaluating this preference dental medicine material in kids among Flemish medical specialty dentists, Vandenbulcke found that biodentine was the foremost most well-liked pulpotomy material in each primary and immature permanent teeth.

Nowicka studied the response of biodentine direct pulp capping in 28 caries-free inframaxillary and jaw permanent intact human molars scheduled for the extraction for dental medicine reasons when mechanical exposure. When 6 weeks, the teeth were extracted, stained with H and E. They found majority of specimens showing an entire dentinal bridge formation and an absence of inflammatory pulp response. Layers of well-arranged odontoblast-like cells and odontoblast were found to create hollow dentin beneath the osteodentin. They conjointly found no statistically vital variations between the biodentine and MTA experimental groups.[14,15]
Han and Okiji compared biodentine and white ProRoot MTA in terms of Ca and Si uptake by adjacent passage dentin and ascertained, whereas each material shaped tag-like structures, dentine component uptake was additional outstanding for biodentine than MTA. The same authors in another study showed higher atomic number 20 uniharness for biodentine as compared with MTA. The tag-like structures shaped were composed of Ca and P-rich and Si-poor materials. Laurent et al. evaluated its genotoxicity, toxicity, and effects on the target cells’ specific functions and located that it did not have an effect on the pulp embryonic cell-specific functions such as mineralization, additionally as expression of albuminoid I, dentin sialoprotein, and nestin.

Pérard M, assessed the biological effects of biodentine, is employed in pulp capping treatment, on pseudo-odontoblastic and pulp cells. They conjointly evaluated the results of biodentine and MTA on organic phenomenon in civilized spheroids and located Col1a1 expression levels (responsible for matrix secretion) were slightly lower in cells civilized within the presence of MTA than in those civilized within the presence of biodentine and also the management cells. They all over that each biodentine additionally as MTA area unit each appropriate for pulp capping.

Villat C performed partial pulpotomy exploitation biodentine in AN immature second right inframaxillary tooth and incontestable a quick tissue response each at the pulpal and root dentin level with formation of a radiopaque bridge at intervals 3–6 months. They advised the utilization of tricalcium salt cement ought to be used as a conservative intervention within the treatment of symptomatic immature teeth.

**BIODENTINE USED AS PULP CAPPING MATERIAL**

Biodentine was conjointly used as direct pulp capping material. BiodentineTM showed:

- A superb tolerance
- The flexibility to save lots of pulp vitality even in tough cases: The vitality take a look at was positive at every recall.

Moreover, biodentine is employed in direct pulp capping indications with an honest success rate. It is necessary to underline that BiodentineTM was employed in contact with pulp tissue in an exceedingly patient older than 21 and maintained the pulp alive.

**BIODENTINE AS A DENTAL REPAIR MATERIAL**

The dental medicine indications of biodentine area unit kind of like the same old atomic number 20 salt primarily based materials, just like the Portland cement (i.e., ProRoot MTA). This sort of product is already well documented.

Several physical, chemical, and biological properties area unit comparable are summarized within the presymptomatic section. However, biodentine has some options that area unit superior to MTA.

- Biodentine consistency is best suited to the clinical use than MTAs.
- Biodentine presentation ensures a higher safety and handling than MTA.
- Biodentine does not need a two-step obturation as within the case of MTA. Because the setting is quicker, there is a lower risk of microorganism contamination than with MTA.

Adding to its ability to be used as dentine substitute, biodentine may safely be used for every indication wherever dentine is broken. Therefore, it is a bonus for the practitioner and also the patient.

The tolerance and effectuality of BiodentineTM in six dental medicine procedures when 3 months and when a pair of years follow-up is in progress:

- Direct pulp capping following unhealthy pulp exposure
- Direct pulp capping following dental trauma/injury to healthy pulp (partial pulpotomy)
- Repair of perforated root canals and/or pulp chamber floor
- Retrograde dental medicine surgery
- Pulpotomy in primary molars
- Apexification.

**CONCLUSION**

Biodentine is widely used for pulp capping, pulpotomy, apexification, and repair material of perforation and reabsorption additionally as root end filling material in the field of dentistry. It is another to formocresol in pulpotomy thanks to the tissue irritating, cytotoxic, and agent effects of formocresol that area unit resolved in the field of dentistry. It is another to formocresol contamination than with MTA.

Due to its major blessings and distinctive options additionally as its ability to beat the disadvantages of alternative materials, biodentine has nice potential to revolutionize the various aspects of managing each primary and permanent in odontology additionally as operative dental medicine. On the opposite hand, any studies area unit required to increase the long run scope of this material relating to the clinical applications.
REFERENCES


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