Case Report

Clinical Applications of Biodentine : A Case Series

Tushar Mishra[1], Shahji Arora[2], Nandamuri Sridevi[3], Vinay Mishra[4]

[1]P.G. student, [2]P.G. Student, [3]Professor, [4]Senior Lecturer, Department of Conservative Dentistry & Endodontics, Rama Dental College, Hospital & Research Centre, Kanpur- 208024, Uttar Pradesh, India

Corresponding author: Tushar Mishra, P.G. student, Department of Conservative Dentistry & Endodontics, Rama Dental College, Hospital & Research centre, Kanpur- 208024, Uttar Pradesh, India

How to cite this article: Tushar Mishra, Shahji Arora, Nandamuri Sridevi, Vinay Mishra. Clinical applications of biodentine : a case series. International Journal of Contemporary Medicine Surgery and Radiology. 2017;2(1):10-14.

A B S T R A C T

Introduction: Calcium silicate cements have occupied a superior position in dentistry. They are used in various clinical situations. Over a period of time there has been an evolution from Portland cement to Biodentine. Biodentine has gained popularity in recent years due to the resemblance to MTA. These are hydrophilic radio-opaque materials which form a sticky self-setting calcium silicate hydrate gel. **Case report:** There is a series of case report that presents a favorable clinical outcome when Biodentine was used for treating palatogingival groove and external cervical root resorption. **Conclusion:** Biodentine is a calcium silicate based material having intrinsic properties such as good sealing correlated to expansion, ability to set in presence of fluid, bioactivity, release of ions acting as epigenetic signals and good biological properties which enables the clinician to use this cement for various clinical applications such as Root perforation, Apexification, resorptive lesions, Retrograde filling materials. This paper throws light on few clinical applications of biodentine such as external cervical root resorption, palato-radicular groove.

Key words: Biocompatibility, Calcium Silicate, Root Resorption

INTRODUCTION

The eventual success of the endodontic surgery relies upon the prevention of leakage of irritants into the periapical tissues.[1]

Amalgam, composites, gold foil, zinc oxide eugenol-based cements, and calcium silicate-based materials eg. portland cements have been extensively investigated when used as an endodontic repair material.

Since 1928 calcium hydroxide has been standard material of choice for maintaining the vitality of pulp since it is capable of stimulating tertiary dentin formation. However it has some drawbacks like poor bonding to dentin, material resorption.[2] Later Mineral Trioxide Aggregate was introduced by Torabinejad et al (PROROOT®, Dentsply International Inc., York, PA, USA) in 1993[3] is used as a material of choice for all dentinal defects due to their biocompatibility & ability to induce calcium phosphate precipitate at interface to periodontium & bone tissue repair. However MTA presents some shortcomings such as; long setting time, difficult handling characteristics, tooth discoloration, lower compressive & flexural strength than dentine, high cost.[4] Recently, a new calcium silicate-based material Biodentine was introduced by Gilles and Olivier in 2010 (Septodont, Saint Maur des Fosses, France).[5]

Biodentine, also known as "dentine in a capsule", a biocompatible and bioactive dentine substitute which overcomes the draw backs of Calcium hydroxide and Mineral trioxide Aggregate.[6] L Grech et al (2013) reported that biodentine has; high wash out value, low fluid uptake resorption value, superior mechanical properties, adequate working time, low setting time. Biodentine shows promising results in the management of the deep carious cavity in operative dentistry whether or not the pulp is exposed. Biodentine shows good physical properties, good pulpal response and is capable of stimulating tissue regeneration. Biodentine is a bio active cement which has the beneficial effect on living cells and has the dentine like mechanical properties.[4] Biodentine has a variety of applications including pulp capping and endodontic repair (apexification, root perforations, retrograde filling, resorptive lesions, and material in endodontic surgery) and can also be used as a dentine replacement material in restorative dentistry.The material is formulated by using the MTA-based cement technology with improvement in some properties of these types of cements, such as physical qualities and handling.[7] This case report presents a favorable clinical outcome when Biodentine was used for treating palatogingival groove and external cervical root resorption.

CASE REPORTS

Case 1: Management of Palatogingival groove

A 29 year old male patient came to Department of Conservative Dentistry and Endodontic, Rama Dental College, Hospital & Research Centre, Kanpur with complaint of dull and intermittent pain at the palatal side of the maxillary right lateral incisor. Patient also complaint of pus discharge from upper front tooth region since one month. Dental history revealed that the patient has undergone root canal treatment twice with respect to the concerned tooth. Patient didn't have any history of trauma to the concerned tooth.Clinical findings revealed, intraoral draining sinus in the labial gingival surface of tooth #12. Intact coronal structure was present with no change in the colour or texture. A V-shaped palatal groove was present at distal aspect at CEJ and extending apically creating a periodontal pocket of 8-9 mm in depth (Figure 1a). Bleeding on probing with grade I mobility was present.Intraoral peri-apical radiograph of the tooth showed a pear-shaped radiolucency with localized bone loss with respect to 12 and root canal treated tooth #12, #11(Figure 1b). Gutta-percha tracing ofthe periodontal pocket pointed towards the periapical area (Figure 1c).

Based on these findings, it was concluded that tooth # 12 having a palato gingival groove predisposed to the development of localized periodontitis, suppurative apical periodontitis with periapical abscess. A combined endodontic - periodontal treatment was planned for the tooth #12 and re rct was planned for #11. First oral prophylaxis was performed. Access opening was performed in endodontically treated tooth so for retreatment GP cone was removed with the help of 25 no H file and disinfecting the area with 2% chlorhexidine digluconate (vconcept, vishal, India). Working length was determined by using electronic apex locator (Root ZX, J. Morita Mfg. Corporation, Kyoto, Japan) and radiographically with 15 no K-file. The root canal was cleaned and shaped by K-files using step back technique. The root canal was copiously irrigated with 3% sodium hypochlorite (PARCAN, Septodont, Panvel, India) and finally irrigated with 17% liquid ethylenediaminetetraacetic acid (EDTA) (PrevestDenpro, Jammu, India). Access cavity was temporized with calcium hydroxide and temporary cement(orafil G). Patient was recalled after 1 week; the tooth was asymptomatic. Root canal was irrigated again with normal saline and dried using paper points. Before obturation, master points were seated to test their suitability to canal and radiograph was taken. The canal was obturated with selected master gutta-percha cone and zinc oxide eugenol sealer utilizing lateral condensation technique. After one week Periapical surgery included apicoectomy was planned along with saucerization and sealing of palatogingival groove which includes the periodontal phase of treatment.Complete extraoral and intraoral mouth disinfection was done with betadine and local anesthesia was administered (xylocaine 2% with epinephrine 1:80, 000). A full thickness surgical flap was raised from the labial aspect and the lesion site was reached (Figure 1d). Granulation tissue was curetted and apicoectomy was performed (Figure 1e).Retro preparation with ultrasonic tips(Figure 1f) was done and biodentine was used for retrograde filling (Figure 1g). A surgical flap was raised from the palatal aspect and stabilized (Figure 1h). Thorough debridement around the groove was performed by meticulous scaling and root planning. Saucerization of groove was done with ultrasonics (Figure 1i). Biodentine (Septodont, St. Maur.des.Fosses, France)

Figure-1a: Periodontal pocket of 8-9 mm in depth; **Figure-1b:** Pre-op IOPAR

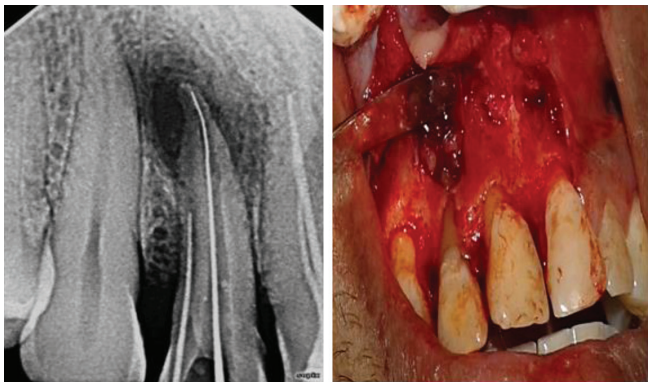


Figure-1c: Working length and GP in groove; **Figure-1d:** Raising full thickness mucoperiosteal flap

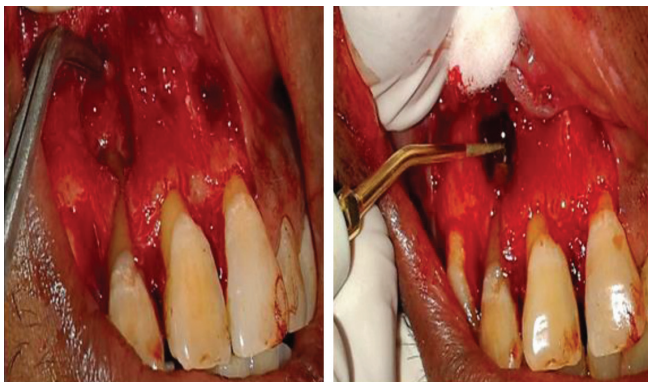


Figure-1e: Curettage of the lesion and apicoectomy; **Figure-1f:** Retropreparation with ultrasonic tip

was mixed according to the manufacturer's instructions and applied into the defect after proper control of bleeding (Figure 1j).The material was allowed to initial set for about 9 min. During the setting phase, the tissues were kept hydrated using moist gauze piece. The flap was approximated and sutured using 3-0 silk suture (Figure 1k).

A 5 Days Follow up reduced probing depth to 4-5 mm (Figure 1l). Two month (Figure 1m) and four month (Figure 1n) follow up revealed healthy periodontal health.

Case 2: Management of External cervical root resorption

A 22 year old healthy female patient came to Department of Conservative Dentistry and Endodontic, Rama Dental College, Hospital & Research Centre, Kanpur with intermittent pain after eating food in upper front tooth region at the distal side of the maxillary left central incisor. Medical history was non-contributory, but dental history revealed that the patient has undergone orthodontic treatment 6 months back. Patient also has the history of root canal treatment 6 months for the same reason.On probing the distal aspect of maxillary left central incisor, a pocket depth of 5mm, and bleeding from gingival sulcus was noticed (Figure 2a). Probing the defect revealed surrounding dentine to be hard and solid with a sharp scraping sound. A periapical radiograph revealed a concave shaped radiolucency in the distal aspect of the left central incisor involving coronal third of root along with bone destruction and a perfectly obturated #21 (Figure 2b).

On the basis of history, clinical examination and radiographic findings a diagnosis of Class 3 invasive cervical resorption in #21 was made.The treatment was directed towards debriding and restoring the defect with a biodentine through a surgical approach as tooth was already obturated. After achieving profound anaesthesia, intrasulcular incision was made on the labial aspect of maxillary left central incisor and full thickness flap extending from the distal aspect of left maxillary central incisor to distal aspect of left maxillary lateral incisor was reflected(Figure 2c). A surgical flap was also raised from the palatal aspect and stabilized (Figure 2d) in order to get a better access to the lesion site.

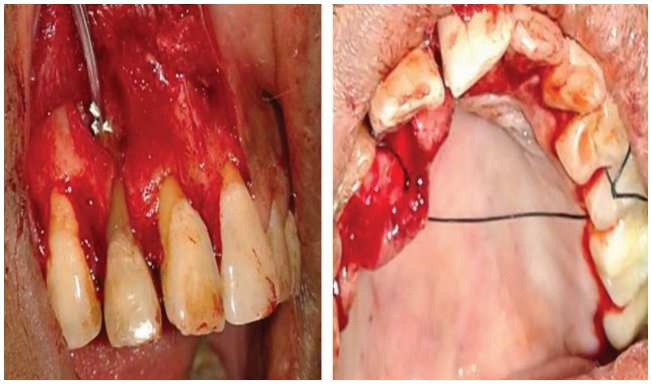


Figure-1g: Root-end filling with Biodentine; **Figure-1h:** Palatal flap raised and tied

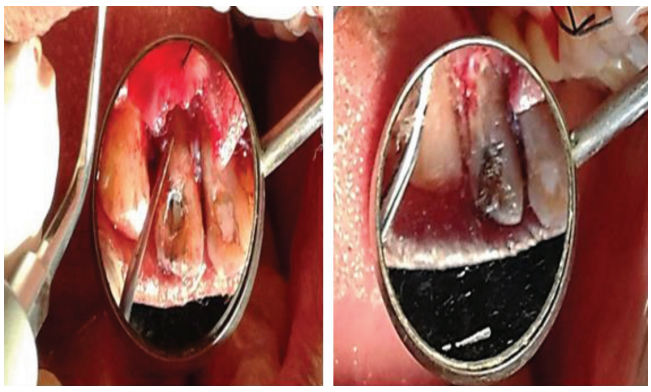


Figure-1i: Saucerization of groove with ultrasonics; **Figure-1j:** Biodentine placed in groove

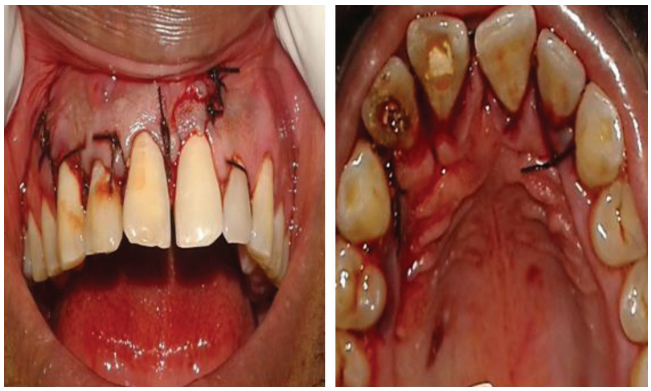


Figure-1k: Suturing with 3-0 black silk suture

Figure-1l: Probing Depth Reduced to 4-5 mm

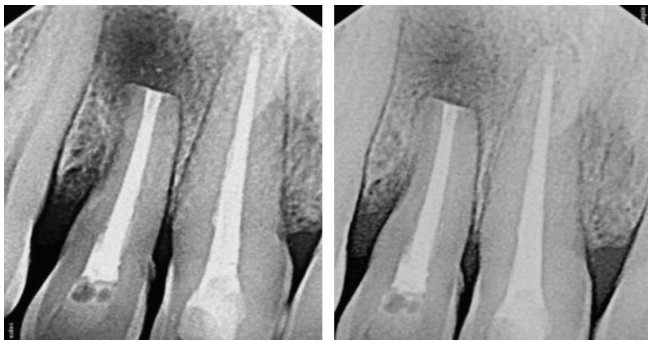


Figure-1m: 2 Months Follow up; **Figure-1n:** 2 Months Follow up

Irregular borders of the defect were smoothed with a bur and resorption defect was curetted. Along with this the cavity was thoroughly irrigated with sterile saline solution and dried with sterile gauge. Biodentine(Septodont, St. Maur.des.Fosses, France) was mixed according to the manufacturer's instructions and applied into the defect after proper control of bleeding (Figure 2e).The material was allowed to initial set for about 9 min. During the setting phase, the tissues were kept hydrated using moist gauze piece. The flap was approximated and sutured using 3-0 silk suture on both palatal and labial aspect (Figure 2f).

A 5 day follow up revealed satisfactory effect (Figure 2g) and a 6 month follow up revealed good healing of both the soft and hard tissues with no other subjective symptoms (Figure 2h).

Figure-2a: 5 mm periodontal pocket on; **Figure-2b:** Preoperative Radiograph distal aspect #21

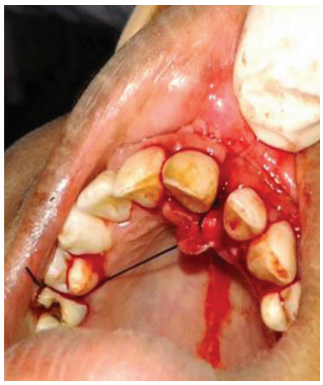
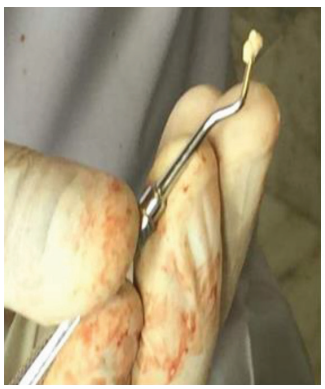


Figure-2c: Full thickness flap raised (Labial); **Figure-2d:** Full thickness flap raised (Palatal)



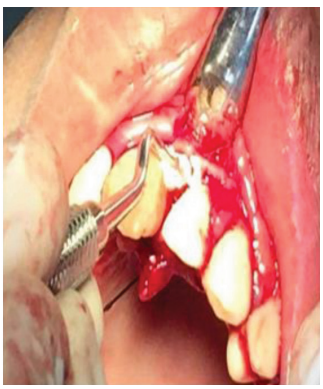


Figure-2e: Biodentine Placement

DISCUSSION

A palatogingival groove is usually seen as a breach on the enamel surface traversing the cingulum extending on to the root surface in varying depth and extension.This anomaly is mostly seen on the maxillary lateral incisor which is notorious with regard to a number of morphologic and anatomic abnormalities.[8]

Yong Chug U et al, classified them into three types on the basis of severity as Type I –The groove is short (not beyond the coronal third of the root), Type II - The groove is long (beyond the coronal third of theroot) but shallow.Type III - The groove is long (beyond the coronal third of the root) and deep.These grooves can be mesial, distal or medial when present on the palatal side.[9] Our case is diagnosed as Type III Palatogingival Groove.Our treatment approach was based on, complete eradication of microbials from root canal permanent thorough sealing of root groove which will close any remaining doors of communication between root canal and periodontium, which was in accordance with the case report of Mele Puthukkudy Liji, Maroli Ramesh kumar (2015). Setting time is reduced due to addition of accelerator - $CaCl_2$. The formation of hydrated calcium silicate gel decreases porosity.[10]

Figure-2f: Suturing with 3-0 black silk suture

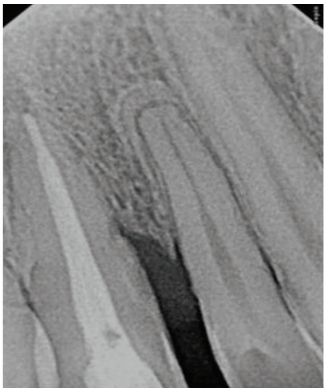


Figure-2g: 5 Day follow up; **Figure-2h:** 6 Month follow up

External cervical resorption (ECR) is the loss of dental hard tissue as a result of odontoclastic action. This inflammatory tissue loss occurs immediately below the epithelial attachment of the tooth.[11] The exact cause of External cervical resorption is poorly understood; several etiologic factors have been suggested such as :Dental trauma, Orthodontic treatment, Intracoronal bleaching, Periodontal therapy, Idiopathic etiology.[12] According to Heithersay classification of external cervical root resorption, our case was diagnosed as a Class 3 External cervical root resorption.[13] Generally, there are three choices for treatment: no treatment with eventual extraction when the tooth becomes

Symptomatic, immediate extraction, surgical access, debridement, and restoration of the resorptivelesion (without/with endodontic treatment).[14] Keeping in mind the case report of Abdelmoumen E et al (2015) the surgical treatment was planned and the results were in accordance with the case report.Compared to MTA, Biodentin has a better consistency after mixing which allows ease of placement in areas of resorptive defect and needs much less time for setting.[15]

CONCLUSION

This case report presents a favourable clinical out come when Biodentine was used for treating Plalatogingival groove, and external cervical resorption. During the procedures we found that the manual mixing of Biodentine liquid with powder can lead to discrepancies, hence a better way of insuring the adequate power:liquid ratio should be ensured by the manufacturer. The radio-opacity of Biodentine is questionable and it should be increased so that a better visualization can be achieved on radiographs.However, further studies are necessary to provide more information about the use of Biodentine for the treatment of resorptive defects. Long term follow up studies are still required involving the restorative procedures using Biodentine by evaluating its biologic and physical properties for a more conclusive evidence.

REFERENCES

1. Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of primary root canal treatment: systematic review of the literature: part 2—influence of clinical factors. IntEndod J. 2008;41:6–31.
2. DudaS,DammaschikeT.MaBnahmenzurVitalerhaltung der pulpa. Gibtes Alternativenzumkalziumhydroxidbei der direktenuberkappung? Quintessenz. 2008;59:1327-1334, 1354.
3. Rao A, Shenoy R. Mineral trioxide aggregate- A review. J ClinPediatr Dent. 2009;34:1-7.
4. Tayet all 2007, Reyes-Carmona et al. 2009, Torabinejad & parirokh 2010.
5. Gandolfi MG, Siboni F, Polimeni A, Bossu M, Riccitiello F, Rengo S, Prati C. In Vitro Screening of the Apatite-Forming Ability, Biointeractivity and Physical Properties of a Tricalcium Silicate Material for Endodontics and Restorative Dentistry. Dentistry Journal. 2013;1:41-60.
6. Priyalakshmi S, Ranjan P. Review on Biodentine-A Bioactive Dentin Substitute IOSR Journal of Dental and Medical Sciences. 2014;13:13-17.
7. Biodentine Active Biosilicate Technology Scientific File, Septodont, Paris, France.
8. Lara VS, Consolaro A, Bruce RS. Macroscopic and microscopic analysis of the palato-gingival groove. J Endod. 2000; 26:345–50.
9. Yong-chun Gu. A Micro–Computed Tomographic Analysis of Maxillary Lateral Incisors with Radicular Groove. J Endod. 2011;37:789–792.
10. Patrick L, Jean C, Michel De M´eob, Jacques D´ejoua, Imad A. Induction of specific cell responses to a Ca3SiO5-based posterior restorative material. Dental materials. 2008;24:1486-1494.
11. Patel S, Kanagasingam S, Ford TP. External Cervical Resorption: A Review. J Endod; 2009;35:616-25.
12. Nikhil V, Arora V, Jha P, Verma M. Non-surgical management of trauma induced external root resorption at two different sites in a single tooth with Biodentine : A case report. Endodontology. 2012;24:150-5.
13. Heithersay GS. Treatment of Invasive Cervical Resorption: An Analysis of Results Using Topical Application of Trichloracetic Acid, Curettage, and Restoration. Quintessence Int. 1999;30:96-110.
14. Schwartz RS, Robbins JW, Rindler E. Management of Invasive Cervical Resorption: Observations from Three Private Practices and a Report of Three Cases. J Endod. 2010;36:1721-30.
15. Nikhil V, Arora V, Jha P, Verma M. Non-surgical management of trauma induced external root resorption at two different sites in a single tooth with Biodentine : A case report. Endodontology. 2012; 24:150-5.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 01-01-2017; **Published online**: 05-02-2017