



An Alternative Approach Of Management Of Grade III Furcation Defects In Mandibular Molars With Grade II/III Mobility Using Light Cure Glass Ionomer Cement

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Abstract

Background- The search for alternative methods to treat grade III Furcation involvement with grade II/III mobility continues to evolve. The use of resin light cure glass ionomer cement to completely fill the furcation entrance may help in improving the mobility status and prolong the longevity of the tooth.

Purpose- The purpose of the current study to treat degree III furcation defects with grade II/ III mobility by attempting to seal the defect by light cure glass ionomer cement.

Methods- A total of 16 Patients were randomly divided into two groups-Group I & Group II. Each group consisted of 8 patients with 8 sites. Group I consists of mandibular molar grade III furcation defects with grade II Mobility, while group II consists of mandibular molar grade III furcation defects with grade III Mobility. All the groups were subjected to open flap debridement and light cure glass ionomer cement (LC-GIC) for the management of the furcation defect. The clinical parameters Plaque index (PI), Sulcular bleeding index (SBI), probing depth (PD), clinical attachment level (CAL), mobility index were evaluated at baseline and at 3 months post treatment.

Results- At follow up, mean PI of Group I was higher as compared to that of Group II while mean GI and CAL was higher in Group II as compared to that of Group I while mean PPD was same in two groups. Mobility was also reduced from grade II/III to grade I. However, no significant difference was observed between two groups for any of the parameters ($p > 0.05$).

Conclusion- LC GIC material was able to produce significant clinical improvement (as measured by clinical probing depth and CAL). No major changes in bone level were seen. Sealing of grade III furcation lesions with resin ionomer cement produced equally good results in grade II and grade III mobile teeth.

Keyword- Light cure glass ionomer cement, Grade III furcation defect, chronic Periodontitis

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INTRODUCTION

The periodontal attachment loss due to periodontitis may result in teeth with furcation involvement, causing degree I, II, or III furcation defects, based on the extent of horizontal component of the bone defect, where degree III is total horizontal destruction throughout the furcation.¹ Long-term studies on treated periodontal patients revealed that molar teeth with prior furcation invasions were the most frequently lost teeth, probably because of failure in keeping the area plaque free owing to complex furcation anatomy.²

Various treatment modalities have been attempted to retain multi-rooted teeth³. Most have had just modest amounts of success. Root amputation and root resection^{4,5,6}, guided tissue regeneration with non-resorbable and resorbable membranes⁵, osseous grafting with freeze-dried bone allograft (FDBA) and demineralized freeze-dried bone allograft (DFDBA), as well as combinations of membrane and grafting material^{7,8}, coronally positioned flaps, and scaling and root planing have all been used in the past as treatment modalities. Regenerative methods that have been effective in treating



grade II mandibular furcation involvements, however, have been less predictable in grade III circumstances.⁹

Therefore, multi rooted teeth with grade III furcation defects can be managed by improving access to the furcation, and eliminating the furcation region through tunneling, furcation plasty.^{5,6} All of these methods assist in maintaining oral hygiene, and they have been used over time with varied degrees of success and complications.² Nevertheless, these methods often accompanies certain complications such as soft tissue growth obstructing the furcation entrance and thereby hinders the maintenance of hygiene, pulpal reaction leading to pulp hyperemia and increased risk of dental root caries in the furcation area.^{10,11}

The search for alternative methods to treat grade III furcation involvements continues to evolve.

Anderegg¹² reported the use of resin ionomer in the treatment of a hopeless tooth #14 having a grade III maxillary furcation defect. The light cured glass ionomer cement was placed to completely fill the 3-furcation entrances of the maxillary upper right first molar. At 6 months the tooth was asymptomatic in function, and its "hopeless" prognosis was upgraded. Resin – ionomer have some interesting properties that may lend themselves well to periodontal furcation application. They are insoluble in oral fluids, adhere to tooth structure, have a lower cure shrinkage rate, a low coefficient of thermal expansion, and a dual cure capability. Additionally they exhibit radio opacity, fluoride release and biocompatibility. The advantages of a furcation sealant are its ease of use, epithelial

attachment, bacteriostatic nature due to fluoride release and cost effectiveness. The material is additionally attractive as it eliminates the need for suturing or tacking the material into place and there is no additional retrieval procedure necessary once the initial placement is complete.^{11,13}

The purpose of the current study to treat degree III furcation defects with grade II/ III mobility by attempting to seal the defect by light cure glass ionomer cement, thus decrease the surface area of the furcation and giving the tooth a chance for routine maintenance procedures. The purpose of this study was to introduce an alternative periodontal/restorative combined procedure that will economically retain teeth with questionable prognosis under regular home care and routine maintenance.

MATERIAL AND METHODS

The study design was a single-blinded, randomized clinical trial to compare the clinical outcomes at baseline and 3 month after the intervention. Ethical clearance for the study was obtained from the Institutional Ethics Committee. An informed written consent letter was signed by all the patients. Inclusion criteria were systemically healthy subjects aged 30- 60 years suffering from chronic Periodontitis with at least 6 sites with PD \geq 5mm and interdental CAL \geq 5mm and BOP in at least 15 teeth, Grade III furcation defect mandibular molars with grade II/III mobility. Exclusion criteria were any root caries, internal or external root resorption, acute or chronic systemic disorders, hematologic disorders, current smokers and tobacco users, and pregnant and lactating

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female patients. Non-cooperative patients with unacceptable oral hygiene were withdrawn from the study. A total of 16 Patients were randomly divided in to two groups-Group I & Group II. Each group consisted of 8 patients with 8 sites. Group I consists of mandibular molar grade III furcation defects with grade II Mobility, while group II consist of mandibular molar grade III furcation defects with grade III Mobility. The following clinical parameters were recorded at baseline and 3 months post operatively for all the sites:

1. Plaque index (PI)¹⁴
2. Sulcus bleeding index (SBI) was measured as the appearance of bleeding within 30 seconds indicates a positive score.¹⁵
3. Probing depth (PD) was measured from gingival margin to base of the pocket using UNC-15 periodontal probe according to technique used by Mealey et al. 1994.¹⁶
4. Clinical attachment level (CAL) was measured from CEJ to base of the pocket using UNC-15 periodontal probe
5. Miller's mobility index was measured using Miller's Mobility Index¹⁷

The patients were subjected to surgery after thorough scaling and root planing and occlusal adjustment was done, if necessary, to relieve occlusal adjustment. In both the groups, Sulcular incisions were made and mucoperiosteal envelop flaps were reflected under local anesthesia 2% lignocaine with 1:80000 adrenaline. Meticulous defect debridement and root planing were carried out with the help of the curettes. Once the root and furcation surfaces were free of hard accretions, the root was acid etched with a 37% ortho-phosphoric acid gel for one minute and washed by water. The etching solution was applied to remove the smear layer and prepare the root surface for the bonding agent. A bonding agent (3M Bonding Agent) was applied and light cured for 25 seconds with light cure device. One drop of the liquid & one scoop of powder of resin glass ionomer cement (Fuji Type II LC, DENTSPLY Co.) was mixed on a mixing pad with plastic spatula according to manufacturer's instructions and carried to the furcation defect with the help of Teflon coated filling instrument. The furcation defect was

completely filled in increment of 1-4 layers with resin glass ionomer cement and light cured for 30 seconds for each increment. After curing the resin glass ionomer cement, excess resin was removed with the help of flame shaped diamond finishing burs and the area was polished with diamond shaped plastic burs. The site was irrigated with povidone iodine and normal saline solution. Flap was repositioned apically by giving interrupted sutures 3-0 black silk suture. Our intention was not to cover the exposed resin, but to replace the tissue so the resin was accessible to brushing and other home care aids and lastly periodontal dressing was placed.

Postoperative instructions were given to all the patients and appropriate medications were prescribed (antibiotic – capsule amoxicillin 500 mg TDS; analgesic and anti-inflammatory drug – tablet diclofenac sodium 50 mg TDS and multivitamin capsule once daily for 5 days) along with 10 ml 0.2% chlorhexidine gluconate mouthwash twice daily for 2 weeks. Seven days after the surgery, dressings and sutures were removed. All patients were recalled at 1 and 3 months for evaluation and maintenance. The clinical parameters were measured using the same probing techniques at 3 months.

Results

Analyses were performed and data were summarized as mean \pm standard error. Pre and post values were compared by paired t-test and the changes in outcome measures of two independent groups were compared by independent Student's t-test. A two-tailed ($\alpha = 2$) $P < 0.05$ was considered statistically significant.

In Group I, baseline mean values for PI, GI, PPD, CAL and mobility at baseline were 2.44 ± 0.43 , 2.13 ± 0.18 , 3.06 ± 0.77 , 7.63 ± 1.15 and 2.50 ± 0.52 respectively while in group II, mean values for PI, GI, PPD, CAL and mobility at baseline were 2.41 ± 0.44 , 2.13 ± 0.19 , 2.88 ± 0.83 , 7.25 ± 1.16 and 2.00 ± 0.0 respectively. The mean values of Group II were higher as compared to Group I while mean GI value of both the groups was same. However, no significant difference was observed between two groups for any of the parameters ($p > 0.05$). [Table 1]

In all the groups, there were significant improvement in all the clinical parameters, At 3 month follow up, the group I values decreased to reach at 1.19 ± 0.19 , 0.58 ± 0.28 , 2.00 ± 0.0 , 6.56 ± 0.63 and 1.94 ± 0.77 respectively, thus showing a decrease of 51.2%, 72.8%, 34.6%, 13.9% and 22.4% respectively and the reduction observed was significant statistically ($p < 0.05$). In group II, at 3 month follow up the values decreased to reach at 1.28 ± 0.21 , 0.53 ± 0.25 , 2.00 ± 0.0 , 6.38 ± 0.52 and 1.38 ± 0.52 respectively, thus showing a decrease of 53.1%, 75.1%, 30.6%, 12.0% and 31.0% respectively which was significant statistically ($p < 0.05$). [Table 1] [graph1]

However, at follow up, mean PI of Group I was higher as compared to that of Group II while mean GI and CAL was higher in Group II as compared to that of Group I while mean PPD was same in two groups. However, no significant difference was observed between two groups for any of the parameters ($p > 0.05$).

Discussion

Management of advanced furcation invasion and questionable prognosis has long been a dilemma for the periodontal community. Various treatment modalities have been used for grade III furcation involved teeth having advanced periodontal destruction. These include: Flap reflection and debridement followed by repositioning of flaps at the original level; Tunneling, which is performed to debride the remaining soft and hard tissues in the furcal area, this in turn, allows access for effective oral hygiene and maintenance; root resection and hemi-section.^{4,5,6}

Tunneling is another approach to treatment, however it may make the tooth prone to root caries.⁵ Root resection or hemi-section has also been used which requires sufficient remaining bony support on at least one root, to convert the non maintainable furcation lesion into an area whose anatomic characteristic permit adequate maintenance of oral hygiene. Therefore although this modality has been used for a long time teeth having grade II or grade III mobility invariably have inadequate bone support on both the roots, so they are poor candidates for treatment using this approach.

Few studies have been conducted on the use of light cure glass ionomer cement as a furcation sealant to assess its potential to maintain a healthier periodontal environment. The rationale for sealing the furcation defect is to minimize surface area available for plaque accumulation and converting plaque retentive areas into areas, where good oral hygiene can be maintained. This helps in controlling the inflammation and checking further loss of attachment. The present study was undertaken keeping the same theme in mind and to clinically assess inflammation, disease activity and attachment level along with patient comfort after sealing the grade III furcations by light cure glass ionomer cement.¹⁸ The LC-GIC has following qualities and benefits such as adhesion to tooth structure and other dental substrates, insolubility in oral fluids, radiopacity, fluoride release, Low coefficient of thermal expansion, dual cure capability, and Biocompatibility.^{18,19}

Other additional benefits are: Simple to position in the intersection, doesn't require a suture to be stable, the development of epithelial adhesion to light curable GIC, helps the gingival flap be completely covered, lowered the risk of root caries due to bacteriostatic properties of emission of fluoride.²⁰

Use of glass ionomer cement in the periradicular region implies that the material will be in close proximity to the healing bone. Biocompatibility of glass ionomer materials with bone has been attributed to the negligible exothermic reaction on setting; the rapid rise in pH as the material hardens²¹ and fluoride that are leached from the set cement provides a beneficial effect for the tissue in proximity to the cement. Fluoride release^{19,22} may also result in antimicrobial activity and an elevation in acid resistance of tooth structure, absence of root caries and may possibly alter the nature /ecology of the plaque surrounding the restoration. **Anderegg et al**¹⁶ noted that the reduction in plaque index can also be explained as light cure GIC exhibited a property of fluoride release which may have altered the nature of plaque surrounding the restoration. Similar results were also noted by **Dragoo**¹¹.



The present study depicts reduction of mean probing depth for Group I to be 2.00 ± 0.0 and for Group II to be 2.00 ± 0.0 . The probing depth reduction for Group I was found to be highly significant at 34.6% level of probability whereas that for Group II was found to be significant at 30.6% probability level. However, the results of Group I were compared with those of Group II, no statistically significant difference was seen. Therefore it can be concluded that LC GIC as furcation sealant is equally effective in reducing PD in teeth having grade II mobility (Group I) and grade III mobility (Group II).

The reduction in PD can be assigned to reduce inflammation following debridement, the ability of tissue to form epithelial attachment and connective tissue adhesion with LC GIC material. Moreover, it can be concluded that the conversion of plaque retentive anatomic contours into periodontal maintainable areas. The present study depicts gain in CAL for Group I to be 6.56 ± 0.63 and for Group II to be 6.38 ± 0.52 . The CAL gain for Group I was statistically highly significant and that for Group II to be significant. However when comparison was conducted between two groups regarding CAL gain, no statistically significant difference was seen. This is in accordance with **Anderegg¹⁶**, **Dragoo¹⁵**.

The gain in CAL may be attributed to biocompatibility of LC GIC which permits formation of epithelial attachment and resolution of infection. This is in accordance with histologic study carried out by **Dragoo¹⁵**, which established the ability of periodontal tissues to adhere to the sealant. In addition, bactericidal effect of the sealant produces by release of fluoride ions. The bone resorption seen in grade III mobile teeth was in accordance with the study by **Fowler and Breault²¹**. However, there is not much evidence in the current literature regarding bone level of the furcation defects treated by this method. The resorption seen in Group II may be attributed to the advanced level of periodontal destruction in these teeth rather than caused by the GIC sealants, as similar resorption was absent in Group I. It was observed that there was reduction in mobility. For Group I, 5 out of 8 patients showed reduction in tooth mobility from grade II to

grade I i.e 31.25% sites reduced in mobility. For Group II, 4 out of 8 patients showed reduction in tooth mobility from grade III to grade II mobility i.e 25 % of sites reduced in tooth mobility. This reduction was again more for Group I. Hence it was observed that there was reduction in tooth mobility at 3 months post-operatively when compared to baseline which is in accordance with the study by **Dragoo¹⁵**, **Anderegg¹⁶** and **Metzler²²**.

It was observed that there was reduction in disease activity at 3 months post operatively when compared to baseline. For Group I, 6 out of 8 patients had bleeding on probing at base line. This no. reduced to 2 post operatively at 3 months i.e 37.5 % of sites that were positive for bleeding on probing reduced to 12.5 % after treatment. For Group II 5 out of 8 patients had bleeding on probing at base line. This no. reduced to 3 post operatively at 3 months i.e 31.25% of sites that were +ve for bleeding on probing reduced to 18.75% after treatment. It was seen that bleeding on probing reduced in both groups post- operatively. This reduction was more for Group I. Hence it was observed that there was reduction in bleeding on probing at 3 months post-operatively when compared to baseline which is in accordance with the study by **Dragoo¹⁵**, **Anderegg¹⁶**.

Certain restorative materials have the ability to reduce and or eliminate the incidence of micro leakage. The light cure glass ionomer cement also provides effective seal to minimize any internal or external bacterial contamination, there by facilitating the health of the gingival complex. The material is additionally attractive for there is no need to suture and there is no additional retrieval procedure necessary when the initial placement is complete.

It can finally be concluded that LC GIC material was able to produce significant clinical improvement (as measured by clinical probing depth and CAL). No major changes in bone level were seen. Sealing of grade III furcation lesions with resin ionomer cement produced equally good results in grade II and grade III mobile teeth. The present study clearly justifies the use of LC GIC



as a sealant in grade III furcation lesions as an alternative treatment approach.

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Table 1: comparison of periodontal health and clinical parameters between the groups at 3 follow up

SN	Parameter	Group I (n=8)			Group II (n=8)			Significance of difference (Mann Whitney U test)	
		Mean	SD	Md	Mean	SD	Md	Z	P
1.	PI	1.28	0.21	1.25	1.09	0.13	1.00	1.868	0.083
2.	GI	0.53	0.25	0.50	0.63	0.33	0.50	0.501	0.645
3.	PPD (mm)	2.00	0.00	2.00	2.00	0.00	2.00	0.000	1.000
4.	CAL (mm)	6.38	0.52	6.00	6.75	0.71	7.00	1.120	0.328



Graph 1: comparison of periodontal health and clinical parameters between the groups at 3 month follow up

