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Direct Composite Restoration for Management of Class I Carious Lesion Using a Biomimetic "Stamp Approach": A Case Series to Stamp A Perfect Occlusal Tomography

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Abstract: *The stamp technique is a novel approach that attempts to simulate the natural occlusal topography of the toothexhibiting an intact occlusal surface with composite restorations while maintaining its form and function. An occlusal stamp or matrix is created that imitates the tooth's morphology and restores the tooth to its original form and that too in less time.*

Keywords: *Class I caries, Direct composite restoration, Biomimetic, Stamp technique*

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I. INTRODUCTION:

The primary objective of the restorative branch of dentistry is to restore the lost tooth structure and to accomplish acceptable contact and contour.[1] The composite restoration can be done by direct or indirect technique. Exceptional technical skills are required to achieve an amicable occlusal and proximal relationship during the direct composite restoration as it is technique-sensitive and time-consuming and also poses a risk of polymerization shrinkage.[2] The matrices play a crucial role in favorable contouring of proximal surfaces but are of no use in establishing acceptable occlusal contact, thereby increasing the chances of over/underrestoration.[3]To overcome theshortcomings, a stamp technique was introducedto mimic natural occlusal anatomy and to minimize polymerization shrinkage by expelling the air during stamp pressing. This technique was introduced by a London-based practitioner namedDr. Waseem Riaz.[4] A Stamp is simply an index or a guide or a negative replica of tomography of the cavitated tooth.Using this approach, prior to cavity preparation, a stamp is fabricated on the unprepared occlusal surface and is pressed against the final uncured composite increment.[4]This case series highlights the predictability and reliability of this biomimetic approach in establishing the original occlusal anatomy and obtaining a harmonious relationship with the adjacent as well as the antagonist's teeth.

II. CASE REPORT:

Case I:A 23-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of blackening of the lower left back tooth. There was not a single relevant history in sight. An intraoral clinical examination revealed good oral hygiene with Class I carious lesion concerning 36 with intact occlusal anatomy (figure 1a).An intraoral periapical radiograph was used to determine the extent of caries and radiographic examination revealed dentinal caries with no pulp involvement. Also, marginal ridge was not involved. Consequently, a treatment plan employing composite restoration usingadirect technique and a stamp method was designed.

After obtaining the patient's informed consent, shade selection was done using theVita classical shade guide. The isolation was done with a rubber dam (Dentsply Sirona) and anocclusal stamp was prepared using the gingival shield(Gingiva Shield VLC, PrevestDenPro) and the applicator tip. The gingival shield was applied on

the intact occlusal surface (figure 1b). The tip of a micro brush served as a handle. The micro brush was immersed into the gingival shield (figure 1c) and then polymerized by light curing (Figure 1d). An occlusal stamp was obtained (Figure 1e). All carious tissues were excavated and the Class I cavity was prepared (figure 1f). Etching was done with 37% phosphoric acid (Echo Etch, IvoclarVivadent)for 20 seconds(figure 1g). The cavity was washed and driedusing a three-way syringe. The bonding agent (Te-Econom Bond, IvoclarVivadent) was applied and light cured for 20 seconds(figure 1h). Composite (IvoclarTe-Econom Plus, IvoclarVivadent) was placed incrementallyin the cavity up to 1mm below the occlusal surface and light-cured for 20 seconds(figure 1i). After placement of the last layer of composite and before curing, a Teflon tape was placed on the occlusal surface(figure 1j). Then, the prepared stamp was pressed over the tape (figure 1k). Later the stamp, Teflon tape and excess material were removedand the polymerization of composite was done by light curing for 20 seconds. Minimal finishing and polishing were done using diamond finishing points (Mani Inc., Japan) and polishing was done using polishing disks (Super-Snap Rainbow Kit, Shofu Inc., Japan) and polishing cups and cones (Shofu Composite Finishing Kit, Shofu Inc., Japan)(figure 1l).

Case II: A 27-year-old male patient reported to the Department with a chief complaint of blackening of the lower left back tooth. Clinical examination showed a Class I carious lesion in 36 with mild cavitation. Radiographic examination revealed dentinal caries with no pulp involvement in 36. Direct composite restoration with the occlusal stamp was planned. After obtaining the patient's informed consent, shade selection and isolation with a rubber dam (figure 2a), the occlusal stamp was prepared using the gingival shield and the applicator tip (figure 2b, 2c). Cavity preparation, infected dentin removal, and composite restoration were done as described in case 1 (figure 2d, 2e, 2f). Teflon tape was placed (figure 2g) and the prepared stamp was pressed over the final increment before curing for 20 seconds. Finishing and polishing were done as described in case 1 (figure 2h).

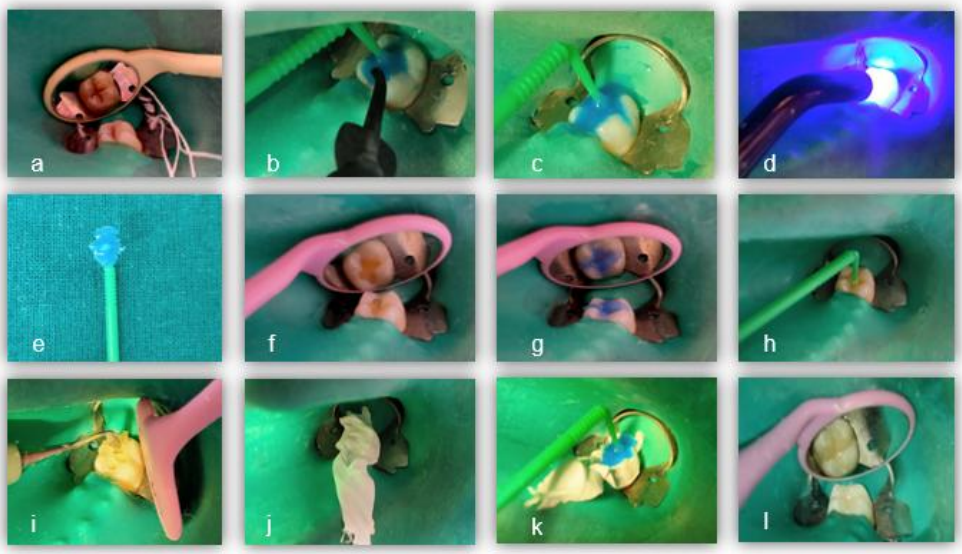

Figure 1: (a) Preoperative photograph (b) Application of Gingival Shield (c) Submerging the micro brush in the shield (d) Light-curing the gingival shield (e) Fabricated occlusal stamp (f) Caries excavation and cavity preparation (g) Etching with 37% phosphoric acid (h) Application of dentin bonding agent (i)Incremental placement of composite restoration(j)Placement of Teflon tape (k) Stamp placement (l) Final restoration and postoperative photograph

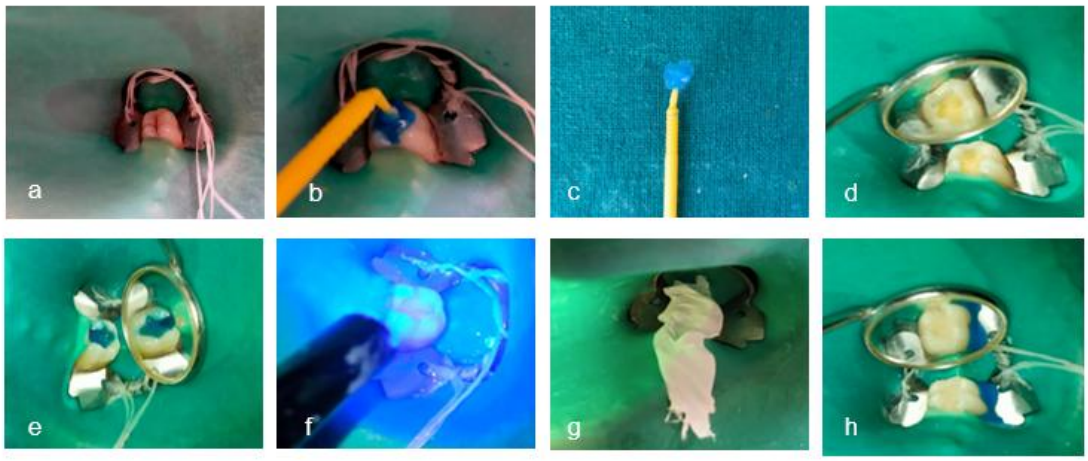

Figure 2: (a) Preoperative photograph (b) Application of Gingival Shield (c) Fabricated occlusal stamp (d) Caries excavation and cavity preparation (e) Etching with 37% phosphoric acid (f) Curing the composite restoration for 20 seconds before placement of last increment (g) Placement of Teflon tape (h) Final restoration and postoperative photograph

III. DISCUSSION:

In posterior teeth, carious lesions usually invade the occlusal surfaces as they are less cleansable. The pit and fissure caries propagate in a triangular orientation with the base at dentin–enamel junction and apex towards enamel which occasionally leaves the superficial enamel intact while causing extensive destruction of underneath dentin. The ultimate goal of any successful restoration is to restore the form and functionof the tooth while maintaining harmony with the adjacent tissues to promote patient complaisance and appraisal towards the dental treatment. With the introduction of minimal intervention dentistry and a greater prediction towards the biomimetic approach, there have been several ameliorations in the management and restoration of posterior Class I carious lesions.

The stamp technique in Class I carious lesions focuses onthe reestablishment of the original occlusal anatomy so as to mimic the natural tooth and minimize the post-restoration occlusal adjustments.[5] This technique is usually indicated in class I and II caries with intact occlusal surfaces and offers several advantages such as minimal finishing and polishing, minimum material consumption, less chair-side time useful especially in patients who cannot open their mouth for alonger time period and the ease.[6]

In this case report, the gingival shield was used to register and duplicate the minute occlusal details of the carious tooth. Other materials which can be used for this function are flowable composites, pit and fissure sealants, pattern resin, polyvinylsiloxane impression material and bite registration paste.[7] Incremental technique was used for placement ofthe composite restoration so as to diminish the resulting polymerization shrinkage.[8] Prior to the curing of the final composite layer, a strip of Teflon tape was placed and then the stamp was pressed onto it. This forbids the sticking of the restoration to the index.[9]Also, the pressure exerted by the stamp decreases the microbubble formation and tampering by oxygen.[10]The achievement of an appropriate cusp-fossa relationship is dependent on the accurate and exact orientation and placement of the fabricated stamp on the last increment of the uncured composite material. Cling film can also be used as a substitute for Teflon tape as it can be retained while curing and secondly it protects the composite restoration from multiple exposures to ambient light.[11]

The Stamp technique, based on the concept of minimally invasive dentistry and biomimetic dentistry is quite an efficient approach to restoring the carious tooth with intact occlusal anatomy. But this technique has certain flaws also. The incorrect placement of the stamp index may lead to distortion. This method is a little skill-sensitive and is associated with failure to create deep pits and fissures.[10]

IV. CONCLUSION:

The stamp technique is a novel and exclusive biomimetic approach to restoring class I caries. This procedure simulates the natural occlusal anatomy with great perfection. Once mastered, it helps the clinician to restore the tooth in less time and that too with considerable excellence.

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