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Review

Direct and Indirect Stamp Technique for Composite Restorations

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Abstract

For direct composite resin restorations, the "stamp technique" aids in achieving accurate occlusal topography. Stamp is an index that mimics the structure of a natural tooth. The cavity is produced after stamp manufacture on an unprepared occlusal surface, and the resulting stamp is then applied to the last composite increment prior to final curing to create a precise duplicate of the pre-operative structure. For patients desiring pre-treatment occlusal anatomy even for posterior teeth, the aesthetic restoration has become standard practice in modern dentistry and offers an appropriate reference for replicating both aesthetic and proper function. In Class I and Class II preparations, where the occlusal surface is undisturbed prior to treatment, the stamp approach is recommended. Light-cure composites, self-cure acrylate resin, polyvinylsiloxane bite registration material, liquid dam material, clear silicon mould, and occlusal transfer devices are some of the materials utilized to make the occlusal mimics. The stamp technique is a quick process that requires less chairside time for polishing and finishing as well as for rebuilding the occlusal morphology. Because the matrix duplicates the occlusal architecture, contouring the restoration does not involve manual labor, specialized tools, or excessive amounts of material. Severely carious teeth cannot be rebuilt with this method, and examination prior to restoration is necessary to guarantee appropriate occlusion.

Keywords: *stamp technique, direct technique, indirect technique, flowable composite*

Introduction

Dental caries, a multifactorial condition causes the demineralization and loss of both the inorganic and organic constituents of teeth (1). The lesions formed gradually change, resulting in pathology with intact enamel surfaces (2). The main objective of restorative dentistry is to restore the optimum shape and functionality of the tooth, therefore a restoration that treats carious lesions should not merely seek to restore the lost tooth structure (3). Restorations may be immediate or delayed. Direct restorations are method-sensitive, time-taking and may not replicate ideal anatomy and occlusion, in contrast to indirect restorations where contact, contour, and occlusion are successfully attained. Dental amalgams, composite, and glass-ionomer cement (GIC) are examples of direct restorative materials. Due to its superior mechanical qualities, aesthetics, and biocompatibility, composite resin restorations have replaced dental amalgam and GIC as the preferred material due to their disadvantages (4). The polymerization shrinkage that directs composites must contend with is a laborious process that necessitates skilled operators in order to produce a pleasing occlusal and cusp-fossa relation. A composite restoration takes twice as long as an amalgam restoration to complete (5, 6). The surface finish produced by abrasives, however, is not as smooth as that produced by a matrix (4). Matrices aid in proximal surface contouring but are ineffective for occlusal surfaces, increasing the possibility of over- or under-restored surfaces (5, 7).

For direct composite resin restorations, the "stamp technique" aids in achieving accurate occlusal topography. [8] Stamp is an index that mimics the structure of a natural tooth (8, 9). The cavity is produced after stamp manufacture on an unprepared occlusal surface, and the prepared stamp is placed against the last increment of composite before curing (7, 8). The miniature impression created by flowable composite or putty prior to tooth preparation is called an index, and a stamp is similar to that. This stamp duplicates the natural morphology of the tooth structure by copying the natural, unaltered tooth structure (7). The resulting stamp is then applied to the last composite increment prior to final curing to create a precise duplicate of the pre-operative structure (9). For patients desiring pre-treatment occlusal anatomy even for posterior teeth, the aesthetic restoration has become standard practice in modern dentistry and offers an appropriate reference for replicating both aesthetic and proper function. But such a replication approach is only effective for restoring teeth with preserved occlusal anatomy or latent caries because it depends on intact occlusal morphology. In Class I and Class II preparations, where the occlusal surface is undisturbed prior to treatment, the stamp approach is recommended (8). For proximal lesions, matricing is necessary before applying an occlusal stamp to the middle or cervical thirds (1). Cavities are plugged with wax and sculpted to the appropriate morphology in cavitated lesions. Due to the elimination of air while stamp pressing, it enables perfect reproduction of the natural occlusal anatomy, little finishing, polishing, and voids with excellent polymerization (10). Light-cure composites, self-cure acrylate resin, polyvinylsiloxane bite registration material, liquid dam material, clear silicon mould, and occlusal transfer devices are some of the materials utilized to make the occlusal mimics (1, 11, 12).

Methodology

This study is based on a comprehensive literature search conducted on October 19, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about direct and indirect stamp technique for composite restorations. There were no restrictions on date, language, participant age, or type of publication.

Discussion

Dental caries has become less common during the last few decades. Fluoride usage is thought to have a positive impact on the occurrence of dental caries (9). Additionally, there is evidence to support the idea that fluoride masks cavities by only producing surface remineralization, which "covers up" deeper cavities. This occurrence, known as "fluoride bombs," shows a clear correlation between the use of fluoride and the rising resistance of the enamel surface (1). Dentinal caries lesions, often known as "hidden caries," are a common occurrence in people even though tooth decay is becoming less common and direct restorations are becoming less necessary (2). When using direct composite resin restorative materials, it is extremely challenging to restore the complicated occlusal anatomy of posterior teeth. The composite restoration takes twice

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as long to finish and polish as conventional restorations. To solve these issues, the novel stamp approach, an alternate placement method for composite restorations, has been presented. A key factor in the effectiveness of the therapy is the pre-treatment case selection of pit and fissure caries with intact morphology (13). In the stamp process, the final composite increment is put against the fabricated occlusal matrix, which replicates the original occlusal morphology of the posterior teeth, and then the composite is cured. The stamp's pressure on the composite resin reduces the creation of microbubbles and oxygen's interference with the final layer's curing, both of which are important long-term success factors (14). According to Geena Mary *et al*., the microbrush stamp technique is a simple process for accurately recreating occlusal topography in teeth with nearly intact occlusal anatomy (7). Alexy Murashkin suggested a novel stamping method and found it to be a practical, advantageous, and biomimetic process (9). In their case study on the occlusal stamp technique, Pompeu *et al*. determined that this method is efficient for restorative work on posterior teeth with concealed cavities and significant dentin involvement (2). The stamp technique is a quick process that requires less chairside time for polishing and finishing as well as for rebuilding the occlusal morphology. Because the matrix duplicates the occlusal architecture, contouring the restoration does not involve manual labor, specialized tools, or excessive amounts of material (10). Severely carious teeth cannot be rebuilt with this method, and examination prior to restoration is necessary to guarantee appropriate occlusion. In addition, the cost of the impression-making material is very high. Pit and fissure sealants, polymethyl methacrylate, pattern resin, gingival dam material, vacuum formed template, and bite registration material are a few more less expensive options for stamps (9).

Lesions caused by caries are frequently found on less-cleanable occlusal regions in posterior teeth. The progress of caries is influenced by the direction of dentinal tubules. Thus, the occlusal surface caries advance in a triangular pattern with apices that are away from the dentin-enamel interface, highlighting the undamaged superficial enamel but severe dentin destruction. Effective restoration refers to re-establishing normal occlusal and proximal morphology while preserving harmony with surrounding tissues. Occlusion is crucial for maintaining orofacial integrity since improper reproduction can result in occlusal disparities and temporomandibular disorders, which can affect the entire orofacial complex (7). By re-establishing optimal structure, functionality, and aesthetic dental structure, the occlusal stamp approach minimizes post-restoration modifications. It is excellent for a busy practice because finishing and polishing take very little time (15). There is little material consumption (7). The stamp's pressure reduces oxygen interference and microbubbles (2). As there would be fewer high spots and no contouring, the indirect approach shortens the time needed to restore numerous teeth in the same quadrant. As a result, it is useful for individuals who have prolonged mouth closure. No isolation agent was applied prior to stamp manufacture in the situations discussed in this case series. However, it is necessary in deep holes and cracks to stop flowable composite from fluxing (12). For making the occlusal stamps in these instances, we employed clear acrylic resin, flowable composite, and liquid dam material.

Because of its wide availability and accurate detail replication, flowable composite is frequently used. The price of the materials is high, nevertheless. Nonetheless, outdated composites can still be used to create stamps, cutting costs (12). Low viscosity makes liquid dam material easily flowable. However, due to its extreme flexibility, it needs a lot of material to be strong enough. The product is also expensive. Transparent acrylic resin is a great material since it is simple to handle, affordable, and precise (2). Because it is transparent, it may be kept in place during curing, but there is a drawback—it results in a rough surface beneath the stamp. Cling film can be used as an alternative to Teflon tape and can be kept on while the composite cures to prevent repeated exposure to ambient light (16). The sandwich method, which utilizes a GIC liner for liquid chromatography to protect the pulp, reduces microleakage (2). Furthermore, placement gradually precludes polymerization contraction. Stamps can be prepared using two methods in Class II restorations. Prior to pressing the stamp onto the final composite increment and curing it, the matrix band must first be removed, as in Class I lesions. In the second method, the stamp is prepared inside before the matrix band is put in place. Consequently, matrix band removal is not necessary. The first method was applied in this case (15). Polyvinyl chloride and acrylic can be used to produce the stamp in an indirect manner. In cases of many and cavitated lesions, indirect technique is advised. Before laboratory stamp creation, the dentist can create the desired occlusal anatomy, which makes it simple to restore many carious sections. The restoration's completion is crucial to its success as a whole. The texture obtained through finishing processes differs from the finish received after final cure. The stamping approach aids in obtaining the greatest finish since it

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minimizes functional and non-functional adjustments. The stamp method is burdened by lower clinical efficacy, recurrent restoration failures, and the inability to replicate significant pits and fissures. A rubber dam is used to prevent aspiration in the event that the stick was to come loose from the stamp. It is not cost-effective, as the materials used are expensive (7). Professionals must stay alert as the incorrect placement will cause distortions (2).

With the advent of minimal intervention dentistry and greater impact on the aesthetic outlook there have been several modifications in terms of techniques as well as restorative procedures used in restoration of Class I cavities. There have been several factors which plays a pivotal role in the success of an ideal composite restoration, out of which two most important factors are polymerization shrinkage and proper cusp fossa relationship with the opposing arch (17). To construct an excellent reproduction of the fissures, marginal ridges, and grooves found in actual teeth, an ideal occlusion contour is desired. Stamp approach entails reproducing the occlusal structure such that it should resemble the normal tooth in Class I carious lesions. This is primarily suggested in cases where the extent of the caries is limited to the enamel and dentine and the cuspal planes are intact. The main benefits of utilizing this technology are shorter procedure times, instantaneous achievement of the correct cusp-fossa relationship, low material consumption, ease of execution during the finishing and polishing process, and lack of additional instrumentation. It also lengthens the lifespan of the restorations by preventing polymerization (7). To construct an excellent reproduction of the fissures, marginal ridges, and grooves found in actual teeth, an ideal occlusion contour is desired. Stamp approach entails reproducing the occlusal structure such that it should resemble the normal tooth in Class I carious lesions. This is primarily suggested in cases where the extent of the caries is limited to the enamel and dentine and the cuspal planes are intact. The main benefits of utilizing this technology are shorter procedure times, instantaneous achievement of the correct cusp-fossa relationship, low material consumption, ease of execution during the finishing and polishing process, and lack of additional instrumentation. It also lengthens the lifespan of the restorations by preventing polymerization. Although this approach has many benefits, it also has some drawbacks, including the need for ability and clinical acumen to carry out the surgery with high precision. While Class II cavities (2, 10) and Class I cavities 5,9 have both adopted this procedure, Class I cavities (1, 18) account for the bulk of cases where pits and fissures are retained. Index has a lower clinical efficacy in situations of recurring restoration failure because it cannot replicate flaws such deep pits and cracks in an occlusal stamp. Because of microbrush and flowable composites, this method is expensive. To minimize polymerization shrinkage, incremental composite layering is prevented. The primary goal of this method is to establish an exact cusp-fossa relation; hence it is crucial to insert the occlusal stamp appropriately and with sufficient accuracy (19). Inability to complete this phase will ultimately lead to restoration deformation and the defeat of the method's main goal.

Conclusion

The stamp approach for composite restorations is practical and advantageous for duplicating and repairing the precise morphology of the teeth with the least amount of time and materials required for finishing and polishing. Given a skilled operator, it is user-friendly and a biomimetic process for direct composite restorations. Recreating the topography has far higher accuracy than the manual approach and can even be used to unusual cavities. The indirect approach can also aid in the restoration of large cavitated lesions, although it is typically only suggested for decay with an undamaged occlusal surface.

Disclosure

Conflict of interest

There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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