Treatment of Teeth with Intact Occlusal Morphology Using Stamp Technique with Different Impression Materials: A Case Report

Oklüzal Morfolojisi Sağlam Dişlerin Farklı Ölçü Malzemeleriyle Stamp Tekniği Kullanılarak Tedavisi: Olgu Sunumu

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ABSTRACT

The 'Stamp' technique is utilized on teeth with a proper and stable occlusal surface to help replicate the patient's precise anatomy after the removal of decayed tissue, particularly in larger cavities. This method can be employed in various instances where the preoperative tooth anatomy remains intact before being affected by decay and ensures the restoration of both the aesthetic and functional occlusal characteristics, resembling the patient's natural tooth structure. In this case report, three different patients admitted to our clinic were clinically and radiologically examined and found to have class I and class II caries with intact occlusal surfaces. These teeth with caries were treated with the Stamp technique using different impression materials to accurately reflect their anatomy. Following the treatments, final restoration photographs were taken and the restorations were evaluated with 1-year follow-up according to FDI criteria.

Keywords: Dental occlusion, Resin composite, Morphology

ÖZ

Stamp tekniği; oklüzal topografisi doğru ve sağlam olan dişlerde, çürük doku uzaklaştırıldıktan sonra özellikle büyük boyutlara sahip kavitelerde hastanın birebir anatomisini sağlamayı kolaylaştırmak adına uygulanan bir tekniktir. Bu teknik, dişin preoperatif anatomisinin sağlam olduğu, çürük nedeniyle harap olmadığı birçok vakada uygulanabilmekte ve hastanın diş yapısına benzer görüntü ve fonksiyonel oklüzyon özelliklerinin tekrardan kazanılmasını sağlayabilmektedir. Bu vaka sunumunda, kliniğimize başvuran üç farklı hastanın klinik ve radyolojik muayenesi yapılarak oklüzal yüzey morfolojileri bozulmamış sınıf I ve sınıf II çürükleri tespit edilmiştir. Çürük varlığı belirlenen bu dişlerin tedavisi, anatomilerinin doğru yansıtlabilmesi için farklı ölçü malzemeleri kullanılarak stamp tekniği ile tedavi edilmiştir. Tedavileri takiben, bitim fotoğrafları alınmış ve restorasyonlar 1 yıllık takipleri ile beraber FDI kriterlerine göre değerlendirilmiştir.

Anahtar Kelimeler: Dental oklüzyon, Rezin kompozit, Morfoloji

INTRODUCTION

Modern dentistry has made significant advances towards biomimetic dentistry, a field that focuses on mimicking natural biological processes. These advances have led to significant improvements in both aesthetics and functionality in dental treatments by improving traditional methods and enhancing them with innovative techniques.¹

Developing adhesive technology and material science have directed an important aspect of this transformation towards minimally invasive dentistry based on the principle of preserving the intact tooth structure. With this approach, the use of dental amalgam has become obsolete in some countries due to mercury-related toxicity, unaesthetic appearance, and the need for excessive preparation, and posterior resin composite applications have become the norm in modern dentistry.^{2,3}

Although composite restorations have become popular among dentists, they involve more complex procedures in terms of application. The finishing time is twice as long as that for amalgam, and color selection is also a necessary step.⁴ Additionally, an important consideration in posterior composite restorations is the occlusal anatomical contour and its interaction with the antagonist tooth. The various matrix systems available for posterior restoration applications mainly provide contour and contact of the proximal surfaces, but cannot help in achieving occlusion. Tasks such as occlusal processing and anatomical shaping are reliant on the manual skill of the dentist in direct restorations. This circumstance can result in occlusal discrepancies in patients, ranging from minor to major. The proprioceptors of the stomatognathic system quickly detect any existing incompatibility after direct restorations, leading to a sense of discomfort in patients, albeit slight. To cope with this, patients may adapt to a new habitual occlusal position, potentially causing significant temporomandibular disorders.⁵

While maintaining a functional occlusion that preserves a positive and stable intercuspid relationship in centric occlusion without mandibular dysfunction symptoms and signs of tooth wear, it also supports the positive adaptation of the neuro-muscular system, temporomandibular joint, teeth, and supporting structures. Moreover, occlusion plays a crucial role in ensuring orofacial integrity, contributing to psychosocial

well-being.^{6,7} To achieve effective restoration by providing accurate occlusal topography in direct **resin composite** restoration applications, the Stamp technique has been recommended.⁵

The Stamp technique, proposed by Dr. Waseem Riaz, is employed in direct resin composite restorations to effortlessly achieve accurate occlusal topography. Additionally, it has been documented for the vertical reconstruction of worn teeth during bite restoration.⁸

The Stamp technique is a technique that can be applied to teeth with Class I or Class II caries and direct restoration indications, where clinical and routine radiographic examination reveals significant caries in the dentin, but with intact marginal ridge and occlusal anatomy.⁹ In teeth with mild or moderate cavitation, this technique can be applied by blocking the cavitation with wax and shaping the occlusal surface according to the patient's occlusion.¹⁰ However, the use of this technique is contraindicated in teeth with excessive destruction of the occlusal surface.^{11,12,13,14}

CASE REPORT

It is advised to utilize the Stamp technique for very small caries or teeth with an intact occlusal surface that has not yet developed cavities. Before starting the preparation, an impression of the original anatomy of the tooth is taken. The occlusal surface is then measured using a soft, fluid impression compound.¹⁰ The obtained impression from these intact surfaces is reapplied to the tooth surface with the assistance of an isolating material, such as Teflon tape, before the final composite layer is polymerized. Preserving the original occlusal anatomy and occlusion enables swift completion of the finishing procedures. Through this technique, the patient's ideal and functional bite can be efficiently restored.⁹

Case 1

A 20-year-old female patient applied to Istanbul University Faculty of Dentistry, Department of Restorative Dental Treatment due to pain caused by sweet and cold foods. Both clinical and radiographic (**Figure 1.1**) examinations were performed. It was determined that the patient's tooth number 47 had **Code 4** caries according to the

Sorumlu yazar/Corresponding Author: Hatun BAL E-mail: balhatun205@gmail.com Doi: 10.15311/ selcukdentj.1458112 International Caries Detection and Assessment System (ICDAS II). Treatment of this tooth was performed by applying the Stamp technique. Isolation was provided with a rubber dam (Figure 1.2). Polishing was performed with a periodontal brush to remove debris from the tooth surface. Without applying any isolator, an impression was taken from the tooth surface with type C silicone (Durosil L, President Dental, Germany) impression agent with putty consistency (Figure 1.3). The impression was removed from the tooth surface and cut around it with a scalpel for ease of application (Figure 1.4).



Figure 1.1. Radiographic image



Figure 1.2. Pre-operative view of the tooth isolated with a rubber dam

Figure 1.3. Taking measurements of the tooth surface with silicone Figure 1.4. Image of the impression removed from the tooth surface

Preparation of the negative impression was started under water cooling. After opening the access cavity with a green-belted diamond round bur (Ø010, Frank Dental, Germany) and aerator (W&H, Austria), carious dentin tissue was removed with a micromotor (W&H, Austria) and tungsten carbide bur (Ø012, Frank Dental, Germany). After the soft and infected carious tissue was removed, the tooth surface was washed and dried with air-water spray to remove debris (Figure 1.5). Adhesive procedures were performed before composite application. The enamel surface was selectively etched with 37% orthophosphoric acid (Etching Gel, President Dental, Germany) for 15 seconds and washed with water for 10 seconds. Excess water was removed so that the tooth surface remained moist. Universal bonding agent (All Bond Universal, Bisco, USA) was applied to both enamel and dentin surfaces according to the manufacturer's instructions. It was thinned with air so that there was no solvent movement and was polymerized with an LED light device (Elipar Freelight 2, 3M ESPE, USA) for 10 seconds. Universal Composite (Zenchroma, President Dental, Germany) was applied in a 2 mm thick layer. Before the last layer was applied and polymerized, Teflon tape was placed on the tooth surface properly (Figure 1.6). The occlusal impression taken was applied to the tooth surface and pressed (Figure 1.7). Then, the impression, tape, and excess composite were removed from the tooth surface and polymerization was completed (Figure 1.8). The rubber dam was removed and occlusion was checked by articulating paper. Minimal polishing with two-step twist system (Diacomp plus Twist, EVE Technik, Germany) and diamond paste (Diamond Polish, Ultradent, USA) application using a goat-hair brush were performed and the restoration was completed (Figure 1.9). The restoration was evaluated according to FDI criteria both immediately after the restoration was completed and after 1 year when the patient returned for a follow-up. Based on aesthetic, functional and biological criteria, the restoration maintained clinically excellent properties except a slight drop off in marginal adaptation among functional properties that was still at a clinically good level that didn't require any repair or replacement (Figure 1.10).



Figure 1.5. Image after removal of infected caries tissue Figure 1.6. View after placing the Teflon tape Figure 1.7. Applying the impression to the final composite layer Figure 1.8. Image after the impression is removed



Figure 1.9. Intraoral view of the tooth after height control and polishing



Figure 1.10. Follow-up image of the tooth after 1 year

Case 2

A radiographic (Figure 2.1) and clinical examination of a male patient who applied to our clinic for the treatment of his carious teeth was performed. As a result of the examination, it was determined that the patient's tooth number 46 had Code 4 interface caries according to the ICDAS II. Since the occlusal morphology and marginal ridge were intact, the Stamp technique was applied to this patient using a flowable composite (Nova Compo, Imicryl, Turkey). First, the tooth was isolated with a rubber dam (Figure 2.2). After the surface attachments were removed, lacquer (Imiseal Lacquer, Imicryl, Turkey) was applied to the tooth surface. After removing the excess with air, a flowable composite was applied to make an impression of the occlusal surface (Figure 2.3), which was then fixed with a bond brush and polymerized with light. After shaping the access cavity with an aerator (W&H, Austria) and diamond round bur (Ø010, Frank Dental, Germany), infected carious tissue was removed (Figure 2.4) with a micromotor and tungsten carbide bur (Ø012, Frank Dental, Germany). The aproximal edge was isolated with matrix tape (Tecci, Turkey) and wedge (Tecci, Turkey). 37% orthophosphoric acid was applied to the enamel surface for 15 seconds. After 10 seconds, the acid was removed by washing it with air-water spray. The tooth surface was only slightly dried so that it remained moist. The universal bonding agent (All Bond Universal, Bisco, USA) was applied to the enamel and dentin surfaces according to the user instructions. The resin composite (Zenchroma, President Dental, Germany) was applied with an incremental technique with a thickness of 2 mm, first forming an aproximal wall structure. In the last layer of composite, the tooth surface was isolated with Teflon tape. The composite-brush impression (Figure 2.5) was adapted to the tooth surface and pressed for a snug fit (Figure 2.6). The impression and Teflon tape were removed. The excess filling was removed with a spatula and polymerized with an LED light device (Elipar Freelight 2, 3M ESPE, USA). Rough finishing was done without removing the rubber dam (Figure 2.7). Occlusal check was completed. Polishing was done with two-step twist system (Diacomp plus Twist, EVE Technik, Germany) and fine polishing disk (Sof-Lex, 3M ESPE, USA) specifically for the distal marginal surface and by diamond paste (Diamond Polish, Ultradent, USA) application using a goat-hair brush (Figure 2.8). The restoration was evaluated according to FDI criteria both immediately after the restoration was completed and after 1 year when the patient returned for a follow-up. Based on aesthetic, functional and biological criteria, the restoration maintained clinically excellent properties except a minor shortcoming in marginal adaptation among functional properties and surface staining among aesthetic properties, which was mainly due to the marginal gap causing discoloration on the edge of the restoration. Those properties were still at clinically sufficient/satisfactory levels that didn't require any repair or replacement (Figure 2.9).



Figure 2.1. Radiographic image



Figure 2.2. Preoperative image of the tooth isolated with a rubber dam

Figure 2.3. Measurement of the occlusal surface with fluid composite

Figure 2.4. Image after removal of infected carious tissue Figure 2.5. Impression of the occlusal surface Figure 2.6. Applying the impression to the final composite layer Figure 2.7. Image before rubber dam removal



Figure 2.8. Intraoral state of the tooth after occlusal check and polishing procedures are completed



Figure 2.9. Follow-up image of the tooth after 1 year

Case 3

A male patient was admitted to our clinic with a detailed anamnesis and was found to be complaining of pain in the right lower quadrant due to sweets. The air-dried teeth were examined in detail clinically and radiographically (Figure 3.1). It was determined that tooth number 46 had Code 4 caries according to the ICDAS II. Examination of the approximal surface with a blunt-tipped probe revealed the presence of cavitation. For treatment, the Stamp technique was applied using a gingival barrier (OpalDam Green, Ultradent, USA) as an impression agent. Isolation was provided with a rubber dam (Figure 3.2). First, lacquer was applied to the tooth surface. Then, the gingival barrier was applied to cover the occlusal surface after the excess was removed (Figure 3.3). It was polymerized with a bond brush. The impression was carefully removed from the tooth surface. The access cavity was opened with an aerator (W&H, Austria) and diamond round bur (Ø010, Frank Dental, Germany) and the infected carious tissue was removed (Figure 3.4) with a micromotor and tungsten carbide bur (Ø012, Frank Dental, Germany). The cavity was isolated by applying matrix tape and a wedge. The enamel surface was roughened with 37% orthophosphoric acid for 15 seconds using the selective etch method. Universal bonding agent (All Bond Universal, Bisco, USA) was applied to the entire tooth surface. After thinning with air, light application was performed for 10 seconds. The composite was applied with a thickness of 2 mm prioritizing the aproximal edge. Before the last layer of composite was polymerized, a barrier impression (Figure 3.5) was applied so that it fit perfectly on the tooth surface isolated with Teflon tape (Figure 3.6). The impression and tape were removed, the excess was cleaned and polymerization was achieved with an LED light device (Elipar Freelight 2, 3M ESPE, USA). A rough finish was applied before the rubber dam was removed (Figure 3.7). After the occlusal check, polishing was completed with two-step twist system (Diacomp plus Twist, EVE Technik, Germany) and fine polishing disk (Sof-Lex, 3M ESPE, USA) specifically for the mesial marginal surface and by diamond paste (Diamond Polish, Ultradent, USA) application using a goat-hair brush (Figure 3.8). The restoration was evaluated according to FDI criteria both immediately after the restoration was completed and after 1 year when the patient returned for a follow-up. Based on aesthetic, functional and biological criteria, the restoration maintained clinically excellent properties except minor chipping causing a downgrade in fractures and retention criterion among functional properties and in surface luster among aesthetic properties. Those properties were still at a clinically good level that didn't require any repair or replacement (**Figure 3.9**).



Figure 3.1. Radiographic image



Figure 3.2. Preoperative image of the tooth isolated with a rubber dam

Figure 3.3. Impression of the tooth surface with gingival barrier
 Figure 3.4. Image after removal of carious tissue
 Figure 3.5. Image of the gingival impression
 Figure 3.6. Application of the impression to the occlusal surface

Figure 3.7. Image just before the rubber dam is removed



Figure 3.8. Intraoral state of the tooth after occlusal check and polishing procedures are completed



Figure 3.9. Follow-up image of the tooth after 1 year

DISCUSSION

Composite resin restorations can be performed through either direct or indirect methods. The decision between these methods is influenced by various factors.¹² Direct techniques offer the advantage of completing the restoration in a single session and at a lower cost. However, their mechanical strength is generally lower compared to indirect restorations. Furthermore, they come with a variety of drawbacks including proximal and occlusal wear, surface roughness, marginal discoloration, loss of marginal integrity, secondary caries, postoperative sensitivity, method sensitivity, and inadequate bonding to dentin.¹³ The indirect technique addresses these limitations. However, considerations such as higher costs and time commitments, the necessity for two appointments, the need for a temporary restoration, and limited reparability may sway patients towards opting for direct methods.¹⁵

The primary objective of restoration is to reinstate the natural form and function of teeth, enhancing the comfort of dental treatment for the patient.¹⁶ The newly introduced Stamp technique is a method that captures the occlusal anatomy of posterior teeth with preserved occlusal topography through the creation of an index. This technique offers an advantage in cases of occlusal caries where the occlusal anatomy or marginal ridges are either minimally damaged or not damaged at all.¹⁷ In this study's showcased case series, an attempt was made to treat carious teeth of patients with preserved occlusal form (class I and class II) using the Stamp technique. The goal was to ensure harmony with their antagonist and neighboring teeth while maintaining the cusp-fossa relationship. Conventional impression material, flowable composite, and a gingival barrier were employed as impression materials in the implementation of this technique. It is advisable to use an isolating agent on the tooth surface when applying a flowable composite or a gingival barrier. This facilitates the easy removal of the impression from the tooth surface without causing damage, while simultaneously preventing these fluid materials from penetrating too deeply by filling the deep pits and fissures. In addition, in patients with limited mouth opening, the traditional impression material may pose difficulty in taking the surface impression on the posterior teeth. Therefore, taking impressions with a fluid composite or barrier using a micro brush may facilitate the feasibility of the procedure. It has been noted that various materials can be readily employed in the implementation of this technique.

The ability to quickly replicate the original morphology in suitable cases highlights the comfort and simplicity of the Stamp technique for both the patient and the dentist. Stretch film can be an alternative to Teflon tape, as it doesn't require removal during exposure. This approach minimizes the impact of ambient light on composite materials, ensuring that the final restoration surface maintains a consistent and appropriate form.^{16,18} These characteristics have proven to be significant for the prolonged effectiveness of composites.⁹

On the other hand, the correct placement of the stamp on the tooth surface immediately after the application of the Teflon tape can be a challenge for beginners. Moreover, the Teflon tape has a certain thickness, which may hinder the transfer of fine details. In the Modified Stamp technique proposed to overcome this problem, a transparent bite impression material is used to create the stamp and Teflon tape is not required during the application phase. Since the stamp is optically transparent, it does not need to be removed before polymerization with light. This new and up-to-date technique allows the occlusal anatomy to be accurately transferred and the restoration to be completed more precisely. Additionally, this also prevents the formation of an oxygen-inhibition layer.¹⁹

Besides the mentioned advantages of the Stamp technique, it has disadvantages such as the need for clinical knowledge and its cost. It necessitates costly materials such as microbrushes, flowable composites, impression materials, or gingival barriers. To overcome this drawback, a suitable spatula such as a cement fulvar can be used instead of a micro brush. In addition, surface impressions can also be taken with expired impression materials, thus contributing to the principles of circular economy.²⁰

CONCLUSION

The Stamp technique can be applied in occlusal caries of all molars and premolars with intact occlusal morphology. With this technique, the patient's original anatomy can be restored with high precision and accuracy. In addition, learning the technique and gaining practice in its application helps save the time required for the completion of the restoration. However, no matter which impression material we use, excess composite must be removed before polymerization and occlusion check and final polishing procedures must be performed after the polymerization stage.

Değerlendirme / Peer-Review

İki Dış Hakem / Çift Taraflı Körleme

Etik Beyan / Ethical statement

Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.

It is declared that during the preparation process of this study, scientific and ethical principles were followed and all the studies benefited are stated in the bibliography.

Benzerlik Taraması / Similarity scan

Yapıldı - ithenticate

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Çıkar Çatışması / Conflict of interest

Çıkar çatışması beyan edilmemiştir.

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Finansman / Grant Support

Yazarlar bu çalışma için finansal destek almadığını beyan etmiştir. | The authors declared that this study has received no financial support.

Çıkar Çatışması / Conflict of Interest

Yazarlar çıkar çatışması bildirmemiştir. \mid The authors have no conflict of interest to declare.

Yazar Katkıları / Author Contributions

Çalışmanın Tasarlanması | Design of Study: HB (%70) OY (%30) Veri Toplanması | Data Acquisition: HB (%60) OY (%40) Veri Analizi | Data Analysis: HB (%65) OY (%35) Makalenin Yazımı | Writing up: HB (%50) OY (%50) Makale Gönderimi ve Revizyonu | Submission and Revision: HB (%60) OY (%40)

REFERENCES

- Murashkin A. "Direct posterior composite restorations using Stamp technique-conventional and modified: A case series." IJDR 2.1 (2017): 3-7.
- Lynch CD, Wilson NH. Managing the phase-down of amalgam: Part I. Educational and training issues. Br Dent J. 2013; 215:109-13.
- Alshehadat SA, Halim MS, Carmen K, Fung CS. The stamp technique for direct Class II composite restorations: A case series. J Conserv Dent. 2016;19(5):490-493.
- Dilley DC, Vann WF, TRO, RMC. Time required for placement of composite versus amalgam restorations. Asdc Journal of Dentistry for Children. 1990;57(3):177-183.
- Geena MG, Kevin RG. Building proximal contacts and contours in resin composite restorations: a technical report. Journal of Scientific Dentistry. 2014;4(1):62-69.
- 6. Gross MD, Mathews JD. (No title). Occlusion İn Restorative Dentistry: Technique and Theory. 1982.
- Roberson TM, Heymann H, Swift EJ, Sturdevant CM. Sturdevant's Art and Science of Operative Dentistry. 2006.
- Ramseyer ST, Helblingb C, Lussic A. Posterior vertical bite reconstructions of erosively worn dentitions and the "Stamp technique" - a case series with a mean observation time of 40 months. The Journal of Adhesive Dentistry. 2015;17(3):283-289.
- Haimilton JC, Krestik KE, Dennison JB. Evaluation of custom occlusal matrix technique for posterior light-cured composites. Operative Dentistry. 1998; 23:303-307.
- G GM, Jayadevan A. Microbrush Stamp technique to achieve occlusal topography for composite resin restorations: a technical report. Journal of Scientific Dentistry. 2016;6(2):76-82.
- 11. Varsha RK. Microbrush Stamp technique-Case report. General Practice Feature. Dentaltown, 2015;98-99.
- 12. Ericson D. What is minimally invasive dentistry. Oral Health & Preventive Dentistry. 2004; 2:287-292.
- Howard NY. Advanced use of an esthetic indirect posterior resin system. Advanced Use of an Esthetic Indirect Posterior Resin System. Compendium of Continuing Education In Dentistry (Jamesburg, Nj: 1995). 1997;18(10):1044-1046.
- Saoji SS, Ikhar A, Manik K, Awghad S, Panchal S. Elevating Restorative Dentistry: Use of the Art of Stamp techniques in Mandibular Posterior Regions. Cureus. 2024;16(7): e64014.
- Azeem RA, MNS. Clinical performance of direct versus indirect composite restorations in posterior teeth: a systematic review. Journal of Conservative Dentistry. 2018;21(1):2.
- Tambake NJ, Tambake S, Gandhi N, Jadhav Y, Madhu K, Burad P. Stamp technique-new perspective of aesthetic dentistry: a case report. losr Journal of Dental and Medical Science. 2017;16(6):49-51.
- Reshawn MI, Kolli S. Knowledge, attitude, and practice survey on the use of Stamp technique for the management of class 1 caries in molars among undergraduate students in dental schools. Journal of Advanced Pharmaceutical Technology & Research. 2022;13(Suppl 2): S421.
- Pompeu JGF, Morais RC, Ferreira TO, Prado VLG, Sampaio TDJS, Pedrosa MDS, ve ark. Occlusal Stamp technique for direct resin composite restoration: a clinical case report. International Journal of Recent Scientific Research. 2016;7(4):12427-12430.
- Qian K, Wang QL, Pan J. 3D Digital Evaluation for Direct Composite Restoration Using the Modified Stamp technique. Chin J Dent Res. 2021;24(3):185-9.
- Liebenberg WH. Occlusal index-assisted restitution of esthetic and functional anatomy in direct tooth-colored restorations. Quintessence International. 1996;27(2):81-88.