

Partial Bonded Ceramic Onlay – A Case Report of a Minimally Invasive Restoration

Nikhil Nagari, Shruthi Proddatoori, Sahithi Nammaniwar, Jayaprada Reddy Surakanti, Jaya Nagendra Krishna

Department of Conservative Dentistry and Endodontics, Kamineni Institute of Dental Sciences, Sreepuram, Narketpally, Nalgonda, Telangana, India

Email for correspondences: nnikhil003@gmail.com

ABSTRACT

Conventionally, crowns were indicated for the restoration of teeth that had lost a significant amount of tooth structure due to caries, tooth-wear, or fracture. With the increasing emphasis on tooth conservation, minimally invasive treatment options offer good esthetic outcomes and durability with minimal tooth reduction. Moreover, the high demand of esthetically pleasing restorations, the focus is shifting toward adhesively bonded ceramic inlays and onlays for restoration of damaged posterior dentition. The present clinical case report represents replacement of tooth structure with bonded ceramic onlay which can be justified according to modern concepts.

Key words: Adhesive bonding, ceramics, indirect restoration, onlay

INTRODUCTION

Loss of tooth structure is a common occurrence in many populations and is frequently replaced by direct or indirect restorations. Consequently, a new range of conservative, tooth-colored, and durable restorative options are available. Partial coverage restorations are rapidly replacing conventional crowns as the demand for minimally invasive restorations increases. Onlay is a partial-coverage restoration that restores one or more cusps and adjoining occlusal surfaces or the entire occlusal surface and is retained by mechanical or adhesive means.^[1] Onlays do not cover the entire external structure and, thus, can simplify the tooth preparation, impression-making, cementation, finishing, and polishing processes. These restorations include ceramic, composite, and metallic inlays and onlays. Despite the outstanding performance of metal onlays, biocompatible


ceramic onlays are the material of choice in modern dentistry.^[2]

In parallel to ceramic improvements, there have been advances in adhesive and cementation agents that combine enhanced bonding between the tooth and the ceramic material and ease of use. Modern adhesives also provide superior bonding, even though proper tooth preparation should not be ignored.^[3]

The present case report presents restoration of teeth with adhesive ceramic onlay as a viable and predictable treatment option in comparison to full veneer crowns in patients treated in a hospital setting.

CASE REPORT

A 27-year-old patient presented to the department of conservative dentistry and endodontics with a chief complaint of food lodgement in the area of the lower left back teeth region for 2 months. The clinical examination and radiographic evaluation revealed distoproximal caries involving the distobuccal cusp and distolingual cusp in relation to tooth 36 [Figure 1]. Based on the examination and to address the patient's concerns about the esthetics of the tooth, a ceramic onlay restoration for tooth 36 was planned. The cavity preparation

| Quick Response Code | Article Info: |
|---|---|
|  | doi: 10.5866/2023.13.10085 |
| | Received: 21-04-2023 |
| | Revised: 18-05-2023 |
| | Accepted: 30-05-2023 |
| | Available Online: 02-07-2023, (www.nacd.in) © NAD, 2023 - All rights reserved |

was done according to the principles of onlay cavity preparation [Figure 2].

Occlusal preparation was done on the distobuccal and distolingual cusps and the distoproximal gingival finish line using 271 and 169L carbide burs. All line and point angles were rounded using 8862 flame-shaped diamond bur to reduce the concentration of internal tensions. The adjacent tooth had a 0.5-mm proximal clearance. A divergence of approximately 10° between opposing walls was established and done using 271 carbide burs. This divergence gives a passive insertion axis for ceramic restorations without unnecessarily destroying the healthy tooth structure. The cervical margin was finished with a deep chamfer, and the cavosurface angles were made at 90°.

After preparation of the cavity, the cavity margins were examined thoroughly. Gingival retraction was carried out only at the distal gingival floor before the impression. Gingival retraction cord

(000 size, Ultradent™ Ultrapak™ Retraction Cord) was positioned 0.5 mm subgingivally and retained for 5 min and then carefully removed. An impression was made using putty and light body impression material using a single technique (Aquasil Soft Putty, Dentsply Sirona, Charlotte, NC) to obtain fine details of the prepared cavity. The cavity was provisionally restored and shade selection was done using vita shade guide. The impression was sent to the laboratory for ceramic onlay fabrication. The prosthesis was examined for polish, texture, and inconsistencies before inserting into the prepared cavity [Figure 3].

The temporary restoration was removed using a scaler and preparation was cleaned with polishing paste and a finishing brush. The prosthesis was evaluated intraorally to assess marginal fit, occlusion, and esthetics before final cementation.

To prepare the ceramic surface for bonding, 9.5% buffered hydrofluoric acid (Porcelain Etch, Ultradent Products, Provo, UT) was applied for 1 min. The surface was, then, rinsed with water and allowed to air dry. A mini sponge was used to apply a silane coupling agent (Rely X Ceramic Primer, 3M ESPE AG, Seefeld, Germany), which was then allowed to evaporate for 3 min before being air dried for 30 s. Concurrently, the prepared tooth was cleansed, and enamel and dentin were etched with 37% of phosphoric acid gel (Primedent) for 15 s, rinsed with water for 20 s, and then blot-dried with a damp cotton pellet to prepare for cementation. Using a microbrush, Single Bond (3M ESPE) was applied in two coats to both surfaces and allowed to air dry gently for 5 s. Rely X ARC®, a dual-cured resin cement (3M ESPE), was employed for cementation [Figure 4].

Following cementation, the onlay was examined for occlusion and marginal adaption. At 1-week and 1-month follow-ups, the patient did not report any pain, discomfort, or sensitivity when chewing or consuming hot or cold meals.



Figure 1: Pre-operative intraoral view showing distoproximal caries involving the distobuccal cusp and distolingual cusp in relation to tooth 36



Figure 2: Minimally invasive onlay cavity preparation done on tooth 36



Figure 3: Ceramic onlay preparation from the laboratory on a dental model



Figure 4: Ceramic onlay cementation done irt 36

DISCUSSION

The selection of restorative material, technique, and adhesive systems are crucial steps that should be taken into concerns primarily based on each individual case. Onlay, where, indicated with careful tooth preparation can benefit by contributing to the protection of vulnerable areas of tooth structure and restoring function by re-establishing the occlusal table. The vitality of the tooth if earlier not infected can be preserved. Onlay is also indicated as the minimum indicated restoration for posteriors after a root canal treatment.^[4]

Over the past 20 years, ceramic restorations have become very popular and routinely used in clinical practice. This is further driven by the significant developments that have improved the mechanical and optical properties of ceramic materials available for dental restorations. In addition, the development of modern manufacturing techniques has reduced the risk of internal flaw development within the ceramic material, which can further enhance its performance.^[5] Ceramic offers physical and mechanical characteristics more similar to enamel and dentine, such as a higher modulus of elasticity, hardness, and coefficient of thermal expansion compared to resinous materials.^[6]

For the success of ceramic restoration, it is important to identify and avoid factors that can impair its clinical performance, such as inferior fabrication, stress tolerance, elastic modulus of the base material, ceramic thickness, cavity preparation, cement selection, adhesion, and surface polishing.^[7]

Onlay offers superior esthetics, a strong adhesive bond to enamel and dentine that preserves teeth structure, reduced plaque accumulation and secondary caries, preservation of soft tissue, and good access for post-operative care.^[6]

The projected 10-year survival of ceramic onlays is 92.4%. If the restorations are firmly attached to the tooth, a good clinical success rate for all-ceramic inlays and onlays can be obtained.^[8] Ceramic inlays and onlays applied with adhesive cement do not fracture and show good clinical performance for up to 6 months.^[9] The survival rate ranged from 91 to 100% of according to research conducted over a median period of 2–5 years. Studies that lasted longer than 5 years often showed a lower survival rate (71–98.5%). Ceramic onlays have a tendency to perform better clinically than inlays.^[3] However, the laboratory charges for inlays and onlays can be as high as those for crowns.

Complications of partial coverage bonded restorations include fractures, marginal integrity loss, adhesion failure, tooth sensitivity, poor adjustment, and microleakage. Other factors that affect clinical performance include secondary caries, gingivitis, plaque accumulation, color instability, radiopacity, anatomical shape, material wear, and wear on adjacent teeth. Other variables such as the state of supporting teeth, patient habits, clinical procedures, and characteristics of the restorative material also affect the survival and durability of the onlay.^[10]

CONCLUSION

Advances in dental care have led to a decline in dental caries, advancements in dental materials, and increased demand for esthetically pleasing restorations. In restoring severely damaged posterior teeth, the use of indirect ceramic partial coverage restorations offers a treatment option that can suit patients' esthetic needs while also restoring the dental form, preserving structurally significant dentine, and protecting the remaining tooth structure.

REFERENCES

1. De Carvalho AB, De Andrade GS, Tribst JP, Grassi ED, Ausiello P, Saavedra GS, *et al.* Mechanical behavior of different restorative materials and onlay preparation designs in endodontically treated molars. *Materials (Basel)* 2021;14:1923.
2. Nirmala S, G SG, Kumar KN, Chukka RR, Reddy N. Ceramic onlay: A case report. *Cureus* 2022;14:e32641.
3. Abduo J, Sambrook RJ. Longevity of ceramic onlays:

- A systematic review. *J Esthet Restor Dent* 2018;30:193-215.
4. Kaul V. Case report onlays in dentistry: An endangered species. *Int J Clin Cases Investig* 2013;5:149-51.
 5. Kelly JR, Benetti P. Ceramic materials in dentistry: Historical evolution and current practice. *Aust Dent J* 2011;56:84-96.
 6. Vohra FA, Baloch HR, Ghani SM. Modern adhesive ceramic onlay, a predictable replacement of full veneer crowns: A report of three cases. *J Dow Uni Health Sci* 2014; 8:35-40.
 7. Meyer A Jr., Cardoso LC, Araujo E, Baratieri LN. Ceramic inlays and onlays: Clinical procedures for predictable results. *J Esthet Restor Dent* 2003;15:338-51, discussion 352.
 8. Beier US, Kapferer I, Burtscher D, Giesinger JM, Dumfahrt H. Clinical performance of all-ceramic inlay and onlay restorations in posterior teeth. *Int J Prosthodont* 2012;25:395-402.
 9. Santos MJ, Francischone CE, Santos Júnior GC, Bresciani E, Romanini JC, Saqueto R, *et al.* Clinical evaluation of two types of ceramic inlays and onlays after 6 months. *J Appl Oral Sci* 2004;12:213-8.
 10. Bustamante-Hernández N, Montiel-Company JM, Bellot-Arcís C, Mañes-Ferrer JF, Solá-Ruiz MF, Agustín-Panadero R, *et al.* Clinical behavior of ceramic, hybrid and composite onlays. A systematic review and meta-analysis. *Int J Environ Res Public Health* 2020;17:7582.