

From Minimal Invasiveness to Maximum Bonding: A Reappraisal of Partial Indirect Adhesive Restorations

¹ Dr. Glynis Miranda; ² Dr. Pallavi S. N.; ³ Dr. Bharath Prabhu

¹ Reader, A.J. Institute of Dental Sciences

² P.G. Student, A.J. Institute of Dental Sciences

³ Reader, A.J. Institute of Dental Sciences

¹ORCID: 0000-0002-1424-6672, ²ORCID: 0009-0007-1133-8516

Corresponding Author: **Dr. Pallavi S. N.**

Abstract: Bonded restorations are considered reliable long-term solutions for restoring both the function and aesthetics of teeth. A key concern in adhesive dentistry is preserving healthy enamel. In line with biomimetic principles, the use of minimally invasive preparation techniques combined with adhesive methods plays a crucial role in achieving successful outcomes. Although minimally prepared restorative approaches are widely recognized as preferable, there remains some debate regarding the application of completely non-invasive techniques. This review aims to discuss the concept of partially bonded indirect restorations, particularly since conventional restorations can negatively impact periodontal health due to issues such as excessive contours and ceramic overhangs. Additionally, it seeks to introduce an updated approach for evaluating the quality and longevity of these partial bonded restorations.

Keywords: Adhesive cementation, principles of biomimetics, bonded restorations, esthetic, minimally invasive treatment, partial indirect adhesive restorations, MDPT, composites, immediate dentin sealing, adhesthethics protocol

I. Introduction

Over the years, advancements in dental materials have focused on replicating the natural structure of teeth, making it possible to create restorations that cover only the damaged portion without requiring extensive surface area for retention. This is largely achieved through the use of modern adhesive systems. However, the success of such restorations depends not only on material development but also on the application of conservative dental techniques. These approaches prioritize the preservation of healthy tooth structure and ensure that the restoration margins remain at a supragingival level. In cases of severely compromised teeth, the traditional method often involves a direct restorative approach, which, while commonly practiced, may present limitations in terms of retention and achieving ideal contour.

Indirect partial coverage restorations have recently gained popularity as a preferred option for managing extensively damaged teeth. This approach focuses on preserving as much natural tooth structure as possible while addressing the compromised areas, thereby restoring both function and aesthetics.¹ Traditional preparation techniques often lead to issues such as over-contouring and ceramic overhangs, which can negatively affect periodontal health. To overcome these drawbacks, a new concept involving partial bonding techniques has been introduced, aiming to enhance both the quality and longevity of restorations.³

Indirect restorations offer several benefits, including minimizing trauma to the pulp and surrounding tissues while preventing further weakening of the remaining tooth structure. The integration of adhesive techniques in restorative dentistry has introduced significant advantages such as improved conservation, enhanced sealing, optimal function, and superior esthetics. These benefits are particularly evident in the case of partially indirect adhesive restorations (PIAR). When combined with materials like lithium disilicate, adhesive methods provide a more conservative and aesthetically pleasing approach for restoring extensively compromised teeth, although this technique may involve higher costs.² Furthermore, partially bonded restorative solutions represent a durable option that effectively restores the tooth's natural characteristics while maintaining an attractive appearance.²⁵

II. Various partial bonded restorations

- Veneers
- Inlay
- Onlay/Overlay
- Tabletop
- Veneerlay
- Vonlay

1. Porcelain veneers

Porcelain possesses key properties, such as high translucency, which make it suitable for use as veneers as well as a bulk restorative material. Porcelain veneers are thin layers designed to closely mimic the natural appearance of teeth,⁴ offering a conservative alternative to traditional full-coverage crowns. These restorations can modify tooth colour, reshape damaged areas, or enhance the surface structure, and they may even help close interdental gaps.⁵ The incisal edge position is based on the treatment plan and wax-up. "Reduction" is only necessary when the incisal edge remains or the tooth is shortened. To achieve an aesthetic and translucent incisal edge, the incisal edge should be 1-2mm in ceramic only, to allow light to transmit. As retention-free restorations, porcelain veneers rely entirely on adhesive bonding for stability. Consequently, the longevity and success of these rehabilitations largely

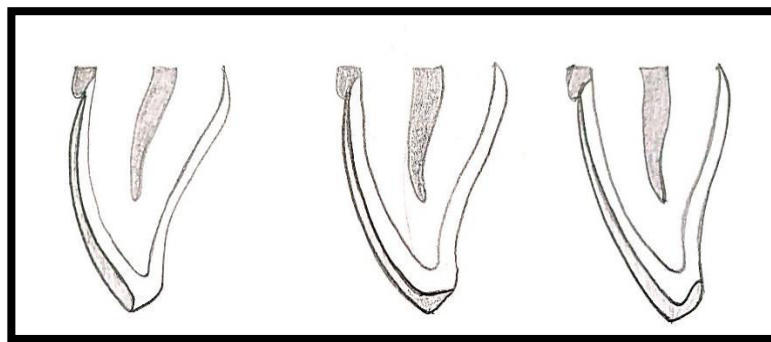
depend on the quality of the bonding process and the precision of the technique employed.⁶

Types of veneer preparations

Type I: Feather in which the veneer is taken up to the height of the incisal edge, but the edge is not reduced.

Type II: 2mm incisal reduction without palatal chamfer

Type III: 1-3 mm incisal reduction with 1mm height palatal chamfer.



TYPE I

TYPE II

TYPE III

2. Non-prep veneers (Lumineers)

Lumineers are an ultra-thin form of ceramic restoration that generally requires minimal or no tooth preparation compared to conventional veneers. Unlike veneers, they are semi-permanent and can be removed later with little to no damage to the underlying tooth structure, making the procedure reversible. The initial appointment is typically shorter due to the absence of trimming or extensive preparation. Lumineers are less effective for masking severe discoloration or deep stains and may not last as long as traditional veneers. However, similar to veneers, they can pose challenges in maintaining gingival hygiene, potentially increasing the risk of periodontal issues if proper care is not taken.⁷

3. Inlay

When a localized area of tooth decay cannot be effectively managed with a conventional filling, an inlay serves as a suitable restorative option. Inlays are specifically designed to fit within the confines of the tooth's hard tissue, occupying the space between the cusps without covering them. Their precise adaptation ensures a

secure fit, which helps prevent debris from entering the restored area and causing further decay.⁸

Indications

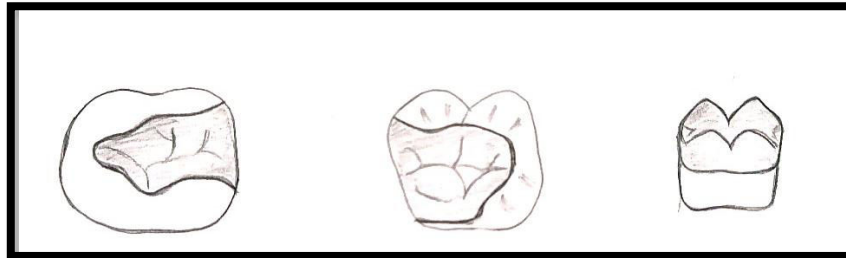
- The cavity width should ideally be limited to less than one-third of the intercuspal distance, ensuring that the preparation remains conservative.
- The tooth must retain strong, self-supporting cusps, and any existing occlusal facets, if present, should be minimal and confined to the occlusal surface.
- Additionally, the tooth selected for restoration should not serve as an abutment for fixed or removable partial dentures.
- Furthermore, the restorative intervention should preserve the existing occlusal and functional surfaces without altering the natural occlusion.

4. Onlay

An onlay is recommended when a tooth has decay that extends to the central and lateral areas, as it can cover one or more cusps. Unlike an inlay, which is confined within the tooth structure and fits between the cusps, an onlay extends over the cusp, partially covering the biting surface. This makes onlays an intermediate option between a conventional filling and a full-coverage crown. They are particularly indicated when the tooth's cusps are compromised, making it unsuitable for an inlay or a direct filling, or when the remaining structure is too weak to withstand normal function without risk of fracture. They are prepared with a long bevel/inclined plane, and enamel prisms are cut perpendicular to their long axes, increasing the number of prisms for adhesion. It also increases ceramic thickness in critical areas as well as esthetic integration due to a gradual blending ("contact lens effect") and favorable cement space. Therefore, an inclined plane/ wide bevel is prepared when no defect or a defect from the coronal to the equator. Onlays allow for reinforcement of the tooth while avoiding unnecessary removal of sound tooth tissue that would be required for a complete crown preparation.⁹

5. Overlay

An overlay is a restorative prosthesis designed to reestablish the integrity of the tooth's occlusal cusps. Unlike traditional full crowns, it extends beyond the occlusal table toward the cervical area while maintaining a more conservative approach. Often referred to as a partial coverage crown, an overlay differs from classical crowns in that its margins are typically positioned supragingivally, thereby preserving periodontal health and reducing the risk of subgingival complications.



INLAY

ONLAY

OVERLAY

6. Veneerlay

Veneerlays are a type of overlay restoration that combines features of veneers and overlays. They differ from conventional overlays in terms of the extent of occlusal coverage, overall thickness, and peripheral limits. Designed to be more tissue-conservative, veneerlays primarily depend on the thickness of the occlusal table rather than extensive tooth reduction. The term itself originates from the combination of “veneer” and “overlay,” reflecting its dual function. These restorations are typically ceramic-bonded and are commonly used in the posterior region to restore both the vestibular surface and the occlusal table, ensuring functional and aesthetic rehabilitation.

7. Tabletop

Tabletops, also known as occlusal veneers, are a type of onlay restoration primarily indicated for cases involving significant wear of multiple occlusal surfaces in posterior teeth. They represent a clinical variation of the overlay, functioning as a partially bonded restoration that provides complete coverage of the cusps. Before their placement, a diagnostic wax-up is essential to determine the appropriate height, functional efficiency, and esthetic integration of the tabletop restoration.¹⁰

8. Vonlay

A conservative esthetic alternative to full coverage crowns to restore damaged posterior teeth.

Indications:

- Full Mouth Rehabilitation for esthetic reasons.
- Tooth wear and cervical lesions
- Structural, color, and texture defects (e.g., fluorosis)
- Multi-surface erosions.

Key aspects:

- Proper insertion path and preparation designs
- Rounded and polished preparation
- Proximal preparation only if necessary (caries, etc.)
- Proper material selection (Lithium Silicate ceramics)
- Optimal bonding protocol

III. Composites or ceramics?

Since endodontically treated teeth are highly susceptible to fracture, the decision regarding the most suitable restorative material and technique is even more difficult.

a. Shortcomings of composites

Composite resin restorations, although widely used, have notable limitations. They require significant chairside time and often lack predictability in terms of long-term success. One key concern is the polymerization shrinkage stress, which can compromise marginal integrity and contribute to microleakage and subsequent secondary caries.^{13,19} Additionally, in cases involving extensive cavities or patients with parafunctional habits, the material is subject to occlusal wear, making it less reliable. Failures involving cuspal coverage tend to be particularly severe in direct composite applications.^{20,21}

Recognizing these challenges, the American Dental Association (ADA) issued guidelines in 1998 recommending that direct composite restorations be reserved for small lesions in areas subjected to minimal occlusal load. They advise against their use in larger, high-stress restorations or where rubber dam isolation is not achievable.^{22,23,24}

b. Why ceramics could be a better option?

- It has been shown that light-cured indirect restorations with a cement thickness of < 200µm generated less contraction stress than light-cured direct composite restorations.^{11,12}
- Allows the practitioner to achieve long-lasting and excellent shade match
- Bonded ceramic restorations (eg, ceramic inlays or onlays and partial ceramic crowns) are clinically acceptable means of restoring extensively destroyed teeth.

- Preserving and strengthening compromised tooth structure while taking advantage of the mechanical benefits of modern adhesive technology and ceramics
- The use of adhesive techniques permits more conservative preparation designs.¹³

IV. Indications of partial indirect bonded restorations

- Medium or large cavities with one or more missing cusps need careful treatment planning. In these cases, covering the damaged cusps can help improve the long-term success of the tooth.
- During oral rehabilitation, changes in tooth shape or increasing the posterior occlusal vertical dimension (OVD) may be required. This approach is useful when a full crown would remove too much tooth structure.
- Studies show that a tooth with cracked tooth syndrome and reversible pulpitis can be treated successfully with a full crown, a complex amalgam, or a bonded composite overlay.¹⁴
- When several medium or large cavities are present in the same quadrant, treatment is still necessary, even if indirect inlay restorations are not the preferred option.

V. Contraindications

- Depressed patients have poor oral sanitation conditions.
- Patients having high caries susceptibility.
- Cases with limited access to the cavity, which can be a problem for preparation, impression, and cementation under the dam.
- A very small cavity, e.g., an inlay, is comparatively unsuitable for such cases as ceramic material requires a high minimum thickness. A composite material is favored in this case.

VI. Drawbacks

- Higher cost
- Technique-sensitive process
- Post-operative sensitivity
- Brittleness and risk of fracture
- Potential for marginal leakage, staining, or decay
- Difficult repairs or replacements
- Not suitable for severely damaged teeth
- Wear on opposing teeth

VII. Cavity design

The cavity design for all-ceramic partial restorations requires the simplest possible basic geometry. In fact, due to adhesive bonding technology, a retentive shape of the preparation is not necessary.

- 1.5mm of pulpal depth starting from the base of the development groove.
- Rounded internal line angles
- 10 to 12 degrees of axial wall convergence.
- 10 degrees or more of divergence on buccal and lingual walls.
- 1 to 1.5 mm of axial wall reduction
- 90° cavosurface margins
- 2mm isthmus width
- 2mm occlusal reduction for cuspal coverage
- Smooth flowing margins
- 20°-30° gingival bevel.

Preparation margins

- Supragingival margins are preferred for adhesive bonding.
- Recommended for caries prevention and periodontal reasons.
- Easier to prepare the cavity, to make the impression, to place the rubber dam, to enable visual control of the marginal seal, and to remove excess cement.
- The quality of the marginal seal is better when evaluated during follow-up.¹⁴

Occlusal preparation

- Begin preparations on a clean, decay-free tooth, removing any remnants of old fillings. Start by creating occlusal grooves to guide the restoration depth; this can be achieved with rounded or tapered burs. When flattening the occlusal surface, utilize conical tapered diamond burs: medium-grit cuts (around 64-126 µm) or coarse-grit cuts (about 107-181 µm) are ideal depending on the clinical demand.

The desired thickness of the remaining restoration depends heavily on the material chosen:

- Layered composite restorations typically require a minimum thickness of around 2 mm, although slightly less may be acceptable in certain circumstances.
- For monolithic restorations such as lithium disilicate ceramics or resin composites reinforced with ceramic, 1 mm thickness is generally acceptable. In cases with routine occlusal load and strong bonding surfaces, thicknesses as low as 0.5 mm may still be sufficient.¹⁵
- To buffer against clinical complications, especially under variable loading or bonding to less robust substrates, a slightly increased thickness between 1.0 and

1.5 mm is considered more conservative and safer, even for durable glass ceramics like monolithic lithium disilicate.

VIII. Types of preparation

Posterior Indirect Adhesive Restorations (PIAR) are used in dentistry to restore damaged teeth while preserving as much natural tooth structure as possible. There isn't a universally accepted classification for the various preparation types, so clinicians often rely on their experience to choose the most suitable design. Here's a simplified overview of common preparation types:

In the case of posterior onlay/overlay, three types of preparation can be applied to the main forms according to the adhesion protocol: 1) Butt joint 2) Bevel 3) Shoulder. A veneer preparation may be used in the case of cuspal and buccal coverage. For a tabletop on a worn dentition, the recommended preparation is an ultraconservative butt joint with a simple surface finishing. Each preparation type is selected based on the specific clinical scenario, aiming to balance tooth preservation with the restoration's durability and esthetics.¹⁶

1) Butt joint

The butt joint preparation is a conservative dental technique ideal for adhesive restorations, requiring minimal tooth alteration. It involves an occlusal reduction that mirrors the natural contours of the cusps and central groove, resulting in a generally flat surface with slight inclinations. At the finishing line, the design should incline toward and follow the occlusal surface, transitioning to a more horizontal plane.¹⁶

Indications for a butt joint preparation:

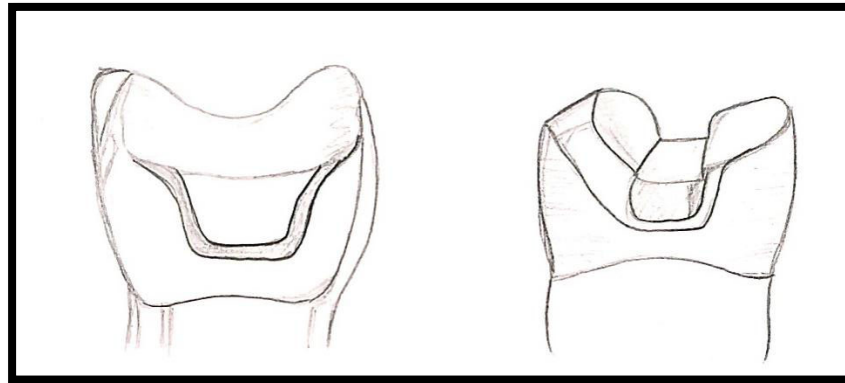
- Cuspal reduction to safeguard against occlusal forces
- Cuspal fracture involving the occlusal or middle third
- Occlusal surface erosion (potentially requiring increased vertical dimension)

2) Bevel preparation

This preparation method is very similar to a butt joint, but adds a key tweak: a noticeable bevel, usually around 45°, spanning about 1 to 1.5 mm in length. This bevel is most commonly applied to the buccal surface, though it may instead be placed on the palatal side. When the bevel encircles the entire preparation, the design may be described as a “full bevel” variant of the traditional butt joint.¹⁷

Indications for a bevel preparation:

- Enhancing esthetic integration at the restoration-tooth junction
- Expanding enamel bonding surface area for stronger adhesion
- Creating additional space in peripheral zones to accommodate restoration material



Bevel Preparation

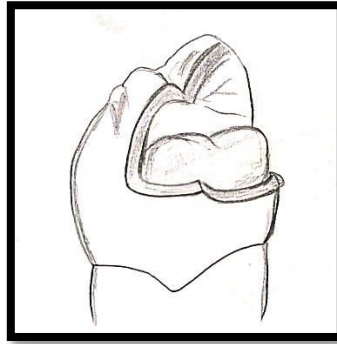
Butt Joint Preparation

3) Shoulder preparation

The shoulder preparation features a 1 mm-thick rounded “shoulder” at the margin, which helps preserve as much enamel as possible. A slightly tapered bur with a rounded internal angle is used to create a smooth finishing line, enhancing structural strength and reducing stress points. If the bur head measures around 1 mm in diameter, it may be used to its full depth for the preparation. However, larger bur heads should be used with restraint and not pressed fully to avoid excessive removal of tooth structure. This balance supports a precise, durable margin while conserving healthy tissue.

Indications of a shoulder preparation:

- Following a deep cuspal fracture (extending into the cervical or sometimes the middle third)
- Need for enhanced structural protection in the cervical area.



Shoulder Preparation

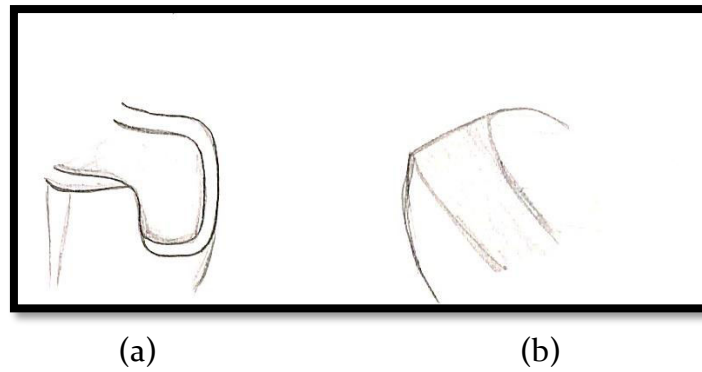
Proximal preparation designs

- There are three types of approaches for the interproximal areas according to the adhesives protocol: slot, bevel, and ridge up.

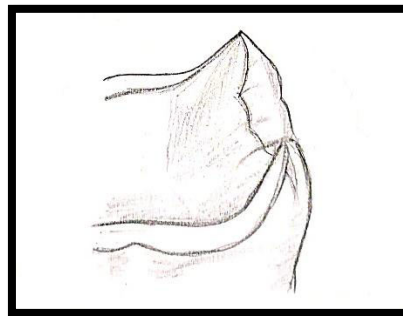
(a)**Slot:** The slot approach is one of the most frequently used interproximal preparation techniques. It features a rounded shoulder, usually about 1 mm in width, consistent with the form of a standard shoulder preparation. This design is so common because it often develops naturally after the removal of an interproximal carious lesion. As a result, it provides a convenient and effective foundation for building a central reconstruction of the dental crown.

(b)**Bevel:** The bevel method offers a more conservative option than the slot technique, particularly for restoring the interproximal area without extensive intervention at the cervical level. One of its main advantages is that it exposes a good enamel surface, which can significantly enhance adhesive cementation. This approach is especially useful for larger interproximal restorations where there is no pre-existing carious lesion and where the preparation is positioned cervically in relation to the contact area.

(c)**Ridge:** The ridge-up approach focuses on preserving the marginal ridge, a critical structural element for the strength of a non-vital tooth. In the ridge preservation variant, the ridge remains intact, while the ridge coverage variant allows only minimal surface modification. When adjacent cusps show reduced thickness, this method can be combined with cuspal coverage to protect the tooth's structure, provided that the ridge is healthy and no cavitated carious lesions are present. This technique is therefore indicated for cases requiring structural reinforcement without compromising ridge integrity.



(a) Slot & (B) Bevel Interproximal Preparations



(c) Ridge up Interproximal Preparation

IX. Morphology driven preparation technique (MDPT)

MDPT is driven by the type/location of defects (no defect=no preparation) and determined by the amount of space needed for the ceramic restoration (typically 1-1.5 mm). It entails continuous inclined plane cavity margins (concave bevel) on buccal/lingual axial walls, when there is no defect or a defect located coronally to the equatorial tooth line (largest tooth circumference). A 1.2 mm butt joint (rounded shoulder) is prepared in the interproximal box (if needed) and on buccal/lingual axial walls when defects/margins are apical to the equator of the tooth.¹⁷

Occlusal surfaces are anatomically reduced based on the type of ceramic used. Adhesion quality is improved by the bevel to optimize the angle at which enamel prisms are cut, increasing the bonding surface. This also enhances aesthetic integration. The amount of tooth “REDUCTION” is to accommodate the ceramic restoration is determined by the space available and the planned design. For example, if we want to increase the size of the tooth or the vertical dimension, the amount of tooth reduction could be significantly less.

X. Immediate dentin sealing (IDS)

When preparing a tooth for an indirect bonded restoration, such as an inlay, onlay, or veneer, dentin surfaces are frequently exposed. In such cases, it's widely recommended to apply a dentin bonding agent (DBA) directly to the fresh dentin. The core concept here is the formation of an “interphase” or “interdiffusion” zone, more commonly

known as the hybrid layer, which results from resin monomers penetrating and melding with the tooth's hard tissues.

Once the infiltrating resin cures, it creates a strong, structural adhesion reminiscent of the dentinoenamel junction (DEJ), often regarded as a model "fibril-reinforced bond." This natural junction bridges two very mineral-rich tissues (enamel and dentin) through a moderately mineralized interface, offering remarkable fracture resistance. Two clinical issues demand careful attention during the dentin bonding procedure: 1) dentin contamination and 2) susceptibility of the hybrid layer to collapse until it is polymerized.

There are at least four rational motives and several other practical and technical reasons supporting IDS.

1. Only freshly cut dentin available immediately after tooth preparation enables the most reliable adhesion with dentin bonding agents (before impression).¹⁸
2. Curing the adhesive layer before placing the composite (precuring) avoids potential collapse of the uncured hybrid layer during restoration seating or composite layering. This practice consistently achieves higher bond strength. Additionally, and importantly, the cured adhesive film's thickness can vary significantly depending on surface geometry: around 60-80 µm on smooth convex areas and up to 200-300 µm in concave regions such as chamfers.
3. Bond strength doesn't reach its peak immediately; it evolves. The hybrid layer gains additional strength over time as monomers complete copolymerization, with observed improvements continuing even a week post-application; this supports allowing a stress-free maturation period for the bond.
4. Sealing dentin immediately helps shield against bacterial infiltration and reduces post-operative hypersensitivity issues that often arise when temporary restorations permit microleakage. This concept was notably proposed by Pashley and colleagues in the early 1990s.

XI. Adhesive cementation

Restoration conditioning

First, the milled ceramic restorations are etched in 5% hydrofluoric acid for about 20 seconds. After etching, they are rinsed thoroughly for 15 s and gently dried. Next, phosphoric acid (35%) was applied for one minute to clean and prepare the surface, followed by a 20 s rinse and drying. A layer of silane is then applied for 60 s and dried, helping establish a chemical bond between the ceramic and resin. Finally, a thin bonding layer is applied, air-thinned, and cured with light for 30 seconds.²⁶

Tooth conditioning

On the tooth side, both the previously placed Immediate Dentin Sealing (IDS) bonding surface and the tooth structure are subjected to airborne-particle abrasion using CoJet Prep. This is performed with 30 µm aluminum oxide particles for 10 seconds at 2.5 bar (30-42 psi), held perpendicular at about 10-15 mm distance.²⁷ Enamel

and IDS-covered areas are then etched with 35% phosphoric acid for under 30 seconds, rinsed for 15 seconds, and dried. A primer is applied for 30 seconds and dried. This step, though sometimes omitted when IDS is present, helps improve wettability and addresses any exposed dentin during cementation. Finally, another thin bonding layer is applied, air-blown to thin, and light-cured for 30 seconds.

Adhesive cementation

For the final step, a dual-cure resin cement is placed on the restoration, positioned carefully, and excess cement is removed. Polymerization is done using a light-curing device, with three cycles per surface (occlusal, buccal, and palatal), each lasting 30 seconds. A rebonding step followed, with an additional 30 seconds of light curing. Glycerin gel was used to block out oxygen inhibition at margins, then cured again for another 30 seconds. Margin finishing is performed with a rubber polisher to ensure smooth, clean edges.³¹

Discussion

Partial bonded restorations represent a valid, minimally invasive option for restoring molars and premolars, achieving outcomes comparable with full crowns, especially when using ceramic materials like lithium disilicate. Their ability to preserve tooth structure and adapt to compromised substrates (e.g., cracked or endodontically treated teeth) underscores their utility in contemporary restorative protocols.

The evolving paradigm in restorative dentistry emphasizes partial bonded restorations, including inlays, onlays, overlays, and partial crowns as conservative yet effective alternatives to full-coverage crowns. Clinical, in vitro, and meta-analytic data increasingly support their use, particularly in the posterior region.²⁸

Moreover, a systematic review focused on endodontically treated teeth (ETT) concluded that partial indirect bonded restorations and full crowns demonstrate comparable survival; however, data on non-vital teeth remain limited and warrant further exploration.²⁹ A retrospective study of lithium disilicate partial bonded restorations using immediate dentin sealing showed very high survival (99.2%) and success (96.7%) rates, underscoring their clinical robustness.

Partial bonded restorations offer clear biological advantages by preserving sound tooth structure, typically removing only 35-47%, compared to up to 75% for full crowns.²⁸ This conservation aids in maintaining tooth vitality, reducing the risk of pulpitis or endodontic complications.²⁶

Biomechanically, lithium disilicate overlays with an adhesive ferrule effect are particularly effective in restoring heavily compromised or cracked teeth, optimizing structural reinforcement while minimizing invasiveness.

Laboratory studies indicate lithium disilicate onlays/partial crowns generally exhibit fracture resistance on par with full-coverage crowns. In contrast, zirconia partial crowns may show lower resistance compared to their full-crown counterparts.²⁶

Additionally, preparation design, such as full cuspal coverage versus partial, impacts fracture resistance and failure mode, although findings vary across studies.

In the recent study, Multi-layer flowable injection technique has been included. This is the fully digitally guided multi-layer flowable injection technique. The digital wax-up is created, including a “cut back” that resembles the dentin “core”. Based on that, three clear PVS indices are fabricated. First, the dentin is injected. Next, a second and third index are used to (alternating) inject the enamel. An “alternating” technique is applied to always inject “every other tooth” and not neighbouring teeth at the same time for better control of interproximal areas.³²

Notably, much of the current evidence derives from observational studies rather than randomized controlled trials (RCTs), limiting the strength of inferences.³⁰ There is also a paucity of long-term RCT data, particularly for restorations on non-vital teeth.²⁹

Further, variability in study designs, outcome definitions, and materials used (ceramic types, adhesive systems) introduces heterogeneity, making cross-study comparison challenging.

Future research priorities include:

- High-quality RCTs with long-term follow-up to robustly compare partial bonded restorations versus full crowns.
- Subgroup analyses comparing vital vs. non-vital teeth, various ceramic systems (e.g., lithium disilicate vs. zirconia), and preparation designs.
- Investigation of cementation protocols, adhesive strategies, and fracture modes in clinical practice.

Conclusion

Evidence to date supports the use of partial bonded restorations, particularly lithium disilicate onlays/partial crowns, as effective, conservative alternatives to full crowns. These restorations preserve more tooth structure and offer high survival and success rates. Nonetheless, to solidify their standing in evidence-based practice, long-term RCTs and standardized reporting are essential.

References

1. Dalli M, Çolak H, Mustafa Hamidi M. (2012). Minimal Intervention Concept: A New Paradigm for Operative Dentistry. *Journal of Investigative and Clinical Dentistry*. 3:167-175.
2. Tyas M.J., Anusavice K.J., Frencken J.E., and Mount, G.J. (2000). Minimal Intervention Dentistry: A Review. *International Dental Journal*. 50: 1-12.
3. Regish K.M., Sharma D, Prithviraj D.R. (2011). Techniques of Fabrication of Provisional Restoration: An Overview. *International Journal of Dentistry*, 134659.

4. Donovan T, Chee W.W. (1993). Conservative Indirect Restorations for Posterior Teeth. Cast Versus Bonded Ceramic. *Dental Clinics of North America*,37:433-443.
5. Ruiz J.L. (2015). Avoiding Subgingival Margins for Healthier Dentistry: Using a Supragingival Preparation Protocol. *Dentistry Today*. 34: 84- 86.
6. Meyer Jr., A, Cardoso L.C., Araujo E, Baratieri L.N. (2003). Ceramic Inlays and Onlays: Clinical Procedures for Predictable Results. *Journal of Esthetic and Restorative Dentistry*. 15: 338-352.
7. Laghzaoui S, Chafii A, Ghattas S, El Matouis and Bennani A. (2021). Minimally Invasive Dental Prosthesis: Overlay,Veneerlay,Tabletops.*Journal of Oral and Dental Health Research*. ;3(2): 129.
8. Goldstein MB. (2007). No-prep/ minimal-prep: the perils of oversimplification. *DentToday*; 26:10.
9. Kaushik P, Singh R, Soujanya E, Prasad LK. (2020). Lithium disilicate ceramic veneers for esthetic restoration of anterior teeth: Two case reports. *J Dent Res Rev*, 7:142-6.
10. Friedman MJ. (2001). Porcelain veneer restorations: a clinician's opinion about a disturbing trend. *J Esthet Restor Dent*; 13:318–327.
11. Pishevar L, Ghavam M, Pishevar A. (2014) Stress analysis of two methods of ceramic inlay preparation by finite element. *Indian J Dent Res*.25(3):364.
12. Sokolowski G, Krasowski M, Szczesio-Wlodarczyk A, Konieczny B, Sokolowski J, Bociong K.(2021) The Influence of Cement Layer Thickness on the Stress State of Metal Inlay Restorations—Photoelastic Analysis. *Materials*.14(3):599.
13. Belvedere PC. (2001)Contemporary posterior direct composites using state-of-the-art techniques. *Dental Clinics of North America*;45(1):49-70.
14. Da Silva D, Ceballos L, Fuentes M. (2021) Influence of the adhesive strategy in the sealing ability of resin composite inlays after deep margin elevation. *J Clin Exp Dent*.e886-e893.
15. Rocca GT, Baldrich B, Saratti CM, Delgado LM, Roig M, Daher R, et al. (2021) Restoration's thickness and bonding to the tooth substrate are determining factors in minimally invasive adhesive dentistry. *J Prosthodont Res*.65(3):407-14.
16. Magne P.(2006) Composite Resins and Bonded Porcelain: The Postamalgam Era?. *Journal of the California Dental Association*;34(2):135-47.
17. Veneziani M. (2017) Posterior indirect adhesive restorations: updated indications and the Morphology Driven Preparation Technique. *Int J Esthet Dent*;12(2):204-30.
18. Samartzi T, Papalexopoulos D, Sarafianou A, Kourtis S. (2021) Immediate Dentin Sealing: A Literature Review. *CCIDE*.Volume 13:233-56.
19. Differences of direct and indirect resin composite and its effect on esthetic restoration,*International Journal of Community Medicine and Public Health*, 2021 | Vol 8 | Issue 9

20. Souza R, Özcan M, Michida S. (2010) Conversion Degree of Indirect Resin Composites and Effect of Thermocycling on Their Physical Properties. *Journal of Prosthodontics*. 19:218-25.
Rosentritt M, Esch J, Behr M, Leibrock A, Handel G. (1998) In vivo color stability of resin composite veneers and acrylic resin teeth in removable partial dentures. *Quintessence international*;29(8):517-22.
21. Hosoya Y.(1999) Five-year color changes of light-cured resin composites: influence of light-curing times. *Dental materials: official publication of the Academy of Dental Materials*. 15(4):268-74.
22. Kolbeck C, Rosentritt M, Lang R, Handel G. (2006) Discoloration of facing and restorative composites by UV-irradiation and staining food. *Dental materials: official publication of the Academy of Dental Materials*.22(1):63-8.
23. Zanin FR, Garcia Lda F, Casemiro LA, Pires-de-SouzaFde C. (2008) Effect of artificial accelerated aging on color stability and surface roughness of indirect composites. *The European journal of prosthodontics and restorative dentistry*.16(1):10-4.
24. Peutzfeldt A. (2001) Indirect resin and ceramic systems.
25. Almiro M, Marinho B, Delgado AHS, Rua J, Monteiro P, Santos IC, et al. (2022) Increasing Acid Concentration, Time, and Using a Two-Part Silane Potentiates Bond Strength of Lithium Disilicate-Reinforced Glass Ceramic to Resin Composite: An Exploratory Laboratory Study. *Materials*. 15(6):2045.
26. Papia E, Larsson C, du Toit M, von Steyern PV. (2014) Bonding between oxide ceramics and adhesive cement systems: A systematic review. *J Biomed Mater Res*. 102(2):395-413.
27. Wang B, Fan J, Wang L, Xu B, Wang L, Chai L. (2022) Onlays/partial crowns versus full crowns in restoring posterior teeth: a systematic review and meta-analysis. *Head Face Med*. ; 18(1).
28. Dioguardi M, Alovizi M, Troiano G, Caponio CVA, Baldi A, Rocca GT, et al. (2021) Clinical outcome of bonded partial indirect posterior restorations on vital and non-vital teeth: a systematic review and meta-analysis. *Clin Oral Invest*. 202125(12):6597-621.
29. Alhamdan MM, Alghuwainem N, Alharbi M, Hummady S. (2024) Clinical Outcome of Indirect Bonded Porcelain Restoration Versus Full-Coverage Crown on Endodontically Treated Teeth in Posterior Areas: A Systematic Review. *Cureus*.
30. Ferraris F. (2017) Posterior indirect adhesive restorations (PIAR): preparation designs and adhesion clinical protocol. *Int J Esthet Dent*;12(4):482-502.
31. Liaropoulou YM, Jiménez AK, Chierico F, Blatz MB. (2025) The Multilayer Flowable Injection Technique for Highly Esthetic Restorations. *J Esthet Restor Dent*.