

Partially Coverage Restoration: An Esthetically Conservative Treatment for a Complex Cavity Restoration

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Abstract

Dental materials have been continuously developing over a long period of time. Every effort has been made to develop the physical and mechanical properties of the materials to mimic the natural tooth substances. However, that has not yet been achieved, making it necessary to apply conservative dental treatments. Conservative treatments are procedures which minimize the amount of defective tooth structure removed while maximizing the remaining amount of intact tooth structure, and defining the margin of the restoration at the supragingival level. In a substantially destructed tooth, the direct restoration, which is the most conservative restoration, has the limitations on the retention or creation of the proper contour of the restoration. The indirectly partial coverage restoration has recently gained in popularity. This treatment preserves the tooth structure while allowing reconstruction of the destructed structure to enable correct and proper tooth functioning and also provides a satisfactory cosmetic appearance. The purpose of this paper is to review and compare the various conservative techniques of partial coverage restorations and the full coverage treatment with crowns.

Keywords

Conservative Treatment, Partially Coverage Restoration, Complex Cavity, Onlay, Veneer

1. Introduction

A conservative treatment is a restorative procedure which limits the amount of defective tooth structure removed and maximizes the remaining amount of intact structure of the tooth, while ensuring that the features of the cavity are still appropriate for receiving restorative materials. This manner of treatment pro-

vides many advantages including reduction of trauma to the pulpal and circumferential tissues and avoids weakening the tooth remnant [1].

A direct restoration is the most conservative treatment. The defective parts of the tooth structure, including the brittle material, are removed as necessary to create a correct abutment, and the restorative materials replace the original tooth structure, ensuring the similar structure, functioning and appearance to the original tooth [2]. However, there are limitations imposed by the extent of the necessary destruction of the tooth structure, which may be substantial, or where it is necessary to alter the occlusion of the patient.

When the tooth structure has been substantially destructed, a direct restoration is difficult to perform to create the proper contours, contact and occlusion of the original. In this case, an indirect restoration is considered since it is better able to create more correct features for better functioning [3]. Indirect restorations can also be partial, using veneers, inlay or onlays. Such partially indirect restorations have become popular for reconstruction of large defects, allowing the conservation of the remnant intact tooth structure [4]. The margins of partially indirect restorations are commonly at the supra-gingival level, which provides many advantages; less danger to the periodontal tissue, convenient access for finishing the margins, enabling easier and more effective daily cleaning and annual checking, thereby, reducing the occurrence of secondary caries. In addition, the remaining tooth structure can be used as a guide to create physiologic tooth contours to maintain the individual features [5].

A partially indirect restoration is very different from a full coverage restoration. For the cavity design, there is no exact preparation pattern in partially indirect restorations (which are also termed partial coverage restorations). The cavity design follows the defective area margins and the outline of any old restorations. The preparation must be carefully designed to cover the weak structure and with no undercut formation. The final restoration is required to be passively delivered into a cavity [6], and is commonly retained in the cavity by the efficiency of either luting cement or an adhesive system [7]. The partial coverage restoration is fabricated to replace the destructed tooth structure so that the natural tooth structure is preserved. A full coverage crown, however, requires the core to be built up with restorative material to reconstruct the features of the tooth prior to removal of the circumferential tooth structure. The surrounding intact tooth structure is then removed to leave the restorative materials as the core to maintain the crown.

This article is a review of the techniques for the conservation of the partial coverage restorations compared with the full coverage crowns. Along with the review, some cases of the partial coverage restorations are demonstrated and all figures were received the consents from patients.

2. Conservative Porcelain Veneer

A natural tooth is composed of two mineralized layers; enamel and dentin, which provide a protective cover for the vital soft pulp tissue at the center of the

tooth. The pulpal tissue is the source of nutrient maintaining the viability of the tooth. The enamel is a translucent inorganic substance which is extremely hard, inflexible and brittle substance, constituting the outer layer of the tooth, and which provides the structural strength of the tooth. The dentin is an opaque yellowish-color substance underlying the enamel, and is softer and more flexible than the enamel. The flexibility of the dentin protects against shattering of the enamel [8].

The translucency of the enamel creates the cosmetic characteristics of the teeth, an important factor in restorative treatments. Every endeavor is made to imitate the features of enamel when applying synthetic restorative materials. Until now, dental porcelain has been the dental material most successful in mimicking the natural look of teeth [9].

Restorations for anterior teeth require not only good esthetic appearance but must also manifest the essential functions of the natural tooth, such as strength, coefficient of thermal expansion, being totally impermeable to food discoloration, total stability under stress, and so on. Dental porcelain has been developed to have these essential mechanical properties, as well as exceptional translucency allowing it to be used as a veneer, as well as a bulk tooth material replacement.

A porcelain veneer is a thin porcelain piece crafted to create the natural look of the patient's own teeth. It is a conservative treatment compared with the full coverage crown. Porcelain veneers are used to modify the color, shape or surface texture of a tooth (Figure 1). It is also able to slightly alter the alignment or the position of teeth including closing spaces between adjacent teeth. In preparing a tooth for a porcelain veneer, the labial surface is reduced by 0.3 - 0.7 mm. The depth of the cavity should be kept at the enamel level to ensure excellent bonding



Figure 1. The preparation for the porcelain veneer to correct the lateral-peg-shaped problem (a). Only the enamel on the labial surface is removed to create the distinct margin and space for the porcelain (b) and (c).

between the veneer and the remaining natural tooth surface. Incisal clearance of 1.5 mm is performed to alter the length of the tooth as needed [10]. The margins of the preparation terminate at the intact tooth structure. The position of the gingival finishing line should be hidden by placing it at the same level of the free gingiva or the designed subgingival margin. The proximal finishing line can be placed lingually to the contact area for the convenience of finishing.

The porcelain veneer is a retentiveless restoration, retained in a place by an adhesive system only. The longevity of the restoration mainly depends on the quality of the bonding material and technique.

3. Full Coverage Crown

A full coverage restoration is a fully extracoronal restoration. The destructed tooth structure is preliminarily replaced by directly restorative materials to create the fully anatomic tooth, following which the circumferential tooth structure is cut off, as in a crown preparation. The full covered crown commonly operates in a devastated tooth where the destructed tooth structure frequently occurs as an intracoronal cavity, class II cavity. In this situation, the crown preparation often removes the circumferentially intact tooth structure whilst leaving the restorative material as a core to retain the crown restoration (Figure 2 and Figure 3). This unfortunately results in the physical and mechanical properties of the restorative materials on the remaining tooth structure being incomparable to the natural tooth structure.

Any technique which is able to replace the lost tooth structure and remove less of the intact tooth structure would provide great benefit to the patient.



Figure 2. Patient complained about the second premolar tooth which looked turning down the alignment when she was smiling (a). This tooth needs to be built up at the core (b) before the crown preparation. For the final preparation, the majority component of the abutment is restorative material while the intact tooth structure on facial and lingual surfaces is removed (c) to retain the porcelain crown (d).

4. Partially Coverage Restoration

The manner of managing the partial coverage restorations is different from the full coverage crown. The defective area is replaced by the restoration without removing the circumferential intact tooth structure. The weak tooth structure, particularly the dental cusps, sometimes needs to be covered when the cavity extends beyond 1/3 of the distance from the cusp tip to the central groove. The margin feature of the functional cusp reduction is a shoulder margin which functions as a ferrule to wrap around the functional cusp with the height of the axial wall at least 1 mm (Figure 4 and Figure 5).



Figure 3. The second premolar tooth has a large resin composite restoration (a). This restoration needs to be replaced as a core restoration. For the crown preparation, the intact tooth structure on the lingual surface has been removed (b) and (c) before placing the porcelain crown (d).

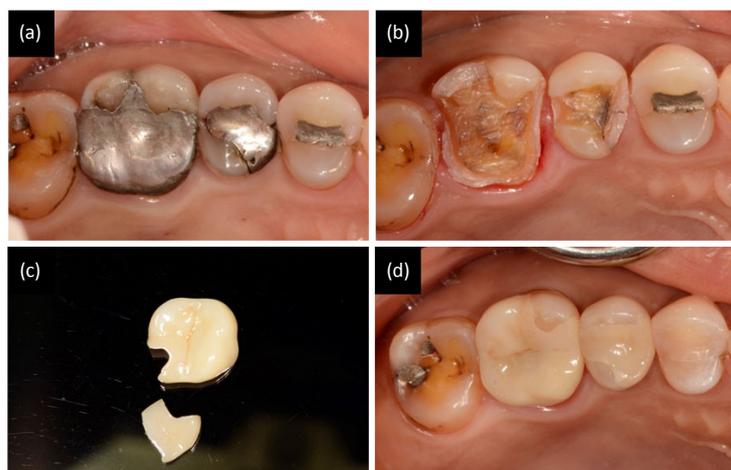


Figure 4. The secondary caries underneath the amalgams of the upper second premolar and first molar teeth (a). After removing the old fillings and decay, the cavities are prepared for porcelain inlays and onlays (b). The zirconia inlay and onlay are bonded using resin cement (c) and (d).

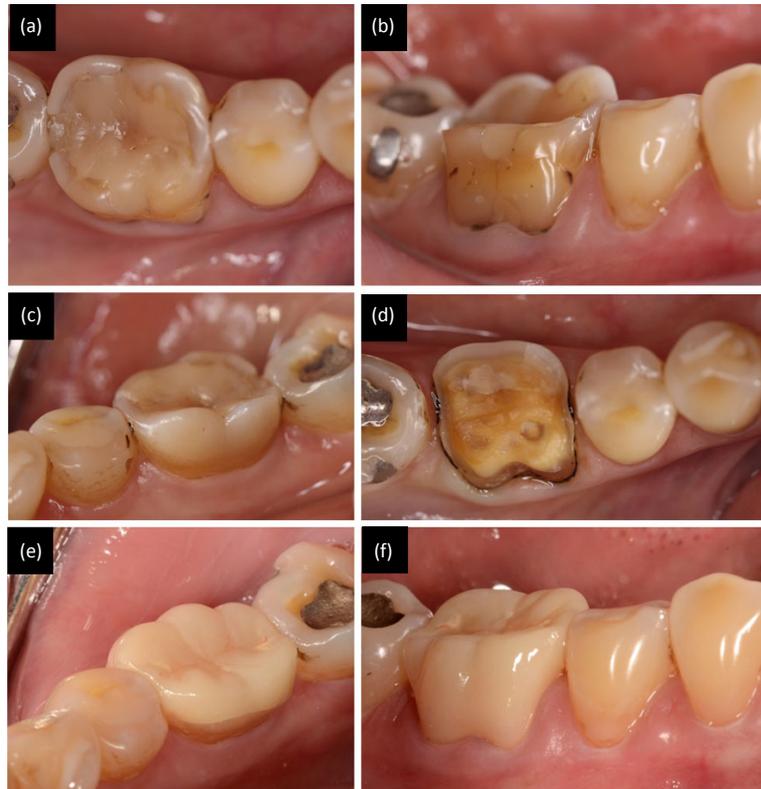


Figure 5. The lower first molar tooth has large resin composite restorations on the occlusal, distal and buccal surfaces with the ditching at the distal restoration and the secondary caries under the buccal restoration (a), (b) and (c). The tooth preparation for the porcelain onlay keeps the intact tooth structure on the lingual surface (d). The zirconia restoration was delivered with the resin cement (e) and (f).

If the defective area is close to the pulpal tissue, the pulpal protective material is used together with the foundation material to follow the topography of the defective area. The foundation material protects the dental pulp tissue. It also blocks out the undercut and creates correct features for receiving the restoration (**Figure 6** and **Figure 7**).

From all above, the partial coverage restorations bring many advantages to patients. However, there are some limitations of this type of restoration when compared with the full coverage crown (**Table 1**). For the maximum profit to patients, the carefully treatment plan is the vital step to select the most suitable treatment for the individual patient.

5. Conclusions

The partial coverage restoration is a conservative treatment. It not only can retain the mechanical functions and properties of the natural tooth, but also has the good esthetic appearance which is important to patients.

The natural tooth structure far excels any synthetic or manufactured substance, and as such every effort should be made to retain the maximum amount of that in any restorative procedure. As well as preserving the natural tooth

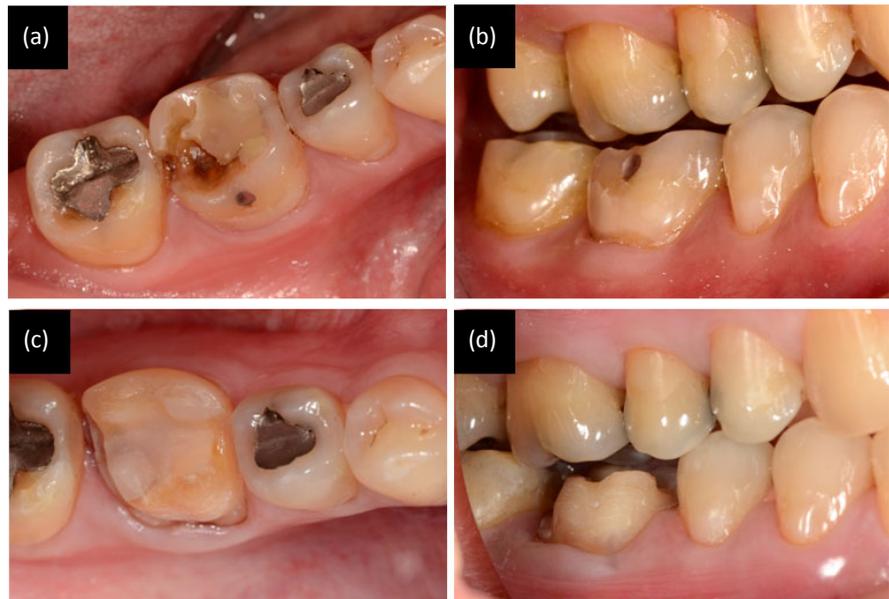


Figure 6. The lower first molar has a defective restoration and secondary caries on the occlusal surface. The outline of the cavity covers all cusps due to a small amount of remaining intact tooth structure (a). The outline also involves the large resin composite on the buccal surface (b). All defective restorations and the lesions are removed from the lower first molar. The foundations are created with the glass ionomer cement (Fuji II LC) (c) and (d).

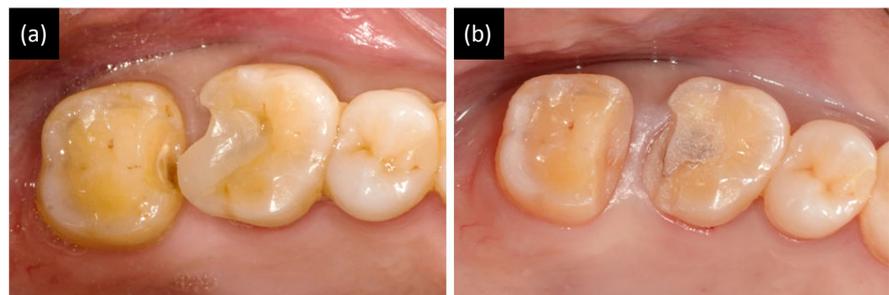


Figure 7. The defective restorations and lesion on the upper first and second molars (a). After they have been removed, the glass ionomer cement (Fuji II LC) is applied to create the foundation for the restorations (b).

Table 1. The comparison between the partial coverage restoration and the full coverage crown.

Partial coverage restoration	Full coverage crown
1. Removing the destructed tooth structure by following the outline of the defective area and old restoration.	1. Removing the circumferential tooth structure.
2. The supragingival margin is common ensuring <ul style="list-style-type: none"> - less danger to the periodontal tissue [1], - finishable margin [10], - daily cleanable margin, - easy check up and detection of dental caries. 	2. The gingival-level margin is common, but <ul style="list-style-type: none"> - may be harmful to the periodontal tissue, - difficult to access to finish the margin, - difficult to access for daily cleaning, - difficult to check up and detect the dental caries.
3. Remaining tooth structure used as a guide to create physiologic tooth contour [2] and [5].	3. Suitable when needing to change the occlusion or alignment of the tooth [10].
4. Requiring an efficient adhesive system [7].	4. Conventional luting cement is sufficient [10].

structure, reconstructing the tooth to ensure full mechanical functioning and stability is of great importance, as is achieving a natural and pleasing cosmetic appearance. The partial coverage restoration is a conservative treatment which, when utilized appropriately, can achieve all of these outcomes: retaining the mechanical functions and properties of the natural tooth and a good esthetic appearance which is important to patients.

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