

A New Design for Anterior Laminate Fixed-Partial dentures; PTU Type I

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Abstract:

A new fixed-partial denture design using laminates is described for the replacement of a missing anterior tooth. In this article advantages, disadvantages, indications and contraindications of the new design have been discussed. This method is best suited for cases with missing incisors and esthetically compromised abutment teeth.

Key Words: Anterior bridge; Porcelain bridge; Esthetic bridge

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INTRODUCTION

In recent years, after introducing the enamel and dentin bonding materials [1,2], esthetics along with conservation of tooth structures have become a main focus in restorative dentistry. The use of porcelain laminate veneers (PLVs) in treating unsightly anterior teeth is a well established method. These veneers are primarily used to correct unaesthetic surface defects in anterior teeth, as well as to mask discoloration, stains, or an accidental loss of incisal edges, and are completed with a minimum of tooth reduction [3-5]. PLV has been used as an esthetic alternative to composite filling restorations, since they can provide the most natural replacement for teeth, and are biocompatible, wear resistant, and color stable. Although different methods have been designed and employed for replacing an anterior missing tooth, it is still a main issue in restorative dentistry. Removable and fixed-partial dentures, lingually fixed bridges and newly Fiber Reinforce Composite (FRC) restorations are examples of various techniques for anterior

tooth replacement [6-8,11].

In the acid-etch-retained metal bridges (lingually fixed), sufficient space is required between the maxillary and mandibular incisors to allow for the cast metal framework. On the other hand, the conventional fixed partial denture technique seems to be a radical procedure since it requires an extensive reduction of the abutment teeth and may be associated with several other problems usually related to full coverage restorations. In this article a new approach which has effectively been used for replacing missing anterior incisors has been described.

Advantages of the new laminate fixed-partial denture (LFPD) laminate fixed-partial denture technique are:

- Providing natural and stable color and is resistance to stain.
 - The ability of reshaping and correcting the abutment teeth.
 - Withstanding wear and abrasion.
- Much less absorption of fluids than any other material.
- Acceptable biocompatibility with gingival



Fig.1: Two missing lateral incisor.

tissues.

- Simplicity of technique.

The disadvantages of this technique are:

- Lower repair ability of porcelain compared to other materials such as composite based materials.
- The color cannot be easily modified once the restoration bonded in position.
- Difficult fabrication and high expense.

MATERIALS AND METHODS

Patient Selection:

The main indication for this design is the replacement of anterior missing central or lateral incisors (Fig. 1). The abutment teeth must be periodontally healthy and stable and their vitality, mobility, crown length and shape should be assessed. The crown length and shape delimitate the bonding surface and are important factors in the retention and long-term prognosis of the LFPD. The appearance of the teeth should be evaluated; unpleasant appearance is more advantageous than healthy good-looking enamel. Excessive incisal contact in protrusive movements should be avoided. Study casts should be obtained and mounted on a semi-adjustable articulator for the para-clinic assessment and completion of the clinical examination

Tooth Preparation:

Tooth preparation consisted of labial and proximal reduction. Tooth structure reduction should not be more than 0.5 mm in depth on the labial surface in order to keep the preparation within the enamel thickness.

A reduction of 0.5mm would usually suffice except for specific cases which require a thicker porcelain laminate. Preparation could be obtained by using a LVS, the special three-tier diamond depth cutter. In small teeth such as maxillary lateral and mandibular incisors, where the thickness of the enamel is minimal, a 0.3mm reduction may only be needed which can be acquired using a LVS.2 diamond depth cutter. After completing the initial cuts, the remaining enamel was then reduced to the same depth, using a coarse round ended diamond. Finer grit diamond burs should be used at marginal areas.

The labial reduction should be extended to the proximal surface in order to hide the margin in the proximal line angles.

For Cervical reduction a knife-edge finish line was prepared on the cervical margin using a fine grit diamond point. Care should be exerted to avoid exposure of the dentin.

Except for cases which require a restoration due to an incisal defect, the preparation is terminated on the incisal edge.

When the laminate preparation was completed, a shallow class III cavity was made on the proximal surface of each abutment teeth from a labial direction with a fine pear shape diamond point (Fig. 2). These cavities should be facing each other on the abutment teeth.

Impression:

An accurate elastomeric impression material such as additional silicon materials are recommended, there is no need for gingival retraction as the porcelain veneer should be finished supra-gingivally..

Laboratory Procedure:

In order to fabricate the pontic, a metal framework bar (this study used Non-precious, THERMABOWD-VNOTM) was fabricated. The framework was tried in the patient's mouth and the fitness was examined.

The framework was sent to the laboratory and porcelain laminate bridges consisting of two laminates and a single pontic were fabricated;



Fig.2: Shallow cavities on the proximal surface and laminate preparation; A: schematic drawing, B: in patient.

A proper shade should be selected (Fig 3). The final visit includes checking the finished restoration for fitness and shade. The bridge was placed in the correct position with a drop of water prior to cementation and the patient was finally allowed to view.

Cementation:

Cementation involves the routine enamel dentin bonding procedure and dual cure resin. The abutment teeth were polished, rinsed and dried. Strips are placed adjacent to the abutments to prevent etching of the adjacent teeth. The enamel bonding (Excite, Vivadent, Liechtenstein) and dual cure resin cement (3M ESPE, Stpaul, USA) were used to bond the bridge to the abutment teeth. The coupling agent (Ceramic Etch Gel, CDI, Cosonete, USA) was applied to the internal surface of the laminate according to the manufacture's instructions. The labial surface of the abutments were etched for 15 seconds, rinsed for 30 seconds and dried. The enamel-dentin bonding agent was applied on the etched labial

surface according to the manufacturer's instructions. The laminate bridge was filled with the dual cured resin material and then seated gently on the correct position. The resin was cured using visible light (Fig 4).

The margins were trimmed with micro-fine diamond burs and diamond polishing paste. Inter-proximal surfaces were also polished with finishing strips. The occlusion was checked in centric, lateral and protrusive movements.

DISCUSSION

The loss of an anterior tooth is always a dramatic occasion which requires a conservative solution on behalf of the dentist in order to provide the best possible care for the patient. A fundamental principle in replacing missing tooth structure or missing teeth is to restore the function and esthetics at minimal biologic cost. Since the developments of acid etch technique in dentistry, many conservative methods have been employed.

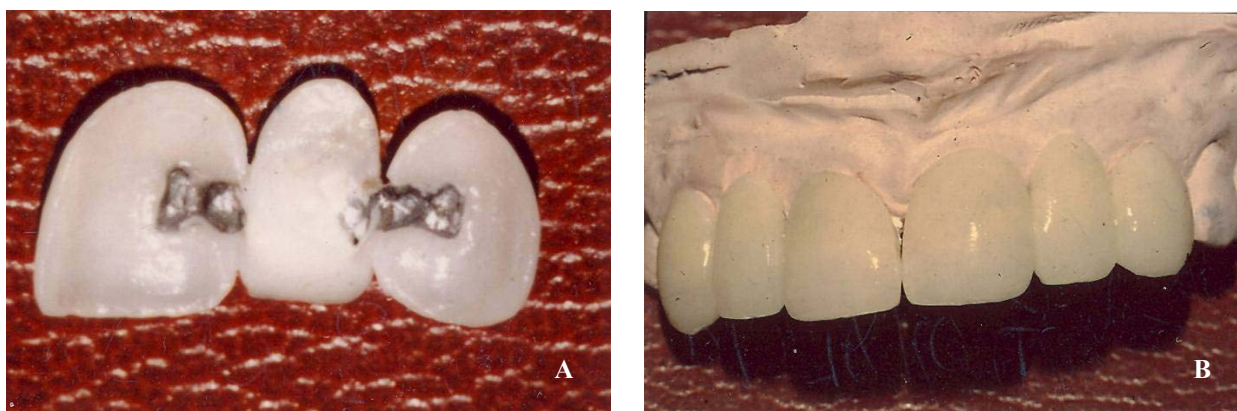


Fig. 3: Bridge consists of two laminate and a pontic (A); the bridge on the cast (B)



Fig. 4: Finished restoration of PTU type 1 bridge.

Some of them are temporary treatments and others like metal adhesive bridges have some restrictions which most often make the method impractical.

The perforated metal framework and a more recent method which uses etching instead of perforation to improve retention have been widely used. However these etch-retained metal bridges require a certain amount of space between the maxillary and mandibular incisors to allow for positioning the cast metal frame. Nevertheless, the increasing failure rate of the etch-retained metal bridges restricts their routine application. Several studies confirm the excellent clinical performance of porcelain veneers [3,4] which encouraged the fabrication and application of etch-retained porcelain laminate bridges to restore anterior missing teeth [9,10]. Porcelain laminate fixed-partial dentures are not stress-resistant because their joints are made of porcelain and can fracture or crack under masticatory forces. Laminate is extremely brittle but after bonding to enamel surfaces, its strength increases and it is able to resist forces; but in porcelain laminate bridges a large amount of stress develops in the joints due to their shape and design, therefore, constitute the weak points of these bridges and less resistant to forces.

The labial path of insertion in this new design makes it suitable for cases in which the abutment teeth are not parallel and provides them with excellent aesthetics. The most important factors in selecting cases are: sound

enamel and adequate crown length and shape of the abutment teeth which could have an important impact on the prognosis.

Recently new glass fiber composite materials with high flexural strength and low water sorption have been introduced [11], but they still cannot compete with porcelain.

Considering the advantages of this method including conservation of tooth structure, improved aesthetics and simplicity of the technique, this method could be recommended for replacing an anterior missing tooth, especially when placement of implants are contraindicated.

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