

## *International Journal of Scientific Research and Reviews*

### **Designing Different Types of Cantilever Prosthesis: Multiple Case Study**

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#### **ABSTRACT**

A critical edentulous case for any dentist is placing a Cantilever prosthesis. Preparing 2 crowns for a single tooth replacement is a common practice, when it can be done with only one crown preparation with similar results. Advancement in implant prosthesis have proven to be a better solution in these kinds of cases. In cases where implant prosthesis cannot be performed or are contraindicated are the prime contenders for cantilever prosthesis. This article provides 3 different types of these cases – (1) Maxillary Canine supported Lateral Incisor (2) Maxillary 2<sup>nd</sup> Premolar supported 1<sup>st</sup> Premolar (3) Mandibular 1<sup>st</sup> Molar and 2<sup>nd</sup> Premolars supported 2<sup>nd</sup> Molar.

**KEYWORDS:** Cantilever, Fixed Prosthesis, Crown, Edentulous, Ante's Law.

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## INTRODUCTION

Single missing teeth with normal adjacent tooth are one of most common cases that are seen by a general dentist. For these types of cases the most common treatment planning is a conventional fixed partial denture, taking support from both sides. A common situation that a dentist finds himself in is the crown preparation of two completely normal tooth for the replacement of single teeth. Other treatment options for consideration include Implants, Removable Partial dentures, Resin bonded bridge and Cantilever bridge. All of these options have their own indications as well as limitations. The treatment plan for the patient is based on factors such as the clinical site, bone, age, cost etc.

To combat the above-mentioned indications, Cantilever proves to be a more appropriate option. Cantilevers are less invasive, less expensive and still achieves similar results as compared to Implants and Conventional Fixed bridges. A Cantilever bridge in dental reference is a bridge that is supported only from one side and left unsupported from other side. There is an important correlation between the biology and mechanics that comes into play when the dentist chooses the option for a Cantilever bridge. The most common places where a Cantilever is placed is missing lateral supported by canine.

This article will be presenting different types of Cantilever bridges under different clinical circumstances.

### ***CASE 1- Maxillary Canine supported Lateral Incisor***

Patient 1

Sex- Male

Age – 40 years

Chief complaint – Replacement of missing tooth

History – Non-contributory to treatment planning

Material Used – Porcelain Fused to Metal

Treatment – 2 Unit Cantilever Bridge.

Recall - every 6 months follow up for first 5 years.

The most common example of a cantilever bridge is a Maxillary canine supported Lateral Incisor. According to Ante's law, the peri cemental area the abutments should be equal or more than that of the tooth to be replaced. So, in this case the peri cemental area of Canine is 204 sq.mm (Table 1) and the peri cemental area of Lateral Incisor is 112 sq.mm (Table 1); which is almost half the area of the Canine. So as per Ante's Law, this type of Cantilever bridge should have a good prognosis. In this case, as we can see, it is an anterior tooth, we have to consider the same shape and size as that of

the missing space to maintain an adequate esthetics and function. We can manipulate the size and shape in posteriors where esthetics is not much of a concern.



Figure 1. Missing Lateral incisor replaced by Cantilever bridge (Front view), Lower picture presents the tooth preparation on Canine and upper picture depicts the restored canine with lateral Incisor.



Figure 2. Missing Lateral incisor replaced by Cantilever bridge. (Lateral view)

**CASE 2- Mandibular 2<sup>nd</sup> Premolar and 1<sup>st</sup> Molar supported Mandibular 2<sup>nd</sup> Molar**

Patient 2

Sex- Female

Age – 45 years

Chief complaint – Replacement of missing tooth

History – Non-contributory to treatment planning

Material Used – Porcelain Fused to Metal

Treatment – 3 Unit Cantilever Bridge.

Recall - every 6 months follow up for first 5 years.

In this case 2<sup>nd</sup> mandibular molar has been replaced with premolar and molar. According to Ante's Law, Peri cemental area of Mandibular 2<sup>nd</sup> molar is 282 sq.mm (Table 1), the peri cemental area of 2<sup>nd</sup> premolar is 135 (Table 1) and for 1<sup>st</sup> molar it is 352 (Table 1). So, consequently the total for the abutments is larger than missing teeth. Also, you can notice in Figure 3, the size of 2<sup>nd</sup> molar has been kept small both mesio-distally as well as bucco-lingually thus decreasing the amount of force it will exert on the abutment. As this is the last teeth in the arch, the size can be easily manipulated without any significant change in occlusion and mastication. The third molar in the clinical picture (Figure 4) was not considered in the occlusion as it was decayed and indicated for extraction.



Figure 3. Replacing 2nd molar with 2nd premolar and 1st molar abutment



Figure 4. Clinical view after Cantilever bridge insertion

### **CASE 3 –Maxillary 2<sup>nd</sup> Premolar supported 1<sup>st</sup> Premolar**

Patient 3 (2015)

Sex- Male

Age – 48 years

Chief complaint – Replacement of missing tooth

History – Non-contributory to treatment planning

Material Used – Porcelain Fused to Metal

Treatment – 2 Unit Cantilever Bridge.

Recall - every 6 months follow up for first 5 years.

In this case, we can see that it does not follow Ante's law. The Peri cemental area for 1<sup>st</sup> premolar is 149 sq.mm.(Table 1) and that of 2<sup>nd</sup> Premolar is 140 sq.mm (Table 1), whereas Ante's Law dictates that the peri cemental area of abutment (2<sup>nd</sup> Premolar) should be equal or more than that of the missing tooth (1<sup>st</sup> premolar). However,the decision to place a Cantilever bridge was taken because of the lack of opposing forces against Maxillary 2<sup>nd</sup> premolar. So, the only force 2<sup>nd</sup> Premolar has to adjust to is the force coming from the Maxillary 1<sup>st</sup>Premolar. Prospectively,If the patient wants to replace the mandibular missing teeth,the option for the fabrication of a Removable Partial Denture(RPD) can be presented considering it is a free end saddle. An RPD would not cause much pressure or force on the opposing teeth as free end RPDs are tissue supported and they distribute the forces over a larger surface area. Subsequently, If the patient is interested in an implant, the Maxillary 1<sup>st</sup> molar is supra-erupted, so the implant in any case would not make contact with the Maxillary 2<sup>nd</sup> Premolar.



Figure 5. 1st Premolar replaced with Cantilever on 2nd Premolar.

## DISCUSSION

Cantilever prosthesis may contribute to the initiation and progression of periodontal diseases, since risk with a cantilever design is certain <sup>2, 3</sup>. The treatment planning with cantilever bridges have been reported successful in the past<sup>4, 5</sup>. The most important factor to be considered and maintained is occlusion. It was mentioned in the literature that minimal functional contact<sup>6</sup>, reduction of the occlusal table<sup>7,8</sup> and emphasis was placed on different design considerations are the prime factors for the success.

Even though, Implants would be the best solution for these kind of single teeth replacements, they have their own limitations too. The most important aspect in an implant placement is Osteointegration. Considering the fact that optimum bone quality plays a vital role in osteointegration, the elderly or people who have been edentulous for a long period of time often present with low bone quality issues. Implant placement is a surgical procedure, hence factors such as medical and oral conditions, immunity, habits (Smoking, alcohol, tobacco) etc. play an important role in the success of an implant. Also, the cost of the procedure and material is comparatively higher than the rest of its counterparts, making it financially difficult for the patient.

**Table 1: The root surface area of periodontal membrane attachments of average normal teeth <sup>1</sup>**

Maxillary	Periodontal membrane attachment (sq. mm.)	Mandibular	Periodontal membrane attachment (sq. mm.)
Central incisor	139	Central incisor	103
Lateral incisor	112	Lateral incisor	124
Canine	204	Canine	159
First premolar	149	First premolar	130
Second premolar	140	Second premolar	135
First molar	333	First molar	352
Second molar	272	Second molar	282
Third molar	197	Third molar	190

## CONCLUSION

The technique of placing a Cantilever bridge offers real medium to long term benefits. In addition to their lower cost, they allow better predictability of esthetic results. As per the findings in this article, it can be concluded that cantilever bridges can be placed in situations where Antes Law is followed and the abutment is under mild forces (Case 1 and Case 3). A cantilever bridge demands extension onto the adjacent teeth only when there are excursive lateral forces, for group function occlusion (Case 2). The 5-year success rate in these kinds of cases are exponentially high.

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