



## Flexible Denture Induced Changes in Palatal Micro Flora Versus Conventional Complete Denture

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### KEYWORDS

Flexible denture,  
swab,  
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### ABSTRACT

The main purpose of this study is to evaluate which more hygienic denture base for complete denture wearers; (Poly methyl methacrylate or thermoplastic flexible denture base).

**MATERIAL AND METHODS:** Twenty complete dentures were constructed for ten patients, ten manufactured from Poly methyl methacrylate and other ten were constructed from flexible thermoplastic resin material. Three swabs were taken of two dentures for each patient, first swab at zero time, second swab after one week and the third swab after one month. The swabs were obtained from the palate of the patient and from the fitting surface of upper denture, to find out which type of denture bases were showing more Candida adhesion and bacterial accumulation especially streptococci and staphylococci.

**RESULTS:** In conventional denture the highest mean value was found in (At zero time) followed by (After 4 weeks), while the lowest mean value was found in (At 1 week). In flexible denture the highest mean value was found in (After 1 week) followed by (After 4 weeks), while the lowest mean value was found in (At zero time).

**CONCLUSION:** Both conventional and flexible dentures induced changes in palatal micro flora and formation of dental plaque but flexible dentures are more because of porosity which act like niches in which microorganism protected even from shear forces and oral hygiene measures.

### INTRODUCTION

Loss of teeth caused by many reasons as trauma, dental diseases, pathological layer, this is not only alters the psychological thought of the patients but also disturbs the esthetics, phonetics, and functional occlusion. Replacement of missing teeth is highly essential in order to restore the defect and regain function as best as possible<sup>(1)</sup>. The complete removable denture which was known as the most common type of treatment in edentulous patients<sup>(2)</sup>, Since ages poly methylmethacrylate (PMMA) used in fabrication of the denture<sup>(3)</sup>.

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The popularity of PMMA as denture base material was attributed to its ease of processing, low cost, light weight, excellent aesthetic properties<sup>(4,5)</sup>, low water sorption and solubility, and ability to be repaired easily. However, low thermal conductivity, inferior mechanical strength, brittleness, high coefficient of thermal expansion and relatively low modulus of elasticity makes it more prone to failure during the clinical service<sup>(6,7)</sup>. Clinical failure of PMMA dentures are most likely in the form of fracture either due to fatigue<sup>(8)</sup> or impact forces<sup>(9)</sup>. Thermoplastic resin appeared and its processing is nothing new in dental techniques<sup>(10)</sup>. Flexible dentures are excellent alternative for conventionally used methyl methacrylate dentures, which not only provide excellent aesthetics and comfort<sup>(9)</sup>, exhibit viscoelastic behavior, little changes on the mucosa<sup>(11)</sup> show excellent biocompatibility<sup>(12)</sup> but also adapt to the shape and movement of the mouth<sup>(11)</sup>.

On other hand, there are some disadvantages of flexible denture; the acrylic teeth are mechanically bonded to thermoplastic nylon; hence the teeth can come out of the prosthesis<sup>(13)</sup>. The valplast shows clinically significant chromatic instability, so the flexible removable partial denture might show staining and discoloration with time<sup>(14)</sup>. Polyamide does not adhere to acrylic resins in the same way that new increments of flexible resin cannot be added to a finished denture, even if the denture is made from the same material, usually preventing rebasing and repair<sup>(15)</sup>.

Human oral cavity contains a mass of microorganisms, which may be altered by application of the complete removable denture in edentulous patients. Complete denture can act as a predisposing factor in the overgrowth of several oral microflora particularly *Candida*, non-aureus *Staphylococci*,  $\alpha$ -hemolytic streptococci, gram negative coccobacillus, non-pathogenic *Neisseria*, and *Corynebacterium*, which emphasize the user's denture hygiene<sup>(16)</sup>. A denture base seated on oral cavity leads to changes in weakening the natural hygienic effect

of tongue and salivary flow, especially, by inducing formation and deposit of biofilms on both prosthetics and adjacent mucosa<sup>(17)</sup>. The surface irregularities increase the probability of bacterial accumulation, and *Candida* adhesion than smooth surface<sup>(18)</sup>.

### Denture plaque

Denture plaque is a dense, complex heterogeneous layer of microorganisms and their metabolites, and it contains more than 10<sup>11</sup> organisms/g (wet weight)<sup>(18)</sup>, plaque on dentures acts as a film for stain deposition<sup>(19)</sup> and if left in a particular area, may calcify and become "tartar" or calculus, which requires dental scaling for removal<sup>(20)</sup>. The most problematic denture plaque occurs on the maxillary fitting surface and composition increased likelihood of the presence of yeast<sup>(21)</sup>. The predominant cultivable microflora of denture plaque includes *Streptococcus* spp., *Staphylococcus* spp., Gram-positive rods, *Veillonella* spp., Gram-negative rods and yeasts<sup>(22,23)</sup>. Denture plaque and poor denture hygiene is associated with stomatitis (*Candida* infection), may also serve as a reservoir of potentially infectious pathogens, an effective oral hygiene regimen is important to control denture plaque biofilm and contributes to the control of associated oral and systemic diseases<sup>(24)</sup>.

## MATERIAL AND METHODS

Ten edentulous patients were enlisted in this study. All were overtly healthy and not in receipt of any antibiotics or using antiseptic mouth rinses. Subjects had a dental clearance for at least one year, a healthy palatal mucosa and had never previously worn prosthesis before receipt of a complete denture for this research. Complete upper and lower dentures were made for each patient from heat-cured polymethyl methacrylate acrylic and i-flex thermoplast. Plaque was collected by vigorous rubbing of a sterile cotton swab over the mid of sample was immediately transferred to a sterile tube containing normal saline, Sampling



was carried out on three occasions for each subject; immediately before insertion of the denture, 1 week after continuous wearing of the denture with no denture hygiene, and four weeks after wearing the denture whilst undertaking normal oral and denture hygiene. Replicate sampling of the palatal mucosa for each patient with carried both conventional and flexible dentures; the area to be swabbed is the palatal mucosa 2 cm x 2 cm template delimiting.

After third swap of conventional denture we leave the patients for two weeks as rest period for treatment and clearance, in this rest period patient should not use the denture except for eating, and patient should use antiseptic mouthwash and antifungal drugs.

## RESULTS

### (1) TAPC results

**Table (1)** The mean, standard deviation (SD) of TAPC in different groups.

Variables	TAPC				P-value
	Conventional acrylic denture		Flexible denture		
	Mean	SD	Mean	SD	
At zero time	4.99	0.37	4.89	0.45	<b>0.585ns</b>
After 1 week	4.81	1.82	5.99	0.35	<b>0.061ns</b>
After 4 weeks	4.98	0.42	5.44	0.53	<b>0.050ns</b>
<i>p-value</i>	<b>0.819ns</b>		<b>0.002*</b>		

\* Significant ( $p < 0.05$ ) ns; non-significant ( $p > 0.05$ )

#### A) Effect of time:

##### a) Conventional acrylic denture:

No statistically significant difference was found between (At zero time), (After 1 week) and (After 4 weeks) where ( $p=0.819$ ).

The highest mean value was found in (At zero time) followed by (After 4 weeks), while the lowest mean value was found in (At 1 week).

##### b) Flexible denture:

A statistically significant difference was found between (At zero time), (After 1 week) and (After 4 weeks) where ( $p=0.002$ ).

A statistically significant difference was found between (After 1 week) and each of (At zero time) and (After 4 weeks) where ( $p=0.005$ ) and ( $p < 0.001$ ) respectively.

No statistically significant difference was found between (At zero time) and (After 4 weeks)

where ( $p=0.073$ ).

The highest mean value was found in (After 1 week) followed by (After 4 weeks), while the lowest mean value was found in (At zero time).

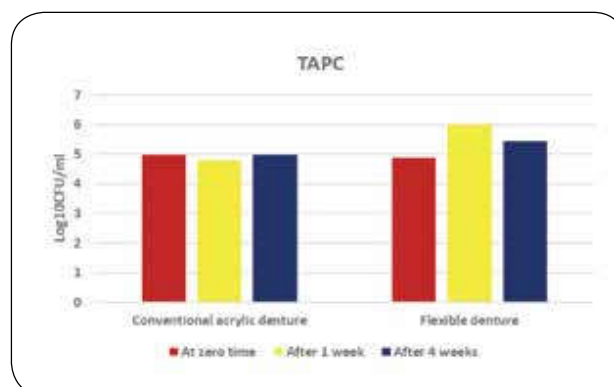


Fig. (1) Effect of time on TAPC for Conventional acrylic denture and Flexible denture

#### B) Effect of denture type:

##### a) First swap (At zero time):

- No statistically significant difference was found between (Conventional acrylic denture) and (Flexible denture) where ( $p=0.585$ ).
- The highest mean value was found in (Conventional acrylic denture), while the lowest mean value was found in (Flexible denture).

### b) Second swap (After one week):

No statistically significant difference was found between (Conventional acrylic denture) and (Flexible denture) where ( $p=0.061$ ).

The highest mean value was found in (Flexible denture), while the lowest mean value was found in (Conventional acrylic denture).

### c) Third swap (After four weeks):

- No statistically significant difference was found between (Conventional acrylic denture) and (Flexible denture) where ( $p=0.050$ ).
- The highest mean value was found in (Flexible denture), while the lowest mean value was found in (Conventional acrylic denture).

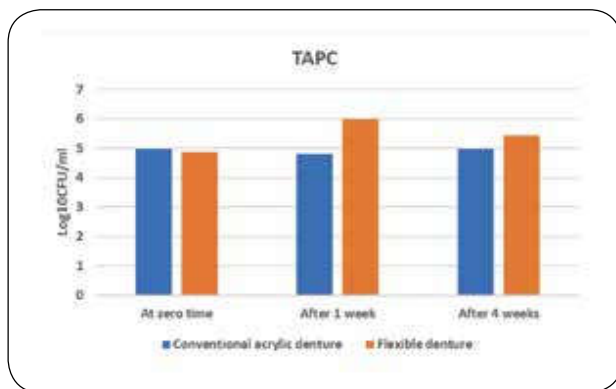


Fig.(2) Effect of denture type on TAPC for Conventional acrylic denture and Flexible denture

## DISCUSSION

As presented in the results of this study there was a statistically significant difference in microbial growth between two dentures this could be attributed to the:

Thermoplastic denture base favor increasing the amount of bacterial count when comparing to conventional denture base and this because of Porosity of the surface despite of the using of injection technique in manufacture.

Also increasing in count of microorganisms may be related the patient's oral condition

including diet, saliva secretion, saliva quality and efficiency of the cleaning procedure.

The presence of dentures (Flexible and conventional) on the oral mucosa alter the local environmental conditions due to inaccessibility of saliva and causes frequent pressure on gums lead to the denture stomatitis or by plaque on the dentures and this agree with the study of Nikawa, et al<sup>(18)</sup>.

Hence stomatitis (inflammation of palatal mucosa) induced by wearing the dentures. The mean value of total bacterial counts is high and the mean value of candida increased and presence of Staph. Species and Strept. Species. Which are common causes of gingival margin plaque resulted in gingivitis and this is agree with the study of Water et al<sup>(25)</sup>.

This study showed the present of the Strept and Staph species. In palatal plaque in conventional denture patients, and this is also reported by both Fatma et al, and Aas, et al in their studies<sup>(26,27)</sup>.

Candida spp. was also increased in mean value in plate in both dentures this result was similar to other studied by Kanlar et al, Fatma et al and Bartlomlej et al<sup>(28,26,29)</sup>.

Dentures, especially acrylic conventional dentures are easily colonized by oral endogenous bacteria, Candida species and extra species such as streptococcus spp. or members of enterobacteriaceae. This microbial reservoir can be responsible for denture related stomatitis and aspiration pneumonia, a life threatening infection especially in geriatric patients and this is similar to that reported by Gornitsky et al<sup>(30)</sup>.

De Freitas F. showed that Candida biofilms had significantly higher growth on polyamide compared with PMMA indicating that poly amide could present a convenient surface for microbial colonization, and this agree with the result of this study. De Freitas found these differences would be attributed to the higher amount of residual monomers in PMMA which produced differences in the resin

surface-charge, being capable of reducing adhesion and inhibiting the growth of *Candida*. The results also showed that the denture cleanser solutions, with or without enzymes, were effective in controlling *Candida albicans* biofilm levels in both polyamide and PMMA resins<sup>(31)</sup>.

The mean value of total bacterial count (micro flora) of palatal plaque after four weeks with the dentures and normal hygiene were decrease in both dentures. That similar to the result cited by Coulter et al<sup>(32)</sup>.

After four weeks wearing of the flexible denture with normal oral hygiene the mean value of total plate counts and Strept. Species increases than at zero time, surface roughness may serve as reservoir with surface irregularities providing an increase microorganism retention and protection from shear force and this result agree with the result mentioned by Ozcan, et al<sup>(33)</sup>.

Szaline LA not agree with this study as he mentioned that thermoplastic resin has absence or low quantity of allergy-inducing residual monomer, lack of porosity, thus preventing the development of microorganisms and deposits.<sup>(34)</sup>

## CONCLUSIONS

- Both conventional and flexible denture bases induced changes in palatal micro flora and formation of dental plaque.
- Flexible denture base induced more changes in palatal micro flora and formation of dental plaque due to porosity which act like niches in which microorganisms protected even from shear forces and oral hygiene measures.

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