

Mucosal Thickness Changes in Flexible and Conventional Cobalt Chrome Removable Partial Dentures Wearers

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الخلاصة

الهدف: تهدف الدراسة الى تحديد التغييرات في سماكة الغشاء المخاطي وذلك باستخدام نوعين من المواد لقاعدة الطقم الجزئية المتحركة (الكوبالت كروم والمرنة) عند لبسها خلال فترة شهرين. مواد وطرائق العمل: ستة مرضى (ثلاثة رجال وثلاث نساء) شملت في هذه الدراسة، وكان عمر المجموعة، على مدى (٥٠) عاما. وقد تم اختيار المرضى عشوائيا من قسم التعويضات السنية في كلية طب الأسنان، جامعة الموصل. تمت دراسة تأثير لبس الطقم الجزئي المرن والكوبالت الكروم التقليدية RPDs (Co-Cr) على الغشاء المخاطي، وقاعدة التسجيل الخاصة من الاكريليك المرني تحتوي على ثلاثة ثقوب لتسجيل القياسات السريرية بأستخدام اداة القياس الرقمية ومتابعة لمدة شهرين بعد لبس طقم اسنان متحرك جزئي. النتائج: اظهرت النتائج أن هناك تغييرات كبيرة في سماكة الغشاء المخاطي في الجزء اللساني ومركز قاعدة طقم الكوبالت كروم الجزئي المتحرك، مع عدم وجود تغييرات كبيرة في سمك الغشاء المخاطي منطقة الثقوب الثلاثة. الأستنتاجات: هذه الدراسة خلصت إلى أن الطقم المرن هو علاج جيد في ادارة اختيار التعويضات السنية القابلة للإزالة. واستنتج من المريض حسب ملاحظاته ان لديه قناعة عالية لهذا الطقم اثناء وظيفته وفقا لملاحظات المرضى فيما يتعلق بالتعويضات الصناعية لطقم الكروم الكوبالت المتحركة.

ABSTRACT

Aim: The purpose of this study was to determine the mucosal thickness changes in two types of removable partial denture base materials (Cobalt Chrome and Flexible) wearers over a two months period. **Materials and Methods:** Six patients (three men and three women) were included in this study, old ages group was over 50 years. The partially edentulous patients were randomly chosen from the Department of Prosthodontics, College of dentistry, University of Mosul. The effect of wearing flexible and conventional cobalt chrome (Co-Cr) RPDs on the underlying mucosa were studied, special record base of visible light cured made for each patients with three holes were used to record clinical measurements using digital caliber and followed up for two months after insertion of denture. **Results:** The result of this study indicated that there are significant mucosal thickness changes in the central and lingual (palatal) positions of the Co-Cr RPDs groups; with no significant mucosal thickness changes in three holes of the Flexible RPDs groups. **Conclusion:** This study concluded that the flexible denture is a good optional treatment in removable prosthodontics management. Patient satisfactions with flexible removable partial denture during function were concluded according to patients remarks in relation to cobalt chrome (Co-Cr) removable prosthodontics type.

Keywords: Flexible Denture and Mucosal Thickness

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INTRODUCTION

If you are missing only a few teeth scattered over either arch (upper or lower teeth), or even if you have a minimum of two teeth on both sides of the arch, you can most inexpensively replace the missing teeth with a removable partial denture (RPD).⁽¹⁾

There are several types of RPDs. All of them use standard teeth as replacements for the missing natural teeth. The differ-

ences between them are the materials (Heat cured acrylic resin, cobalt chrome, or thermoplastic Nylon Valplast®) used to support the denture teeth and retain the RPD in the mouth.^(2,3)

Resorption of residual ridges is a complex and common biophysical process. The rate of resorption varies among different individuals and within the same individual at different times.⁽⁴⁾ Factors related to the rate of resorption are divided into

anatomic, metabolic, hormonal, and nutritional, functional, and prosthetic factors.^(4,5)

Moderate, intermittent forces exerted on the bony ridge by a prosthesis, may be stimulating and help to preserve rather than destroy the bony ridge, but excessive force causes resorption of the residual ridge.⁽⁵⁾ The resorption occurring beneath denture bases has been investigated in which there is decreasing in both high and density of the underlying bone.⁽⁶⁻⁹⁾ Also RPDs have been associated with the loss of periodontal attachment and marginal bone loss adjacent to abutments,⁽¹⁰⁾ and traumatic ulceration of mucosa.⁽¹¹⁾

In a healthy mouth, the sub mucosa is firmly attached to the periosteum of the underlying supporting bone and will usual-

ly withstand the pressures of the dentures. When the sub mucosal layer is thin, the soft tissues will be nonresilient, and the mucous membrane will be easily traumatized.⁽¹²⁾ The purpose of this study was to determine the mucosal thickness changes in two types of removable partial denture base materials (Cobalt Chrome and Flexible) wearers over a two months period.

MATERIALS AND METHODS

Six patients (three men and three women) were participated in this study, old ages group was over 50 years. The patients were randomly chosen from a group of partially edentulous (class I, II or long span class III Kennedy) (Figure 1).



Figure (1): Partially edentulous clinical case

Patient for at least one year without prosthesis at the Department of Prosthodontics, College of dentistry, University of Mosul. All patients were medically fit with no any systemic disease. The patients were divided into two groups: the first group (two men and one woman) selected to construct flexible removable partial dentures (FRPD) done by using thermoplastic Nylon Valplast® (China) and the second group selected to construct cobalt chrome removable partial dentures (Co-Cr RPD) (one man and two women).

Constructions of Removable Prosthesis:

An accurate impression (muco-static impression technique) was taken for every patient with heavy and light body rubber base impression material.⁽¹³⁾ The impression was poured with die stone Silky Rock (Whip Mix Louisville, USA) with a 1:4 water/ powder ratio to get the master cast.⁽¹⁴⁾ Proper design for each case was selected and drawn on the cast after making surveying.⁽¹³⁾

For the group of Co-Cr RPDs, the frame work was constructed and checked in the patient mouth (Figure 2).



Figure (2): Framework of Co-Cr RPDs Lower, Upper framework and Flexible denture.

Vertical and horizontal maxillo-mandibular relationship was determined for each patient.⁽¹³⁾ All dentures were constructed with maximum teeth intercuspation, processed in conventional methods, while all components (Clasp, major, minors, artificial flanges and denture base)

of flexible partial denture (FRPD) were constructed with flexible removable partial dentures by using thermoplastic Nylon Valplast® (China) , Flexite casting machine and special flask,⁽¹⁵⁾ and inserted in the patient mouth (Figure 3, 4 and 5)



Figure (3): Closely fit elastic stopper in the hole of the record base. (A): Frontal view. (B): Lateral view.



Figure (4): Clinical measurement of the thickness of mucosa



Figure (5): Radiographic examination of the position of the dental needle

The average time of wearing the dentures by all patients was 16 ± 1 hours daily.

Both groups of the RPDs constructed were 2 mandibular and 1 maxillary removable partial dentures.

Cast and Record Base Guide Constructions:

For each patient, another impression was taken with alginate irreversible hydro-

colloid using stock tray and anatomic form impression technique (muco-static impression technique), and poured with plaster with a 1:2 water/ powder ratio.⁽¹²⁾ The record base was constructed on the cast by using visible light cure acrylic VLC (Megadenta Dental Product) with even thickness of $2 \text{ mm} \pm 0.01$. A three small holes 3 mm in diameter on the record base were made 5 mm away from the last abutment

tooth in the dental arch, the first hole in the center above the crest of the alveolar bone, the second hole is vertically toward the bucal vestibule 5 mm away from the central hole, and the third hole is vertically toward the lingual vestibule 5 mm away from the central hole.

Clinical Measurements: An intra oral clinical measurement of the thickness of mucosa was taken for each patient at three different times, the first measurement at the time of insertion (before wearing denture), the second and third measurement after one and two months of wearing the denture. A fine sterile dental needle with elastic stopper of endodontic file (3 mm in diameter and 1.5 mm in thickness) locked in each 3 holes (central, bucal, lingual) of the record base (3 mm in diameter) to prevent movement of the fine sterile dental needle; and then record base placed in patient mouth (Figure 3). The needle was inserted after using spray anesthesia until it touches the bone, and the length of the sterile dental needle to the stopper was

measured using a digital vernea (LEZACO, CHINA) (Figure 4).

Panoramic radiographs of the position of the dental needle to check the touching of bone by the dental needle were performed with a constant current of 10 mA, exposure time of 15 seconds, the voltage 80 kV (Siemens). The type of machine was (STARTO 2000) CEI-Bologna, ITALY (Figure 5).

After recording the all clinical measurements of the thickness of mucosa of all patients (3 reading for every patient) the mean, standard deviation, t-test and correlation of the thickness before insertion and after insertion of prosthesis were calculated for the (Co-Cr RPDs) wearers and (FRPDs) wearers before and after two months of denture insertion.

RESULTS

The result of the measurement (Mean, standard deviation, paired sample t-test and correlation of the thickness before insertion and after insertion of prosthesis) was listed in the (Tables 1, 2, and 3) and (Figure 6).

Table (1): Measurements taken in central holes.

Denture Type	No. of RPD	Mean (mm)	Standard deviation	paired sample t-test	Significance
FRPDs (before insertion)	4	4.96	0.93	0.74	Not significant
FRPDs (after 2 months)	4	4.74	0.45		
Co-Cr RPDs (before insertion)	4	7.38	1.39	3.09	Significant *
Co-Cr RPDs (after 2 months)	4	6.60	1.81		

*: Significant at $p \leq 0.05$. FRPDs: Flexible Removable Partial Dentures. RPD: Removable Partial denture. Co-Cr RPDs: Cobalt-Chrome Removable Partial Dentures.

Table (2): Measurements taken in buccal holes.

Denture Type	No. of RPD	Mean (mm)	Standard deviation	paired sample t-test	Significance
FRPDs (before insertion)	4	5.63	1.41	2.60	Not significant
FRPDs (after 2 months)	4	5.06	1.05		
Co-Cr RPDs (before insertion)	4	5.69	1.88	2.52	Not significant
Co-Cr RPDs (after 2 months)	4	5.08	1.67		

FRPDs: Flexible Removable Partial Dentures. RPD: Removable Partial denture.

Co-Cr RPDs: Cobalt-Chrome Removable Partial Dentures.

Table (3): Measurements taken in lingual (palatal) holes.

Denture Type	No. of samples	Mean (mm)	Standard deviation	paired sample t-test	Significance
FRPDs (before insertion)	4	5.20	0.796	1.84	Not significant
FRPDs (after 2 months)	4	4.70	0.517		
Co-Cr RPDs (before insertion)	4	6.53	2.112	3.23	Significant *
Co-Cr RPDs (after 2 months)	4	6.40	2.136		

*: Significant at $p \leq 0.05$. FRPDs: Flexible Removable Partial Dentures.

Co-Cr RPDs: Cobalt-Chrome Removable Partial Dentures.

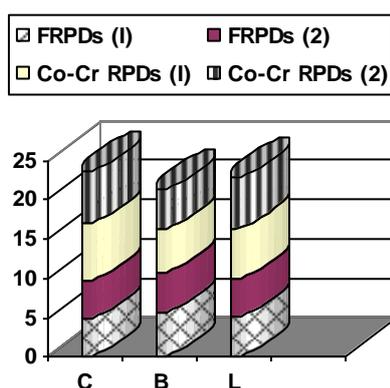


Figure (6): A histogram showing the measurement of mucosal thickness changes of Co-Cr and flexible RPDs.

FRPDs (1): Measurement before insertion. FRPDs (2): Measurement after 2 months. Co-Cr (1): Measurement before insertion. Co-Cr (2): Measurement after 2 months. C: Central hole. B: Buccal hole. L: Lingual hole.

DISCUSSION

According to the statistical analysis of the result (Table 1 to 3 and Figure 6) founded that there are significant mucosal thickness changes in the central holes in the group of Co-Cr RPDs in relation to FRPDs, and this is similar to that found by Marei *et al.*⁽¹⁶⁾ But there are no significant mucosal thickness changes in the buccal holes in the both groups of Co-Cr RPDs and FRPDs and this is because there are no heavy forces applied on the buccal side to the underlying mucosa and bone and most of the forces are distributed through the buccal clasp.⁽¹⁷⁾ While there are significant mucosal thickness changes in the lingual (palatal) holes in the group of Co-Cr RPDs in relation to FRPDs and this may be due to the thick mucosa in the palatal side with a sub mucosa containing adipose and glandular tissues making the tissue displaceable.⁽¹²⁾ So no significant mucosal changes in the FRPDs, where as in the Co-Cr RPDs, the mucosal changes may be due to the heavy forces transmitted through the metallic major connectors that affect the mucosal tissues and this is similar to that found by Picton and Wills.⁽¹⁸⁾

CONCLUSIONS

With the limitation of this study, the following concluding remarks can be obtained:

1- There was a short period of time between the two reading (before insertion and after two months of wearing dentures) {FRPD and Co-Cr RPD}.

2- Significant mucosal thickness changes were observed in the central and lingual (palatal) positions of the Co-Cr RPDs groups; with no significant mucosal thickness changes in the three holes of the FRPDs groups.

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