Atatürk Üniv. Diş Hek.Fak.Derg
Cilt: 15, Sayı:1, Sayfa:29-33, 2005

A COMPARISON OF THE BASAL SEAT AREAS OF THE MAXILLARY AND MANDIBULAR DENTURES ACCORDING TO ARCH SHAPES

Prof. Dr. Nuran YANIKOĞLU* **Doç. Dr. Gözlem CEYLAN****
Prof. Dr. L. İhsan ALADAĞ*

ARK ŞEKİLLERİNE GÖRE ALT VE ÜST PROTEZLERİN OTURDUĞU ALANLARIN KARŞILAŞTIRILMASI

ÖZET

Bu çalışmada, oval, kare ve üçgen gibi farklı alveolar ark şekillerinde olan üst ve alt tam protezlerin kapladığı alanın yüzey ölçümü ve bunların karşılaştırılması yapıldı. Farklı damak şekline sahip doksan hastanın çinko oksit öjenol ölçü maddesi ile alınan final ölçülerinden modeller hazırlandı. Dişsiz üst ve alt çene modelleri üzerinde protezin oturacağı alan işaretlendi. Sonra elastomerik ölçü maddesi bu kısma yayılarak sertleşmesi beklendi. Sertleşen ölçü maddesi parçalara ayrılarak grafik kağıdı üzerine konuldu, çevresi çizildi. Bu kısımlar planometre ile bir araştırmacı tarafından ölçüldü. Varyans analizi sonucunda, kret şekillerine göre üst protezlerin kapladığı alanlar arasında farklılık bulunmuştur ($P<0.01$). Üst protezin kapladığı alanın, alt protezin alanından yaklaşık 1.7 kat fazla olduğu tespit edilmiştir.

Anahtar kelimeler : Protezin kapladığı alan, alveol kret şekli, üst ve alt tam protezler.

SUMMARY

In this study, measurement of the denture bearing areas of the maxillary and mandibular dentures according to different arch shapes (ovoid, square and tapering) were performed. The last impression was made from zinc oxide and eugenol impression paste of ninety edentulous patients with different arch shapes. The denture bearing area of the maxillary and mandibular cast was marked with an indelible pen. The rubber-base impression material was applied on the cast. The set rubber-base impression was divided into parts and pressed on the graph paper The outlines of each part were drawn on the graph paper and measured with a planimeter by the same operator.

As a result of analysis of variance, there were statistical differences found between basal seat areas of the maxillary dentures according to the arch shapes ($P<0.01$). It was found that the mean denture bearing area in the edentulous maxillae was approximately 1.7 times greater than the area of the edentulous mandible.

Key Words: Basal seat areas, arch shapes, maxillar dentures, mandibular dentures.

INTRODUCTION

The inevitable change in the height and contour of the residual ridge, health and condition of the hard and soft tissues affects the success of the most precisely constructed prosthesis.[1,2] After the teeth are extracted, the residual ridge

* Atatürk Üniversitesi Diş hekimliği Fakültesi, Protetik diş Tedavisi Anabilim Dalı, Erzurum
** Ondokuz mayıs Üniversitesi, Diş hekimliği Fakültesi, Protetik diş Tedavisi Anabilim Dalı, Samsun.

resorption is most rapid in labial and buccal bone during the first year in denture wearers.[3-5] The reduction in the height of the residual ridge is the most significant process,[2] a positive correlation was discovered between the length of the mandible and the reduction in the height of the maxillary anterior residual ridge.[4,6] The reduction in the anterior residual ridge height in the mandible has been determined to be four times the rate of loss found in the maxillae.[4]

The reduction in size of the residual ridge affects the size of the dentures and also the size of area of the basal seat.[3]One millimeter of bone loss in a wide jaw may indicate something which is quite different for a narrow alveolar ridge.[6]

There are many physical factors affecting the retention of complete dentures. Some physical factors are under the control of the dentist : [7] a) Maximal extension of the denture base, b) Maximal contact between the mucous membrane and the denture base.

The other factors affecting the retention of the complete dentures are interfacial surface tension, adhesion, capillary attraction and atmospheric pressure. These factors are directly proportional to the area of the basal seat covered by the denture base.[7] The form of the ridge and palate definitely affects the retention and stability of complete dentures. The U-shaped form is the most favorable one. The U-shaped ridge has the best resistance to vertical and lateral forces.[8-11] In the construction of dentures, the denture base matrix is the most important portion, both esthetically and functionally.[12]

This study was aimed to determine whether there was any relationship between basal seat area and arch shapes in edentulous patients.

METHOD

A method which was adapted from a study by Luthra [3] for the measurement of the basal seat areas of the maxillary and mandibular dentures was used. In the prosthodontic literature, arch shapes have been classified asytapering, square and ovoid.[7-10] Ninety patients (thirty patients for each alveolar arch shapes) with different arch shapes were selected for the investigation (Fig.1 and 2). A final impression was made from zinc oxide and eugenol impression paste of edentulous patients with different arch shapes (square, tapering and ovoid). The denture bearing area of the maxillary cast was marked with an indelible pen. The usage of the elastomeric impression materials can be applied on the cast in a thin even layer of thickness and once set is sufficiently elastic enough to be withdrawn from the cast without distortion.The elastromeric base was removed from the cast after allowing it to set for 30 minutes. The impression of the colored lines on the cast had been reproducedin the elastomeric base. The palatal portion was divided into two parts at midline so that each part of the impression could easly be spread on graphy paper, then the ridge portion was divided (Fig.3).

The divided parts of the set rubber-base impression were pressed on the graph paper (Fig 4). The outlines of each part were drawn on the graph paper with a planimeter and counted three times to minimize the counting error made by the

same operator. The analysis of variance (ANOVA) was used to compare measurements.

Fig 1. The maxillary casts with different arch shapes.

Fig 2. The mandibular casts with different arch shapes.

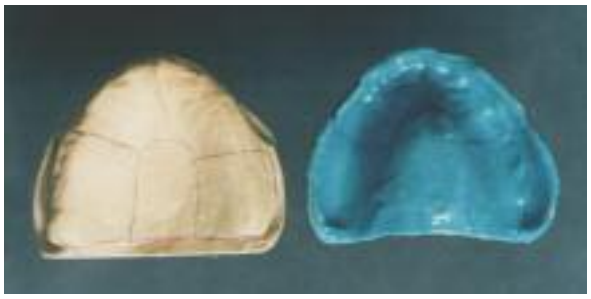

Fig 3.The outline ofthe maxillar denture base on cast and the set rubber-base impression.

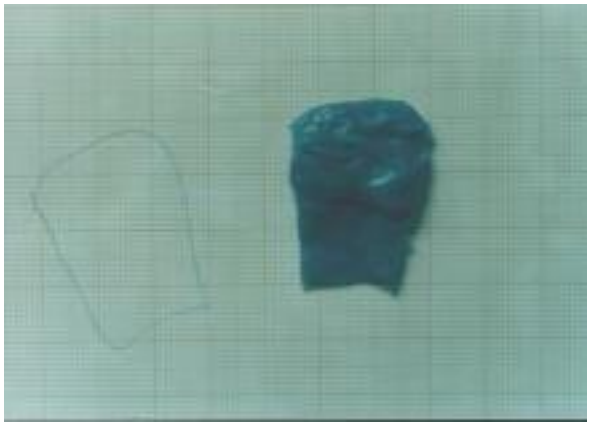

Fig 4. The outlines of divided parts on the graph paper.

RESULTS

The means and standard deviations of these values according to the arch shapes are given in Table 1. The mean value of the basal seat area of maxillary denture was 21.62 cm^2 in ovoid arch , 22.12 cm^2in squared arch and 20.91 cm^2 in tapering arch. The mean value of the basal seat area is the biggest in the square arch shape. The mean value of the basal seat area of mandibular denture was 12.13 cm^2 in ovoid arch, 12.46 cm^2 in squared arch and 11.98 cm^2 in tapering arch.

Table1. Mean and Standard deviations of basal seat area of the maxillary and mandibular dentures according to arch shapes (n=30) (cm^2).

Arch shapes / Basal seat area	Ovoid	Square	Tapering	
	Mean± SD	Mean± SD	Mean± SD	
Maxillar	21.62±0.89	22.12±0.76	20.91±0.93	**
Mandibular	12.13±0.69	12.46±0.79	11.98±0.66	NS
Maxillar/ mandibular	1.78±0.19	1.77±0.26	1.74±0.22	NS

** P<.01 NS: Not significant

The maxillary and mandibular basal seat ratio was 1.78 in ovoid arch, 1.77 in squared arch and 1.74 in tapering arch.

As a result of the analysis of variance, the relation between the basal seat areas in maxillary dentures with different arch shapes was significant from the statistical point of view (P<0.01). There was no statistically significant differences between the basal seat areas of mandibular denture.

DISCUSSION

The amount of the residual ridge resorption varies greatly between individuals and between different parts of the same mouth.[5] These differences are of importance to the practice of prosthetic dentistry. The facial guides include diagnostic casts, roentgenograms, the size and form of the face, the size and form of the cast and extracted teeth. [13]

In 1967 Pietrokouski and Massler [14] demonstrated the view from the occlusal plane, the crest of the residual alveolar ridge shifts lingually in the maxillae and mandible. Both arches were resorbed in vertical and lingual directions. The anatomic topography of the bodies of the maxillae and mandible was not the same.

The residual ridges aid the positioning of the artificial teeth if the natural teeth were recently extracted and the cortical plates of bone remain intact. Unfortunately the crests of the residual ridges do not remain in the same antero-posterior and medio-lateral positions after the extractions.[8] The size of the projected denture foundation area on the tentative plane of occlusion in the posterior section showed no significant correlation with the degree of alveolar ridge resorption.[15]

The ratio of the basal seat area of the ridge to the basal seat area of the palate in maxillae had been measured by Luthra.[3] However, the maxillary and mandibular basal seat areas (ridge and the palate) have not been measured according to arch shapes. According to Watt et al.,[5] the mean denture-bearing area was found 22.96 cm^2 in the edentulous maxillae and 12.25 cm^2 in edentulous mandible. It was suggested that the mean denture bearing area in the edentulous maxillae was approximately 2 times greater than the area of the edentulous mandible. However, this is not an evaluation according to the vault forms.

In this study, it was found that the mean denture bearing area in the edentulous maxillae was approximately 1.7 times greater than the area of the edentulous mandible. It can be said that these measurement differences depend on the arch shapes and the different resorption amounts of the alveolar ridge at the jaws. Watt [5] reported that maxillary and mandibular basal seat ratios have similar values. At the edentulous maxilla, the measurement values of the denture basal seat were very similar to those of the authorities.[3,5,16]

The mean value of denture bearing area in tapering arch was 20.91 cm^2. It is smaller than the other values. In this arch shape, it was difficult to ensure the retention of the denture base.

The arch shapes have no effect on the basal seat surface of the mandibular denture. However,it is known that either, the low or the high position of the alveolar ridge will effect the basal seat areas of the both dentures.[17]

There was no opportunity to discuss the measurement of the basal seat area of the maxillar and mandibular denture according to the arch shapes as there was no literature found concerning this.

CONCLUSION

This is a methodological study. A simple measurement of basal seat area of maxillary and mandibular denture was done. The basal seat area of maxillary denture is approximately 1.7 times of the mandibular denture. There were statistical significant differences between the basal seat areas of maxillary dentures with different arch shapes.

REFERENCES

1. Lynde TA, Unger JW. Preparation of the denture-bearing area- an essential component of successful complete-denture treatment. Quintessence Int 1995;26(10):689-695.
2. Unger JW, Elinger CW, Gunsolley JC. An Analysis of the effect of mandibular lengthonresidual ridgeloss in the edentulous patient. J Prosthet Dent 1992;67:827-30.
3. Luthra SP.Measurement of the area of the maxillary basal seat for dentures. J Prosthet Dent 1973;30:25-27.
4. Tallgren A.The continuing reduction of the residual alveolar ridges in complete denture wearers:A mixed-longitudinal study covering 25 years.J Prosthet Dent 1972;27:120-32.
5. Watt DM, Likeman PR. Morphological changes in the denture bearing area following the extraction of maxillary teeth.Br Dent J 1974;136:225-35.
6. Klemetti E, Lassila L, Lassilla V. Biometric design of complete dentures related to residual ridge resorption. J Prosthet Dent 1996;75:281-84.
7. Hickey JC, Zarb GA.Boucher's prosthodontic treatment for edentulous patients. 8th ed.St.Louis:C.V Mosby,1980:7,8,19,22-24.
8. Heartwel CM,Rahn AO.Syllabus of Complete Dentures. 3th ed. Philadelphia:Lea and Febiger,1980: 175-180,311-14,320-25.
9. Ellinger CW,Rayson JH,Terry JM,Rahn AO.Synopsis of complete dentures. London: Lea and Febiger,1975:57-66,81,108-123.
10. Kawabe S. Kawabe's complete dentures. Tokyo: Ishiyaku Euro-America Inc, 1992.p.18,109.
11. Colon A, Kotwal K, Mangelsdorff AD. Analysis of the posterior palatal seal and the palatal form as related to the retention of complete dentures. J Prosthet Dent 1982;47(1):23-27.
12. Zimmerman DE,Cotmore JM.Denture esthetics (I) Denture base contour. Quintessence Int 1982:543-49.
13. Wehner PJ,Hickey JC,Boucher CO.Selection of artificial teeth.J Prosthet Dent 1967;18:222-32.
14. Pietrokovski J,Massler M:Alveolar ridge resorption following tooth extraction.J Prosthet Dent 1967;17:21.
15. Suenaga K, Sato T, Nishigawa G, Minagi S. Relationship between size of denture foundation area and resorption of alveolar ridge in the edentulous mandible. J Oral Rehabil 1997;24(4):315-319.
16. Johnson DL,Holt RA,Duncanson MG.Contours of the edentulous palate.JADA 1986;113:35-40.
17. Harvey WL,Hoffman W,Hochstetter R,Rouland D.Large edentulous ridges-Are they better for dentures than small ridges? J Prosthet Dent 1982;47:595.