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The Prevalence of Occlusal Disharmony and Its Associated Causes in Complete Dentures

Parsa Atashrazm, DMD, MS; Mohammad Hosein Dashti, DMD, CAGS

Abstract

Aim: Occlusal disharmony is frequently observed among edentulous patients. With the side effects of occlusal disharmony in mind, the goal of this research was to investigate the prevalence of occlusal disharmony in inserted complete dentures and its associated causes.

Methods and Materials: This cross-sectional study was conducted on 107 selected patients. Factors such as age, gender, ridge relationship on the articulator, occlusal scheme, and the performance of a clinical remount from patients' treatment records were investigated. The presence and/or status of any occlusal disharmony was determined by a calibrated prosthodontist extraorally and qualitatively. Occlusal disharmony is defined as the absence of simultaneous bilateral contacts between the opposing posterior teeth in centric relation. The prevalence of occlusal disharmony was determined and the roles of the aforementioned factors were studied and analyzed using a Chi-square analysis. The results were considered significant at $p<0.05$.

Results: Out of 107 patients, 31 patients (28.8%) showed occlusal disharmony. No statistically significant relationship was found between occlusal disharmony and age, gender, ridge relationships, or occlusal scheme ($p<0.5$). Twenty-five (81%) out of 31 complete dentures with occlusal disharmony were not clinically remounted. There was a highly significant relationship between the absence of clinical remounting and occlusal disharmony ($p<0.001$).

Conclusion: Within the limits of this study, the prevalence of occlusal disharmony was noticeable. A randomized clinical trial is strongly recommended to investigate factors related to the incidence of occlusal disharmony.

Clinical Significance: It is important to refine the occlusion of a complete denture after laboratory processing of the denture before it is delivered to the patient.

Keywords: Occlusal disharmony, edentulous patients, occlusion in complete dentures, clinical remount.

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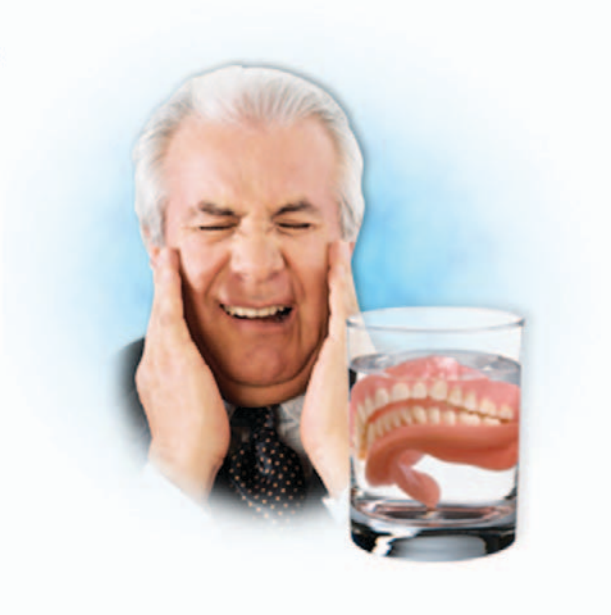
Introduction

Occlusal disharmony, or uneven contact of the teeth in centric relation, presents a number of problems for patients with complete dentures.[1-5] Although there are some reports on the presence of occlusal problems in patients with complete dentures after one year or more,[6-8] there are no reports concerning the prevalence of occlusal disharmony in complete denture wearers immediately following denture placement. The reason for the absence of such a report may be due to the simultaneous occurrence of occlusal disharmony and other problems that may simply be coincidental, as it is often very difficult to isolate the effects of occlusal disharmony intraorally as a single entity among complete denture complications.[4,9]

There can be several consequences of occlusal disharmony in complete dentures including the following:[1-16]

- A nonuniform distribution of occlusal forces on the basal seat
- Inflammation and ulceration of the supporting tissues
- Accelerated residual ridge bone resorption
- Rapid morphological changes in facial height
- Increased patient discomfort
- Compromised reflex adaptability
- Need for frequent adjustments.



Moreover, increased parafunctional movement and poor masticatory performances have been attributed to the lack of uniform occlusal contacts.[16-18] These consequences can eventually lead to the loss of denture stability and retention if patients fail to seek adjunctive treatments such as a denture reline or a denture rebase procedure. The resultant lack of retention, stability, and support will inevitably cause a loss of confidence in the dental profession.[5,12]

Good-quality dentures with a harmonious occlusion lead to patient satisfaction with their dentures as well as with the high level of masticatory performance and efficiency. Such patients adapt to their dentures much faster than individuals with occlusal disharmony.[9,12,17,18] On the other hand, patients with occlusal problems require more subsequent visits, require a longer time to adapt to their dentures, are frequently dissatisfied, and may gradually become maladaptive denture wearers.[3]

The clinical experiences of prosthodontists indicate occlusal error may result from a number of clinical and laboratory factors including the following:[2-4,13-14,19]

- Warping of the record bases
- Erroneous recording of centric relation
- Erroneous mounting procedures
- Failure to close processing flasks completely prior to curing
- Use of too much pressure in closing processing flasks
- Contraction of polymethyl methacrylate during polymerization
- Denture warpage due to overheating during polishing
- Displacement of the edentulous mucosa during impression taking
- Unfavorable oral anatomy
- Properties of the dental materials used in the fabrication of the dentures.

There may be demographic variables such as age and gender as well as clinical variables such as occlusal schemes, ridge relationships, and clinical remounting that require consideration in dealing with occlusal error.

The prevalence of uneven occlusal contacts after complete denture placement has not been investigated. Due to the significance of the consequences of occlusal disharmony and the lack of information about the prevalence of uneven occlusal contacts between upper and lower complete dentures after placement, this study was designed to determine the prevalence of occlusal disharmony in centric relation and its associated causes.

Methods and Materials

A total of 107 edentulous patients were selected and completely informed about the nature of this cross-sectional study conducted in the Department of Removable Prosthodontics of the Islamic Azad University in Tehran, Iran. All patients had been treated with conventional complete dentures and then were introduced into the study no more than 30 days after placement of their new dentures. The procedures were performed in accordance with the ethical standards of the responsible Committee on Human Experimentation as defined by the Islamic Azad Dental School research committee. All of the patients with immediate dentures, over dentures, implant-assisted prostheses, single complete dentures, and complete dentures without the performance of laboratory remount were excluded from this study.

In order to locate occlusal contacts, a remounting procedure was done for each complete denture, as shown in Figure 1.

The orientation relation was recorded using the facebow registration record (Teledyne, Hanau, Buffalo, NY). The mandibular denture was stablilized by placing both index fingers of the operator intraorally on the buccal flanges and the thumbs placed extraorally on the chin while guiding the mandible into centric relation.[3] Centric relation was then recorded using bite registration compound (GC Corporation Tokyo, Japan). Maxillary and mandibular complete dentures were then mounted on a modified two-dimensional articulator (Model 96 H_2, Teledyne, Hanau, Buffalo, NY) by means of the face bow registration record and centric relation record, respectively. In order to verify the accuracy of the original centric relation records, a second centric relation was recorded for each patient and examined on

Figure 1. The verified clinical remounted complete denture on the semi-adjustable articulator.

Figure 2. The articulating paper was used to identify and mark the occlusal contacts of the verified clinical remounted complete denture.

Figure 3. The occlusal marks of a clinical remounted complete denture.

the articulator.[3] A calibrated prosthodontist used 60 micron articulating paper (Bausch KG, Koln, Germany) to interpret the actual contact of the teeth qualitatively by tactile sensation (Figure 2).[3]

Figure 3 shows a typical example of the occlusal marks obtained with the clinical remounted complete denture.

Occlusal disharmony is defined as the absence of simultaneous bilateral contacts of the opposing posterior teeth in centric relation of the jaws. The total numbers of occlusal contacts for each complete denture were measured, and less than three occlusal contacts between the left and right posterior teeth are considered to constitute occlusal disharmony.

Associated factors such as ridge relationships (Classes I, II, and III) and the occlusal schemes, or occlusal forms of the denture teeth (anatomic teeth, semi and nonanatomic teeth)[20] were observed extraorally on the articulator.

Patient treatment records were used to help determine whether or not a clinical remount procedure had been performed. The related data were classified and presented in the form of descriptive statistics. The prevalence of occlusal disharmony was determined for all of the subjects. Data regarding the associated factors were analyzed statistically using Chi-square tests and an odds ratio. The results were considered significant at the level of $p<0.05$.

Results

This study was conducted on 107 patients with newly inserted complete dentures. The gender distribution of the study population included 52 (48%) men and 55 (52%) women. The mean age was 57 years, with an age range from 32 to 81 years; 41 (38%) patients were 65 years old or over and 66 (52%) patients were less than 65 years old. Of the 107 patients, 31 (28.8%) had occlusal disharmony, whereas 76 (71.2%) patients had no occlusal disharmony.

The prevalence of occlusal disharmony in patients 65 years-old and above was 12 (39%), and 19 (61%) for those patients less than 65 years of age. There was no significant statistical relationship between occlusal disharmony and age of studied patients ($p<0.9$) (Table 1).

With regard to gender, 17 (60%) women and 14 (40%) men had occlusal disharmony. There was not a meaningful relationship between occlusal disharmony and gender ($p<0.9$) (Table 1).

Table 1. Distribution of understudied complete dentures based on occlusal disharmony in terms of different associated factors.

Associated Factors	Occlusal Disharmony		
	Not Present (N =76)	Present (N = 31)	p-Value
Age:			
< 65 years	47 (62%)	19 (61%)	p<0.9
65 years and over	29 (38%)	12 (39%)	
Gender:			
Men	38 (50%)	14 (44%)	p<0.9
Women	28 (50%)	17 (56%)	
Ridge relationships:			
Class I	58 (76%)	21 (68%)	p<0.4
Class II and III	18 (24%)	10 (32%)	
Occlusal scheme:			
Anatomic	50 (65%)	22 (73.3%)	p<0.6
Semi- and non-anatomic	26 (35%)	9 (26.7%)	

Table 2. Distribution of understudied complete dentures based on occlusal disharmony in terms of clinical remount.

Clinical Remount	Occlusal Disharmony			
	Not Present (N =76)	Present (N = 31)	p-Value	Odds Ratio
Performed	68 (94.6%)	6 (6.6%)	p<0.0001	35
Not performed	8 (5.4%)	25 (93.4%)		

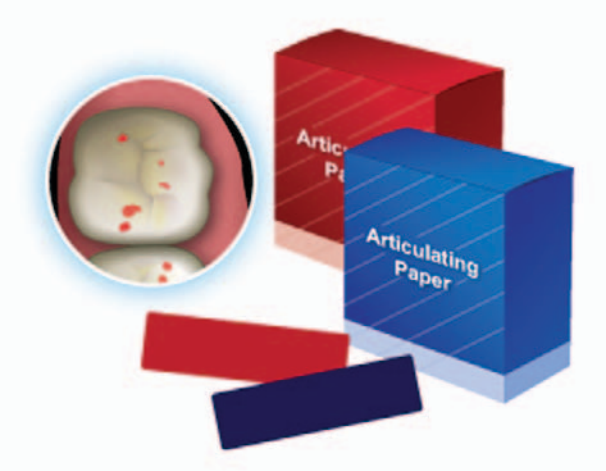
Of the 107 patients in the study, 79 (74%) had a Class I ridge relationship and 28 (26%) had Class II and III ridge relationships. There were 21 patients with Class I and 10 with Class II and Class III ridge relationships showing occlusal disharmony. No meaningful relationship was found between ridge relationship and occlusal disharmony (p<0.4) (Table 1).

Among the subjects, 35 (34.6%) patients had nonanatomic and semi-anatomic teeth and 72 (65.4%) had anatomic teeth. In the non- and semi-anatomic teeth group there were 9 (27%) with occlusal disharmony, with 22 (73%) in the anatomic teeth group. This finding indicates no meaningful relationship between occlusal disharmony and the occlusal form of teeth (p<0.6) (Table 1).

According to the clinical records for each patient, a clinical remount procedure was performed for 74 (69%) patients, while the remaining 33 (31%) had no remount procedure done. Of 31 cases with occlusal disharmony, 6 (19.5%) were in the remounted group, whereas 25 (80.5%) were in the group of patients with no clinical remount performed. This demonstrates a highly meaningful relationship between the absence of clinical remount and occlusal disharmony (p<0.0001). An odds ratio of >35 indicates the probability of occlusal disharmony occurring in complete dentures with no clinical remount procedures performed is 35 times greater than when the remount procedure was performed (Table 2).

Discussion

In this cross-sectional study, the occlusion of recently inserted complete dentures was assessed using a clinical remount procedure, which is reliable and the gold standard method for occlusal analysis of complete dentures.[3] These results showed 28.8% of the 107 subjects with complete dentures had occlusal disharmony. As stated previously, there are no reports currently in the literature on the presence of occlusal disharmony in recently inserted complete dentures. However, a recent study demonstrated the mean number of teeth with occlusal marks and the mean number of occlusal markings used in the remount methods are 5.65 and 7, respectively.[19] The marks on the occlusal surfaces of complete dentures in that study were measured using photographic slides for projection purposes to facilitate the identification of occlusal marks of studied complete dentures. In the present study, the number of occlusal contacts was determined directly. The occlusal contacts in the present study were obtained from two occlusal marks on opposing teeth. In other words, either the occlusal contacts were felt or articulating paper was placed at the location of engagement between the teeth in order to determine the location of the occlusal contacts. Although the aims of the two previously mentioned studies were not the same, the methods and materials used are similar in some aspects. Landa[10] suggests the occlusion of all



complete dentures should be adjusted after fabrication in the laboratory; otherwise patients will suffer uncompensatable and irreversible damage to the supporting tissues. However, Landa did not discuss the prevalence of occlusal problems with complete dentures after insertion.

The findings of the present study were based only on the centric relation position of the jaws. Perhaps eccentric interferences would have been more pronounced. Therefore, other studies designed to evaluate the occlusal disharmonies in eccentric relations should be carried out.

This research demonstrated a highly significant relationship between occlusal disharmony and absence of the clinical remount procedure ($p<0.001$). Several studies mentioned the importance of clinical remount procedures in decreasing occlusal errors. Wilson and Rees,[19] Schlosser,[13] Schuyler,[14] Landa,[10] Firtell et al.[12] have all suggested this method for the elimination of occlusal problems. However, except for Wilson and Rees and Firtell et al., other investigators have only emphasized this procedure without any research-based studies to provide essential evidence. Wilson and Rees[19] demonstrated the intraoral use of articulating paper between the occlusal surfaces of complete dentures leads to more numerous, probably spurious occlusal markings compared with using a remount procedure. They recommend complete dentures be remounted in an articulator for analysis and adjustment of complete denture occlusion. Al-Quran[1] and Shigli et al.[2] concluded the clinical remount procedure results in a highly significant improvement in the comfort of upper dentures and in the fit and comfort of lower dentures. Moreover, Nimmo[20] and Ansari[21] presented simple and less time-consuming methods that persuaded dentists to perform clinical remount procedures. In a clinical trial, Holt[9] showed the positive effects of using a pressure indicator paste (PIP) and the clinical remounting procedure, with the clinical remount procedure being more effective than using only PIP. The effects of PIP were not investigated in the present study. Another study to consider its effect is suggested.

The findings of this research show factors such as age, gender, ridge relationships, and occlusal scheme or posterior occlusal forms were not significantly associated with occlusal disharmony. In a clinical trial, Firtell et al.[12] showed the absence of a clinical remount procedure introduced most of the oral damage, and different occlusal forms were not significant. The findings of Firtell et al.[12] and the present study are also supported by Lang's statement, "the choice of a posterior tooth form for complete denture is an empirical procedure and is done in a subjective manner; to this end, the current results fail to identify a superior tooth form."[22]

The mean age of the edentulous population in this study was 8 to 10 years younger than in more developed countries (i.e., 57 years versus 65 to 67 years).[19,23] It is difficult to generalize any conclusion based on small sample sizes for the foundation of a meaningful conclusion relies on a strict adherence to conventional removable prosthesis fabrication concepts. The patients in less developed countries not only reach the edentulous state at a younger age and, consequently, suffer from the inevitable sequelae of the edentulous state for a longer period, but they are also less capable of seeking the more advanced treatment modalities (such as dental implants) due to financial considerations.

Conclusions

Within the limitations of this descriptive study, occlusal disharmony was demonstrated to be significant. Due to the negative impacts of occlusal disharmony on the quality of complete dentures, the subject of occlusion and occlusal refinement of complete dentures must be further emphasized in the curriculum of dental schools.[24]

Clinical Significance

It is important to refine the occlusion of a complete denture after laboratory processing of the denture before it is delivered to the patient.

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