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# The Investigation of Occlusal Contacts During the Retention Period

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**ABSTRACT**

Removable retention appliances were applied to 20 treated orthodontic patients, and their occlusal contact points were determined from occlusal registrations taken at the beginning and the end of retention. Furthermore, to determine the results at the end of retention, the occlusion of 20 treated patients was compared with a control group of another 20 subjects who had an ideal occlusion. During the retention phase the number of contacts in centric occlusion increased significantly. No significant difference was observed with regard to the location of contacts. Whereas the number of ideally located contacts was similar to that in the control group, differences were observed in actual and canine contacts between the groups. At the end of retention, the balancing side contacts in lateral movements and the posterior contacts in protrusive movements were generally determined as near contacts and showed a similarity to the control group. In order to maintain the occlusal stability that is needed for the success of orthodontic treatments, ideal occlusal contacts and localization of contacts in centric and eccentric occlusion should be considered.

**KEY WORDS:** Stability, Settling, Occlusal contacts.

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## INTRODUCTION Return to TOC

The goal of orthodontic treatment should be ideal tooth alignment, esthetics, and occlusal stability. Occlusal stability, which may be defined in structural and functional terms, affects the health of the stomatognathic system and may play an interceptive role against relapse, which occurs after active treatment.[1,2]

When structural stability is obtained as demonstrated by the absence of dental and skeletal relapse, functional stability is provided by good intercuspation with multiple tooth contacts and no occlusal interferences or slides in centric relation besides the proper contacts during eccentric movements.[3] One of the most important factors in occlusal stability is the existence of centric stops. The centric stops that take place on functional cusps ensure the stability of teeth.[4]

Whereas maximizing tooth contacts in centric occlusion minimizes the stresses distributed on teeth, ideally located centric contacts cause vertically directed forces parallel to the long axes of the teeth.[1] Thus, ideal location of occlusal contacts and an increased number of occlusal contacts are important. The number of occlusal contacts in centric occlusion increases and decreases during the chewing cycle, and the contacts from centric occlusion to lateral and protrusive movements also provide occlusal stability.[4] The undesirable contacts that occur during lateral and protrusive mandibular movements are harmful for the dentoalveolar structures.[1] Further, it has been suggested that good occlusal contacts and intercuspation may be the keys to a stable orthodontic result.[2,3,5]

Appliances used during the retention period stabilize the results obtained during active treatment. However, besides the retention appliances, ideal occlusal contacts have a great importance for occlusal stability.[5] This study aimed to evaluate the number and especially the location of contacts occurring in centric and eccentric positions during the retention period.

## MATERIALS AND METHODS Return to TOC

Twenty Class I patients, (mean age 17.00 ± 1.5 years) who were treated with standard edgewise mechanics and had the first four premolars extracted, were included in this study. All patients were given upper and lower removable Hawley retention appliances with instructions to wear them all the time for the first six months and in the night alone for the next three months. During the fixed appliance therapy and retention period, the second molars were not included in treatment. A control group was formed from another 20 individuals (mean age 17.00 ± 1.80 years) who had ideal occlusion and no history of orthodontic treatment.

The functional jaw positions were evaluated intraorally, and occlusal records were taken in centric (maximum intercuspation) and eccentric occlusion at the beginning of retention and at the end of nine months of retention. The terminal point for lateral occlusion was defined as end-to-end maxillary and mandibular cusps on the working side. The terminal point for the protrusive registration was defined as edge-to-edge maxillary and mandibular anterior teeth. The eccentric positions were initiated from the maximum intercuspal position (centric occlusion). Records were taken with silicon putty (Optosil plus) impression material. The material was placed over the mandibular teeth, and the subjects were instructed to close tightly on the back teeth and to slide the lower jaw to the right, to the left, and anteriorly in the manner they had been shown previously.[6–9]

The perforations in the impression material were identified as actual contacts, and translucent areas were identified as near (light) contacts.[10–12] Actual and near contacts were transferred onto the study models and marked using different colors.

The posterior contacts and the contacts on the canines, premolars, and molars were determined on the lower study models. The location of posterior contacts were evaluated

according to the method of Ramfjord and Ash.[4] Contacts that took place on cusp-marginal ridges and within 1 mm of that area were identified as “contact in ideal location.” Contacts in other areas were identified as “contact in not ideal location.” Contacts in ideal locations and in not ideal locations were not determined in protrusive movements. Because the first premolars had been extracted in the study group, first premolar contact areas were not taken into consideration in the control group either. The distributions of the contacts according to their locations were recorded in centric and eccentric occlusion. The ratio of these contacts to the number of total contacts was calculated at centric occlusion.

A Wilcoxon test was used to statistically evaluate the differences between the beginning of retention and the end of nine months. Differences between the groups were determined by the Mann-Whitney *U*-test.

## RESULTS Return to TOC

Table 1 shows the descriptive statistics and the significance of the differences between the pre- and postretention mean values. The increased number of premolar and molar contacts in centric occlusion was statistically significant. Both the number of contacts in ideal and not ideal locations and the number of actual and near contacts showed a significant increase. The number of ideally located contacts in right lateral movement on the balancing side and near contacts in left lateral movement on the working side both decreased significantly.

Table 2 shows the mean differences between study group and control group at the end of retention. When the number of contacts in centric and eccentric occlusion at the end of retention was compared with the control group, the numbers of canine contacts and actual and near contacts in centric occlusion were significantly different between the groups. In lateral movement the number of canine contacts on the working side also showed a significant difference between the groups.

Table 3 shows the changes in distribution and characteristics of posterior contacts in centric occlusion during the retention phase. During retention, a statistically significant increase in the number of “ideally located” and actual contacts on premolars occurred. All the contacts on the first molar were increased significantly. On second molars, the ideally located, not ideally located and actual contacts showed a significant increase.

Table 4 shows the percentage and the distribution of contacts (as ideally located, not ideally located, actual, and near) on posterior teeth in centric occlusion at the end of the retention period. Over 20% of the posterior contacts were premolar contacts. Evaluation of the premolar contacts showed that ideally located contacts were 17.9% and not ideally located contacts were 2.8%. The ideally located contacts were 15% actual and 2.9% near contacts. The not ideally located contacts were 1.3% actual and 1.5% near contacts.

First molar contacts were 39% of the posterior contacts. Of these, the ideally located contacts were 29.3% and the not ideally located contacts were 9.7% of the first molar contacts. These ideally located contacts were 23.2% actual and 6.1% near contacts. Not ideally located contacts were 2.1% actual and 7.6% near contacts.

Second molar contacts were 40.3% of the posterior contacts, and 16.3% of these were ideally located contacts, whereas 24% of these were not ideally located contacts. For second molars, ideally located contacts were 7.9% actual and 8.4% near contacts. Not ideally located contacts were 19.5% actual and 4.5% near contacts.

Table 5 shows the distribution of posterior tooth contacts in eccentric occlusion at the end of the retention period. Premolar contacts were not observed on the working and balancing sides in lateral movements. The greatest number of first molar contacts, which were actual contacts, was seen on the working side in right and left lateral movements. The second molar contacts were mainly ideal location contacts on the working and balancing sides. The majority of these contacts were actual contacts on the working side and near contacts on the balancing side. In protrusive movement, the near contacts were observed mainly on the second molar.

## DISCUSSION Return to TOC

The occlusal table that is established by orthodontic treatment may be related to the health of the temporomandibular joint and the masticatory muscles[3,13] and also may have a role in the stability of the orthodontic treatment.[1,2] Evaluation of the number and location of the occlusal contacts, which may be the most important predictors of occlusal stability, would help to explain any relapse that might occur in the future.

An increase in the number of occlusal contacts represents an improved interdigitation.[6] In centric occlusion, the increased occlusal contacts reduce the stress distributed on the teeth.[1] In this study, the number of posterior contacts in centric occlusion increased significantly during the retention period. The number of occlusal contacts reached a total of 19 at the end of retention.

McNamara and Henry[14] reported a mean increase of posterior contacts from 17.4 to 19.7 at the end of a one-year retention period, whereas Gazit and Lieberman[10] reported a mean increase of 11.2 to 17.4. After a three-month retention phase, Durbin and Sadowsky[6] found a 16% increase in the number of posterior contacts. One year after orthodontic treatment, Sullivan et al[15] found 7.26 posterior contacts in an adolescent group and 19 posterior contacts in an adult group. Haydar et al[16] reported that, after a three-month retention period, the number of total contacts was 22.4 in a Hawley group and 27 in a positioner group.

In this study, a comparison of the end of retention and control group values showed that there were no differences in the number of posterior contacts in centric occlusion; however, the number of actual contacts was greater than the number of near contacts at the end of retention. This was presumably the result of continued mobility of teeth during retention and eruption of teeth that was possible because of using the Hawley appliance.

In addition to the increased number of contacts, the ideal location of these contacts directed vertical forces parallel to the long axes of the teeth, providing maximum periodontal support.[1,17] The number of ideal contacts and not ideal contacts that increased significantly during retention were found to be the same as the number of contacts in the control group. However, the new occlusal table that was obtained by orthodontic treatment should have ideal properties in order to adapt to the surrounding tissues. This adaptation to the surrounding tissues is present in the control group. The construction of ideal posterior occlusal guidance results in distributing the occlusal forces on the maximum number of inclined planes during interdigitation.[18]

During the retention phase in this study, and while in centric occlusion, the numbers of “contacts in ideal location” and actual contacts at premolars were increased, and “contacts in ideal location” and “contacts in not ideal location” at the first and second molars showed a similar increase. Evaluation of the characteristics and distribution of the posterior contacts at the end of retention showed that almost all contacts at the second premolar were actual and in ideal locations. At first molars, 29.3% of the contacts were in ideal locations, and most of them were actual contacts. The proportion of contacts in not ideal locations at the same tooth was 9.7%, and these were near contacts. At the second molars, 24% of the contacts were not in ideal locations, which was a higher proportion than at the first molars, and 19.5% of them were actual contacts. The high ratio of not ideally located contacts of second molars might be the result of not including the second molars in the active and retention treatments.

Finally, throughout the retention period, the increase in the number of contacts in ideal locations may suggest a good relation between the quality of the posterior occlusion and the health, function, and perhaps the stability of the dentition. But the increase in the number of contacts in not ideal locations also suggests that settling should be done at the last phase of the active treatment rather than postpone it to the retention period.[5,11]

Occlusal stability is necessary not only for static occlusion but also for functional occlusion. Especially during chewing and deglutition, contacts occur in centric occlusion and from centric occlusion through lateral and protrusive movements. Depending on the type of occlusion, the location of working and balance side contacts will contribute to occlusal interferences.[4]

In this study, the decreased number of working and balance side contacts and, in protrusive movements, the decreased number of posterior contacts in lateral movements was not

significant. At the end of retention, in lateral movements almost all working and balance side contacts were in ideal locations. Whereas no contact was observed at premolars on the working side, actual contacts were distributed to the canines, second molars, and mostly the first molars. Contacts on the balancing side were near contacts and mostly located on second molars. In protrusive movement, almost all contacts were near contacts and most of the posterior contacts were located on the second molars. The distribution of the contacts in eccentric occlusion at the end of retention showed a similarity with the control group.

Ramfjord and Ash[4] suggested that balancing side contacts were not necessary in the natural teeth and, unless such contacts were light, they should be defined as balance side interferences. Rinchuse and Sassouni[8] and Sadowsky and Polson[9] all reported that balancing side and protrusive contacts after fixed therapy were similar to those of untreated subjects in lateral and protrusive movement records taken with-silicon based impression material.

Dawson[1] reported that the most harmful contacts were balancing side contacts in lateral movement and bilateral posterior contacts in protrusive movements because the teeth and condyle could not counteract the stresses that occurred at these regions.

Storey[3] suggested that occlusal interferences may result in adaptations such as tooth movement, tooth wear, or condylar displacement. Therefore, occlusal interferences have the potential to cause relapse of dental relationships. In this study, the distribution of occlusal contacts obtained on the working side at the end of retention showed a greater degree of unilateral balanced occlusion (group function) than canine-guided occlusion.[5,12]

The number and characteristics of the contacts that were obtained by orthodontic treatment showed a similarity to those of the contacts in subjects with normal occlusion. However, this should not mean that there is no potential to cause harm in the stomatognathic system.[8,19,20]

## CONCLUSIONS Return to TOC

- As an important sign of occlusal stability, a significant increase in the number of posterior contacts was found during the retention period.
- A significant increase in the number of contacts in ideal locations, which was two-thirds of the number of posterior contacts, was found throughout the retention period. This result may also be an important sign of occlusal stability.
- The increase in the number of contact in not ideal locations, which was one-third the number of posterior contacts, was also statistically significant throughout the retention period. This suggests that rather than expecting the occlusion to settle into correct contact positions, it should be finished as close to the ideal as possible when the active appliances are removed. If settling is postponed to the retention period, then retention appliances that are prepared by making setups are preferred.
- Because the contacts in not ideal locations that were actual contacts were observed mostly on the second molars, these teeth should be included in both fixed and retention treatments.
- The contacts on the balancing side in lateral movements and the contacts on the posterior region in protrusive movements are near contacts, which is also an important factor for occlusal stability.
- Although the number and location of the contacts showed similarity with those of the normal occlusion group, it should be remembered that the occlusal table that was established by orthodontic treatment did not adapt to the surrounding tissues as in the normal occlusion group. Therefore, after active treatment and retention, static and functional occlusion should be evaluated and number and location of occlusal contacts should approach the ideal as closely as possible.

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**TABLES** Return to TOC

**TABLE 1.** Descriptive Statistics and Significant Differences Before and After the Retention[a]

| | | Right Lateral Movement | | | | | | Left Lateral Movement | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Working Side | | | Balancing Side | | | Working Side | | |
| | | x | Sd | *P* | x | Sd | *P* | x | Sd | *P* |
| Posterior | Before | 1.45 | 1.0 | NS | 0.75 | 0.7 | NS | 1.85 | 1.1 | NS |
| | After | 1.30 | 1.0 | | 0.55 | 0.8 | | 1.55 | 1.1 | |
| Canine | Before | 0.25 | 0.4 | NS | 0.00 | 0.0 | NS | 0.45 | 0.5 | NS |
| | After | 0.30 | 0.4 | | 0.05 | 0.2 | | 0.55 | 0.5 | |
| Ideal location | Before | 1.40 | 1.0 | NS | 0.75 | 0.6 | * | 1.70 | 0.9 | NS |
| | After | 1.20 | 0.9 | | 0.40 | 0.8 | | 1.55 | 1.6 | |
| Not ideal location | Before | 0.05 | 0.2 | NS | 0.00 | 0.0 | NS | 0.15 | 0.4 | NS |
| | After | 0.10 | 0.4 | | 0.15 | 0.5 | | 0.00 | 0.0 | |
| Actual contact | Before | 1.15 | 1.0 | NS | 0.00 | 0.0 | NS | 1.30 | 1.0 | NS |
| | After | 1.20 | 1.0 | | 0.00 | 0.0 | | 1.40 | 1.3 | |
| Near contact | Before | 0.30 | 0.8 | NS | 0.75 | 0.7 | NS | 0.55 | 0.9 | * |
| | After | 0.10 | 0.3 | | 0.55 | 0.8 | | 0.15 | 0.4 | |
| Premolar | Before | 0.05 | 0.2 | NS | 0.05 | 0.2 | NS | 0.15 | 0.4 | NS |
| | After | 0.05 | 0.2 | | 0.00 | 0.0 | | 0.00 | 0.0 | |
| First molar | Before | 0.80 | 0.7 | NS | 0.20 | 0.4 | NS | 0.95 | 0.9 | NS |
| | After | 0.85 | 0.7 | | 0.10 | 0.3 | | 0.85 | 0.8 | |
| Second molar | Before | 0.60 | 0.8 | NS | 0.50 | 0.7 | NS | 0.75 | 0.8 | NS |
| | After | 0.40 | 0.7 | | 0.45 | 0.7 | | 0.70 | 0.97 | |

[a] x, mean; Sd, standard deviation; NS, not significant.
* $P < .05$, ** $P < .01$, *** $P < .001$.

**TABLE 1.** Extended

| Left Lateral Movement | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Balancing Side | | | Protrusive Movement | | | Centric Occlusion | | |
| x | Sd | *P* | x | Sd | *P* | x | Sd | *P* |
| 1.10 | 0.9 | NS | 3.70 | 2.3 | NS | 11.45 | 3.9 | *** |
| 0.70 | 0.9 | | 3.30 | 2.1 | | 19.00 | 3.2 | |
| 0.00 | 0.0 | NS | 1.35 | 0.9 | NS | 2.25 | 0.9 | NS |
| 0.00 | 0.0 | | 1.30 | 0.9 | | 2.20 | 0.7 | |
| 0.95 | 0.9 | NS | — | — | | 7.50 | 2.5 | *** |
| 0.60 | 0.8 | | — | — | | 12.00 | 2.1 | |
| 0.15 | 0.4 | NS | — | — | | 3.95 | 2.5 | *** |
| 0.10 | 0.3 | | — | — | | 7.00 | 2.4 | |
| 0.10 | 0.3 | NS | 0.40 | 0.7 | NS | 7.20 | 3.8 | *** |
| 0.05 | 0.2 | | 0.40 | 1.1 | | 13.20 | 3.8 | |
| 1.00 | 0.9 | NS | 3.30 | 2.0 | NS | 4.25 | 2.6 | * |
| 0.65 | 0.8 | | 2.70 | 1.9 | | 5.80 | 2.5 | |
| 0.10 | 0.3 | NS | 0.75 | 0.9 | NS | 2.20 | 1.4 | *** |
| 0.05 | 0.2 | | 0.40 | 0.7 | | 3.95 | 1.3 | |
| 0.40 | 0.6 | NS | 0.85 | 1.1 | NS | 4.20 | 1.7 | *** |
| 0.25 | 0.7 | | 0.75 | 1.1 | | 7.40 | 2.4 | |
| 0.60 | 0.7 | NS | 2.10 | 1.4 | NS | 5.05 | 1.9 | *** |
| 0.40 | 0.7 | | 1.95 | 1.6 | | 7.65 | 1.7 | |

**TABLE 2.** Mean Differences Between Control Group and Study Group at the End of Retention[a]

| | | Right Lateral Movement | | | | | | Left Lateral Movement | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Working Side | | | Balancing Side | | | Working Side | | |
| | | x | Sd | *P* | x | Sd | *P* | x | Sd | *P* |
| Posterior | Study | 1.30 | 1.0 | NS | 0.55 | 0.8 | NS | 1.55 | 1.2 | NS |
| | Control | 1.90 | 1.5 | | 1.00 | 0.9 | | 2.35 | 1.7 | |
| Canine | Study | 0.30 | 0.5 | ** | 0.05 | 0.2 | NS | 0.55 | 0.5 | * |
| | Control | 0.75 | 0.4 | | 0.10 | 0.3 | | 0.85 | 0.4 | |
| Ideal location | Study | 1.20 | 0.9 | NS | 0.40 | 0.7 | NS | 1.55 | 1.2 | NS |
| | Control | 1.85 | 1.5 | | 0.55 | 1.1 | | 2.05 | 1.5 | |
| Not ideal location | Study | 0.10 | 0.4 | NS | 0.15 | 0.5 | NS | 0.00 | 0.0 | NS |
| | Control | 0.05 | 0.2 | | 0.45 | 0.8 | | 0.30 | 0.7 | |
| Actual contact | Study | 1.20 | 1.0 | NS | 0.00 | 0.0 | NS | 1.40 | 1.3 | NS |
| | Control | 0.75 | 1.3 | | 0.15 | 0.8 | | 0.95 | 1.2 | |
| Near contact | Study | 0.10 | 0.3 | NS | 0.55 | 0.8 | NS | 0.15 | 0.4 | NS |
| | Control | 0.45 | 1.3 | | 0.85 | 1.1 | | 0.95 | 1.2 | |
| Premolar | Study | 0.05 | 0.2 | NS | 0.00 | 0.0 | NS | 0.00 | 0.0 | NS |
| | Control | 0.35 | 0.4 | | 0.00 | 0.0 | | 0.35 | 0.6 | |
| First molar | Study | 0.85 | 0.7 | NS | 0.10 | 0.3 | NS | 0.85 | 0.8 | NS |
| | Control | 0.90 | 0.7 | | 0.45 | 0.7 | | 0.90 | 0.8 | |
| Second molar | Study | 0.40 | 0.7 | NS | 0.45 | 0.6 | NS | 0.70 | 0.9 | NS |
| | Control | 0.65 | 1.0 | | 0.55 | 0.9 | | 1.10 | 1.0 | |

[a] x, mean; Sd, standard deviation; NS, not significant.
* $P < .05$, ** $P < .01$.

**TABLE 2.** Extended

| Left Lateral Movement | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Balancing Side | | | Protrusive Movement | | | Centric Occlusion | | |
| x | Sd | *P* | x | Sd | *P* | x | Sd | *P* |
| 0.70 | 0.9 | NS | 3.30 | 2.1 | NS | 19.00 | 3.2 | NS |
| 1.20 | 1.0 | | 2.75 | 2.5 | | 19.30 | 4.5 | |
| 0.00 | 0.5 | NS | 1.30 | 0.9 | NS | 2.20 | 0.7 | * |
| 0.05 | 0.2 | | 0.95 | 1.0 | | 2.85 | 0.9 | |
| 0.60 | 0.8 | NS | — | — | | 12.00 | 2.1 | NS |
| 1.00 | 0.8 | | — | — | | 11.80 | 3.0 | |
| 0.10 | 0.3 | NS | — | — | | 7.00 | 2.4 | NS |
| 0.20 | 0.4 | | — | — | | 7.50 | 3.1 | |
| 0.05 | 0.2 | NS | 0.40 | 1.0 | NS | 13.20 | 3.8 | ** |
| 0.45 | 0.9 | | 0.75 | 1.4 | | 8.50 | 3.9 | |
| 0.65 | 0.9 | NS | 2.90 | 1.9 | NS | 6.80 | 2.5 | ** |
| 0.75 | 0.8 | | 2.00 | 2.1 | | 10.80 | 4.7 | |
| 0.05 | 0.2 | NS | 0.40 | 0.7 | NS | 3.95 | 1.3 | NS |
| 0.10 | 0.3 | | 0.10 | 0.3 | | 4.45 | 1.4 | |
| 0.25 | 0.7 | NS | 0.75 | 1.0 | NS | 7.40 | 2.4 | NS |
| 0.35 | 0.6 | | 1.55 | 0.8 | | 8.05 | 2.1 | |
| 0.40 | 0.7 | NS | 1.95 | 1.5 | NS | 7.65 | 1.7 | NS |
| 0.75 | 0.8 | | 2.10 | 2.0 | | 6.80 | 2.2 | |

**TABLE 3.** Changes in Distribution Characteristics of Posterior Contacts at Centric Occlusion During the Retention Period[a]

| | | Before Retention | | After Retention | | |
|---|---|---|---|---|---|---|
| | Centric Occlusion | x | Sd | x | Sd | *P* |
| Premolar | Ideal location | 2.15 | 1.3 | 3.40 | 1.4 | ** |
| | Not ideal location | 0.30 | 0.6 | 0.55 | 0.6 | NS |
| | Actual contact | 1.55 | 1.3 | 3.10 | 1.8 | ** |
| | Near contact | 0.80 | 0.8 | 0.80 | 1.0 | NS |
| First molar | Ideal location | 3.20 | 1.3 | 5.55 | 2.1 | ** |
| | Not ideal location | 1.00 | 0.8 | 1.85 | 1.2 | ** |
| | Actual contact | 2.35 | 1.8 | 4.80 | 2.3 | ** |
| | Near contact | 1.90 | 1.2 | 2.60 | 1.4 | * |
| Second molar | Ideal location | 2.10 | 1.0 | 3.15 | 1.3 | ** |
| | Not ideal location | 2.65 | 1.4 | 4.50 | 1.1 | ** |
| | Actual contact | 3.35 | 1.9 | 5.20 | 2.0 | * |
| | Near contact | 1.45 | 1.2 | 2.45 | 1.6 | NS |

[a] x, mean; Sd, standard deviation; NS, not significant.
* $P < .05$; ** $P < .01$.

**TABLE 4.** Percentage and Distribution of Contacts on Posterior Teeth at Centric Occlusion at the End of Retention[a]

| | | Centric Occlusion | | | | |
|---|---|---|---|---|---|---|
| | | x | Sd | % of Total Posterior Contacts | | |
| Premolar | Actual contacts in ideal location | 2.85 | 1.6 | 15 | 17.9 | 20.7 |
| | Near contacts in ideal location | 0.55 | 0.8 | 2.9 | | |
| | Actual contacts in not ideal location | 0.25 | 0.6 | 1.3 | 2.8 | |
| | Near contacts in not ideal location | 0.30 | 0.4 | 1.5 | | |
| First molar | Actual contacts in ideal location | 4.40 | 2.1 | 23.2 | 29.3 | 39 |
| | Near contacts in ideal location | 1.15 | 1.3 | 6.1 | | |
| | Actual contacts in not ideal location | 0.40 | 0.6 | 2.1 | 9.7 | |
| | Near contacts in not ideal location | 1.45 | 1.0 | 7.6 | | |
| Second molar | Actual contacts in ideal location | 1.50 | 1.0 | 7.9 | 16.3 | 40.3 |
| | Near contacts in ideal location | 1.60 | 1.3 | 8.4 | | |
| | Actual contacts in not ideal location | 3.70 | 1.4 | 19.5 | 24 | |
| | Near contacts in not ideal location | 0.85 | 1.0 | 4.5 | | |

[a] x, mean; Sd, standard deviation.

**TABLE 5.** Distribution of Posterior Teeth Contacts at Eccentric Occlusion at the End of Retention[a]

| | | Right Lateral Movement | | | | Left Lateral Movement | | | | Protrusive Movement | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Working Side | | Balancing Side | | Working Side | | Balancing Side | | | |
| | | x | Sd | x | Sd | x | Sd | x | Sd | x | Sd |
| Premolar | Ideal location | 0.05 | 0.2 | 0.00 | 0.0 | 0.00 | 0.0 | 0.05 | 0.2 | — | — |
| | Not ideal location | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | — | — |
| | Actual contact | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| | Near contract | 0.05 | 0.2 | 0.00 | 0.0 | 0.00 | 0.0 | 0.05 | 0.2 | 0.40 | 0.1 |
| First molar | Ideal location | 0.85 | 0.7 | 0.10 | 0.3 | 0.85 | 0.8 | 0.25 | 0.7 | — | — |
| | Not ideal location | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | — | — |
| | Actual contact | 0.85 | 0.7 | 0.00 | 0.0 | 0.80 | 0.0 | 0.00 | 0.0 | 0.10 | 0.1 |
| | Near contract | 0.00 | 0.0 | 0.10 | 0.3 | 0.10 | 0.3 | 0.25 | 0.7 | 0.65 | 0.2 |
| Second molar | Ideal location | 0.35 | 0.6 | 0.30 | 0.6 | 0.75 | 0.8 | 0.30 | 0.4 | — | — |
| | Not ideal location | 0.10 | 0.5 | 0.15 | 0.4 | 0.00 | 0.0 | 0.10 | 0.3 | — | — |
| | Actual contact | 0.40 | 0.6 | 0.00 | 0.0 | 0.70 | 0.9 | 0.05 | 0.2 | 0.30 | 0.1 |
| | Near contract | 0.05 | 0.3 | 0.45 | 0.6 | 0.10 | 0.3 | 0.35 | 0.6 | 1.65 | 0.3 |

[a] x, mean; Sd, standard deviation.

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