Original article

Slide in Centric on a Random Sample of Students of the School of Medicine in Split

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Abstract

Introduction: A slide in centric is defined as a slide from centric relation to maximum intercuspation. Understanding contact between natural teeth is important for longevity of the stomatognathic system, diagnosis and therapy planning. The aim of this study was to determine the difference in the length of slide in centric in population according to dental status, sex and previous orthodontic therapy.

Materials and methods: The study was conducted on a sample of 33 students at the University of Split, School of Medicine (dental study).

Results: Slide values do not follow normal or Gaussian distribution according to the Kolmogorov–Smirnov test ($p<0.05$). For that reason, they were represented by the median as a measure of central tendency. The arithmetic mean of a slide in centric is 0.95 mm ± 0.47 mm. A slide in centric was not present in only 10% of the subjects. A slide between 0.5 mm and 1.5 mm to maximum intercuspation was present in 90% of the examinees. There was no statistically significant difference in the length of slide between the subjects who had all teeth and those who had missing teeth 1-4 ($z= 0.507$; $p= 0.612$). There was no significant difference in the length of slide between women and men ($z= 0$, $p=1$). There was no significant difference in the length of slide between the patients who underwent orthodontic therapy and those who did not ($z=0.253$; $p=0.800$).

Conclusion: There is some controversy about slide in centric and its etiological role in the development of temporomandibular disorders. Slide in centric is very significant because it indicates occlusal instability and can eventually lead to temporomandibular dysfunction, which do not have to be of the same aetiology..

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Introduction

Understanding the contact of teeth in certain positions and during the movement of the mandible is important for longevity of the stomatognathic system, diagnosis, planning prosthodontic treatment, and treatment of dysfunctions (1). Occlusion principles are gnathological or of a "freedom in centric" type. In the gnathological type of occlusion, maximum intercuspation is equal to centric relation. Therefore, there are no initial contacts during the closing movement around the kinematic axis. This type of occlusion is called centric occlusion (2). A group of gnathological or organic occlusion ensures that during laterotrusion, contacts occur only on cuspids, while any other contact or slide on any other tooth represents interference (3). Numerous authors, among whom Lauritzen (4), define cuspid guided occlusion as physiological and thus desirable. Cuspid guided occlusion is generally found in young population. The other type of occlusion is "freedom in centric" (4, 5, 6). Posselt was the first author to describe the concept of "freedom in centric" (7). The freedom in centric concept allows a slight initial contact of the antagonists during the closing movement of the mandible, around the kinematic axis, and a slide to the maximum contact between the lower and upper teeth. This slide is considered normal and physiological only if it occurs in the sagittal direction. A slide in centric is defined as movement from the initial contact of the antagonistic teeth in centric occlusion to maximum intercuspation. The slide is approximately 0.5-1 mm. It is acceptable when it occurs in the anterior direction (8). Mann and Pankey use the term "long centric" to describe the case where there is an anterior slide between the retruded contact position and habitual occlusion in a length of approximately 1 mm (9).

Freedom in centric defines the possibility of movement from the initial centric contacts to maximum intercuspation in all orthogonal planes: the horizontal, frontal, and sagittal plane. Over time, the attitude about physiological relations in the temporomandibular joint has been changing. Centric relation and its definition have been evolving for years. There are at least 25 definitions of centric relation (10). Initially, it was the posterior superior position of the condyle in relation to fossa articularis to an anterior superior position. The currently recognised centric relation definition indicates the maxillo-mandibular relation in which the condyle articulates with the thinnest avascular part of the articular disc with the disc-condyle complex in the anterior-superior position against the inclined plane of the articular eminences (11). Therefore, it is also the most distal unstrained physiological relation of the mandible against the maxilla, from which lateral movements are possible.

Despite differences between definitions, centric relation is a repeatable position and it is used as a reference position in prosthetic treatment. Only in 10% of the population does maximum intercuspation coincide with centric relation, which represents a mutually protected occlusion or gnathological occlusion. Regarding the rest of the population, there is a difference between the initial contact in centric relation (retruded cuspal position) and maximum intercuspation. This slide is approximately 0.5-1.5 mm. Changing occlusal surface due to prosthetic rehabilitation, a prosthodontic appliance or a dental filling can cause a premature contact during the closing movement in central relation and consequently to the loss of equilibrium or pathological occlusion (12). Slide in centric of 2 mm is one of the most important occlusal parameters pointing to joint pathology (13, 14) and relates to mandibular instability (15). Some studies have confirmed the influence of slide in centric (in a length of over 2 mm) on joint pathology (16). As far as such slide exists between the position of centric relation and maximal intercuspation, diagnoses given in clinical practice can very often reveal pain in the lateral pterygoid muscle. This muscle pain disorder represents temporomandibular dysfunction and can be easily misunderstood for intracapsular temporomandibular disorders.

The aim of this study was to determine if slide in centric occurs in young healthy population

without any signs of temporomandibular dysfunction according to dental status, sex and previous orthodontic treatment (with or without therapy).

Materials and Methods

A cross-sectional study was conducted as a clinical examination on each subject. It included a random sample consisting of student volunteers of the University of Split, School of Medicine (dental study). All students were informed about the study and 33 students signed an informed consent.

Of the total sample tested, 25 persons were students of Dental Medicine and 8 were students of Medicine. The youngest subject was 20 years old and the oldest subject was 24 years old. In terms of sex, there were 13 men and 20 women participating in the study. The mean age of female subjects was 22.4+/-1.2 and the mean age of male subjects was 22.6+/-1.1 years. The mean age of the entire sample was 22.4+/-1.2 years. From the total sample tested, 21 subjects underwent previous orthodontic treatment, whereas 12 participants did not.

During the clinical examination, Decayed, Missing, and Filled Permanent Teeth (the DMFT index) was defined for each student sample. Slide in centric of every participant was measured using a wax bite record. The participants were positioned in a dental chair in an upright position, with the head resting on a headrest. A warmed, trimmed and softened wax plate was adjusted to the maxillary dental arch. Mouth closing in centric relation was achieved using the Dawson bimanual guiding technique to the point of initial contact between the mandibular teeth and the wax bite plate. Closing under guidance continued until the wax plate was bitten through and the initial contact of the antagonistic teeth was made. After registering the initial contact in centric relation, participants bit the wax plate to the point of maximum intercuspation. After removing the wax plate from the mouth, the length of slide was measured using a caliper. The statistical analyses used included the Kolmogorov–Smirnov test and descriptive analyses.

Results

In this clinical examination, dental status was recorded. Eleven male subjects and 14 female subjects had all teeth, representing 79% of the sample. One male subject and two female subjects were missing one tooth, representing 9% of the sample. One male subject and one female subject (3% of the sample) had two missing teeth. One female subject (3% of the sample) had three missing teeth and two female subjects (6% of the sample) had four missing teeth. Veneer or other dental restorations were not observed in any of the participants. Orthodontic therapy was administered to eight male subjects and 13 female subjects or 64% of the sample. The mean value of slide in centric in the entire sample was 1 mm (ranging from 0 mm to 1.5 mm). Regarding the male subjects, the values of slide in centric measured ranged from 0 to 1.5 mm, with a mean value of 1 mm. The same values were obtained upon examination of 20 female subjects. The slide values do not follow normal or Gaussian distribution according to the Kolmogorov–Smirnov test ($p<0.05$). For that reason, they were represented by the median as a measure of central tendency (min-max). Arithmetic mean of slide in centric was 0.95 mm ± 0.47 mm.

Based on the dental status of the subjects with all teeth, slide in centric of 1 mm was observed in 25 subjects, ranging from 0 to 1.5 mm, using the Mann–Whitney U test 0.612. Slide in centric of 1 mm (0-1.5 mm) was equally observed in both genders using the Mann–Whitney U test value of 1.0. Participants who underwent orthodontic therapy had slightly higher values of slide in centric – 0-1.5 mm – compared to the participants who did not undergo orthodontic therapy, whose values ranged from 0 to 1.4 mm, Mann–Whitney U test 0.800.

Table 1 shows the subjects according to variables in relation to slide in centric (no centric, positive side). Of 25 participants who had all teeth, 21 of them had slide in centric with an initial contact during closure in centric relation, with an equal distribution between male and female subjects. A higher percentage of existing slide in centric was observed in the participants who underwent orthodontic therapy.

Table 1. Subjects according to variables in relation to slide in centric (no slide, positive slide)

		Slide in centric	
		0 (no slide)	Slide
Dental Status	Have all teeth	4	21
	Missing 1-4 teeth	2	6
Sex	Women	4	16
	Men	1	12
Orthodontic therapy	No	1	12
	Yes	4	16

No statistically significant difference in the length of slide in centric between the examined subjects who have all teeth and those who had missing teeth 1-4 (z= 0.507; p= 0.612) was observed in this study. Furthermore, no significant difference in the value of slide in centric between women and men (z= 0; p = 1) was observed in this study. A statistically significant difference in the value of slide in centric between the subjects who underwent and the subjects who did not undergo orthodontic therapy (z = 0.253; p = 0.800) was not observed. Table 3 shows the number of subjects according to the variables studied in relation to slide in centric (no slide, slide in centric present). Slide in centric was not observed in only five subjects.

Discussion and Conclusion

There is some controversy about slide in centric and its etiological role in the development of temporomandibular disorders. In 1918, Harris observed slide in centric of 1 mm or less. Only in 10 % of the population does centric relation coincide with central occlusion, but in 90 % of the population, a slide from retruded contact position to maximum intercuspation occurs. Mandible slide (there is a slide) in an amount of 0.5 mm-1.5 mm. Results of this study comply with the data from the literature because slide in centric was not observed in only five subjects (33). Ramfjord and Ash (17) and Froemden (18) assume that the freedom in centric occlusion increases proportionally with age, based on the degree of tubercle abrasion. Results of this survey do not support Ramfjord's, Ash's and Froemden's opinion. This study was carried out

on a compact and young age group and it indicates a large percentage of slide in centric occurrence. Some researchers state that slide in centric over 2 mm has a significant etiological impact on temporomandibular dysfunctions (p-value of 0.008) (15, 19). Using a sample of 749 patients, Nilner showed that temporomandibular dysfunction correlates with slide in centric (20). Gnathologists confirm that malocclusion contributes to the pathology of the temporomandibular joint by selective grinding after orthodontic treatment (21). In this study, a statistically significant difference in slide in centric between the subjects who have all teeth and the subjects with missing 1-4 teeth ($z = 0.507$; $p = 0.612$) was not found, as shown in Table 1. Those results point out the fact that functional adaptation persists by entrenched neuromuscular adaptation after a partial loss of the teeth. Although a stable relation between the mandible and maxilla in the maximum habitual intercuspation existed before the loss of teeth, it persisted during partial loss of teeth. Initial contact of the remaining teeth during the closing movement initiates the same movements as a jaw with teeth. In this study sample, there was no significant difference in the length of slide in centric between the subjects who underwent orthodontic therapy and those who did not ($z = 0.253$; $p = 0.800$). This was also assumed by Haralur, who confirmed, in his study on a sample of 36 patients (who underwent orthodontic therapy) and a control group (who did not undergo orthodontic therapy), that the length of slide in centric and orthodontic therapy were not correlated (22). There is no significant difference in the length of slide between women and men ($z= 0$, $p=1$). It is obvious that sexual dimorphism was not observed in our study. In some studies, there is no correlation between slide in centric and temporomandibular disorders (23). Slide in centric is highly significant because it indicates a premature contact during the closure of the jaw and possible occlusal instability, which can eventually lead to temporomandibular dysfunction, which do not have to be of the same aetiology. In contrast, Huber and Hall stated in their study that slide does not affect the temporomandibular joint (24). There is no common opinion about slide in centric potential pathology because the central nervous system could diminish potentially damaging forces through neuromuscular control and the compensatory mechanism.

The measurements and applied methodology are basic, useful in everyday practice and dental offices lacking sophisticated equipment. Accuracy is not on a high level, but can provide useful information for practitioners. Such a study should be repeated on a more comprehensive sample in order to identify the differences between each group more easily. By using a greater sample, the result will be more valuable. However, this investigation included only student volunteers, who participated in the study during one semester. Therefore, the sample is relatively small. Nevertheless, the data obtained in this study can provide useful information for practitioners. In everyday work, the difference between the closure of the jaw in centric relation and slide of 1 mm can produce harmful forces on teeth and TMJs as well as cause muscle fatigue and pain. Using a simple and quick method, the practitioner can obtain necessary information regarding the type of occlusion. By doing so, it is possible to avoid interreference during reconstructive procedures.

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