

## Pattern of occlusal contacts in eccentric position of mandible in dental students

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### Abstract

**Introduction:** Canine protection and group function are the two stand out occlusal schemes observed during laterotrusive movement of the mandible. The study aims to evaluate the frequency of these occlusal schemes in Nepalese dental students.

**Materials and methods:** A cross-sectional study was conducted among dental students in People's Dental College and Hospital, Kathmandu, Nepal after the ethical approval from PDCH-IRC. Sixty four undergraduate students aged 21-30 years, were examined for the occlusal contact patterns in lateral mandibular movements using 12 $\mu$ m shim stock. The data were analyzed using SPSS software (version 21)

**Result:** On 1mm laterotrusive position on mandible, 43 subjects (67%) showed group function, 15 subjects (24%) canine guided and 6 subjects (9%) non specified occlusion. On 3mm laterotrusive movement, 31(48%) subjects showed group function and 27 subjects (42%) showed canine guided occlusal scheme. The most frequent mediotrusive contact was the second molar followed by the first molars during both 1mm and in 3mm excursion

**Conclusion:** Majority of occlusal schemes of the study population were group function followed by canine protection and non specified occlusion. Canine protected occlusion scheme was increased on 3mm lateral excursion. Most of mediotrusive side contact seen on 2nd molar on 1mm.

**Key words:** Canine guided, Group function, Laterotrusive, Mediotrusive contact, Occlusal contact pattern, Shimstock

### Introduction

Smooth, symphonious and synchronized movements are essential for physiological occlusion during lateral excursions of the mandible. The alignment of teeth and their occlusal relationship in the arch (occlusal

scheme) plays a significant role in the mandibular movements during static and dynamic position.

Two occlusal schemes stand out to be the most common in natural dentition, the first being canine protection (canine guided occlusion), which forces a vertical chewing pattern and prevent wear of remaining teeth in lateral occlusion and guides the mandible movement directly through contact or indirectly through periodontal receptor.<sup>1,2</sup> The second concept is the group function as in which multiple teeth act as a group, and making contact on functional side which is desirable pattern for distribution of functional forces with smooth movement of TMJ.<sup>3,4</sup> Any contact pattern that

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have no clarification of the afore mentioned lateral occlusal schemes are categorized as non-specified occlusal scheme.<sup>5</sup>

During lateral excursions, no teeth contact on mediotrusive side is preferred to prevent the destructive oblique forces which cause trauma to natural dentition, periodontal involvement and TMJ disorder.<sup>7,8,9</sup> Avoidance of contact of teeth on mediotrusive is not always feasible in natural dentitions even with the presence of canine protected or group function occlusion which can be detrimental to harmonious function of masticatory system and are therefore termed as cuspal interferences.<sup>9,10</sup>

The objective of this study is to determine the prevalence of occlusal contact pattern and presence of contact in mediotrusive side in eccentric position of mandible in dental students.

## Materials and Methods

A descriptive cross-sectional study was conducted at People's Dental College and Hospital from 10<sup>th</sup> December 2020 to 10<sup>th</sup> January 2021 after receiving Ethical approval from the institutional review committee (IRC) of Peoples Dental College and Hospital (Reference number:1. Ch No 14 (2077/2078).

Undergraduate students aged from 21- 30 years, (first, second, third and fourth years) of People's dental college and hospital were selected by convenience sampling method. A total sample size of 64 subjects were calculated by

$$n = \frac{z^2pq}{d^2}$$

$z = 1.96$  and with 95% confidence interval permissible error of 12% and prevalence= 60% from the previous article.<sup>2</sup>

This study included complete dentate students, regardless of presence or absence of third molars without signs and symptoms of the

TMD and without previous orthodontic therapy. The subjects had Angle's class I occlusion, and without previous occlusal adjustments. Subjects with shifting of mandibular midline, tooth showing attrition into the dentine, missing teeth or tooth in the either arch, fractured teeth, presence of crowns or bridge, large restorations involving the incisal edge or a cusp tip and apparent pathologic periodontal problems were excluded from the study. The participants gave their voluntary signed written informed consent as approved by the Ethical committee of People's Dental College and Hospital.

Each subject was seated in a dental chair in an upright position. Maxillary central incisors of the subject were marked with a pencil at 1mm and 3mm in the maximum intercuspal positions. The subjects were then taught and asked to make the desired lateral mandibular excursion using a face mirror. A 12 micrometer thickness shimstock (Bausch Arti- Fol<sup>®</sup> metallic 12 $\mu$ , Germany) which doesn't disturb the proprioception mechanism,<sup>6</sup> was placed between the occlusal surface of maxillary and mandibular teeth. The subjects were advised to close his/her mandible into maximum intercuspal position and instructed to glide the mandible to the previously marked 1mm and 3mm position. Occlusal contacts were recorded in laterotrusion side and mediotrusive side. The same procedure was carried out with the subject gliding the mandible on the opposite side.

## Results

Out of 64 subjects, 56 were female and 8 were male. The average age of participants was 21.22 $\pm$ 1.39 years. On 1mm laterotrusion position of mandible, 43 subjects (67%) showed group function, 15 subjects (24%) had canine guided and 6 subjects (9%) had unclassified occlusion. On 3mm laterotrusion movement, 31(48%) subjects showed group function and 27 subjects (42%) showed canine guided occlusal

scheme. The subjects with canine guided did not show any contact of teeth in both 1mm and 3mm on mediotrusive side. The number of tooth

contacts in laterotrusive and mediotrusive side during group function in 1 and 3mm are shown in tables 1,2,3 and 4.

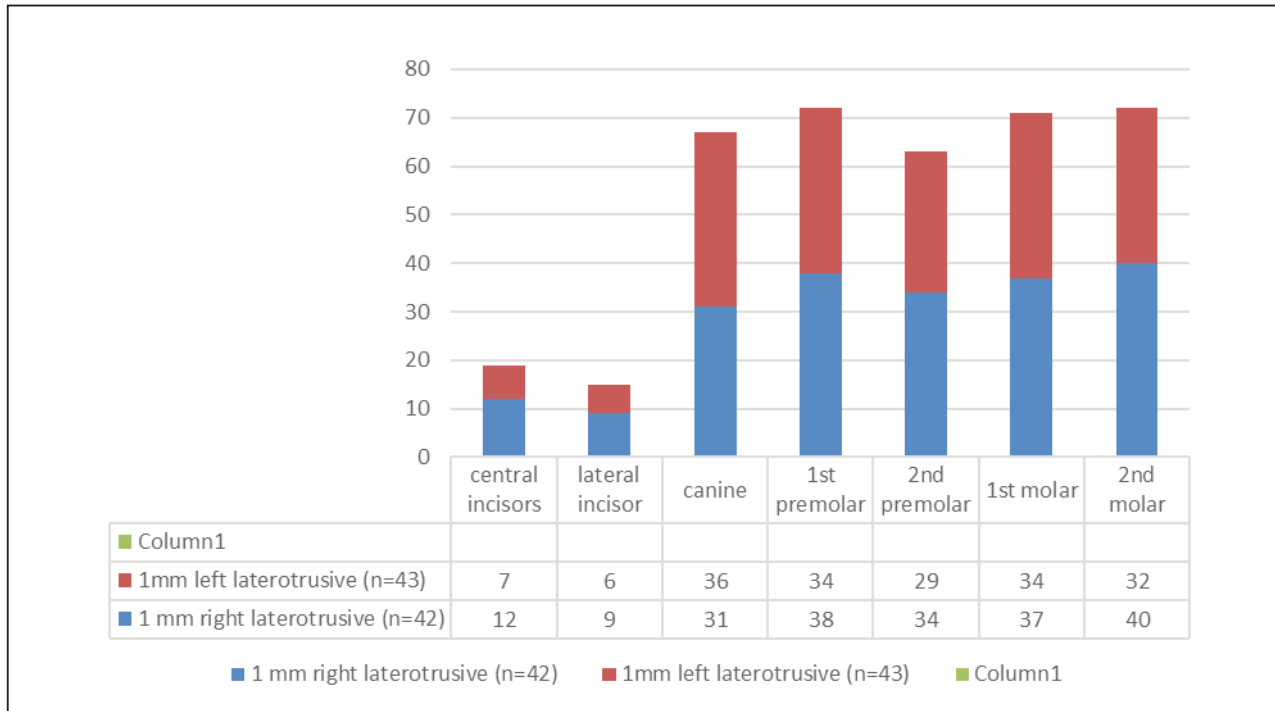


Figure 1: Laterotrusive contact of teeth in 1mm

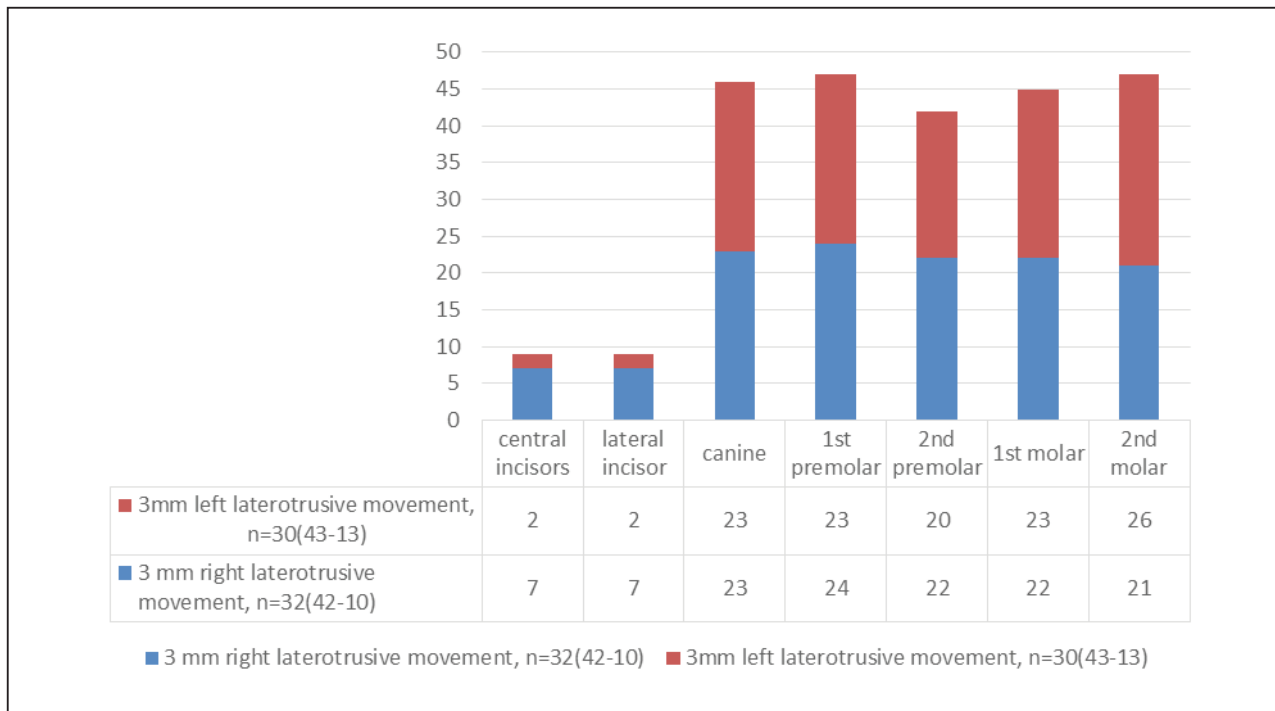


Figure 2: Mediotrusive contact of teeth in 1 mm

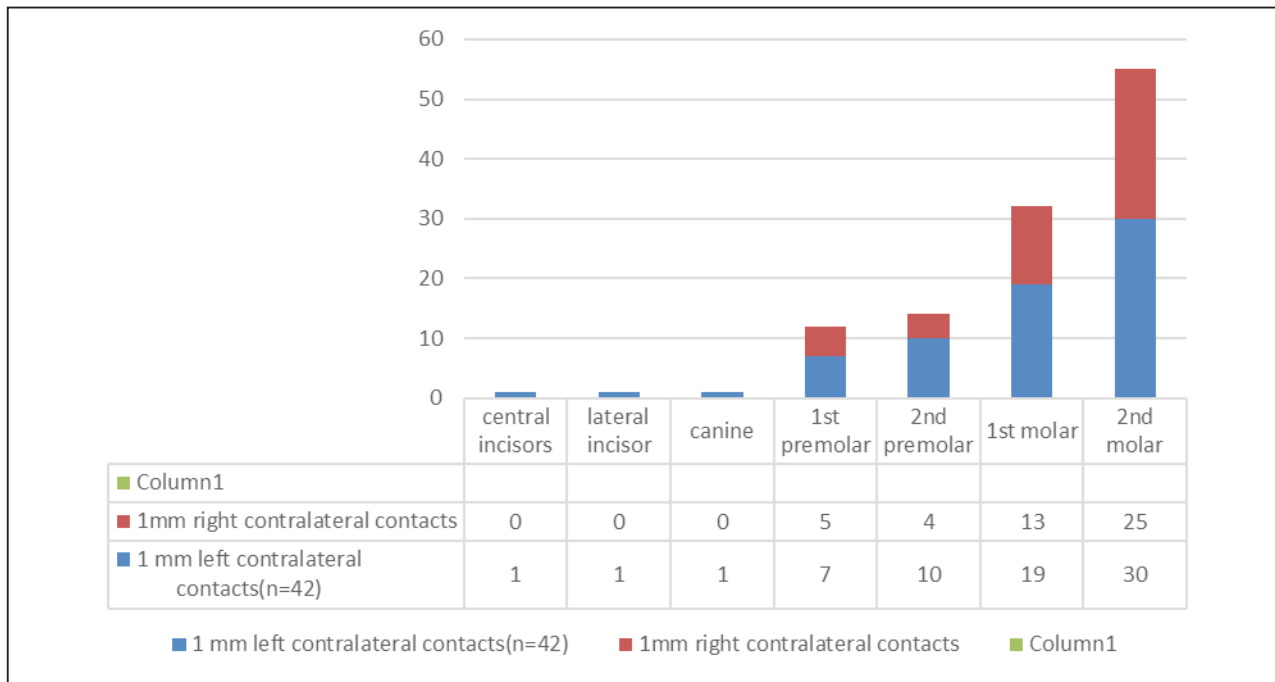


Figure 3: Laterotrusive contact of teeth in 3mm

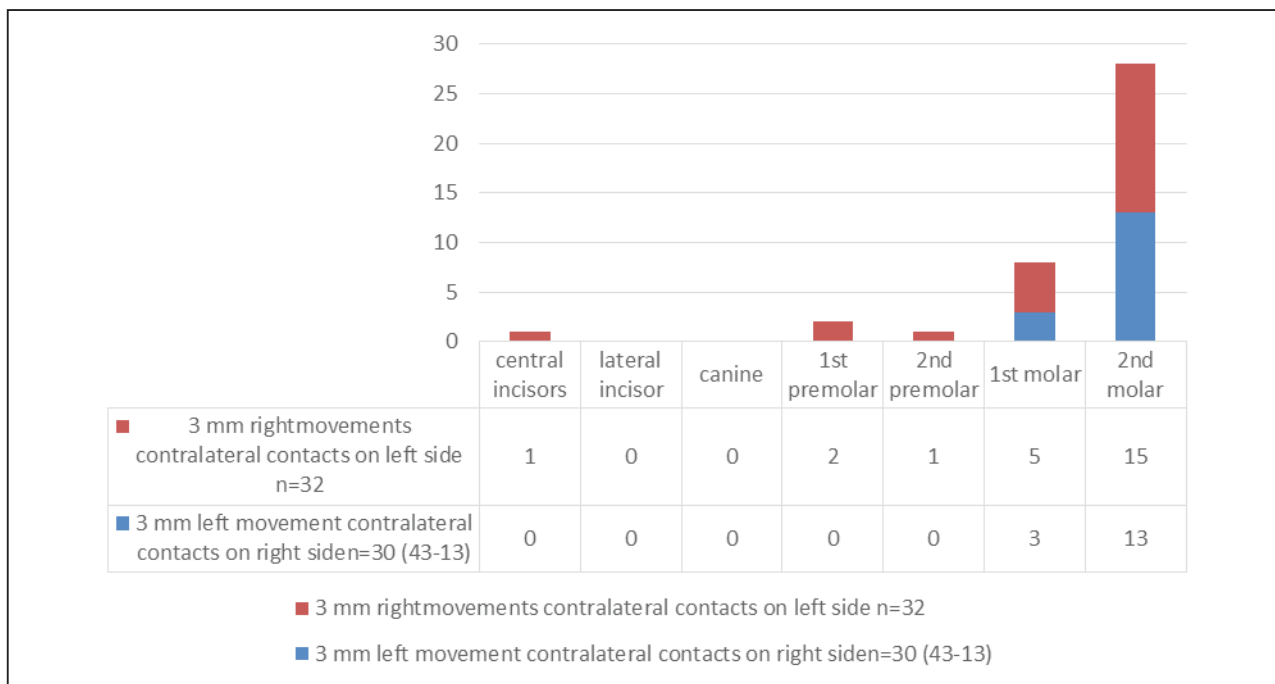


Figure 4: Mediotrusive contact of teeth in 3mm

**Discussion**

It is obligatory to establish the proper occlusal scheme in Prosthodontic rehabilitation. The occlusal scheme of an individual may depend on various factors like age, occlusal relationship (angle’s classification), and degree of lateral

excursion. The selected age group of the subjects were in their late teens and early twenties with class I occlusion and negligible occlusal wear. These inclusion factors assures that there would be no age related alterations of occlusion in the study as older subjects might have tooth wear which might alter the outcome.<sup>2</sup>

The two points of contacts evaluated in this study covered the initial and complete excursive jaw movements. The authors elected a 1 mm lateral position as the initial phase or occlusal phase of chewing and swallowing cycle by choosing the median point of various studies that ranged from 0.5 to 1.5mm, which represents the occlusal contact of initiation of functional movement.<sup>6,5, 11</sup> The 3mm point was chosen for complete excursion reflecting the positional contact during incising food and para function such as bruxism.<sup>12</sup>

There have been conflicting results from various studies on, which occlusal scheme is the most predominant in this age group. Our study revealed that the majority of occlusal scheme in this age group was group function (67% in 1mm and 48% in 3mm) which contradicts to studies stating that the normal pattern that majority of young people have canine guided occlusion.<sup>5,12,13</sup> However there are few studies agreeing with our findings (33.5%).<sup>3,14</sup> Similarly designed study conducted in Nepal agreed that the majority of occlusal schemes were group function but were varying to the rest of our results stating that nonspecific followed by canine guided were the most prevalent.<sup>12</sup> Our study suggests that canine guided occlusal schemes were the second most frequent occlusal scheme and the least prevalent was non specific occlusion scheme. The variation of occlusal pattern may be attributed to difference in criteria used for sample selection, difference in dietary daily ration, cultures as well as impact of different registration material and also difference in classification system which may be the auxiliary circumstance that contribute to the observed difference.<sup>12, 15, 16</sup>

It was observed that (27%) of group function converted into canine guidance on shifting from 1mm to 3mm. The percentage of canine guided occlusion increased from 24% to 42% when shifting from partial excursion to complete excursion. The increase of canine guided

occlusion during this transition of excursion is in agreement with similar studies.<sup>2,14, 17</sup> This percentage shift of conversion from one occlusal scheme to another has not been previously highlighted enough. The conversion of occlusal scheme may create confusion on the occlusal scheme categorization of the patient. It may be practical to categorize the occlusal scheme for a patient in complete (3mm) lateral excursion rather than partial excursion (1 mm) as the partial excursion is closer to the maximum intercuspation.<sup>5</sup>

In our study, mediotrusive side contact of teeth were absent in subjects with canine protection occlusion, whereas teeth contacts were noted on those subjects with group function. Subjects with group functions had averaged 33% in 1mm and 50% in 3mm total disocclusion on mediotrusive side during lateral excursions. Group function with mediotrusive contacts cannot be considered as balanced occlusion. These mediotrusive contacts can only be considered as indicators of balanced occlusion.<sup>5</sup>

The most frequent non-working side contact was the second molar followed by the first molars during both 1mm and in 3mm excursion. These findings were in agreement with studies of Ogawa T et al and Ingervall B et al.<sup>2,14</sup> The prevalence of mediotrusive contacts decreased with increasing eccentric movement of the mandible. This finding can be explained by a greater cusp incline of the second molar than the first molar.<sup>18</sup>

It is noteworthy that majority of the studies have simply classified occlusal schemes as canine and group functions. This simplified concept does not shed light upon the mediotrusive contacts. It seems necessary to add a modification to the current classifications of lateral occlusal schemes by specifically denoting the side and designating whether there are mediotrusive contacts in such occlusal schemes or not. We have tried to fulfill the criteria of a more

acceptable lateral occlusal scheme desired by other authors<sup>2,15</sup> by proposing the following modification to the current classification to add clarity in the actual types of occlusion more precisely. eg.

- a. Group function with disocclusion
- b. Group function without disocclusion
- c. Canine guided with disocclusion
- d. Canine guided without disocclusion

Overall, the aim of the study was fulfilled but it does have some limitation. As the study was solitary centered study, small sample size with class I occlusion only which prohibit the generalization of outcome of this study. Further studies should be done in multicenter, in large sample with other types occlusion by mounting the cast on adjustable articulator with face bow.

During occlusal rehabilitation in dentistry, where it is likely to use particular occlusal scheme, ample of studies have been observed to ratify a rational based on choosing group guided and canine guided occlusion. Canine guided occlusion and group function occlusion are evenly satisfactory when restoring complex restorative treatment indicated but practitioner should consider an occlusion scheme that is simple, practical and conservative with considerations to function and esthetics.<sup>19</sup>

### Conclusion

This study demonstrated that group function scheme was predominant on lateral excursion, both in initial and complete, among dental students. However, it is of interest to note that canine protected scheme increased on complete excursion. Mediotrusive contacts were observed in group function scheme alone which were often seen on 2nd molar and at in 1mm position.

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