

Original Research Article

The Relationship between Static and Dynamic Occlusion in Natural Permanent Dentition: A Descriptive Epidemiological Study

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ABSTRACT

Introduction: The canines are involved predominantly in the lateral excursion movements thanks to the considerable height of their crowns, powerful root implantation in the bone and their orientation in the arch which helps a particularly good periodontal proprioception. Receptors constantly inform the central nervous system on the spatial position of the mandible and appropriate muscles.

Materials and methods: The primary role of the canine in the movements of mandibular lateral excursion motivated us to conduct a survey, concerning 220 subjects, through which we aim to:

- Determine the prevalence of different types of protection in lateral excursion and the frequency of mandibular canine participation.
- Search for the existence of a possible correlation between the type of protection and Angle class.

Results: Canine protection consists primarily by Angle Class II up to 31.25%. Half of the subjects with protection group are in Angle Class I, 33.33% of subjects with balanced occlusion are in Angle Class III. Non canine participation consists in 31.25% of subjects with Angle Class II

Conclusion: According to our study, there is a significant relationship between static and cinematic occlusion: the protection group is mainly attributed to patients with angle class I. while for patients with Angle class II, canine protection is more common. Other factors must be taken into account when assessing overall occlusal scheme such as changes in the occlusion with age for the same subject, the presence of interference and wear facets.

Keywords: lateral excursions, canine, protection, Angle classification.

INTRODUCTION

The occlusion is the manner the upper teeth engage with the lower teeth.

Static occlusion is the study of teeth contacts when jaws are not moving. This static occlusion is characterized by the Angle classification that dates from the late nineteenth century:

- Class I: the mesiobuccal cusp of the first upper molar is aligned with the buccal groove of the first lower molar. In

addition, the upper canine is found between the canine and the first lower premolar.

- Class II: when the mesiobuccal cusp of the first upper molar is found forward relative to the buccal groove of the mandibular first molar.

- Class III: when the mesiobuccal cusp of the first upper molar is found distally with respect to the buccal groove of the mandibular first molar. ^[1]

Dynamic occlusion is the study of the contacts that teeth make when the mandible is moving - contacts when the jaw moves sideways, forwards, backwards, or at an angle.

There are different concepts that describe the contacts between maxillary and mandibular teeth during lateral excursion of the mandible:

***Canine protection:**

In lateral excursion, there is disclusion of non working side due to contact only between the opposing canines of working side. [2]

***Group function:**

Within lateral excursion, a lack of contact of the non-working and working side contacts. This concept allows freedom of proglissement movement of the mandible of about 1.5 mm from IOM maintaining tooth contacts to the centric occlusion position, it is the long Centric. [3]

***Balanced occlusion:**

The simultaneous contacting of the upper and lower teeth on the right and the left and in the anterior and posterior occlusal areas in centric and eccentric positions within the functional range. [4]

Canine guidance said to favor the vertical chewing pattern and to prevent wear of teeth, as in lateral occlusion where the canines guide the mandibular movement directly or indirectly through periodontal receptors. [5]

***No canine participation:**

The lack of participation of the canine in mandibular movement laterality (due to agenesis, deepbite, etc.) is a factor predisposing to dysfunction of stomatognathic complex. It explains some simultaneous lateral mastication and some bruxisms. The resulting different situations, if tolerated, are strictly adaptive. The leading role of canines cannot, in any event, be transferred safely to any dental unit, due to the fragility of their dental structure, their supporting tissues and lack of periodontal proprioception. [2]

MATERIALS AND METHODS

A descriptive epidemiological study focused on 250 peoples selected randomly from a heterogeneous class of Tunisia. We included students and employees, with varying age range, and masculine and feminine gender with different static and cinematic occlusal scheme according to Angle's classification with or without non working side interferences.

The average age of the population is 31 years with a standard deviation of 11 years and extremes of 15 and 64 years old. We adopted the following exclusion criteria:

- Patients less than 15 years old
- Restored, decayed or missing canine
- Faulty position or canine malformation
- Completely edentulous subjects or wearing a total or partial removable denture
- Presence of deciduous canines
- Patient who underwent orthodontic treatment
- Subjects with a history of craniofacial trauma
- All subjects who refused to participate in the study

All recordings were made by the same practitioner in morning hours to avoid diurnal variation. The non-working and working occlusal contacts have been recorded in a canine position substantially 2 to 3 mm lateral to the maximum intercuspation occlusion.

Data analysis is performed using the tool SPSS (Statistical Package for Social Sciences). The test χ^2 is used and the level of statistical significance was $p < 0.05$.

RESULTS

Table 1: Prevalence of different protection types in lateral mandibular excursions

| protection type | Number | % |
|-------------------------|--------|-------|
| Canine protection | 53 | 24.09 |
| Group protection | 101 | 45.90 |
| Balanced occlusion | 25 | 11.36 |
| No canine participation | 41 | 18.36 |
| Total | 220 | 100 |

Table2: Correlation Angle Class / protection type

| | Canine protection (53=24.09%) | Group protection (101=45.90%) | Balanced occlusion (25=11.36%) | No canine participation (41=18.63%) | Total |
|--------------------------|----------------------------------|----------------------------------|--------------------------------------|---|------------------|
| Class I (145=72.86%) | 32 22.07% | 74 51.03% | 17 11.72% | 22 15.17% | 145 100% |
| Class II (48=24.12%) | 15 31.25% | 15 31.25% | 3 6.25% | 15 31.25% | 48 100% |
| Class III (145=3.02%) | 1.0 16.67% | 2.0 33.33% | 2.0 33.33% | 1.0 16.67% | 6.0 100% |
| p | 10 ⁻⁶ | 10 ⁻⁶ | 10 ⁻⁶ | 10 ⁻⁶ | 10 ⁻⁶ |

DISCUSSION

Prevalence of different protection types in lateral mandibular excursions.

According to our study, most contact patterns (45.9%) belonged to group function while Canine protection presented 24.09%.

Asawaworit et al [6] proved in a study of 104 subjects aged from 18 to 50 years the higher percentage of group protection which is 68.7% for the male gender and 67.6% for the female gender, while the percentage of canine protection varies between 16.4% for the male gender and 18.9% for the female gender. This result is very close to that given by Kahn et al, [7] where the study of 55 subjects from New York and has shown a protection group percentage 65% right and 67% left while the canine protection represented 35 % for the side right and 33% for the left.

Singh et al [8] selected 100 systematically healthy undergraduate students between the age group of 18 to 25 years. They found that most contact patterns belonged to group function, and a few to canine protection which confirms our results; and that majority of the contact patterns were those other than canine protection and group function and were unclassifiable.

Other studies have shown divergent results such as the study of AL-Hiyasat et al [9] realised on a total of 447 subjects, with an age range of 14–17 years; canine guided occlusion was the dominant type of dynamic occlusion (57%).

A systematic review proved that the canine-guided occlusion tends to be more frequently observed. [10]

In another study managed by Shetty et al, [11] a total of 300 subjects between the age group of 18-25 years were selected as study sample. These subjects were grouped into square, ovoid and tapered arch forms depending on the shape of their arch. Canine protected occlusion was seen largely in subjects with square arch form (79.55%) than group function occlusion (20.45%). Group function occlusion (93.6%) was seen largely in subjects with tapered arch form compared to canine protected occlusion (6.4%).

A study planned by Athiban [12] managed on 239 subjects selected between the age group of 17-22 years showed that majority of subjects 92.3% and 88.37% having canine guidance in age group of 17 and 18 years respectively. But above 19 years there is an increase in prevalence of group function occlusion, with around 77.19%, 100%, 88.37% of individuals in age group of 20, 21, 22 years respectively.

This study confirmed that change in occlusal scheme from canine guidance to group function was found in transition stage from adolescents to adulthood during the period of dental under graduation which could be related to the food habits, psychological factors and stress.

The relationship between static and dynamic occlusion

According to our study:

- Canine protection is shown primarily in subjects with Angle class II up to 31.25%
- 33.33% of subjects with balanced occlusion are in Angle Class III.
- 31.25% of subjects with canine protection are in Angle Class II.

- The no canine participation consists in 31.25% of subjects with Angle Class II.

AL-Hiyasat ^[9] proved that there was an association between canine guidance with class II static occlusion.

The relationship between static and dynamic occlusion was investigated in a sample of 94 dental students (39 males and 55 females) with an age range of 21–30 years by Al-Nimri et al ^[13] revealed that at the 0.5 mm position, the pattern of dynamic occlusion was different in relation to various static occlusion features but without reaching a significant level. While at the 3 mm position, the pattern of dynamic occlusion was significantly affected by incisor relationship.

The study planned by Asawaworarit et al ^[6] demonstrated that there was no demographic or occlusal factors that strongly related to any particular occlusal scheme

A systematic review concluded that the prevalence of the lateral occlusion schemes appears to be influenced by different factors: the magnitude of excursion, an individual's age and the static occlusal relationship. ^[10]

CONCLUSION

Group function was the dominant type of dynamic occlusion.

According to this study and taking into account the other studies performed by others in different countries, there is a significant correlation between static and dynamic occlusion, knowing that the canine protection is more common in subjects with Angle class II and that group function was the dominant type of dynamic occlusion.

It does not seem appropriate to describe and classify the patterns of occlusal contact using only existing classification system. A clear description regarding the position of mandible should be included in definition for research as well as clinical situations. ^[8]

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