

Occlusal Schemes during Eccentric Jaw Movements in Dental Students of Lahore Medical and Dental College, Lahore

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ABSTRACT

Background: Occlusion plays an important role in the health of stomatognathic system. Care full designing and rehabilitation of occlusal scheme in restoring lost dentition is required.

Aim: To find out the occlusal schemes and to study the nature of occlusal contacts during maximum intercuspation to protrusive and lateral excursions.

Study design: A cross-sectional observational study.

Place & duration: Prosthodontic Department, Lahore Medical and Dental College from 10th Jul '21 to 10th October'21.

Methodology: A total of 104 dental students were selected and their occlusal schemes were classified. Participants occlusal interferences i.e; centric, protrusive, mediotrusive and laterotrusive were also recorded using shim stocks, diagnostic instrument and by visual assessment. Horizontal and vertical overlap of anterior teeth was also measured.

Results: Among 104 participants studied, 61.5% were found having canine guided occlusal scheme, 29.8% having group function whereas 8.7% had the combination of both. Majority participants do not have any occlusal interference 79.8%, whereas 20.2% were having interferences out of which the group function occlusal scheme had maximum number of interferences, 10(9.6%). Insignificant relationship was obtained between presence of interferences and occlusal schemes, $P > 0.05$. The type of interference most commonly seen was the protrusive interferences (37.5%).

Conclusion: The type of occlusal scheme commonly observed is canine guided occlusion, however there were no occlusal factors that were significantly associated to any particular occlusal scheme.

Keywords: Laterotrusive, Canine protected occlusion, Canine guided occlusion Group function occlusion, Occlusal schemes,

INTRODUCTION

Occlusion is defined as the static contact of maxillary and mandibular teeth.¹ Restorative dentistry involves the restoration of broken-down teeth and restoration of not only the normal anatomy but the re-establishment of dynamic and static occlusion². In normal healthy occlusion multiple pinpoint contacts occur between mandibular and maxillary teeth in maximum intercuspation, during protrusive (forward movement) and in laterotrusive (lateral movement of mandible) movements of the mandible^{2,3}. There are two concepts of occlusal schemes in natural dentition; that are the canine-guided occlusion and group function occlusion^{2,3,4}.

Canine guided occlusion is the occlusion in which canines of maxilla and mandible contact with each other during lateral mandible movement in such a way that all posterior teeth become out of occlusion.^{4,5} It has been speculated that this occlusion type protects the posterior teeth from overloading during lateral movement.^{5,6} Canines' location, anatomy and strong proprioceptive abilities well tolerate the occlusal loads.⁶ The group function occlusion is the occlusion that exists in people with missing, abraded or restored canines⁶. Multiple teeth come in contact between maxilla and mandible during lateral movements on working side (the side towards which mandible moves) and no contact of teeth on the balancing side (the side of arch from where the mandible moves away)⁷. Groups of teeth take up the occlusal load and thus relieve the rest of the teeth from occlusal trauma^{6,8}. Abnormal occlusal relations or interferences highly affect the health of teeth and tissues⁹. An occlusal interference is the term used to describe abnormal occlusal contacts between upper and lower teeth in static as well as dynamic relation. When interferences occur, they are unfavorable and disturbing to the periodontium, alveolar bone and teeth themselves^{9,10}.

When a part of occlusion needs restoration, the restoration must be consistent with already existing occlusal scheme. But when whole dentition needs rehabilitation due to attrition, erosion and cusp fractures the choice of selecting the occlusal scheme should be carried out^{8,11}. In the restorative dentistry during oral rehabilitation there is a need to choose the occlusal schemes and that could be done on the basis of epidemiological data combined with the knowledge of masticatory system^{2,7}. Biological variations for example genetic variation can affect specific tooth size, shape and function¹². The studies on such topics are scarce in our country. So, the purpose of the study was to find out the most common occlusal schemes (canine guided and group function) in our region as well as the associated occlusal relationship like vertical and horizontal overlap of anterior teeth in each occlusal scheme. It will also highlight the prevalence of commonest existing interferences. This would help in designing the best occlusal scheme in patients who have lost the anatomical details of dentition and need full mouth rehabilitation.

METHODOLOGY

A total of 104 dental students of both genders were selected from the Prosthodontic department of Lahore Medical and Dental College, Lahore in three months' time i.e.; from 10th July to 10th Oct' 21. The age of the participants ranged from 19 to 25 years. It was a cross-sectional observational study and sample was collected using non-probability purpose sampling. The sample size was obtained from the previous study carried out on nature of occlusion during eccentric movements. All participants included had complete permanent dentition except 3rd molars. Participants without previous or current history of orthodontic treatment were included. All participants who had natural dentition without artificial crowns, fixed partial dentures and occlusal adjustments were selected. The participants not willing to give consent were excluded from the study. Those having restorations involving incisal edges or cusp tips of teeth, temporomandibular joint

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problems and those with malaligned teeth were also excluded. Teeth showing signs of attrition, abrasion and erosion were also not included in the study. Informed consent was obtained and ethical approval was taken from the Institutional Dental Ethical Committee.

The subjects were seated in dental chair in upright position. Two experienced Prosthodontists examined the occlusal scheme of the participants under bright light with the help of mouth mirror and shim-stocks. The static (maximum intercuspation) and dynamic occlusion (right and left lateral movement of mandible) of each participant along with interferences were assessed. The subjects were asked to close the teeth in maximum intercuspation (position where maxillary and mandibular teeth meet). A shim-stock of 8-micron thickness was placed in between upper and lower incisors to find out if any contact occurs between them. If posterior teeth contacted and no contact between anterior teeth in maximum intercuspation then it was recorded as normal occlusion without interference, however if contact found between anterior teeth, it was recorded as interference. To record the type of occlusal scheme on right and left side of the arches, the gliding movements of mandible were performed. Shim stock was placed between upper and lower teeth and subjects were asked to move the mandible on right side (working side). Occlusal scheme was recorded as canine guided if only canines of right side of the arch are in contact, whereas if more than three teeth in contact it was recorded as group function occlusal scheme. The interferences i.e.; abnormal occlusal contacts were also recorded on both sides of the arch i.e.; the right working side (the side towards which mandible moves), the left balancing side (the side of arch from where the mandible moves away). When teeth come in contact on right working side, there should be no tooth contact on the left balancing side, if present it was recorded as balancing interference. Whereas the working interference would be the contact of only one tooth. Shim stock was held by the examiner in between teeth and constant pulling force used to assess during these lateral gliding movements on right and left side. Now the subject was asked to move the mandible on the left side which by doing so was now left working side and right side became the balancing side. The occlusal scheme (canine guided or group function) was noted and the interferences on left working and right balancing sides were recorded.

Occlusal contact at the protrusive movement (edge to edge anterior teeth contact) was also checked. There should be no contact of posterior teeth (molars & premolars) in edge-to-edge incisor position, if persists it is recorded as protrusive interference. To check shim stock was placed on posterior teeth and subject moved mandible in to edge-to-edge position. By pulling the shim stock the assessment was made if posterior teeth hold the shim stock or not. If they hold then that was recorded as protrusive interference. Next the vertical and horizontal overlap of incisors was measured in mm with scale.

Data analysis: SPSS version 20 was used to analyze the data. Chi-square test was used to find out the association of the type of occlusal scheme with gender and type of occlusal interferences. Vertical and horizontal overlap distances among different occlusal scheme was compared using one way ANOVA. The significance level will be set at $P=0.05$.

RESULTS

A total of 104 participants were included in the study. Out of all the participants 72(69.2%) appeared were females and 32(30.8%) were males. The age ranged from 20 to 25 years and average age was 22.80 years \pm SD1.410. Majority of the participants, 64(61.5%) were found having canine guided occlusal scheme. 31(29.8%) reported having group function occlusal scheme whereas 9(8.7%) possessed the combination of both, Table I. The most prevalent occlusal scheme in male was the canine guided occlusal scheme, whereas in female the group function was the most common scheme, Table I. Distribution of occlusal scheme with gender found

no significant difference; Chi-sq=.498; $p = > 0.05$. There was equal distribution of group function and canine guided and combination between gender. We also found that the majority of the participants do not have any occlusal interference 83(79.8%), whereas 21(20.2%) were having interferences out of which the group function occlusal scheme had the maximum number of interferences, 10(9.6%), canine guided occlusion had 8(7.7%) and combination had 3(2.9%). The insignificant relationship was obtained between presence of interferences and occlusal schemes, Chi Square =.256; $P>0.05$, Table II. The type of interference most commonly seen was the protrusive interferences, that accounts for 6(37.5%), the second most common was centric interference, 5(31.2%), followed by the balancing interference 4(25%). The interference that was the least reported was working interference 1(6.2%). The mean incisors vertical and horizontal overlap of anterior teeth reported were 2.27 \pm .455 SD and 2.93 \pm .747 SD. The horizontal and vertical overlap distance was insignificantly different among all occlusal schemes $p>0.05$ (Table III).

Table I: Occlusal scheme distribution with respect to gender (n=104)

Occlusal scheme	N%	Male, n=32	Female, n=72
Canine guide	64(61.5)	22(68.8%)	42(58.3%)
Group function	31(29.8)	7(21.9%)	24(33.3%)
Combination	9(8.7)	3(9.4%)	6(8.3%)

Table II: Occlusal interferences within each occlusal scheme (n=104)

Occlusal scheme	Percentage of interferences	Presence of interference	
		Yes	No
Canine guided (n= 4)	8(7.7)	18(28.1)	46(71.9)
Group function(n=31)	10(9.6)	3(9.7)	28(90.3)
Combination(n=9)	3(2.9)	0(0.00)	9(100.0)
P		.256	

Table II: Measurement of horizontal and vertical overlap with respect to occlusal scheme, N=104

Occlusal scheme	Horizontal overlap (mean \pm SD)	Vertical overlap Mean \pm SD
Canine guided(n=64)	2.30 \pm .515	2.89 \pm .781
Group function(n=31)	2.23 \pm .363	3.03 \pm .633
Combination(n=9)	2.24 \pm .291	2.87 \pm .910
P	.750	.703

DISCUSSION

Occlusion has a vital role in various disciplines of dentistry. In full mouth rehabilitation cases the dentists are at loss of selecting the best occlusal scheme for the patients.¹³ Biological variations have an influence on occlusion and not much literature on such topics is available in our country hence conducted the study to find out the most common occlusal schemes (canine guided and group function) in our region as well as the associated occlusal relationship like vertical and horizontal overlap of anterior teeth in each occlusal scheme.

The most observed occlusal scheme in male participants was the canine guided whereas the group function was more common in females. Likewise, AV Sreekumar¹⁴ and coworkers carried out a study on 100 dental students and studied occlusion during eccentric mandibular movements. They reported male patients having canine guided and female with group function occlusion as was the result of the current study. In contrast Kashif Aslam¹⁵ and coworkers reported dominance of canine guided occlusal scheme in both the genders. Out of 225 males 67% had canine guided occlusal scheme and 55% showed group function. Out of 375 females 77% had canine guided and 53% showed group function occlusion. We believe that the variation in the occlusion types in different studies is due to the biological differences i.e., genetics that influence the occlusion types.¹⁵ However, studies suggested that the occlusion of choice in prosthodontics and orthodontic treatments in young patients should be canine guided as it is the most suitable occlusal scheme because of the canine being the strongest anterior tooth with

longest root to bear the lateral loads.¹² However, with age the canine tip resorbs due to attrition and occlusion shifts to the group function occlusion^{16,17}.

Gender difference with respect to variation in occlusal schemes have been studied in few studies in the past to know whether there exists a significant difference or not and mixed results were found^{14,15,18}. We however, reported insignificant difference in the distribution of occlusal scheme and gender. Similar results were documented by Kashif Aslam¹⁵ and coworkers and reported insignificant difference in gender with respect to both occlusal schemes, $p > 0.05$. In relation to gender, Ogava¹⁹ et al reported insignificant difference in the frequency of occurrence of group function and canine guided occlusion in their respective study. However, contrasting results were found in a study by AV Sreekumar¹⁴ and coworkers, where general tendency to show canine guided occlusion was found in males and group function occlusion in females and this difference was statically significant. However, in accordance to the results of current study Asawaworari¹⁸ and coworkers studied occlusal schemes distribution in group of Thais and found equal distribution of types of occlusion in both genders. Variation in the results could be due to the variation in biological, racial and genetical variations^{14,15}.

The occlusal scheme impacts masticatory function, aesthetics and comfort²⁰. The two most suitable occlusal schemes in health natural dentition are canine guided and group function or a combination of both^{20,21,22}. In the present study we found majority of the participants 61.5% having canine guided occlusal scheme followed by the group function 29.8% and the least observed was the combination of both 8.7%. AV Sreekumar¹⁴ and coworkers also found 87% subject showing post disocclusion during protrusive movement. 74% showed post disocclusion during lateroprotrusion e.g., canine guided occlusion on both sides. They reported bilateral canine guided occlusion in 58%. Just like them we also found maximum number 61.5% of participants having canine guided occlusal scheme where all posterior teeth disoccluded during lateral mandibular movement except canines on working sides. However, 29.8% participants in our study had group function occlusion, and 8.7% had combination of both. Similarly, AV Sreekumar¹⁴ reported 8% population having combination occlusal scheme. Asawaworari¹⁸ and coworkers in contrast reported dominance of group function occlusion i.e., 68.3% in Thai population with group function occlusion, 17.3% canine guided and 12.5% with combination of both. Contrasting results were also seen in the study done by Kashif Aslam¹⁵ and coworkers where they reported 49.09% participants having canine guided and more participants i.e., 51.06% with group function occlusal scheme. We believe that the general and environmental variations affect the tooth shape, size and its function that results in possession of occlusal scheme types¹. Moreover, genetical variation in different populations of the world plays its role.

Occlusal interferences are abnormal occlusal contact that must be checked and removed for the health of patients stomatognathic system that includes teeth and associated structures, muscles and temporomandibular joints.²³ We found majority of the participants without having any occlusal interferences i.e., 79.8%. Occlusal interferences were reported only 20.2% in our participants out of which the group function occlusal scheme had the maximum number of interferences, 9.6%, canine guided occlusion had 7.7% and combination had 2.9%. We also reported insignificant relationship between presence of interferences and occlusal schemes. The horizontal and vertical overlap distance was also insignificantly different among all occlusal schemes.

Regarding the type of interferences, most commonly observed interferences was the protrusive interference, that accounts for 37.5%, the second most common was centric interference, 31.2%, followed by the balancing interference 25.0%. The interference that was the least reported was working interference 6.2%. AV Sreekumar¹⁴ and coworkers reported 17% population with protrusive interference, whereas Asawaworari¹⁸

and coworkers reported 20.2% population having interferences and similar to our study the most common interference type seen was protrusive; 57.14% followed by balancing interference; 38.1% and working interference 4.1%. Studies have reported that the occlusal interferences lead to altered muscle and temporomandibular joint functions, further leads to occlusal wear, periodontal stress and bone resorption. It is important to evaluate the occlusion in restorative and prosthodontic rehabilitation because the teeth occlusal surface must be functional unit of stomatognathic system of the patient.²⁴ Mandibular functions like mastication, speech, and swallowing should not be disturbed by teeth interferences and there should be no overloading of temporomandibular joint and attachment apparatus during centric and eccentric movements^{23,24,25,26}. We further suggest that the arbitrary selection of occlusal scheme either canine guided or group function, in oral rehabilitation in Prosthodontics and restorative dentistry should be avoided. Every patient has unique stomatognathic system and patient's different craniofacial structures or chewing pattern along with the associated muscles and temporomandibular joints and teeth must be in harmony with the selected occlusal scheme that should be interference free^{24,25,26}.

Limitation of the study was its small sample size and canine guided and group function occlusion was checked intraorally which could have been counterchecked with face bow records mounted on an articulator.

CONCLUSION

The type of occlusal scheme commonly observed is canine guided occlusion, however there were no occlusal factors that were significantly associated to any particular occlusal scheme.

Authors contributions: SHAR: Data collection/Manuscript writing, FA: Conceived idea/designed research, AZ: Statistical analysis, AS: Data collection, FY: Manuscript final reading, MUI: Literature review, SN: Research supervisor

Conflict of interest: Nil

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