Original Research Article

THE PATTERN OF OCCLUSAL CONTACT IN LATERAL MANDIBULAR JAW POSITION

ABSTRACT:

OBJECTIVE: To determine the pattern of occlusal contacts in lateral jaw position of the mandibles in different of molar classification.
STUDY DESIGN: Observational study.

SETTING: Study carried out at Department of Prosthodontics; Institute of Dentistry, LUMHS, Jamshoro, Pakistan from June 2020 to December 2020.

MATERIAL & METHOD: Subjects having normal Angle's class 1 occlusal alignment, both male and females aged between 20-30 years old and subjects having full dentition with the exception for third molars were included the study. While Subjects with severe attrition problems, Subjects were placed in a dental chair with the Frankfurt level parallel to the floor. The interocclusal contacts were recorded with 12µ thick shim stock in four lateral positions on both sides; 0.5, 1, 2, and 3 mm measured with Vernier caliper from the maximum intercuspation point. The shim stock was placed on the occlusal surface on the right side, and the subject was asked to close his/her mandible in the maximum intercuspation position. While a constant pulling force was maintained on the shim stock, the subject was then asked to perform a habitual gliding movement to the right. When the subject's mandible was moved 0.5 mm right from the intercuspal position, the presence or absence of an occlusal contact were examined and recorded.

RESULTS: From 81 patients, the minimum age was found 20 years and maximum age was 30 years with mean and standard deviation of the age was 25.40 ± 2.84 years. Males were 44/81 (54.3%) while females were 33/81 (45.7%). The different lateral positions on right side of tooth of patients at 0.5mm were 225, 1mm were 176, 2mm were 161 and 3mm were 140. The different lateral positions on left side of tooth of patients at 0.5mm were 197, 1mm were 171, 2mm were 146 and 3mm were 123.

CONCLUSION: In the current study, significant association was found between tooth number and first molar tooth lateral position on right side but there was no significant association for other positions and between tooth numbers and different lateral position on left side.

KEY WORDS: Occlusion, Contact Jaw Position

INTRODUCTION:

Occlusion is defined as the act or process of closure of maxillary or mandibular teeth[2]. Occlusion not only means contact of teeth but it is an important component to facilitate the harmonious activity of masticatory apparatus.[3] Masticatory apparatus consists of three parts, teeth, periodontal tissue and articulatory system (Joints of temporomandibular joint (TMJ) is two, so has to be plural only, Muscle and occlusion).[4] Activity of these structure facilitate the mastication, speech, and deglutition.[5] A healthy occlusion maintains the health and physiological functioning of the masticatory apparatus. Pathological or traumatic occlusion can produce occlusal wear, over stress in periodontal membrane and TMJ problems.[6]

The occlusion could be static or dynamic.[7] Dynamic occlusion is further classified into canine guided occlusion and group function.[8] When mandible moves laterally, contact between maxillary and mandibular canine on working side it is called canine guided occlusion, if multiple maxillary and mandibular teeth contact on working side it is then called group function.[9] The prevalence of the lateral occlusion scheme at 0.5 and 3 mm positions was observed in study conducted by Abduo J et al, where they observed the prevalence of canine-guided occlusion was observed 59% as compared to older studies that showed 21.9%. They also found prevalence of group function was 23.9% as compared to older studies that showed 45.3%.[10]

Therefore, the contact between the teeth depends on the degree of lateral movement of the mandible and the fact that few studies have examined the shape of occlusal contact in lateral mandibular movement. Therefore, further investigation of occlusal contact patterns in lateral mandibular motion is required. The aim of this study was to determine the shape of the occlusal contact at the lateral mandibular position in different molar classifications with different angles. This research will help medical professionals understand the correct occlusal contact pattern when planning restoration preparation, and patients will have more stable prosthesis.

MATERIAL & METHOD:

This was an observational study carried out at Department of Prosthodontics; Institute of Dentistry, LUMHS, Jamshoro, Pakistan from June 2020 to December 2020. Ethical approval was obtained from ethical review board. Patients was informed and written consent

was taken. The data was collected using a structured proforma to record the findings of this study along with patient's demographic data. Subjects having normal Angle's class 1 occlusal alignment, both male and females aged between 20-30 years and Subjects having full dentition with the exception for third molars were included in study. While Subjects with severe attrition problems, subjects having dental caries (especially occlusal caries, over erupted teeth, restorations involving cuspal region, history of orthodontic treatment and subjects with diagnosed temporomandibular disorder were excluded from this study.

The participant was positioned on a dental chair in an upright position with the Frankfurt's horizontal plane parallel to the floor. The inter-occlusal contacts were recorded with 12µ thick shim stock in four lateral positions on both sides; 0.5, 1, 2, and 3 mm measured with Vernier caliper from the maximum intercuspation point. To guide these lateral positions, the maxillary central incisors were marked with a water-resistant marker pen. These marks provided guidance for amount of mandibular movement from maximum intercuspation. The shim stock was placed on the occlusal surface on the right side and the participant was asked to close his/her mandible in the maximum intercuspation position. While a constant pulling force was maintained on the shim stock, the participant was asked to perform a habitual gliding movement to the right. When the participant's mandible was moved 0.5 mm right from the intercuspal position, the presence or absence of an occlusal contact was examined and recorded on the proforma. The teeth holding the shim stock were considered to have occlusal contact. The same procedure was performed in the 1, 2, and 3 mm right position, 0.5, 1, 2 and 3 mm left positions and recorded in proforma.

RESULTS:

From 81 patients, the minimum age was found to be 20 years and maximum age was 30 years with mean and standard deviation of the age was 25.40 ± 2.84 years. Males were 44/81 (54.3%) while females were 37/81 (45.7%) (Table No.1). The different lateral positions on right side of tooth of patients at 0.5mm were 225, 1mm were 176, 2mm were 161 and 3mm were 140. The different lateral positions on left side of tooth of patients at 0.5mm were 197, 1mm were 171, 2mm were 146 and 3mm were 123. Significant association was found between tooth numbers and M1 lateral position on right side but it was not found

for other positions. Significant association was not found between tooth numbers and different lateral position on left side having p-value greater than 0.05 (Table No.2-5).

DISCUSSION:

The aim of the present study was to determine the form of occlusal contacts in lateral jaw position of the mandible. The present study was conducted from the patients of Department of Prosthodontics; Institute of Dentistry, LUMHS, Jamshoro. Eighty-one patients were included after fulfilling the inclusion and exclusion criteria by using nonprobability convenient sampling. It was descriptive cross-sectional study to observe the different patterns of occlusal contacts in lateral jaw position of the mandible.

The approval of synopsis from institutional ethical review committee was taken and data of eighty-one patients was collected after fulfilling the inclusion and exclusion criteria for different lateral jaw position at 0.5mm, 1mm, 2mm, as well as 3mm. Among 81 patients, it was observed that the minimum age was 20 years and maximum age was 30 years with mean and standard deviation of the age was 25.40 ± 2.84 years. Males comprised 54.3% while females were 45.7%. In reported literature of occlusal contact patterns, it is revealed that the occlusal contacts have been measured in an edge-to-edge position of the canines around 3 mm lateral from the maximum inter-cuspation [11] or in an irregulated position. Due to this the above mentioned position is rarely used during mastication except in parafunction such as bruxism and in incising food [12]. Other researchers also studied the form of occlusal contact in the range of 1 to 3 mm in regulated positions from the maximum intercuspation[13].

Kinematical investigations by Ogawa et al.[14] reported that the occlusal contact pattern in this position (0.5 mm) must be evaluated when examining the role of occlusal contact on masticatory function and the occlusal gliding contact during mastication would occur in the 0.5 mm position. A type of occlusal contact pattern was revealed from the data in the total range from the 0.5 mm to the 3 mm position, namely, group function, canine protection or balanced occlusion. Moreover, the group function and the forms of canine protection with non-working side contacts were categorized differently by different studies[15] and were designated as being either canine protection or group function limited on the working side or balanced occlusion.

In this study, contact frequency at 0.5mm lateral position on right side of Molar 1 was 31, 26 contact at 1mm, 11 at 2mm while there were 9 at 3mm, which is closer to the study conducted by Singh. A. et. al.[16] in which there were 34 patients of 0.5mm contact lateral position on right side, 22 at 1mm, 18 at 2mm and 11 at 3mm. Similarly, in our study, out of all the four lateral positions on right side (1st molar), 0.5 mm lateral position showed contacts that progressively decreases for further lateral positions that is 0.5mm, 1mm, 2mm and 3mm in the following frequency 8, 9, 4 and 3 respectively. Similar results were found in decreasing order for first molar on right side.[17]

In the study of El-Bialy. et.al[18] from all teeth, only canine showed consistent contact frequency throughout all four positions, whereas both 1st premolar and 2nd premolar showed significant decrease in the contact frequency through lateral positions from 1 to 2 mm. Similar results were found in our research for both 1st premolar and 2nd premolar but significant for 1st molar and it was not significant for 2nd molar.

CONCLUSION:

We conclude that significant association was found between tooth number and molar first lateral position on right side but it was not found for other positions as well as significant association was not found between tooth number and different lateral position on left side and had p-value which was found to be greater than 0.05.

REFRENCES:

1. Bhatt A, Vishesh G, Kumar B. Occlusion: The Foundation of Dentistry: A review. Int J Dent Health Sci. 2015; 2(2):342-8 .
2. Glossary of Prosthodontic Terms. 8th ed. J Prosthet Dent 2005;94:1085-9.
3. Okeson JP. Evolution of occlusion and temporomandibular disorder in orthodontics: past, present, and future. Am J Orthodontics and Dentofacial Orthopedics. 2015 May 1;147(5):S216-23.
4. Imran T, Ahmed N, Nazeer B. Pattern of occlusal contacts in intercuspal position of natural teeth. IDJR. 2016;4(1):19-21.

5. Naveed H, Aziz SM, Hassan A, Khan W, Azaz AA. Patterns of partial edentulism among armed forces Personnel reporting at armed forces institute of Dentistry Pakistan. PODJ. 2011;31(1):217-21.
6. Sreekumar AV, Rupesh PL, Pradeep N. Nature of Occlusion during Eccentric Mandibular Movements in Young Adults. J Contemp Dent Pract. 2012;13(5):612-7.
7. Bhatt A, Vishesh G, Kumar B. Occlusion: The Foundation Of Dentistry: A review. Int J Dent Health Sci. 2015; 2(2):342-8
8. Sidana V, Pasricha N, Makkar M, Bhasin S. Group function occlusion. Indian J Oral Sci. 2012;3:124-8.
9. Singh A, Sangur R, Rao BL, Mahajan T. A Clinical Study to Determine the Pattern of Occlusal Contacts in Lateral Positions and Its Validity in Classifying Guidance Patterns. J Indian Prosthodont Soc. 2013;13(2):101-107.
10. Abduo J, Bennamoun M, Tennant M, Mcgeachie J. Effect of prosthodontic planning on lateral occlusion scheme: a comparison between conventional and digital planning. J Appl Oral Sci 2015;23(2):196-205.
11. Imran T, Ahmed N, Nazeer B. Pattern of occlusal contacts in intercuspal position of natural teeth. Int Dent J Res 2016;4(1):19-21 12 McCoy. Occlusion confusion. AGD 2013;69-5.
12. Kulmer S, Ruzicka B, Stainer M, Niederwanger A. Established prosthodontic rules confirmed in natural adolescent occlusion. international journal of stomatology & occlusion medicine. 2011 Aug 1;4(1):20-7.
13. McCoy G. Occlusion confusion. Gen Dent. Jan-Feb 2013;61(1):69-75
14. Bhatt A, Vishesh G, Kumar B. Occlusion: The Foundation Of Dentistry: A review. Int J Dent Health Sci. 2015; 2(2):342-8.

15. Verma M, Nanda A, Sood A. Principles of occlusion in implant dentistry. Journal of the International Clinical Dental Research Organization. 2015 Dec 1;7(3):27.
16. Pain O. Prevalence of static and dynamic dental malocclusion features in subgroups of temporomandibular disorder patients: Implications for the epidemiology of the TMD occlusion association. Quintessence Int. 2015;46:341-9.
17. Fisher B. Temporomandibular Joint Outcomes Following Orthognathic Surgery.
18. El-Bialy T, Farouk K, Carlyle TD, Wiltshire W, Drummond R, Dumore T, Knowlton K, Tompson B. Effect of low intensity pulsed ultrasound (LIPUS) on tooth movement and root resorption: A prospective multi-center randomized controlled trial. Journal of clinical medicine. 2020 Mar;9(3):804.

Table-1:
DESCRIPTIVE STATISTICS
n=81

VARIABLE	FREQUENCY (n)	PERCENTAGE (%)
GENDER		
• MALE	44	54.3%
• FEMALE	37	45.7 %
Male to Female ratio 1.18:1		
AGE (Years)		
• 20-25 years	52	41.8 %
• 26- 30 years	33	30.0 %

Table - 2:
Contact frequency at different lateral positions on right side
n= 81

Tooth	0.5mm	1mm	2mm	3mm
• **Group A (C, PM1 and PM2)**	186	141	146	128
• **Group B (M1)**	31	26	11	9
• **Group C (M2)**	8	9	4	3
• **Total**	225	176	161	140

C:Contact, PM: PreMolar , M: Molar

Table – 3:
Contact Frequency At Different Lateral Positions On Left Side
n= 81

Tooth	0.5mm	1mm	2mm	3mm
• **Group A (C, PM1 and PM2)**	175	156	136	116
• **Group B (M1)**	20	14	9	5
• **Group C (M2)**	2	1	1	2
• **Total**	197	171	146	123

C:Contact, PM: PreMolar , M: Molar

Table - 4:
Significant relations between tooth no. and different lateral position on right side
n= 81

Tooth	Chi. Square	P-Value	Significance
• **Group A (C, PM1 and PM2)**	9.73	0.284	Non Significance
• **Group B (M1)**	8.75	0.042	Significance
• **Group C (M2)**	9.92	0.364	Non Significance

C:Contact, PM: PreMolar , M: Molar

Table - 5:
Significant relations between tooth no. and different lateral position on right side
n= 81

Tooth	Chi. Square	P-Value	Significance
• **Group A (C, PM1 and PM2)**	9.75	0.136	Non Significance
• **Group B (M1)**	12.34	0.418	Non Significance
• **Group C (M2)**	9.75	0.638	Non Significance

C:Contact, PM: PreMolar , M: Molar