Original Study

RELATIONSHIP BETWEEN OCCLUSION PATTERNS IN LATERAL MOVEMENT WITH SOME PERIODONTAL PARAMETERS IN PATIENTS WITH MODERATE TO SEVERE PERIODONTITIS

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ABSTRACT

Aim: Periodontal disease is one of the most common oral disease which without control leads to alveolar bone destruction and mobility of tooth. It has also emotional and social problems. Many factors are involved in beginning and progression of the periodontal disease. One of the important factors is unsuitable and destruction occlusion pattern. So, the aim of the current study was to determine relationship between occlusion patterns in lateral movement with some periodontal parameters in patients with moderate to severe periodontitis.

Materials & Method: In this study, 31 patients (19 female and 12 male) with moderate to severe evaluated for occlusion pattern, aspect occlusion pattern were determined using Boucher classification as anterior group function (AGF), canine rise (CR), partial group function (PGF) and total group function (TGF). Then clinical attachment loss (CAL), probing depth (PD), bleeding on probing (BOP) and interdental bone destruction patterns were measured. Then the findings at 4 occlusion groups were measured in working side on AGF and CR occlusion patterns.

Results: According to the findings, the mean CAL and PD in PGF and TGF were more than CAL, PD in CR and AGF occlusion patterns. In more than 80 percent of the occlusion patterns, bleeding on probing was observed and dominant bone destruction was horizontal. The mean CAL and PD in central and lateral AGF occlusion patterns was more than VAL and PS in premolar, molar and canine. In PGF occlusion pattern, the man CAL and PD in posterior teeth was more than mean CAL and PD in central and canine.

Conclusion: These results suggested CAL, PD was less than other occlusion patterns. Also, these parameters on occlusion patterns of the posterior teeth were less in disclusion type.

Key words: Laterotrusive movement, Occlusion pattern, periodontal parameters.

Introduction

Periodontal disease is one of the most common oral disease which without control leads to alveolar bone destruction and mobility of tooth. Many factors are involved in beginning and progression of the periodontal disease.[1] Periodontal disease is an endogenous microbial disease that damages the dental structure and the periodontium. The disease derives from the cellular and humoral response of the host, altering the homeostasis of the periodontal tissues and causing inflammation and destruction by means of bacterial enzymes and virulence factors.[2] One of the important factors is unsuitable and destruction occlusion pattern.[3] Establishing or providing occlusion that successfully permits efficient masticatory function is basic to dentistry and survival.[4] The collective arrangement of the teeth in function is quite important and has been subjected to a great deal of analysis and discussion over the years.[5] Occlusion plays an important role in prosthodontic, restorative, orthodontic and periodontal treatment. The position of tooth contact can be divided into a static or dynamic occlusal relationship.[6] The static intercuspal relationship of the teeth and the act of closing the teeth together (dynamic) is commonly known as occlusion.[7]

There are three recognized concepts that describe the manner in which teeth should and should not contact in the various functional and excursive positions of the mandible.[8] They are bilateral balanced occlusion, unilateral balanced occlusion, and mutually protected occlusion.[5] Bilateral balanced occlusion is a concept that is not used as frequently today as it has been in the past. It is largely a prosthodontic concept which dictates that maximum number of teeth should contact in all excursive positions of the mandible. This is particularly useful in complete denture construction.[9] Group function and canine protection have been used as categories for classification of the patterns of occlusal contacts in lateral excursions in natural dentition. In the glossary of prosthodontic terms, Group function is defined as multiple contact relations between the maxillary and mandibular teeth in lateral movements on the working side.[10]

Canine protection is defined as form of mutually protected articulation in which the vertical and horizontal overlap of the canine teeth disengages the posterior teeth in the excursive movements of the mandible.[11] The occlusal contact pattern varies according to the mandibular position examined. There is no description regarding the mandibular position when examining occlusal contacts, which may account for the inconsistencies among the findings of the previous studies.[2] Comprehensive and appropriate occlusion reconstruction therapy is necessary for orthodontic treatment of adult patients with malocclusion with periodontal disease associated with occlusal trauma.[2] The BOP is the main predictor of periodontal disease and is induced by penetration of the periodontal probe. It should be interpreted in a global manner, because its presence is

not absolutely indicative of disease, while its absence is indeed a reliable indicator of periodontal health.[12] So, the aim of the current study was to determine relationship between occlusion patterns in lateral movement with some periodontal parameters in patients with moderate to severe periodontitis.

Materials and Method

This study was done on 31 patients (19 female and 12 male) with moderate to severe periodontitis referred to the School of Dentistry, Hamedan University of Medical Sciences, (Haemedan, Iran) during 2016-17. The inclusion criteria were having of the all teeth except third molar, a > 3 mm adhesion cites and the non-working-side interocclusal contacts had no attachment. Then clinical attachment loss (CAL), probing depth (PD), bleeding on probing (BOP) and interdental bone destruction patterns were measured. The BOP was done in 4 buccal, lingual, Mesial and distal side of each tooth using Williams periodontal probe using 25g force in horizontal dental lie and bleeding (+) and without bleeding (-) were recorded. Aspect occlusion pattern were determined using Boucher classification as anterior group function (AGF), canine rise (CR), partial group function (PGF) and total group function (TGF). Then the findings at 4 occlusion groups were measured in working side on AGF and CR occlusion patterns. The frequency of non-working-side contact on each tooth was analyzed according to the lateral position, namely, percentages of lateral movements with contacts were calculated on each tooth from the data of both the right and left sides. The bone disclusion type was done using OPG graph in each patient. Disclusion between two teeth recorded as horizontal and with an angle marked as vertical.

Statistical analysis

Obtained data were processed in excel and then analyzed using SPSS statistical software (Version 16).

Results

The frequency of the right occlusion pattern in patients with moderate to severe periodontitis is presented in figure 1.

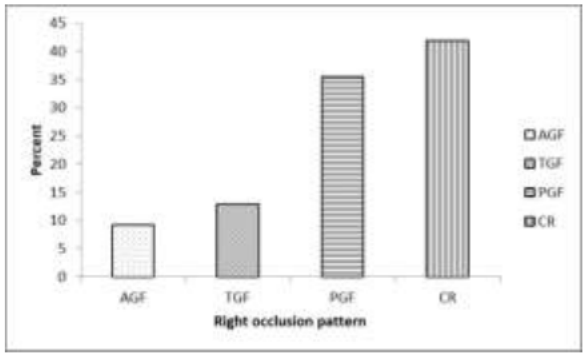

Figure 1. Frequency of the right occlusion pattern in patients with moderate to severe periodontitis.

As seen, the frequency for CR, PGF, TGF and AGF were 41.9, 35.5, 12.9 and 9.15, respectively.

The frequency of the left occlusion pattern in patients with moderate to severe periodontitis is presented in figure 2.

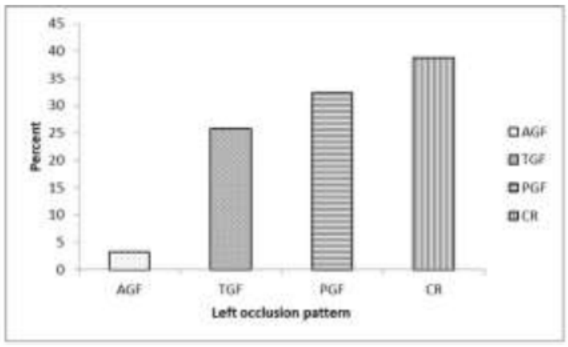

Figure 2. Frequency of the left occlusion pattern in patients with moderate to severe periodontitis.

As seen, the frequency for CR, PGF, TGF and AGF were 38.7, 32.3, 25.8 and 3.2 percent, respectively. The left disclusion of the teeth in CR and AGF group in patients with moderate to severe periodontitis in immediate and progressive were 81.8 and 18.2 percent, respectively.

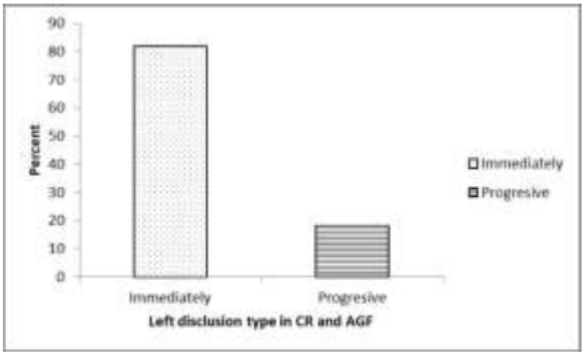

Figure 3. Left disclusion of the teeth in CR and AGF group in patients with moderate to severe periodontitis.

The right disclusion of the teeth in CR and AGF group in patients with moderate to severe periodontitis in immediate and progressive were 81 and 19 percent, respectively.

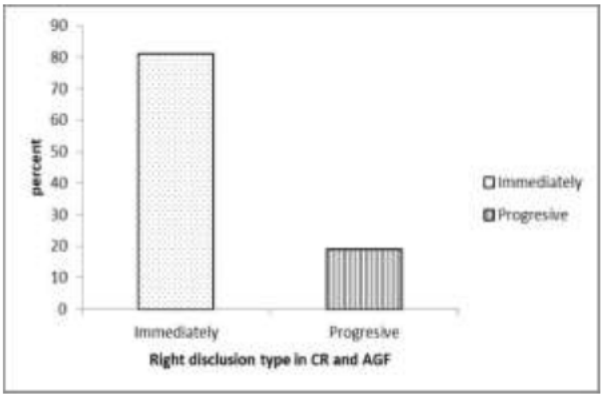

Figure 4. Right disclusion of the teeth in CR and AGF group in patients with moderate to severe periodontitis.

The frequency of the bleeding on probing in central incisor in patients with moderate to severe periodontitis is presented in figure 5-8.

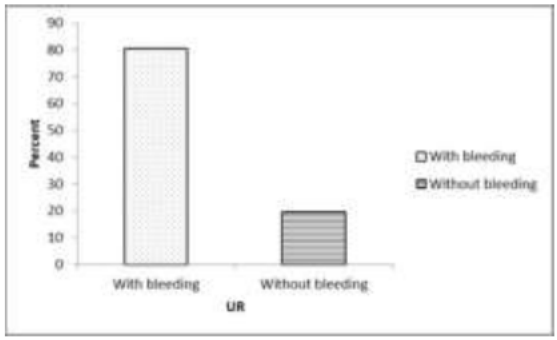

Figure 5. Frequency of the bleeding on probing in central incisor in patients with moderate to severe periodontitis.

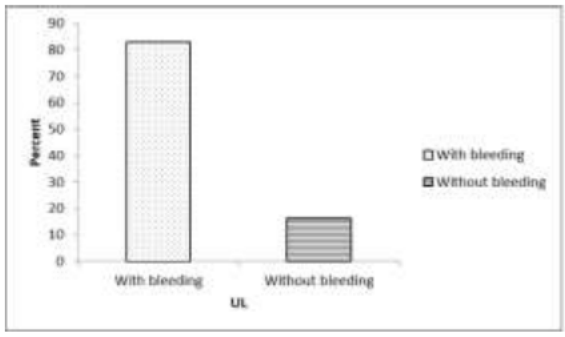

Figure 6. Frequency of the bleeding on probing in central incisor in patients with moderate to severe periodontitis.

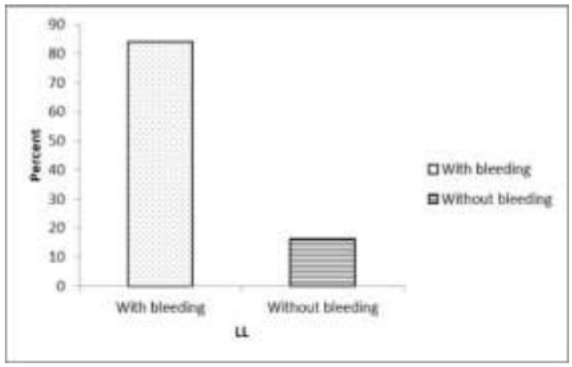

Figure 7. Frequency of the bleeding on probing in central incisor in patients with moderate to severe periodontitis

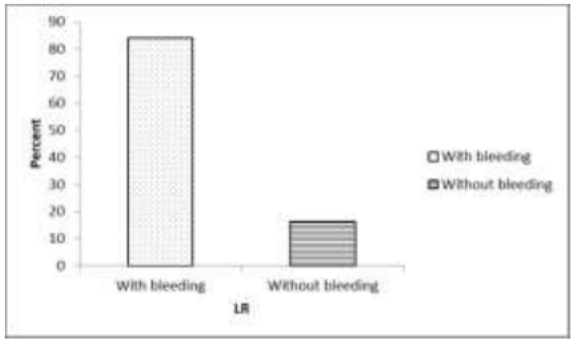

Figure 8. Frequency of the bleeding on probing in central incisor in patients with moderate to severe periodontitis

The frequency of the bleeding on probing in lateral teeth in patients with moderate to severe periodontitis is presented in figure 9-12.

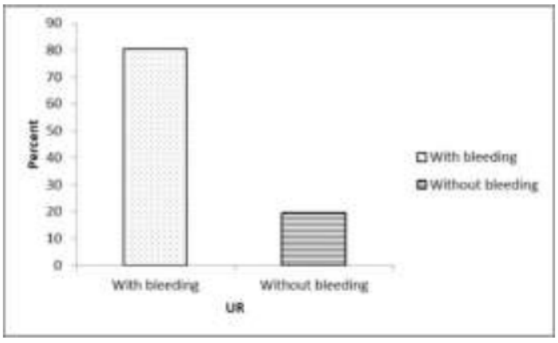

Figure 9. Frequency of the bleeding on probing in lateral teeth in patients with moderate to severe periodontitis

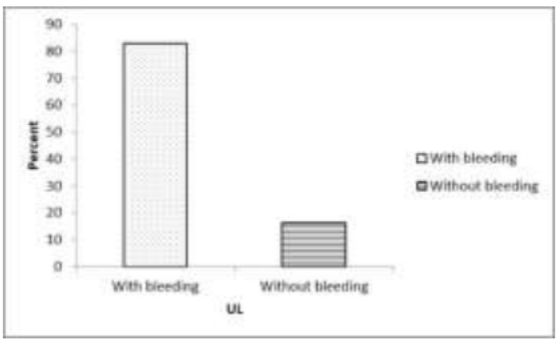

Figure 10. Frequency of the bleeding on probing in lateral teeth in patients with moderate to severe periodontitis

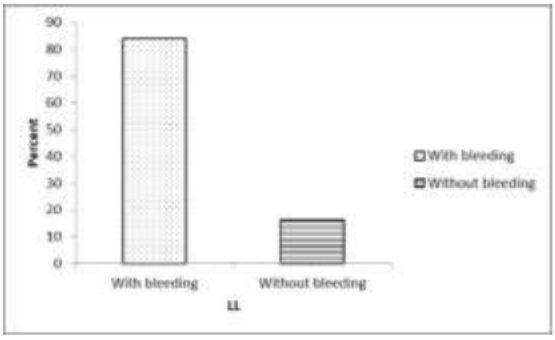

Figure 11. Frequency of the bleeding on probing in lateral teeth in patients with moderate to severe periodontitis.

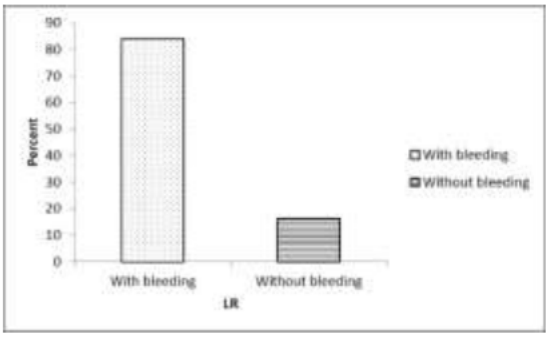

Figure 12. Frequency of the bleeding on probing in lateral teeth in patients with moderate to severe periodontitis.

Additionally, the frequency of the bleeding on probing in Canine, first and second premolar teeth in patients with moderate to severe periodontitis is shown in table 1.

	UR	UL	LL	LR
Canine				
With bleeding	80.6	83.9	83.9	83.9
Without bleeding	19.4	16.1	16.1	16.1
1st premolar				
With bleeding	87.9	87.1	90.3	87.1
Without bleeding	21.1	12.9	9.7	12.9
2nd premolar				
With bleeding	87.9	83.9	87.1	87.1
Without bleeding	21.1	16.1	12.9	12.9

Table 1. Frequency of the bleeding on probing in Canine, first and second premolar teeth in patients with moderate to severe periodontitis.

As seen the bleeding on probing in canine teeth for UR, UL, LL and LR were 80.6, 83.9, 83.9 and 83.9 percent, respectively. In first molar teeth for UR, UL, LL and LR were 87.9, 87.1, 90.3 and 87.1, respectively. Also, in second molar teeth for UR, UL, LL and LR were 87.9, 83.9, 87.1 and 87.1 percent respectively.

The frequency of the interdental bone destruction in patients with moderate to severe periodontitis is presented in table 2.

	1 UR	1 UL	1 LL	1 LR
Horizontal	80.6	80.6	80.6	83.9
Vertical	19.4	19.4	19.4	16.1
	2 UR	**2 UL**	**2 LL**	**2 LR**
Horizontal	83.9	83.9	83.9	77.1
Vertical	16.1	16.1	16.1	22.9
	3 UR	**3 UL**	**3 LL**	**3 LR**
Horizontal	80.6	83.9	83.9	83.9
Vertical	19.4	16.1	16.1	16.1
	4 UR	**4 UL**	**4 LL**	**4 LR**
Horizontal	74.2	77.4	80.6	80.6
Vertical	25.8	22.6	19.4	19.4
	5 UR	**5 UL**	**5 LL**	**5 LR**
Horizontal	71	74.2	77.4	77.4
Vertical	29	25.8	22.6	22.6
	6 UR	**6 UL**	**6 LL**	**6 LR**
Horizontal	64.5	64.5	67.7	71
Vertical	35.5	35.5	22.3	29
	7 UR	**7 UL**	**7 LL**	**7 LR**
Horizontal	67.7	67.7	67.7	77.4
Vertical	22.3	22.3	22.3	22.6

Table 2. Frequency of the interdental bone destruction in patients with moderate to severe periodontitis.

Discussion

As periodontal disease progresses CAL occurs through the destruction of the periodontal ligament and its adjacent alveolar bone, subsequently leading to gingival recession and pathologic periodontal probing depth.[13] Therefore, the degree of CAL reflects the severity of CAL and can be used as an indicator to estimate the severity of periodontal disease. CAL, which measures the distance between the cement-enamel junction and the lowest point using a periodontal probe, is a criterion for the assessment of the severity of periodontal disease in the diagnosis.[14] Although periodontal disease occurs primarily due to bacteria within the gingival crevice or the periodontal pocket, it may be affected indirectly by many other risk factors occurring changes in the vascular system, severity of inflammatory reactions and systemic immunological responses.[13]

This study has demonstrated that the mean CAL and PD in PGF and TGF were more than CAL, PD in CR and AGF occlusion patterns. In more than 80 percent of the occlusion patterns, bleeding on probing was observed and dominant bone destruction was horizontal. The mean CAL and PD in central and lateral AGF occlusion patterns was more than VAL and PS in premolar, molar and canine. In PGF occlusion pattern, the man CAL and PD in posterior teeth was more than mean CAL and PD in central and canine. The occurrence of non-working-side occlusal contact depends on morphological and kinematical factors. These include the cuspal inclines of the Medio-lingual cusps on upper molars and disto-buccal cusps of lower molars, and mandibular movement, which is governed by anterior and condylar guidance.[15] In a study Al-Nimri *et al*.[5] studied functional occlusal patterns and their relationship to static occlusion and reported the distribution of protrusive excursion patterns was significantly influenced by incisor, canine, and molar relationships. Singh *et al*.[16] reported on pattern of occlusal contacts in lateral positions and its validity in classifying guidance patterns 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. The dynamic nature of the lateral occlusion scheme at the different arch positions is attributed to teeth morphological factors. As excursion progresses, the total contact area is reduced, which means less teeth will be in contact. This observation supports the concepts of "progressive occlusion", in which many teeth initially control the occlusion, followed primarily by the canines during the maximal excursion.[17] Following the prosthodontic planning, it was clear that the frequency of the canine contact was increased, followed primarily by the first premolars.[17]

The presence of occlusal contact in different lateral positions may have different roles in biomechanics around the related teeth. For instance, the force on individual teeth may be more traumatic in the more lateral positions because of the increased vector of the force. Occlusal force is transmitted to the teeth during four functional and parafunctional stages: mastication, swallowing, clenching and grinding. The occlusal contact during mastication and swallowing is suggested to occur mainly in lateral positions close to the maximum intercuspation i.e. within 1 mm of

the maximum intercuspation.[18] In many studies of occlusal contact patterns, the occlusal contacts have been recorded in an edge-to-edge position of the canines approximately 3 mm lateral from the maximum intercuspation, or in an unregulated position.[19] A comparative study has shown that shim stock has better reliability than articulating film for examining occlusal contacts, and that shim stock provides acceptable reliability in the clinical measurement of occlusal contacts.[20] Canine protection and group function have been described as forms of therapeutic occlusion in the natural dentition, based on the theoretical background and clinical failure of balanced occlusion.[21] Canine protection has been defined as contact only between the maxillary and mandibular canines on the working-side.[15] Group function was defined as contacts between the working side opposing teeth in a segment or group.15

In conclusion, these results suggested CAL, PD was less than other occlusion patterns. Also, these parameters on occlusion patterns of the posterior teeth were less in disclusion type.

References

1. Ocampo Yáñez BR, Marín González MG. Treatment of localized ggressive periodontitis with platelet-rich plasma and bone allograft. Clinical case report. Rev Odont Mex 2015;19(2):106-114.
2. Paknejad M, Khorsand A, Yaghobee S, Motahhari P, Etebarian A, Bayani M *et al*. Cementogenesis in patients with localized aggressive periodontitis. J Dent of Tehran Univ Med Sci 2015;12(5):347-351.
3. Oluranti OD, Ifeoma LU. Referral mode and pattern of malocclusion among patients attending the Lagos University Teaching Hospital, Lagos, Nigeria. Odontostomatol Trop 2009;32(128):17-23.
4. Dawson PE. The envelope of function. Functional occlusion from TMJ to smile design, 1st edn. Mosby Elsevier, Canada, 2007; pp-141–148
5. Al-Nimri KS, Bataineh AB, Abo-Farha S. Functional occlusal patterns and their relationship to static occlusion. Angle Orthod 2010;80(1):65-71.
6. Van't Spijker A, Kreulen CM, Bronkhorst EM, Creugers NH. Occlusal wear and occlusal condition in a convenience sample of young adults. J Dent 2015;43(1):72-77.
7. Watanabe-Kanno GA, Abrão J. Study of the number of occlusal contacts in maximum intercuspation before orthodontic treatment in subjects with Angle Class I and Class II Division 1 malocclusion. Dent Press J Orthod 2012;17(1):138-147.
8. Rinchuse DJ, Kandasamy S, Sciote J. A contemporary and evidence-based view of canine protected occlusion. Am J Orthod Dentofacial Orthop 2007;132(1):90-102.
9. Taira A, Odawara S, Sugihara S, Sasaguri K. Assessment of occlusal function in a patient with an angle class I spaced dental arch with periodontal disease using a brux checker. Case Reports in Dentistry 2018;2018:3876297.
10. Nakamura Y, Gomi K, Oikawa T, Tokiwa H, Sekiya T. Reconstruction of a collapsed dental arch in a patient with severe periodontitis. Am J Orthod Dentofacial Orthop 2013;143(5):704–712.
11. Kawagoe T, Suruta J, Miyake S, Sasaguri K, Akimoto S, Sato S. Relationship between occlusal contact patterns and the prevalence of non-carious cervical lesions. J Dent Health 2008;58:542–547.
12. Martínez-Lima M, Sánchez-Suárez R, Lavandero-Espina A, González del Sol L. Behavior of periodontal emergencies and risk factors in adolescents, Ángel Ameijeiras Polyclinic, Guanabacoa. Rev Haban Cienc Med 2014;13(2):196-206.
13. Holtfreter B, Schwahn C, Biffar R, Kocher T. Epidemiology of periodontal diseases in the Study of Health in Pomerania. J Clin Periodontol 2009;36(2):114-23.
14. Kinane D, Bouchard P; Group E of European Workshop on Periodontology. Periodontal diseases and health: consensus report of the sixth european workshop on periodontology. J Clin Periodontol 2008;35(8 Suppl):333-7.
15. Koyano K, Ogawa T, Suetsugu T. The infuence of canine guidance and condylar guidance on mandibular lateral movement. J Oral Rehabil 1997;24(11):802-7.
16. 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.
17. 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
18. Ogawa T, Ogimoto T, Koyano K. The relationship between non-working-side occlusal contacts and mandibular position. J Oral Rehabil 2001;28(10):976-981.
19. Bourgeois D, Bouchard P, Mattout C. Epidemiology of periodontal status in dentate adults in France, 2002-2003. J Periodontal Res 2007;42(3):219-27.
20. Southard TE, Southard KA, Stiles RN. Factors influencing anterior component of occlusal force. J Biomech 1990;23(12):1199-207.
21. Thornton LJ. Anterior guidance: Group function/canine guidance. A literature review. J Prosthet Dent 1990;64(4):479-82.

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