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Centric Relation: A Survey Study to Determine Whether a Consensus Exists Between Prosthodontists and Orthodontists

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Abstract

Purpose: The purpose of this study was to evaluate whether there is a consensus among prosthodontists and orthodontists as to the definition of centric relation.

Materials and Methods: A survey constructed from five definitions of centric relation (CR) as provided from the "Glossary of Prosthodontic Terms" was sent to the chairpersons of every prosthodontist and orthodontist program in Tunisia. The different responses were analyzed statistically by: chi square analysis and examined by use of 95% confidence intervals.

Results: We obtained 80 responses from prosthodontists and 67 from the orthodontists, representing 54% and 45% of the total responses, respectively. The survey study showed a significant difference between Orthodontists and prosthodontists responses regarding the definition of centric relation. Orthodontists and prosthodontists had no significantly different response regarding definition of centric occlusion. Regarding the definition of maximum intercuspation, there was a significant difference between orthodontists and prosthodontists.

On another hand, there was a significant difference between the two groups on the need for mounting models in centric relation or in CO. Concerning the direction in which the mandible and the condyle move If the patient has a CR/CO slide, there was no significant difference between the 2 groups respectively.

Conclusion: The results of this survey highlight a lack of consensus and inconsistency regarding the CR definition among prosthodontists and orthodontists, which lead more likely to confusion among practitioners.

Keywords: dental occlusion; dental specialist; survey; consensus

Introduction

Communication between different dental specialists must be clear and used terms should be well defined. There are still some ambiguities between dental practitioners regarding the definition of the centric relation (CR). Orthodontic treatment ensures the management of cross bite, open bite, collapsed occlusion plane (due to over erupted teeth), and tilted teeth and it is usually performed prior to prosthetic treatment. After orthodontic treatment, the management of remaining spacing among teeth is frequently carried out using fixed denture prosthesis to ensure esthetic and function. In fixed denture prosthesis, many clinic cases require, after orthodontic treatment, the use of CR as reference for occlusion record and for the mountain of the cast on articulator. Nevertheless, other clinic cases need MI for occlusion registration and to mounting the models in the same position. In 1930, based on observation of dry skulls, the National Society of Denture Prosthetics gives the first definition: The first definition of the National Society of Denture Prosthetics was published in 1930. Centric relation position, when the condyles are in the most posterior position and lateral movements of the mandible are still possible [1]. The definition of CR has evolved over the past half-century from being a posterior and superior position of the condyle in relation to the glenoid fossa to an anterior superior position [2-4]. Multiple definitions of centric relation (CR) have evolved over time that may have created confusion or impeded understanding. A recent attempt to achieve a singular definition by surveying the members of the Academy of Prosthodontics (AP) did not achieve majority consensus [5]. The purpose of this study was to determine whether there is a consensus among orthodontists and prosthodontists related to the definition of CR.

Materials and methods

To evaluate differences between prosthodontists and orthodontists related to condylar position, an electronic survey was constructed. The definition of CR was limited to the five most commonly used definitions as provided by the Academy of Denture Prosthetics' "Glossary of Prosthodontic Terms"

(GPT) (table 1). Furthermore, there were questions relating to centric occlusion (CO), (table 3;5) and the reference used to mountain The casts on articulator. The questionnaire of the survey was sent to 85 Orthodontists programs, (70% male and 30% female) and 100 Prosthodontists) programs (65% were male and the rest were female 35%) in Tunisia. Full-time faculty members, MOH Hospital, and Private Hospital asked to complete the survey.

The average of age of orthodontists and prosthodontists is 29-38 years old, we obtained 80 responses from prosthodontists representing 54% of the total responses and 67 from the orthodontists. In this survey study the different responses were analyzed statistically by chi -square analysis and examined by use of 95% confidence intervals (Table 1).

Table 1: Questions and responses related to centric relation count

		CR is defined as which of the following?					Total
		Condyles are in their most posterior-superior position within their fossa	Condyles are in their most anterior-superior position within their fossa	Condyles articulate with the thinnest avascular portion of discs complex in the anterior superior position	condyle is in its highest position on the posterior surface of the avascular eminence	condyle is in its most superior neutral position	
Dentiste	Prosthodontist	11(14%)	55(68%)	4	2	8	80
	Orthodontiste	42(63%)	12(18%)	3	3	7	67
Total		53	67	7	5	15	147

Table 2: Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45,344 Ł	4	,000
Likelihood Ratio	48,498	4	,000
Linear-by-Linear Association	4,841	1	,028
N of Valid Cases	147		

Ł. 4 cells (40,0%) have expected count less than 5. The minimum expected count is 2.28.

Result

We acquired 80 responses from prosthodontists and 67 from the orthodontists, representing 54% and 45% of the total responses, respectively. According to this study there is a significant difference between prosthodontists and orthodontists regarding the question related to definition of CR relation, (chi-square =45, df=4, p<0,0001 (table2). More orthodontists choose the first answer 63% than prosthodontists (14%). Nevertheless, more prosthodontists (68%) are confident to select the second answer than orthodontists 18%. However, there is no statistically significant difference between surgeons and orthodontists as to the remaining answers. Concerning the definition of centric occlusion there is no significantly different response between orthodontists and prosthodontists (p>0.3).

Table 3: questions and responses: Count Cross tab

		CO is defined as which of the following?	
		Position at maximum intercuspation	Patient's natural closing interdigitation
Dentit	Prosthodontist	70	10
	Orthodontist	55	12
Total		125	22

Table 4: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	839a	1	360		
Continuité Correction	467	1	494		
Likelihood Ratio	835	1	361		
Fisher's Exact Test				487	247
Linear-by-Linear Association	833	1	361		
N of Valid Cases	147				

(Table 3&4), a. 0 cells (0, 0%) have expected count less than 5. The minimum expected count is 10.03. b. Computed only for a 2x2 table

On another hand and regarding the definition of MI there is a significant difference between orthodontists and prosthodontists (table 5&6) chi-square =5, df=2, p<0, 05). Regarding the question related to the need for mounting models in CR or in CO or no specific position during treatment planning, there was a significative difference between the 2 groups. Approximately 72% of prosthodontists believed that the models should be mounted in CO rather than CR. Nonetheless 68% of orthodontists thought that the CO should be used as reference for the mountain of casts chi-square =31, df=2, p<0, 0001. Concerning the two last questions related to the CR/CO slide and the direction of movement of the mandible and condyle, respectively. There was no significant difference between the two groups regarding mandibular movement p<0.7 and condylar movement p<0.3.

Table 5: questions and responses cross tab count

		Maximal Interception occurs when			Total
		condyles in a slightly translated position	complete Intercuspation of the opposing teeth regardless of the condylar position	complete intercuspation of the opposing teeth dependent of the condylar position	
	Prosthodontst	9	55	16	80
Dentait	Orthodontise	18	37	12	67
Total		27	92	28	147

Table 6: Chi-Square Tests

		Value	Df	ASM. Sig. (2-sided)
Pearson Chi-Square		5,990 Ł	2	050
Likelihood Ratio		6,025	2	049
Liner-by-Liner Association		3,035	1	082
N of Valida Cases		147		

Ł: 0 cells (0,0%) have expected count less than 5. The minimum expected count is 12.31.

Discussion

Before 1987, CR was considered as a retruded (posterior-superior) condylar position and in our study 68% of orthodontists agree with this definition [6]. In the 1970s, Roth, gnathologic orthodontist, suggested that orthodontists should embrace the principles of gnathology that had long been held by eminent prosthodontists and restorative dentists [7,8,21-25]. He advocated that orthodontic treatment is analogous to doing full-mouth occlusal rehabilitation, with the difference being that orthodontics did not "cut" or modify the natural tooth structure. Although contemporary orthodontic gnathologists believe in attaining an anterior-superiorcondyle position at the same time the teeth are in CR (CR-CO), there is little scientific evidence to support this view [9]. Gnathologically oriented orthodontists advocate the use of the terminal hinge axis position, the need for pretreatment CR-MI–converted lateral cephalograms and the placement of gnathologic positioners immediately after orthodontic appliances are removed Orthodontic gnathologists believe that it is possible to locate a particular position of the condyles precisely in the glenoid fossa via CR recordings [10]. Nongnathologic orthodontists tend to use hand-held models and noninstrument-oriented CR techniques. Their aims are to obtain the best occlusal relationship within the

framework of optimal dentofacial esthetics, function and stability [11]. The latest edition of the Glossary of Prosthodontic Terms (GPT) defines CR as "a maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterior-superior position against the slopes of the articular eminences [7,4]. In our study 68% prosthodontists agree with this definition. Many prosthodontists use retruded CR only as a guide so that dentures can be fabricated a millimeter or so anterior to this position [11]. The argument for anterior-superior positioned condyles was the belief that distally displaced condyles can cause anterior and medial displacement of the TMJ disks would be prone to develop TMJ symptoms [12,13]. There is no one ideal position of the condyle in the glenoid fossa, but there is a range of normal position [14-22]. A study conducted by Jasinevicius TR and co related to Centric relation definitions taught in 7 dental schools suggested that the controversy will continue, because there is no consensus regarding the definition of centric relation within the 7 dental schools surveyed [23]. Early studies found that CO usually was 0.1 to 1.8 mm anterior to CRO, depending on the population studied and the age of the subjects [24].

In 1995, Lindauer and colleagues studied the condylar movements and centers of rotation during jaw opening in eight subjects without TMD using a sonic digitizing system. They found that all of the subjects demonstrated both rotation and translation during the initial phase of jaw opening, and none had a center of rotation at the condylar head. Their findings support the theory of a constantly moving, instantaneous center of jaw rotation that is different for different people. This intial translatory movement is not incorporated in the mechanic of articulator and thus, it does not replicate the patient's mandibular movement with precision to localize the occlusal interferences [25]. To avoid some of the confusion about the term "CR-CO," Recently, CO-CR (or CR-CO) and MI-CR (or CR-MI) in which MI is synonymous with CO, have been used interchangeably. Although CO and MI have been used synonymously in the past, the most recent editions of GPT6,7 have made a distinction between the two terms [4,26]. Maximum intercuspation (MI) has been defined as "the complete intercuspation of opposing teeth independent of condylar position [26]. CR is a position of the condyles independent of tooth contact, whereas centric occlusion (CO) is an interocclusal dental position of the maxillary teeth relative to the mandibular teeth.2 Maximum intercuspation (MI) has been defined as "the complete intercuspation of opposing teeth independent of condylar position [26]. The results of this study clearly show a significant lack of a consensus between prosthdontists and orthodontists as to the definition of CR

Conclusion

This survey study agrees with other studies that a lack of consensus exists between prosthdontists and orthodontists regarding the definition of centric relation. Although communication and therapeutic project between orthodontists and prosthodontics require certain precision, the disagreement and confusion continue.

Declarations

Ethical Statement

All authors confirm that the manuscript meets the ethical standards including proper statistical investigations and thorough ethical reviews.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

References

1. Posselt U. (1952). Studies in the mobility of the human mandible. *Acta Odontol Scand,* 10:1520.
2. Glossary of prosthodontic terms. (1987). *J Prosthet Dent*, 58:713-762.
3. Academy of Denture Prosthetics. (1956). Glossary of prosthodontic terms (ap. *J Prosthet Dent* USA, 692:5-34.
4. The Academy of Prosthodontics. (1999). Glossary of prosthodontic terms. 7th ed. *J Prosthet Dent San Diego*, 81(1):39-110.
5. Wiens JP, Goldstein GR, Andrawis M, Choi M, Priebe JWJ. (2018). Defining centric relation. Prosthet Dent. 120(1):114-122.
6. Becker CM, Kaiser DA, Schwalm C. (2000). Mandibular centricity: centric relation. J Prosthet Dent.83:158-160.
7. Roth RH. (1973). Temporomandibular pain-dysfunction and occlusal relationships. *Angle Orthod,* 43(2):136-153.

8. Roth RH. (1981). Functional occlusion for the orthodontist, Part III. *J Clin Orthod*, 15(3):174-179.
9. Rinchuse DJ. (1995). Counterpoint: a three-dimensional comparison of condylar change between centric relation and centric occlusion using the mandibular position indicator. *Am J Orthod Dentofacial Orthop*, 107:319-328.
10. Lavine D, Kulbersh R, Bonner P, Pink FE. (2003). Reproducibility of the condylar position indicator. *Semin Orthod*, 9(2):96-101.
11. Rinchuse D J. Kandasamy S. (2006). Centric relation A historical and contemporary orthodontic perspective. *4 JADA*, 494-501.
12. Roth RH. (1973). Temporomandibular pain-dysfunction and occlusal relationships. *Angle Orthod*, 43(2):136-153.
13. Roth RH. (1981). Functional occlusion for the orthodontist, Part III. *J Clin Orthod*, 15(3):174-179, 182-198.
14. Okeson JP. 5th ed. St. Louis MO. (2003). Mosby Year Book Elsevier; Management of temporomandibular disorders and occlusion, 416-418(605).
15. Schiffman E. (1986). Mandibular dysfunction, occlusal dysfunction, and parafunctional habits in a non-clinical population. *J Dent Res*.65:306-314.
16. McNamara JA, Seligman DA, Okeson JP. (1995). Occlusion, orthodontic treatment and temporomandibular disorders: A review. *J Orofac Pain*. 9:73-90.
17. Turp JC, Schindler HJ, Rodiger O, Smeekens S, Marinello CP. (2006). Vertical and horizontal jaw relations in reconstructive dentistry: A critical review. *Schweiz Monatsschr Zahnmed*, 116:403-417.
18. Turp JC, Greene CS, Strub JR. (2008). Dental occlusion: A critical reflection on past, present and future concepts. *J Oral Rehabil*, 35:446-453.
19. Andrews LF. (1972). The six keys to normal occlusion. *Am J Orthod Dentofacial Orthop*. 62:296-309.
20. Dawson PE. (1985). Optimum TMJ condyle position in clinical practice. *Int J Periodontics Restorative Dent*, 5:10-17.
21. Rinchuse DJ. (1995). Counterpoint: a three-dimensional comparison Condylar change between centric relation and centric occlusion using the mandibular position indicator. *Am J Orthod Dentofacial Orthop*,107:319-328.
22. Mohl ND. (1991). Temporomandibular disorders: the role of occlusion, TMJ imaging, and electronic devices—a diagnostic update. *J Am Coll Dent* 58(3):4-10.
23. Jasinevicius TR, Yellowitz JA, Vaughan GG, Brooks ES, Baughan LW, Cline N, Theiss LB. (2000). Centric relation definitions taught in 7 dental schools: results of faculty and student surveys. *J Prosthodont*, 9(2):87-89.
24. Sicher H, DuBrul EL. (1968). Oral anatomy. Mosby: St. Louis, 1970: 155-60. 64. Ingervall B. Recording of retruded positions of mandible in children. *Odontol Revy*, 19(1):65-82.
25. Lindauer SJ, Sabol G, Isaacson RJ, Davidovitch M. (1995). Condylar movement and mandibular rotation during jaw opening. *Am J Orthod Dentofacial Orthop*, 107(6):573-577.
26. The Academy of Prosthodontics Glossary of prosthodontic terms. (1994). 6th ed. *J Prosthet Dent San Diego*, 71(1):41-112.

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