



Arguing over the definitions and its implication: Reconsidering centric relation in dentistry

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Abstract

The centric relation (CR) is the most controversial concepts in dentistry. It was originally introduced to be a clinical reference for restoring the occlusion. As many as more than seven definitions emerged up to now, which had been confusing both the researchers and clinicians. The spatial relationship of the condyle to other structures was the focus of the arguments among those different definitions, based on which different registration methods were introduced. However, the reference role of CR does not need a definitive spatial position, but a repeatable starting position as it per se; then the most suitable mandible position can be found through a trial and error process by testing the stomatognathic system function. Among the current registration methods, the author adopts a modified approach based on the condylar reference position (RP) method. From the preliminary study, this method is more clinically convenient and its result is more stable. The arguments over the CR definitions overlooked the reference nature of the concept; instead, a practical trial and error approach based on the modified RP method had a good implication in clinical practice.

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Short communication

Centric Relation (CR) is probably the most controversial concept in dentistry, with significantly impact on education, clinical practice, and research as well. Historically, more than seven definitions were put under the term "centric relation" in the academic glossaries, [1,2] and yet no consensus is achieved. Different definitions were held between different specialists over the decades [3] and dental students in different schools were taught different versions of the concept [4]. Considering the importance of CR in many fields of dentistry, the controversy reflects the current limitation of research and technology, and also the conflict between different treatment paradigms [5].

Attempts were made to reach a universally accepted definition. Glossary of Prosthodontic Terms, one of the oldest glossary in dentistry, stopped listing all possible definitions in its latest version and gave only one instead, based on its own survey and meetings [6]. However, this definition does not achieve a simple majority, and clinical practices and researches were still diverse regarding CR [7]. The definition of one clinical term is meaningful only when it helps frame the clinical and research processes. Even if one definition is accepted within the academia, the shift of treatment paradigm needs to occur to affirm the establishment of this definition. Currently this is impossible



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with insufficient convincing clinical evidence and lack of standardized widely-accepted research methodology.

Despite the arguing over the definitions, several attributes of CR are recognized between clinicians, educators, and researchers within the dental community. The greatest level of consensus was achieved as “A clinically determined relationship of the mandible to the maxilla”, “A repeatable position independent of tooth contact”, “A starting point for vertical, lateral, and protrusive movement”, and “A clinical useful repeatable reference position for mounting casts for developing a functional occlusion” [7]. With no doubt, CR is a maxillo-mandibular relationship in which the masticatory system can maximize its physiological functions. Therefore, to apply CR in clinical practice, several attributes, such as “clinically determined”, “repeatable”, and “reference position”, became important in the process. However, the repeatability of contemporary clinical CR registration methods is not satisfactory, which dampens the controversy over the concept [8-15].

Gothic arch tracing, bimanual registration, chin guidance or control, and power centric bite are the common methods to record CR position in practice [15]. However, researches on the repeatability of these methods are often contradictory. Gothic arch tracing applies a small gadget to locate CR with little interference from the operator. Originally this method was used in full denture reconstruction, and it showed a good consistency among edentulous patients; [10] but the consistency was poor when it was applied to dentate patients [8]. Bimanual manipulation was introduced to deal with the oral rehabilitation of dentate patients and was reported to have a good repeatability in one study [12]. One major drawback of this technique is the high skill demand. It involves muscle deprogramming with an anterior jig and solely operator guided procedures. Clinicians must be well trained before applying the technique. As a result, poor consistency was found between different operators [13,14] Our data has also shown both gothic arch tracing and bimanual manipulation had a variability of over 2 mm for condylar positions in healthy volunteers without temporomandibular disorders (unpublished). Chin guidance and power centric bite are just two modified versions of the above mentioned two techniques respectively. Poor repeatability was also reported for the two registration methods [13,15].

It should be noted that gothic arch tracing and bimanual manipulation are based on two contradictory definitions of CR. Theoretically, gothic arch tracing places the condyle to its rear-most position, and bimanual manipulation guides the condyle to its most anterior and superior position [1,5]. The lack of repeatability of the registration methods adds to the arguing of CR definitions. However, these arguments focused on details and lost the sight of the whole picture. If the purpose is to find a physiologically strong maxillo-mandibular relationship, the controversy over condylar position or condyle-disc relation is of less importance. What is needed most is a reference point from which a highly individualized suitable position can be found through trial and error method. The development of techniques to analyze mandible functions makes this trial and error process possible for the suitability of one mandible position can be tested and confirmed. Therefore, locating an individualized CR is a process of different clinical non-invasive and reversible tests with few risks. A removable appliance such as intra-oral splint can be used to hold the position, and to change the position slightly by adding or subtracting the occlusal surface. A full set of analysis would be used to assess each mandible position until

the most suitable one was found.

The concept of condylar Reference Position (RP) developed by Dr. Slavicek has all the essential attributes of CR concept, except it does not specify the condylar position within the fossae or the condylar-disk relation [16]. The RP was simply determined by deprogramming the muscles with posterior bite on cotton rolls and then slightly control on the chin by the operator. Currently in our research, we modified the technique by eliminating the operator guidance (Figure 1) and found a slightly better repeatability of condylar position for healthy volunteers (unpublished data) (Table 1). Unlike gothic arch tracing, this method has no need for specially-designed gadgets, and unlike the other traditional methods, this method uses more convenient vinyl polysiloxane for bite recording. The modified method is simpler and less technique sensitive, and the registration is considerably thinner than the above-mentioned ones, which entitles a more precise mounting. It can be adapted to various clinical situations. It is “clinically determined”, and more “repeatable”, also a “reference (a position to start with)” for mounting casts and developing functional occlusion. With the aid of mandible function analysis, RP can fulfill the role that various versions of CR are currently playing.

Maybe a consensus on CR can be reached with technology that provides greater clarity in the future, which might include the modified RP registration. But the essence of CR is to have a reference for clinical treatment, and recent development of mandible function analysis makes guiding the condyle to a specific spatial position unnecessary. Perhaps CR varies greatly between individuals, but variation can be eliminated with a stable reference and a trial and error process. More efforts should be placed on the function of the masticatory system and less on the morphological relation of different anatomic structures.

Figures

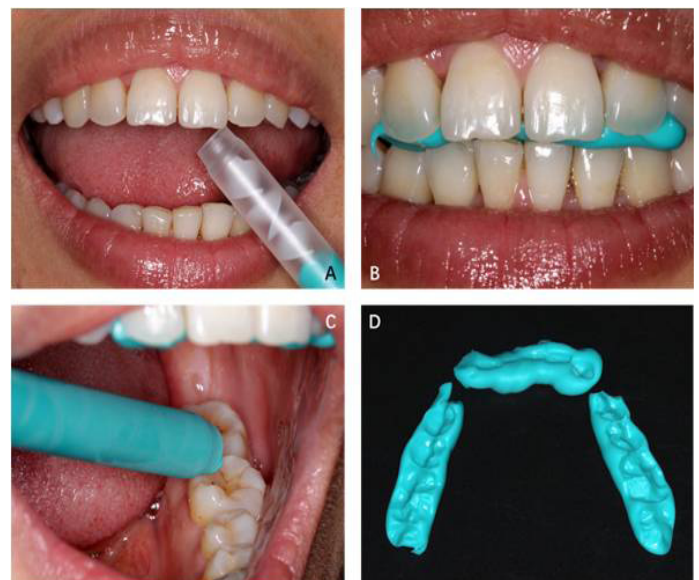


Figure 1: From panel A to C. The modified registration procedure for the reference position. Panel D. The occlusal record for the reference position

Tables

Table 1: Internal Variation of Condylar Positions between Different Registrations Methods among Healthy Volunteers without Temporomandibular Disorders

	Gothic arch tracing (mm)	Bimanual manipulation (mm)	Modified RP (mm)
Antero-posterior direction	2.03±1.77	3.02±1.59	0.78±1.25
Vertical direction	0.58±1.00	1.02±0.89	0.61±0.89
Left-right direction	0.48±0.37	0.64±0.42	0.52±0.63

RP: Reference Position. Data are expressed as “average ± standard deviation”

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