Maxillomandibular relationship philosophies for prosthodontic treatment: A survey of dental educators

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Statement of problem. A variety of treatment philosophies persist concerning the need for coincidence of centric occlusion (CO) and maximum intercuspation (MI) in prosthodontic restoration; however, no consensus exists.

Purpose. The purpose of this study was to determine the philosophies of dental educators throughout the United States at both the predoctoral and postdoctoral levels and to compare their attitudes toward desirable maxillomandibular relationships in defined clinical situations.

Material and methods. A survey was constructed with 5 clinical scenarios presented describing patients with a difference between maximum intercuspation and centric occlusion. The survey was mailed to 171 dentists involved in either predoctoral or postdoctoral dental programs in the United States; including 56 dental schools; the Army, Navy, and Air Force postdoctoral programs; 8 Department of Veterans Affairs postdoctoral programs; and 7 hospital-based programs. Descriptive statistics of the responses were provided. Chi-squared ($\alpha=.05$) and Fisher’s exact test analyses ($\alpha=.05$) comparing predoctoral and postdoctoral program responses for each question were performed.

Results. Forty-three predoctoral dental school program responses were received. Forty-one postdoctoral program directors, including the dental school–based programs, 3 armed service branches, 2 Veterans Administration programs, and 1 hospital-based program responded to the survey. Fifteen respondents indicated that they represented both predoctoral and postdoctoral programs, and these data were deleted from the sample. Summarized results for each question reflect on whether the clinicians philosophically believed patients were better off with the elimination of an existing occlusal interference between MI and CO or not. There was no statistically significant difference seen between the predoctoral and postdoctoral responses.

Conclusion. The controversy regarding the preferred mandibular position for treatment of dentulous and partially edentulous patients continues among dental educators at both the predoctoral and postdoctoral levels in the United States. (J Prosthet Dent 2005;93:86-90.)

**CLINICAL IMPLICATIONS**

*Based on this study, there is a continuing lack of consensus among dental educators as to whether CO and MI should be coincident at the definitive treatment position.*

Advances in prosthodontics cannot solely be viewed as a simple refinement of materials and techniques. An integral part of such progress is the development of terminology and treatment philosophies that accurately depict current understanding. Occlusion is one of the most controversial and continuously evolving areas of prosthodontics. As knowledge of this subject increases, terminology and treatment philosophies have required constant revision to accommodate this new understanding. Although a relative uniformity of occlusal terminology has been established, treatment philosophies differ greatly. The variety of philosophies is likely a consequence of the limited evidence-based research and the large volume of anecdotal information available.

A basic tenet of occlusal philosophies is the concept of a maxillomandibular treatment position. Even before the invention of the dental articulator in the early 1800s, dentists attempted to make intraoral maxillo- mandibular records. These attempts and later refinements were driven by the observation that edentulous patients had a difficult time repeating a closure position,
but that a repeatable closure position was highly desirable for stability of the denture bases.\(^4\) This repeatable position became known as centric relation position.\(^2\)

As dentists became more capable in the restoration of natural teeth, this concept was extended to dentate patients. Centric relation is defined as “the maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective discs with the complex in the anterior-superior position against the shapes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superior and anteriorly. It is restricted to a purely rotary movement about the transverse horizontal axis.”\(^5\)

However, the use of centric relation as the accepted position for prosthodontic treatment of dentate patients is not as universally accepted as it has been for edentulous patients.\(^6\) One philosophy suggests that all patients should be equilibrated or restored so that centric occlusion (CO) and maximum intercuspation (MI) are coincident.\(^7\) Another concept makes these positions coincident only with a diagnosis of occlusal abnormality or when restoring multiple posterior teeth,\(^8\) and a similar rationale holds that patients should be restored at the position of maximum intercuspation if a stable relationship exists.\(^9\) The treatment position for patient function advocated by Wood\(^1\) may or may not coincide with the patient’s centric relation.

A recent extensive review of the literature by Keshvad and Winstanley\(^10\) provides several plausible explanations for the ongoing divergence of opinions. The authors state that present interpretations of mandibular treatment position are a reflection of the dental literature, in which some authors assert a CO-MI discrepancy should be eliminated because this should be interpreted as a sign of occlusal disharmony.\(^1,11-13\) Other authors view a discrepancy as a normal state resulting from a balance of functional forces that should be maintained in the absence of dysfunctional signs or symptoms.\(^14-18\)

The purpose of this study was to determine the philosophies of dental educators throughout the United States at both predoctoral and postdoctoral levels, and to compare attitudes toward desirable maxillomandibular relationships in defined clinical situations.

**MATERIAL AND METHODS**

A survey was designed with 5 clinical scenarios presented describing patients with a discrepancy between maximum intercuspation (MI) and centric occlusion (CO). A question was created for each of the 5 scenarios requesting the preferred position, MI or CO, in which to restore the patient, and multiple choices were provided (Fig. 1). All questions except question 2 had an “Other ... Please explain” choice. Approval from the Medical College of Georgia’s Human Assurance Committee was obtained for this study.

The survey was mailed to 171 dentists, chairpersons of departments involving occlusion or prosthodontics in predoctoral dental programs, or directors of postdoctoral dental programs in the United States. The directory of the American Association of Dental Schools was used in part to help identify the schools and the heads of departments and programs. For postdoctoral prosthodontic programs, the directors surveyed included those from the Army, Air Force, and Navy programs, 7 Department of Veterans Affairs programs, 7 hospital-based programs, and 34 programs associated with dental schools.

Organization of predoctoral programs varied. For each school, questionnaires were mailed to all identified department chairs of occlusion, prosthodontics, restorative dentistry, or similarly titled sections involved in the determination of occlusal philosophy used in the treatment of prosthodontic patients. The introductory letter requested that if there were individuals more familiar with the predoctoral philosophy, the survey should be passed on to them. The data were analyzed with chi-square and Fisher’s exact tests using statistical software (NCSS 2001; NCSS Statistical Software, Kaysville, Utah) with a significance level of α=.05.

**RESULTS**

Fifty-three total predoctoral responses were received from the 55 predoctoral programs surveyed. The responses came from only 43 of the 55 predoctoral programs. Fifty-seven responses from postdoctoral programs were received from all 3 of the armed services programs, 3 Department of Veterans Affairs programs, 2 hospital-based programs, and 33 postdoctoral programs associated with dental schools. Fifteen responses indicated they represented both predoctoral and postdoctoral programs, and they were deleted from the sample.

The responses for questions 1-5 are presented in Table I and summarized in Table II. The number of responses for each choice is broken down for each of the categories of faculty answering the question: postdoctoral or predoctoral. Even though the letter explaining the questionnaire stated that centric occlusion was defined as the first contact of the teeth with the mandible in centric relation position, there were multiple comments indicating some confusion on the part of the respondents. For question 2, typical comments from those programs selecting answer B, “eliminate CO-MI slide,” or C, “do occlusion procedures other than [listed] above,” often included first evaluating and treating the temporomandibular dysfunction. Occlusal splint therapy was often recommended, followed by reevaluation of occlusion to determine the need for occlusal equilibration. Only 18 predoctoral educators answered...
QUESTIONNAIRE ON PHILOSOPHY OF USING CO VERSUS MIP IN PROSTHODONTIC RESTORATIONS

IN THE FOLLOWING CLINICAL SITUATIONS, PLEASE SELECT THE MOST APPROPRIATE CHOICE OF HOW YOU OR YOUR SCHOOL CHOOSES AN OCCLUSAL SCHEME FOR PROSTHODONTIC RESTORATIONS.

Unless otherwise stated, assume that these hypothetical patients show no evidence of excessive tooth wear, no TMD symptoms and no evidence of occlusal related tooth mobility.

1. You have a 55-year-old completely edentulous patient who has worn the same dentures for the past 15 years. The teeth are worn, the VDO is decreased, and the posterior teeth interdigitate best at an MI position 1 mm anterior to centric occlusion. You are going to fabricate new mucosal borne dentures with cusped teeth. Your maxillomandibular position of choice is:
   a. MIP coincident with CO
   b. MIP 1 mm anterior to CO
   c. Other … Please explain

2. You have a 26-year-old patient who has 28 intact teeth with minimal conservative restorations. She has a Class I jaw relationship and a Class I tooth relationship. She has a .5 mm slide from CO to MIP, with a portion of the slide being anterior and a portion being in a lateral direction. She has anterior disclusion in all excursive movements. She presents with classic signs and symptoms of acute TMD of approximately 1 month’s duration. In treating her TMD would you:
   a. Eliminate the CO-MIP slide
   b. Leave her occlusion as is
   c. Do occlusion procedures other than above

3. You have a 50-year-old patient with a full compliment of maxillary teeth in good alignment. He is missing all mandibular molars and the right second premolar. He desires a removable partial denture replacing his mandibular posterior teeth. He has a .5 mm slide between CO and MIP. Would you:
   a. Fabricate RPD to existing MIP occlusion
   b. Equilibrate to MIP = CO prior to making RPD
   c. Other … Please explain

4. You have a 38-year-old patient who is missing maxillary right and left third molars and mandibular right and left first and third molars. He desires to have mandibular right and left first molars replaced with tooth-borne fixed partial dentures. He has a .5 mm slide from CO to MIP. How would you establish his occlusion in the FPD?
   a. Equilibrate the dentition prior to tooth preparation to make MIP = CO
   b. Do the tooth preparation in both quadrants to eliminate all posterior interferences and make the interocclusal record at CO and restore the occlusion at CO = MIP
   c. Do the FPDs one side at the time, retaining the patient’s existing MIP
   d. Other … Please explain

5. You have a 35-year-old patient who is missing her maxillary right central incisor and desires a tooth-borne FPD to replace it. She has a .5 mm slide from CO to MIP. In MIP her maxillary and mandibular anterior teeth contact, which creates anterior disclusion in all eccentric movements. Through mounted diagnostic casts, it has been determined that by equilibrating the posterior teeth until CO = MIP at the existing VDO, the anterior teeth will no longer be in contact at MIP. How would you establish her occlusal relationship on the new maxillary anterior FPD?
   a. Equilibrate the dentition so that CO = MIP and leave all anterior teeth out of MIP contact
   b. Equilibrate the dentition so that CO = MIP and restore the lingual surfaces of maxillary right and left central and lateral incisors and canines, including the new FPD, to restore MIP contact
   c. Equilibrate the dentition so the CO = MIP and restore MIP contacts on the new FPD, leaving the maxillary right and left canines and left lateral incisor out of contact in MIP
   d. Restore the patient in her existing MIP position
   e. Other … Please explain

School: ____________________________________________________________________________________________
Position: ___________________________Postdoctoral _______________________Predoctoral
Position Title: _______________________________________________________________________________________

Fig. 1. Questionnaire on philosophy of using CO versus MIP in prosthodontic restorations.
question 2. For question 3, 10 comments were received. A typical comment was to create a “long centric.” For question 4, there were few comments and none of these was repeated. For question 5, several respondents commented that they selected answer D, “restore the patient in their existing MIP position,” assuming that the patient was asymptomatic.

In Table II, the responses were categorized as CO or MI. For question 4, answers A and B indicated CO as the preferred treatment position, whereas C maintained the patient’s existing MIP position. Answers A, B, and C in question 5 designated CO, and answer D represented a choice of MI. All responses of “Other ... Please explain” (questions 1, 3, 4, and 5) and “Do occlusion procedures other than above” (Question 2) were excluded from the statistical analyses. Chi-square and Fisher’s exact test statistical analyses showed no significant difference in the answers of the predoctoral or postdoctoral faculty groups.

DISCUSSION

Currently, searching for the truth relative to occlusion does not substitute for knowledge obtained from evidenced-based research, but agreement in a survey can reflect the current understanding of treatment philosophy. There was a difference as to whether or not the respondents believed patients were better off with the elimination of an existing occlusal interference so that centric occlusion and maximum intercuspation would be coincident at the definitive treatment position. Assuming the respondents are competent clinicians, patients similar to those types seen in the survey could be successfully treated by either philosophy, either restoring them at their existing MI position (retaining the occlusal interference from MI to CO) or equilibrating the teeth to make MI and CO coincident (eliminating the occlusal interference from MI to CO) prior to restoration. In the opinion of the authors, because both treatment modalities are feasible, it would seem prudent to avoid occlusal equilibration of natural teeth and to restore patients at their existing MI positions when possible.

Numerous investigators have reported that the majority of dentate patients demonstrate a discrepancy between CO and MI positions.8,13-17 The question is whether this movement between CO and MI is potentially harmful to patients or perhaps physiologically beneficial. A possible hypothesis as to why it might be beneficial is proposed by the authors. The condyle must slide slightly forward to accommodate the MI position. As the elevator muscles exert force on the mandible while the patient clenches in MI, the mandible flexes and elongates, and the condyles move posteriorly. The small distance from MI to CO provides the space required for the condyle to move.

There is no present evidence to confirm that MI-CO occlusal interferences are either harmful or beneficial. Until research provides a definite diagnosis of some pathosis, it is the authors’ opinion not to equilibrate or provide treatment to eliminate a condition found in most individuals that may be beneficial. There are some patients that lack an MI position, and in restoring these patients it is a prosthodontic necessity to use CO. However, for dentate patients with an existing MI...
position, equilibration to remove a slide may not be indicated.

Differences between predoctoral and postdoctoral responses might have been expected for several reasons. Patient screening for predoctoral programs tends to eliminate complex occlusal patient treatment. Because these patients are not encountered in the predoctoral clinics, no definitive philosophy for such treatment would be necessary at that level. Additionally, perhaps fewer predoctoral programs may have had access to a clinician skilled in treating temporomandibular disorders to complete the survey. Interestingly, a tendency of both predoctoral and postdoctoral educators surveyed to eliminate the discrepancy between CO and MI positions appeared to decrease as the number of remaining natural teeth increased.

The limitations of this study include the fact that participants may not have understood the questions. Confusion could have arisen owing to changing definitions of terms used such as CO, which previously was used to indicate MI. In looking for differences between predoctoral and postdoctoral programs, some individuals responded as representing both programs. These responses were excluded from the sample.

Because of the continuing lack of agreement among educators after several decades, the authors suggest that future research should include more evidence-based occlusion studies. An investigation into why these differing philosophies continue to exist would also be interesting.

CONCLUSIONS

Within the limitations of this study, the following conclusions were drawn:

The controversy regarding the preferred mandibular position for treatment of dentulous and partially dentulous patients continues among dental educators at both the predoctoral and postdoctoral levels.

There was no significant difference between the predoctoral and postdoctoral responses for the clinical situations presented in the survey.

REFERENCES


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