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Diagnostic Occlusal Adjustment: Case Presentation for Dental Students

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Abstract

Introduction: The concept of occlusal therapy as an aspect of overall patient care can be difficult for a dental student to grasp. A clear understanding of the position of the teeth, temporomandibular joints, and articulator components is necessary as the position of the teeth and condyles moves from centric relation to maximum intercuspation. **Methods:** This slide-show presentation, self-assessment rubric, and instructor guide were created to enhance student understanding of occlusal concepts. Peter Dawson's occlusal concept of mutually protected occlusion is demonstrated as duplicated casts are adjusted to make centric relations and maximum intercuspation equal. **Results:** This educational resource has been utilized for the past 2 years at our dental school as part of the preclinical occlusion course. It has also been used in the dental clinic for third- and fourth-year students as the need arises for occlusal adjustment on a patient. While we have no hard data on the number of times it has been utilized, the feedback from faculty and students has been positive. The students are consistently able to utilize the educational resource to guide them through the steps of performing a diagnostic occlusal adjustment to the satisfaction of the proctoring faculty. **Discussion:** Existing articles and textbooks mention all of the concepts and steps seen in this resource, but the limitation of print media results in minimization and consolidation of these concepts and steps. This resource presents the detail that is lacking in textbooks.

Keywords

Temporomandibular Joint, Diagnostic, Occlusal Adjustment, Occlusion, Semiadjustable Articulator, Cone Beam Computed Tomography

Educational Objectives

After completion of this educational resource, the student will be able to:

1. Describe the movements of the mandibular condyles as they move from centric relation to maximum intercuspation on the case presented, and then correlate those movements with the movements of the condylar elements of the articulator as they move from centric relation to maximum intercuspation on the case presented.
2. Describe the steps of a complete diagnostic occlusal equilibration on mounted casts.
3. Evaluate the amount and sequence of reduction necessary to establish centric relation equal to maximum intercuspation.

Introduction

The entire concept of occlusion is a complicated subject matter. Dental experts have significant disagreements on the various approaches. Some are firm believers in centric relation (CR) as the basis for a stable dental occlusion.¹ Others support neuromuscular position.² Still others support maximum intercuspation (MI).³ At present, there is not a clear consensus on what is the most effective occlusal philosophy.⁴ Consequently, practicing dentists and students alike have a difficult time understanding occlusion and implementing it into the daily practice of dentistry. It is beyond the scope of this educational resource to address all of the various occlusal philosophies, so it focuses on demonstrating Peter Dawson's occlusal concept of mutually protected occlusion. The starting point for a healthy occlusion in Dawson's concept is CR, the mandibular jaw position in which the head of the condyle is situated as far anteriorly and superiorly as possible within the glenoid fossa.¹

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Appendices

- A. Instructors Guide to Diagnostic Occlusal Adjustment.docx
- B. Diagnostic Occlusal Adjustment.pptx
- C. Diagnostic Occlusal Adjustment - Self-Assessment Rubric.xlsx

All appendices are peer reviewed as integral parts of the Original Publication.

The concept of mutually protected occlusion requires the student to be able to visualize and understand the dynamic interactions of the teeth, the temporomandibular joint, and the muscles of mastication as they work together to create and maintain a stable occlusion. In a mutually protected occlusion, all teeth are in contact (CR equals MI). There are no lateral or protrusive contacts anywhere except on the anterior teeth, and minimal muscle activity is required to maintain the condyles at their most anteriorly and superiorly position within the glenoid fossa.¹ A quick Google search of *centric relation help* returns over 21 million citations. There exists a great need to create an approach to teaching occlusion that simplifies a complex subject into a hands-on experience that will make sense to dental students.

Many hours are devoted to teaching dental students how to wax a crown with proper contours, as well as ideal anatomy with cusp-to-fossa or cusp-to-ridge contacts. Students are taught the techniques for taking a face bow recording of the maxilla relative to the condyles and Frankfort horizontal plane. They learn how to take a CR record and how to mount the casts on a semiadjustable articulator. These techniques, while not easy, are usually mastered by almost all of our students.

What comes next is not so easily mastered. The students evaluate the mounted casts in CR and determine that only a few teeth touch in CR. They release the articulator latch, slide the casts into MI, observe that most if not all teeth touch in MI, and decide to build all future dentistry from MI. A common observation of dental students as they evaluate their clinical cases (which have been mounted in CR) is that CR is so far away from MI they would have to rebuild an entire dental arch to make CR equal MI.

A diagnostic occlusal adjustment of duplicated casts mounted in CR allows the student to visualize the location and amount of tooth structure that must be removed in order to make CR equal MI. Recording the incisal pin position in CR and then again after CR equals MI reinforces the concept that small changes in the posterior teeth have a significant effect on anterior tooth positions. The use of a putty matrix created before any changes are made allows the student to visualize that minimal removal of interferences can make a significant change in an occlusion. Our observation is that once a student has performed a diagnostic occlusal adjustment, he/she is much more likely to consider CR as the starting position for dental care.

There are no prior MedEdPORTAL resources that demonstrate this concept. The strength of this presentation is its simplicity. The clarity and number of images walk the students and faculty through a complicated subject step by step. Existing articles and textbooks discuss the concepts and steps seen in this resource, but the limitation of print media results in minimization and consolidation of these concepts and steps, which leads to a lack of understanding by the students. This MedEdPORTAL resource presents the detail lacking in the textbooks and print articles.

The presentation is an actual case in which one of us was treated by the other two. It attempts to guide the student into looking at occlusion as part of the big picture. The patient's chief complaint is esthetics due to the development of multiple diastemata. The diastemata are the result of pressure from the tongue pushing against the premaxilla (the tongue is being thrust against the premaxilla during clenching.) The clinical examination reveals abfractions, incisal wear, and abraded cuspal inclines. These are all signs of a malocclusion. It becomes obvious that the first step in developing a treatment plan is to evaluate the occlusion and determine if it can be improved. Can CR be made to equal MI? Can anterior contacts be established and a mutually protected occlusion be developed? The presentation correlates the clinical photographs of the teeth, articulator elements, diagnostic casts, and radiographs as the occlusion is evaluated and ultimately adjusted until CR equals centric occlusion.

Methods

We utilize this resource during the first-year dental students' course on occlusion. The presentation is additionally assigned to third- and fourth-year dental students by their clinical faculty whenever the patient requires an occlusal adjustment in the opinion of the faculty.

We chose a slide-show presentation for this educational resource as it allows faculty to rearrange the slides to best fit their teaching preferences. The students are encouraged to store the slide presentation on their cell phones or tablets to review before performing a diagnostic occlusal adjustment. They can also use the presentation to explain an occlusal adjustment procedure to a patient.

An instructor's guide (Appendix A) provides overall guidance on implementing the resource. The presentation (Appendix B) is compatible with any computer, tablet, or cell phone capable of running Microsoft PowerPoint. The presentation can also be converted to a PDF document for additional compatibility. The presentation consists of 48 slides. This educational resource can be viewed as part of a classroom environment or assigned to students to supplement classroom instruction.

The self-assessment rubric (Appendix C) is utilized when the student is assigned to perform a diagnostic occlusal adjustment on a clinical case.

Debriefing

If the resource is utilized as a classroom presentation, the students are asked the following questions:

1. What are the condyles doing as the teeth move from CR to MI? (The right condyle is rotating as the left condyle translates, as evidenced by the patient's shift to the left on closing into MI.)
2. What are the articular elements doing as the teeth move from CR to MI? (The right condylar element rotates while the left drops away from the CR position.)
3. Describe the location and amount of reshaping of the teeth necessary to make CR equal MI.
4. Can the occlusion be adjusted so that CR equals MI without needing major restorative work?

Results

This educational resource has been utilized for the past 2 years at our dental school as part of the preclinical occlusion course. It has also been used in the dental clinic for third- and fourth-year students as the need arises for occlusal adjustment on a patient. While we have no hard data on the number of times it has been utilized, the feedback from faculty and students has been positive. The students are consistently able to utilize the educational resource to guide them through the steps of performing a diagnostic occlusal adjustment to the satisfaction of the proctoring faculty.

The material presented in this educational resource was incorporated into chapter 6 of the textbook *Contemporary Fixed Prosthodontics* (fifth edition).⁵ However, due to space limitations in the textbook, the educational resource presented here contains much more detail to allow the student to perform the procedure with minimal guidance.

Discussion

This educational presentation was developed to integrate and simplify the many facets of occlusion. Dental students have a difficult time being able to integrate what they are taught into clinical practice. The disciplines of operative dentistry, endodontics, and periodontics most often consider occlusion on a tooth-by-tooth basis. Only in fixed and removable prosthodontics is occlusion considered as a complete system of teeth, muscles, and the temporomandibular joint, all under neural control to be evaluated and treated as a unit. Even in fixed and removable prosthodontics, the existing occlusion is often utilized due to financial, technical, or time considerations rather than strictly adhering to the concept of a mutually protected occlusion. The dental student is left confused. The preclinical lectures stress how important the occlusal concepts are, yet students seldom see the concepts implemented in clinical practice. They lack the hands-on experience of modifying an occlusion to make CR equal MI. All too often, dental schools graduate a student who does not understand the value of a mutually protected occlusion and lacks clinical experience dealing with the total occlusal concept.

The first time the student views this presentation, it is part of a comprehensive course in occlusion. The student memorizes the facts and hopefully learns and internalizes a small part of the concept. A year or so later, the student is now in the clinic treating patients. The restorative faculty evaluates a patient and determines that a thorough occlusal evaluation is necessary. The student is asked to review the presentation again, but this time as a cookbook recipe for performing a diagnostic occlusal adjustment. The student begins to develop a feel for the concept of mutually protected occlusion as he/she alters the casts by either subtraction, addition, or a combination. Lastly, when the faculty and student together determine that the patient would benefit from an occlusal adjustment, the student becomes the teacher. The student now uses portions of the presentation and the diagnostic casts to explain to the patient the reasons why the student is suggesting treatment, how it will be carried out, and what the benefits are.

The material presented here is not a comprehensive manual on occlusion. It was designed to be a simple first step for students to help them look at the big picture of occlusion without getting lost in the details. The goal is help the student develop confidence in evaluating an occlusion. The faculty who have tried utilizing the presentation have been very positive in their feedback; however, occlusion is a subject that people feel strongly about. Outside of the orthodontic and restorative departments, most faculty have little interest in occlusion. However, within those two departments, the concepts and views on occlusion cover a wide range of philosophies. It can be difficult to convince other faculty to utilize the presentation if it is not 100% in agreement with their own beliefs.⁴

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Ethical Approval

Reported as not applicable.

References

1. Dawson PE. *Functional Occlusion: From TMJ to Smile Design*. St. Louis, MO: Mosby Elsevier; 2007.
 2. Perry C. Neuromuscular control of mandibular movements. *J Prosthet Dent*. 1973;30(4, pt 2):714-720.
 3. Turp JC, Greene CS, Strub JR. Dental occlusion: a critical reflection on past, present and future concepts. *J Oral Rehabil*. 2008;35(6):446-453. <http://dx.doi.org/10.1111/j.1365-2842.2007.01820.x>
 4. Baker PS, Parker MH, Ivanhoe JR, Gardner FM. Maxillomandibular relationship philosophies for prosthodontic treatment: a survey of dental educators. *J Prosthet Dent*. 2005;93(1):86-90. <http://dx.doi.org/10.1016/j.prosdent.2004.11.002>
 5. Rosenstiel SF, Land MF, Fujimoto J. *Contemporary Fixed Prosthodontics*. 5th ed. St. Louis, MO: Mosby Elsevier; 2015.
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