Choosing a Starting Point for Restorative Dentistry

The goal for all responsible dentists should be to help patients acquire a comfortable dentition that is in balance with the muscles, tendons, ligaments, and the condyle/disc assembly in and out of function. This article presents three different reference points, one of which must be chosen by today's restorative dentists as a starting point for treatment. These three reference points are centric occlusion (also termed maximum intercuspation), neuromuscular occlusion, and centric relation. This article explains the critical importance of selecting centric relation as the point of reference when starting restorative dentistry or orthodontics.

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**CENTRIC OCCLUSION**

Centric occlusion (CO) has always been defined as a tooth-to-tooth relationship. In at least 90% of the patient population there is a discrepancy between centric relation (CR) and CO.\(^1\) CO is easily obtained, as it represents the patient's acquired bite, and is utilized by the majority of general dentists and orthodontists as a reference position. Since CO does not take into account the condition or position of the condyle/disc assembly or interferences to CR, it cannot be considered a consistently repeatable position for occlusal therapy or comprehensive restorative dentistry.

**NEUROMUSCULAR OCCLUSION**

Neuromuscular occlusion has been defined as a "relaxed muscle" position. This philosophy was initiated by Dr. Bernard Jankelson in the 1970s.\(^2\) He was attempting to find a repeatable position to start restorative treatment that was not CR. He theorized that the occlusal scheme should start from a position that allowed the elevator muscles the greatest amount of relaxation (least electromyographic [EMG] activity). To achieve this he passed an

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The majority of occlusal scholars advocate CR as a starting point of occlusal or restorative therapy. There is a learning curve to achieve consistent, pinpoint location of CR with bimanual manipulation.

DISCUSSION

In the day-to-day practice of

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Figure 10. Condyle goes to CR and only the back teeth or tooth touch(es). A chain reaction of damage resulting from this asymmetry can now take place.

Figure 11. Preoperative facial view of patient with a CR/CO discrepancy that required occlusal rehabilitation to relieve symptoms.

Figure 12. Preoperative occlusal view of maxillary teeth.

Figure 13. Preoperative occlusal view of mandibular teeth.

Figure 14. Preoperative right lateral view.

Figure 15. Preoperative left lateral view.

Figure 16. Postoperative facial view.

Figure 17. Postoperative occlusal view of maxillary teeth.

Figure 18. Postoperative occlusal view of mandibular teeth.

Figure 19. Postoperative right lateral view.

Figure 20. Postoperative left lateral view.

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electric current through the third division of the inferior alveolar nerve to cause the temporalis and masseter muscles to obtain their maximal resting length. This position is determined by muscle, with little regard for condyle/disc position. It is easily achievable with the right equipment, with a minimal learning curve. Proponents of this theory state that since this position is measurable, it is therefore scientific.

CENTRIC RELATION

CR is defined as "the relationship of the mandible to the maxilla when the properly aligned condyle/disc assemblies are in the most superior position against the eminentia irrespective of tooth position or vertical dimension."

CR is the optimal arrangement of joint, disc, and muscle. In the healthy joint/disc complex, the condylar head is pressed against the posterior slope of the articular eminence in the most superior position in the fossa, with the connective tissue disc interposed between the bones, and the lateral pterygoid muscle completely relaxed in its connection to both the disc and the condyle (Figures 1 and 2).

This position is consistently repeatable because of the bony stop for the condyle/disc assembly as the condyle hinges on its axis through the medial pole. It is not a rest position but a loaded (strained), active one.
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Clinical dentistry, dentists are asked to determine the source of the patient's discomfort and/or pain. The way that the teeth fit together compared with the position and condition of the condyle/disc assembly (not dental decay) seems to be the main problem patients encounter (Figures 3 through 6). Sensitivity to cold and percussion, headaches, joint pain, facial pain, concomitant ear pain, or fullness and vertigo are just some of the symptoms experienced. These symptoms may range from minimal to severe, depending on the patient's adaptability and the chronicity of the problem. In order to determine the origin of the problem for treatment purposes, certain relationships should be evaluated:

1. The tooth-to-tooth relationship of the mandible to the maxilla when the muscles load the teeth and joints compared with the condition and position of the condyle/disc assembly.
2. The active state of occlusal problem. Is it caused by function or parafunction?
3. Is the problem initiated by the natural dentition or existing dental restorations?
4. Is the problem caused by anterior teeth, posterior teeth, or both?
5. Is the problem pathologic?
6. Is it an occlusal problem?

An understanding of the anatomy of the condyle/disc assembly is essential, as it is the only connection of the lower jaw to the upper jaw. The tooth-to-tooth relationship is determined by the location and condition of this assembly. When it is positioned in the most superior part of the glenoid fossa, it is a consistently repeatable position as long as the teeth do not interfere. With this information in mind, we should revisit the three positions normally utilized by today's dental practitioners for treatment.

**CENTRIC OCCLUSION AS A STARTING POINT FOR TREATMENT**

Because it is the easiest and fastest way to register a bite, CO is very likely the most commonly used reference point. One might argue that since the majority of people have a discrepancy between CO and CR, and a lot of people do not have symptoms of pain, CO is the appropriate position from which to initiate treatment. In some cases this is correct (Figures 7 and 8). CO can be utilized as the treatment position in those cases where there is no pathologic wear evident, no joint pain, no change of tooth position, no cracked teeth or abstractions (signs of instability). There also should be no temporomandibular joint (TMJ) signs or symptoms, including muscle or joint pain. Careful evaluation of the occlusion is mandatory to ensure no signs or symptoms are overlooked. Although difficult to ascertain by even the most astute clinician, the patient who does not put the teeth together in function or parafunction is also restorable from the CO position.

**NEUROMUSCULAR CENTRIC OCCLUSION AS A STARTING POINT FOR TREATMENT**

Historically, neuromuscular CO as a starting point for restorative therapy has been invalidated by the scientific dental community6 and the majority of clinical dentists. In recent non-peer-reviewed publications, this philosophy is again being presented as the only scientific, measurable means of starting restorative treatment. This group suggests that joints are not "load bearing" by quoting Dr. Jankelson's book8 that states, "when the joints become stress bearing areas, pathology results when the stress exceeds the joint accommodations."

This belief is contradicted by many excellent studies stating that joints are load bearing,9,10 and that their opposing tissues are designed for these loads,11,12 but we can also use a common sense approach. We know through the literature and our own anecdotal experiences that we can place tremendous pressures on our teeth. In order for this to happen, the condyle/disc assembly must act as a load-bearing area for the muscle pressures. The joints, teeth, and elevator muscles function as a C1-III lever system with the fulcrum being located at the joint, the force applied by the muscle, and the load being the teeth. It is reasonable to believe that the load could be placed with the condyle not being bone braced but muscle "splinted," as would be necessary with neuromuscular CO.

Unfortunately, neuromuscular centric ensures that the lateral pterygoid muscle will be contracted as the condylar head is down and forward on the distal slope of the eminence.13 Upon finishing the restoration, when the condyle seeks CR the only point of contact will be the back teeth, and the condyle will seek CR (Figures 9 and 10). This will trigger muscle hyperactivity,16 broken or cracked back teeth, worn or cracked front teeth, headaches, joint pain, etc. Some people will have these symptoms and others who adapt will not. When heavy stresses are placed on a disc that is misaligned, damage can occur to the disc and the condylar head. This gives credence to the importance of neuromuscular harmony (muscles functioning in symmetry).

A study by Hickman17 is quoted by the neuromuscular proponents as proof that patients have more strength clenching from the neuromuscular centric position. In this study people were asked to clench maximally from three positions: neuromuscular centric, with a leaf gauge between their anterior teeth, and from CR. Electrodes were placed on the masseter and temporalis muscles, and EMG activity was measured during this clenching. The highest EMG recordings were in the elevator muscles of the patients who started from the neuromuscular position. They interpreted these results by saying that patients therefore have more biting force from this position.

Any general interpretation would be that the system is now so inefficient with the condyle not braced against the eminence that the elevator muscles have to overwork to get the teeth clenched. Maximal forces should not take place on bit-
ing, but when there is a bolus of food between these teeth (about 2 mm apart). The CR position is so efficient that less bite force is necessary to seat the condyle and supply bite force to the new prosthesis.

The main argument presented by the proponents of neuromuscular occlusion against CR is that CR is not "measureable" with instrumentation, and is therefore not scientific. As doctors, should we assume that everything that can be measured is valid, even if the measurement has no relationship with its intended function? Albert Einstein once stated, "Not everything that can be measured counts and not everything that counts can be measured."

**CENTRIC RELATION OCCLUSION**

Since 1905 when Christiansen first attempted to record CR with an impression bite record,¹⁹ clinicians and scientists have attempted to find the most stable and repeatable position from which to begin restorative therapy. Methods included using posterior tongue positioning,¹⁴ chin-point guidance,²⁰ and bilateral manipulation.²¹ Initially, the most posterior position of the condyle in the fossa was thought to be appropriate²² (probably because of recording techniques), and this lasted in the literature through the mid 1980s. In 1987 the Glossary of Prosthodontic Terms redefined CR to eliminate the "rearmost" or posterior position and add the anteriosuperior position.²³ This indicated a major paradigm shift.

In 1993 Parker²⁴ utilized this definition of CR to advance the belief that only the leaf gauge and manipulative techniques were proper to conform to this new regimen. He also felt that any mandibular retrusive movement through manipulative techniques invalidated the technique, and that CR was physiological when acquired properly. By 1995 Dawson²⁵ was supplementing the CR literature by explaining that structurally deformed condyle/disc assemblies may be stable if they can function comfortably with no signs of tenderness or tension on compressive loading. He coined the term "adapted centric posture" in lieu of CR to help clinicians determine when functionally deformed condyle/disc assemblies are stable enough to initiate restorative treatment. Dawson²⁶ felt so strongly about the importance of the relationship of the condyle/disc assembly to the teeth that in 1996 he introduced a new classification system for occlusion that related CO (maximum intercuspation) to the position and condition of the TMJs. This is in contrast to the historic orthodontic angle classification system that relates the location of the teeth in maximum intercuspation with no regard to the condyle/disc assembly to classify the occlusion.

For almost 100 years dentists have been aware of the need to find a reference point that is dependable, repeatable, measurable, and reasonably easy to access by continued on page 100
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Differences of opinion abound among occlusal scholars, but a common
vein has surfaced:
(1) Joints function on a hinge in the first 15 to 20 mm
of opening, and this allows us
to visualize jaw movement
with articulation.
(2) Neuromuscular har
mony is mandatory for
smooth, efficient function.
(3) Joints are load bear
ing.
(4) Physiology and anato
my suggest the condyle/disc
assembly should be in the most
superior position of the emi
nence in functional loading.
(5) CR is the physiologic,
comfortable, and repeatable
reference point to initiate
restorative therapy.
(6) A patient can function
outside of CR but will return
to this position in parafunc
tion or when supplying hea
y bite forces (Figures 11
through 20).

CONCLUSION
The goal for all responsible
dentists should be to help
our patients acquire a com
fortable dentition that is in
balance with the muscles,
tendons, ligaments, and the
condyle/disc assembly in and
out of function. The TMJ
should be considered the
foundation on which we
build the occlusal scheme. It
must be stable and able to
withstand any bite forces
placed upon it. It should also
be a consistently repeatable
position to produce the most
effective mechanical advan
tage for the muscles to per
form their functions of chew
ing, seating (loading) the
condyle, and positioning the
disc, and to initiate occlusal
therapy. Condyle/disc posi
tion is crucial to establish
neuromuscular harmony.
The only joint position that
offers these advantages is
CR.
CO can be utilized as a
treatment reference position
under the following condi
tions: when no signs of in
stability exist (tooth wear,
mobility, tooth change of
position, cracked teeth, ab
fractions) along with no
signs or symptoms of hyper
occlusion interferences to
CR (headaches, muscle pain,
ear pain, etc.), or if we can
show that the patient never
puts the teeth together (espe
cially in parafunction).
One would have to dis
count the anatomy and
physiology of the masticato
ry system to suggest that
the neuramuscular occlusion
centric position should be
used at any time. Fortu
nately or unfortunately,
opening the bite rarely caus
es discomfort and often
relieves TMJ symptoms by
bringing the condyle down
and forward, away from the
inflamed retrodiscal tissues.
Neuramuscular proponents
will claim this to be success
ful treatment. They are not
allowing the components of
the masticatory system to
operate at their optimal
mechanical advantage an
tomically and physiologic
ally, and are depending on
the adaptability of the system
to integrate this philosophy.
A careful evaluation of
the teeth, supporting tis
sues, muscles, ligaments,
and the condyle/disc assembly is mandatory. An understanding of the pertinent literature combined with clinical experience will ensure our best efforts to provide each patient with the neuro-muscular harmony necessary for an efficient and stable masticatory system.

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