

Functional Occlusion: Science-Driven Management



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"Wisdom is not a product of schooling, but a lifelong attempt to acquire it"

~Albert Einstein

Among the handful of clinicians and educators who have determinedly followed Einstein's formula for acquiring wisdom, John Kois stands out as a master. This past May in Atlanta, the Academy had the great pleasure of hearing Dr. Kois speak about the occlusal system from his unique perspective.

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SYSTEMATIC APPROACH TO RISK ASSESSMENT

Dr. Kois states that a predictable approach to the management of occlusion is *always* about a correct diagnostic approach. For Dr. Kois, a systematic approach to risk assessment in all four areas—periodontal, biomechanical, functional, and dentofacial—ensures that the clinician is clear about the clinical factors he or she faces. An appropriate treatment plan is only possible when considering these factors. Managing the occlusal parameter, however, is made more difficult because of the three-dimensional nature of the face. Changing the vertical dimension in the patient also changes the horizontal components; therefore, understanding how these fit together and how this system works is critical to predictable restorative results.

THREE P'S

Dr. Kois proposes a fresh and straightforward approach to defining the parameters of the occlusal system, by considering his "Three P's."

P1 represents the *position* of the joint. Due to the articular disk and the fact that there is a certain amount of soft tissue around it, it is difficult to precisely locate the position that some call centric relation (CR). P1 may be the maximum intercuspal position (MIP), or existing occlusion in patients with acceptable function. It also may be CR, the orthopedic position of the joint, or the myocentric position.

P2 relates to how the teeth fit together in the posterior aspect of the mouth. P2 also impacts the relationship of the teeth within the framework of the smile and the face (i.e., making the teeth longer affects occlusal vertical dimension and increases tooth display).

P3 is the *pathway*, or guidance system in the front. The masticatory system actually works or chews from the outside in.

FIVE KEY QUESTIONS TO DETERMINE RISK LEVEL

According to Dr. Kois, there are five possible occlusal risk diagnoses, ranging from (at the lowest risk level) acceptable function, to constricted chewing pattern and occlusal dysfunction, to (at the highest treatment risk level) parafunction or sleep bruxism, and neurologic disorders. Patients who are low risk can tolerate almost any restorative treatment, whereas treatment of those patients with sleep bruxism or neurologic disorders has a much poorer prognosis. It is important to know the risk level prior to treatment. Dr. Kois teaches how to determine this diagnosis by *always* asking patients five key questions.

1. *Do you have a problem chewing gum?* (A "yes" answer indicates

a possible constricted chewing pattern.)

2. *Do you have problems chewing bagels or dry chewy food?* (A "yes" answer indicates possible occlusal dysfunction.)
3. *Have your teeth changed in the past five years?* Ask about wear, shorter or thinner teeth, looseness or mobility, or development of open spaces. This question helps to assess change, and is extremely important in determining whether the disease is active or has adapted from previous activity. Enamel wears approximately 11 microns per year; under normal circumstances, it should take 100 years to wear through one millimeter of enamel. This question helps the patient become aware of any changes and it helps determine whether their teeth are wearing out faster than their chronological age dictates. The key is knowing if the change is active or whether the patient has adapted and therefore is no longer breaking down. If the patient has adapted, however, that adaptation has been at a price. If the anterior teeth are worn and veneers are placed, without managing the occlusion, the veneers will be at risk.

The patient might say "no" to the first three questions if they have already adapted, but Dr. Kois cautions us to remember that the adaptation has been made at a price. For instance, if they answer "no" to the first two questions but have changed their diet to soft food, they have adapted by altering their diet. These questions not only help the dentist diagnose, but also create patient awareness, helping them understand that their occlusion has

had an impact on their quality of life. Some patients are indifferent about dietary adjustments or visual changes to their teeth, yet their answers to the questions still give the dentist a sense of the rate of adaptation. Are the teeth breaking down at a rate that is unacceptable? Dentistry need not treat every little change, but the goal is to recognize what is getting worse and breaking down. If the adaptation is incomplete and the breakdown is active, treatment may be indicated to help control or eliminate the haphazard adaptation that is occurring.

4. *Do you have more than one bite?* (An affirmative answer may indicate dysfunction.)
5. *Do you have any problems with sleep?* Ask about restless leg syndrome, movement disorders, or if the patient kicks the covers off at night. (If the answer is "yes" consider parafunction [sleep bruxism] or neurologic disorder as a possible diagnosis.) Look to see if the teeth are really flat. Dr. Kois urges us to remember that only 4 to 8% of the population has true sleep bruxism. In considering neurologic disorders, look at the patient's medical history, ask about all medications, and be cognizant of drug use. Remember, equilibration will not help these patients. To protect their dentition, an occlusal guard is recommended.

If a patient answers "yes" to *any* of these five questions, he or she does not have acceptable function. Affirmative responses indicate that the patient is breaking down and there is a definite risk and an associated decreased prognosis.

Additionally, these questions provide an excellent opportunity

to engage the patient in conversation regarding the condition of their teeth and various options for their protection. Patients do not always realize that their teeth are designed to outlast them. It is the clinician's responsibility to help the patient understand that the consequences of inefficient chewing may lead to a disability—including unfavorable esthetics, pain in the muscles or joints, sensitivity in the teeth, or tooth mobility—that could negatively affect their quality of life.

Remember, however, that problems do not always indicate a need for treatment. It is the *magnitude* of the problem that determines the level of risk and need for treatment. For example, the patient's age is an important factor. If the patient is a teenager, wear on the teeth is of a much greater concern than in an older patient. What will the teeth look like in 10 years, and is that acceptable? If the level of tooth mobility and the symptoms and history of the joints and muscles are all acceptable, but the patient answers "yes" to any of the five questions, function is not acceptable and the patient must be informed that their dentition is at risk. In patients over age 50, the risk may be minor and may not warrant treatment. If the patient is younger, however, and needs veneers due to chipped or broken-down front teeth, the occlusion must be managed first.

CENTRIC RELATION

Centric relation, Dr. Kois reminds us, is only about the joint; it has nothing to do with the teeth. The first point of contact when the mandible rotates into CR is centric occlusion (CO). The difference between CO and MIP is called the *slide*, but

the slide has no diagnostic meaning and does not indicate how the system chews. For treatment purposes, CR is only a starting point and not a diagnostic concept. It is acceptable if the patient is not in CR, if they have acceptable function, and the vertical remains stable. These patients can be restored in MIP.

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In health, the jaw mechanics work from the outside in. The mandible comes forward, bites into food, and goes behind the front teeth to chew food in the back. The most important aspect of occlusion is having a stable P2, or "home." Difficulties in achieving P2 are encountered in patients who do not have acceptable function, because of problems in trying to orient the system. CR is a therapeutic—not a diagnostic—protocol and is used to refine the occlusion to a place that the brain can find using P1 (the orthopedic position of the jaw). If the goal is to open the vertical or change the occlusion, a reference position or starting point like CR is needed. Once CR or P1 is established, P2, where the teeth fit together, is determined. Finally, P3, the guidance system for the anterior teeth, is worked out. It must be done in that order.

OTHER DIAGNOSTIC CLUES

In addition to asking the five questions previously discussed, diagnostic clues also can be found by examining the teeth or utilizing a cephalometric radiograph. Radiographs are helpful in determining the position of the maxilla and the mandible. Wear on the teeth can be

an indicator of constricted chewing envelope (wear on the lingual of maxillary anteriors and labial of mandibular anteriors, but little to no wear on posterior teeth); dysfunction (wear on posterior occlusal surfaces and edges of anterior teeth); or parafunction and neurologic disorders (severe wear throughout, where the facets line up together on the casts). Additionally, patients with dysfunction do not have a good P2, which provides bilateral equal intensity contacts from left to right and from cuspids back. These patients may complain of "clenching."

FINDING P1 OR CR

Dr. Kois' system for finding P1 or CR is the deprogrammer appliance. It is similar to a Hawley Bite Plane, NTL, or Lucia jig, except that the deprogrammer has a single point of contact in the front to factor out flexure of the mandible and it allows for treatment of the patient in that reference position. Prior to treatment, the spot must be reproducible and the patient must be comfortable (which may take several weeks of appliance use). Once this spot is established, P1, the reference position, is maintained and the vertical can be either opened or closed at that position. If the spot is reduced on the deprogrammer until a tooth touches, this initial spot of contact is called CO (it should be the same tooth that touches when the patient removes the deprogrammer).

The deprogrammer is a means of equilibrating if the CO contacts are on the posterior teeth, as is often seen in dysfunction. If the initial point of contact in CR is on the front teeth (as is typically seen with constricted chewing patterns), equilibration is not an option; either

orthodontics or an additive procedure for the posterior teeth must be considered. In treatment, the goal is for bilateral equal intensity contacts on shimstock from the cuspids back and no contact on the incisors. Once P2 is established, P3 is worked out by having the patient sit up and chew on thick (200-micron) articulating paper. The key is to look for blue streaks or guidance interferences on the lingual surfaces of the maxillary anterior teeth and adjust them out. This is best accomplished with a high-speed electric handpiece at one-quarter to one-half the output, using a fine diamond with water and final polish with a brownie point.

The facebow by Panadent (Grand Terrace, CA) is a system for transferring functional and esthetic information from the patient to the articulator. It allows the casts to communicate the way the teeth look in the face, and provides a functional reference as well. It is designed to

easily record the midline, esthetic plane, and vertical/horizontal position of the teeth from the patient to the articulator on a plastic piece that attaches to a platform on the articulator. This is extremely helpful in guiding treatment decisions and communication to the laboratory technician, as the platform can be dialed up or down to achieve the desired result and allow a wax-up at this position. The vertical position of the teeth is actually determined by how the teeth look in the face, much like a denture. The horizontal position is determined by the diagnosis. The greater the force the patient generates and the higher the diagnostic risk, the flatter the guidance should be. Treatment also can be planned in phases so that financial limitations are minimized, while the three P's are all maintained. P2 can be managed in composite or with "snap-on smiles" until more permanent onlays or crowns can be done.

SUMMARY

There is a great deal of talk about concepts in dentistry, but not about specific parameters on how to treat the patient. Once a specific occlusal diagnosis is made, the system for treatment is the "Three P's." The goal is for bilateral equal intensity contacts from a reference position, after first evaluating how the front teeth look in the face. This article has presented a system for accurate analysis and treatment planning of incisal edge position, occlusal plane, P2, and P3 (which, again, is guidance from the outside in).

Remember, as Einstein said, "*The significant problems we face cannot be solved at the same level at which we created them.*" It does indeed require a different thought process. *AH*



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