Egyptian Prosthodontic Association (EPA Newsletter)

Centric Relation and Muscle Deprogramming: Foundations for Functional Stability

Electronic Newsletter

Volume 5. Issue 1

January 2026

A stable musculoskeletal position of the jaw is of paramount importance in dentistry, particularly for restorative procedures and the management of temporomandibular disorders. (1) This is because centric relation, as a position, serves as a repeatable reference point for jaw movements, ensuring occlusal harmony and minimizing muscle strain. (2) Centric relation is one of the triad of functional stability, alongside muscles and stable occlusion, therefore, its accurate determination is critical for long-term treatment success. (3)

Various techniques have been described to locate centric relation, ranging from operator-guided methods to patient-determined approaches, each with its own advantages and disadvantages. (4) Operator-guided (passive) approaches allow the operator to position the jaw in centric relation without active involvement of the patient's neuromuscular feedback. (5) Patient-determined (active) techniques rely on the patient's own muscle activity to position the condyles in centric relation (CR). This can be beneficial, as it minimizes the risk of exceeding normal physiological limits and helps prevent joint or muscle disorders, however, these methods necessitate separating the posterior teeth with an occlusal device before making the CR record. (6, 7)

Occlusal devices used to locate centric relation provide posterior teeth separation, which decreases the activity of the elevator muscles and relaxes the lateral pterygoids by interrupting the proprioceptive signals that inform the brain of jaw position. This interruption allows the masticatory muscles to relax and the condyles to passively settle into their most superior and anterior position within the glenoid fossa. (8) Consequently, employing an occlusal device to determine CR effectively minimizes muscle activity and enables precise centric relation recording without the need for direct operator guidance or interference. (9, 10)

Occlusal devices that provide posterior teeth separation include the Lucia jig, the leaf gauge, and anterior deprogrammers.

The Lucia jig (Figure 1) Various versions of the Lucia jig have been developed, including proprietary jigs that can be relined chairside over the anterior teeth and fully fabricated acrylic resin jigs made entirely chairside. Initially, deprogramming was suggested for patients considered "difficult" to manipulate bimanually (11), with the patient wearing the jig for about 30 minutes prior to bimanual manipulation. However, questions have been raised about whether this duration is sufficient for complete muscle deprogramming and relaxation (12), leading to recommendations for extended splint deprogramming. (13-15)

The leaf gauge (figure 2) method is a well-established, patient-guided technique that is straightforward to perform clinically. (16) To record centric relation (CR), several flexible plastic leaves are placed between the anterior teeth to slightly separate the posterior teeth. The recording material is then applied to the occlusal surfaces of the lower posterior teeth, and the patient gently closes on the leaves to obtain the CR record. While easy to use, this technique does not deprogram the muscles or disrupt existing muscle memory/engrams. (6)

When the patient applies gentle pressure, the method is unlikely to exceed physiological limits or induce mandibular deviation, which could compromise the accuracy of the CR record, and studies have shown that using leaf gauges produces minimal masseter activity. (17) The technique is suitable for dentate or partially dentate patients but is challenging with full dentures, as it can cause tipping. It is not recommended for patients with a restricted envelope of function. (18)

Extra caution is needed for patients with a significant overbite, as the anterior teeth may slip over the leaves, or with sore or mobile teeth, which could lead to mandibular deviation during CR registration. (6)

Anterior deprogrammers are removable acrylic appliances that provide posterior teeth separation and have been shown to reduce electromyographic activity in the masticatory muscles (19-21), and for this reason they have been recommended as a treatment option for temporomandibular disorders (TMDs). (22, 23) The American Dental Association has also approved their use as a potential management approach for headaches. (24)

For several decades, it has been proposed that achieving neuromuscular relaxation should be an essential component of any physiologically based and scientifically sound method for recording centric relation. (25) As a result, the use of anterior deprogrammers has grown increasingly popular, as they may support a more physiologically favorable approach to capturing centric relation.

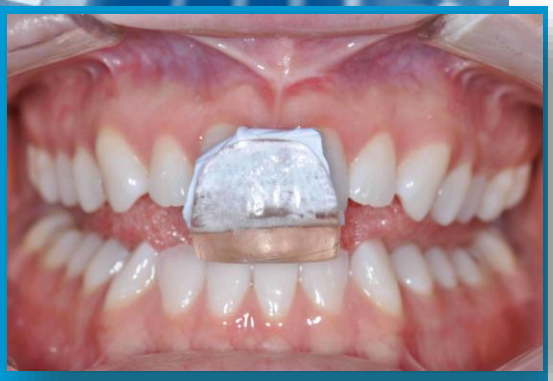

Figure 1: Lucia Jig in Place

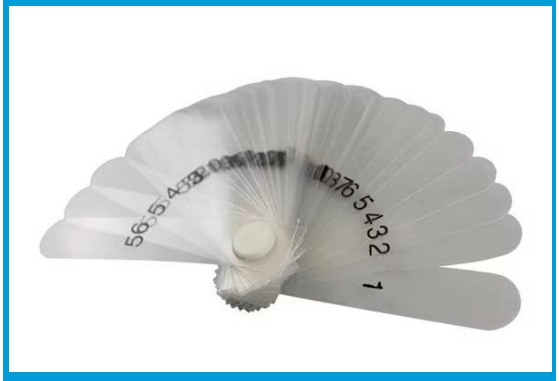

Figure 2: The Leaf Gauge

Anterior deprogrammers include modified Hawley appliance, nociceptive trigeminal inhibition splints, and the Kois deprogrammer **(Figure 3).**

Figure 3: The Kois Deprogrammer

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