


Increased head stabilization by activating and strengthening neck muscles

Dr. Karen Johnston, a prominent Canadian concussion researcher, noted that: "The force required to concuss a fixed head is almost twice that required to concuss a mobile head". Further, there is some correlation between the degree of rotation that the head goes through on impact and the severity of the concussion that might result.

By activating additional head and neck muscles at the time of impact this arc of rotation might be decreased, leading to less harmful movement of the brain inside the skull. Some researchers have begun to show that by being able to clench down harder on a mouth guard the activation of the head and neck muscles might serve to stabilize the head. Some have suggested further that this effect might be in place whether or not the athlete sees the impact coming.

Muscle Strength and Head Stabilization

- MG and clenching may promote increased neck muscle activity
- Stabilization of head may decrease rotational arc during trauma

The image is a composite of two photographs. The top photograph shows a male weightlifter in a blue singlet performing a clean and jerk lift with a barbell. The bottom photograph shows a person lying on a table in a laboratory setting, with their head and neck area being measured or monitored by a device.

I

believe

there is a subset of soldiers (or athletes in contact sports) with TMJ (jaw joint) dysfunction and a predisposition for concussion who can benefit from use

of a dental appliance to distribute forces from blows to the mandible.

Research

on concussions in football players indicate that sudden oblique blows to the head seem most correlated with concussion especially in skill position football

players. This invites the prospect that early contraction of the large neck muscles (trapezius and sternocleidomastoid (SCM)) could provide protection against such oblique blows in athletes and soldiers. Studies have shown that the

SCM and trapezius contract when the closing muscles of the mandible contract

to stabilize the mandible into tooth occlusion. When a potential concussion victim prepares to withstand a blow does early placement of the mandible into occlusion via a dental appliance allow quicker contraction of the head stabilizing muscles to withstand the forces from an oblique blow?

To investigate the effect of the Maher CMO to prevent concussions in soldiers, two benefits must be investigated; the ability of the appliances to distribute forces directed thru the mandible by prospectively investigating the response of those with and without TMJ dysfunction to the use of the appliance, and the response to those with neck muscle contraction during jaw clenching to various thicknesses of the appliance.

I'd be willing to work with you to develop a proposal for a SBIR or other grant opportunity submission.

I look forward to your correspondence.

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[Cranio](#). 1996 Oct;14(4):320-5.

The relationship between jaw posture and muscular strength in sports dentistry: a reappraisal.

[Gelb H](#), [Mehta NR](#), [Forgione AG](#).

Abstract

From the late 1970s until the early 1990s, there have been several reports of improved appendage muscle strength and athletic performance. Much of the criticism of using a mouthguard alone or in conjunction with a splint, such as a mandibular orthopedic repositioning appliance (MORA), to enhance athletic performance has been aimed at study designs, controls, periods of time, double blindness, and the placebo effect. Although it would appear that designing a study which pleases both clinician and researcher would be a difficult task, studies have been performed that do meet the "gold standard." The results favor the premise that jaw repositioning can enhance appendage muscular strength and athletic performance. Studies performed during the mid-1980s, and to which the scientific community refers to continually, on closer examination are flawed.

PMID:

9110627

[PubMed - indexed for MEDLINE]

[Indian J Dent Res](#). 2012 Jan-Feb;23(1):122. doi: 10.4103/0970-9290.99060.

Comparative evaluation of condylar position in symptomatic (TMJ dysfunction) and asymptomatic individuals.

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Source

Division of Orthodontics, The Ohio State University, Columbus, Ohio, USA.

Abstract

CONTEXT:

The etiopathogenesis of temporomandibular joint (TMJ) disorders has been attributed to multiple factors and, while the importance of centric relation (CR) has been acknowledged in dental literature, the role of condylar position and CR-CO (CO-centric occlusion) discrepancy in TMJ dysfunction (TMD) has been a source of controversy.

AIM:

To establish the relationship between condyle position and TMD.

SETTING AND DESIGN:

This was a case-control study to evaluate condylar displacement and interarch CR-CO discrepancy in symptomatic subjects (with TMD) and compare them with asymptomatic subjects.

MATERIALS AND METHODS:

Forty subjects were screened for TMD based on Helkimo index and grouped into asymptomatic and symptomatic groups. CR was registered using the modified Roth power centric bite registration after neuromuscular deprogramming. Models thus mounted on an Advanced Dental Design (AD2) articulator were evaluated for interarch CR-CO discrepancy. The condylar position discrepancy was recorded on a device MCD (measured condylar deviation).

STATISTICAL ANALYSIS:

The Student's t test was used to test statistical significance. The paired t test and the unpaired t test were used for comparing results within and between the groups. Pearson correlation coefficient was used to find out the correlation between MCD measurements and dental three-dimensional (3D) model analysis measurements. The Chi-square test was used to evaluate the qualitative data.

RESULTS:

The average vertical and horizontal condylar displacements were significantly greater in the symptomatic group than in the asymptomatic group. There were significant deviations at the level of the occlusion in both groups. Conclusion: Condyle position may play a significant role in the etiopathogenesis of TMJ disorders.

PMID:

22842268

[PubMed - in process]

Free full text

[Todays FDA](#). 1989 Nov;1(3):1C-3C.

Optimum temporomandibular joint (TMJ) condylar position.

[Abdel-Fattah RA](#).

Abstract

Controversy exists over the value of the TMJ condylar position in the fossa. Many clinicians associate the concentric position to the normal individuals and the retruded position to the dysfunctional condition. It is also recommended that therapeutically, the condyle should be placed on the posterior slope of the articulating eminence. Different groups of investigators claim that the condylar position, centric, retruded or protruded has little or no value and is not correlated with dysfunctional situations. This controversy is attributed to the inconsistency of research methodology. Using a large number of subjects, defining age and sex, careful selection of subject, using tomographic analysis with similar section locations and excluding individuals with disturbed occlusal condition are recommended for a research of this type. The conclusion is that the condylar position is an end product of many dynamic changes such as growth and remodeling, functional matrix activities, occlusal alteration, functional adaptation and individual variation. It is suggested that diagnosis and treatment of TMJ disorders should not be based solely on the radiographic position of the condyle. Consideration of general body conditions is an essential part of total patient management. TM joint condylar position has been explained as the position of the mandibular condyles in the glenoid fossa when teeth are in maximum intercuspation. Clinicians have based their diagnosis and treatment of temporomandibular joint disorder on this position. The optimal condylar position has been a controversial matter in dentistry for many years. The purpose of this paper is to review the literature pertaining to condylar position and to discuss its significance in clinical practice.

PMID:

2700660

[PubMed - indexed for MEDLINE]

[J Prosthet Dent](#). 1976 Oct;36(4):426-40.

Posterior bilateral condylar displacement: its diagnosis and treatment.

[Weinberg LA.](#)

Abstract

One type of condylar displacement (posterior bilateral) was discussed as an etiologic factor in TMJ dysfunction. Joint noise, tenderness on muscle palpation, and acute TMJ pain are all considered signs of TMJ dysfunction. Any joint noise is considered to be an early dysfunctional symptom because of its higher incidence in association with palpable muscle pain or acute TMJ dysfunction. Sometimes the joint noise will immediately precede acute muscle pain and/or fluctuate with the painful symptoms. The treatment of bilateral posterior condyle displacement has been described. The mandibular anterior teeth were shortened and the maxillary posterior occlusion adjusted so that the mandible could be repositioned in an anterior position without increasing the vertical dimension of occlusion. A silver-plated maxillary cast was obtained and mounted on a semiadjustable articulator (Hanau) with a face-bow. The mandibular cast was mounted in the dysfunctional (retruded) centric relation. The articulator was moved into a protrusive position by the amount of anterior correction that is needed to reposition the condyles into the middle of the fossae symmetrically on both sides. The original TMJ radiographs provide the necessary information for this clinical judgment. Acrylic resin was placed in the space created between the condylar sphere and stop on the articulator. An acrylic resin temporary repositioning prosthesis constructed on the metal cast has two functions. It provides a therapeutic trial for the anterior condylar repositioning, and it holds the mandible in the therapeutic position while TMJ radiographs confirm the corrective position of the condyles in the fossae. After a successful 6 to 8 week trial period with remission of symptoms, a gold prosthesis was constructed on the same cast in the same therapeutic position. It remains to be seen whether, after several years, the condylar suspension system changes from a dysfunctional centric relation to a new functional centric relation in which the patient can no longer return to the posterior displaced condylar position in the fossa. Only with painstaking observations, accurate TMJ radiographs, complete documentation, and after-care can a more scientific approach to the diagnosis and treatment of TMJ dysfunctional pain syndrome be achieved.

PMID:

1067424

[PubMed - indexed for MEDLINE]