

Relationship Between Forward Head Posture and Diagnosed Internal Derangement of the Temporomandibular Joint

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The purpose of this study was to determine if a sample of patients with internal derangement of the temporomandibular joint had a significantly greater amount of forward head posture than did an age- and gender-matched control group. Twenty-two patients at a single head, neck, and temporomandibular joint treatment center, who had the diagnosis of internal derangement of the temporomandibular joint, were compared with a control group of volunteers. The angle of each patient's head position was measured from four photographs (two of the patient sitting and two of the patient standing) with a diagonal line drawn from the spinous process of the seventh cervical vertebra to the tragus of the ear and a horizontal line drawn perpendicular to a plumb line suspended from the ceiling. The angles measured from each of the four photographs were averaged, and this figure was paired with that generated from an age- and gender-matched person in the control group. Results indicated that there was not a significantly greater degree of forward head posture in the experimental group.

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Correction of forward head posture (FHP) is widely accepted as one of the primary goals of physical therapy in treatment of patients with internal derangements of the temporomandibular joint (TMJ).¹⁻³ However, the link between FHP and this pathology is disputed. Kraus,¹ in one source, theorizes that FHP produces a tendency for the mandible to translate posteriorly because of the passive tension of the suprahyoid muscles in that posture. Posterior translation of the mandible may contribute to dislocation of the articular disc as the mandibular condyle migrates posterior to the disc. However, in another source, the same author cautions that the link between craniomandibular dysfunction and the muscle imbalances that often accompany these disorders should not be considered a cause and effect relationship.⁴ Darlow et al⁵ find no significant link between craniomandibular myofascial pain syndrome and FHP. Braun,³ however, found a significantly higher degree of FHP and rounded shoulders in symptomatic female craniofacial pain patients than in asymptomatic women. Passero et al² associate FHP with postural imbalance of the mandible. Clark et al⁶ find a statistically significant increase in the incidence of cervical complaints in patients with TMJ disorders as compared to controls and a higher incidence of postural anomalies, although the latter factor did not achieve statistical significance. Kirveskari et al⁷ report a statistically higher incidence of signs of craniomandibular disorders (as diagnosed by a dentist) in patients who had sought

treatment for cervical pain as compared to those persons without complaints for cervical pain. On the basis of these findings, a need exists for more evidence to clarify the link between FHP and TMJ dysfunction. This study was undertaken to assess whether a sample of persons with diagnosed internal derangement of the TMJ would have a greater amount of FHP than an age- and gender-matched control sample possessing none of the signs, symptoms, or history of internal derangement of the TMJ.

Materials and Method

Experimental Group

The experimental group consisted of 22 volunteers (19 women and 3 men; average age of 38.6 years; age range of 14 to 68 years). These individuals had all presented with a complaint of preauricular jaw pain of at least 3 months' duration. The diagnosis of internal derangement of the TMJ was made by one dentist and was based on clinical examination, which included manual testing of the joint and the recording of auscultated joint sounds. The diagnosis of internal derangement was confirmed with magnetic resonance imaging in all cases. A majority of the individuals demonstrated internal derangement with reduction ($n = 17$), the rest presented with internal derangement without reduction ($n = 5$). All members of this group were patients in a single, hospital-based head, neck, and TMJ center.

Control Group

The control group consisted of 22 volunteer subjects closely matched for age and gender (average age of 35.4 years; age range 13 to 69 years). These individuals denied that they were presently experiencing, or had any history of, clicking or locking of the TMJ. Furthermore, they denied any history of facial, jaw, or ear pain.

Instrumentation

The camera used for data collection was a Canon EOS 620/650 with a Canon Speedlite 300 EZ flash (both Canon, Tokyo, Japan). Angles were measured from profile photographs with a transparent plastic protractor. The chairs used for the

sitting photographs each had a rigid horizontal seat that was between 30 and 35 cm off the floor and had a rigid back and arm rests.

Data Collection

Four profile photographs of the head, neck, and shoulders of all individuals were taken, two with persons in a sitting position and two with persons in a standing position, from a standardized distance of 1.15 meters. A tripod camera mount (Titan 3000, ACME, New Jersey) was used to standardize camera height at 1.32 meters. The seventh cervical vertebra (C7) of each person was identified via palpation of what was assumed to be the spinous processes of the sixth cervical vertebra (C6) and C7 and by having each patient actively extend the neck. The spinous process of C7 was judged to be the most superior of the spinous processes that did not translate anteriorly upon active extension.⁸ It was revealed and marked with a surgical tape marker for ease of identification in the photographs. The patients were unaware that posture was the attribute being studied. Neither sitting nor standing posture was standardized to best record each subject's habitual head and neck posture.

The angle of FHP was measured from the photographs by drawing a horizontal line through C7 and a line from the superior aspect of its spinous process to the tragus of the ear, as described by Darling et al.⁹ A plumb line was included in the photographic field to establish a vertical reference. Using this method, if a line connecting the tragus and the spinous process of C7 was vertical, the angle would be 90 degrees, and if a line connecting tragus and the spinous process of C7 was horizontal, the angle would be 0 degrees. A mean was factored from the angles measured in the four photographs. Both the photography and the angle measurement were performed by a single researcher (Figs 1 and 2).

The single-tester reliability of the photograph and angle method was established prior to the analysis of the photographs by taking 10 photographs of a single individual and analyzing each photograph for FHP. The variation of the FHP angle could not exceed 10 degrees for the method to be considered reliable as defined by the researcher prior to data collection. The measurements generated from the reliability study were 52, 51, 51, 52, and 53 degrees for sitting position photographs and 53, 55, 48, 56, and 53 degrees for standing position photographs. All measurements fell within an 8-degree range, fulfilling the reliability requirement. The method was particularly con-



Fig 1 Example of photograph of patient in standing position.



Fig 2 Example of photograph of patient in sitting position.

sistent in sitting position photographs, where all measurements fell within a 3-degree range.

Data Analysis

Means and standard deviations of degrees of FHP were calculated from the raw data and applied to a paired *t* test as described by Oyster et al.¹⁰ Every internal derangement patient was paired with a control of the same gender and similar age (maximum age difference between cohorts was 4 years, average was 1.96 years). The formula for the paired *t* test is:

$$t = \frac{x\Delta - \sqrt{(s\Delta - n \text{ of pairs})}}{n}$$

where

x = mean of sample angles of FHP

s = mathematical constant

n = number of pairs

and

$$\alpha = .05$$

Results

The mean angle of FHP for the internal derangement group was 49.9° (range = 38.0° to 60.0°, standard deviation = 4.6°). The mean angle of FHP for the control group was 52.0° (range = 40.5° to 59.8°, standard deviation 5.6°). The *t* value was

Table 1 Average Angle of FHP in Control Group Compared With Internal Derangement of the TMJ Group

	Control group	TMJ group
<i>n</i>	22	22
Age range (y)	13-69	14-68
Average age (y)	35.4	38.6
FHP angle range (°)	40.5-59.8	38.0-60.0
Average FHP angle (°)	52.0	49.9
<i>t</i>	1.12	
<i>df</i>	21	
<i>P</i> *	.725	

*Not statistically significant.

calculated as 1.185, and the two-tailed significance was calculated as .25. Therefore, no significant difference was found between the matched pairs (Table 1).

Discussion

This correlational study did not establish a relationship between FHP and internal derangement of the TMJ. The independent variables of age and gender were controlled in the design of this study, and each member of the internal derangement group was paired with a control of the same gender and similar age. Variables not controlled for included origin of pathology, race, occupation,

and socioeconomic status. Occlusal factors were not addressed because most recent research indicates a lack of correlation between occlusal discrepancies and occurrence of TMJ disorders.¹¹⁻¹⁴ Also, only the diagnostic category of internal derangement of the TMJ was investigated for a relationship to FHP in this study; relationships may exist between head FHP and other categories of craniomandibular dysfunction, such as arthritic disorders or myofascial pain syndrome.⁵ Further study is needed to explore the relationships between head and neck posture and other categories of craniomandibular dysfunction, as well as to check the reproducibility of the results of this study. Further study is also needed to establish the appropriateness of routine correction of FHP in physical therapy treatment of craniomandibular disorders.

Conclusion

Results of this study indicate that there was not a significantly greater degree of FHP in a sample of persons with internal derangement of the TMJ than in a control sample without history or current complaints consistent with craniomandibular dysfunction. Because this study matched age and gender between internal derangement patients and controls, it indicates that FHP is not linked with internal derangement of the TMJ utilizing this analysis.

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Resumen

Relación Entre la Postura Anticipada de la Cabeza y el Diagnóstico de Malfuncionamiento Interno de la Articulación Temporomandibular

El propósito de este estudio fué el de determinar si una muestra de pacientes afectados por el malfuncionamiento interno de la articulación temporomandibular (ATM), presentaba una postura anticipada de la cabeza significativamente más pronunciada, en comparación a los pacientes de control cuyas edades y géneros concordaban con aquellos del grupo experimental. Veintidós pacientes pertenecientes a un centro de tratamiento para cabeza, cuello y ATM, afectados por malfuncionamiento interno de la ATM, fueron comparados a un grupo de control compuesto por voluntarios. Se midió el ángulo de la posición de la cabeza de cada paciente, por medio de cuatro fotografías (dos con los pacientes sentados y dos parados) con una línea diagonal dibujada desde el proceso espinoso de la séptima vertebra cervical al trago de la oreja y una línea horizontal dibujada perpendicularmente a una línea vertical suspendida del techo. Se calculó, el promedio de los ángulos medidos de cada una de las cuatro fotografías, y este dato se comparó a la información generada por el grupo de control. Los resultados indicaron que el grupo experimental no presentaba una postura anticipada de la cabeza significativamente más pronunciada en comparación al grupo de control.

Zusammenfassung

Beziehung zwischen Vorhaltestellung des Kopfes und diagnostizierter Diskopathie des Kiefergelenkes

Das Ziel dieser Studie war zu ermitteln, ob eine Gruppe von Patienten mit Diskopathie des Kiefergelenkes signifikant mehr Vorhaltestellung des Kopfes aufwies als eine Kontrollgruppe mit gleicher Alters- und Geschlechtsverteilung. Aus einem Kopf-, Hals- und Kiefergelenk-Zentrum wurden 22 Patienten mit der Diagnose Diskopathie des Kiefergelenkes verglichen mit einer Kontrollgruppe freiwilliger Probanden. Der Winkel der Kopfhaltung wurde bei jedem Patienten auf vier Photographien (2 vom sitzenden, 2 vom stehenden Patienten) gemessen, indem eine diagonale Linie vom processus spinosus des siebenten Halswirbels zum Tragus des Ohrs und eine Horizontale gezogen wurden. Die Winkel aus den 4 Photographien wurden gemittelt und Paare gebildet mit den entsprechenden Werten aus der Kontrollgruppe. Die Resultate zeigten, dass es in der experimentellen Gruppe keine signifikant vergrößerte Vorhaltestellung des Kopfes gab als in der Kontrollgruppe.