Revista Odontológica Mexicana — Facultad de Odontología

Vol. 15, No. 2 • April-June 2011
pp 72-76

ORIGINAL RESEARCH

Temporomandibular joint dysfunction in 9 to 14 year old patients programmed for orthodontic treatment

Disfunción de la articulación temporomandibular en pacientes de 9 a 14 años pretratamiento de ortodoncia

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ABSTRACT

This study was carried out at the Hospital Infantil de Mexico Federico Gomez (Federico Gomez Mexico Children´s Hospital). The purpose of the study was to know and assess the relationship between functional and occlusal characteristics with temporomandibular joint dysfunction. (TMD). These characteristics can be trauma history, discrepancy between occlusion and centric relation (OC/CR), type of dentition (mixed or permanent), onychophagia, finger sucking, oligophagia and lingual projection. All these factors have to be taken into account before initiating orthodontic treatment. Data were collected from 150 patients of the Orthodontics Department of the Hospital Infantil de Mexico Federico Gomez (Mexico's Children's Hospital Federico Gomez). 54.3% of the patients were female and 41.6% male. The average age in these patients was 12.2 years. 78.8% of the patients presented midline deviation, 25.2% were afflicted with anterior crossbite, and 27.8% showed posterior crossbite. 59.6% of the patients had permanent dentition, 40.4% presented mixed dentition. 86.8% had received previous dental treatment. 41.1% presented molar Class I, 33.3% Class II and 25.8% Class III. 18% of patients had history of some facial trauma. 7% presented a discrepancy between OC and CR larger than 2 mm. 27.2% and 11.3% respectively presented pain and articular sounds in the temporomandibular joint (TMJ). Finger sucking habits were present in 7.9% of the sample population, and finally 2% of the patients presented bruxism. In the logistics regression model the statistically more significant variables were the finger sucking habit and posterior crossbite.

RESUMEN

El presente estudio se realizó en el Hospital Infantil de México, Federico Gómez, con la finalidad de conocer y evaluar la relación entre características oclusales y funcionales con la disfunción de articulación temporomandibular (DTM), tales como: antecedentes traumáticos, discrepancia entre oclusión y relación céntrica (OC/RC), tipo de dentición mixta o permanente; onicofagia, succión digital, oligofagia, y proyección lingual antes de iniciar el tratamiento de ortodoncia. Se recolectaron los datos de 150 pacientes del Servicio de Ortodoncia del Hospital Infantil de México Federico Gómez. Encontrándose que el 54.3% comprendió al sexo femenino, y el 41.6% al sexo masculino, con una media de edad de 12.2 años; el 78.8% presentó desviación de líneas medias, 25.2% presentó mordida cruzada anterior y el 27.8 mordida cruzada posterior. El 59.6% presentó dentición permanente, 40.4% dentición mixta, 86.8% recibió tratamiento dental previo, un 41.1% presentó clase molar I, 33.3% C II y 25.8% C III. El 18% tuvieron antecedentes de algún traumatismo facial. El 7% presentó una discrepancia entre OC y RC mayor de 2 mm; el 27.2% y 11.3% presentaron ruidos articulares y dolor en la articulación temporomandibular (ATM) respectivamente, el hábito de succión digital se presentó en 7.9% de la población, y finalmente 2% presentó bruxismo. En el modelo de regresión logística, las variables que resultaron estadísticamente más significativas fueron el hábito de succión digital y la mordida cruzada posterior.

Key words: Temporomandibular dysfunction, bruxism, onychophagia, oligophagia.
Palabras clave: Disfunción temporomandibular, bruxismo, onicofagia, oligofagia.

INTRODUCTION

The American Dental Association (1982) defines temporomandibular joint disorders (TMJD) as a group of functional alterations of the masticatory system.[1] Temporomandibular dysfunction (TMD) is frequent in functional disorders of the temporomandibular joint (TMJ). It generally manifests itself as an alteration of the normal movement of condyle and disk. It produces articular sounds, sometimes accompanied with the presence of pain. Temporomandibular dysfunction can also manifest itself as a sensation of stiffness when the patient opens his mouth. In some cases, the lower jaw can block. This causes limitations or deviations of

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the mandibular movements.[1] Any disruption or alteration which generates the elongation of the disc ligaments or a thinning of the disc can cause problems of the condyle-disc unit. This comes about when force is applied to the retrodiscal tissues. These tissues lack a suitable anatomical structure which allows them to withstand force, it is possible, therefore that these tissues will suffer alterations.[2,3,19] It becomes obvious that one of the commonest factors are macro and microtraumatisms.

A microtraumatism can be induced by the articular load developed by some schemes of muscular hyperactivity, such as bruxism or teeth gnashing.[4,5] This is especially true in cases when the bruxism is intermittent and tissues have no ability to adapt. Another type of microtraumatism is due to mandibular instability, this is due to the elongation of disc ligaments when these strive for mandibular stability.[1]

Epidemiological studies on TMJD have been carried out in the last two decades, and a great effort has been made to clarify its causes.

Generally, it is accepted that the origin of the functional disruptions of the stomatognathic system is due to many factors. Nevertheless, although in children and adults TMJD prevalence has been high, no predominant cause has been elicited.

Some of the factors under discussion are functional malocclusions (occlusal interferences) which Dawson,[6] and Ramford[7] deem very important. Other authors like Rugh[8] and Beaton[9] consider that psychological factors are of greater importance.

It has been suggested to continue this research in groups with different characteristics such as those of patients with histories of dentofacial traumatisms, oral parafunctions, malocclusions, different emotional states etc.

Some researchers, like Egermark-Eriksson,[10] and Helm,[11] have exhaustively analyzed the relationship of functional and morphological malocclusions with temporomandibular joint disfunctions (TMJD). This research has been carried out through longitudinal studies. The results show, in general terms, that occlusal factors have a slight influence in functional disorders. In addition to this, reports of Kess,[12] and Egermark-Eriksson,[13] show that orthodontically treated patients suffer a lower prevalence of TMJD signs and symptoms. We can thus infer that occlusal factors do indeed play a role in the origins of craniomandibular disorders.

Scientific literature dealing with TMJD in children is rather scarce and it suggests that prevalence between signs and symptoms related to TMJD in children is 20-74% and 22-68% respectively.[14]

Epidemiological studies on temporomandibular disorders (TMD) show that they can originate early the in craniofacial growth and development stages. These studies equally show that a high percentage of the children present many of the signs and symptoms found in adults. This leads us to consider that this dysfunction is not a degenerative disorder related to advanced age in patients.[15,16]

There is evidence of articular disorders' signs and symptoms that can be associated with certain morphological and functional malocclusions in patients not yet fully developed.[17] According to other researchers, the relation between TMD and certain malocclusion problems such as occlusal interferences, anterior open bite, and anterior and posterior crossbite confirm the multifactorial etiology of the temporomandibular disorders.[18] Mannheimer,[20] expresses the interaction and/or sum of etiological factors. He establishes the joint relationship of TMJD with the presence of malocclusions, facial asymmetries, and also the inclination of the oclusal plane, since a condyle can be more affected on one side than on the other. Actually, the main role would be of traumatic or bacterial etiology, and its distribution affinity on one of the sides,where malocclusion occurs, would be a secondary fact.[21]

Rocabado,[22] emphasizes the need of surveying children who eat their fingernails or suck their fingers. These growing children adopt corrupted postures which lead to posture scoliosis. If these tainted postures are not resolved at early stages of development they will cause unsolvable structural problems in the later adult, for the individual lacked compensating growth and development.[21]

When studying the onset of temporomandibular joint disorders, it is difficult to conclusively prove the task carried out by occlusal factors, parafunctional habits, age of patient and even his gender. In the present study we try to research this subject, to some extent, on a defined sector of Mexican population.

We analyze here associations between TMJD and some of its signs and symptoms, with a set of variables.

It is important to gather information on the state of the TMJ before initiating orthodontic procedures. We have to keep monitoring the TMJ status all during treatment as well as at the end of it. Nocturnal o parafunctional activities have also been recognized as contributing factors.[23]

The purpose of this study is to determine which factors are related to temporomandibular dysfunction.

In this study we presented the following hypothesis: patients who are prone to suffer dysfunctions in the

temporomandibular joint are those who are afflicted with parafunctional habits such as finger sucking, tongue projection, onychophagia, oligophagia and bruxism; as well as those who show great discrepancies between occlusion and centric relation, certain mandibular deviations, articular sounds, preauricular pain or pain in the masticatory muscles, deviated dental lines, excessive or negative HMS (Hemifacial Microsomia Syndrome), craniofacial alterations, posterior crossbite, molar class II or III, mixed dentition, or history of traumatism.

METHODS AND MATERIALS

This is a cross study of analytical nature. From October 2004 to October 2005, we studied 150 patients selected from the orthodontic clinic of the Mexico's Children Hospital Federico Gomez.

We collected data through the following means: direct patient interrogation, routine exploration of the oral cavity and temporomandibular joint area, by means of extrauricular and intrauricular palpation.

We studied all patients admitted for orthodontic treatment at the Orthodontics Clinic of the Federico Gomez Mexico Childrens Hospital, during the period of 2005-2006.

Patients were excluded from this study when they presented, (when subjected to exploration), any degenerative condition which could affect the TMJ. We excluded as well those presenting some syndrome affecting this area (Goldenhar syndrome, hemifacial microsomia), or patients afflicted with TMJ ankyloses.

We considered as variables the following: articular noises (signs) articular pain on palpation (symptoms), trauma history, OC/CR discrepancy, maximum oral opening, type of dentition, mandibular deviations, previous dental treatments, craniofacial anomalies. We also considered variables oral habits like onychophagia, finger sucking, oligophagia, lingual projection and bruxism *(Table I)*.

The variable related to TMJD in children was constituted according to the following variables: articular pain, articular sounds and discrepancies between occlusion and centric relation.

These three variables are dichotomic. (with 0,1 values). We consider we have TMJD when there is an alteration of the normal movement between condyle and disc, which then produces articular sounds. We must point out that articular pain and discrepancy in OC/CR are not necessarily present in TMJD.

Independent variables included in the analysis were: age, gender, molar class, type of dentition, horizontal overbite, trauma history, maximum opening, craniofacial anomalies, previous dental treatments, posterior crossbite, parafunctional habits, and mandibular deviations *(Table I)*.

We estimated averages, standard deviations and variable proportions. We analyzed the relationships among variables through a binary process of logistical regression. We used the computer program SPSS 12.0.

RESULTS

The total sample was distributed as follows, 54.3% female, 41.6% male, average age 12.2 years and standard deviation (SD) was 1.82. 78.8% presented midline deviation, 25.2% anterior crossbite, 27.8% posterior crossbite. 86.8% had received previous dental treatment. 44.1% presented molar class I, 33.3% presented molar class II and 25.8% presented molar class III. 7% presented discrepancy between occlusal and central relation larger than 2 mm; 27.2% and 11.3% presented respectively articular noise and TMJ pain. 56.6% presented permanent dentition and 40.4% mixed dentition.18% had history of facial trauma. 15.1% of patients in this sample suffer some type of craniofacial alteration.

2% of the patients informed of a decrease in oral opening to less than 25 mm. 24% of the patients did not inform of habits of any kind; 7.9% presented finger sucking habit, 28.1% were afflicted with lingual projection, 21.2% presented onychophagia, 23.2% and oligophagia 13.9%. Finally, 2% presented bruxism.

Table I. Logistic regression models to explain factors influencing temporomandibular joint.

Dependent variables	Odds reason	p value	Confidence interval 95%
Cross bite	2.43	0.026	1.11 – 5.33
Finger sucking	5.16	0.019	1.31 – 20.40
Lingual projection	0.92	0.870	0.34 – 2.50
Onychophagia	0.54	0.251	0.19 – 1.54
Oligophagia	1.89	0.249	0.65 – 5.56
Constant	0.34	0.002	

According to the regression model, patients with posterior crossbite experience a 2.4 times higher risk of presenting TMJD. TMJD is 5.2 more frequent in patients presenting history of finger sucking. Nevertheless, the confidence interval of this last variable is very wide, this is probably due to colinear problems.

The omnibus test is based in the χ^2 distribution to evaluate the accuracy of the models adjustment, according to the obtained value of p. Therefore, the omnibus test (p = 0.001) in this study indicates that the model adjusts well to the data. Nevertheless, the model's explanatory ability is low since Nagelkerke's pseudo r^2 was 0.19.

Statistically significant variables were finger sucking habits and crossbite.

DISCUSSION

TMJ research embraces an enormous scope. This allows to perform analysis geared to giving greater clarity on the TMJ disorders and above all its etiology. These studies are now carried out in children and teenagers as well as in adults who, in past decades, were the only group subject to study. We know that the TMJD etiology, or even for that matter the general etiology of all TMD is a very complex subject harboring many disagreements as to which are predisposing factors. Each separate researcher, according to the location where the study is carried out, to the characteristics of the group being surveyed, and to available financial resources, considers important certain signs and symptoms. For this reason we decided to include the aforementioned variables in this study.

Alamoudi,[24] mentions the presence of TMD and its direct bearing with the patients' emotional problems. He stresses the interest the dentist has to display for these children's problems. He considers there is no direct relationship between oral parafunction and TMJ disorders, and he opposes the theories presented by authors like Umana.[17]

Contrary to the theories of Alamoundi[24] and in support of Umana,[17] Rocabado,[22] and the results of our present study, consider that finger sucking habit is a predisposing factor for TMJD in our population. In another study,[25] Farsi supports this previous theory, that is to say that oral parafunctions have a significant role in TMD disorders. The results of his studies showed significant correlation between cheek gnawing, onychofagia, finger sucking and bruxism.

On the other hand, posterior crossbite was considered a significant variable. We attribute this to an occlusal instability due to the presence of occlusal interferences or premature contact points. This supports theories reported by Castillo H.[26] In their studies, they reached the conclusion that the factors associated with temporomandibular joint disorders and with its indicators are: premature contact and centric relation, abnormal slidings to maximum space between cusps; occlusal interferences especially on the balance side; anterior guide elements where the contact of maximum space between cusps overhangs and molar relationship.

The research by Rocabado,[22] and Estrella Sosa,[21] are interesting. They study the bodily posture adopted by patients in the presence of certain parafunctional habits, that we have already mentioned, and the direct relationship with the presence of TMJD. More research is needed in this field. It would be equally important to carry out TMJ studies with the help of diagnosis aids such as magnetic resonance, posterior-anterior X rays, and clinical pictures, so as to be able to accurately analyze and assess TMJ in our population, and thus support Mannheimer's theories on the presence of TMJD combined with facial asymmetries and malocclusions.[20]

CONCLUSIONS

The larger section of the child population surveyed in this study presented some type of temporomandibular dysfunction symptom. Factors which predisposed towards TMJD were the habits of finger sucking and posterior crossbite. It is important to detect early any signs and symptoms that indicate some dysfunction in the temporomandibular joint before proceeding to administer orthodontic, orthopedic and/or surgical orthodontic treatments. The way to achieve this is to establish some sort of early therapy which can achieve improved functional results in the patient. Following this, we can even prevent physical and functional deterioration in the temporomandibular joint.

REFERENCES

1. Okeson, Jeffrey P. *Tratamiento de oclusión y afecciones temporomandibulares*. 5ª. Edición Madrid 2003. Ed. Mosby.
2. Isberg A, Isacsson G, Johansson AS, Larson O. Hiperplastic soft-tissue formation in the temporomandibular join associated with internal derangement. A radiographic and histologic study. *Oral Surg Med Oral Phatol* 1986; 61: 32-38.
3. Holumlund AB, Gynther GW, Reinholt FP. Disk derangement and inflamatory changes in the posterior disk attachment of the temporomandibular joint. *Oral Surg Oral Med Oral Pathol* 1992; 73: 9.
4. Israel HA, Diamond B, Saed Nejad F, Ratcliffe A. The relationship between parafunctional masticatory activity and arthroscopillaty diagnosed temporomandibulare joint pathology. *J Oral Maxillofacial Surg* 1999; 57: 1034-1039.

5. Nitzan DW. Intraarticular pressure in the functioning human temporomandibular joint and alteration by uniform elevation of the occlusal plane. *J Oral Maxillofac Surg* 1994; 52: 671-679.
6. Dawson PE. *Evaluation, diagnosis and treatment of occlusal problems*. 2 ed. St Louis: Mosby 1989: 122-6.
7. Ramfjord SP, Ash MM. *Occlusion*. 3 ed. Philadelphia: WB Saunders, 1983: 245-51.
8. Rugh JD, David SE. Temporomandibular disorders: Psychological and behavioral aspects. In: Sarnat BG, Laskin D et al. *The temporomandibular joint*. 14 ed. Philadelphia: WB; Saunders 1992: 324-45.
9. Beaton RD, Egan KJ, Nakagawa-Kogan H, Momson KN. Self-reported symptoms of stress with temporomandibular disorders; comparison to healthy men and women. *J Prosthet Dent* 1991; 65: 289-93.
10. Egermark-Eriksson I, Carlsson GE, Magnusson T, Thilander B. A longitudinal study on malocclusion in relation to signs and symptoms of craniomandibular disorders in children and adolescents. *Eur J Orthod* 1990; 12: 399-407.
11. Helm S, Petersen PE. Mandibular dysfunction in adulthood in relation to morphologic malocclusion at adolescence. *Acta Odontol Scand* 1989; 47: 307-14.
12. Kess K, Bakopulos K, Witt E. Temporomandibular joint function with and without orthodontic treatment. *Eur J Orthod* 1991; 13: 192-6.
13. Egermark J, Thilander B. Craniomandibular disorders with special reference to orthodontic treatment: an evaluation from childhood to adulthood. *Am J Orthod Dentofacial Orthop* 1992; 101: 28-34.
14. Okeson PP. Temporomandibular disorders in children. *Pediatr Dent* 1989; II: 325-329.
15. Moyers RE. The development of occlussion and temporomandibular joint disorders. In: Carlson D, Mc Namara JA, Ribben KA (eds). *Developmental aspects of temporomandibular joint disorders*. Ann Arbor: University of Michigan Press, 1985: 53-60.
16. Egermark-Eriksson I, Carlsson GE, Ingeryall B. Prevalence of mandibular dysfunction and orofacial parafunction in 7, 11 and 15 year old Swedish children. *Eur J Orthod* 1981; 3: 163-172.
17. Umaña G. Disfunción temporomandibular en escolares. Estudio epidemiológico. *Rev Estomatol* 1992; 2: 18-28.
18. Egermark-Eriksson I, Ingervall B, Carlsson GE. The dependence of mandibular dysfunction in children on functional and morphologic malocclusion. *Am Orthod* 1983; 83: 187-194.
19. Bernal M, Tsamtsouris A. Signs and symptons of temporomandibular joint dysfunction in 3 to 5 year old children. *J Pedodont* 1986; 12: 37-40.
20. Mannheimer J. *Prevention and restoration of anormal upper quarter posture, in postural considerations in the diagnosis of tratment of cranio-cervical-mandibular and related chronic pain desorders. ed. gelb m, ishiyarku euro américa*. St. Louis, 1991, pp. all.
21. Sosa E, Gabriela. *Detección precoz de los desordenes temporomandibulares*. Edición año 2006. Ed. AMOLCA. Colombia. Pp. 20.
22. Rocabado M, Arthrokinematics of the temporomandibular joint. *Clinical Management of head, neck and TMJ pain and dysfunction*. Ed. W.B. Saunders Company 1985, Philadelphia, 47-67.
23. Graber TM, Vanarsdall R. Ortodoncia. *Principios generales y técnicas*. 3ª. Edición 2000. Ed. Panamericana. Argentina.
24. Alamoudi N. Correlation between oral parafuncion and temporomandibular disorders and emocional status among Saudi children. *J Clin Pediatric Dent* 2001; 26: 78-80.
25. Farsi N, Alamoudi N, Feteih R. Asociation between temporomandibular disorders and oral parafunctions in Saudi Children. *Department of Preventive Dental Sciencies, Faculty of Dentristy*. King Abdulaziz University P.O. Box. 86209. Saudi Arabia. 2004; 106: 9-14.
26. Castillo Hernández R. Asociación de las variables oclusales y la ansiedad con la disfunción temporomandibular. Hospital clínico-quirúrgico Docente de Santa Clara. *Revista Cubana de Ortodoncia*. Enero-junio, 1995.

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