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RESEARCH ARTICLE

EFFICACY OF THE COMPREHENSIVE TREATMENT OF GNATHOLOGICAL SPLINT THERAPY AND ORTHODONTICS IN PATIENTS WITH TEMPOROMANDIBULAR JOINT DYSFUNCTION OF OCCLUSAL ETIOLOGY.

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Abstract

Temporomandibularjoint dysfunction (TMD) is present in 50% of the world population, its chronicity and progression to severe stages, affect the quality of life of patients who suffer from it and compromise the stability and functionality of the entire gnathic system. This study examines the efficacy of a comprehensive clinical treatment of TMD of occlusal etiology, through a temporary-conservative gnathological splint therapy and a subsequent permanent correction of the occlusal scheme through orthodontic treatment. Methods: 48 patients with TMD of occlusal etiology were examined after the treatment of gnathological splint and orthodontics. Through an exhaustive clinical examination, the diagnostic index of Helkimo and the condylar position indicator test (CPI), the signs and symptoms of TMD were measured before and after treatment, and then compared and analyzed statistically to determine the effect and the magnitude of the treatment on the TMD ($p > 0.05$). Results: The average age of the patients was 30.1 (± 8.50), 62.5% were female patients. Statistically significant differences were observed, the average of the initial DTM was 5.9 points (moderate) and the condylar distraction was 2.5 mm (pathological). Post-treatment the final DTM average was 1.83 points (mild), with an average condylar distraction of 1.62 mm (normal). The decrease in the presence of 1 or more symptoms was observed in 18.7%, of clinical signs in 52.1% and of occlusal interferences in 14.5% of patients. Conclusion: The comprehensive clinical management of the TMD with gnathological splint and orthodontics, allows the control and reduction of the clinical signs and symptoms, prevents its progression to severe stages, and guarantees the stability and functionality of the gnathic system in a long term.

Introduction:-

The pathologies that affect the temporomandibular joint (TMJ), are known as temporomandibular joint disorders, within them, the most frequent problems are the functional disorders of the muscles of mastication(Sánchez et al. 2009),called temporomandibular dysfunction (TMD) , which occur in the world population with a prevalence of

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50% of symptoms and up to 90% of clinical signs, affecting mainly women between 20 and 50 years of age(Lescas et al. 2012; Qvintus et al. 2015; Santana et al. 2013).In Mexico it is considered that 1 of every 3 people have at least one clinical sign of TMD(Moreno et al. 2015).The disorders of the muscles of mastication are a set of conditions characterized by pain in the TMJ and surrounding muscles, such as limitation of jaw movement, joint noises, predominantly morning-type headache, bruxism and dental hypersensitivity. Symptoms of TMD usually appear around the second decade of life(Fernández et al. 2015), with a degree of mild pain that usually goes unnoticed or is misdiagnosed. Chronic inflammation of the masticatory muscles and its progression to severe stages affect the quality of life of people who suffer from it and compromise the stability and functionality of the entire gnathic system long-term(Buescher 2007).

The etiology of TMD is multifactorial and includes the presence of dental malocclusions, parafunctional habits, facial trauma, and psychological disorders. In most patients, more than one factor is present(Gnanashanmugham et al. 2015). In patients with chronic pain, it has been observed that the presence of the psychological-social factor such as stress-anxiety, influences the control of the facial neuromusculature and the mandibular posture, being considered the main trigger or aggravating factor of the TMD(Cabrera et al. 2009). However, currently the occlusal factor is considered the main etiological component of the disease, since the presence of occlusal interferences has been observed in up to 95% of patients with TMD(León and García 2010; Islas et al. 2011; Gnanashanmugham et al. 2015; Cabrera et al. 2009; González et al. 2000).

An occlusal interference is a premature tooth contact point that inhibits the occlusion of the remaining surfaces to have stable surfaces and harmonious contacts, in which to achieve maximum intercuspation of the dental surfaces, the condyle moves out of its centric position, preventing the physiological closure of the jaw during chewing. This condylar displacement brings continuous effects and periods of parafunctional muscle activity(Puigdollers and Iglesia 2005), such as the contraction of the sarcomere group of muscle fibers, the increase in blood vessel pressure, decrease in blood and oxygen volume, and the production of lactic acid, causing the pain and sensitivity of the chewing muscles to any muscular contraction during occlusion.

Various methods for the treatment of TMD of occlusal etiology have been studied. Orthodontic treatment has been used individually to permanently correct the malocclusions that affect the functionality of the temporomandibular joint. Although there is no evidence of an association between orthodontic treatment and the risk of suffering TMD(Fernández et al. 2015; McNamara 1997; Varga 2010), it has been observed that such treatment prevents its development, reporting an effectiveness of 24.3% in the control of TMD(Olsson and Lindqvist 1995).

Likewise, the specific use of gnathological splints has been reported successfully in the literature(Gnanashanmugham et al. 2015; Rivero 2000; Lotzmann 1996), with an effectiveness of up to 90% in the relaxation of the masticatory muscles and the control of myofascial pain, allowing a temporary correction of the occlusal component of the TMD without irreversibly altering the position of the teeth. The gnathological splint aims to achieve a musculoskeletal stable position, by simulating an ideal occlusion free of occlusal interferences in which the teeth present a uniform and simultaneous contact, thus allowing the relaxation and reduction of muscle tension.

Before we can treat the functional occlusion of a patient, we must resolve the signs and symptoms of TMD, to obtain a stable maxillomandibular relationship and guarantee the health of all the components of the gnathic system after treatment(Puigdollers and Iglesia 2005). The treatment of TMD of occlusal etiology should involves a temporary and conservative phase through the gnathological splint in which the control of the signs and symptoms of the TMD is achieved; and then a permanent phase through orthodontics in which the permanent correction of the occlusal factor is carried out, with the main goal of maintaining joint health achieved through gnathological splint therapy and avoiding the recurrence of TMD.

Objective:-

This study evaluates the effectiveness of a comprehensive treatment of gnathological splint and orthodontic care in patients with temporomandibular joint dysfunction of occlusal etiology.

Material and methods:-

An observational, ambispective and longitudinal study was carried out.48 patients discharged from the Institute of Bioprogressive Orthodontics were examined, in a range of age of 18 to 50 years, diagnosed with TMD of occlusal etiology prior to the comprehensive treatment of gnathological splint and orthodontics. This study consisted in an exhaustive clinical examination of the TMJ, the masticatory muscles and the functional occlusion. The measurement of the signs and symptoms of the TMD was carried out through two questionnaires, the Helkimo Diagnostic Index and the condylar position indicator (CPI) test.

The degree of TMD was evaluated through diagnostic index of Helkimo, according to the diagnostic scale ranging from 0-25 points, the TMD was categorized as clinically healthy (0 pts), mild degree (1-5 pts.) moderate degree (5 - 10 pts.) and severe degree (11-25 pts.). Through the CPI test, the degree of condylar distraction in the vertical, sagittal and transverse planes was evaluated in millimeters, and its average was categorized as healthy (0 mm) normal (0-2 mm) pathological (+2 mm).

The measurements were made before and after the integral treatment of gnathological splint and orthodontics, for its later comparison and statistical analysis, in order to determine the effect and the magnitude of the treatment on the TMD.

Ethical considerations

This study was approved by the Research Ethics Committee of the Higher School of Medicine of the Instituto Politécnico Nacional. Informed consent was used and the subjects of study were kept confidential.

Results:-

The average age of the patients was 30.1 with a standard deviation of ± 8.50 years, 62.5% were women. In the initial evaluation, prior the treatment, 47.9% of patients reported the presence of one or more symptoms, of which the most frequent was the stress-anxiety factor with 41.6% and the joint clicking with 27%. Regarding the signs, 100% of the patients had at least one clinical sign present, the most frequent were muscle pain and joint clicking with 79.1% respectively. The presence of at least one occlusal interference was found in 93.8% of patients. According to Helkimo's diagnostic index and the CPI test, the DTM average was 5.9 points, corresponding to a moderate degree, and the average condylar distraction was 2.5 mm corresponding to a pathological value.

Table 1. Frequency of descriptive data before and after treatment

Variable	N	Before treatment	After treatment	P Value
Age	48	30.8 ±8.50		
Sex Female (%) Male (%)	48	30 (62.5) 18 (37.5)		
Oclussal interferences (%)	48	45 (93.8)	38 (79.2)	0.016[a]
Symptoms (%)	48	23 (47.9)	14 (29.2)	0.004[a]
Signs (%)	48	48 (100)	23 (47.9)	0.001[a]
Helkimo Index	48	5.94 ±3.36	1.83 ±2.41	0.001[b]
Condylar distraction	48	2.92 ± 0.68	1.62 ±0.72	0.001[b]

[a]= McNemar statistical test
[b]= T-Student's statistical test

After the integral treatment,the percentage of patients with the presence of 1 or more symptomsdecreased 18.7%, the most frequent symptoms after treatment were the stress-anxiety factor with 10.4% and bruxism with 8.3%. The presence of 1 or more clinical signs of TMD decreased by 52.1%, the most frequent signs after treatment were joint clicking with 22.9% and muscle pain with 12.5%. The presence of occlusal interferences decreased in 14.5% of the patients. According to the diagnostic index of Helkimo and the CPI test, the average score of the DTM after treatment was 1.83 points, corresponding to a mild degree, and the average final condylar distraction was 1.62 mm corresponding to a normal value.

Before the treatment 100% of the patients had TMD, of which 41.7% corresponded to mild degree, 45.8% to a moderate degree and 12.5% to a severe degree. After the integral treatment of gnathological splint therapy and orthodontics, 52.1% were reported without clinical signs of TMD, 33.3% with mild degree, 12.5% with moderate degree and 1% with severe degree respectively .

Helkimo's Index	**Score**	**Before treatment (%)**	**After treatment (%)**
Clinically healthy	0	0	52. 1
TMD mild	1 – 4	41.7	33.3
TMD moderate	5 – 9	45.8	12.5
TMD severe	10 - 25	12.5	1

Table 2:-DTM grade frequency before and after treatment

The control and the decrease of TMD after the treatment of gnathological splint therapy followed by orthodontics was observed.

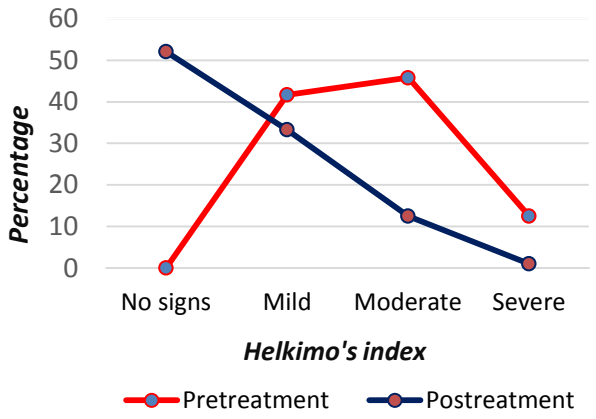

Figure 1:- Comparison of the Helkimo index before and after treatment.

According to the statistical analysis of the categorical variables through the McNemar test, values of P <0.05 were observed, for which it was determined that the treatment of gnathological splint and orthodontics induces significant changes in the improvement of symptoms, signs and occlusal interferences of the TMD. The statistical analysis of the continuous variables through the T-student test and d Cohen, showed significant changes, in the control of TMD from moderate to mild (p=0.016) with a large effect size (d=1.1) and the degree of condylar distraction from pathological to normal (p = 0.001) with a medium effect size (d=0.5).

Discussion:-

The prevalence of TMD was higher in the female sex and the average age of the patients was 30.1 years, similar results are shown in other investigations carried out. (Olsson &Lindqvist, 1995, Sadowsky & Polson 1984). A total remission of the TMD was reported in 52.1% of patients, with a score of 0 corresponding to clinically healthy on the diagnostic scale of Helkimo. A greater percentage of patients free of TMD after treatment is observed when compared with the study by Olsson (1995), in which the mandibular function of patients was evaluated, before and

after the individual orthodontic treatment, for which it is established that differences are due to the fact that in this study, the correction of the malocclusion through orthodontics was carried out after the stabilization of the mandibular function performed by the gnathological splint, achieving a lower percentage of patients with TMD after treatment. This study supports the conclusions of Aubrey (1978) which states that, if we have the concept of constructing an occlusion that adapts to the mechanism of mandibular functionality, in which the mandibular condyles are seated in their physiological centric position, the syndrome of pain and dysfunction of the TMJ can be eliminated in the patient after treatment.According to Farrar and McCarthy (1983) the presence of occlusal interferences greater than 2 mm is a predisposing factor for this type of disorders. In this study, it was found that these occlusal discrepancies were not determinant of the presence and degree of TMD, since some patients with condylar distraction greater than 2 millimeters were found, without referred joint symptoms. In an orthodontic treatment, even positioning the teeth in an optimal contact relationship, with the correct inclinations, there may be occlusal interferences caused by discrepancies in size and dental shape, which compromise the stability of joint health (Ingervall, 1972; Timm et al. al., 1976; Aubrey, 1978; Roth, 1981). To obtain optimal occlusal contacts after orthodontic treatment, an occlusal calibration is often necessary, so this occlusal adjustment must be part of the orthodontic treatment in order to create a functional occlusion free from interference. (Heimlich 1960, Heide 1964, Perry 1969, Williams 1971). In this study it was observed that in spite of having observed a decrease of the average of millimeters of condylar discrepancy to normal values (1.62 mm) the presence of occlusal interferences was present in 70% of the patients after the treatment, for which it is agreed with previous investigations to the need to include the occlusal calibration as part of the orthodontic treatment to obtain a stable functional occlusion.

Conclusion:-

The integral clinical management of temporomandibular dysfunction through gnathological splint and orthodontics induces significant changes in the symptoms, signs and occlusal interferences, allowing the control and decrease of the degree of TMD, prevents its progression to severe stages, and guarantees the long-term stability and functionality of the gnathic system.

Bibliographic references:-

1. Buescher, Jennifer J. (2007): “Temporomandibular Joint Disorders.” American Family Physician 76 (10).
2. Cabrera Villalobos, Yanelys; Álvarez Llanes Marina; Gómez Mariño, Mercedes; Malcom Castillo, María E. (2009): “Oclusión y Estrés En El Síndrome Dolor-Disfunción Temporomandibular: Presentación de Un Paciente.” Revista Archivo Médico de Camagüey 13: 1–10.
3. Fernández-González, Felipe J., Aránzazu Cañigral, José L. López-Caballo, Aritza Brizuela, Isabel Moreno-Hay, Jaime del Río-Highsmith, and José A. Vega (2015): “Influence of Orthodontic Treatment on Temporomandibular Disorders. A Systematic Review.” Journal of Clinical and Experimental Dentistry 7 (2): e320–27.
4. Gnanashanmugham, B Saravanan, MR Sukumar, and TFaisal Tajir. (2015): “Gnathological Splint Therapy in Temporomandibular Joint Disorder.” Journal of Pharmacy and Bioallied Sciences 7 (5): 316.
5. González Quintana, Idalmis D., Ileana B. Grau León, and Lourdes C. De Los Santos Solana (2000): “Detección de Interferencias Oclusales En Pacientes Con Trastornos Temporomandibulares.” Revista Cubana de Estomatologia 37 (2): 95–101.
6. Islas Moreno N, Ruidíaz V and Jiménez C (2011). “Disfunción de La Articulación Temporomandibular En Pacientes de 9 a 14 Años Pretratamiento de Ortodoncia.” Revista Odontológica Mexicana 15: 72–76.
7. León Ileana Grau, and Rogelio Cabo García (2010): “Evaluación de La Oclusión En Pacientes Con Trastornos Temporomandibulares y Desarmonías Oclusales.” Revista Cubana de Estomatologia 47 (2): 169–77.
8. Lescas Méndez, M., Sosa, A., Sánchez, M., Ugalde-Iglesias, C., Hernandez, ME., and L. Ángeles-Castellanos, M., Rojas-Granados, A., Ubaldo-Reyes (2012): “Trastornos Temporomandibulares.” Revista de La Facultad de Medicina de La UNAM 55 (1): 4–11.
9. Lotzmann, Ulrich. (1996): “Occlusal Appliances for Functional Therapy.” The Journal of Gnatology 15 (1).
10. McNamara, James a. (1997): “Orthodontic Treatment and Temporomandibular Disorders.” Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 83 (1): 107–17.
11. Moreno Rojas, Mayra Hortensia, Pedro lara Mendieta, and Arcelia Felicitas Meléndez Ocampo(2015): “Perfil Clínico Epidemiológico Del Trastorno Temporomandibular En Mexicanos Con Maloclusión.” Revista Mexicana de Ortodoncia 3 (2): 79–83.
12. Olsson, Martin, and Berit Lindqvist. (1995): “Mandibular Function before and after Orthodontic Treatment.”

European Journal of Orthodontics 17 (3): 205–14.
13. Puigdollers Andreu, and Fernando de la Iglesia (2005): "La Ortodoncia Según Roth." Revista Española de Ortodoncia 35 (4): 371–76.
14. Qvintus, V., A. L. Suominen, J. Huttunen, A. Raustia, P. Ylöstalo, and K. Sipilä. 2015. "Efficacy of Stabilisation Splint Treatment on Facial Pain - 1-Year Follow-Up." Journal of Oral Rehabilitation 42 (6): 439–46.
15. Rivero, Janett Casanova. 2000. "Uso de La Placa Neuromiorelajante En Pacientes Portades de Disfunción Temporomandibular."
16. Ros Santana Marcos, Yanireydis Moreno Chala, Katiuska Rosales Rosales, Yordania Osorio Capote, and Liudmila Morales Cordoví (2013) "Grado de Disfunción Temporomandibular En Mayores de 19 Años." Medisan 17 (12): 9089–95.
17. Sánchez, Hormiga, Claudia Milena, Bonet Collante, Alodia Martínez, Jaimes Barros, Alexandra Patricia (2009): "Prevalencia de Signos y Síntomas de Trastornos Temporomandibulares En Una Población Universitaria Del Área Metropolitana de Bucaranga, Santander."
18. Varga Marina Lapter(2010) "Orthodontic Therapy and Temporomandibular Disorders." Medical Sciences 34 (March): 75–86.