Electrosonographic evaluation in patients with temporomandibular disorders, treated by interocclusal appliance

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Abstract

The purpose of this study was to evaluate, through computerized electrosonography, the effectiveness of interocclusal appliance therapy, used by patients with temporomandibular disorders. Twenty two patients, male and female, ages between 18 and 53 years old, with temporomandibular disorders, were examinated and treated. The electrosonographic evaluations were carried out before the beginning of the treatment and 90, 120, 150 days after using the interocclusal appliance. It is important to emphasize that these appliances received canine guidance and group function modification at the 90th and 120th day, respectively. The collected informations were submitted to statistical analysis of polinomial regression, and revealed had a significant increase in joint sounds frequency in the right TMJ.

Key Words:
craniomandibular disorders, interocclusal appliance, joint sounds.

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Introduction

Sounds emitted of temporomandibular joint (TMJ) is one of the important clinical characteristics for the diagnosis of the temporomandibular disorders (TMD) and it is classified in clicks, snaps and crepitus[1]. The crepitus verified in TMDs during mandibular excursions, can be originated by the articular discus perforation, causing osseous contact direct with the condyle with mandibular fossa[2], or still as a result of irregularities in the articular surfaces resulted from congenital abnormalities, neoplasty proliferations or inflammatory disorders[3].

The articular sound is considered a signal of biomechanic disequilibrium in TMJ from the alteration in lubrication mechanism, the incorrect relation between condyle and articular disk, the morphologic alterations in the articular surfaces, the deficiency in the ligaments and the lack of synchronism between the closing mandibular muscles and the superior portion of lateral pterygoid muscle[4]. Although to be suggestive of internal disorders in TMJ, the noise is presented in 44% of the asymptomatic individuals, and in half of them, the sound occurs in the peak of the articular eminence[5].

The therapy through interocclusal appliance, is a therapeutical modality that promotes ache relief in some types of TMJs and parafunctions, although there still are questionings regarding its way of action[6-7].

The electrosonography is based on the spectral analysis of the articular noise, with data supplies about frequency, amplitude, and its moment of occurrence. This is of great value in the auxiliary diagnosis of the TMJs, supplying more necessary information about articular noise, and still being a system of not invasive diagnosis[5,8-11].

The propose of the present study was to analyze, the effect of the plain interocclusal appliance, modified with canine guidance and group function, in articular noises during 150 days of treatment, through computerized electrosonography.

Material and Methods

Twenty-two patients were selected by anamnesis chart[7] and radiographic examination of the TMJs, being fifteen women and seven men, between 18 and 53 years old, according to the following criteria of inclusion: totally toothed and carrying signals and symptoms of temporomandibular disorders. Patients carrying TMJs who had been submitted previously to the treatments with interocclusal appliance and/or surgical, had been excluded from this study. All the selected patients had signed a free and clarified term for the treatment and research, which was approved by the Committee of Ethics in research of the Institution.

The patients were submitted to a molding of the dental arch with alginate (JELTRATE – Dentsply, Brazil) for construction of the respective models in plaster. The assembly in semi-adjustable articulator (GNATUS 9600 – Gnatus Equip. Med. Odont. Ltd, Brazil) of the models in plaster was proceeded, and the determination of the maximum habitual intercuspation was realized through a wax register. All interocclusal appliance had been waxed on the models of the superior arc, the incisal pin of the articulator was regulated in function of the free functional space. The interocclusal appliance carried out confectioned in thermic activated colorless acrylic resin. It was through computerized evaluations by electrosonography of the right and left TMJs, before, during and after the treatment with interocclusal appliance. For this evaluation, transducers had been installed (piezoelectric accelerometer), in the anatomical condyle points in the right and left TMJs, in the corresponding region to the terminal hinge axis.

A computerized diagnostic system K6-I DIAGNOSTIC SYSTEM (Myo-Tronics, Inc., Tukwila, W.A., USA), wich consists of an electrosonograph (Electrosonogram ESG–1) connected to a conventional computer (Pentium II, USA).

During the electrosonographic evaluations, the patients had remained themselves seated, in comfortable position, without support for the head and with the same one guided according to the Frankfurt horizontal plain parallel to the floor. The patients were instructed to only remove the interocclusal appliance in the electrosonographic evaluation.

After the transducers were located, was requested to the patients to open the mouth widely. The interincisal distance was checked with a millimeter ruler and this measure was used to calibrate the device, the minimum of opening would have to be of 35 mm.

After that, the patients were carrying through mandibular movements of opening and closing, following a cursor in the computer screen. After certifying the mandibular movement synchronism with the cursor, the register was carried for a period of ten seconds, with accepted and recorded speed of 25mm/s.

For the analysis three periods were selected for mandibular opening and three for mandibular closing, corresponding to the beginning (first 6 mm), middle and end (last 6 mm) of each cycle. After that, the results were printed and the arithmetic average of the six (6) periods of each cycle. Again the average was carried through, now of the four (4) registered cycles offered by the electrosonographic evaluation, getting the corresponding final value to the frequency of the articular noise.

The electrosonographic evaluations were performed before the insertion of the interocclusal appliance, 90 days after the beginning of the treatment, and after each modification of the same ones: 120 and 150 days. After 90 days of treatment, the appliances had the occlusal surfaces transformed, to promote the posterior teeth disclusion, during the mandibular movements, through canine guidance and group function. The guidances inclusion were directly done in the patients mouth, by adding autopolymer acrylic colorless resin in the interocclusal appliance until the minimum possible disclusion of the posterior teeth occurred, during the lateroprotrusive movements. The first modification was carried through in

90th day of treatment, which was the canine guidance. The second modification was carried through in 120th day of treatment, which was the group function guidance. The patients had used the respective appliances in each one of the versions modified for a period of 30 days.

The statistics analysis used for the study, which has variable quantitative as the period of treatment, was of polynomial regression.

Results

The data about the frequency of the right and left TMJs noise, in function of the period of treatment, are shown in Table 1.

The analysis of polynomial regression, of the averages of the frequency of the right TMJ noise, showed significant differences (p=0,0064) between the evaluations, increasing in function of the period of treatment (Table 1). It is observed in the dispersion graph, that had a linear increase of the right TMJ noise frequency, during the treatment (Figure 1).

For the left TMJ, the referring averages of the noise frequency, did not shown significant differences (p>0,05) between the evaluations, in function of the period of treatment (Figure 2).

Table 1 – Distribution of original means (M) and standard deviations (SD) in electrosonographic activity (Hz), in relation to the period of treatment to right and left TMJs.

	Frequency			
Period(days)	Right TMJ		Left TMJ	
	M	SD	M	SD
0	26,88*	(±19,05)	49,16	(±42,40)
90	38,90*	(±26,76)	74,46	(±50,69)
120	47,35*	(±34,46)	62,38	(±56,63)
150	50,96*	(±34,35)	57,00	(±64,00)
R^2	0,98		ns	

Means followed by ""differed at a 1% level of significance.*

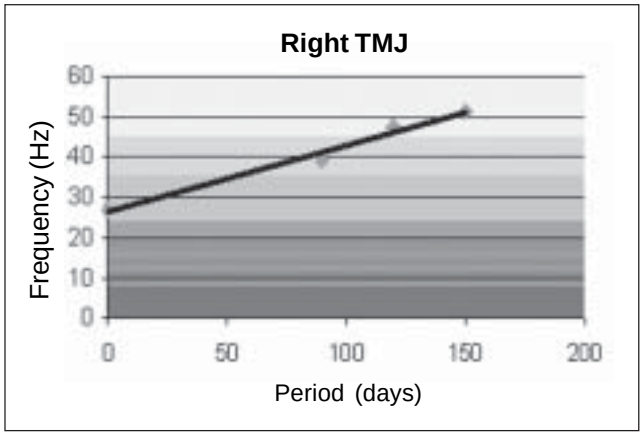

Fig. 1 – *Graphic ilustration of the articular noise frequency (Hz) to right TMJ, based on the period of treatment.*

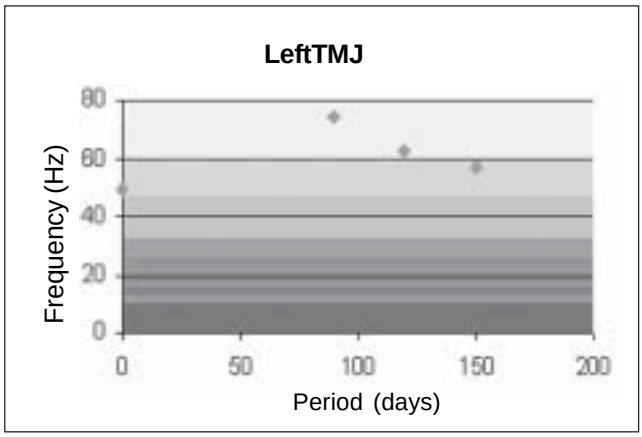

Fig. 2 – *Graphic ilustration of the articular noise frequency (Hz) to left TMJ, based on the period of treatment.*

Discussion

The articular noise is one of the signals of the temporomandibular disorders that can indicate alterations in the temporomandibular joints, and the treatment wants to reestablish the intracapsular/muscular complex of the individual. The first objective of the temporomandibular disorder treatment is the control of pain and the discomfort. In its beginning, most of the treatments come back toward the reduction of the painful symptoms, consisting of methods as: self-control stimulation, medicines and physiotherapy, and the use of interocclusal appliance, reversible modalities[12-13]. This way, a considerable number of clinical works with the objective to study the therapeutical effect of the plain interocclusal appliance, in the control of the signals and symptoms of the temporomandibular disorders, had been described[14-18].

The results observed in this study with relation to the frequency of the articular noise in the right TMJ, were significantly (p<0,01) higher in the beginning of the treatment of that found for Hutta et al.[9], Christensen and Orloff[19], Tallents et al.[5], Olivieri et al.[20] and Garcia et al.[21], for symptomatic individuals. In elapsing of the treatment the registered values had increased, blinding in normal considered levels of frequency in asymptomatic individuals, being in accordance with the works of Christensen and Orloff[19], Tallents et al.[5], Olivieri, et al.[20], Garcia, et al.[21], showing that the therapeutic used in this study, was efficient in the reestablishment of the noise in the temporomandibular joints of the right side. For the TMJ of the left side, in elapsing of the treatment, significant differences (p>0,05) in the relative values had not occurred the frequency of the articular noise, that they had been remained inside of the considered standards of normality[5,19-22]. The difficulties without if standardizing the characteristics of the noises, a time that the absolute values adequately do not identify the period of the disarrangement intra-articular[5], and the displacements of the record in reduction, which they can emit noises of the

lesser frequency, current from the absence in the movement of the articular disk, and still joints with initial inflammations that they can generate noises from you append 25hz of frequency[23], can explain the results gotten for the TMJ of the left side.

When the result of the effect of the disclusion guidances on the frequency of the articular noises was analyzed, perceived that for the right TMJ, the canine guidance and group function, had contributed for a significant increase of the frequency of the noise, in the period of instituted treatment, while that for the left TMJ, the disclusion guidance had not influenced in significant way in the variation of the referring values to the frequency. Perhaps this behavior, reflects the state of health of the joints, suggesting that the left TMJ has been less affected for the temporomandibular disorders, as suggests Table 1. However, the variation of the values of frequency enters the TMJs of the right side and left, in the end of the treatment, they had show clearly that the values had extended it a numerical approach (Table 1), evidencing that the therapeutical one with plain interocclusal appliance with guidances, tend to homogenize the frequency of the noises between the joints of the right and left side, consequence of the functional synchronism of the muscles[7,24]. The diagnosis and the plan of treatment of the TMDs, are of great importance in the final result in the resolution of the disorders.

According to the results obtained in this study, we can conclude that electrosonographic evaluations consist in a criterion of diagnosis auxiliary as for the conditions of the complex disk/condyle. By considering this, concluded that the use of interocclusal appliances had a significant increase in joint sounds frequency in the right TMJ.

References

1. Garcia AR, Madeira MC Ruídos articulares e o tratamento das desordens temporomandibulares. Rev Assoc Paul Cir Dent 1999; 53: 109-15.
2. Moffett B The morphogenesis of the temporomandibular joint. Am J Orthod Dentofacial Orthop 1966; 52: 401-15.
3. Vincent SD, Lilly GE Incidence and characterization of temporomandibular joint sounds in adults. J Am Dent Assoc 1988; 116: 203-6.
4. Farrar WB, McCarty WL. Inferior joint space arthography and characteristics of condylar paths in internal derangements of the TMJ. J Prosthet Dent 1979; 41: 548-55.
5. Tallents RH, Hatala M, Katzberg RW, Westesson PL Temporomandibular joint sounds in asymptomatic volunteers. J Prosthet Dent 1993; 69: 298-304.
6. Dylina TJ. A common-sense approach to splint therapy. J Prosthet Dent 2001; 86: 539-45.
7. Landulpho AB, Silva WAB, Silva FA, Vitti M. The effect of the occlusal splints on the treatment of temporomandibular disorders: a computerized electromyographic study of masseter and anterior temporalis muscles. Electromyogr clin Neurophysiol 2002; 42: 187-91.
8. Bracco P, Deregibus A, Piscetta R, Giaretta GA. TMJ clicking: a comparison of clinical examination, sonography, and axiography. J Craniomandib Pract 1997; 15: 121-6.
9. Hutta JL, Morris TW, Katzberg RW, Tallents RH, Espeland MA. Separation of internal derangements of the temporomandibular joint using sound analysis. Oral Surg Oral Med Oral Pathol 1987; 63: 151-7.
10. Mohl ND. Reliability and validity of diagnostic modalities for temporomandibular disorders. Adv Dent Res 1993; 7:113-9.
11. Sutton DI, Sadwsky L, Bernreuter WK, McCutcheon MJ, Lakshminarayanan AV. Temporomandibular joint sounds and condyle/disk relations on magnetic ressonance images. Am J Orthod Dentofacial Orthop 1992; 101: 70-8.
12. Dimitroulis G, Gremillion HA, Dolwick MF, Walter JH. Temporomandibular disorders. 2. Non-surgical treatment. Aust Dent J 1995; 40: 372-6.
13. Wright EF, Schiffman EL. Treatment alternatives for patients with masticatory myofascial pain. J Am Dent Assoc 1995; 126: 1030-9.
14. Carraro JJ, Caffesse RG. Effects of occlusal splints on TMJ symptomatology. J Prosthet Dent 1978; 40: 563-6.
15. Goharian RK, Neff P. Effects of occlusal retainers om temporomandibular joint and facial pain. J Prosthet Dent 1980; 44: 206-8.
16. Greene CS, Laskin DM. Splint therapy for the myofascial pain-dysfunction (MPD) syndrome: a comparative study. J Am Dent Assoc 1972; 84: 624-8.
17. Magnusson T, Carlsson GE. Treatment of patients with functional disturbances in the masticatory system. A survey of 80 consecutive patients. Swed Dent J 1980; 4: 145-53.
18. Sheikholeslam A, Holmgren K, Riise C. Therapeutic effects of the plane occlusal splint on signs and symptoms of craniomandibular disorders in patients with nocturnal bruxism. J Oral Rehabil 1993; 20: 473-82.
19. Christensen LV, Orloff J. Reproducibility of temporomandibular joint vibrations (electrovibratography). J Oral Rehabil 1992; 19: 253-63.
20. Olivieri KAN, Garcia AR, Paiva G, Stevens C. Joint vibrations analysis in asymptomatic volunteers and symptomatic patients. J Craniomandib Pract 1999; 17: 176-83.
21. Garcia AR, Madeira MC, Paiva G, Olivieri KAN. Joint vibration analysis in patients with articular inflammation. J Craniomandib Pract 2000; 18: 272-9.
22. Gallo LM, Airoldi R, Ernst B, Palla S Power spectral analysis of temporomandibular joint sounds in asymptomatic subjects. J Dent Res 1993; 72: 871-5.
23. Owen AH Rationale and utilization of temporomandibular joint vibration analysis in na orthopedic practice. J Craniomandib Pract 1996; 14: 2: 139-53.
24. McCarroll RS, Naeije M, Kim YK, Hansson TL Short-term effect of a stabilization splint on the asymmetry of submaximal masticatory muscle activity. J Oral Rehabil 1989;16: 171-6.