EFFECTS OF TEMPOROMANDIBULAR DISORDERS TREATMENT ON CERVICAL PAIN: A CLINICO-DESCRIPTIVE INVESTIGATION

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Abstract

Objectives: To this day, the research of relationships between the stomatognathic and the tonic postural systems is the object of many medical investigations. The aims of the present study are: 1. To ascertain and assess the existence of a prevalence in the relationship between cervical pain and temporomandibular disorders (TMD) on a large group of dysfunctional patients; 2. To assess the variation of cervical pain after dysfunction-specific non invasive therapies.

Methods and Materials: A sample of 1690 dysfunctional patients was initially selected. Of 460 patients experiencing cervical pain, 141 complied with the inclusion criteria of this study. Dysfunctional and cervical pain, assessed using NRS (Numeric Rating Scale), was graded in 5 categories arranged in numerically ascending order before (T0) and after (T1) non invasive treatment. Data were assessed through segmentation analysis and univariate statistical analysis.

Results: 1. Of the initial population (n=1690) of dysfunctional patients, cervical pain prevalence resulted in 27.22% (n=460). 2. Out of 141 patients treated for TMD, 35 (24.82%) became asymptomatic after treatment. Of the106 remaining cases, mild pain resulted in 32 patients (22.70%), moderate in 43 (30.50%), strong in 20 (14.18%), and severe in 11 (7.80%).

Conclusions: Besides confirming a correlation between TMD and cervical pain, this study showed TMD therapy as moderately effective in the treatment of cervical pain.

Clinical Significance: Strong and severe forms of cervical pain were less sensitive to treatment. For these, an interceptive-preventive approach is suggested.

Key words: TMD, cervical pain, occlusal therapy.

Short title: TMD and cervical pain

Introduction

In patients with a dental condition, the frequent presence of signs and symptoms which not limited to the stomatognathic system, but extend to the whole cranium and even to the outermost extremities, has suggested a functional/dysfunctional relationship (cause-effect) between the stomatognathic and the tonic-postural systems. This can be explained by the interdependence of the anterior and posterior postural chains.[1] In fact, a positive correlation was found between head posture and both cranium-facial morphogenesis [2-4] and mandibular position and movement.[5] Of great interest in dentistry is the possibility that a specific occlusion may correspond to a specific spine posture,[6,7] thus explaining functional mobility alterations in the cervical spine down to the sacroiliac joint, which are triggered by the insertion of occlusal interferences.[8] Electromyographic and postural modification in the cervical section[9,10] and cervical pain variation[11] were recorded after occlusal therapy. Similarly, occlusal modifications were found following postural therapy.[12] If, on one hand, emphasis is given to the role of occlusion and its alignment in cervical posture,[13] on the other hand, to this date scientific evidence does not mark a clear and linear association.[14-16] Nevertheless, in clinical practice the presence of cervical spine disorders is increasingly found in dysfunctional patients,[17-24] and contradicting results[25-27] add uncertainty and confusion in the choice of treatment for patients suffering from TMD and cervical pain.

The aims of the present study are: 1. To assess the prevalence of cervical pain in a population of dysfunctional patients; 2. To analyze a group of consecutive patients suffering from TMD and cervical pain in order to assess the effectiveness of TMD-specific non-invasive therapies on the evolution of cervical pain.

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Methods and materials

The retrospective investigation involved a large sample of 1690 dysfunctional patients who underwent medical examination consecutively between 2002 and 2004 at the Medical Centre for Temporomandibular Joint (TMJ) Dysfunctions of the Odontostomatology Department of La Sapienza University, Rome.

Following clinical anamnesis and palpation tests, patients not suffering from cervical pain were excluded, bringing the sample down to 460 patients.

Subsequent inclusion criteria consisted of: 1. Intensity at least of mild grade cervical pain; 2. Absence of a) neurological and/or psychic disorders, Axis II grade > 1;[28] b) congenital stomatognathic disorders, c) systemic and/or traumatic joint and/or musculoskeletal disorders; 3. Availability to take part in the study; 4. Completeness of medical files; 5. Need for treatment; 6. Dentition suitable with a correct use of splints; 7. Due to the complex interrelationship of somatic (Axis I) and psychosocial factors (Axis II) in the etiology of chronic pain syndromes, treatments were selected according to the following diagnosis criteria (Research Diagnostic Criteria for Temporomandibular Disorders: RDC/TMD): Axis I Group I a/b (myofascial pain alone or with limited opening)- Group II a/b/c (disk displacement pathologies)- Group III a/c (TMJ arthralgia and osteoarthrosis)- Axis II grade 1 (mild mental disorders).[28]

The final sample consisted of 141 patients treated consecutively : 14 males and 127 females, aged 15 to over 70, with a prominence of the 15 - 30 age range (37.59%). A control group of non treated subjects was excluded in this investigation. The dysfunctional patients suffered from arthralgia (39%), reducible (26.95%) or irreducible (3.55%) dislocated temporomandibular disk, cephalea (headaches, 9.33%), structural alterations (4.97%) or other conditions unrelated to disk dislocation, such as ligamentous laxity and open lock (15.6%) with an irrelevant prevalence on the left side. Pain symptoms for TMD (articular pain and, in addition, cephalea) and cervical pain were described before (T0) and after (T1) treatment through NRS (Numeric Rating Scale) with a 5-step grading: 0. Asymptomatic (NRS 0-19); I. Mild (NRS 20-39); II. Moderate (NRS 40-59); III. Strong (NRS 60-79); IV. Severe (NRS 80-100) 29 .

On the basis of therapeutic protocol effectiveness assessed through segmentation analysis, 4 patient subgroups were established: A. Recovered: absence of dysfunctional symptoms and NRS for cervical pain equalling 0; B. Improved: at least one improved symptom and none worsened for TMD and decreased or unvaried NRS associated with reduced pain occurrence frequency (< 1 occurrence per week); C. Stable: no TMD symptom variation and NRS unvaried also frequency-wise; D. Worsened: no improved symptoms and at least one worsened for TMD, NRS increased and/or showing greater frequency compared to initial stage.

Table 1 :
Percentages of treatments used alone or in combination

Treatment	No. of patients	%
Pharm	4	2,84
Gnathologic		
- Repositioning splints	90	63,83
- Neuromuscolar splints	20	14,18
Physio	3	2,13
Combination of treatment		
- Repositioning splints/Physio	12	8,51
- Neuromuscolar splints/Physio	11	7,80
- Neuromuscolar splints/Pharm	1	0,71
	141	**100**
Gnathologic		
- Farrar	56	39,72
- Di.T.R.A.	8	5,67
- RA.DI.CA.	5	3,55
- SS	20	14,18
- Assorted splints	21	14,89
Pharm	4	2,84
Physio	3	2,13
Combination of treatment		
- Farrar/Physio	12	8,51
- SS/ Physio	11	7,80
- SS/ Pharm	1	0,71
	141	**100**

In line with the latest medical literature,[30] the adopted non invasive therapies were:

Pharmacological treatment (PHARM): treatment using non-steroidal anti-inflammatory drugs (NSAIDs) (Nimesulide 100 mg, once or twice per day per 7 days per os) taken singularly or in association with myorelaxant drugs (Cyclobenzaprine 10 mg, per day for 5 days per os) with a 5-day alternating cycle to be repeated more than twice within the therapy session;[31]

Gnathologic treatments: Splints were used according to individual diagnosis for the current and most relevant pathology. Conforming to standard methods, the following splints were adopted:

1. Tridimensional repositioning occlusal splints, acting directly on TMJ in TMD dysfunctions such as reducible or irreducible dislocated temporomandibular disk, arthralgia and symptomatic arthrosis.[32,33]
2. Neuromuscolar occlusal splints for muscle relaxation.[34]

All splints, both repositioning and neuromuscular, had to be worn according to varying individual prescriptions for each patient, varying from a minimum of rest/night wear to a maximum of 16 hours/day. Patients were visited every 3-4

Table 2
Numeric Rating Scale (NRS) categories for cervical pain at T0 (A) pre-treatment and T1 (B) after treatment

NRS	(A): T0		(B): T1	
	No. Patients	%	No. Patients	%
0. Asymptomatic	0	0	35	24.82
I. Mild	25	17.73	32	22.70
II. Moderate	40	28.37	43	30.50
III. Strong	32	22.70	20	14.18
IV. Severe	44	31.21	11	7.80
	141	100	141	100

weeks for the whole treatment duration, ranging from 6 to 12 months. The pathologic situation was checked at each visit to individually re-balance the occlusal surfaces of the splints and to progressively reduce the daily wear of splint. The final goal was to slowly free each patient from their splint after recovery. [32]

Physiotherapic treatment (PHYSIO): individual application of global posture rehabilitation methods[31] and disc recapture techniques according to Rocabado.[35]

Combination of treatments: According to diagnosis and severity of symptoms, the above treatments were chosen to be used alone or combined. (Table 1).

Independently from the choice of treatment, the whole treatment averaged 9.2 months, with individual variations depending on different clinical responses.

The obtained data were subsequently processed in order to visualize treated patient history and the final composition of the 5 NRS groups for cervical pain at T1.

Univariate statistical analysis allowed for a descriptive examination of the data. The obtained variables were expressed in terms of absolute frequency and of percentage.

Results

Following the analysis of all 1690 dysfunctional patients, a prevalence of cervical pain was found in 27.22% (460) of cases. After excluding some of the factors contributing to cervical pain (see inclusion criteria), 141 patients remained. In these cases, the ones suffering most were female (90.1%) and aged 15 - 30 (37.59%). Mostly bilateral symptoms resulted (78.01%), but were otherwise limited only to right (12.77%) or left side (9.22%), showing no correlation with the most affected anatomical site for TMD.

At T0, independently of dysfunctional symptom variation, the sample showed the following NRS distribution for cervical pain: 25 grade I patients (17.73%), 40 grade II patients (28.37%), 32 grade III patients (22.70%) and 44 grade IV patients (31.21%) (Table 2, A).

At T1, 35 patients (24.82%) showed NRS grade 0 for cervical pain, 32 patients (22.70%) showed grade I, 43 patients (30.50%) showed grade II; 20 patients (14.18%) showed grade III, and 11 patients (7.80%) showed grade IV. (Table 2, B).

Composition analysis at T1 of the 5 selected categories showed that the group of asymptomatic patients[35] consisted mainly of individuals from the mild (40.00%) and moderate (25.71%) categories, followed by the strong (22.86%) and, in the minority, by the severe (11.43%) groups. Similarly, patients who suffered from mild degree cervical pain at T1 came mainly from the moderate group (40.63%) and to a lesser extent from the strong (18.75%) and severe (6.25%) groups. The remaining 34.38% of patients (mild group) remained stable. A large portion of patients with moderate NRS at T0 (41.86%) showed no change in symptoms after therapy, while 23.26% and 34.88% of patients belonging respectively to the strong and severe groups showed improvement at T1. 70% of patients with strong pain came from the severe group, while 30% of cases remained stable at T1 and 18.18% worsened.

At T1, 81.82% of patients with severe pain reported no improvement. (Table 3).

A global evaluation of cervical pain and dysfunctional symptoms made using segmentation analysis (Table 4) showed: recovery in 28 patients (19.86%); improvement in 75 (53.19%); stability in 35 (24.82%) ; worsening in 3 (2.13%).

Data concerning the symptoms evolution for cervical pain and TMD (articular pain and, in addition, cephalea) at T0 and T1 are reported in Table 5.

Discussion

Although cervical pain symptoms are prevalent in TMD,[17,20] medical literature concerning the possible effects of occlusal splints on the cervical compartment is limited.[9-11,15]

Cane et al[11] tested the effectiveness of a 2-month occlusal therapy using a Michigan splint in the treatment of cervical pain on a sample of 20 patients. The comparison with a non-treated group positive to cervical pain, showed that pain

Table 3:
Composition of the 5 groups using NRS at T1, with percentage reference to patient's medical history.

NRS group	N. patients	History	
0. Asymptomatic	35	**NRS**	**%**
		IV	11.43
		III	22.86
		II	25.71
		I	40.00
I. Mild	32	**NRS**	%
		IV	6.25
		III	18.75
		II	40.63
		I	34.38
II. Moderate	20	**NRS**	%
		IV	34.88
		III	23.26
		II	41.86
		I	0.00
III. Strong	43	**NRS**	%
		IV	70.00
		III	30.00
		II	0.00
		I	0.00
IV. Severe	11	**NRS**	%
		IV	81.82
		III	18.18
		II	0.00
		I	0.00

improved after splint use in 11 patients against one single patient case in the control group, indicating a positive effect of occlusal treatment on cervical muscles.[11] Such preliminary results call for rigorous studies to be carried out on large samples.

Our investigation analyzed 3 samples of dysfunctional patients, each sample being a selection of the previous and thus containing a decreasing number of patients. In line with the findings of other authors,[17,20] the larger initial sample (1690 cases) assessed the association between TMD and cervical pain, with a prevalence of 27.22% (460 cases).

Analysis of the final sample (141 patients suffering from TMD and cervical pain and positive to the inclusion criteria), showed that 90.1% of patients most suffering from cervical pain were female and 37.59% belonged to the 15-30 age range.

A high prevalence of cervical pain at such young age is unusual and suggests relevant comorbidity of the two investigated diseases. Considering that pain is the symptom which often draws a patient to medical attention, knowledge of the limitations in the application of TMD conservative therapy in patients suffering from strong or severe cervical pain is essential for an adequately informed consent on behalf of these patients. TMD therapy was moderately effective in treating cervical pain (Table 2 A, B), with a regression of symptoms in 35 patients (24.82%) at T1.

The data concerning TMJ pain and cephalea (headaches) evolution were of greater interest and superimposable, showing the disappearance of pain in 102 patients out of 141 (Table 5).

In particular, the association of the gnathologic and the pharmacologic treatments obtained the best results in solving TMD, whilst it was not possible to ascribe the variation in cervical symptoms to the application of a specific therapy. Evidence showed instead that symptoms at T0 are decisive in determining the end results: patients who showed no symptoms at T1 belonged to groups presenting mild and moderate symptoms at T0, while patients suffering from strong or severe pains at T0 remained stable (30% of strong group and 81.82% of severe group), showing poorer response to therapy (Table 3).

Table 4 :
Classification of sample in 4 segmentation groups at T1

GROUP	No. patients	%
A. Recovered	28	19.86
B. Improved	75	53.19
C. Stable	35	24.82
D. Worsened	3	2.13
	141	100

It is common knowledge that stress, the emotional state and behaviour of each individual play an important role in the examined diseases. In fact, 75% of the sample was positive to grade 1 of Axis II,[28] while patients showing a grade higher than the first were not taken into account in order to avoid diagnostic confusion.

Another limitation in data reading is in the lack of a control group of non-dysfunctional patients.

Conclusions

The present investigation confirms the existence of TMD and cervical pain comorbidity.

Non-invasive treatment protocols, applied singularly or in combination, were effective on articular and head pain, and indirectly on cervical pain, confirming the need of an inter- and multi-disciplinary approach in the treatment of these diseases. Results concerning articular pain and cephalea were especially relevant, showing a parallel behaviour which ended with the disorders disappearing in 72,3% of cases. On the contrary, cervical pain was less sensitive to treatment, especially in the strong and severe cervical pain categories, for which an interceptive-preventive approach is suggested.

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Table 5:
NRS-based comparison of symptom evolution for cervical pain, articular pain (TMJ) and cephalea at T0 and T1

	Cervical pain		TMJ pain		Cephalea (Headaches)	
	No. patients		No. patients		No. patients	
NRS	T0	T1	T0	T1	T0	T1
0	0	35	6	102	33	102
I	25	32	9	21	7	17
II	40	43	32	10	22	9
III	32	20	26	5	20	9
IV	44	11	68	3	59	4
	141	141	141	141	141	141

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