Distribution of craniomandibular disorders, occlusal factors and oral parafunctions in a paediatric population

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ABSTRACT

Aim The aim of this work was to gather clinical data on craniomandibular (CMD)/temporomandibular joint (TMJ) disorders in a paediatric population. Methods The clinical study population comprised patients with TMJ disorders who were being treated in the orthognathic ambulatory clinic of the University of Naples, where an instrumental and clinical study was performed. Data were recorded for extra and intraoral findings, Angles classification and malocclusions. Radiographic examinations were carried out. Study models were fabricated for evaluation. TMJs were assessed by palpation as well as masseter, temporal, suprahyoid, sternocleidomastoid, suboccipital, paravertebral and trapezius muscles to evaluate any possible pain. Auscultation of the TMJ was used to determine presence of articular sounds and their type (cracks, crunches, clicks) by the use of a stethoscope. Pain localisation was evaluated according to these movements taking into account site, intensity, frequency, and duration. Episodes of headache were recorded according to its intensity (mild, moderate, intense), frequency (daily, weekly, monthly), site (top of the head, occiput, temple, frontal, overorbital region, back of the head) and the duration of the episodes (in minutes, hours or whether constant). Results A substantial number of the 106 patients included in the study showed a malocclusion with prevalence in Angles Class II cases. Bruxism, onychophagy, TMJ pain, headache, mouth opening partial inability, mastication difficulty and articular sound were the most representative symptoms. Conclusion The identification and recognition of factors, such as malocclusions and parafunctions, are considered fundamental to early diagnosis of TMJ problems, which is the most useful way to avoid a dysfunctional state of the stomatognathic system. Keywords: TMJ disorders, Malocclusion, Parafunctions.

Introduction

The term craniomandibular disorders (CMD) is used as a synonym for temporomandibular joint (TMJ) disorders and is considered as the main cause of pain in the extradental orofacial region [AACC, 1990]. Such disorders comprise a series of morphofunctional alterations and abnormalities involving the temporomandibular articulation, the masticatory muscles and the structures associated with these [AACC, 1990; Gray et al., 1994]. TMJ disorders are mainly connected to inflammatory and/or degenerative processes [Pereira, 2002]. The aetiology and pathogenesis of the disorders is multifactorial and very complex. Accordingly, there are often difficulties in assessing the best treatment approach.

In the TMJ genesis the following three main groups of factors must be considered [AACC, 1990; Gray, 1994; Alamoudi, 1998, 2000, 2001; Farsi, 2000]:
- predisposing factors - iatrogenic, anatomical, constitutional, psychic (bruxism, parafunctions) and pathologic (malocclusion);
- provoking factors - micro or macrotraumas;
- on-going factors - social, psychological and systemic diseases.

Females are the most often affected with a 5:1 F/M ratio. The signs and symptoms are multiple and among the most frequent are: pain usually located at the TMJ; TMJ sounds; TMJ movement limitations and headache [Bakke, 2001; Bell, 1986].

TMJ disorders may be categorised as
intracapsular, extracapsular and capsular. The intracapsular or internal derangement mainly consists of disc dislocation. The extracapsular derangements are caused by the functional overactivity of the masticatory muscles as recognised by either main causes, such as stress and psychic problems, or marginal causes such as occlusal and parafunctional problems. The capsular derangements are detected by such pathologic presentations as sinovites, fibrositis, periartthritis and traumas in or to the temporo-mandibular ligament apparatus [AACD, 1990; Gray et al., 1994; Pereira, 2002].

The craniomandibular disorders can present several pathologic pictures:
- algic dysfunctional syndrome;
- arthritis degenerative pathology;
- disc dislocation;
- rheumatoid arthritis;
- psoriatic arthritis;
- condylar hyper/hypoplasia;
- infections;
- ankylosis;
- neoplasia.

Though not yet well proven, a correlation between CMD and malocclusions should be considered. In fact, malocclusion is thought to be a predisposing factor to the CMDs as an occlusal balance allows the stomatognathic system to bear the action of a number of pathogenic noxae. When the orthopaedic stability is insufficient, even relatively irrelevant events can alter its functionality [Okeson et al., 1996; Lipp, 1990].

The aim of this work was, therefore, to gather further clinical data on CMDs distribution in a paediatric population.

**Materials and methods**

The study population consisted of 106 patients, 74 females and 32 males, ranging from 10 to 18 years of age. These children and adolescents had presented with TMJ disorders over a two year period (2000-2001) at the Orthognatodontic Department of Head and Neck, Oral Cavity and Audio-Verbal Communication Pathology, Paediatric Dentistry Section, II University of Naples.

The inclusion criteria for the study were:
- symptomatology causing referral for craniomandibular disorders;
- muscular and articular symptoms (TMJ pains, articular movements limitation, articular sounds, pains in the muscles of mastication);
- otorhinolaryngological symptoms (tinnitus, otalgia, hypacusia, dizziness);
- symptoms in other regions of head and neck (headache, pains in the neck muscles and during mastication);
- motivation to the treatment and to follow-up.

A preliminary examination, based on objective intra and extraoral criteria, a gnathologic record was completed. The data for the study also included a photographic assessment, dental arch markings and records. Impressions were taken and study models fabricated. Finally a radiographic examination based on orthopantomograph, teleradiography (lateral and posterior-anterior projections), TMJ dynamic stratigraphy and nuclear magnetic resonance (NMR) as well as cephalometric and electromiographic analysis were completed.

In each case history, the main disturbances, symptoms associated with the TMJ and any functional impediments, characteristics of the pain, a general medical history, presence of parafunctions and any insufficiency of the respiratory system were evaluated.

The clinical examination included the following observations for each patient:
- standing position and alignment of the spinal column;
- possible parafunctions and breathing type;
- face and oral cavity (deglutition type);
- analysis of the dental system: static and dynamic occlusion, evaluation of any malocclusion and of possible oral pathologies;
- mandibular dynamic analysis included evaluation of mandibular opening movements, lateral and protrusive movement and the Helkimo index was taken as a model for the measurements (Table 1) [Helkimo, 1974].

Pain localisation was evaluated according to these movements taking into account site, intensity, frequency, and duration. Headache was evaluated according to its intensity (mild, moderate, intense), frequency (daily, weekly, monthly), site (top of the head, occiput, temple, frontal, overorbital region, back of the head) and the duration of the episodes (in minutes, hours or whether constant).

The articulation of the TMJ was assessed by palpation of the articulation in order to check on any oedematous state. In addition the masseter, temporal, suprahyoid, sternocleidomastoid, suboccipital, paravertebral, and trapezius muscles were palpated to evaluate any possible pain. Auscultation of the TMJ was the final phase of the
objective exam to determine presence of articular sounds and their type (cracks, crunches, clicks) by the use of a stethoscope. Finally, extra and intraoral photographs were taken together with dental arch records and impressions for study of the models, radiographic examination (as detailed above).

**Results**

The population consisted of 106 children and adolescents with a preponderance of females (80%) affected in comparison with males (20%). As for the distribution according to the age, the most affected group was mainly from 16 to 18 years (Fig. 1). Of the total population studied 60% of the patients suffered from extracapsular, 30% suffered from intracapsular and 10% from capsular disorders.

<table>
<thead>
<tr>
<th>A. Mandibular mobility*</th>
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<tbody>
<tr>
<td>Normal = 0</td>
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<tr>
<td>Somewhat reduced = 1</td>
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<tr>
<td>Heavily reduced = 5</td>
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<tr>
<th>B. Temporomandibular joint function</th>
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<tbody>
<tr>
<td>Plane movements without sounds and without deviations (&lt;/=2 mm) = 0</td>
</tr>
<tr>
<td>Sounds in one or both joints and/or deviations (&gt;2 mm) = 1</td>
</tr>
<tr>
<td>Locking or luxation = 5</td>
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<tr>
<th>C. Muscular pain</th>
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<tbody>
<tr>
<td>No pain or palpation = 0</td>
</tr>
<tr>
<td>Pain on palpation at one to three sites = 1</td>
</tr>
<tr>
<td>Pain at four or more palpation sites = 5</td>
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<tr>
<th>D. Temporomandibular joint pain</th>
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<tbody>
<tr>
<td>No pain or palpation = 0</td>
</tr>
<tr>
<td>Lateral aspect pain = 1</td>
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<tr>
<td>Distal aspect pain = 5</td>
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Sum of scores (values A+B+C+D): 0 = Di0; 1-4 = DiI; 5-20 = DiII

*Mandibular mobility was tested for three movements
A) maximal opening: >/=40 mm=0; 30-39 mm=1; <30 mm=5;
B) maximal right lateral movement: >/=7 mm=0; 4-6 mm=1; 0-3 mm=5
C) maximal left lateral movement: >/=7 mm=0; 4-6 mm=1; 0-3 mm=5; sum of a+b+c: 0=score 0 (normal); 1-3=score 1 (somewhat reduced); 4-15=score 5 (heavily reduced)
(modified after Helkimo, 1974)

**TABLE 1 - Index system used for examination of clinical TMJ disfunction in a child population.**
addition, 27% showed closed lock episodes with 82% occurring with an open and 18% closed, mouth (Fig. 2).

TMJ sounds were present in 41% of the sample and were mainly unilateral (65%). The sounds were mainly clicks (75%), cracks (15%) and crunches (10%). Dizziness was reported by 31% of the patients, mainly by those ranging from 17 to 18 years of age. Partial inability at opening the mouth was reported by 45% of the patients with TMJ problems (Fig. 3). Difficulty in mastication was detected in 47% of the cases, 37% showed difficulty in deglutition and 30% showed facial muscles tics (Fig. 4).

Bruxism was noted in 45% of the cases, onychophagy in 25% and nibbling of the lips in 15%. Sometimes several parafunctions were combined, whereas an absence of parafunctions was reported in only 15% of the cases (Fig. 5).

**Discussion**

This study has highlighted that problems with TMJ do occur in paediatric populations and are more commonly found in females with the most affected age period being from 16 to 18 years. The results of this study also show that there is an increased prevalence in subjects with Class II malocclusions showing a possible correlation between malocclusion and cranio-mandibular disorders.

Parafunctions play an important role in determining TMJ disorders. As for the symptoms, the most commonly reported were TMJ pain, headache, mouth opening partial inability, mastication difficulty and TMJ sounds. The Helkimo scores indicated the presence of important dysfunctions is modest in children but is greater in teenagers. All this confirms that the symptoms related to the CMD/TMJ increase in importance as the age rises. The authors also observed that young patients with mixed dentitions showed a modest prevalence of the clinical signs of TMJ problems in spite of the presence of open bites, unilateral and bilateral cross-bites, crowding and parafunctions. On the other hand, the main prevalence of the clinical signs was observed mostly in the permanent dentitions. The evolving character of young patients appears to be fundamental in order to be able to prevent and detect the predisposing factors, potential pathologies, psychic factors and dysgnathiae as Class II malocclusions are more

**FIG. 2** - Bar graph showing percentage of child and adolescent patients presenting with TMJ symptoms of pain, headache and joint locking.

**FIG. 3** - Bar graph showing percentage of child and adolescent patients presenting with TMJ symptoms of joint sounds, dizziness and partial inability to open their mouth.

**FIG. 4** - Bar graph showing percentage of child and adolescent patients presenting with TMJ symptoms of facial tics, difficulty in mastication and deglutition.

**FIG. 5** - Pie chart showing distribution of child and adolescent patients presenting with various parafunctions.
likely to have deviant condylar positions [Egermark-Ericksson et al., 1982; Gelb, 1985].

Attempts to show possible correlations in certain malocclusions, such as Class II with CMD/TMJ were various. Such correlations were verified in some previous studies but no relevant occlusal situations that may be easily clinically detected came to light either in this study or in those reported previously [Egermark-Ericksson et al., 1983; Gyanelly et al., 1989; Hellsing, 1990].

To date the subject of TMJ diagnosis and pain remains controversial and much debated as CMD aetiology is multifactorial, related to the developing occlusions and age. In addition dysgnathiae and other factors, such as psychic and constitutive factors (ligament laxity), often contribute in determining them [Greene, 1999; Greene and Laskin, 2000; Greene, 2001]. So any occlusal factor may affect CMD but not necessarily in a pathologic way, as the remodelling ability of the articulation allows it to adapt to various conditions. A direct cause-effect relation between some occlusal morphologic alterations and CMD has not been directly proven. However, the presence of such alterations can contribute in compromising the TMJ functions by requiring a higher degree of adaptability of the stomatognathic system [Lipp, 1990]. Accordingly, it is worth highlighting that the dentist, paediatrician and family doctor should not underestimate such problems and the causes that determine them.

**Conclusion**

In the light of these data the identification and recognition of factors, such as malocclusions and parafunctions, are considered fundamental to early diagnosis of TMJ problems. Their early identification is the most useful way to avoid a dysfunctional state of the stomatognathic system later in life.

**References**


