Late effects of orofacial trauma on the temporomandibular joint

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PREFACE

This booklet was prompted by a study by Professor Lipa Bodner and myself which looked at the long-term effects of trauma on the temporomandibular joint. Although the immediate effects of orofacial trauma are well managed, less attention has been paid to the later effects on the joint and its musculature. We found that these effects were noticeable no matter what the initial treatment of the trauma.

Attention to these later effects should be an integral part of the management of trauma involving the temporomandibular joint whether a result of direct or indirect trauma. We hope that this booklet will make clinicians more aware of these late effects and encourage long term follow up of these patients.

The booklet is not intended as a detailed study of the subject but as an introduction and overview. It gives enough information to understand and deal with these patients but also a guide for future study for those wishing a deeper understanding of the field.
INTRODUCTION

Trauma to the orofacial region will often involve, either directly or indirectly, the temporomandibular joint and its musculature. There are bound to be both immediate, short term effects and later long-term sequelae. Each needs to be addressed in the successful management of these traumatic events.

Temporomandibular disorders (TMD) have been defined as a group of disorders of the temporomandibular joint and its musculature (McNeill et al., 1990). They may be included in the larger category of musculoskeletal disorders, and are the most common chronic non-dental orofacial pain conditions (Dworkin et al., 1990; Romanelli, Mock & Tenenbaum, 1992).

Approximately 33% of the general population will have more than one sign or symptom of TMD (Okeson, 1993; McNeill, 1997). The literature suggests that approximately 5% of the general population will need treatment for a TMD with studies reporting values that vary between 2% and 7% (Lipton, Ship, Larach – Robinson, 1993). Females seem to predominate in
most studies and certainly so in those seeking treatment (Dworkin et al., 1990; Shimshak & DeFuria, 1998; Nilsson, 2007). Most patients are, in fact, women in their child bearing years. Fischer and his co-authors (2006) found that in a sample of 204 patients with TMD, 36% reported a previous head or neck injury. In 194 patients without a TMD, only 25% reported previous head or neck injury.

The cardinal signs of temporomandibular disorders are pain in the joint or orofacial muscles, joint sounds and limitations of mandibular movement. In addition, TMD may be associated with other complaints such as headache, earache, tinnitus, numbness, loss of hearing, fatigue, sleep disorders, subjective feeling of swelling.

TMD is not one condition but several different disorders under one umbrella. The aetiology of TMD is considered to be multifactorial with muscle hyperactivity and excessive loading of the temporomandibular joint seeming to play a prominent role. This multifactorial aetiology can best be illustrated by a Venn diagram (figure1).
Figure 1 The aetiology of TMD may involve the overlap of several factors

This illustrates the fact that more than one factor may be involved in the aetiology and removing, or dealing, with one factor may not be enough, leaving enough overlap of remaining factors to maintain the condition.

Trauma may be only one of the factors involved. This trauma may be macrotrauma, in the form of hard and/or soft tissue trauma, or microtrauma such as that due to long standing parafunction.

For a TMD to develop often requires an event which may be trauma or micro trauma, such as long-standing bruxism. However, to maintain a TMD requires some perpetuating factor which may also be bruxism. TMD patients report more trauma than do controls (Ohrbach et al., 2011)
Trauma may involve the soft tissue with no bone fracture. There may be a fracture of the mandible or maxilla without any damage to the condyle. Fracture of the condyle may occur with or without fracture of the body of the mandible.

Indirect trauma includes whiplash injury with no direct blow to the face. This has been said to cause symptoms consistent with TMD. Symptoms of TMD may also be referred from cervical structure injuries but a direct causal relationship has not been established. The relationship between TMD and whiplash is still unclear with some studies supporting and others questioning the link.

Jaw, head and neck pain may occur after motor vehicle accidents (Kolbinson et al., 1997) but can also be associated with other conditions such as Lyme disease (Heir & Fein, 1998). Certain systemic conditions can involve the temporomandibular joint. Examples of these are Ehlers – Danlos syndrome and rheumatoid arthritis (De Coster, Hartens, De Paepe, 2005; Miller et al., 1997; Engstrom et al., 2007).

Headache has been associated with the development of TMD. It has been found that patients with temporomandibular
disorders report more headache episodes than do patients with no signs or symptoms of TMD (Schokker et al., 1990, 1990a; Liljestrom et al., 2005). Forty six percent of patients with tension type headache had associated musculoskeletal problems. Patients with migraine had only a 7% association with musculoskeletal problems (Marcus, Nash & Turk, 1994). There seems to also be an association with whiplash injury, TMD and headache (Friedman & Weisberg, 2000).

Females seem to have more severe headache than males in both TMD and non – TMD groups (Pettengill, 1999). Myofascial pain and trigger points can also generate and maintain headaches (Davidoff, 1998).

Whiplash remains a contentious area in the aetiology of TMD. Some studies seem to find a positive relationship (Klobas et al., 2004; Häggeman – Henrikson et al., 2004) while others have suggested that it is not a major factor.
COMORBIDITY AND CENTRAL SENSITIZATION

Positive correlation has been found between oro – mandibular dysfunction, anxiety, muscular stress and tension type headache (Segu et al., 1999). An association also exists between TMD and other functional disorders such as fibromyalgia, irritable bowel syndrome, dysmenorrhoea, chronic fatigue syndrome and others (Aaron et al., 2000; D’Aurea Furquim et al., 2013; Harper et al., 2016).
Recent studies have shown that co-morbid pain conditions have a negative impact on both diagnosis and the management of TMD patients (Koutris et al., 2013).

TMD patients reported an average of 1.7 co-morbid pain conditions compared to 0.3 reported by non-TMD subjects. These patients have also been found to have low diffuse nociceptive inhibition control (DNIC) or, as it is now known, dysfunctional conditioned pain modulation, compared to non-TMD subjects. They also show greater generalised pain than non-TMD controls (Svenson et al., 2001; Ayesh et al., 2007). In the same vein, TMD and cervical pain patients show reduced pain thresholds for pain in the hand (Silveira et al., 2014).

As we have noted above, TMD is associated with other functional pain conditions such as fibromyalgia, irritable bowel syndrome, chronic headache, dysmenorrhoea, chronic fatigue syndrome and lower pelvic pain.

The common factor here may well be central sensitization (Hong Chen et al., 2013; Lorduy et al., 2013). This involves amplification of ascending pain pathways in the central nervous system and/or dysfunction of descending inhibitory pathways (Latremoliere and Woolf, 2009).
Amplification of ascending nociceptive pathways involves increased neuronal activity and speeding up of synaptic transfer. This may be facilitated by a number of different factors, some genetic, some epigenetic and some peripheral and environmental (Slade et al., 2016; Bortsov et al., 2013; Al – Harthy et al., 2016; Ribeiro – Dasilva et al., 2017)

The scheme below outlines some of these pathways
It is certainly possible that those patients showing long term painful after effects of orofacial trauma may have a predisposition to widespread body pain. This may be due to central sensitization in addition to other psychosocial and cultural parameters (List and Jensen, 2017)

**LONG TERM EFFECTS OF OROMAXILLOFACIAL TRAUMA**

**DIRECT TRAUMA**

Although the immediate effects of direct trauma are dramatic, if well managed they are short lived with good resolution. Thus swelling, immediate pain and limitation of movement disappear in days to weeks and for some this is the end of the episode. For others however, later sequelae may follow.

It has been reported that 26% of patients with TMD could identify an associated traumatic event. Of these, motor vehicle accidents accounted for 46%, occupational accidents 34%, sports injuries 15% and oral surgery procedures 8% (Singh,
Trauma has been identified as a factor in TMD in the OPPERA study (Orbach et al., 2011)

Patients with TMD and a history of trauma showed more severe signs and symptoms and psychological dysfunction compared to TMD patients with no history of trauma (Landzberg et al., 2017)

There may be noticeable restrictions in mandibular movement. This may be due to ankylosis. Fibrous ankylosis usually occurs 4 – 5 months post trauma and manifests by progressive reduction in mouth opening. A bony ankylosis forms approximately one year post trauma and is noticeable for a dramatic limitation of mouth opening.
Local anaesthesia, given as an inferior alveolar block can also result in a closed lock. This is probably due to trismus because of haematoma formation, damage to the medial pterygoid muscle or involvement of the sphenomandibular ligament. Needle damage to the nerve by direct contact may also contribute (Kempster et al., 2016)

Direct trauma to the temporomandibular joint may lead to a secondary osteoarthritis with attendant pain, limitation of movement and crepitation. In addition, a capsulitis or synovitis may also result (Yun & Kim, 2005).

It is common therefore for these patients to develop a TMD. This may be either myogenous or arthrogenous in origin. These effects occur some time after the initial trauma. Several studies have, however, shown that there were few temporomandibular joint symptoms following condylar fractures that had been repaired surgically (Gerbino et al., 2009)

In these cases, the trauma is the event precipitating the disorder. However, as is often the case in TMD, there is some
factor other than this which will maintain the condition. A common perpetuating factor in these conditions is bruxing. This may be diurnal or nocturnal and is often the latter.

We have found that using orthopaedic tests (Bezuur et al., 1988; Hansson, 1988). together with the temporomandibular opening index (TOI), we can identify 2 subgroups of myogenous TMD patients. One subgroup has a high TOI while the other has a low TOI (Miller et al., 2000). This index is a relationship between active and passive mouth opening and can help in categorizing TMD patients. It also is independent of variable such as age, gender, ramus length and gonial angle.

**The temporomandibular opening index (TOI)**

\[
\text{TOI} = \frac{\text{Passive opening}_{\text{mm}} - \text{Active opening}_{\text{mm}}}{\text{Passive opening}_{\text{mm}} + \text{Active opening}_{\text{mm}}} \times 100
\]

Our initial findings suggest that the myogenous group of TMD patients with a history of trauma has a greater number of patients in the high TOI group than the myogenous TMD patients without trauma (personal communication). This may
have significance in the management of these patients and therefore warrants further study.

Arthrogenous patients can also be divided into several different groups. Some patients will develop an anterior disc displacement with reduction. This may progress to a closed lock with increasing deformation of the displaced disc. A closed lock may also occur de novo. This may be due to increased load leading to anchored disc phenomenon (Nitzan & Etsion, 2004). This too will lead to reduction in maximum voluntary mouth opening but less so than in adhesion or ankylosis. Changes in the lubricating system of the joint may also be a factor in the development of disc displacements (Manfredini, 2009; Nitzan et al., 2002) Typically, these patients have mouth opening up to 30mm.
**Figure 2** Different trauma groups

In an interesting study into the relationship of facial trauma to TMD, we looked at four groups of trauma patients (see figure 2). The first group had trauma to the orofacial region but there was no fracture of the orofacial skeleton (figure 3).

![Figure 3](image)

**Figure 3** Trauma to the orofacial region but with no fracture

Trauma to the joint may be due to impact forces. This may lead, via translation of strain on cells, to the release of chemical mediators and to inflammation. A further possibility is the development of a later myogenous TMD because of a dysponosis of muscles. Nociceptive impulses act via the γ efferent system of muscle spindles to produce splinting effects. This later could lead to changes in muscle action and a subsequent myogenous TMD.

The second group with direct trauma consisted of patients with fractures of the orofacial skeleton other than condylar fracture (figure 4).
The third group had a condylar fracture or both condylar and other mandibular or maxillary fractures (figure 5 and 5a).
We included a group of arthrogenous TMD patients who had had no trauma as a control group in this study (Figure 6).

![Image of teeth]

**Figure 6** Arthrogenous TMD with no previous trauma. Note the use of an anterior repositioning apparatus.

The late effects were greater and lasted longer in the fracture groups. We also noted in our own study, that in the group with orofacial trauma but no skeletal fracture, there was a tendency for patients to start with an arthrogenous TMD and then with time move over to the myogenous group. We did not find this in the other groups (Table 1).

**Table 1** Long term effect of trauma on the temporomandibular joint

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<tr>
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<th>Trauma no fr</th>
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<th>cond fr</th>
<th>arthrog</th>
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<tr>
<td></td>
<td>Arth</td>
<td>myog</td>
<td>arth</td>
<td>myog</td>
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<tr>
<td>10d post trauma</td>
<td>8</td>
<td>2</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1m post trauma</td>
<td>6</td>
<td>2</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>6m post trauma</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
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d = days  fr = fracture  m= months

We then looked at the later sequelae of trauma as determined by patient report and examination after 10 days, 1 month and six months post trauma. Long term effects were found in all patient groups (Table 1). Similar conclusions have been reported in a previous study (De Boever & Keersmaekers, 1996).

Pain of myogenous origin, psychological disorders and a history of trauma have been found to be closely related and this may account for the move from arthrogenous to myogenous TMD as found (Kim et al., 2009)
INDIRECT TRAUMA

This includes whiplash and associated cervical injury which may affect the temporomandibular joint or may lead to adverse changes in muscle action (dysponesis).

Whiplash continues to be a contentious area in the aetiology of TMD. There are two opposing camps, those that find a positive association and those that do not find any association between the two.

In a retrospective study of 300 patients with TMD after a motor vehicle accident, common presenting symptoms included, in descending order, jaw pain, neck pain, post trauma headache, jaw fatigue and severe TMJ clicking. This suggested a need for examination of the joint no matter what one thought of the relationship between whiplash and TMD (Friedman &
Weisberg, 2000). In another study of 59 patients who had had whiplash injury 34% showed delayed symptoms of TMD at one year follow up compared with only 7% in a matched control group, again emphasizing the need for following these patients (Sale & Isberg, 2007). This higher prevalence of signs and symptoms of TMD in chronic whiplash sufferers was also found in a study by Klobas, Tegelberg & Axelsson (2004) in a Swedish population. A significant number of other studies have supported this view (Häggman – Henrikson et al., 2004; Carroll, Ferrari & Cassidy, 2007; Hernandez et al., 2006) to mention a few. It has been suggested that pain intensity during the initial stage of a whiplash injury could be a risk factor for the later development of TMD (Häggman – Henrikson et al., 2016).

Arthroscopic examination of patients with TMD after a whiplash injury showed a wide variation of changes, none of which seemed specific (Abd – Ul – Salam, Kyshtalskyj & Weinberg, 2002)

On the other hand a significant number of studies have found little or no association between whiplash injury and the development of a TMD. Thus, A 3D finite element analysis concluded that neither front nor rear end low velocity impact could produce damage to the soft tissues of the joint (White et
al., 2005; Perez Del Palomar & Doblare, 2007). A further study comparing acute whiplash patients with ankle injury patients found that post trauma TMD pain was rare in both groups (Kasch et al., 2002)

Patients developing TMD after a motor vehicle accident have been reported to respond less well to usual treatment than those TMD patients who have not had a motor vehicle accident. Those patients litigating reported more non-reducing discs than non-litigating patients (Gruschka et al., 2007) but settling insurance claims prior to the last clinic visit did not appear to have a significant effect on post trauma progress (Kolbinson et al., 1997)

The effect of litigation and negligence claims must also be considered. A number of studies have found that litigation is not a factor in the long-term effect of whiplash injury or on the treatment outcomes for this subgroup (Sterner & Gerdle, 2004; Ovadia et al., 2004; Sapir & Gorup, 2002) while others have found that it is indeed a factor in both the prolonging of symptoms and in the treatment outcome (Cassidy et al., 2000; Joslin, Khan & Bannister, 2005).
Sixty percent of patients with TMD after a motor vehicle accident suffer from symptoms suggestive of affective disorder compared to 14% in non-motor vehicle accident TMD patients (Romanelli, Mock, Tenenbaum, 1992).

Patients with both a TMD and whiplash injury scored higher on somatic complaints questionnaire, and on sub scores of the Symptom Checklist – 90 – Revised (SCL – 90 – R) for obsession, somatization, depression, and anger/hostility. In addition, they tended to show only a decrease in muscle tenderness, while the non-whiplash TMD group showed improvement in all categories including headache (Krogstad, Jokstad, Dahl, Sabuleva, 1998).

These patients also showed a decrease in functional efficacy (Bunketorp – Käll, Andersson & Asker, 2007; Williamson et al., 2007) and an increase in symptoms of post-traumatic stress disorder (Williamson et al., 2007) as well as more psychological stress and more widespread pain suggestive of a more widespread chronic pain disorder (Visscher et al., 2005).
CONCLUSION

Trauma to the orofacial region is not infrequent. The immediate effects are well handled, but the possibility of long term complications does not receive enough attention.

- **Long term effects on function were found in all trauma groups**

- **These effects were greater and lasted longer in the fracture groups**
Although not every case of trauma results in long term consequences, these can occur and can vary from myogenous TMD to arthrogenous conditions. Fibrous and bony ankylosis may develop, as may degenerative joint disease.

Long term monitoring of these patients therefore appears to be advisable.

LITERATURE


Abd – Ul – Salam H, Kryshtalskyj B, Weinberg S. Temporomandibular joint arthroscopic findings in patients with


Cassidy JD, Carroll LJ, Cote’ P, Lemstra M, Berglund A, Nygren A. Effect of eliminating compensation for pain and


Hong Chen H, Slade G, Pei Feng Lim PF, Miller V, Maixner W, Luda Diatchenko L. The relationship Between Temporomandibular Disorders, Widespread Palpation


Estrogen-Induced Monocytic Response Correlates with TMD Pain: A Case Control Study.

Ribeiro-Dasilva MC\(^1\), Fillingim RB\(^2\), Wallet SM\(^3\).

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Abstract

Temporomandibular disorders (TMD) are a set of conditions characterized by pain and dysfunction in the temporomandibular joint and muscles of mastication. These pain conditions are associated with considerable morbidity, societal costs, and reduced quality of life. The prevalence varies between 4\% and 10\%, with females at higher risk, and a higher prevalence occurs during reproductive years. The increased prevalence of TMD in females and low prevalence in childhood reinforce that sex hormones, like estrogen, play an important, complex role in the pathophysiology of these disorders. The goal of this study was to determine whether women with TMD exhibit a monocytic hyperinflammatory response compared with control women, and to examine associations of monocytic inflammatory responses with clinical pain. Eighteen women, aged 18 to 35 y, were seen during their follicular menstrual phase. A blood sample was collected, a clinical questionnaire about pain history was administered, and a Research Diagnostic Criteria (RDC) exam was performed. Extracted monocytes were stimulated with the toll-like receptor (TLR)-4 ligand, lipopolysaccharide (LPS), in the presence and absence of estrogen, and the levels of IL6 expression evaluated. Women with TMD showed a systemic hyperinflammatory phenotype,
manifested by an increased monocytic release of cytokines after an inflammatory insult, and this was further increased by estrogen. In addition, monocytes from participants who self-reported more pain on the VAS scale produced higher levels of IL6 compared with those from participants who self-reported lower pain sensitivity. These data suggest that an estrogen-induced hyperinflammatory phenotype in women with TMD may at least in part contribute to heightened clinical pain, perhaps via central sensitization.


**Painful Temporomandibular Disorder: Decade of Discovery from OPPERA Studies.**

Slade GD¹, Ohrbach R², Greenspan JD³, Fillingim RB⁴, Bair E⁵, Sanders AE⁶, Dubner R⁷, Diatchenko L⁸, Meloto CB⁹, Smith S⁹, Maixner W⁹.

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**Abstract**

In 2006, the OPPERA project (Orofacial Pain: Prospective Evaluation and Risk Assessment) set out to identify risk factors for development of painful temporomandibular disorder (TMD). A decade later, this review summarizes its key findings. At 4 US study sites, OPPERA recruited and examined 3,258 community-based TMD-free
adults assessing genetic and phenotypic measures of biological, psychosocial, clinical, and health status characteristics. During follow-up, 4% of participants per annum developed clinically verified TMD, although that was a “symptom iceberg” when compared with the 19% annual rate of facial pain symptoms. The most influential predictors of clinical TMD were simple checklists of comorbid health conditions and nonpainful orofacial symptoms. Self-reports of jaw parafunction were markedly stronger predictors than corresponding examiner assessments. The strongest psychosocial predictor was frequency of somatic symptoms, although not somatic reactivity. Pressure pain thresholds measured at cranial sites only weakly predicted incident TMD yet were strongly associated with chronic TMD, cross-sectionally, in OPPERA’s separate case-control study. The puzzle was resolved in OPPERA’s nested case-control study where repeated measures of pressure pain thresholds revealed fluctuation that coincided with TMD’s onset, persistence, and recovery but did not predict its incidence. The nested case-control study likewise furnished novel evidence that deteriorating sleep quality predicted TMD incidence. Three hundred genes were investigated, implicating 6 single-nucleotide polymorphisms (SNPs) as risk factors for chronic TMD, while another 6 SNPs were associated with intermediate phenotypes for TMD. One study identified a serotonergic pathway in which multiple SNPs influenced risk of chronic TMD. Two other studies investigating gene-environment interactions found that effects of stress on pain were modified by variation in the gene encoding catechol O-methyltransferase. Lessons learned from OPPERA have verified some implicated risk factors for TMD and refuted others, redirecting our thinking. Now it is time to apply those lessons to studies investigating treatment and prevention of TMD.

Pain distribution and predictors of widespread pain in the immediate aftermath of motor vehicle collision.

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Abstract
BACKGROUND:
Musculoskeletal pain is common after motor vehicle collision (MVC). The study objective was to evaluate distribution of pain and predictors of widespread musculoskeletal pain in the early aftermath (within 48 h) of collision.

METHODS:
European American adults aged 18-65 years presenting to the emergency department (ED) after collision who were discharged to home after evaluation were eligible. Evaluation included an assessment of reported pre-collision psychological characteristics, crash characteristics, current pain severity and location, and current psychological symptoms. Adjusted risk ratios were estimated using generalized linear models.

RESULTS:
Among 890 participants included in the study, 589/890 (66%) had pain in three or more regions, and 192/890 (22%) had widespread musculoskeletal pain (pain in seven or more regions). In adjusted analyses, the presence of widespread pain was strongly associated with depressive and somatic symptoms prior to collision, pain catastrophizing, and acute psychological symptoms, and was not associated with most collision characteristics (road speed limit, extent of vehicle damage, collision type, driver vs. passenger, airbag deployment). The reported number of body regions that struck an object during the collision was associated with both reported pre-collision depressive symptoms and with widespread pain.

CONCLUSION:
More than one in five individuals presenting to the ED in the hours after MVC have widespread pain. Widespread pain is strongly associated with patient characteristics known to be modulated by supraspinal mechanisms, suggesting that stress-induced hyperalgesia may influence acute widespread pain after collision.


Potential psychosocial risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study.
Fillingim RB1, Ohrbach R, Greenspan JD, Knott C, Dubner R, Bair E, Baraian C, Slade GD, Maixner W.

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Abstract
Case-control studies have consistently associated psychosocial factors with chronic pain in general, and with temporomandibular disorders (TMD) specifically. Moreover, a handful of prospective studies suggest that preexisting psychosocial characteristics represent risk factors for new onset TMD. The current study presents psychosocial findings from the baseline case-control study of the
Orofacial Pain Prospective Evaluation and Risk Assessment (OPPERA) cooperative agreement. For this study, 1,633 TMD-free controls and 185 TMD cases completed a battery of psychosocial instruments assessing general psychosocial adjustment and personality, affective distress, psychosocial stress, somatic awareness, and pain coping and catastrophizing. In bivariate and demographically adjusted analyses, odds of TMD were associated with higher levels of psychosocial symptoms, affective distress, somatic awareness, and pain catastrophizing. Among controls, significant gender and ethnic group differences in psychosocial measures were observed, consistent with previous findings. Principal component analysis was undertaken to identify latent constructs revealing 4 components: stress and negative affectivity, global psychosocial symptoms, passive pain coping, and active pain coping. These findings provide further evidence of associations between psychosocial factors and TMD. Future prospective analyses in the OPPERA cohort will determine if the premorbid presence of these psychosocial factors predicts increased risk for developing new onset TMD.

PERSPECTIVE:
This article reports baseline psychosocial findings from the OPPERA Study, a large prospective cohort study designed to discover causal determinants of TMD pain. Findings indicate significant differences between TMD cases and TMD-free controls across multiple psychosocial constructs, and future analyses will determine whether these psychosocial factors increase risk for new onset TMD.

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Clinical findings and pain symptoms as potential risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study.

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Abstract
Clinical characteristics might be associated with temporomandibular disorders (TMD) because they are antecedent risk factors that increase the likelihood of a healthy person developing the condition or because they represent signs or symptoms of either subclinical or overt TMD. In this baseline case-control study of the multisite Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA) project, 1,633 controls and 185 cases with chronic, painful TMD completed questionnaires and received clinical examinations. Odds ratios measuring association between each clinical factor and TMD were computed, with adjustment for study-site as well as age, sex, and race/ethnicity. Compared to controls, TMD cases reported more trauma, greater parafunction, more headaches and other pain disorders, more functional limitation in using the jaw, more nonpain symptoms in the facial area, more temporomandibular joint noises and jaw locking, more neural or sensory medical conditions, and worse overall medical status. They also exhibited on examination reduced jaw mobility, more joint noises, and a greater number of painful masticatory, cervical, and body muscles upon palpation. The results indicated that TMD cases differ
substantially from controls across almost all variables assessed. Future analyses of follow-up data will determine whether these clinical characteristics predict increased risk for developing first-onset pain-related TMD PERSPECTIVE: Clinical findings from OPPERA's baseline case-control study indicate significant differences between chronic TMD cases and controls with respect to trauma history, parafunction, other pain disorders, health status, and clinical examination data. Future analyses will examine their contribution to TMD onset.


Temporomandibular disorders: Old ideas and new concepts.

List T1,2,3, Jensen RH4.

Abstract

Background Temporomandibular disorders (TMD) is an umbrella term for pain and dysfunction involving the masticatory muscles and the temporomandibular joints (TMJs). TMD is the most common orofacial pain condition. Its prominent features include regional pain in the face and preauricular area, limitations in jaw movement, and noise from the TMJs during jaw movements. TMD affects up to 15% of adults and 7% of adolescents. Chronic pain is the overwhelming reason that patients with TMD seek treatment. TMD can associate with impaired general health, depression, and other psychological disabilities, and may affect the quality of life of the patient. Assessment Evaluations indicate that the recently published Diagnostic Criteria for TMD (DC/TMD) are reliable and valid. These criteria cover the most common types of TMD, which include pain-related disorders (e.g., myalgia, headache attributable to TMD, and arthralgia) as well as disorders associated with the TMJ (primarily disc displacements and degenerative disease). As peripheral mechanisms most likely play a role in the onset of TMD, a detailed muscle examination is recommended. The persistence of pain involves more central factors, such as sensitization of the supraspinal neurons and second-order neurons at the level of the spinal dorsal horn/trigeminal nucleus, imbalanced antinociceptive activity, and strong genetic predisposition, which also is included in DC/TMD. Conclusion The etiology is complex and still not clearly understood, but several biological and psychosocial risk factors for TMD have been identified. Several studies indicate that patients with TMD improve with a combination of noninvasive therapies, including behavior therapy, pharmacotherapy, physical therapy, and occlusal appliances. More stringently designed studies, however, are needed to assess treatment efficacy and how to tailor treatment to the individual patient.

KEYWORDS: Headache; management; orofacial pain; risk factors; temporomandibular disorders
Patients with Concomitant Chronic Neck Pain and Myofascial Pain in Masticatory Muscles Have More Widespread Pain and Distal Hyperalgesia than Patients with Only Chronic Neck Pain.

Muñoz-García D1,2, López-de-Uralde-Villanueva I1,2,3,4, Beltrán-Alacreu H1,2,3, La Touche R1,2,3,4, Fernández-Carnero J2,3,4,5.

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Abstract

Objective:

Insufficient evidence exists to compare widespread pain (WP), pain sensibility, and psychological factors that occur in patients presenting with chronic neck pain (CNP) or a combination of temporomandibular disorder (TMD) and other complaints. The present study compared the pain sensibility and psychological factors of subjects with CNP with those with TMD + CNP.

Design:

Cross-sectional study.

Setting:

Local community.

Subjects:

A nonprobabilistic convenience sample of 86 persons with CNP or TMD was recruited into three groups: CNP, TMD with myofascial pain in masticatory muscles with cocomitant CNP (TMD + CNP), and asymptomatic control groups consisted of 27, 29, and 30 participants, respectively.

Methods:
Participants underwent a clinical examination to evaluate WP with computerized assessment based on the pain drawing, pressure pain thresholds (PPT), and psychological factors, which were evaluated using the pain catastrophizing scale (PCS) and the state-trait anxiety inventory (STAI).

Results:

Statistically significant differences were observed between participants with CNP and TMD + CNP for WP (t = -2.80, P < 0.01, d = -1.06). Post hoc analyses only revealed significant differences between TMD + CNP participants and asymptomatic controls for PPT at extratrigeminal areas. Pearson correlation analyses showed a moderate positive association between symptomatic groups within the WP and STAI (P < 0.05) and a moderate negative association between PCS and PPT (P < 0.05) at the right tibialis muscle.

Conclusion:

TMD + CNP participants had more areas of pain and also showed widespread pain hyperalgesia. Both groups of participants had psychological factors positively associated with STAI and WP; further, PCS and the PPT at the extratrigeminal region were negatively associated with each other in both groups, except for the left tibialis in the TMD + CNP group.


Psychosocial and Somatosensory Factors in Women with Chronic Migraine and Painful Temporomandibular Disorders.


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Abstract

Introduction. Psychosocial and somatosensory factors are involved in the pathophysiology of chronic migraine (CM) and chronic temporomandibular disorders (TMD). Objective. To compare and assess the relationship between pain catastrophizing and kinesiophobia in patients with CM or chronic TMD. Method. Cross-sectional study of 20 women with CM, 19 with chronic TMD, and 20 healthy volunteers. Pain catastrophizing and kinesiophobia were assessed. The level of education, pain intensity, and magnitude of temporal summation of stimuli in the masseter (STM) and tibialis (STT) muscles were also evaluated. Results. There were significant differences between the CM and chronic TMD groups, compared with the group of asymptomatic subjects, for all variables (p < .05) except kinesiophobia when comparing patients with CM and healthy women. Moderate correlations between kinesiophobia and catastrophizing (r = 0.46; p < .01) were obtained, and the strongest association was between kinesiophobia and magnification (r = 0.52; p < .01). The strongest associations among physical variables were found between the STM on both sides (r = 0.93; p < .01) and between the left and right STT (r = 0.76; p < .01). Conclusion. No differences were observed in pain catastrophizing and kinesiophobia between women with CM and with chronic TMD. Women with CM or chronic TMD showed higher levels of pain catastrophizing than asymptomatic subjects.


Temporomandibular disorders in patients with rheumatoid arthritis: A clinical study.

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Abstract

OBJECTIVES:
The aim of this study is to evaluate the prevalence and type of temporomandibular disorders (TMD) in patients with rheumatoid arthritis (RA).

MATERIALS AND METHODS:
Fifty-four patients having RA treatment at Cukurova University in Rheumatology Clinic were enrolled to the study. Demographic and rheumatologic data were recorded. The patients were examined in Dental Faculty by using Research Diagnostic Criteria/TMD (RDC/TMD) axis I
and answered RDC/TMD axis II Biobehavioral Questionnaire. Data were evaluated according instructions for scoring and assessment of RDC/TMD. Mann-Whitney test was performed to compare continuous variables between two groups and Kruskal-Wallis test was performed to compare continuous variables for more than two groups.

RESULTS:

Although their activity situations were 55.6% active and 44.4% inactive, the distribution of treatment modality was 31.5% for anti-tumor necrosis factor-α (TNF-α) and 68.5% for disease-modifying antirheumatic drugs (DMARD). The distribution of temporomandibular joint (TMJ) involvement was: 9.3% with no involvement, 7.4% with joint involvement, 64.8% with muscular involvement, 18.5% with both muscular and joint involvement. Rheumatologic functional scores were (0) 3.7%, (1) 50%, (2) 38.9%, (3) 7.4%. Patients' chronic pain was graded from 0 to 4 and the distribution was 3.7%, 24.1%, 20.4%, 31.5% and 20.4%, respectively. The mean duration of RA for anti-TNF-α (11.47 ± 7.67) was significantly higher compared with DMARD (7.09 ± 5.21) \( P = 0.040 \).

CONCLUSION:

There was a high prevalence of TMD in RA patients, and muscular involvement was the highest among the TMJ involvements. Thus, this study supports TMJ examination should


**Association Between Clinical Signs of Temporomandibular Disorders and Psychological Distress Among an Adult Finnish Population.**

Tuuliainen L, Sipilä K, Mäki P, Könnönen M, Suominen AL.

Abstract

AIMS:

To evaluate the association between signs of temporomandibular disorders (TMD) and psychological distress in a general population-based sample of Finnish adults.

METHODS:

The Health 2000 Survey was conducted in 2000-2001 by the National Institute for Health and Welfare in Finland. Of the sample of adults aged 30 or over \( n=8,028 \), 79% participated in a clinical oral health examination, which included examination of TMD signs. The participants \( n=6,155 \) also completed questionnaires, including the 12-item General Health Questionnaire (GHQ-12), which measured psychological distress. Associations between TMD signs and psychological distress measured by the GHQ-12 were examined in both genders. Statistical measures included chi-square tests, t tests, and logistic regression analyses.

RESULTS:

The prevalence of the TMD signs (limited opening, clicking, crepitation, temporomandibular joint [TMJ] palpation pain, and muscle palpation pain) was 11.2%, 17.6%, 10.5%, 5.1%, and 18.9% in women, and 6.1%, 12.9%, 5.3%, 2.4%, and 7.2% in men, respectively. High GHQ-12 scores, measured as continuous variables and in quartiles by distress level, were significantly associated with masticatory muscle pain on palpation in both genders \( P<.05 \) and with TMJ pain on palpation in women \( P<.05 \). Additionally, high GHQ-12 scores as continuous were associated with TMJ crepitation in men \( P<.05 \). The logistic regression analyses showed that higher GHQ-12 scores were associated significantly
with masticatory muscle pain on palpation both in women (odds ratio [OR]=2.18; 95% confidence interval [CI]=1.6-2.9) and men (OR=2.03; 95% CI=1.3-3.1).

**CONCLUSION:**
TMD signs and psychological distress appear to be associated. However, due to the limitations of the study, the findings can be regarded as preliminary.


**The effect of culture on pain sensitivity.**


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**Abstract**

Cross-cultural differences in pain sensitivity have been identified in pain-free subjects as well as in chronic pain patients. The aim was to assess the impact of culture on psychophysical measures using mechanical and electrical stimuli in patients with temporomandibular disorder (TMD) pain and pain-free matched controls in three cultures. This case-control study compared 122 female cases of chronic TMD pain (39 Saudis, 41 Swedes and 42 Italians) with equal numbers of age- and gender-matched TMD-free controls. Pressure pain threshold (PPT) and tolerance (PPTo) were measured over one hand and two masticatory muscles. Electrical perception threshold and electrical pain threshold (EPT) and tolerance (EPTo) were recorded between the thumb and index fingers. Italian females reported significantly lower PPT in the masseter muscle than other cultures (P < 0.001) and in the temporalis muscle than Saudis (P = 0.003). Swedes reported significantly higher PPT in the thenar muscle than other cultures (P = 0.017). Italians reported significantly lower PPTo in all muscles than Swedes (P ≤ 0.006) and in the masseter muscle than Saudis (P < 0.001). Italians reported significantly lower EPTo than other cultures (P = 0.01). Temporomandibular disorder cases, compared to TMD-free controls, reported lower PPT and PPTo in all the three muscles (P < 0.001). This study found cultural differences between groups in the PPT, PPTo and EPTo. Overall, Italian females reported the highest sensitivity to both mechanical and electrical stimulation, while Swedes reported the lowest sensitivity. Mechanical pain thresholds differed more across cultures than did electrical pain thresholds. Cultural factors may influence response to type of pain test.
TMD and chronic pain: a current view.

Furquim BD, Flamengu LM, Conti PC.

This review aims at presenting a current view on the physiopathologic mechanisms associated with temporomandibular disorders (TMDs). While joint pain is characterized by a well-defined inflammatory process mediated by tumor necrosis factor-α and interleukin, chronic muscle pain presents with enigmatic physiopathologic mechanisms, being considered a functional pain syndrome similar to fibromyalgia, irritable bowel syndrome, interstitial cystitis and chronic fatigue syndrome. Central sensitization is the common factor unifying these conditions, and may be influenced by the autonomic nervous system and genetic polymorphisms. Thus, TMDs symptoms should be understood as a complex response which might get worse or improve depending on an individual's adaptation.

Persistent orofacial muscle pain.


Abstract

The pathophysiology of persistent orofacial myalgia has been the centre of much controversy. In this article we suggest a novel descriptive term; 'persistent orofacial muscle pain' (POMP) and review current evidence that supports the hypothesis that the induction of POMP involves the interplay between a peripheral nociceptive source in muscle, a faulty central nervous system component and decreased coping ability. In this context it is widely accepted that a complex interaction of variable intrinsic and extrinsic factors act to induce POMP and dysfunction.

Myogenous temporomandibular disorders: diagnostic and management considerations.

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Abstract

Myogenous temporomandibular disorders (or masticatory myalgia) are characterized by pain and dysfunction that arise from pathologic and functional processes in the masticatory muscles. There are several distinct muscle disorder subtypes in the masticatory system, including myofascial pain, myositis, muscle spasm, and muscle contracture. The major characteristics of masticatory myalgia include pain, muscle tenderness, limited range of motion, and other symptoms (eg, fatigability, stiffness, subjective weakness). Comorbid conditions and complicating factors also are common and are discussed. Management follows with stretching, posture, and relaxation exercises, physical therapy, reduction of contributing factors, and as necessary, muscle injections.

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Is there an association between anxiety/depression and temporomandibular disorders in college students?

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Abstract

OBJECTIVE:
Considering the high incidence of Temporomandibular Disorders (TMD) in the population aged 15-30 years and the fact that students are exposed to stressful psychosocial factors, the purposes of this study were: to verify clinical symptoms and jaw functionality in college students with TMD according to the anxiety/depression (A/D) level and to evaluate the correlation between A/D and functionality, maximum mouth opening (MMO) and pain and muscle activity.

MATERIAL AND METHODS:

Nineteen students with TMD diagnosed according to the Research Diagnostic Criteria for Temporomandibular Disorders underwent two assessments during an academic semester. The evaluations were based on questionnaires (MFIQ - Mandibular Function Impairment Questionnaire; HADS - Hospital Anxiety and Depression Scale), clinical measurements (MMO without pain, MMO and assisted MMO; palpation of joint and masticatory muscles), and electromyography. The HADS scores obtained in the two assessments were used to classify all data as either "high" or "low" A/D. Data normality, differences and correlations were tested with the Shapiro-Wilk test, Student's t-test (or the Wilcoxon test), and Spearman test, respectively. The alpha level was set at 0.05.
RESULTS:

None of the clinical variables were significantly different when comparing low and high A/D data. In low A/D there was a significant correlation between HADS score and: MFIQ (P=0.005, r=0.61), and MMO without pain (P=0.01, r=-0.55).

CONCLUSIONS:

Variation in A/D level did not change clinical symptoms or jaw functionality in college students with TMD. Apparently, there is a correlation between TMJ functionality and A/D level, which should be further investigated, taking into account the source of the TMD and including subjects with greater functional limitation.
Thus, anxiety levels and open lips were associated with TMD in children. Owing to the cross-sectional design of the present study, the associations observed may have a bidirectional relationship.


The associations between psychosocial aspects and TMD-pain related aspects in children and adolescents.

Al-Khotani A1,2, Naimi-Akbar A3, Gjelset M4, Albadawi E5, Bello L6, Hedenberg-Magnusson B4,7,8, Christidis N4,7.

Abstract

BACKGROUND:

Temporomandibular disorders (TMD) in children and adolescents is prevalent with pain as a common component, and has a comorbidity with psychosocial problems such as stress, depression, anxiety as well as somatic complaints. Therefore, the aim of the study was to investigate if psychosocial problems in children and adolescents are associated with TMD with pain (TMD-pain) and TMD without pain (TMD-painfree) when compared to children and adolescents without TMD.

METHODS:

This cross-sectional study consisted of 456 randomly selected children and adolescents, enrolled from 10 boy's- and 10 girl's- schools in Jeddah, between 10 and 18 years of age. On the examination day, prior to the clinical examination according to Research Diagnostic Criteria for TMD Axis I and II, the participants first answered two validated questions about TMD pain, and after that the Arabic version of the Youth Self Report scale. According to their clinical examination and diagnosis the participants were divided into three groups; non-TMD group, TMD-pain group, and TMD-painfree group.
RESULTS:
The TMD-pain group presents a higher frequency of the internalizing problems anxiety, depression and somatic complaints than non-TMD group (p < 0.05). Regarding externalizing problems the only significant association found was for aggressive behavior in the TMD-pain group (p < 0.05). The TMD-pain group also shows a higher frequency of social problems than the non-TMD group. However, no such difference was found when compared to the TMD-painfree group. There was also a significant association with a higher frequency of thought problems in the TMD-pain group (p < 0.05). The children's and adolescents’ physical activities were within border line clinical range for all three groups, whereas the social competence was within the normal range. There were no significant associations between any of the groups in this respect.

CONCLUSIONS:
TMD-pain in children and adolescents does not seem to affect the social activities. However, TMD-pain seem to have a strong association to emotional, behavior and somatic functioning, with higher frequencies of anxiety, depression, somatic problems, aggressive behavior and thought problems, than children and adolescents without TMD-pain. With respect to the biopsychosocial model the present study indicates that there are significant associations to psychosocial, somatic and behavioral comorbidities and TMD-pain in children and adolescents in the Middle East region.


Mental Status as a Common Factor for Masticatory Muscle Pain: A Systematic Review.
Wieckiewicz M1, Zietek M2, Smardz J1, Zenczak-Wieckiewicz D3, Grychowska N1.

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Abstract
Masticatory muscle pain (MMP) is the primary reason for chronic non-odontogenic orofacial pain in the human population. MMP has become a considerable social problem, which affects about 12-14% of the adult population and is 1.5-2 times more frequent in women than in men. This term defines a pain which has its origins in the masticatory muscles. Although MMP is typically felt in the face, jaws, and preauricular area, MMP can radiate to the ear, teeth, head, and neck. This systematic review explains the relationship between MMP and common mental states, such as anxiety, depression, mood and stress-related disorders, and is reported in accordance with PRISMA guidelines. We performed a search in the PubMed database for peer-reviewed articles published after November 1st 2006 in the context of MMP and mental states. According to the defined criteria, 38 studies were finally included into the systematic review, of which prospective cohort studies were found to be the most common. We investigated four primary outcomes (anxiety, depression, mood disorders, and stress-related disorders) and several secondary outcomes of search. Seventy-nine percent of
studies concerned depression, 42% anxiety, 29% mood disorders, and 21% stress-related disorders. Most of the studies showed a relationship between MMP and alterations in mental status. Nonetheless, the researchers usually evidenced only the co-occurrence of psychiatric disorders and dysfunctions of the masticatory muscles among the group of patients, in large part in women. Moreover, some studies were marked with limited generalizability of the reported results, quality flaws and heterogeneity. In the light of the analyzed literature, the causal relationship between mental states and MMP is still not clearly established.

KEYWORDS:
anxiety; depression; masseter muscle pain; masticatory muscle pain; mental disorders; mood disorders; myofascial pain syndrome; stress-related disorders


Is myofascial pain in temporomandibular disorder patients a manifestation of delayed-onset muscle soreness?
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Abstract

OBJECTIVE:
In a study to the possible role of overuse of the jaw muscles in the pathogenesis of jaw muscle pain, we used a protocol involving concentric and eccentric muscle contractions to provoke a state of delayed-onset muscle soreness (DOMS) in the jaw muscles of healthy individuals. We tested whether the accompanying signs and symptoms would yield the temporary diagnosis of myofascial pain according to the research diagnostic criteria for temporomandibular disorders (RDC/TMD) in these individuals.

METHODS:
Forty persons (mean age±SD=27.7±7.5 y) performed six, 5-minute bouts of eccentric and concentric jaw muscle contractions. Before and immediately after the exercise, and 24 hours, 48 hours, and 1 week later, self-reported muscle fatigue and pain, pain-free maximum mouth opening, pressure-pain thresholds, and the number of painful jaw muscle palpation sites were recorded.

RESULTS:
Significant signs and symptoms of DOMS in the jaw muscles were found, which all had resolved after 1 week. In 31 (77.5%) of the participants, these signs and symptoms also gave rise to a temporary diagnosis of myofascial pain according to the RDC/TMD.

CONCLUSIONS:
The results of this study demonstrate that an experimental protocol involving concentric and eccentric muscle contractions can provoke DOMS in the jaw muscles and the temporary diagnosis of
myofascial pain according to the RDC/TMD. The results observed strengthen the supposition that
the myofascial pain in TMD patients may be a manifestation of DOMS in the jaw muscles.

Satisfaction with Life in Orofacial Pain Disorders: Associations and Theoretical Implications.

Boggero IA, Rojas-Ramirez MV, de Leeuw R, Carlson CR.

Abstract

AIMS:
To test if patients with masticatory myofascial pain, local myalgia, centrally mediated myalgia, disc
displacement, capsulitis/synovitis, or continuous neuropathic pain differed in self-reported satisfaction
with life. The study also tested if satisfaction with life was similarly predicted by measures of physical,
emotional, and social functioning across disorders.

METHODS:
Satisfaction with life, fatigue, affective distress, social support, and pain data were extracted from the
medical records of 343 patients seeking treatment for chronic orofacial pain. Patients were grouped
by primary diagnosis assigned following their initial appointment. Satisfaction with life was compared
between disorders, with and without pain intensity entered as a covariate. Disorder-specific linear
regression models using physical, emotional, and social predictors of satisfaction with life were
computed.

RESULTS:
Patients with centrally mediated myalgia reported significantly lower satisfaction with life than did
patients with any of the other five disorders. Inclusion of pain intensity as a covariate weakened but
did not eliminate the effect. Satisfaction with life was predicted by measures of physical, emotional,
and social functioning, but these associations were not consistent across disorders.

CONCLUSIONS:
Results suggest that reduced satisfaction with life in patients with centrally mediated myalgia is not
due only to pain intensity. There may be other factors that predispose people to both reduced
satisfaction with life and centrally mediated myalgia. Furthermore, the results suggest that satisfaction
with life is differentially influenced by physical, emotional, and social functioning in different orofacial
pain disorders.

Cognitive-behavioral profiles among different categories of orofacial pain patients: diagnostic and treatment implications.

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Abstract

Psychological homogeneity in temporomandibular disorders (TMD) is not conclusive. The multidimensional pain inventory (MPI) has previously identified 3 cognitive-behavioral profiles in TMD and chronic pain patients. Our aims were to replicate these findings in another cultural setting and relate the profiles to the diagnosis and to the treatment demand and outcome. The MPI was administered to 112 referrals comprising 6 categories of patients diagnosed with TMD or intractable orofacial pain. Dysfunctional profiles (high in pain and distress) were most common in patients with orofacial pain of obscure origin and more common in myofascial pain patients than in patients with other TMD diagnoses. Interpersonally-distressed profiles were found in all categories. Among patients with disk displacement, the 3rd profile (adaptive copers with low pain and distress and high control and activity) was most common in earlier successfully diskectomized patients and least common in those about to undergo invasive interventions. A dysfunctional profile was associated with treatment failure, conservative or surgical, and with the demand for radical therapy. Some support for a cyclical causality between pain and psychological factors was found. It is concluded that the robustness of the MPI as a relevant assessment instrument was further strengthened.


Depression and somatization in patients with temporomandibular disorders.

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Abstract

STATEMENT OF PROBLEM:

Psychological and behavioral traits may be important for the diagnosis and management of orofacial pain.

PURPOSE:

This study compared the levels of depression and somatization in patients in single and multiple research diagnostic criteria for temporomandibular disorders (RDC/TMD) diagnostic groups.

MATERIAL AND METHODS:

The RDC/TMD was established to allow standardization and replication of research into the most common forms of muscle- and joint-related research and is divided into 2 axes: axis I, clinical TMD, and axis II, pain-related disability and psychological status. One hundred seventeen patients (28 male and 89 female; mean age, 33.3 +/- 10.3 years) with RDC/TMD-defined clinical TMD were selected. The RDC/TMD history questionnaire and examination forms were input directly into computers with the use of a software program developed at the National University of Singapore (NUS TMDv1.1 software). Axis I and II variables were generated online and automatically archived for statistical analysis. Patients were subsequently classified into 7 groups based on the presence of the various RDC/TMD axis I diagnostic groups: group A, myofascial pain only (group I); group B, disk displacement only (group II); group C, other joint conditions such as arthralgia, osteoarthritis, and osteoarthrosis only (group III); group D, myofascial pain and disk displacement (groups I and II); group E, myofascial pain and other joint conditions (groups I and III); group F, disk displacement
and other joint conditions (groups II and III); and group G, myofascial pain, disk displacement, and other joint conditions (groups I, II, and III). Differences in mean Symptom Checklist-90 scores between groups were compared by analysis of variance/Scheffé tests to contrast depression and somatization levels between the various axis I diagnostic groups (alpha=.05).

RESULTS:

The frequencies of the different groups were as follows: group A, 26.5%; group B, 29.9%; group C, 12.8%; group D, 6.0%; group E, 13.7%; group F, 4.3%; and group G, 6.8%. Approximately 39% of patients were clinically depressed, and 55% had moderate to severe somatization. Differences in mean depression and somatization with pain item scores were significant between groups (P<.05).

CONCLUSION:

Within the limitations of this study, patients diagnosed with myofascial pain and other joint conditions (group E) had significantly higher levels of depression (P=.03) and somatization (P=.03) than patients diagnosed with only disk displacements (group B).


A clinically relevant animal model of temporomandibular disorder and irritable bowel syndrome comorbidity.

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Abstract

Temporomandibular disorder and irritable bowel syndrome are comorbid functional chronic pain disorders of unknown etiology that are triggered/exacerbated by stress. Here we present baseline phenotypic characterization of a novel animal model to gain insight into the underlying mechanisms that contribute to such comorbid pain conditions. In this model, chronic visceral hypersensitivity, a defining symptom of irritable bowel syndrome, is dependent on 3 factors: estradiol, existing chronic somatic pain, and stress. In ovariectomized rats, estradiol replacement followed by craniofacial muscle injury and stress induced visceral hypersensitivity that persisted for months. Omission of any 1 factor resulted in a transient (1 week) visceral hypersensitivity from stress alone or no hypersensitivity (no inflammation or estradiol). Maintenance of visceral hypersensitivity was estradiol dependent, resolving when estradiol replacement ceased. Referred cutaneous
hypersensitivity was concurrent with visceral hypersensitivity. Increased spinal Fos expression suggests induction of central sensitization. These data demonstrate the development and maintenance of visceral hypersensitivity in estradiol-replaced animals following distal somatic injury and stress that mimics some characteristics reported in patients with temporomandibular disorder and comorbid irritable bowel syndrome. This new animal model is a powerful experimental tool that can be employed to gain further mechanistic insight into overlapping pain conditions.

PERSPECTIVE:

The majority of patients with temporomandibular disorder report symptoms consistent with irritable bowel syndrome. Stress and female prevalence are common to both conditions. In a new experimental paradigm in ovariectomized rats with estradiol replacement, masseter inflammation followed by stress induces visceral hypersensitivity that persists for months, modeling these comorbid pain conditions.

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KEYWORDS:

Comorbid pain; estrogen; irritable bowel syndrome; stress; temporomandibular disorder; visceral hypersensitivity

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