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File ID	339497
Filename	Chapter 9: Summary

SOURCE (OR PART OF THE FOLLOWING SOURCE):

Type	Dissertation
Title	The triangle bruxism, pain, and psychosocial factors
Author	D. Manfredini
Faculty	Faculty of Dentistry
Year	2011
Pages	211
ISBN	978-90-902-6384-7

FULL BIBLIOGRAPHIC DETAILS:
http://dare.uva.nl/record/397329

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Chapter 9

SUMMARY

The etiology of temporomandibular disorders (TMD) is a highly debated issue in the dental and orofacial pain literature. A multivariate pattern of interacting factors is currently called into cause to explain the etiopathogenesis and clinical manifestations of TMD symptoms. Among those, the study of the mutual interactions between pain, bruxism, and psychosocial factors represents a promising field of research to get deeper into the knowledge of TMD. The general aim of this thesis was to deepen several aspects of the above-mentioned "triangle". The specific aims were: (1) to systematically review the literature on bruxism, with focus on its relationship with TMD and on the role of psychosocial factors in bruxism's etiology **(Chapters 2 and 4)**; (2) to investigate for the relationship between self-reported bruxism and TMD **(Chapter 3)**; (3) to study the influence of psychological symptoms on sleep-time masticatory muscles activity **(Chapter 5)**; and (4) to assess the psychosocial impairment of TMD patients and its relationship with the physical diagnoses **(Chapters 6 and 7)**.

To achieve these aims, three lines of research were adopted, respectively providing a systematic assessment of the bruxism literature **(Chapters 2 and 4)**, a multicenter project involving four University clinics specialized in the management of TMD patients (viz., Padova, Amsterdam, Tel Aviv, and Helsinki) **(Chapters 3, 6, and 7)**, and an experimental protocol with a portable device to record jaw-muscle EMG activity during sleep **(Chapter 5)**.

The analysis of the literature on the bruxism-TMD relationship **(Chapter 2)** was hampered by several concerns regarding the diagnostic criteria to detect bruxism. It was not possible to discuss data on the relation between specific TMD signs and symptoms and the different bruxism-related motor activities, viz. clenching and grinding, due to the very low level of specificity which characterized the majority of investigations. In general, works in which bruxism was diagnosed by means of self-report or clinically showed a positive association with TMD pain, but they were characterized by some potential bias and confounders at the diagnostic level (e.g., pain as a criterion for bruxism diagnosis). The findings in these studies could not be replicated in more rigorous research settings adopting polysomnographic and/or electromyographic criteria to diagnose bruxism. Consistent findings were described to suggest that anterior tooth wear is not a major risk factor for

TMD. Likewise, it was found that experimental, sustained jaw clenching may provoke acute muscle tenderness, but this is not likely to be the main initiating factor for the onset of chronic pain. As a recommendation for the future, the adoption of approaches focusing on the different types of bruxism and TMD was encouraged to improve the methodological quality, and thus the interpretability of future research.

In **Chapter 3**, retrospective analysis of data gathered at two highly specialized centers for the treatment of TMD, bruxism, and orofacial pain (i.e., the Universities of Padova and Tel Aviv) was performed to assess the correlation between self-reported awake and sleep bruxism on the one hand and the different forms of TMD on the other. In line with previous literature findings, an association between self-reported bruxism and TMD was described in the overall sample, but some differences emerged between the two clinics' samples. In particular, the more widespread use of TMJ imaging techniques in Italy led to a higher prevalence of multiple diagnoses, and the significantly higher prevalence of self-reported bruxism in patients with myofascial pain alone, as described in the Israeli sample, was not replicated in the Padova one. Very little information could be gathered on the potentially different relation with awake and sleep bruxism, since the patient's capability to discriminate between the two entities is likely low. Also, it is likely that the described bruxism-myofascial pain association might have been biased by relying on an anamnestic bruxism diagnosis only, which may have caused patients considering myofascial pain as an analogous of bruxism. From an epidemiological viewpoint, the different age distribution of bruxism and TMD diagnoses described in both clinics' samples seems to support the hypothesis that the bruxism cannot be considered the unique responsible for all TMD symptoms and that other factors are involved in the potential cause-and-effect link between the two disorders. At this stage, there appears to be a need for cautionary statements on the potential usefulness of cross-sectional investigations to retrieve valid information for the clinical setting, because at best, such investigations are able to describe unspecific bruxism-TMD associations.

The same concerns regarding the strategies adopted to diagnose bruxism also affected the literature on the role of psychosocial factors in the etiology of bruxism **(Chapter 4)**. Indeed, factors like the concurrent presence of pain, which may be strongly

linked to psychopathology, act as confounding variables that complicate the study of the bruxism-psychosocial factors relation. Even though most data on the etiology and characteristics of bruxism came from sleep laboratory studies, there is a paucity of literature on the role of stress and psychosocial disorders in polysomnographically monitored bruxers. These few works failed to demonstrate an association with any of the investigated psychosocial factors, thus dismantling the early literature hypothesis of a strict bruxism-stress relation. By contrast, the majority of data about the association between psychosocial disorders and bruxism came from studies adopting a clinical and/or self-report diagnosis of bruxism. In general, as in the case of the bruxism-TMD literature, this kind of studies showed some sort of association of bruxism with anxiety, stress sensitivity, depression, and other personality-related characteristics, apparently in contrast with the outcomes of sleep laboratory investigations. A plausible hypothesis to explain these findings is that clinical studies are more suitable to detect wake bruxism (clenching type), while the classical polysomnographic studies focused only on sleep bruxism (grinding type). As a concluding remark, it was suggested that wake clenching may be associated with psychosocial factors and a number of psychological symptoms, while there seem to be no evidence to relate sleep bruxism with psychosocial disorders. Again, future works should be directed toward the achievement of a better distinction between the two forms of bruxism in order to facilitate the design of studies on this topic.

Interesting findings on the bruxism-psychological factors relationship came from the experimental protocol attempting to describe the correlation between sleep-time masticatory muscle activity (MMA) and psychological symptoms by the use of an EMG home-recording device in a group of healthy volunteers completing a battery of psychometric questionnaires **(Chapter 5)**. Support was provided to the hypothesis that the duration of sleep-time MMA, especially during the early phases of a night's sleep, may be related to anxiety trait, and not to anxiety state or other psychological symptoms. The total work produced by the four investigated muscles, viz., bilateral masseter and anterior temporalis, during the first two hours of EMG sleep recording, was also predicted by anxiety trait scores, while anxiety state levels were not predictors of the work produced during sleep. The role of depression symptoms seems to be less important. Neither state nor

trait anger were predictors of sleep-time MMA. These findings may support the view that personality features related with the individual management of anxiety, viz. trait, are likely to be more important than acute episodes of anxiety, viz., state, in the etiology of sleep-time MMA. The role of other investigated psychological symptoms (viz., depression and anger) is likely to be less important.

A psychosocial assessment was also performed in TMD patients, with the description of RDC/TMD axis II findings collected at three University clinics (viz., Padova, Amsterdam, and Tel Aviv) **(Chapter 6)**. A severely limiting pain-related impairment (GCPS grade IV) was detected in 5.7% of the study population (N=1149), thus suggesting that the portion of TMD patients developing high disability is limited. Severe depression and somatization were shown in 21.4% and 28.5% of the overall sample, respectively, with some differences between the clinics, the reasons of which are likely to be found in socio-cultural factors to be addressed with future studies. The relationship between depression and somatization levels with the rate of pain-related disability was strong, thus suggesting the good internal construct of the RDC/TMD axis II assessment, with all components related with each other. Interestingly, differences between patients with pain for more or less than six months were limited to the levels of pain-related impairment (GCPS scores), while no differences emerged for depression and somatization levels. As a suggestion coming from these findings, the research criteria for chronic pain need to be redefined, taking into account also qualitative criteria and not only duration criteria.

The clinical implications of the above findings were addressed with a study assessing the psychosocial component as well as the physical component of TMD pain, as in **Chapter 7**, which included a sample of community-based subjects recruited at the University of Helsinki, along with TMD patients recruited at the Universities of Padova and Tel Aviv. The aims were to search for a correlation between RDC/TMD axis I diagnoses and axis II pain-related disability, and to identify clinical (axis I) and psychosocial (axis II) predictors of high pain-related disability. Findings suggested that the correlation between axis I diagnoses and pain-related impairment is not significant in the patients' populations. The significance of such relationship in the non-patient community sample may suggest that treatment-seeking behavior and other factors related with the pain experience are more

important than the physical findings to determine the degree of psychosocial impairment. Such suggestion was supported by a regression analysis performed on the whole sample, showing that predictors for high pain-related disability are to be found within the psychosocial realm. As a recommendation, the clinical impact of these findings has to be assessed with future investigations aiming to better identify both the physical and psychosocial predictors of treatment outcome.

Taken together, findings from this thesis suggested that:

- Bruxism, pain, and psychosocial factors have mutual interactions to form a triangle-like diagram that is likely to play a major role in the TMD practice.
- The establishment of standardized and reliable criteria for specific bruxism activities is a main target for future research as to avoid confusion coming from the adoption of unspecific terms and diagnostic approaches.
- The RDC/TMD classification, which is under revision at the time of writing of this thesis, confirmed to be helpful for multicenter data gathering and comparison.
- The degree of psychosocial impairment in TMD patients is not related to the axis I diagnoses, and it depends on the presence of pain (and not on its location). Thus, psychosocial factors are likely to be more important than physical findings as predictors for treatment seeking behaviors and as prognostic markers.