The office syndrome: a potential risk factor of TMD and headache. maybe vice versa?

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Abstract

Have you ever brought home from work with a headache, nausea, fatigue, red eyes, chest tightness, or various aches and chronic pains? If yes, you might experience so called sick office, office syndromes (OFS), or sick building syndromes (SBS). This syndrome describes a myriad of ailments reported by office workers. OFS presents headache and neck, shoulder and back pain, aching arms, wrists and fingers, numbness of wrists or feet, eye stain, dry eyes, and pain related to chronic underlying illness, such as arthritis or neuritis. In psychological aspects, patients with OFS have fatigue, stress, and lack of concentration. Temporomandibular joint and muscle disorders (TMD) are a very common musculoskeletal condition resulting in chronic pain and disability. The ignored, but potential relationship between OFS and TMD is not far from being linear; nevertheless, it has never been dealt with in other reviews. Since the jaw, head and neck position work all together very closely; therefore, postural issues should be taken into account when patients experience TMD symptoms, headache, and OFS.

This review addresses current understanding of the correlation of OFS, TMD, and headache attributed to TMD, as well as their classification, epidemiology, and neurobiological mechanism of central sensitization.

Key words: temporomandibular disorders, headaches, office syndromes, chronic pain, sick building syndromes, central sensitization, headache attributed to TMD.

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Introduction

Office syndromes are the term to describe a group of ailments reported by office workers. In a last couple of decades with the advent of air conditioners, mostly office buildings have been constructed without windows, which provide air fresh, in order to save cost and to increase energy usage. Therefore, this kind of poor ventilating environment inevitably induces ailments due to stayed in place germs and other air contaminants. To elaborate a number of this syndrome in details, OFS presents headache and neck, shoulder and back pain, aching arms, wrists and fingers, numbness of wrists or feet, eye stain, dry eyes, and pain related to chronic underlying illness, such as arthritis or neuritis. In psychological aspects, patients with OFS have fatigue, stress, and lack of concentration.

Although temporomandibular joint and muscle disorders (TMD) are a very common musculoskeletal condition resulting in chronic pain, dysfunction, and disability[59], it seems less likely to be studied as the potential correlation between OFS and TMD.

Regarding headaches, these symptoms are one of the most commonly reported medical complaints. Most people in the world have suffered from one episode of headache pain or another multiple times in their lives. Some of TMD symptoms are *not only* related to jaw areas because the complex connection of masticatory muscles and innervation of the face that travels nearby. In particular at a temporalis muscle, a jaw closing muscle, one of the primary muscles of mastication, a broad fan-shaped muscle lies over the temporal areas. As a result, the patients who developed TMJ symptoms can also develop headache, so-called headache attributed to TMD[56], and even widespread body pain including back pain, neck pain, shoulder pain and so forth.

Office syndromes (OFS): epidemiology and classification

Office syndromes have been most often reported by 60-70% office workers most often within the age range of 16-35 years, and very common among those above 55 years old due to stress from high responsibility[1]. People with OFS usually reported working for long periods of time per day, lacking ergonomic knowledge (poor posture), and working in the buildings with poor air ventilation. Research in 2001 reveals that OFS could be divided into 2 groups: firstly, **a specific OFS** applies to a group of illnesses with a fairy homogeneous clinical picture and known etiology (infectious, immunological or allergic)[2]. Secondly, **a non-specific OFS** applies to a group of heterogeneous and non-specific, work-related symptoms, including irritation of skin and mucous membranes of the eyes, nose and throat, headache, muscle pain, fatigue and concentration difficulties. In 2006, scientific findings[1,3] revealed the measured psychosocial circumstances appeared more influential than the tested environmental factors. Most risk factors, which had been reported, are paper work and psychosocial workload. Therefore, regarding practical implications, psychosocial stress factors as well as personal factors such as age, gender, asthma, and indoor exposures, should be applied in studies on symptoms compatible with OFS. The study in Sweden[4] showed OFS has more prevalence among females.

Temporomandibular joint and muscle disorders (TMD)

Temporomandibular joint and muscle disorders are a significant public health problem affecting approximately 5 to 12% of the population[5]. Several authors found about 22% of the U.S. population, in the survey of 45,711 households, has more than one episode

of jaw pain within the prior six months[6-7]. Dworkin et al. also found that 65 to 85% of the U.S. population has experienced TMD throughout their lives[16]. TMD is the second most common musculoskeletal condition (after chronic low back pain) resulting in pain and disability[5]. As 15% of TMD patients develop chronic TMD, and 50% of those seeking care for TMD, still have pain 5 years later. The annual cost for treatment of TMD has doubled in the last decade to billions not including associated imaging costs[5,7]. Coordinated efforts to study TMD have identified psychosocial factors interact dynamically; contributing to and maintaining pain-related TMD. Several studies have reported a strong association between psychological distress and biophysical disorders to TMD[10-15]. Jarvik et al. suggested that psychosocial factors are considered the most important predictors for the occurrence or persistence of chronic TMD pain, which appear to be more important than the imaging-based pathology[8-9]. Some authors also showed that patients with TMD pain share some characteristics in common with other chronic pain, such as headache and back pain, including the similar pain intensity levels were similar and associated with behavioral and psychological dysfunction[17]. Since TMD also has shown higher prevalence in females rather than males, some studies[18] investigated association between estrogen receptors on TMJ surfaces. Mahan and Alling[44] suggested that pathological changes in the TMJ could refer pain to the orbit that presented a lancinating or piercing pain. Subjects with TMD can also present pain that radiates to the ear, temporal, ramus, neck and other areas[45].

Office syndromes contributing to TMD and/or headache

It seems that non-specific office syndromes share similar characteristics to TMD. However, the possible association has not been mentioned in any article before. Therefore, the aim of this current article is to suggest that the possibility of how OFS would be associated with TMD. To begin with, regarding TMD, as shown in several studies[19-24], one of its etiological factors is bruxism. Then, the psychogenic etiology of bruxism is stress[24-26]: Vanderas et al in 1999 found the correlation between bruxism and the stress hormones levels in urine. As mentioned earlier, psychological overload, e.g. stress, frustration plays a significantly important role in OFS. Therefore, if the OFS pain remained untreated, it has a possibility to spread into the jaw areas. Not only does stress represent a possible risk factor of OFS, but working with poor posture does also induce more suffering from pain of OFS[27-28,34].

TMD and poor posture

TMD are usually manifesting one of the cardinal characteristics: intra-articular disorders (joint sound, degenerative joint disease), limitation of jaw movements, as well as muscle and/or joint pain. Other complaints related to TMD are headache, ear-related symptoms and cervical spine disorders[39-41]. There are many articles supporting the dynamic relationship between dental occlusion and head posture. The relationship of cervical and head postures with musculoskeletal painful conditions such as neck pain, back pain, and shoulder pain, TMD have been of much interest to researchers and clinicians[30-33,38]. Tilting the head can influence the cervical EMG activity[36-37]. Palazzi et al. conducted research on effect of body position on EMG patterns of sternocleidomastoid and masseter muscles. It has shown that the body positions and parafunctional habits could be closely correlated with the clinical symptoms. Kritsineli in 1992 showed that forward head position had

a significant relationship with TMD and malocclusion[34]. Wright et al. found that encouraging postural training in TMD patients increases more effective treatments[41].

TMD pain as a spread and/or referral of pain: leading to office syndromes

Patients suffering from TMJ pain may develop referred pain to neck and shoulder areas. This kind of pain can be referred from TMJ itself or from myogenic trigger points. A number of studies revealed that neck and shoulder symptoms are usually detected in patients with mandibular dysfunction[42-43]. Patients with moderate TMD frequently presented referred pain to surrounded areas e.g. the ear, temporal, ramus, neck and other areas[45-46]. The pain located in sternocleidomastoid, masseter, medial pterygoid, and lateral pterygoid muscles may also be referred to the TMJ, especially when myofascial trigger points are involved. Trigger points can develop from temporomandibular joint malfunctions such as inflammation, displaced disc disorders, and osteoarthritis. The number of studies has shown a correlation between the TMJ pain and identified sites of referred pain. Headache was the most common finding, which correlates with findings of others[47-48]. Based on research studies shown in last couple of decades, that if peripheral nociceptive mechanisms have been activated repeatedly and prolonged enough, they could become central sensitization. Likewise, if TMD muscle pain disorders had been untreated, they would be spread into greater areas or even the whole body. The following is the theory supporting our statements.

A. Peripheral nociceptive mechanism and sensitization

The nociceptive endings in peripheral tissues can be triggered by various types of noxious stimuli (thermal, chemical, mechanical), and then they activated action potentials in their associated afferent fibers, which forwardly lead to CNS. As a result of tissue-damaging stimuli and inflammation mediators, these result in changes, including an increased excitability of the nociceptive endings, so called peripheral sensitization. Sensitized nociceptors show spontaneous activity, lowered activation threshold, and increased responsiveness to following noxious stimuli. In clinical setting, these changes display spontaneous pain, allodynia, and hyperalgesia, which commonly seen as features of chronic and persistent pain, e.g. myofascial TMD pain and TMJ pain (arthralgia). Regarding chemical mediators, which are involved in nociceptive transmission or modulation in CNS e.g. the excitability amino acid glutamate, and opioid-related substances like enkephalin, glutamate is synthesized by primary afferent cell bodies and by activating glutamate receptors [*N*-methyl-D-aspartate (NMDA) and non-NMDA receptors situated in the afferent endings. It activates excitability and induces pain. The human and animal studies on peripheral glutamic mechanisms show gender-related differences since glutamate-evoked afferent barrage is more significantly in females than males[49-51].

B. Central nociceptive mechanism and sensitization

The release of excitable amino acid glutamate from the afferents results in the activation of nociceptive neurons, which are two main types: nociceptive specific (NS) and wide dynamic range (WDR). Glutamate triggers these neurons by processing with two different receptors for glutamate, namely NMDA and AMPA (alpha-amino-3-hydroxy-5-methyl-4-isoxazole-propionic acid), and others. While the activation of AMPA is short-lived and rapid, the stimulation of NMDA receptor requires a long period of activation, called wind-up or central sensitization. It has been

revealed that several NS and WDR neurons with cutaneous receptive fields also received convergent afferent inputs from soft tissue like dental pulp tissue, TMJ or masticatory muscle, which are thought to contribute to the spread and referral of pain[52-55]. To elaborate what causes can contribute this phenomena to happen, with the induction of inflammation, peripheral tissue injury, or nerve fibers, the extensive convergent afferent inputs possible lead to central neuronal changes. Also, the chemicals released by the peripheral tissues or primary afferent neurons during inflammation or injury may increase the excitability of peripheral sensitization. In clinical settings, inflamed tooth pulp, TMJ, or muscles can give rise to spontaneous response, lowering of activation threshold, receptive field expansion, and increases of response of NS and WDR neurons, so central sensitization occurs, which contributes to spread, referred, deep pain conditions. Central sensitization can last for days or even weeks if unresolved.

Discussion

This current review highlights the understanding of some possible correlation of non-specific typed OFS, TMD, and headache attributed to TMD. This review suggests that TMD directly correlated with poor postures. While there are many articles support this correlation like mentioned in this review; some articles[57-58] are inconsistent with the result. Therefore, the relationship between head posture and TMD is not the simple one, which means *not* a simplistic cause-effect relationship.

Based on these findings, there is no shown a clear-cut definition of poor postures; some include only head tilting[36-37], and some cervical positions[30-31]. Should it include shoulder-back alignment to define poor postures? There is no a standard measurement to define poor postures in this level, which can influence chronic pain issues. Moreover, pertaining central sensitization related pain syndromes, they are difficult illnesses to classify. In case of fibromyalgia and chronic fatigue syndromes, both have a wide range of physical symptoms, spread across many body systems and are unsurprisingly associated with multiple psychological symptoms. Likewise, OFS present several overlapping symptoms with fibromyalgia and chronic fatigue syndromes, in terms of widespread pain and psychologically associated symptoms. A few questions propping up; is that possible that patients with fibromyalgia might experience OFS before developing into fibromyalgia? whether there are any environmental risk factors developing fibromyalgia. Based upon the findings, no other reviews correlate these factors together yet. In fact, these chronic widespread pain syndromes show unknown causes; therefore, if the future research addresses pathophysiological mechanism of these symptoms, it would bring the light to their unknown etiology.

Although this review represents poor postures as one of the cardinal features of OFS, in fact this syndrome also includes other psychologically important symptoms like mental fatigue and concentration difficulties[2]. Nevertheless, other psychological problems like depression, anxiety, and mental frustration due to sleep deprivation, which have significantly influenced on chronic pain issues, particularly in TMD[8-15]. Yet it has never been mentioned as much in case of OFS. Therefore, for better future trials, psychological aspects should be studied more intensively as pathological influences because the recent scientific findings in OFS issues revealed that psychosocial circumstances appeared more influential than the environmental factors[1-3].

Concerning practical implications, individual factors such as gender, should be applied in studies. As mentioned earlier in this review both OFS and TMD seem to have some common characteristics like higher

prevalence rates in females over males[4, 18]. Perhaps, sex hormones would influence etiology of OFS. Regarding psychological susceptibility, the prevalence of chronic pain symptoms in the female population is still evident. This may be because males and females perceive psychosocial work conditions differently, and potentially react to stress factors unevenly. Therefore, the psychosocial work environment must be included as important as genders and other factors.

In conclusion, most of studies including in this review have shown a potential correlation between a non-specific types OFS as well as TMD, and/or headache attributed TMD. However, correlation is not simply causation. Regarding, the pain modulatory effects, they vary from one person to another, consistent with the idea that pain is highly personalized and susceptible to a variety of biological, pharmacological, psychological, genetic, and environmental influences. The Future trials should be large enough to provide clinically meaningful, and adequately powered. It should be included well-defined validation and reliable outcome measures.

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