**Aviation stress and dental attrition**

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**ABSTRACT**

Voluntary clenching of the teeth is a common maneuver used to facilitate peripheral monosynaptic reflexes and motor system excitability. It has also been indicated that an aggressive biting is associated with a significant attenuation of the stress-induced increase of nor-adrenalin turnover in the brain. Therefore, occlusion of the masticatory organ contributes significantly to an individual’s ability to manage stress. Pathological tooth wear is often associated with bruxism, which appears in turn to be influenced by psychosocial factors. Variables such as general stress, work-related stress, and personality traits have been increasingly considered as initiating, predisposing, and perpetuating factors for bruxism. Bruxism can cause pain and irreversible damage to the teeth, periodontium, masticatory muscles, and temporomandibular joint. Bruxism in an otherwise normal dentition can be recognized as a valid system prophylaxis for all stress-related situations. We sought to evaluate the potential of aviation related stress to induce bruxism and tooth wear leading to dental attrition among Indian Air Force Flying pilots. Subjects were 100 Indian Air Force (IAF) officers of Flying branch who were undergoing routine annual dental examinations at an Air Force Dental Clinic during a 4 week period. One Dental officer using set criteria examined each subject and estimated the tooth wear. Subjective evaluation was based on questionnaire including conscious awareness of bruxism, hypersensitivity and temporomandibular joint pain or discomfort. Awareness of bruxism was also noted as to whether continuous and persistent, momentary while undertaking flying tasks and maneuvering or nocturnal while resting. Bruxism was found in 51% of the overall group of pilots: 61% of the helicopter pilots, 57% of fighter pilots and 32% of transport pilots. Of the total group, twelve subjects had a score of over four and required immediate attention for the condition. 37% of the subjects were aware of their parafunctional habit and resorted to the same as a measure to overcome occupational stress. Air force aircrew may be relatively vulnerable to deleterious effect of bruxism as a consequence of chronic aviation stress. The accelerated rate of tooth attrition in this young population calls for dental and psychological preventive efforts.

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**Introduction**

The term stress originates from physical science where it refers to the force placed upon an object to cause straining, bending, or breaking. In the human context and in psychology, however, stress is often used to describe the body’s responses to demands placed upon it, whether these demands are favorable or unfavorable and are in the form of life stress, organizational stress, task-based stress and environment stress. Stress is any change (rapid, frequent, unexpected) in the environment that forces a person to make adjustments or adaptations. Stress reduces performance and precludes safety. The combination of stress, speed, fatigue, and errors in aviation lead to accidents. Stress reactions are the emotional and physical wear and tear on the mind and body resulting from coping with life’s problems and events. Fight or Flight is the instinctive reactions promoted by the physiological consequences of adrenaline like rush that occurs in response to stress. The more stress, the more stamina, growth, and seasoning an individual may acquire [1]. The

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aviation environment is a high-risk environment and rich in potential stressors such as temperature, acceleration, noise and communication, decompression sickness, vibration, hypoxia, exhaust fumes and motion sickness. Bruxism in proper dentition can be recognized as a valid system prophylaxis for stress related situations. Occlusion of the masticatory organ contributes significantly to an individual’s ability to manage stress. It has also been indicated that an aggressive biting is associated with a significant attenuation of the stress-induced increase of nor-adrenalin turnover in the brain.

Dental attrition has a multifactor etiology, with age and the geometry of canine guidance having a significant influence, in addition to commonly accepted para function [2]. Clinical observations and data from the literature indicate a high prevalence of functional disturbances of the masticatory system, especially Temporo Mandibular Joint (TMJ) dysfunctions and bruxism. Clinical observations indicate that these disturbances are caused mainly by malocclusion, iatrogenic factors, and increased psycho-emotional tension. There are various studies in literature which have related the various intrinsic and extrinsic factors for bruxism and dental attrition including psychological factors, occupation, diet etc [3]. Such a study, however, has not been undertaken exclusively amongst flying crew. Therefore this paper makes an attempt to correlate the presence of bruxism and dental attrition as a direct response to occupational momentary psychomotor stress in aviators.

Material and Methods

Subjects were 100 IAF officers who were undergoing routine annual dental examinations at an Air Force Dental Clinic during a 4 week period. Of these subjects, 34 were transport pilots, 36 were helicopter pilots and 30 were fighter pilots. Participation was voluntary. Subjects were healthy and homogeneous with respect to socio-economic status, middle level seniority in active flying with the mean age of 31 yr +/- 4.3. Officers who came to the clinic with dental emergencies were excluded from the study.

Dental assessment: One Dental officer using set criteria examined each subject and estimated the tooth wear visually, using a standard dental probe, dental mirror, unit illumination, and cotton rolls, as needed. The tooth wear was estimated according to a 6-point scale: 0-no apparent wear, 1- slight wear, 2-wear of enamel only, 3-wear into the dentin in single spots, 4-exposure of dentin in an area of more than 2 mm, 5-wear of more than one-third of the clinical crown. In the statistical analysis, every subject had eight scores: the highest score for each four dental regions (incisors, canines, premolars and molars) in the upper and lower jaws. Subjects who scored “3” in at least two teeth were defined as suffering from bruxism, since this degree of tooth-wear has clinical importance regarding dentin exposure with resulting tooth sensitivity, cracked tooth syndrome, increased risk of rapidly developing dental caries, and the relatively rapid loss of facial vertical dimension. Subjective evaluation was based on questionnaire including conscious awareness of bruxism, hypersensitivity and temporomandibular joint pain or discomfort. Awareness of bruxism was also noted as to whether continuous and persistent, momentary while undertaking flying tasks and maneuvering or nocturnal while resting. The number of flying hours till the examination day was also recorded. The difference in the prevalence of bruxism among the experimental groups was analyzed by means of Chi-square for independency tests.

Results

Bruxism was found in 51% of the overall
group of pilots: 61% of the helicopter pilots, 57% of fighter pilots and 32% of the transport pilots. The average flying was more than 2500 hours. Of the total group, seventeen subjects had a score of four or above and required immediate attention for the condition. 37% of the subjects were aware of their para-functional habit and confirmed resorting to the same as a measure to overcome occupational stress. The difference in the prevalence of bruxism among the experimental groups was analyzed by means of Chi-square for independency tests with the degree of freedom of two and the p value of 0.05 the value for the test group was 9.88 which was much higher than the table value of 5.88 thus being statistically significant denoting a positive relationship between aviation as occupational stress and the presence of dental attrition.

Discussion

Mechanical affliction result in alterations to the tooth structure and is generally manifested as tooth wear. Traditionally, it has been divided into three categories: abrasion, attrition, and erosion. However, most clinical cases of tooth wear involve more than one of these processes. It is often easier to make a diagnosis by looking for the signs of the fundamental wear processes rather than trying to categorize the individual case. Wear can be caused by direct tooth surface-to-surface wear (attrition), an intervening slurry (abrasion), or a corrosive environment (erosion). Wear occurs during mastication, but also at other times. Each classification acts through a distinct process that is associated with unique clinical characteristics. Clinical observations and data from the literature indicate a high prevalence of functional disturbances of the masticatory system, especially TMJ dysfunctions and bruxism. A review of literature points to the interaction of the three entities in the initiation and progression of lesions that may act synchronously or sequentially, synergistically or additively, or in conjunction with other entities to mask the true nature of tooth wear, which appears to be multi factorial. Pathological tooth wear is often associated with bruxism, which appears in turn to be influenced by psychomotor factors (total and

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Table 1: Mean Attrition Scores (MAS) of Different Groups
average perceived stress, state and trait anxiety) [4].

Bruxism is generally defined as a destructive habit of para-functional nonproductive diurnal or nocturnal clenching and grinding action between the upper and lower teeth. Bruxism is a centrally induced phenomenon common to all people and unrelated to local factors. During this activity, extremely strong forces can be applied for time periods exceeding those of functional mastication. The clenching and bruxing function of the masticatory organ is an emergency exit during periods of psychic overloading. These biomechanical loads create many dental problems, such as abfractions, hypersensitivity, pain and irreversible damage to the teeth, periodontium, masticatory muscles, and temporo-mandibular joint. Variables such as general stress, work-related stress, and personality traits have been increasingly considered as initiating, predisposing and perpetuating factors for bruxism [5].

The workplace represents a unique environment where stress and personality play major roles in performance. Therefore, it is one of the most widely studied issues related to stress: mainly the aspects of ambiguity, conflict, and workload, as well as stress derived from an acute increase beyond the usual demands of the job. Military aviation represents a unique working environment that exposes the employee to chronic stress that might give rise to a variety of problems, among them health issues. Military aircrew members, in particular, represent a population that is constantly exposed to occupational stress, even during peacetime. Stress, the unique bond between the environmental demands toward the individual and his ability to cope with them, is associated with undesirable physical consequences. The relationship between stress and ailment is based on the assumption that stress brings about life changes that disturb the vital homeostasis of the affected individual followed by a struggle to regain the primary situation. This struggle entails undesirable changes in various physical systems.

Life changes that endanger illness are not necessarily severe in their intensity, such as natural or personal disasters. Even low key stressful causes or demands can trigger illness if they are frequent in appearance and chronic by nature. Whereas acute stress, limited by length, allows for the physical system to recover, a chronic stress factor can constantly waste the individual’s resources and interfere in the healing process. Human beings do not necessarily respond to stress in exactly the same way. Hence, the consequence of a stressful situation depends on numerous variables other than the intensity and length of the event. Personality variables include the individual’s coping style, both in stress perception and coping techniques. Thus, some people are less resilient to stress and therefore suffer more from the physical and psychological consequences of stress.

Voluntary contraction of the teeth is a common maneuver used to facilitate peripheral monosynaptic reflexes. The teeth clenching maneuver has a facilitatory effect on upper and lower extremities [6]. Cortical and subcortical sites contribute to this effect in hand muscles while only subcortical sites are involved in this facilitatory effect on the lower extremity. The emergence of state anxiety is the first stress response and the primary protest. Up to a certain plateau level, anxiety remains stable. Then, nature of the stress response changes and takes a biological aspect. Increased cortisol plasma levels, the secondary protest, is observed and gives evidence of an intensified and sustained stress response. Such a gradual phenomenon is particularly reported in elevated psychological distress, which is associated with loss of control [1]. Air force aircrew may be relatively vulnerable to deleterious
bruxism as well as other signs of chronic stress[7]. This in the long term can cause extensive parafunctional abusive habit and in turn severe attrition of the occlusal surface of the tooth leading to loss of enamel and dentin, hypersensitivity, loss of vertical facial dimension and temporomandibular joint syndrome.

The work environment has been reported as one of the causal factors of dental pathology. In addition, work characteristics such as irregular shift work have been connected to bruxism and therefore it seems that the military setting and especially a military aviation setting is another pathogenic factor associated with dental diseases. In this study the incidence of bruxism was more than 50% when compared to various studies in the general population being in the range of 5% to 35%[2,4]. Pilots suffering from bruxism apparently tend to use less effective coping strategies, more emotionally oriented methods and denial, less task-oriented methods. The accelerated rate of tooth attrition in this young population calls for dental and psychological preventive efforts. The preventive strategies to reduce the incidence of pathologic wear due to bruxism is firstly the conscious awareness and trying to refrain from vigorous clenching when the subject is appraised of the habit. Meditation and relaxation exercises have been found to improve coping mechanisms avoiding extensive bruxism. Occlusal splints and resilient synthetic wafers worn by the subjects during flying sorties prevent physical contact of the occlusal surfaces thus preventing wear of the enamel. The limitations of this study were the presence of various confounding factors and biases such as age, diet, built, psyche, dentition and occlusal patterns, different stress coping techniques undertaken by the subjects, functional occlusion status, etc. However, the high incidence of dental attrition amongst the subjects in a preliminary random study definitely raises the need for more extensive probing into the occurrence on a larger population with more exhaustive study parameters to exclude the mentioned biases and confounding factors.

References