Pain of Modern Age Text Neck Syndrome: A Traditional Review

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Abstract

Text Neck Syndrome (TNS), referred to as the syndrome of the 21st century, is a health problem which has the potential to affect millions globally, particularly children and adolescents. TNS occurs as a result of exposure to neck flexion with prolonged use of smart devices. This review aims to examine the mechanism, assessment and physiotherapy, and rehabilitation approaches used in the treatment of TNS. There are a limited number of studies in the literature regarding the evaluation and treatment of TNS. The evaluation of TNS requires the assessment of several parameters, including the patient's history, pain level, range of motion, and muscle stiffness. A variety of conservative treatment approaches are used for TNS treatment, including physiotherapy, rehabilitation techniques, pharmacological intervention, rest, and patient education. The findings of the studies indicate that physiotherapy and rehabilitation approaches, including neck stabilization, low-load endurance, cervical range of motion, posture-oriented exercises, and stretching techniques, are effective in reducing TNS symptoms. Further studies are needed to establish the optimal treatment of TNS.

Keywords: Text neck syndrome, forward head posture, neck pain, posture, physiotherapy, smartphone use.

Modern Çağın Ağrısı Metin Boyun Sendromu: Geleneksel Derleme

Öz

Metin Boyun Sendromu (TNS), 21. yüzyılın sendromu olarak adlandırılan, başta çocuklar ve ergenler olmak üzere dünya çapında milyonlarca kişiyi etkileme potansiyeline sahip bir sağlık sorunudur. TNS, uzun süreli akıllı cihaz kullanımı ve boyun fleksiyonuna maruz kalmanın bir sonucu olarak ortaya çıkmaktadır. Bu derlemenin amacı, TNS'nin mekanizmasını, değerlendirmesini ve tedavisinde kullanılan fizyoterapi ve rehabilitasyon yaklaşımlarını incelemektir. TNS'nin değerlendirilmesi ve tedavisi ile ilgili literatürde sınırlı sayıda çalışma bulunmaktadır. TNS' nin değerlendirilmesi, hastanın öyküsü, ağrı seviyesi, hareket açıklığı ve kas sertliği gibi bir dizi parametrenin değerlendirilmesini gerektirir. TNS tedavisi için fizyoterapi ve rehabilitasyon teknikleri, farmakolojik ajanlar, dinlenme ve hasta eğitimi dahil olmak üzere çeşitli konservatif tedavi yaklaşımları kullanılmaktadır. Çalışmaların sonuçları, boyun stabilizasyonu, düşük yoğunluklu endurans egzersizi, servikal hareket açıklığı egzersizleri, postür odaklı egzersizler ve germe teknikleri dahil olmak üzere fizyoterapi ve rehabilitasyon yaklaşımlarının TNS semptomlarını azaltmada etkili olduğunu göstermektedir. TNS'nin optimal tedavisini belirlemek için daha fazla çalışmaya ihtiyaç vardır.

Anahtar Sözcükler: Metin boyun sendromu, ileri baş postürü, boyun ağrısı, postür, fizyoterapi, akıllı telefon kullanımı.

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Introduction

Neck pain, which has multiple potential causes, is a significant public health issue in modern society[1]. The World Health Organization (WHO) has identified neck pain as the fourth leading cause of disability among all health problems[2]. Neck pain has a significant impact on global disability, as it leads to increased treatment costs, decreased productivity, and delays in returning to work[3]. Epidemiological study data evaluating the general population indicate that the one-year incidence of neck pain can reach up to 40%[4]. Furthermore, according to the WHO Global Burden of Disease neck pain ranks eighth as a cause of disability for individuals with any health issue between the ages of 15-19[5]. Research shows that 73% of university students and 64.7% of home workers experience neck or back pain, and 39.2% of these individuals reported to be less productive due to neck pain[6,7].

Although numerous factors contribute to the development of neck and back pain, the increasing integration of technology into daily life and the increased utilisation of mobile phones have led to the emergence of a new condition, known as 'text neck syndrome' (TNS). Referred to as the syndrome of the 21st century, TNS is defined as an overuse injury of the cervical vertebrae caused by repeated stress resulting from incorrect posture during use of mobile devices, primarily personal computers and smartphones[5–8]. The term TNS was initially proposed by Dr. Dean L. Fishman, an American chiropractor, to describe a range of complaints associated with the use of smart devices, particularly observed in children and adolescents[5]. The improvement of mobile technology has led to an increase in the number of individuals engaging in prolonged periods of forward head posture while using handheld devices, including smartphones, computers, tablets, and e-readers. It is estimated that approximately 75% of the global population spends hours every day in this position[8,9]. Especially children and adolescents spend an average of five to seven hours per day on mobile devices with the head tilted forward for reading, texting, and leisure activities. This cumulative load is equivalent to an average of 76-106 days per year and may have serious implications[10].

Due to the widespread use of smart devices that have emerged in the modern era TNS has been labelled the "pain of the modern age"[11]. Given the extensive use of these devices and their early adoption by younger age groups, it is believed that TNS has the potential to impact millions worldwide[8]. Despite the perception that TNS is mainly a childhood or adolescent disorder, Vate-U-Lan et al.[12] suggest that TNS could affect individuals of all ages with excessive smart device use. In this context, the objective of this review was to examine all aspects of TNS from the physiotherapist's point of view.

Biomechanical Changes Due to Text Neck Syndrome

The weight of the head on the spine significantly increases with neck flexion[10]. The adult head weighs approximately 5 kilograms (kg) and in the neutral position applies a force of between 4.5 and 5.5 kg on the neck muscles[8,10]. Forces on the neck structures reach 12 kilograms with 15° of cervical flexion, and more than twice the load is applied to the cervical spine compared to the neutral position. Furthermore, the load of head weight increases to 18.14 kilograms at 30° cervical flexion, 22.23 kilograms at 45° cervical flexion, and exceeds five times at 60°, reaching 27.22 kilograms[10]. Barrett et al.[13] showed

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that long-term exposure to flexion movement will increase compression loads by twofold in the entire cervical region and fourfold in the anterior part. In addition to the increased load on the cervical muscles with neck flexion, prolonged and static loading may have a negative effect on the cervical ligaments, tendons, and bone structures. As a result, changes in posture can lead to discomfort in the cervical region and associated anatomical structures[14].

Forward head posture (FHP) has the potential to induce muscular imbalances, characterized by elongation of the anterior neck muscles alongside contraction and shortening of the posterior neck muscles[15]. For instance, the sternocleidomastoid (SCM) muscle exerts a significant force to hold the head upright in individuals who maintain FHP over an extended period, which consequently leads to the shortening and weakening of the muscle. By causing changes in the center of gravity of the head, FHP disrupts the balance mechanisms. This impairment in balance mechanisms is not limited to the head and neck region; it also affects the postural control of the trunk and the whole body[16]. Similarly with FHP the distance between the suprasternal notch and the mandible increases, which results in infra-supra hyoid muscle weakness by pulling the mental process backwards and downwards[17].

Prolonged incorrect posture can result in impairment of all four postural quadrants (head and cervical spine, upper limbs, lower limbs, lumbar spine and pelvis). This phenomenon can be attributed to forward displacement of the center of gravity with FHP, resulting in thoracic kyphosis and increased lordosis of the lumbar vertebrae[16].

Risk Factors

Although the underlying mechanism of TNS can be explained by biomechanical processes, there is a deficit of literature regarding risk factors and related additional causes. It is well established that prolonged periods of sitting without back support during mobile device use, coupled with female gender, are significant risk factors for the development of neck and upper back/shoulder pain[18]. In their examination of the symptoms and associated factors related to TNS, Kokiwar et al. reported that the prevalence of pain in this population was significantly higher in men compared to women. The majority of individuals with TNS experience greater pain in standing in comparison to lying positions. The intensity of the pain significantly increases when the mobile device is held at the abdominal level. This phenomenon can be attributed to the direct proportional increase in the cervical flexion angle during the use of the device at lower levels[19]. In a separate study, the intensity of neck pain demonstrated a direct relationship with age and the duration of mobile device use[20].

Literature reveals that the primary factors influencing the prevalence of neck and shoulder pain associated with TNS can be grouped into three categories: the duration and frequency of mobile device use, the purpose of mobile device use and the angle of the neck in relation to the body while using the mobile device[21–23].

Clinical Manifestation and Symptoms of Text Neck Syndrome

Mechanical stress originating from the cervical region due to misuse of smart devices has the potential to cause a range of symptoms, including dysfunctional movement patterns, poor alignment, balance problems, and respiratory, circulatory, digestive, and nervous

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system dysfunction[15–17]. Furthermore, FHP may be associated with decreased range of motion (ROM), decreased quality of life, and impaired proprioception[16].

The prolonged sitting posture and static posture patterns place a load on anatomical structures, which in turn causes musculoskeletal pain[24,25]. Upper quadrant musculoskeletal pain is a common issue in children and adolescents, largely attributed to increased physical inactivity and the overuse of screen-based activities[26,27]. The prevalence of neck complaints in smartphone users varies between 17.3% and 67.8%. Among university students, the most common musculoskeletal problems encountered when using smartphones include neck (59.6%), shoulder (51.82%), and upper back (54.4%) pain[28]. A study conducted in the United States revealed that 40% of students reported experiencing neck pain or spine pain due to mobile device use[29]. Turgay et al.[30] conducted a similar study in our country, results indicated that smartphone use may be a potential risk factor for musculoskeletal symptoms, poor sleep quality, and depression.

Long-term digital screen addiction is associated with an increased risk of eye discomfort and visual problems[16,31]. Increased prevalence of eye discomfort related to digital screen use, which has also been named computer vision syndrome (CVS)[16]. The visual effects of brightness, resolution, and image quality of mobile technology devices may also contribute to the severity of CVS[16]. Studies have indicated that the most common ocular manifestations of excessive digital use include visual fatigue (12%), dry eyes (7%) and nearsightedness (3%), and that the primary contributing factor is texting in an FHP[32].

Low-frequency electromagnetic fields created by mobile phones, computers, wireless internet, and televisions is another risk factor in TNS, which can lead to sleep difficulties, dizziness, headaches, tingling in the hands, ringing in the ears, eye pain, heart conditions, electrosensitivity, low immunity and attention deficit hyperactivity disorder (ADHD)[33,34]. However, children and adolescents are often unaware of the long-term potential damage of electromagnetic fields or have insufficient understanding of this issue[5,32].

Long-term use of tablets and smartphones has the potential to negatively affect neurological development and the normal developmental process in childhood and adulthood[16]. Quality of life in adulthood can be negatively affected by disruption of the normal developmental process[5,32]. This draws attention to young people with widespread use of mobile technology and increases concern about the potential consequences of limiting their access to high levels of welfare and health support, which could result in a future characterized by pain, loss of function and disability (Table 1.) [5,32].

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Table 1. Possible Symptoms and Disorders Related to Text Neck Syndrome

Attention Deficit
Hyperactivity Disorder
Low Immunity
Electrosensitivity
Eye Fatigue
Eye Pain
Dry Eyes
Near Sightedness
Poor Posture
Poor Balance
Decreased Range of Motion
Reduced Proprioception
Incorrect Body Alignment
Dysfunctional Movement Patterns
Jaw Pain
Temporomandibular Joint Dysfunction
Dizziness
Ringing in The Ears
Shoulder Tension
Arm and Forearm Pain
Carpal Tunnel Syndrome
Tingling in The Hands
Cervical Sensorimotor Control Disorders
Neck Pain
Cervical Spatial Change
Headaches and Migraines
Difficulty Sleeping
Psychological Problems

Assessment of Text Neck Syndrome

The patient's history is significant in both the evaluation and the treatment planning process. When a patient presents to the clinic with neck pain, the initial steps are to take a patient history and perform a physical examination. A comprehensive patient history should include an assessment of various factors, including medical history, family history, exercise and dietary habits, and the specific symptoms presented. The scope of the physical examination includes the evaluation of postural disorders and lesions in the neck. Furthermore, it is important to palpate for any areas of muscle stiffness and to identify any sensitive areas during physical examination. Another vital component of the assessment is pain evaluation. If there are indicators of more serious causes of neck pain, such as nerve root compression, fracture, or a serious underlying medical condition

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during the patient history and physical examination, further diagnostic imaging methods and other tests should be employed[35].

One of the most significant challenges in the diagnosis of TNS is the lack of clearly defined diagnostic criteria[36]. X-ray and magnetic resonance examinations are reported to be normal in the majority of individuals with TNS and an FHP[37]. Vijayakumar et al.[38], emphasized that the presence of three or more of the following symptoms in individuals with mobile device use for three hours or more daily should be considered as TNS; neck pain, back pain, shoulder pain, headache, insomnia, tingling, and numbness in the hands. From a different perspective, Sarraf et al.[39] suggested that the presence of TNS can be detected by photographing the neck postures of individuals in four different positions during ten minutes of phone use. Damascano et al.[40] developed a reliable special visual method that includes self-assessment of the individual to define text neck posture. In this method, patients are presented with four different photographs and asked to indicate in which posture they use mobile devices the most in their daily. In addition to these TNS-specific assessment strategies, it is also necessary to evaluate the patient's pain, posture, grip strength, range of motion, and mobile device usage habits[36].

Physiotherapy and Rehabilitation Approaches in Text Neck Syndrome

Given that TNS is not a pathology that requires surgical intervention, it is recommended that preventive and conservative treatment approaches be employed[39]. The conservative approach to the treatment of text neck involves patient education, the use of pharmacological agents, and physiotherapy and rehabilitation practices. Physical therapy and rehabilitation approaches used in reducing the symptoms of acute TNS include warm-up exercises, rest, cold or hot applications, classical massage techniques, postural correction techniques, and lifestyle changes. In addition to physiotherapy and rehabilitation techniques, drug therapy, injections and acupuncture may be beneficial for chronic TNS symptoms[8]. Therapeutic approaches such as low-load endurance training, scapular muscle retraining, and strengthening and stretching exercises have also been demonstrated to contribute to improvement in neck pain by creating major changes in the craniovertebral angle[16,41].

Nathani et al.[42] conducted a study involving 54 individuals with TNS investigating the effects of a personalized physiotherapy program consisting of three sets of 10 repetitions of cervical range of motion and trapezius muscle stretching exercises, in addition to thumb metacarpophalangeal joint mobilization. The results of this study showed improvement in general health status by reducing pain intensity and neck disability level in individuals with TNS and smartphone addiction. A further study compared the efficacy of neck stabilization exercises with contrology training in TNS. The findings demonstrated that neck stabilization is more effective than contrology training in increasing the craniovertebral angle, the ROM of the cervical spine and reducing pain intensity[43].

Farooq et al.[44] concluded that the Elongation Longitudinaux Avec Decoaption Osteo-Articulaire (ELDOA) method and post-facilitation stretching are effective in the treatment of both neck pain and functional disability. In addition of these results, the ELDOA method, which is based on the principle of maintaining certain postures for one minute, aimed at strengthening and decompression of the spine, proved to be more

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effective than post-facilitation stretching for neck pain and functional disability in patients with TNS.

Sarraf et al.[39], demonstrated that the Self-Management Corrective Exercises protocol, applied to the deep cervical flexor and scapulothoracic muscles, was an effective method for reducing pain intensity in university students with TNS and smartphone addiction. Furthermore, it is established that posture-oriented exercises, such as Pilates and yoga, are protective against TNS, which has deleterious effects on the younger population by fostering dependency and disability[38]. The results of the study by Shah et al.[41] which demonstrated that the combination of Pilates with a conventional exercise program was more effective than the conventional exercise program alone in reducing both neck pain and disability, as well as in improving muscle strength and endurance supports this view.

Prevention Strategies

Prolonged static neck flexion results in increased stress on the cervical spine. This increased stress on the cervical spine may lead to early degeneration, which may cause developmental, social, and psychological complications. Although it is challenging to abstain from the use of mobile devices in the 21st century, children and adolescents should refrain from prolonged neck flexion for several hours each day and continue their daily activities by maintaining a neutral spinal alignment[45–47].

The implementation of effective prevention strategies is of critical importance in the context of TNS. In terms of prevention strategies, the education of families and the compliance of families with such prevention programs are as important as that of children and adolescents. Regarding this subject, the Italian Paediatric Society recommends that parents educate their children about the positive and wise use of mobile technology and provides some recommendations to parents. Furthermore, the Association recommends the "understand-learn-control" method for the appropriate use of mobile devices. In this method, parents are expected to gain an understanding of the current use of technology, both by empathizing with their children and by playing games with them to help them control their screen time. Furthermore, it is recommended that parents establish clear limitations and guidelines regarding the duration of mobile device usage and that they educate their children about the potential risks associated with such technology, providing specific examples to illustrate these risks[48].

Another recommendation regarding screen time is that children under the age of two should not use electronic media, and that children between the ages of two and five should be permitted a maximum of one hour of screen exposure per day[49]. Excessive use of mobile devices, particularly in children and adolescents, should be avoided, and frequent breaks should be taken during screen time. Ergonomic strategies should be employed to minimize the stress on the head, neck and upper extremities during the use of smartphones, tablets and personal computers. Prolonged keyboard use and high repetition of scrolling movements with the mouse should be avoided. In addition to this, large and heavy mobile devices should not be held in one hand for extended periods[50].

In parallel with the increase in the duration of mobile technological device use in children, young people, and adolescents, it is important to inform physiotherapists

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regarding the development and characterization of TNS for effective prevention. Finally, individuals should be trained by a physiotherapist in inappropriate exercise programs[16].

Conclusion

Text neck syndrome, a condition that has the potential to affect millions of people worldwide, develops as a result of biomechanical changes due to excessive smart device use. Assessment methods for TNS include personal history, physical examination, and postural evaluation. It is recommended that the positive effects of exercise approaches, which are the most effective methods for the treatment of TNS, be utilized to minimize the negative effects on the normal development process, and minimize pain and loss of function. To prevent TNS, it is essential that families are informed about the correct use of smartphones and other smart devices in an appropriate, ergonomic posture. Similarly, it is vital that physiotherapists are informed regarding the assessment and treatment of TNS. Finally, individuals with TNS should receive instruction on how to implement personalized exercise programs.

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