BO‘YIN VA BOSH MUSHAKLARI, CHAYNOV VA MIMIKA MUSHAKLARI, ULARNING YOSHGA BOG‘LIQ XUSUSIYATLARI

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Annotatsiya. *Bo‘yin va bosh mushaklari inson yuz va bo‘yin strukturalarining harakatini ta’minlaydigan murakkab anatomo-funksional tizimni tashkil etadi. Ushbu mushaklar ikki asosiy guruhga bo‘linadi: chaynov mushaklari (masalan, sternokleidomastoid, trapezius) va mimika mushaklari (masalan, orbikulyaris oris, zygomaticus major/minor, frontalis). Chaynov mushaklari bosh va bo‘yning postural barqarorligini, bosh harakatlarini va nafas olish jarayonlarini ta’minlaydi, mimika mushaklari esa hissiy ifodalarni hosil qiladi va kommunikatsiyada muhim rol o‘ynaydi. Yosh o‘tishi bilan mushaklarning tonusi, elastikligi va morfometriya ko‘rsatkichlari o‘zgaradi; bu esa yuz ifodalari va bo‘yin harakatlarining o‘zgarishiga olib keladi. Ushbu ish bo‘yin va bosh mushaklarining anatomik xususiyatlari, ularning yoshga bog‘liq transformatsiyalari va klinik ahamiyati haqida tizimli ma’lumot beradi.*

Kalit so‘zlar: *bo‘yin mushaklari, bosh mushaklari, chaynov mushaklari, mimika mushaklari, yoshga bog‘liq o‘zgarishlar, morfometriya, yuz ifodalari, postural barqarorlik, elastiklik, anatomik tahlil*

МЫШЦЫ ШЕИ И ГОЛОВЫ, ШЕЙНЫЕ И МИМИЧЕСКИЕ МЫШЦЫ, ИХ ВОЗРАСТНЫЕ ОСОБЕННОСТИ

Аннотация. *Мышцы шеи и головы формируют сложную анатомо-функциональную систему, обеспечивающую движения лица и шеи. Эти мышцы подразделяются на две основные группы: шейные мышцы (например, грудино-ключично-сосцевидная, трапециевидная) и мимические мышцы (например, orbicularis oris, zygomaticus major/minor, frontalis). Шейные мышцы поддерживают постуральную стабильность головы и шеи, обеспечивают движения головы и участвуют в дыхательном процессе, тогда как мимические мышцы формируют эмоциональные выражения и играют важную роль в невербальной коммуникации. С возрастом тонус, эластичность и*

морфометрические характеристики этих мышц изменяются, что влияет на мимику лица и подвижность шеи. Настоящая работа предоставляет систематическую информацию об анатомических особенностях мышц шеи и головы, их возрастных трансформациях и клиническом значении.

Ключевые слова: *мышцы шеи, мышцы головы, шейные мышцы, мимические мышцы, возрастные изменения, морфометрия, мимика, постуральная стабильность, эластичность, анатомический анализ*

NECK AND HEAD MUSCLES, CERVICAL AND FACIAL (MIMETIC) MUSCLES, AND THEIR AGE-RELATED CHARACTERISTICS

Article. *Neck and head muscles constitute a complex anatomical and functional system responsible for head and facial movements. These muscles are categorized into two main groups: cervical muscles (e.g., sternocleidomastoid, trapezius) and mimetic muscles (e.g., orbicularis oris, zygomaticus major/minor, frontalis). Cervical muscles maintain postural stability, facilitate head movements, and participate in respiration, whereas mimetic muscles generate facial expressions and play a critical role in nonverbal communication. With aging, muscle tone, elasticity, and morphometric characteristics change, affecting facial expression and neck mobility. This work provides a systematic overview of the anatomical features of neck and head muscles, their age-related transformations, and clinical significance.*

Keywords: *neck muscles, head muscles, cervical muscles, mimetic muscles, age-related changes, morphometry, facial expression, postural stability, elasticity, anatomical analysis*

Introduction

The muscles of the neck and head form a complex anatomo-functional system of the human body, playing an essential role in maintaining postural stability of the head and neck, enabling head movements, and creating facial expressions [1][2]. These muscles are divided into two main groups: the masticatory muscles (such as the sternocleidomastoid and trapezius) and the facial expression muscles (such as the orbicularis oris, zygomaticus major/minor, and frontalis), whose anatomical location, structural characteristics, and functional roles differ significantly [1][3]. The masticatory muscles contribute to maintaining postural stability of the head and neck, supporting movement control, participating in respiration, and ensuring muscular coordination [2][4].

The muscles of facial expression are located in the superficial layer of the head and neck and originate from bone but insert into the skin, lacking a fascial layer. Therefore, they directly control skin movement and play a central role in producing

emotional expressions [3][5]. When these muscles contract, they create folds and characteristic facial movements on the skin surface, enabling the transmission of emotional states to others [1][6].

With aging, morphological and physiological changes occur in the muscles of the neck and head. The elasticity of the masticatory muscles, particularly the sternocleidomastoid and trapezius, decreases, whereas their tone increases; this process may be associated with fatty infiltration of muscle tissue and alterations in the extracellular matrix [2][5]. Likewise, the elasticity and contractile capacity of facial muscles diminish with age, leading to changes in facial expressions and a decline in mimetic function [4][6].

Furthermore, the topographic anatomy of the neck muscles, the fascial layers, and the morphometry of muscle fibers are sensitive to age-related transformations. For example, structural changes in the fascia nuchae and superficial cervical muscles affect their mobility and elasticity [6][7]. Studies indicate that in older individuals, particularly women, a forward head posture and increased body mass index contribute to elevated stiffness and tone of the sternocleidomastoid and trapezius muscles [4][2].

Clinically, these changes affect not only aesthetic appearance but also postural and motor functions. Electromyographic studies show age-related alterations in the activity of the zygomaticus major and orbicularis oris muscles, as well as significant transformations in the procerus and corrugator supercilii muscles [1][5]. At the same time, the mechanical properties and mobility of the neck muscles play an important role in developing clinical rehabilitation and preventive strategies [3][7].

Overall, studying the anatomical, morphometric, and functional characteristics of the neck and head muscles in the context of aging is crucial not only from medical and aesthetic perspectives but also for developing strategies to maintain postural stability and muscular function [2][6]. This article provides a systematic and scientific overview of the anatomical structure of the neck and head muscles, as well as age-related transformations of the facial and masticatory muscles.

Materials and Methods

The primary objective of this study was to determine the anatomical structure, morphometric parameters, and age-related transformations of the muscles of the neck and head. Human subjects and anatomical specimens were selected for the research. For macroscopic analysis, head and neck specimens fixed in formalin were used. In addition, healthy subjects were selected according to age groups, allowing morphological and functional assessment of age-related changes.

During macroscopic examinations, the anatomical location, points of origin and insertion, fiber orientation, and fascial connections of the sternocleidomastoid, trapezius, orbicularis oris, zygomaticus major and minor, frontalis, and other facial

muscles were identified. Muscle length, thickness, and surface area were measured using morphometric instruments.

For microscopic analysis, muscle tissues were prepared using histological staining techniques. This analysis allowed the identification of muscle fiber density, thickness, fatty infiltration, and characteristics of the extracellular matrix. Immunohistochemical methods were used to differentiate fiber types and assess elasticity parameters.

Additionally, surface electromyography (sEMG) was used to evaluate the functional characteristics of the facial and neck muscles. This method enabled the measurement of muscle contractility, tone, and activity levels. Parameters were compared across age groups, which made it possible to identify age-related differences.

Radiological imaging techniques (MRI and DTI) were also used to visualize the internal structure of the neck and head muscles, the orientation of muscle fibers, and their relationship with surrounding tissues. These methods allowed the study of muscle morphology both in vivo and postmortem.

All measurements and analyses were processed using statistical software, and age-related morphometric and functional characteristics were identified. The effects of age, sex, and body mass index on muscle properties were also evaluated.

Results and Discussion

The results of the study revealed that the tone of the sternocleidomastoid and trapezius muscles increases with age, while their elasticity decreases. These changes are explained by fatty infiltration of muscle tissue and transformations within the extracellular matrix. In facial muscles—particularly the zygomaticus major and orbicularis oris—age-related reductions in elasticity and contractile capacity were observed, leading to notable alterations in facial expressions and diminished mimetic function.

Morphometric analyses demonstrated that the length and thickness of the neck muscles change with age; these alterations affect postural stability and head movements. Microscopic examinations showed an age-related decline in muscle fiber density and morphological integrity, as well as an increase in collagen fibers, which contributes to greater muscle stiffness.

Functional assessments using surface electromyography (sEMG) indicated that the contractile activity of the masticatory muscles remains relatively stable with age, whereas facial muscles exhibit a significant decline. This finding corresponds to the age-related weakening of facial expressions and a reduction in the range of mimetic movements.

Radiological imaging results confirmed age-related transformations in muscle fiber orientation and density. MRI and DTI analyses revealed detailed changes in the internal morphology of the muscles and their integration with surrounding structures.

Additionally, the effects of body mass index and head posture on muscle mechanical properties were identified: a higher BMI and forward head posture were associated with increased stiffness and tone of the sternocleidomastoid and trapezius muscles.

Overall, the findings demonstrate that the anatomical and functional characteristics of the neck and head muscles undergo complex age-related changes. These transformations affect not only aesthetic and mimetic functions but also postural stability and motor performance, highlighting the importance of considering them in rehabilitation and preventive strategies.

Conclusions

The muscles of the neck and head form a complex anatomo-functional system that plays a central role in maintaining postural stability of the head and neck, coordinating movements, and generating facial expressions. The findings of the study showed that the elasticity of the masticatory muscles decreases with age, while their tone increases, significantly influencing postural stability and head movements. In facial muscles, age-related reductions in contractile capacity lead to a narrower range of facial expressions and a weakening of emotional expressiveness.

Furthermore, morphometric and microscopic analyses revealed changes in muscle fiber density, fatty infiltration, and collagen fiber distribution, all of which determine the mechanical and functional properties of the muscles. Functional and radiological assessments provided opportunities to identify not only the aesthetic but also the clinical and postural aspects of age-related changes.

Overall, the age-related transformations of the neck and head muscles require a comprehensive examination of their anatomy, morphology, and function as an integrated system. These findings hold practical significance for developing rehabilitation, preventive, and aesthetic interventions.

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