Review Article
Volume 12:2, 2021

Journal of Forensic Research

ISSN: 2157-7145

Open Access

A Review on Homologous Relations in Muscle Forms: Result of Phylogeny between Reptiles and Man

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Abstract

The biological diversity of vertebrates is uniquely significant to the concept of phylogeny. Phylogeny is a branch of evolutionary biology that studies the evolutionary relationships between certain organisms. Reptiles and mammals are said to share the same evolutionary ancestry called the amniotic-egged ancestor. This ancestor is divided into two groups; sauropsids (reptiles) and the synapsids (mammals). According to some authors, the broadest group of the reptilian family is the sub-class Squamata. Examples of animals within this sub-class include, lizards, crocodiles, snakes and amphisbaenians. However, man (*Homo sapiens*) belonging to the primate class, are the most intelligent and complex of all mammals.

Keywords: *Homo sapiens* • Mammals • Phylogeny

Introduction

This article seeks to review the homologous relationships in muscle phylogeny between the reptiles and primates (in particular, Homo sapiens), thereby analyzing the basis for morphological changes that could have occurred during the evolutionary process. One of the major challenges that have been encountered by various anatomists and biologists is having a uniformity in the homologous arrangement of muscles in vertebrate groups. This is to say that there are certain differences among authors in how they view the evolution of muscles among vertebrate species. The possible reason for this current challenge is that the position and attachment of these muscles change during evolution. For instance, the position and attachment of a muscle to the same bone or cartilage in one vertebrate may differ in origins from those of another vertebrate species.

Literature Review

In examining the phylogenic relations in the head and neck regions, the muscle, intermandibularis posterior present in reptiles is homologous to the mylohyoideus and digastricus anterior muscles in primates (Jarvik, 1963 & 1980). All three muscles play a huge role in the opening of the jaw. Morphologically in reptiles, the intermandibularis posterior attaches to the Meckel'ss cartilage to the basihyal cartilage. In humans, the mylohyoideus muscle takes origin from the mylohyoid line of the inner mandible and inserting on the hyoid bone while the digastricus anterior muscle attaches to the digastric fossa on the base of the mandible. In *Homo sapiens*, both muscles are closely united anatomically as they share a common embryological origin, the first pharyngeal arch [1]. The morphological orientation of the reptilian mandible had evolved to a more depressed form in primates, simultaneously causing the hyoid bone to change its shape from a less thinner, slightly V-shaped to a thicker, cortical H-shaped hyoid found in primates. As a result of this evolutionary change, the mandible in primates played a unique role in swallowing and speech making [2].

The muscle, adductor mandibulae (A2) found in most reptiles share a homologous characteristics with the masseter muscle found in primates. They both act in elevating the mandible. With respect to the tensor tympani in primates, this muscle is synapomorphic with the pterygomandibularis muscle in reptiles [3,4]. It is believed that the evolutionary change of these muscles was aided by the disappearance of the quadrate and articular bones (both forming parts of hinge jaw in reptiles) – subsequently evolving in primates to form the incus and malleus, bones of the middle ear. In primates, as a result of this phylogenic process, the existence of a temporomandibular joint is clearly defined unlike in reptiles where there is no articulaton between the temporal bone and the mandible.

A study by Gasser showed that the stylohyoideus muscle in humans, partly along with the digastricus posterior are derivatives of the depressor mandibulae in reptiles while stapedius muscle is homologous to the levator hyoideus in reptiles. A study by Joufroy and Saban in 1971 has shown that the cervico-mandibularis muscle in reptiles such as lizards, is homologous to the platysma myoides present in humans while the hyobranchialis in reptiles evolved to stylopharyngeus in humans. The stylopharyngeaus in humans originate from the styloid process (formed from the second hyoid arch). This arch is closely related to this arch. Both the hyobranchialis and stylopharyngeus are innervated by the glossopharyngeal nerve (CN-IX), which further supports their homology. Finally, the dilator laryngis in most reptiles is believed to have evolutionarily modified into the cricoarytenoideus posterior in humans. The cricothyroideus is a pharyngeal, not a laryngeal muscle.

Discussion

According to a review done, it is of their belief that humans have fewer mandibular muscles than reptiles such as lizards [4]. In the pectoral region of these reptiles, there were notable muscles which evolved into more specialized muscles in humans. The sternocoracoideus in reptiles is homologous to the subclavius muscle in humans, supracoracoideus changed to the infraspinatus, deltoideus scapularis and deltoideus clavicularis became a more specialized deltoid in man, while the subcoraco scapularis became the subscapularis in humans [4,5]. Although, some muscular features that both reptiles and man only share among the vertebrate species as a result of similarities within their skeleton are the trapezius and the sternocleidomastoid muscles [6-10].

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Received 18 January, 2021 ; **Accepted** 27 January , 2021; **Published** 04 Febraury , 2021

Conclusion

Within the forelimb region of reptiles, the fexor digitorium longus is homologous to the fexor digitorium profundus in humans, the fexor breves profundi evolved in humans into the interossei palmares. Also, there were evolutionary changes in the musculature of the extensor group of forelimb region. The extensor antebrachii et carpi radialis in reptiles became the extensor carpi radialis longus while the extensor antebrachii et carpi ulnaris evolved into extensor carpi ulnaris in man. However, some of the unique similarities in muscular architecture between both vertebrate species include, biceps brachii, brachialis, palmaris longus, pronator teres, lumbricales, abductor pollicis longus and brevis muscles.

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How to cite this article: Oghenefego Michael Adheke. “Homologous Relations in Muscle Forms as a Result of Phylogeny between Reptiles and Man: A Review” *J Forensic Res* 11 (2020) 12:464.