MUSCULATURE ORIGINATING FROM THE LATERAL EPICONDYLE OF THE HUMERUS LITERATURE REVIEW

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ABSTRACT

The literature review of the present study demonstrated that the musculature that originates from the lateral epicondyle of the humerus is of complex architecture and still difficult to understand in its entirety. Through the analysis of articles from the last five years, we concluded that the muscles that have their origin there may present anatomical variations of 0.36% to 35% in muscle and/or tendon structure. Reports describe four other muscles that did not exist in classical architecture that may be present in this region. This is of paramount importance in the surgical programming of this region, aiming at its integral composition and possible variations.

Keywords: Epicondyle. Lateral. Humerus. Anatomy.

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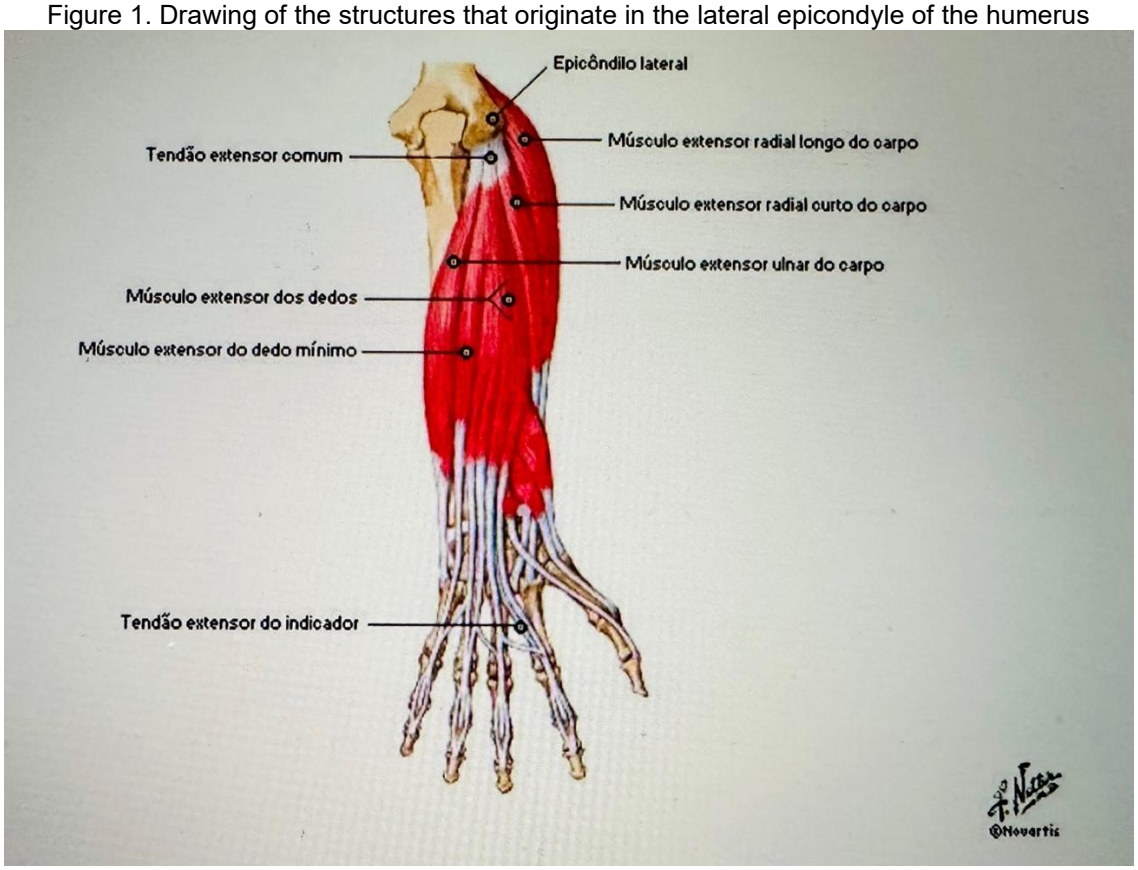
INTRODUCTION

The lateral epicondyle of the humerus is an anatomical landmark where the extensor and supinator muscles originate, that is, muscles that perform extension movements, both in the radiocarpal joint and in the metacarpophalangeal joints, abduction and adduction of the hands and fingers. (MOORE, 2024) (Figure 1)

Figure 1. Drawing of the structures that originate in the lateral epicondyle of the humerus



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We will verify, through a literature review, the specific composition of the lateral epicondyle of the humerus by analyzing the number of structures in this region.

In this context, the objectives of this work were:

- Collection of classic and contemporary literature that deals with the theme.
- Identification of how many and which components make up this anatomical set/region.

METHODOLOGY

The methodology of choice for the following research was a bibliographic review with an exploratory approach.

For Marconi and Lakatos (2019), bibliographic reviews are intended to put the researcher in direct contact with everything that has been written, said or filmed on the subject. Not being a mere repetition of the subject, but providing analysis of the theme from another perspective or approach, to reach new conclusions.[3]

After choosing the theme and preliminary research, a targeted research was carried out through a bibliographic survey, using the following databases: LILACS (Latin American and Caribbean Literature in Health Sciences), MEDLINE (Medical Literature Analysis and Retrieval System Online), SCIELO (Scientific Electronic Library Online), PUBMED (International Literature in Health Sciences). Thus, the characteristics of the research were defined to then discuss, interpret and present the results achieved.

The guiding question was: Are there variations in its composition?

For a bibliographic review of the theme, searches were carried out in printed bibliographies and digitized articles. The Anatomical Laboratory of the University of Contestado (UNC) was also used to complement and analyze "in loco" its structures.

The articles were collected until March 2025, preferably up to 5 years old, surveying works specifically related to the proposed theme and resulted in 10 articles.

In them, a pattern was perceived in the problem addressed, that is, the authors also had the same doubt as in the present study with the object of the research.

Understanding this subject is of great importance for physicians and professionals who work in both the field of orthopedics and radiology.

HISTORY

According to Tatsuo Sakai (2007) in his revisional article "Historical evolution of anatomical terminology from a scientific to modern" the history of *anatomical nama* can be divided into five stages.

The first is represented by the oldest extant anatomical treatises by Galen of Pergamon in the Roman Empire, where he used a limited number of anatomical terms that were essentially colloquial words in the Greek of that period. (Lydiatt, D. D.; Bucher, G. S., 2010 and Nutton, V., 2012)

The second stage, Andreas Vesalius in the early sixteenth century described anatomical structures in his book De Humani Corporis Fabrica Libri Septem known as the first modern book of anatomy, which presented magnificent details and illustrations, although he did not coin substantially any anatomical terms he developed a system that distinguished anatomy structures with ordinal numbers, Andreas Vesalius was considered, while still alive, as the creator of modern anatomy. (Lydiatt, D. D.; Bucher, G. S., 2010)

The third stage at the end of the sixteenth century he calls being marked by a great innovation in the development of specific anatomical terms, especially muscles, vessels and nerves. Thus marking a great advance in the anatomical nomina. The main figures were Jacobus Sylvius in Paris and Gaspard Bauhin in Basel, Switzerland. (Lydiatt, D. D.; Bucher, G. S., 2010 and Nutton, V., 2012)

Between Bauhin and international anatomical terminology, many anatomy textbooks were written mainly in Latin in the seventeenth century, and in modern languages in the eighteenth and nineteenth centuries. (Lydiatt, D. D.; Bucher, G. S., 2010)

Faced with the diverse terminology in numerous anatomical forms and books, anatomists came together to try to create terms that were logically consistent, intelligible in themselves, clear in meaning and compact in form. (Sakai, T., 2007 and Lydiatt, D. D.; Bucher, G. S., 2010)

It took six years to arrive at the establishment of guidelines and it was at the ninth conference of the AnatomischeGessellschaft held in Basel, Switzerland that the international anatomical terminology in Latin was published as Anatomical Basel Nomina. It is important to note that each country could have the freedom to translate the official Latin terms into its own language for teaching purposes. The anatomical Basel Nomina was not a new terminology, but rather a careful selection of existing names, the product of an international group of anatomists working together. (Lydiatt, D. D.; Bucher, G. S., 2010 and O'Rahilly, R., 1989)

As science progressed, the terminology was revised several times until the current Anatomical Terminology, both in Latin and English. The first English-language edition of the Eycleshymer, published in 1917, records the results of the work at the Basel Conference. In the preface, it states that they searched from 50,000 names to 5,000 structures, reducing them to 5,000. They did so, and currently, the convention has had several subsequent editions that counts 7,000 terms. (Sakai, T., 2007 and Lydiatt, D. D.; Bucher, G. S., 2010)

RESULTS AND DISCUSSION

The posterior compartment of the forearm is composed of the extensor muscles (name of the muscles), that is, muscles that perform extension movements, both in the radiocarpal joint and in the metacarpophalangeal joints, abduction and adduction of the hands and fingers. (Moore, 2024)

Extensor Carpi Longus Radialis Muscle

The extensor carpi radialis longus muscle is responsible for performing the extension and abduction movements of the hand in the radiocarpal joint, as well as being activated during the wrist-clenching dynamics. It originates in the lateral epicondyle of the humerus, more specifically in the lateral supraepicondylar crest of the humerus, and inserts on the dorsal aspect of the base of the second metacarpal. (Moore, 2024)

Regarding the anatomical variations of the extensor radialis muscles of the wrist, a study presented distinct variants that demonstrate an incidence rate of 12% to 35% in the population. This report describes the discovery of an additional tendon of the extensor carpi radialis longus muscle. From this perspective, knowledge about these anatomical variations is essential to understand clinical cases of neuromuscular dysfunctions, lateral epicondylocopathy and nerve entrapment. (Meend, S.; Yadav, S. K., 2024)

Another report observed a new combination of anatomical variations involving the compartment of the extensor carpi radialis muscle, presenting an accessory tendon originating from the extensor carpi radialis longus and traveling through the primary tendon through the second compartment of the extensor retinaculum. In this aspect, knowledge of these muscle variations is extremely relevant to surgeons who perform tendon transfers and reconstructive procedures of the forearm. (Coello, M. A.; Coomar, L. A.; Compbell, M. A., 2024)

Extensor Carpi Radialis Brevis Muscle

The extensor carpi radialis brevis muscle, like the extensor carpi radialis longus, performs the extension and abduction movements of the hands. It originates in the lateral epicondyle of the humerus and inserts on the dorsal aspect of the base of the third metacarpal. (MOORE, 2024)

Regarding the anatomical variations of the extensor radialis muscles of the wrist, a study presented distinct variants that demonstrate an incidence rate of 12% to 35% in the population. Report describes the discovery of an additional tendon of the extensor carpi radialis brevis muscle. From this perspective, knowledge about these anatomical variations is essential to understand clinical cases of neuromuscular dysfunctions, lateral epicondylocopathy and nerve entrapment. (Meend, S.; Yadav, S. K., 2024)

Another report observed a new combination of anatomical variations involving the compartment of the extensor carpi radialis muscle, addressing bilateral agenesis of the extensor carpi radialis brevis muscle. In this aspect, knowledge of these muscle variations

is extremely relevant to surgeons who perform tendon transfers and reconstructive procedures of the forearm. (Coello, M. A.; Coomar, L. A.; Compbell, M. A., 2024)

Extensor Digitorum Muscle

The extensor digitorum muscle is in charge of performing the extension of the four medial fingers in the metacarpophalangeal joints and secondarily in the interphalangeal joints. It originates in the lateral epicondyle of the humerus and inserts on the extensor expansions of the four medial fingers. (Moore, 2024)

A report describes the bilateral duplication of the extensor digitorum tendon (DE) to the second digit, which demonstrates an incidence of 3.2% in the entire population. In addition, the clinical importance of these muscles is reflected in surgical procedures for tendon reconstruction to restore hand and thumb function after trauma or rupture. (Ma, A. et al, 2021)

The study investigated the anatomy of the extensor tendons of the hand in fetuses, focusing on the ED muscle, which plays an essential role in finger movements. To do this, 86 upper limbs from 43 fetuses between 17 and 40 weeks of gestation were analyzed. The researchers performed dissection and microscopic observation to better understand how many tendons each muscle had, how they were connected, and whether there were any unusual variations. It has been found that ED can have 3 to 8 tendons, with four being the most frequent amount. The tendon of the fourth finger was the most duplicated. This type of knowledge is super useful for preventing problems still in the fetal phase, facilitating surgical corrections in cases of congenital malformation and helping doctors to interpret imaging tests correctly, avoiding confusion with tumors or cysts. (Öztürk, K. et al, 2020)

Extensor digitorum minimi muscle

The extensor digitorum minimi (MDE) muscle is responsible for performing the extension of the fifth finger at the metacarpophalangeal joint and secondarily at the interphalangeal joint. It originates in the lateral epicondyle of the humerus and inserts on the expansion of the extensor muscle of the fifth finger. (Moore, 2024)

The study investigated the anatomy of the extensor tendons of the hand in fetuses, focusing on the EDM muscles, which play an essential role in finger movements. To do this, 86 upper limbs from 43 fetuses between 17 and 40 weeks of gestation were analyzed. The researchers performed dissection and microscopic observation to better understand how many tendons each muscle had, how they were connected, and whether there were any unusual variations. The EDM had between 1 and 5 tendons. One of the interesting findings

was a rare case of MDE with five tendons, something that has never been described before in the literature. This type of knowledge is super useful for preventing problems still in the fetal phase, facilitating surgical corrections in cases of congenital malformation and helping doctors to interpret imaging tests correctly, avoiding confusion with tumors or cysts. (Öztürk, K. et al, 2020)

Another study looked at the variations of accessory tendons in the dorsal compartments of the wrist, which are key to understanding injuries and aiding in reconstruction surgeries. 14 wrists of adult cadavers were examined, identifying differences in the number, shape and insertion of extensor tendons. Among the findings, the presence of a double tendon of the extensor digitorum minimus (MDE) in one of the cadavers stood out. These anatomical differences can impact the diagnosis of certain conditions and offer alternatives to tendon grafts. The research reinforces the importance of considering these variations in surgical planning and treatment of wrist injuries. (Ogut, E.; Barut, C., 2021)

Extensor Carpi Ulnaris Muscle

The extensor carpi ulnaris muscle is responsible for promoting the extension and adduction of the hands in the radiocarpal joint, and is also active during the wrist-clenching movement. It originates in the lateral epicondyle of the humerus and inserts on the dorsal surface of the 5th metacarpal. (Moore, 2024)

Agenesis, that is, the absence of one of the superficial extensor muscles of the forearm, is quite rare. Bilateral agenesis of the extensor carpi ulnaris muscle was found in a case report. The knowledge of this anatomical variation is extremely important to orthopedic surgeons and hand surgeons, since they perform tendon transfers in case of ulnar or median nerve paralysis, as well as the treatment of dorsi ulnar diseases. In this context, the absence of the extensor carpi ulnaris muscle can cause wrist instability because the distal radioulnar joint is not supported, in addition to the functional impairment of the fifth digit of the hand and the cushioning of the radiocarpal joint. (Granite, G. et al, 2022)

Another study looked at the variations of accessory tendons in the dorsal compartments of the wrist, which are key to understanding injuries and aiding in reconstruction surgeries. 14 wrists of adult cadavers were examined, identifying differences in the number, shape and insertion of extensor tendons. A thin tendon separated from the extensor carpi ulnaris (ECU) was discovered, with a different insertion than usual. These anatomical differences can impact the diagnosis of certain conditions and offer alternatives to tendon grafts. The research reinforces the importance of considering these variations in surgical planning and treatment of wrist injuries. (Ogut, E.; Barut, C., 2021)

Other findings

Anatomical variations represent challenges to health professionals, especially surgeons. In this circumstance, a rare finding of radial intermediate carpal extensor muscles (RCIS) originating bilaterally between the extensor carpi radialis longus (RCCE) and brevis (RCTE) muscles, two RCIS muscles that performed a deep trajectory to the RCT with two separate tendons, an RCIT muscle positioned between the RCT and the RCB. Thus, the knowledge of these anatomical variations is of paramount importance to avoid incorrect diagnoses and problems in the treatment of injuries to the muscles involved. (Oheneba, B.; Yue, F. L., 2023)

This study investigates unusual anatomical variations in the extensor muscles of the forearm. He found an additional muscle called the extensor propria digiti medio (EMP), whose tendon traveled an irregular path, passing through the second extensor compartment. Two muscles acting on the index finger were located: one of them was the extensor index and common middle (IMT**),** with three tendons (two for the index finger and one single for the middle finger), and another extensor index tendon with non-standard development. These modifications can be important for doctors and surgeons, as they can lead to misdiagnoses of wrist pain and increase the risk of injury during hand surgeries. In addition, the paper examines the relevance of the embryonic development of these variations and explores the possibility that certain muscles are inheritances of evolution. (Vaida, M. A. et al, 2020).

In this study, he identifies a rare accessory muscle, known as the Extensor Digitorum Brevis (EDBM). It was inserted in the tendon of the extensor index index (IS), which demonstrated a typical structure. Modifications such as this exhibit a frequency of only 0.36-0.38% in cadaver studies. Understanding these anatomical variations is very important for orthopedists and plastic surgeons, thus avoiding iatrogenic injuries during on-site procedures. (Piagkou, M. et al, 2024)

Another study evaluates a muscle with variation called the Extensor Digitorum Brevis (EDBM), observing its presence and particularity in different populations. We analyzed 31 studies involving 9,686 hands, and the overall occurrence rate of EDBM was estimated at 1.96%. This muscle can insert essentially on the index finger, sometimes on the third finger, and interact with the extensor index (IE) muscle. Although its presence is usually asymptomatic, some people may feel pain and swelling on the back of the hand, especially workers who repeat movements on a daily basis. This can lead to misdiagnoses, as EDBM can be fooled with dorsal ganglia of the wrist. In addition, the study highlights the clinical importance of this muscle for hand surgeons, who must know it to avoid misdiagnosis and

improper measurements. Techniques such as MRI and ultrasound can help identify it correctly. (Triantafyllou, G. et al, 2024)

As a didactic summary, we express the review of this bibliographic research in the exposition of Chart 1 below:

MUSCULATURE ORIGINATING IN THE LATERAL EPICONDYLE	CLASSICAL ANATOMY	BIBLIOGRAPHIC SURVEY
Extensor Carpi Longus Radialis Muscle	Unique	- Additional tendon
Extensor Carpi Radialis Brevis Muscle	Unique	- Additional tendon - Bilateral absence
Extensor Digitorum Muscle	1 belly 4 tendons	- 2 wombs - 3 to 8 hamstrings
Extensor digitorum minimi muscle	Unique	- From 2 to 5 tendons
Extensor Carpi Ulnaris Muscle	Unique	- Bilateral absence - Atypical insertion
Extensor Radialis Medius Muscle	It didn't exist	Recent report
Extensor Proprius Muscle of the Middle Finger	It didn't exist	Recent report
Extensor Digitorum Brevis Muscle	It didn't exist	Recent report
Extensor Digitorum Brevis Muscle	It didn't exist	Recent report

Chart 1: Comparison of Classical Anatomy with current bibliographic survey

CONCLUSION

The literature review of the present study demonstrated that the musculature that originates from the lateral epicondyle of the humerus is of complex architecture and still difficult to understand in its entirety.

Through the analysis of articles from the last five years, we concluded that the muscles that have their origin there may present anatomical variations ranging from 0.36% to 35% in muscle and/or tendon structure.

Reports describe four other muscles that did not exist in the description of classical architecture can be found in this region.

This is of paramount importance in the surgical programming of this region, aiming at its integral composition and possible variations.

REFERENCES

1. Coello, M. A., Coomar, L. A., & Campbell, M. A. (2024). Unique bilateral variation of the extensor carpi radialis longus: A case report. Journal of Functional Morphology and Kinesiology, 9(2), 109. https://doi.org/10.3390/jfmk9020109

2. Granite, G., Smith, J., & Jones, R. (2022). Bilateral agenesis of the extensor carpi ulnaris muscle of a 70-year-old white male donor. Journal of Surgery, 7, 1470. https://doi.org/10.29011/2575-9760.001470

3. Lydiatt, D. D., & Bucher, G. S. (2010). The historical Latin and etymology of selected anatomical terms of the larynx. Clinical Anatomy, 23(2), 131–144. https://doi.org/10.1002/ca.20912

4. Ma, A., Wang, H., & Zhang, L. (2021). Point in a different direction: A case of bilateral absence of extensor indicis. Folia Morphologica, 81(2), 520–525. https://doi.org/10.5603/FM.a2021.0026

5. Marconi, M. A., & Lakatos, E. M. (2019). Fundamentos de metodologia científica (8ª ed.). São Paulo, SP: Atlas.

6. Meend, S., & Yadav, S. K. (2024). Additional tendinous slips of extensor carpi radialis longus and brevis of hand: A case study. Journal of the Anatomical Society of India, 73(4), 371–373. https://doi.org/10.4103/jasi.jasi_123_24

7. Moore, K. L., Dalley, A. F., & Agur, A. M. R. (2024). Moore: Anatomia orientada para a clínica (9ª ed.). Rio de Janeiro, RJ: Guanabara Koogan.

8. Netter, F. H. (2019). Netter: Atlas de anatomia humana (7ª ed.). Rio de Janeiro, RJ: Elsevier.

9. Nutton, V. (2012). Vesalius revised. His annotations to the 1555 Fabrica. Medical History, 56(4), 415–443. https://doi.org/10.1017/mdh.2012.26

10. O'Rahilly, R. (1989). Anatomical terminology, then and now. Acta Anatomica, 134(4), 291–300. https://doi.org/10.1159/000146709

11. Ogut, E., & Barut, C. (2021). Accessory tendons and anatomical variations of the dorsal compartments of the wrist: A descriptive cadaveric study. Global Medical Journal, 33(3), 48–52.

12. Oheneba, B., & Yue, F. L. (2023). Co-occurrence of asymmetrical bilateral extensor carpi radialis intermedius and bilateral sternalis muscles in an anatomical donor. Folia Morphologica, 83(2), 461–465. https://doi.org/10.5603/FM.a2023.0041

13. Öztürk, K., Dursun, A., & Kastamoni, Y. (2020). Prevalence of the extensor digitorum, extensor digiti minimi and extensor indicis tendons and their variations. Hand Surgery and Rehabilitation, 39(4), 320–327. https://doi.org/10.1016/j.hansur.2020.03.005

14. Piagkou, M., Tsakotos, G., & Tsoucalas, G. (2025). An extensor digitorum brevis manus coexisting with the typical extensor indicis muscle: A rare dissection finding. Anatomical Science International, 100(1), 128–132. https://doi.org/10.1007/s12565-024-00745-2

15. Sakai, T. (2007). Historical evolution of anatomical terminology from ancient to modern. Anatomical Science International, 82(2), 65–81. https://doi.org/10.1111/j.1447-073X.2007.00180.x

16. Triantafyllou, G., Tsikouris, G., & Piagkou, M. (2025). The extensor digitorum brevis manus variability and clinical significance: A systematic review with meta-analysis. Surgical and Radiologic Anatomy, 47(1), 18. https://doi.org/10.1007/s00276-024-03507-4

17. Vaida, M. A., Rusu, M. C., & Muresan, A. N. (2021). Bilateral anatomical variations in the extensor compartment of forearm and hand. Surgical and Radiologic Anatomy, 43(5), 697–702. https://doi.org/10.1007/s00276-020-02640-8