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# Bilateral extensor medii proprius: A cadaveric case report

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**Ethics**
This cadaveric case report was conducted in accordance with established ethical standards for the use of human anatomical specimens. Institutional review determination/approval was obtained under IRB number 2024-179. The cadaver was obtained through a legitimate body donation program for medical education and research. All identifying information was excluded to preserve donor anonymity and confidentiality in accordance with accepted ethical guidelines. The specimen was handled with respect and professionalism throughout the dissection and documentation process.

**Conflict of Interest**
No conflict of interest was declared by the authors.

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## Abstract

During dissection of a formalin-fixed cadaver in the upper-limb unit of a gross anatomy laboratory, bilateral anomalous muscle bellies and tendons, identified as the extensor medii proprius (EMP), were observed in the posterior compartments of the forearms. The muscle originated from the distal one-third of the ulna and inserted on the extensor hood and proximal interphalangeal joint of the third digit, with an additional tendinous slip connecting to the extensor hood of the third digit and intertendinous connections to the second digit. Both tendons shared a canal with the extensor indicis (EI) and extensor digitorum (ED) tendons. The EMP was distinguished from the EI and ED by its insertion on the third digit and by a separate muscle belly, unlike the ED, which has a common origin and multiple tendons to digits two through five, and the EI, which inserts on the second digit. Although anomalies of the extensor forearm muscles are not uncommon, the literature documenting these variants remains limited. Recognition of these variants is clinically relevant because they can contribute to misdiagnosis when evaluating dorsal hand pain, affect surgical planning, or provide potential graft sources during reconstructive procedures. This report describes the bilateral EMP variant and discusses its prevalence, clinical significance, and possible embryological origin.

**Keywords:** extensor medii proprius, extensor indicis, forearm anatomical variation, embryology, cadaveric dissection

## Introduction

The normal anatomy of the extensor compartment of the forearm includes the extensor indicis (EI) muscle, with its tendon inserting into the extensor hood of the second digit, and the extensor digitorum (ED) muscle, with its tendons inserting into the extensor hoods of digits two through five. The proximal attachment of the EI is on the distal one-third of the posterior surface of the ulna and the interosseous membrane, whereas the ED originates from the lateral epicondyle of the humerus. The EMP is an anatomical variant analogous to the EI, with its tendon inserting at the base of the third digit rather than the second digit [1]. The cadaver presented with oligodactyly involving the right second digit, although the EMP was present bilaterally. The anomalous muscle and tendon were identified in one of 15 cadavers during dissection of the deep extensor forearm muscles in a first-year anatomy course at Rocky Vista University College of Osteopathic Medicine.

The prevalence of variant muscles in the flexor compartment of the arm that may entrap neurovascular structures has been reported as 2.68% [2]. Although extensor compartment variants such as the EMP are less frequently reported, their presence has been documented in anatomical studies [3]. Recognition and investigation of these anomalies remain important because awareness can improve diagnostic accuracy and guide surgical intervention. This report describes the variant EMP muscle and tendon, its possible effects on functional use of the hand, and potential embryological origins.

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## Case presentation

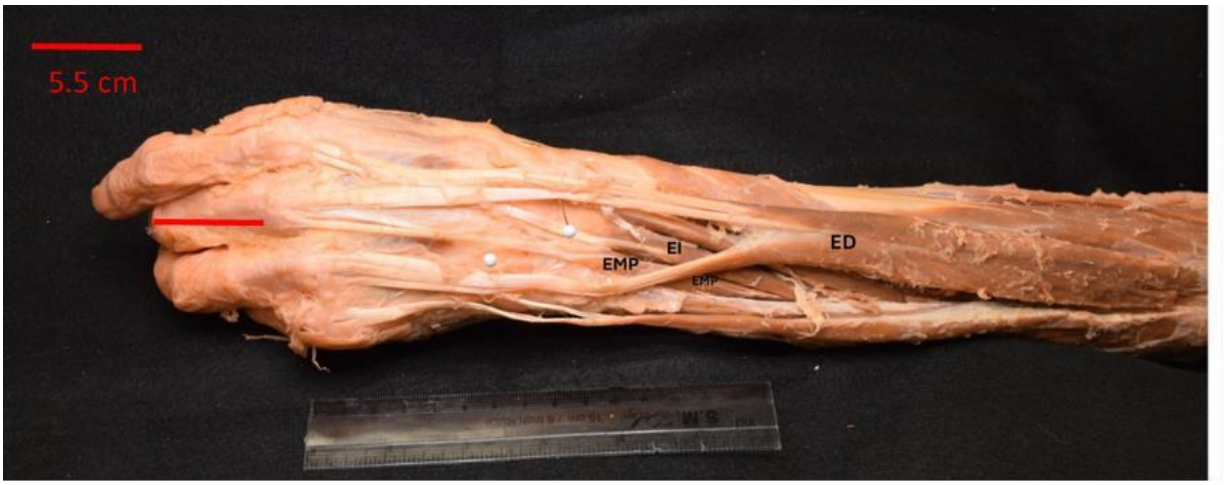
The muscle belly of the EMP originated from the distal one-third of the ulna, just distal to the EI muscle, without connections to the interosseous membrane (Figure 1). The thickest tendon slip traversed the dorsum of the hand to reach the extensor hood of the third digit on the ulnar side and then continued past the metacarpophalangeal joint to insert on the ulnar side of the proximal interphalangeal joint of the third digit. An additional tendinous slip arose from the EMP muscle belly, inserted into the extensor hood of the third digit, and provided intertendinous connections to the second digit. Both tendons traversed the wrist through a shared canal with the EI and ED tendons. The relationship of the EMP muscle belly and tendon to the ED and EI is shown in Figure 2. The deep aspect of the muscle belly was supplied by the anterior interosseous artery after it perforated the interosseous membrane and reached the posterior forearm compartment, with additional superficial supply from the posterior interosseous artery. Although the nerve supply was not visually confirmed, the EMP was presumed to be innervated by the posterior interosseous nerve (PIN) because of its proximity to the PIN and other muscles supplied by this nerve.

## Discussion

The origin of the EMP is incompletely understood; however, several hypotheses have been proposed regarding possible embryological or evolutionary origins. During limb development, muscle progenitor cells derived from the hypaxial portion of the somites migrate into the limb bud and are organized into dorsal and ventral muscle masses [4]. These masses subsequently undergo differentiation and splitting to form individual muscles, a process that is not yet fully understood [5]. Anomalies such as the EMP may arise from incomplete or altered separation of these muscle groups, resulting in accessory muscle bellies or tendons. Similar explanations have been proposed for other forearm anomalies, supporting the concept that disruptions in normal muscle development can lead to anatomical variations [6, 7].

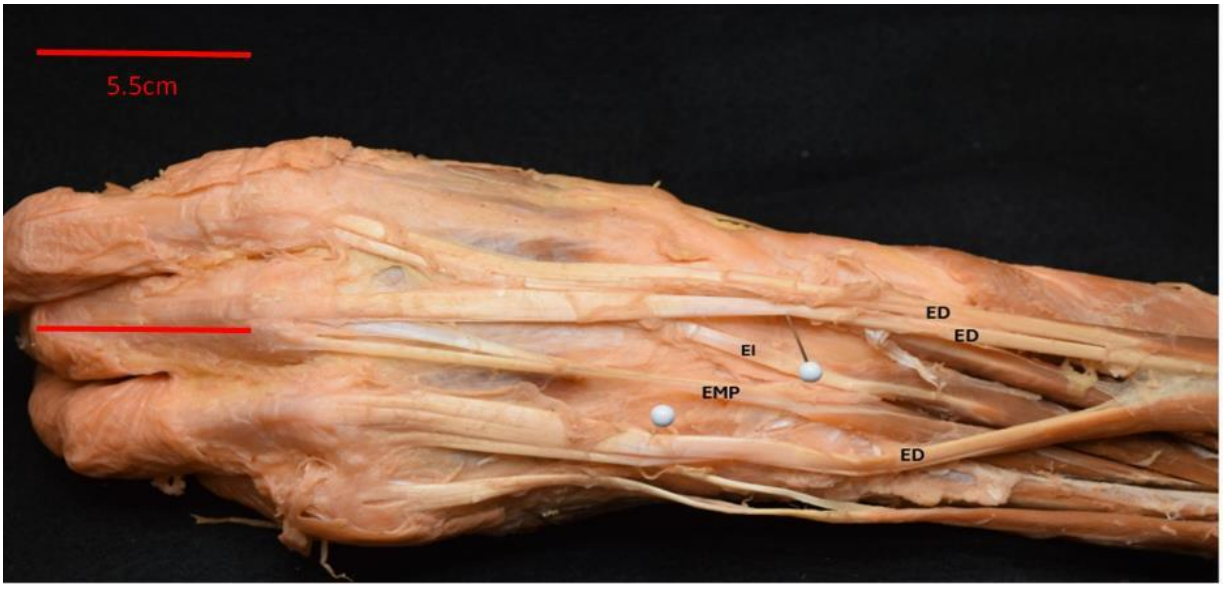
In addition to embryological explanations, anatomical studies have suggested a possible evolutionary origin for these variants. The presence of muscles such as the EMP, extensor indicis proprius (EIP), and extensor indicis et medii communis (EIMC) in nonhuman primates supports the hypothesis that these structures may represent phylogenetic remnants rather than

**Figure 1.** Extensor medii proprius with the muscle belly originating from the distal one-third of the ulna and the tendon inserting into the extensor hood of the third digit.




**Abbreviations:** ED: extensor digitorum, EI: extensor indicis, EMP: extensor medii proprius.

**Figure 2.** Extensor medii proprius with a distinct muscle belly and tendon located deep to the ED and medial to the EI.




**Abbreviations:** ED: extensor digitorum, EI: extensor indicis, EMP: extensor medii proprius.

developmental variations of the normal arrangement [8]. Although these studies provide insight into the possible origin of the EMP, further research is needed to determine whether variants such as the EMP are primarily evolutionary or embryological in origin.

Understanding the anatomy and incidence of anomalous tendons and muscles of the extremities is clinically relevant because some variants may require surgical intervention. Additional musculature in the extensor compartments may contribute to crowding beneath the extensor retinaculum, leading to pain and nerve entrapment. These presentations may be misdiagnosed as more common conditions such as ganglion cysts, tenosynovitis, or soft-tissue tumors [9]. Prior reports have shown that anomalous tendons can directly contribute to symptomatic presentations requiring surgical intervention, further emphasizing the need for accurate identification and diagnosis to improve patient outcomes [10].

Anomalous tendons and muscles can also provide resources for surgical reconstruction. Although the current literature does not provide specific statistics, EI tendons are commonly used in graft and tendon transfer procedures, suggesting that variant tendons may also be useful for surgical reconstruction [9]. In addition, accessory slips may produce clinical symptoms or complicate identification of normal tendon anatomy during surgical procedures. Preoperative awareness and careful intraoperative assessment are therefore essential to ensure accurate identification and minimize the risk of surgical complications [11].

In summary, this case report highlights the bilateral presentation of the EMP and emphasizes the importance of recognizing anatomical variations within the forearm. Although these variations are not routinely emphasized in medical education, their recognition is important for improving diagnostic accuracy and informing surgical planning, ultimately contributing to optimal patient outcomes.

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