On the innovative genius of Andreas Vesalius

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Chapter 3

Vesalius on the absence of the palmaris longus muscle

Chapter based on article

The first description of the absence of the palmaris longus muscle

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Chapter 3. Vesalius on the absence of the palmaris longus muscle

Introduction
The palmaris longus muscle is a slender flexor muscle of the forearm and is thought to tense the palmar aponeurosis in movements of the hand and to provide palmar flexion. The incidence of unilateral or bilateral absence of the palmaris longus varies from 1.5 per cent to 63 per cent with multiple influential factors such as body size, gender, ethnicity, and populations [1]. To date, Matteo Realdo Colombo (or Renaldus Columbus, c. 1516, Cremona, Italy – 1559, Rome, Italy) has been acknowledged as having been the first to record, in 1559, this possible absence in his work De Re Anatomica Libri XV (De Re Anatomica) [1-4]. Such acknowledgement denies the earlier record by Andreas Vesalius (1515-1564), the founder of modern anatomy, in his De Humani Corporis Fabrica Libri Septum (De Fabrica) that was published in 1543. In this chapter, we present his record of this muscle and its possible absence and discuss his observations.

Vesalius’ description of the palmaris longus muscle and its absence
Vesalius described the palmaris longus muscle in the 41st chapter of the second of the seven books comprising De Fabrica. This 87-paged second book was entirely devoted to The Ligaments and Muscles. The part devoted to the muscles of the arm and hand opens with the palmaris longus muscle as it was the first muscle that Vesalius encountered during his dissection. He indicated this “Muscle attached by its sinewy thinness to the middle of the palm and the skin on the inside [palmar side (R.J.B. and J.J.H.)] of the fingers” in Tabulae I, II, III, and IV representing four of his famous ‘muscle-men’ (Figures 3.1 and 3.2) [5] and described it as follows [6]: “...the muscle whose sinewy thinness broadens out to stretch under almost the whole of the bare, hairless portion of the hand. This muscle grows out by means of a sinewy and rounded beginning from the apex of the inner tubercle of the humerus; it lies over and is attached to the middle of the two muscles that flex the wrist (which come forth from the same tubercle). Others write that it lies between their heads, but this is not so. Its beginning becomes immediately thicker and fleshy and forms a muscle belly that is not overly thick; this proceeds rather obliquely to a point halfway along the length of the forearm, and then becomes thin and slender once again and ends in a tendon that is narrow but broader than it is deep and not at all rounded. This reaches all the way to the root of the wrist; in the inner area of the wrist it begins to broaden out, and is attached to the skin of the hand all the way to the last phalanx of the fingers. The fibrous connections by which this attachment is achieved are so strong and continuous that it is difficult to separate the skin on the inside of the hand from the sinewy thinness of the tendon even with a sharp razor. Yet, if Galen thought that this tendon is attached to the whole of the hairless area of the hand in man (as he says it is in apes), his opinion is certainly not to be accepted as the truth. In fact the tendon is attached only to the skin in the middle of the hollow of the palm but does not touch the skin covering the muscle that we shall describe as abducting the little finger obliquely from the others, nor does it stretch under the skin that covers the musculous flesh lying over the first joint of the thumb and comprising several muscles. In addition, no portions of this tendon run to the sides of the fingers; but it can with great difficulty be seen to be attached also to the inner area of the fingers. The muscle producing this tendon is slender,
Chapter 3. Vesalius on the absence of the palmaris longus muscle

Figure 3.1: Tabula I of Book 2 - Ligaments and Muscles of the first print of Vesalius’ De Humani Corporis Fabrica Libri Septum that was published in 1543. It shows the first of the famous, so-called muscle-men. The letter Y on the right arm indicates the “muscle extending a broad tendon into the hand .[.].” [5]
and in the middle of the forearm stretches, as we pointed out, over the others of this region. It is nowhere embraced by a ligament peculiar to it, and broadens out only in the hand. There was no reason for it to be large since, in our view, it is not responsible for the movement of any bone.”

Following, Vesalius described his observations on the absence of the palmaris longus in a paragraph titled The Muscle Whose Tendon Broadens Out is Sometimes Missing [6]: “At both Padua and Bologna I have more than once had occasion to point out that the muscle we are now considering was undoubtedly not present, and that the portion of the tendons flexing the wrist, before they pass the wrist, ended in the broad tendon. Sometimes, indeed, we have seen that the portion which plays the part of the broad tendon extends, not from those tendons, but from the transverse ligament that covers the tendons on the inside of the wrist. Similarly, in humans (though not in apes) no tendon broadens out beneath the foot, for (as you will hear) a membrane very similar to the broad tendon grows out from the heel bone.”

Discussion

Vesalius and his observation on the absence of the palmaris longus muscle

Vesalius’ De Fabrica revolutionized the study of anatomy and led to the overturn of the Galenic system that had dominated science for fourteen centuries [7]. In his work, Vesalius led the way through human anatomy by describing his actual dissections and discoveries. This way, he corrected approximately two hundred references to anatomical structures that had erroneously been attributed to human anatomy by Galen who had based his knowledge on the dissections of animals [7]. In his description of the palmaris longus muscle Vesalius acknowledged that others had previously described this muscle but indicated the flaw in the observations of Galen, stressing twice that the anatomy of men is unlike the anatomy of apes.

Still, even Vesalius’ description was not flawless as he reported that “it can with great difficulty be seen to be attached .[..].. to the skin of the hand all the way to the last phalanx of the fingers” (Figure 3.2) [6]. Obviously, he considered the aponeurosis palmaris to be part of the muscle’s tendon and over-estimated the distal extension of this aponeurosis. Moreover, Vesalius held the view that the palmaris longus was “not responsible for the movement of any bone.” [6] While this is true literally, he probably oversaw that the palmaris longus helps flexing the hand at the wrist. Remarkedly, Vesalius commented on the presence of “the portion which plays the part of the broad tendon” in case of absence of the muscle proper by noting its similarity to the fascia plantaris.
Chapter 3. Vesalius on the absence of the palmaris longus muscle

Figure 3.2: Tabula IV of Book 2 - Ligaments and Muscles of the first print of Vesalius’ De Humani Corporis Fabrica Libri Septum. The λ on the structure dangling down from the right hand indicates the “broad tendon of the hand together with its own tendon, hanging down from the topmost phalanges of the four fingers of the right hand . . . .” [5]
Chapter 3. Vesalius on the absence of the palmaris longus muscle

Colombo and the observation on the absence of the palmaris longus muscle

Colombo had been an apprentice to the Venetian surgeon Giovanni Antonio Lonigo for seven years before he enrolled at the University of Padua to study medicine, in 1540. He was noted to be an exceptional student of anatomy and praised by Vesalius in the first print of De Fabrica as “my close friend [Realdo Colombo] a keen student of anatomy who is at present Professor of Sophistics at Padua” [8]. When Vesalius left for Basel to oversee the printing of De Fabrica, toward the end of 1542, Colombo was commissioned temporarily by the rectors of Padua to teach anatomy in Vesalius’ place [9]. Although elected to succeed Vesalius as lecturer in surgery and anatomy in Padua by the Venetian Senate in 1544, Colombo moved to Pisa at the behest of Cosimo I de Medici. In 1548, he moved on to Rome to teach at Sapienza. In Rome, he befriended (and treated) Michelangelo with whom he intended, but failed, to publish an illustrated anatomy text to rival Vesalius’ De Fabrica. Instead, his non-illustrated text De Re Anatomica was published posthumously, in 1559, through the efforts of his sons [10]. In a separate eight-paged part titled Book XV, Those things rarely found in anatomy that followed the main body of text of the De Re Anatomica Colombo noted: “I saw some in whom certain muscles were lacking, as in some notable madmen during whose dissection I was very watchful; I observed that they lacked that muscle from which a broad tendon extends in the palm; they did not lack that wide tendon, but it arose not from the aforesaid muscle but from the brachial ligament.” [10]

Priority of the observation on the absence of the palmaris longus muscle

Over time, the relationship between Colombo and Vesalius deteriorated. While teaching Vesalius’ classes in 1543 Colombo pointed out several errors Vesalius made, most notably his attributing properties of veterinarian eyes to the human eye. When Vesalius found out upon his return to Padua, he was outraged. He publicly ridiculed Colombo, stating he was “an uneducated man, a half knower, who learned something from me about anatomy [...]” [9] and deleted all mention of Colombo from the second print of De Fabrica. By the time Colombo’s De Re Anatomica was published, both men had become bitter rivals. Consequently, it remains unknown whether the observation on the absence of the palmaris longus was based on joined work, or plagiarized by Colombo. Colombo’s work owed not a little to Vesalius’ De Fabrica and Colombo allegedly was “not loathe to appropriate the work of others and to announce quite blandly that the discovery was his own” [10].

Conclusion

We conclude that Colombo has not been the first to record the possible absence of the palmaris longus muscle as Vesalius already noted it in his De Fabrica, some 16 years earlier.
Chapter 3. Vesalius on the absence of the palmaris longus muscle

References