

## Anomalous origin of the Abductor Pollicis Longus (APL): clinical and surgical applications

Cerqueira, PC.<sup>1</sup>, Silveira, D.<sup>2</sup>, Siqueira, SL.<sup>3</sup>, Silva, AT.<sup>4\*</sup>, Franco, AG.<sup>4</sup>,  
Gama, HVP.<sup>4</sup>, Sales, MC.<sup>1</sup>, Casagrande, MM.<sup>1</sup> and Oliveira, BVM.<sup>5</sup>

<sup>1</sup>Acadêmicos do 3º ano do curso de Medicina, Monitores da disciplina de Anatomia, Departamento de Anatomia, Faculdade de Ciências Médicas de Minas Gerais – FCMMG, Al. Ezequiel Dias, 275, Santa Efigênia, CEP 30130-110, Belo Horizonte, MG, Brasil

<sup>2</sup>Acadêmico do 5º ano do curso de Medicina, Monitor da disciplina de Anatomia, Departamento de Anatomia, Faculdade de Ciências Médicas de Minas Gerais – FCMMG, Al. Ezequiel Dias, 275, Santa Efigênia, CEP 30130-110, Belo Horizonte, MG, Brasil

<sup>3</sup>Pós-doutor em Ciências e Técnicas Nucleares, Mestre e Doutor em Cirurgia, Universidade Federal de Minas Gerais – UFMG, Professor Adjunto de Cirurgia, Universidade Federal de Ouro Preto – UFOP.

Professor Assistente de Anatomia, Departamento de Anatomia, Faculdade de Ciências Médicas de Minas Gerais – FCMMG, Al. Ezequiel Dias, 275, Santa Efigênia, CEP 30130-110, Belo Horizonte, MG, Brasil

<sup>4</sup>Acadêmicos do 4º ano do curso de Medicina, Monitores da disciplina de Anatomia, Departamento de Anatomia, Faculdade de Ciências Médicas de Minas Gerais – FCMMG, Al. Ezequiel Dias, 275, Santa Efigênia, CEP 30130-110, Belo Horizonte, MG, Brasil

<sup>5</sup>Acadêmico do 6º ano do curso de Medicina, Monitor da disciplina de Anatomia, Departamento de Anatomia, Faculdade de Ciências Médicas de Minas Gerais – FCMMG, Al. Ezequiel Dias, 275, Santa Efigênia, CEP 30130-110, Belo Horizonte, MG, Brasil

\*E-mail: adri\_ana\_torres@hotmail.com

### Abstract

The Abductor Pollicis Longus (APL) is known to have a big variety in its number of insertion tendons. Because of that, studies about variations in its origin are not frequently achieved like studies about its insertion forms. This study describes an anatomic variation of the Abductor Pollicis Longus, with an anomalous venter originated of the inferior portion of the lateral border of the radio. Surgical and clinical implications are in relation principally with the big number of tendons of insertion of the APL, but there are related cases in the literature in that additional venter of this muscle also can be involved in the physiopathology of clinical syndromes, like the tenosynovitis of de Quervain.

**Keywords:** abductor pollicis longus, tenosynovitis, de Quervain syndrome.

### 1 Introduction

The first finger of the hand is functionally the most important finger. The loose of the first finger's function affects 40-50% of the hand's function. Because of that, the study of the anatomic variations that affect the first finger's movements has large importance.

The APL has its origin on the superior side of the interosseous membrane's posterior part and adjacent areas of the radio and ulna. Its tendon generally is inserted in the base of the first metacarpal bone and trapezia.

The Abductor Pollicis Longus is known to exhibit numerous variations of its insertion (JACKSON, VIEGAS, COON et al., 1986) and, for this reason, studies about its origin aren't so frequent like studies about its form of insertion. The APL's tendon helps the stabilization of the carpometacarpal articulation of the first finger and is unique just in 30% of the cases, double in 50% and multiple in 20% (VOLLALA, 2006), and it can exist until nine tendons (MANSUR, KRISHNAMURTHY, NAYAK et al., 2010). The accessory tendons are found inserted in trapezia (30%), abductor pollicis curt (44%), opponens pollicis (16%) or linked to the thenar fascia. However, the presence of numerous tendons of insertion can increase the friction between them and cause an inflammation in the scabbard of

the abductor pollicis longus and extensor pollicis curt, in the first compartment of the extensor retinacula, contributing to the etiology of a syndrome named tenosynovitis of de Quervain (BUNNEL, 1948). In addition to that, the presence of additional venters can be a contributing factor in the cause of this syndrome.

This study describes a variation on the origin of the Abductor Pollicis Longus (APL). Its previous knowledge can be useful to surgeons and clinics, because frequently these professionals can come across this variation and its clinical and surgical implications.

### 2 Materials and Methods

The dissection was done in the Laboratory of Human Anatomy of the "Faculdade de Ciências Médicas de Minas Gerais", being evaluated and dissected about 173 superior limbs between the years of 1992 and 2011.

The evaluation of this anatomic variation was permitted throughout the dissections performed with a homogeneous and standardized form in different cadavers that, linked with the anatomic study of the superior limb, permitted to compare and demonstrate the variation. Initially, it was

identified the extensor retinacula and removed the fascia of the forearm's posterior part. It was identified and dissected the radial extensor curt of the carp, the radial extensor long of the fingers and the extensor of the minimum finger. After it, it was dissected the ulnar extensor of the carp, the supinator and finally the three latest muscles, that were: the abductor pollicis longus and the extensors long and curt of the index. It was take pictures of the forearm with the anatomic variation, confirming its description. Posterior studies and pursuits were performed with the objective of to describe the variation. The databases utilized were Lilacs, Pubmed, Scielo and Medline with the descriptors abductor pollicis longus, anatomic variation, variation, origin, insertion syndrome.

### 3 Results

In our dissections of the superior limb, it was found a cadaver of the male sex that the muscle abductor pollicis longus of the right forearm had two separated origins, being one posterior, localized in the superior third part of the interosseous membrane's posterior face and adjacent parts of radio and ulna and another anterior, originating in the inferior part of the lateral radio's border, linked with part of the flexor longus of the carp and its tendon. The separated origins of the abductor pollicis longus were weld in the tendon of insertion of the more common abutor pollicis longus' venter and its common tendon were inserted in the lateral face of the first metacarpal bone, its original place of insertion (Figures 1 and 2).

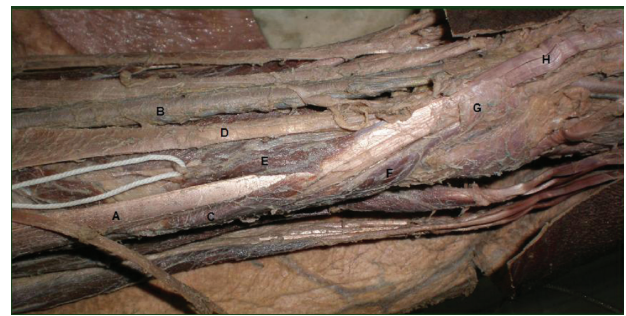
### 4 Discussion

The abductor pollicis longus is known by the variability in the form of insertion of its multiple tendons. Anatomic variations in the number of tendons of insertion and in the local where it is inserted are commonly described. However, the world literature doesn't have much articles that describe variations in the origin of this muscle (RAI, RANADE, MAMATHA et al., 2010).

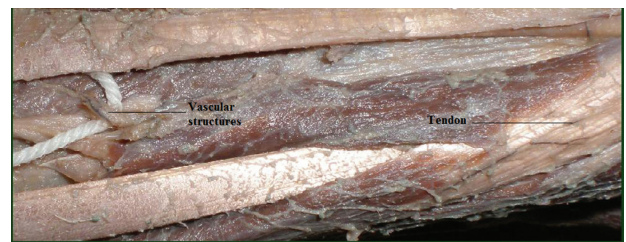
Fabrizio and Clemente (1996) related to have found an additional muscular venter coming from the lateral and distal portion of the abductor pollicis longus and inserting in the lateral and dorsal superficial part of the radio. Before its insertion, however, the additional venter goes on a superficial course on the tendon of the muscles radial extensor longus and curt of carp, forming to these tendons a structure like a retinaculum or a tunnel. The muscular anomalous portion had, normally, a tendon of insertion that was inserted in a variable way. Fabrizio and Clemente (1996) found this variation on the forearm of 15 cadavers in a total of 50 dissected cadavers.

Vollala (2006) also reports to have found a specimen with the additional muscular venter surging of the distal and lateral portion of the abductor pollicis longus, proximally to the formation of its tendon. This additional and anomalous portion had a own tendon of insertion and was inserted in smart muscles of the first finger (abductor curt, opponet and flexor curt). Vollala (2006) also described variations in the number of tendons of insertion and in the variability on the forms of insertion of the abductor pollicis longus.

According to Rai, Ranade, Mamatha et al. (2010), duplications and triplications of the insertion tendon of the abductor pollicis longus are frequently reported. Mansur,



**Figure 1.** Picture of the right forearm of a male cadaver. **A:** tendon of the radial extensor long. **B:** radial artery. **C:** posterior venter of APL. **D:** Tendon of the flexor long of the carp. **E:** anomalous venter of APL. **F:** muscular venter of extensor long of the thumb. **G:** first compartment of the extensor retinacula opened. **H:** duplicities of the tendon of APL.



**Figure 2.** Amplified picture showing the region where the APL's anomalous venter is linked to the posterior venter of this muscle, and the vascular structures, composed of one artery and one vein.

Krishnamurthy, Nayak et al. (2010) describe similar anatomic variation, with a quantity of nine tendons of insertion of the muscle in question.

The descriptions of Rai, Ranade, Mamatha et al. (2010) were the ones that most came to the variation found by our study. In their dissections, they report to have found a rare variation on the origin of the abductor pollicis longus in the forearm of a male cadaver. The fibers of the muscle were organized like two distinct venters, one anterior and another posterior to the tendon of the extensor radial long of the carp, exactly like the observed in the present case. In addition to that, the author relates to have found a total of eleven tendons of insertion coming from the posterior normal venter of the muscle in question and an additional tendon coming from the anterior anomalous venter of the abductor pollicis longus that differs from our study.

In our study, it was observed the abductor pollicis longus with an adicional and anomalous origin, coming directly from the lateral border of the distal portion of the radio. The muscle, because of that, was presented with two distinct venters, one anterior and another posterior to the radial extensor long of the carp that were converging one to the other. The anomalous venter (anterior) ended in the own tendon of the typical venter (posterior), in addition to present with an own vascular pedicle. A variation similar to this seems not to have been described in the medical literature.

This anatomic variation can has effects *in vivo*. The distal link of the tendon of the abductor pollicis longus demonstrates the intimal relation with the carpometacarpal

articulation of the first finger and affirms the contribution of this muscle in its stabilization. In this form, there is the speculation that the presence of an additional venter of the muscle abductor pollicis longus can age like a better stabilization of the carpometacarpal articulation. Then, the arrange formed by the presence of the additional venter can strength the typical arrange, causing difficulty and preventing the anomalous dislocation and the curvature in argue of the tendons of the muscles radial extensor long and curt of the carp and, like this, permitting a bigger quantity of strength to be created between the pulse during the movements of extension and abduction of the hand (FABRIZIO and CLEMENTE, 1996).

Another analyze of the consequences of this variation if referred to the syndrome of intersection. The syndrome of intersection in the forearms is a condition, normally dolorous, not diagnosed frequently. The syndrome normally presents with illness, crepitation, rub and swelling in the area of the intersection between the muscles abductor pollicis longus and extensor curt of the first finger with the muscles radial extensor long and curt of the carp, near 4 cm above the fist (GRUNDBERG and REAGAN, 1985). According to Fabrizio and Clemente (1996), the presence of an additional muscular venter in the abductor pollicis longus can be a factor of contribution to the etiology of the syndrome of intersection.

The surgical treatment of the syndrome involves, normally, the decompression of the typical muscular venters of the abductor pollicis longus and of the radial extensor curt of the carp. However, the surgery of decompression can't be completely efficient in cases where existed an anomalous and additional venter of the abductor pollicis longus maintaining a structure like a retinacula compressing the tendons of the muscles radial extensor long and curt of the carp, like the case of this article (FABRIZIO and CLEMENTE, 1996).

The basic pathology of the syndrome of intersection is still controversial. Much authors believe that the basic pathology is a result of the friction between the muscular ventres of the abductor pollicis longus and extensor curt of the first finger and the tendons of the radial extensors long and curt of the carp, producing tendinitis and bursitis in the area of the intersection of these structures. However, (GRUNDBERG and REAGAN, 1985) relate to believe that the basic problem is a tenosynovitis of the second extensor retinacula's compartment that is presented with illness and swelling next to the pathological area. In their surgical dissections, the authors observed swelling in the muscular venter of the muscles in question (abductor pollicis longus and extensor curt of the first finger) and of the tissues in the area, however all of the studied cases were accompanied by tenosynovitis in the scabbard of the radial extensor long and curt of the carp inside the second compartment of the extensor retinacula. In addition to this, the symptoms were alleviated in all of the patients treated by decompression of the second compartment of the extensor retinacula without one surgical procedure directly on the muscular venters. Grundberg and Reagan (1985) utilized these founds to sustain that the basic pathology – and more consistent – to the intersection syndrome is the tenosynovitis of the radial extensor long and curt of the carp's scabbard in the second compartment of the extensor retinacula. According to the author, the fact of this compartment be tight, the

tenosynovitis presents with physical founds not in the area of the retinacula, but next to it, 4 cm above the fist.

Condition very similar to the syndrome of intersection is called De Quervain's syndrome. Both are presented with the same symptoms; however the De Quervain's syndrome is the tenosynovitis of the first compartment of the extensor retinacula and the symptomatic involvement occur distally to the syndrome of intersection's area (GRUNDBERG and REAGAN, 1985). It has been suggested that the variations in number of the tendons of insertion of the abductor pollicis longus and the corresponding osteofibrose of the canal where they pass (first compartment of the extensor retinacula) are involved in the etiology and subsequently the surgery to decompression of the De Quervain syndrome (VOLLALA, 2006). According to Uribe, Buendia, Rodriguez et al. (2010), the tenosynovitis of De Quervain is one of the most frequently observed diseases that involve the fist.

In addition to all of that, the association of the abductor pollicis longus with the carpometacarpal articulation of the first finger demonstrates the big clinical importance of anatomical variations in the muscles and tendons of this region to the reconstructive surgery of the hand and of the first finger (VOLLALA, 2006). The knowledge of these variations is important, for example, when we considerate the tendons like one alternative of repair or graft. Interposition material is frequently utilized in the treatment of the osteoarthritis in the base of the first finger or of lesions of the tendons and ligaments of the hand. The observation of the duplicated tendons or multiple tendons in the first compartment of the extensor retinacula permitted the exploration of the possibility to utilize the accessory tendon of the abductor pollicis longus like a material of graft in these types of treatments (BRAVO, BARCO and BULLÓN, 2010).

## 5 Conclusion

In this way, considering the importance of the mobility of the fist and of the first finger in the function of the hand and the complexity of the surgical procedures that normally are being used to solve the dysfunctions in this area, the knowledge of the typical anatomy of this region and of the local anatomic variations are of big utility to a lot of health professionals (FABRIZIO and CLEMENTE, 1996). In this way, analyzing the primordial paper of the abductor pollicis longus and its importance to the first finger's function and of the human hand, we observe how the knowledge of its action is important in the clinical evaluation and the surgical reconstruction of the superior limb (VOLLALA, 2006).

## References

- BRAVO, E., BARCO, R. and BULLÓN, A. Anatomic Study of the Abductor Pollicis Longus: A Source for Grafting Material of the Hand. *Clinical Orthopaedics and Related Research*, 2010, vol. 468, p. 1305-1309. PMID:19760470 PMCid:PMC2853646. <http://dx.doi.org/10.1007/s11999-009-1059-4>
- BUNNEL, S. *Surgery of the hand*. 2nd ed. J.B. Philadelphia: Lippincott, 1948. p. 455-457.
- FABRIZIO, PA. and CLEMENTE, FR. A variation in the organization of abductor pollicis longus. *Clinical Anatomy*, 1996, vol. 9, n. 6, p. 371-375. [http://dx.doi.org/10.1002/\(SICI\)1098-2353\(1996\)9:6<371::AID-CA2>3.0.CO;2-E](http://dx.doi.org/10.1002/(SICI)1098-2353(1996)9:6<371::AID-CA2>3.0.CO;2-E)

- GRUNDBERG, AB and REAGAN, DS. Pathologic anatomy of the forearm: intersection syndrome. *Journal of Hand Surgery-American Volume*, 1985, vol. 10, n. 2, p. 299-302.
- JACKSON, WT., VIEGAS, SF., COON, TM., STIMPSON, KD., FROGAMENI, AD. and SIMPSON, JM. Anatomical variations in the first extensor compartment of the wrist: a clinical and anatomical study. *Journal of Bone and Joint Surgery-American Volume*, 1986, vol. 68, n. 6, p. 923-926. PMID:3733780
- MANSUR, DI., KRISHNAMURTHY, A., NAYAK, SR., KUMAR, CG., RAI, R., SUJATHA D'COSTA, S., KRISHNAMURTHY, DI. and PRABHU, LV. Multiple tendons of abductor pollicis longus. *International Journal of Anatomical Variations*, 2010, vol. 3, p. 25-26.
- RAI, R., RANADE, AV., MAMATHA, T., JIJI, PJ., D'COSTA, S. and MAHESHWARI, C. A Rare Origin of Abductor Pollicis Longus. *Romanian Journal of Morphology and Embryology*, 2010, vol. 51, n. 2, p. 399-400. PMID:20495764
- URIBE, WAJ., BUENDIA, GDPP., RODRIGUEZ, JMF. and VIEIRA FILHO, JGC. Tenosinovites De Quervain: uma nova proposta no tratamento cirúrgico. *Revista Brasileira de Cirurgia Plástica*, 2010, vol. 25, n. 3, p. 465-9. <http://dx.doi.org/10.1590/S1983-51752010000300011>
- VOLLALA, VR. Abductor pollicis longus: a study of 50 south Indian cadavers. *Firat Tıp Dergisi*, 2006, vol. 12, n. 1, p. 17-1.

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