Original article

Study of anatomical variations of motor branch of the median nerve in the carpal tunnel[1]

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Abstract

Introduction: The palm branch of the median nerve has a lateral and a medial division. From the lateral division descend from the motor branch of the medial nerve. This branch can emerge in a extraligamentous, subligamentous and transligamentous forms. Being the medial nerve the biggest variation. To intend to observe the variation of the branch medial motor nerve classify it as extraligamentous, subligamentous or tranligamentous and if there are duplications of the branch with the objective of minimizing possible iatrogenesis during the surgical act. **Materials and Methods**: This study it's a kind of descriptive one with analysis of the variations of the branch medial motor of 20 hands, 10 right and ten left ones, that was earlier prepared by formaldehyde injection a 10%. It was realized a longitudinal cut in anterior part of the hand face, extending from the metacarpophalangeal articulation pleat until the main wrist pleat flexion. Then it was made a transverse incision covering the entire articulation pleat. Snapped up all the skin subcutaneous tissue and muscular fascia. It was done a longitudinal incision in the carpal ligament in order to show the path of the motor branch. All pieces were numbered and photographed. **Results and Conclusion**: From the left hands were found 9 extraligamentous, where one of them was duplicated, and 1 subligamentous. From the rights, 9 extraligamentous and 1 subligamentous. There was no tranligamentous situation. In 90% of the cases it was observed the extraligamentous situation and in 10% subligamentous which are compatible with the literature data that revolve around these values.

Keywords: median nerve, dissection, carpal tunnel syndrome, anatomy.

1 Introduction

The median nerve originates from the medial and lateral fasciculus of the brachial plexus with a long way from its origin to the palmar region. In this region, located proximal to the flexor retinaculum, situated laterally to the tendons of the flexor surface of the fingers, but more distally he spends is between the retinaculum and the tendon in the "carpal tunnel". Immediately proximal to the flexor retinaculum, originates from the palmar cutaneous branch of the median nerve, which has a medial and a lateral division. Division side, comes the motor branch of the median nerve (GRAY, 1988; MOORE and DALLEY, 2007).

The motor branch of the median nerve emerges from the retinaculum so variable. It can emerge, according to the classification of Poisel, Ursprung and Verlauf (1974), on how extraligamentous, and subligamentous transligamentous, and subligamentous extraligamentous, or there may be no duplication. This classification corresponds to group I of Lanz (1977). In extraligamentous, the distal branch to the retinaculum motor rises and thus current flows retrograde to innervate muscles of the thenar region. In subligamentous, the branch rises within the carpal tunnel and remains deep to retinaculum to reach the thenar muscle. In transligamentous, the branch rises within the carpal tunnel and thereby perforates the retinaculum to achieve the thenar muscle (AL-QATTAN, 2010).

In a prospective study of 100 patients, we identified the following percentages of the trajectory of the motor branch of the median nerve: 56% extraligamentous, 34% subligamentous, 9% transligamentous and 1% preligamentous (AL QATTAN, 2010). However, in a study of 30 cadaveric hands were dissected, Caetano, Caetano, Fregona et al. (2005) 83,3% extraligamentous, 13,3% subligamentous and 3,4% transligamentous types. In the same study, it was found, dissected into two hands, two duplications, one on each side (CAETANO, CAETANO, FREGONA et al., 2005). In another study with 100 cadaveric hands, Poisel, Ursprung and Verlauf (1974) reported the presence in the situation extraligamentous in 46% of hands. It is understood, therefore, variation in the pattern of the branch origin situations motor median nerve.

Thus, knowledge of the location and origin of the motor branch of the median nerve are important for the planning and conduct of surgical incisions in the carpal region for treating Carpal Tunnel Syndrome. Knowledge of anatomical variations nerve helps to prevent incomplete decompression in the surgical treatment of the syndrome and prevents iatrogenic injury during surgery (KHALIL, LAHIJI and PHALSAPHY, 2006).

Based on the content above, this study aims to identify the prevalence of anatomical variations of the motor branch

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of the median nerve in the carpal tunnel region, according to the classification of Poisel.

2 Materials and Methods

This is a descriptive study, which was conducted at the Laboratory of Human Anatomy, Federal University of Paraíba. Taking a random sample of 10 cadavers for analysis of variations in the path of the median nerve in its passage through the carpal tunnel region. Were analyzed both the left hand and the right, taking the analysis of 20 nerves. The 10 anatomical specimens corresponded to previously prepared corpses by injecting 10% formalin.

The work was based on the techniques of dissection ordinary carpal region, following and respecting the anatomical planes. Being held a median longitudinal incision in the anterior of the hand, extending the crease of the metacarpophalangeal joint 2 cm proximal to the flexion crease of the wrist main. The following took place two transverse incisions covering the entire lateral-lateral extension of the anatomic limits proximal and distal to the first longitudinal incision performed. Rose a square flap of skin and subcutaneous tissue with subsequent excision of exposure even with the transverse carpal ligament, fascia and aponeurosis palmar thenar and hypothenar. The palmaris longus tendon when present was resected for better visualization of the study area, as well as the palmar aponeurosis, superficial palmar arch and existing fat tissue (LANZ, 1977).

Following the course of the motor branch of the median nerve was observed in relation to the transverse carpal ligament, followed by a longitudinal incision along the ulnar border of the transverse carpal ligament, dissection and resection for the same total exposure of the median nerve. The perineural fascia was removed from the median nerve and its branches, especially the motor branch to the thenar muscles.

The proximal course of the median nerve in the carpal tunnel was observed, as well as their variations. The instrument used corresponded to the instruments typically used in cases of dissection. Data were tabulated for descriptive statistical analysis. Upon completion of data collection, the pieces were numbered, photographed (for comparison with what is reported in the literature) and stored in containers for storage of the Laboratory of Human Anatomy UFPB.

3 Results and Discussion

Twenty hands were dissectes and tem on the right side. The total dissected hand, it was found 90% (n = 18) extraligamentous type, 10% (n = 2), subligamentous type, 0% (n = 0) and a doubling transligamentous extraligamentous 5% (n = 1) (Table 1). Regarding left hands 100% (n = 10), observed 90% (n = 9), that the branch situations extraligamentous engine was 10% (n = 1), and subligamentous 0% (n = 0), transligamentous. In the situation observed extraligamentous a part where the branch was duplicate 10% (n = 1). (n=10) we found 90% (n = 9), extraligamentous, we found 90% (n = 9), extraligamentous situations, 10% (n = 1), subligamentous and 10% (n = 1), transligamentous. There was no overlap in the right hand (Table 2).

Based on the findings, it was observed that the situation was more extraligamentous found, a result similar to all scientific studies found in our literature search. However, the frequency of the situation extraligamentous varied in our finding literature. Therefore, studies that most nearly of our series (90%, n = 18 of 20) in a cadaveric dissection hands were Ahn, Yoon, Koo (2000) 96.1% (n = 340 of 364); Caetano, Caetano, Fregona et al. (2005) 83.3% (n = 25 of 30); Kithsiri , Sujatha and Fernando (2009) 88% (n = 53 of 60); Lindley and Kleinert (2003) 99.2% (n = 522 of 526); Mumford, Morecraft and Blair (1987) 80% (n = 16 of 20); Tountas, Bihrle, Macdonald et al. (1987) 81.5% (n = 75

Table 1. Type, number, and percentage changes from the branch duplication of both hands.

Variation Type	Amount	%	Duplications
Extraligamentous	18	90	1
Subligamentous	2	10	0
Transligamentous	0	0	0
Total	20	100	1

Table 2. Type, quantity, and doubling the percentage changes in motor branch of the median nerve of the left hand.

Variation Type	Amount	%	Duplications
Extraligamentous	9	90	1
Subligamentous	1	10	0
Transligamentous	0	0	0
Total	10	100	1

Table 3. The type, quantity, and doubling of the percentage changes in the motor branch of the median nerve of the right hand.

Variation Type	Amount	%	Duplications
Extraligamentous	9	90	0
Subligamentous	1	10	0
Transligamentous	0	0	0
Total	10	100	0

of 92), and in surgical procedures 97% (n = 796 of 821) (Table 4).

Regarding the subligamentous situation, there are differences with values between 0.2% and 34%. Our study (10% n = 2 of 20), approached the findings Tountas, Bihrle, Macdonald et al. (1987), 9.8% (n = 9, 92); Caetano, Caetano, Fregona et al. (2005), 13.3% (n = 4 of 30); Kithsiri, Sujatha and Fernando (2009), 12% (n = 7 to 60) (Table 4).

The situation transligamentous was not found in our study. This result is in agreement with those of Kithsiri, Sujatha and Fernando (2009) 0% (n = 0 to 60), Ahn, Yoon, Koo et al. (2000) 1.1% (n = 4 at 354), Lindley and Kleinert (2003) 0.2% (n = 1 to 526), Tountas, Bihrle, Macdonald et al. (1987) (1.2% (n = 10 to 821). It is important to consider that studies of Ahn, Yoon, Koo et al. (2000); Lindley and Kleinert (2003); Tountas, Bihrle, Macdonald et al. (1987) had a number of ligaments transligamentous greater than zero due to its large sample. According to Al-Qatan (2010), high percentages of transligamentous situation should raise questions. Studies may be biased, since the branch transligamentous is often associated with thenar muscle atrophy, a second explanation is confusing fine oblique fibers of the region's carpal ligament with the situation transligamentous (Table 4).

The duplications of the motor branch of the median nerve, also known as lateral branches of the median nerve, are difficult to find. In the literature, there are few descriptions. Tountas, Bihrle, Macdonald et al. (1987) reported the occurrence of 0.97% (n = 8 821) and 2.26% (n = 2 to 93), Al-Qatan (2010) 1% (n = 1 to 100). These studies corroborate our (5%, n = 1 to 20). However, some studies differ from data reported above. Khalil, Lahiji and Phalsaphy (2006) 31.6% (n = 19, 60), Olave, Prates, Gabrielli et al. (1996) 38.3% (n = 23, 60) and Caetano, Caetano, Fregona et al. (2005) 20% (n = 6 to 30), which states that their study differs from other studies available in the literature (Table 4).

Our study found the same frequencies (Table 2 and 3), for the right hand and left, except for the presence of duplication. These data differ from the data reported by Olave, Prates, Gabrielli et al. (1996) subligamentous the situation, which in their study shows a 30% difference between the right and left hand. However, values shows very similar situation in extraligamentous (right hand, left hand and 46.7%, 50%). The situation transligamentous was not observed on the predominance of hand. Duplications were not related.

For the different values found in our literature, racial differences should be taken into consideration (AL-QATTAN, 2010). Studies with similar ethnic groups showed similar results. Poisel, Ursprung and Verlauf (1974) from Germany and Stancic, Eskinja and Stosic (1995), from Croatia and Lindley and Kleinert (2003), Tountas, Bihrle, Macdonald et al. (1987) from State Mississippi U.S., Al-Qatan (2010) Saudi Arabia and Iran Khalil, Lahiji and Phalsaphy (2006). However, in Brazil the results are somewhat similar in view of the broad mixture of Brazilian territory. Caetano, Caetano, Fregona et al. (2005) and Olave, Prates, Gabrielli et al. (1996) in Brazil have often variables.

Table 4. Comparison of the variation of the motor branch of the median nerve in the scientific literature, plus the results of this study.

Author	Extraligamentar (%)	Subligamentous (%)	Transligamentar (%)	Duplication	Nº Total
CAETANO, CAETANO, FREGONA et al., 2005[1]	83,3%	13,3%	3,4%	20,0%	30
KHALIL, LAHIJI and PHALSAPHY, 2006[1]	46,7%	28,3%	11,9%	31,6%	60
KITHSIRI, SUJATHA and FERNANDO, 2009[1]	88,0%	12,0%	0%	*	60
MUMFORD, MORECRAFT and BLAIR, 1987[1]	80,0%	0%	20,0%	*	20
OLAVE, PRATES, GABRIELLI et.al., 1996[1]	48,3%	18,3%	15,0%	38,3%	60
POISEL, URSPRUNG and VERLAUF, 1974	46,0%	31,0%	23,0%	*	100
STANCIC, ESKINJA, and STOSIC, 1995[1]	47,7%	20,0%	18,5%	*	65
TOUNTAS, BIHRLE, MACDONALD et al., 1987[1]	81,5%	9,8%	8,70%	2,16%	92
AL-QUATTAN et.al., 2010[2]	56,0%	34,0%	9,0%	1,0%	100
AHN, YOON, KOO et al., 2000	96.1%	2,80%	1,10%	*	354
LINDLEY and KLEINERT, 2003[2]	99,2%	0,2%	0,2%	*	526
TOUNTAS, BIHRLE, MACDONALD et al., 1987[2]	97,0%	2,0%	1,2%	0,97%	821
This Study	90,0%	10	0	5%	20

1 - Studies in cadaveric hands; 2 - Studies in surgical procedures; * - not reported in the study.

4 Conclusion

The situation extraligamentous is the most common, as well as reports in the literature. There should be further research to observe equality between right hand and left hand on the classification Poisel. Moreover, greater amount of studies should be performed to confirm or rectify the suspicion that ethnic groups influence the frequency of rating Poisel.

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