



Morphological variations of median nerve observed in patients during carpal tunnel release surgery: A cross-sectional study.

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Article received on:

01/02/2021

Accepted for publication:

21/08/2021

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ABSTRACT... Objective: To study the morphological variations of median nerve observed in patients during carpal tunnel release surgery. **Study Design:** Cross Sectional study. **Setting:** Qazi Hussain Ahmad Medical Complex, Nowshera. **Period:** One year (November, 2019 till October, 2020). **Material & Methods:** This Cross-sectional study was conducted after obtaining ethical approval from the Institutional Ethical Review Board (IERB), NMC in which people were tracked with mild to severe carpal tunnel symptoms for a year. Less than 24 hours after their arrival, the Patients were operated on under local anesthesia in Qazi Hussain Ahmad Medical Complex, Nowshera, Pakistan. Each surgical method viewed the nerve. Branches around the carpal tunnel were seen and documented on a Microsoft Excel spreadsheet. 150 were planned. The statistics were in percentages. **Results:** In 150 instances, 102 (68%) were female and 48 (32%) were male. 138 (92%) individuals showed normal median nerve morphology, whereas 12 (8%) had aberrant branching. The transverse carpal ligament had significant splitting. There was a persistent median artery in three of the 12 instances. **Conclusion:** The top division of the median nerve showed altered branching morphology. As with the persistent median artery, recurring median artery raises the chance of median nerve dysfunction.

Key words:

Carpal Tunnel Syndrome, Morphological Variations, Median Nerve, Persistent Median Artery, Transverse Carpal Ligament.

Article Citation: Haris M, Haris S, Deeba F, Khan MJ, Sultana S, Rabail. Morphological variations of median nerve observed in patients during carpal tunnel release surgery: A cross-sectional study. Professional Med J 2021; 28(12):1788-1792. <https://doi.org/10.29309/TPMJ/2021.28.12.6321>

INTRODUCTION

Surgical clinicians may come across certain morphological variations while performing certain common surgical procedures. One such procedure is the release of carpal tunnel in those patients who presented to the surgical clinicians with modest or serious carpal tunnel syndrome.¹ According to research, the carpal tunnel, which is located near the wrist, is a location where many such morphological modifications may manifest themselves.² Changes in its path and branches are examples of such modifications. The median nerve is a brachial plexus twig.³ The brachial plexus medial and lateral cords create the median nerve.⁴ The median nerve normally travels on the lateral surface of the brachial artery, which is the typical path of the nerve. Afterwards, it goes anterior to the artery and then comes to rest on its medial side of the elbow. Until it reaches the forearm, there is no branch to any

muscle in the axilla or arm, which is a natural phenomenon. It then travels to the antebrachium, passing through the two tips of the pronator teres, and crisscrosses the ulnar artery, which is present deep to both heads of the pronator teres. Some of the divisions of the nerve are connected to muscles in the anterior compartment of the forearm.⁵ As it progresses, it penetrates deeper and beneath the flexor retinaculum, passing into the carpal tunnel and emerging superficial to the long tendons of the forearm flexor muscles, and into the ulna.⁶ This is the most critical spot where any pressure or irritation may lead to a condition known as carpal tunnel syndrome.⁷⁻⁹ Such condition may lead to feebleness or paraplegia of the thenar muscles and thus the skin over these muscles also change eventually. As the nerve comes out of the flexor retinaculum, it divides and gives off certain important branches to muscles of the palm and other palmar digital nerves.

Acquaintance of the morphological alterations and variations in the course of nerves is pretty much important for the surgeons and other clinicians in identifying certain neuronal pathologies and inferring nonconforming clinical signs and symptoms present in patients.^{10,11} Such variations if remain unidentified, will ultimately lead to conditions where clinical outcomes will be devastating and painful for the patients.

The rationale of this study was to highlight and document the morphological variations in and around the carpal tunnel and thus in this way to help the clinicians and surgeons to perform safe surgical interventions.

MATERIAL & METHODS

This cross sectional study was conducted at Qazi Hussain Ahmad Medical Complex for One year (November, 2019 till October, 2020). Non-probability convenient sampling was done.

This research study was done for about 01 year. A total of around 150 patients were enrolled in this study that ages were around 27–55 years and had modest and harsh carpal tunnel syndrome coming to the outpatient department (OPD) of Qazi Hussain Ahmad Medical Complex, Nowshera from different areas of the province. Coldness, itchy, and distress in the various finger like index, middle and also thumb as well as trouble managing small items were among the main complaints of the patients who came to the OPD. A thorough history of the patient was taken, and a complete set of clinical evaluation data was recorded.

Only those patients who had previously had a hand or wrist fracture or who were pregnant were excluded from this study. Patients who had moderate or severe symptoms of carpal tunnel syndrome and who had retorted to medical prescription were also not included from the study. Tinel's and Phalen's tests were carried out in each instance.¹² The patient after obtaining their informed written consent were surgically intervened as day cases under local anesthesia in main OT of Qazi Hussain Ahmad Medical Complex, Nowshera. The median nerve

was acknowledged and cautiously studied in the surgery. It was necessary to record any morphological difference of the median nerve and its extensions in and around the carpal tunnel on a structured sheet in order to diagnose the condition. The percentages used to represent the data were recorded.

RESULTS

Out of 150 patients, 102 (68%) were females and 48 (32%) were males (Table-I (a) & I (b)). Usual morphology of the median nerve was found in 138 (92%) patients whereas, 12 (8%) had an altered structure rendering to its branches. The change in morphology which was observed was the lofty splitting near the transverse carpal ligament. Moreover, among the 12 cases of altered morphology, 03 cases had a persistent median artery. There was no linkage of the morphological variation with age and gender of the patients.

S. No	Observed Variation of Median Nerve	Frequency n = 150	Percentage
1.	Median nerve bifurcation	7	4.6%
2.	High bifurcation with persisting median	2	1.3%
3.	High bifurcation without persisting median	5	3.3%

Table-I (a). Variation of median nerve and its association with persistent median artery.

S. No	Observed Variation of Median Nerve	N	Age Mean \pm SD*
1.	High bifurcation associated with persistent median artery	2	33.26 \pm 12
2.	High bifurcation without persisting median	5	29.44 \pm 10.1

Table-I (b). Variation of median nerve and its association with persistent median artery.

*SD= Standard deviation

DISCUSSION

The division of the median nerve is typically exposed to morphological changes.^{2,13,14} Morphological changes of the nerve and in close proximity assemblies may be identified clinically or during surgery, cadaverous

dissection and postmortem. In activities where precise identification of the nerve is required, such as traumatic injury rehabilitation and carpal tunnel syndrome release, a knowledge of the morphological alteration of the median nerve at the wrist is essential. The purpose of this research was to find out the presence of morphological changes in the middle nerve in patients undergoing carpal tunnel release surgery at a tertiary hospital in the district of Nowshera, Khyber Pakhtunkhwa.

Researchers have observed morphological changes of the median nerve in close proximity to the carpal tunnel syndrome on several occasions and in a variety of studies.² In 2014, Pawan Agarwal et al. conducted a look-alike research on new cadavers, which showed the existence of premature splitting of the median nerve into medial and cross divisions in 11.5% of instances.¹⁵ A similar examination of 3300 carpal tunnel disease operations accomplished by Castorina et al.¹⁶ found 18 instances of early splitting or division of the median nerve, while high splitting was detected in 07 cases (4.6%) out of 150 carpal tunnel syndrome patients in our research. It is necessary to keep in mind the possibility of a persistent median artery (PMA) throughout the clinical run-through.

The prevalence of PMA varies from 2.2% to 27.1% in the general population. PMA has been linked to carpal tunnel syndrome and other ailments.¹⁷ Chen et al. conducted another research on 160 median nerves which were observed by means of ultrasonography and colour Doppler ultrasonography in which they studied 160 wrists, a bifid median nerve was observed in 15 (9.4%) wrists, and a persistent median artery was observed in 12 (7.5%) wrists. Some research highlights the PMA association with premature bifurcation of the median nerve or a bifid nerve pattern in the carpal tunnel was discovered in 63% of instances.¹⁸ According to our findings, the PMA was found in two instances (1.3%) in total of 150 patients, and its existence was associated with a magnified bifurcation of the median nerve in both cases, which were consistent with a research conducted by Haładaj

R, et al., as well as Eiken O et al. They revealed certain instances of PMA coming from the ulnar artery that were related to premature splitting of the median nerve.^{17,19} Because of the scientific importance of the existence of this artery in the carpus, there is a well-documented cause for the development of median nerve compression. This artery, which supplies gore to the middle nerve and the muscles in close vicinity, also the pollex and circular side of the first finger, may be injured and cause blood supply problems in the upper limbs to become compromised as well. Obtaining an understanding of the prevalence of persisting median artery must be portion of the pre surgical operation foundation in order to evade the danger of damage during carpel release surgery.

The exposed portion of the carpal tunnel has been reduced in size via surgery. This means that in contrast to a thorough itemisation, where the entire nerve can be recognised from its source at the brachial plexus, its path through the arm and antebrachium and also the kindling point, the median nerve cannot be anticipated in a significant way.

CONCLUSION

As a result of this research, we can infer that there is morphological diversity in the route of the median nerve in the construction of a high splitting of the nerve into cross and medial branches in the brain. With the presence of a persisting median artery, this kind of morphological variation may potentially be explored further. If there is a persisting median artery, there is a significant likelihood of related median nerve abnormalities occurring.






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3	Farah Deeba	Results writing.	
4	Muhammad Jehangir Khan	Discussion writing.	
5	Shagufta Sultana	Abstract writing.	
6	Rabail	Introduction Writing.	