

To Investigate the Vascular and Neural Anatomy of the Hand in Adult Cadavers at a Tertiary Care Centre

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ABSTRACT

Background: The knowledge about innervation of the hand and hand-related structures is important because the median nerve at wrist is important in repair of traumatic injuries and treatments of compression syndrome. The present study was conducted to investigate the vascular and neural anatomy of the hand in adult cadavers.

Materials and Methods: The present study was conducted to investigate the vascular and neural anatomy of the hand in adult cadavers. Forty adult cadaver hands were examined by the anatomical dissection method. The presence of the SPA, the MN, DPA were recorded. Statistical analysis was performed with IBM SPSS Statistics (International Business Machines Corporation (IBM), New York, USA), version 22 for Windows.

Results: In the present study forty adult cadaver hands were examined by the anatomical dissection method. In this study the frequency of superficial palmer arch type I was maximum (12.5%) and minimum was Type VI. The frequency of median nerve type II was maximum (15%) and minimum was Type III. The frequency of deep palmer arch type I was maximum (17.5%) and minimum was Type III.

Conclusion: This study concluded that the frequency of superficial palmer arch type I, the frequency of median nerve type II and the frequency of deep palmer arch type I was maximum.

Keywords: Superficial Palmer Arch, Median Nerve, Deep Palmer Arch.

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INTRODUCTION

Awareness of anatomical variations of the median nerve at the wrist is important in repair of traumatic injuries and treatment of compression syndrome because in these situations, precise dissection of the nerve is mandatory and such variations are not infrequent.¹ The superficial palmar arch (SPA) and deep palmar arch (DPA), which are formed by the ulnar artery (UA) and radial artery (RA), are the structures feeding the hand.² The extrinsic and intrinsic muscles of the hand provide hand movements. The extrinsic muscles of the hand are innervated by the radial nerve (RN), ulnar nerve (UN), and median nerve (MN). The intrinsic muscles of the hand are innervated by the UN and MN.² Nerve injuries in the hand are common and continue to pose a challenge to the upper extremity surgeon.^{3,4} Depending on the mechanism of injury, elapsed time since nerve transection, and degree of soft-

tissue edema, techniques of nerve coaptation include direct repair, hollow tube (conduit/connector) repair, and repair with autograft or allograft.⁵ The knowledge of variation will prevent damage to the median nerve during the surgical release of the carpal tunnel in patients of carpal tunnel syndrome and reduces on table confusion in cases of the median nerve injury.⁶ The present study was conducted to investigate the vascular and neural anatomy of the hand in adult cadavers.

MATERIALS AND METHODS

The present study was conducted to investigate the vascular and neural anatomy of the hand in adult cadavers. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute. Forty adult cadaver hands,

which had been previously fixed in a 10% formaldehyde solution, were examined by the anatomical dissection method. All cases with congenital anomalies, deformities and injuries to the hand and wrist were excluded from the study. Only one hand (left) of each cadaver was dissected. Dissections were performed under a surgical microscope at $\times 5$ magnification. To remove the skin of each hand, two transverse incisions passing through the wrist fold and finger roots and a vertical incision joining the midpoint of these two incisions were made. After the skin was removed, subcutaneous adipose tissue was cleaned, and the palmar aponeurosis was removed. Firstly, the presence of the SPA was evaluated. After the measurements of the SPA were completed, the number of branches from the MN, the DPA were determined. Then, the DPA was classified according to the data obtained.

Statistical Analysis

Analysis was performed with IBM SPSS Statistics (International Business Machines Corporation (IBM), New York, USA), version 22 for Windows.

RESULTS

In the present study forty adult cadaver hands were examined by the anatomical dissection method. In this study the frequency of superficial palmar arch type I was maximum (12.5%) and minimum was Type VI. The frequency of median nerve type II was maximum (15%) and minimum was Type III. The frequency of deep palmar arch type I was maximum (17.5%) and minimum was Type III.

Table 1: Frequency of the superficial palmar arch types

Types	n (%)
Type I	5 (12.5%)
Type II	1 (2.5%)
Type III	2 (5%)
Type IV	1 (2.5%)
Type V	2 (5%)
Type VI	0 (0%)
Type VII	1 (2.5%)

Table 2: Frequency of the median nerve types

Types	n (%)
Type I	4 (10%)
Type II	6 (15%)
Type III	0 (0%)
Type IV	1 (2.5%)

Table 3: Frequency of the deep palmar arch types

Types	n (%)
Type I	7 (17.5%)
Type II	1 (2.5%)
Type III	0 (0%)

DISCUSSION

With the exception of the palmar cutaneous branch, the median nerve does not usually give off branches in the distal third of the forearm. Significant variation of the median nerve appears to be uncommon and most major anatomy textbooks make no reference to such variations.^{7,8}

In the present study forty adult cadaver hands were examined by the anatomical dissection method. In this study the frequency of superficial palmar arch type I was maximum (12.5%) and minimum was Type VI. The frequency of median nerve type II was maximum (15%) and minimum was Type III. The frequency of deep palmar arch type I was maximum (17.5%) and minimum was Type III.

In the study conducted by Loukas *et al.*, the DPA was separated into three types according to the arteries forming the arch. According to this study, if the DPA was formed by the RA and inferior deep palmar branch of the UA, it was defined as "type D-I." If it was formed by the RA and superior deep palmar branch of the UA, it was defined as "type D-II." If it was formed by the RA and both deep palmar branches of the UA, it was defined as "type D-III." In the study, type D-I was found at a rate of 60% ($n = 120$), type D-II was found at a rate of 30% ($n = 60$), and type D-III was found at a rate of 10% ($n = 20$).⁹

Lanz described the variations in the median nerve anatomy as 46%, 7.5%, 2.9% and 2.9% in Lanz group I to IV respectively. Lenz did not report on type I variation but rather quotes Poisel's findings for group I which involve the study of 100 cadaver hands.¹⁰

Henneberg and George observed the presence of median artery providing substantial blood supply to hand in 96 dissected forearms of 15 adult African females and 49 adult males. They found the highest incidence (27.1%) of PMA than previously reported by any author. They did not find any significant difference in its occurrence between sexes or between right and left limbs.¹¹

Natsis *et al.* found two unilateral cases of PMA originating from the ulnar artery along with high division of the median nerve before entering the carpal tunnel. Such an artery may result in several complications such as carpal tunnel syndrome, pronator syndrome, or compression of the anterior interosseous nerve. Therefore, the presence of a PMA should be taken into consideration in clinical practice.¹²

CONCLUSION

This study concluded that the frequency of superficial palmar arch type I, the frequency of median nerve type II and the frequency of deep palmar arch type I was maximum.

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