# Medial and Lateral Antebrachial Cutaneous Nerve Anatomy: Implications for Digital Nerve Grafting

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**INTRODUCTION:** The medial and lateral antebrachial cutaneous nerves (MABC and LABC) are commonly used as donors for autologous nerve grafting for upper extremity nerve injuries. There is some literature examining the anatomical variation of the medial and lateral antebrachial cutaneous as well as the internal topography of the nerves [1,2]. There is one older study which provides a description of surgical harvest for the MABC, but it does not provide a detailed description of the anatomy or anatomical variations [3]. The goal of our study was to provide an updated detailed description of the individual nerve anatomical variations and how their sizes relate to digital nerve grafting. The purpose of our study was to provide a qualitative description of both the medial and lateral antebrachial cutaneous nerves, the variation in their anatomical course and branching patterns as well as a quantitative assessment of the size of the individual branches in comparison to digital nerves to assess the size suitability for nerve grafting procedures. Our hypothesis was that the MABC would have a more variable course and branching pattern compared to the LABC. We hypothesized that the anterior branch of the MABC would be the most consistently present branch with a diameter closely matching the digital nerve.

**METHODS:** Ten fresh frozen upper extremities (Ave age of 74 years; 5 males, 5 females) were dissected to determine the location and frequency of the MABC and LABC and their branches as appropriate. Initial dissection was made according to a published description of MABC nerve harvest 2 cm anterior and 2 cm distal to the medial epicondyle [3]. The presence or absence of MABC branches in the incision described by Nunley et al. was recorded. The MABC branches were then carefully traced proximally and distally taking note of any branching variations. The LABC was identified by dissecting in the subcutaneous tissues over the anterolateral aspect of the antecubital fossa and traced proximally and distally. Photographs of the dissected nerves (Figures 1 and 2) were taken to determine their average diameter at the following locations: main body of the MABC just proximal to its division into its anterior and posterior branches, anterior branch of the MABC distal to the epicondyle, posterior division of the anterior branch of the MABC distal to the epicondyle, posterior branch proper of the MABC distal to the epicondyle, LABC distal to the epicondyle, and the middle finger digital nerve in "Zone 2" as previously described by Higgins et al.[2]. Image J software was used to measure a cross-sectional width of each nerve or nerve branch. The width dimension was assumed to be equivalent to the diameter of each nerve branch. A one-way repeated measures ANOVA, with a Bonferroni correction for multiple comparisons, was used to compare the size of the different nerves and their branches.

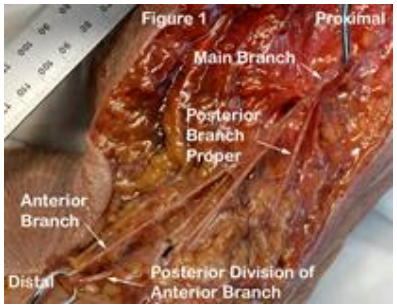
**RESULTS:** In 9 out of 10 specimens the anterior branch of the MABC was identified in the incision described by Nunley et al. In the one specimen where there were no branches in the described incision, the anterior branch was found more anteriorly in the forearm. In 5 of the 10 specimens there was a posterior proper branch of the MABC. In all but two specimens there were two branches of the anterior branch of the MABC, which we described as an anterior division and a posterior division of the anterior branch. One specimen had two posterior divisions of the MABC and their diameters were averaged for analysis. Two specimens did not have a posterior division of the anterior branch of the MABC and no nerve dimensions were available for one arm due to poor positioning of the scaling ruler. This left 7 specimens for a statistical comparison of the nerve sizes of the main body of the MABC, the anterior and posterior divisions of the anterior branch of the MABC, the LABC and the digital nerve. Statistically, the main body of the MABC was significantly larger ($p=0.001$) than the anterior branch and larger ($p=0.04$) than the LABC (table1). There were no significant differences in the nerve size between the digital nerve and any of the others.

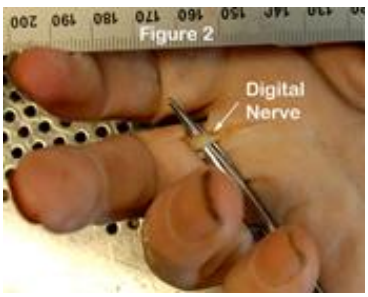
**DISCUSSION:** A detailed knowledge of anatomy and potential anatomic variations is essential in reliably selecting autologous donor nerve graft for digital nerve defects. We validated the previously described technique for MABC nerve graft harvest and provided further qualitative and quantitative information regarding MABC and LABC anatomy. We found that the MABC has a main branch proximal to the epicondyle and divides into two main branches: an anterior and posterior branch. The posterior branch dividing proximal to the medial epicondyle is not always present. The anterior branch of the MABC was found to consistently to have two divisions an anterior and posterior division which divide anterior and distal to the medial epicondyle. These branches are typically used for digital nerve graft. Our results show that either the anterior or posterior division of the anterior branch can be used as they have comparable size. The LABC is in a predictable location in the subcutaneous tissues in the lateral aspect of the forearm and does not give off any large branches. The size of the LABC at its midpoint is comparable to the MABC branches. Interestingly, the size of the digital nerve in Zone 2 may be more comparable to the size of the main trunk of the MABC. Although this may be a better size match, clinically this may present with an unsatisfactory donor site deficit if it is used for a graft. Limitations of this study include: a small sample size, cadaveric dissection with potentially altered soft tissue tension when compared to the in vivo setting, as well as measurement variability and error from the photographs. This study provides important anatomical detail that is valuable to surgeons when selecting donor nerves for nerve grafting procedures.

**SIGNIFICANCE/CLINICAL RELEVANCE:** An anatomical description of the MABC and LABC with a comparison of their sizes relative to digital nerves will provide clinicians valuable information in selecting the most appropriate autologous nerve graft donor for reconstruction of digital nerve injuries.

**REFERENCES:** 1. Benedikt et al. J Plastic, Reconstructive Aesthetic Surg (2017). 2. Higgins et al. J Hand Surg (2001). 3. Nunley et al. J Bone and Joint Surgery (1989)

**ACKNOWLEDGEMENTS:** Funded by the Department of Orthopedic Surgery, SUNY Upstate Medical University




| Table 1 | Width (mm, std dev) | Number found |
|---|---|---|
| Main branch of MABC | 2.5 (0.7) | 10 |
| Anterior branch | 1.7 (0.7) | 10 |
| Posterior division of anterior branch | 1.8 (0.7) | 8 |
| Posterior Branch Proper | 1.5 (0.6) | 5 |
| LABC | 1.6 (0.5) | 10 |
| Digital Nerve | 2.9 (0.7) | 10 |