

# Localizing the Course of the Radial Nerve Based on Anatomical Landmarks: A Cadaveric Study

Jake Powell, OMSIII, Kalan Barnes, M.S., OMSII, Cameron Beck, OMSIV, Matthew Skinner, MD, William F Pientka II, MD, Cara L. Fisher, Ph.D.

## Author Affiliations:

Texas College of Osteopathic Medicine<sup>1</sup> and Center for Anatomical Sciences<sup>2</sup>  
University of North Texas Health Science Center at Fort Worth

## Conflict of Interest:

The authors declare there is no conflict of interest.

## Introduction:

The location of the radial nerve in the spiral groove is important for surgeons to understand preoperatively due to the risk of iatrogenic injury during surgical approaches to the humerus<sup>1</sup>. The purpose of this study is to define the course and variability of the radial nerve along the posterior humerus in relationship to the medial and lateral epicondyles.

## Methods:

20 fresh-frozen cadaveric arms were studied while in a lateral recumbent position with the shoulder and the elbow flexed 90° and supported, as done intraoperatively. A level was used to ensure the 90° angle and proper alignment of the arm (Figure 1). A medial longitudinal incision was made over the posterior humerus to expose the triceps brachii muscle. Dissection through the triceps brachii was performed and the radial nerve was identified along with the profunda brachii vessels. Six measurements were taken utilizing a Polhemus electromagnetic digitizer (Figure 2).

## Results:

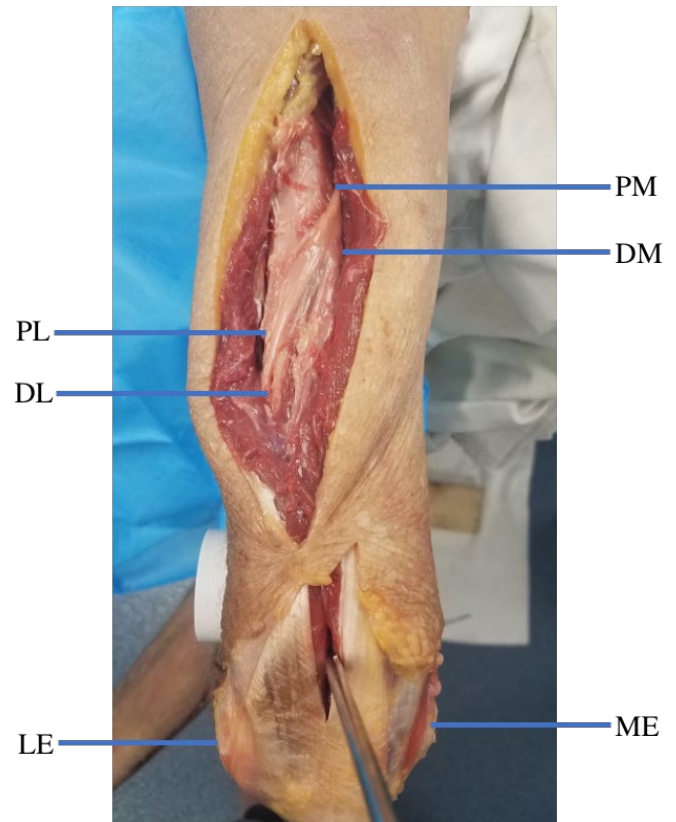
The mean distance from the medial epicondyle to the midpoint of the medial crossing of the radial nerve humerus is 17.19cm (95%CI 15.58 – 18.80). The distance of the lateral epicondyle to the midpoint of the radial nerve at the lateral crossing is 12.25cm (95% CI 11.26-13.24).

## Discussion:

The most common complication in the posterior approach of the humerus is radial nerve palsy in 11.53% of patients. The academic standard of localizing the radial nerve in the radial groove is based on the distance from the medial and lateral epicondyles to the points where the radial nerve crosses the humerus posteriorly<sup>2,3</sup>. The measurements from the Gerwin et al. study define the radial nerve crossings at 20.7 cm proximal to the medial epicondyle and 14.2 cm proximal to the lateral epicondyle and have been cited for decades as dogma in the field of orthopedic surgery<sup>1</sup>. Our results suggest a more accurate measurement to locate the radial nerve preoperatively.



(Figure 1 – level indicating level alignment of arm at 90 degrees)



(Figure 2 - Identification of landmarks used for measurement)

### References:

1. Gerwin M, Hotchkiss RN, Weiland AJ. . Alternative Operative Exposures of the Posterior Aspect of the Humeral Diaphysis. *The Journal of Bone and Joint Surgery-American Volume*. 1996;78(11):1690–1695.
2. Carlan D, Pratt J, Patterson JM, Weiland AJ, Boyer MI, Gelberman RH. The radial nerve in the brachium: an anatomic study in human cadavers. *J Hand Surg Am*. 2007 Oct;32(8):1177-82. doi: 10.1016/j.jhssa.2006.07.001. PMID: 17923300.
3. Yin P, Zhang L, Mao Z, Zhao Y, Zhang Q, Tao S, Liang X, Zhang H, Lv H, Li T, Tang P. Comparison of lateral and posterior surgical approach in management of extra-articular distal humeral shaft fractures. *Injury*. 2014 Jul;45(7):1121-5. doi: 10.1016/j.injury.2014.02.034. Epub 2014 Mar 12. PMID: 24685053.
4. Jain RK, Champawat VS, Mandlecha P. Danger zone of radial nerve in Indian population - A cadaveric study. *J Clin Orthop Trauma*. 2019 May-Jun;10(3):531-534. doi: 10.1016/j.jcot.2018.02.006. Epub 2018 Feb 21. PMID: 31061584; PMCID: PMC6492309.