

Posterior Interosseous Nerve Graft: Utilizing Surface Anatomy to Predict Length for Digital Nerve Reconstruction

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Introduction

Digital nerves are particularly susceptible to injury and are the most commonly damaged peripheral nerve.¹ Several options exist for repair, however autologous nerve grafts remain the superior option.² Multiple sites for donor nerves exist, yet each carries its own risks.

The distal sensory terminus of the posterior interosseous nerve (PIN) provides primary innervation to the dorsal articular capsule of the wrist.³ Harvesting of this nerve leaves no clinically detectable deficit in proprioception of the wrist or sensation of the forearm and is of similar cross sectional area of the distal digital nerves.^{2,4}

The length of PIN available may vary by patient size. In this study we sought to develop a method to accurately predict the length of PIN in regards to individual patient anthropometry.

Methods

Data Source: Fresh frozen cadaveric upper extremity specimens were obtained from the Acland Fresh Tissue Lab at the University of Louisville.

Study: Several anthropometric measurements of the upper extremity were obtained in order to develop a reproducible ratio. Dissection of the radial nerve with isolation of PIN was performed. The nerve was then resected proximally to the last muscular branch and distally to its disappearance in the dorsal wrist capsule in order to obtain accurate length.

Statistical Analysis: A Pearson Correlation was performed in order to obtain a reproducible ratio. Once the ratio for PIN length to ulna length was determined to be 0.25, a calculated PIN length was obtained. The measured and calculated PIN lengths were compared using a t-test.

Results

Table 1: Demographics and Measured and Calculated Distances

Cadaver	1	2	3	4	5	6	7
Gender	M	F	F	M	M	F	M
Laterality (hand)	R	R	L	R	L	L	L
Length of Ulna: ulnar styloid to olecranon (cm)	30.6	24.3	23.8	24.8	27.5	23.7	26.2
Measured length of PIN (cm)	9.6	5.5	5.4	5.6	7.0	4.9	6.3
Predicted length of PIN (1/4 Ulna length) (cm)	7.65	6.08	5.95	6.20	6.88	5.92	6.55

Figure 1: PIN Length vs Ulna Length

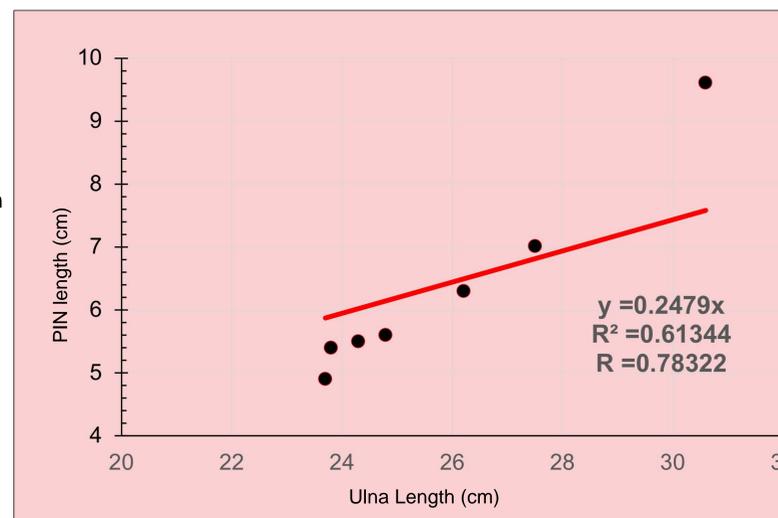


Figure 2: Specimen 6: PIN with final branch to extensor indicis muscle

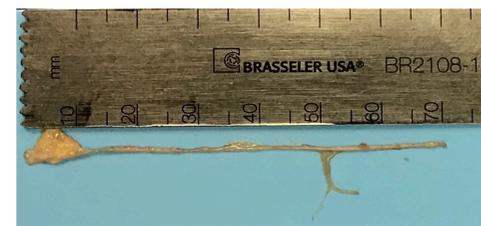


Figure 3: Specimen 6: PIN length

- 7 specimens, 4 males and 3 females, were dissected
- On average:
 - Length of the PIN was **6.33 cm (range: 4.9 -9.6 cm)**
 - Length of the ulna was **25.8 cm (range: 23.8- 30.6 cm)**
- The ratio of PIN to ulna length was **0.248** with a **R = 0.783**
- Using one-fourth (0.25) the length of ulna, the mean predicted length of the PIN was **6.46 cm (range: 5.92 - 7.65 cm)**
- On univariate analysis, there was no significant difference between the measured and predicted PIN length, **p=0.73**

Conclusion

- Anthropometric ratios predicated on reproducible surface anatomy can be a viable and useful tool in predicting the available nerve length for potential digital nerve reconstruction in cadaveric specimens.
- Using a ratio of one-fourth the length of the ulna, the predicted length of the sensory PIN available for harvest in a cadaver was not significantly different than the actual measured length in a reproducible fashion.
- Further studies may prove useful in relating patient anthropometry to predicting the total harvestable length available of other potential donor nerves.

References

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