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APPLIED ANATOMY OF WRIST INNERVATION RELEVANT TO ULTRASOUND GUIDED INTERVENTION FOR CHRONIC WRIST PAIN

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Introduction

Chronic wrist pain impairs hand and wrist functions that are essential for independence with activities of daily living and engagement of vocational roles.¹ Potential source of chronic wrist pain includes the triangular fibrocartilage complex (TFCC), distal radio-ulnar joint (DRUJ), or radiocarpal joint (RCJ). While surgical denervation offers salvage therapy following failed conservative management, improvement in pain and functions has been inconsistent and suboptimal.² Minimally invasive, ultrasound (US)-guided percutaneous radiofrequency ablation (RFA) denervation is an emerging alternative that may alleviate chronic wrist pain while restoring and preserving motor function. Although previous studies provide some preliminary knowledge on wrist innervation, the success of RFA denervation rests upon additional details on the course and distribution of the articulating branches specific to the TFCC, DRUJ, and RCJ. Our study aims to address this gap in current literature, as well as their relations to anatomical landmarks that are discernable to US.

Materials and Methods

IRB approval was obtained from the Human Research Ethics Program at the University of Toronto (RIS 40469). Fourteen formalin embalmed specimens were serially dissected to expose the origin, course, and distribution of articular branches innervating the TFCC, DRUJ, and RCJ. Mapping of the innervation to these joints, the bony and soft tissue landmarks corresponding to each articular branch supplying the wrist were documented, digitalized, and reconstructed into 3-dimensional models (Figure 1).

Results/Case Report

The posterior interosseus (PIN), anterior interosseus (AIN), lateral antebrachial cutaneous (LACN), and dorsal cutaneous branch of ulnar (DCBUN) nerves were found to innervate the TFCC, DRUJ, and/or RCJ in all specimens. Innervation was also found from the palmar cutaneous branch of the ulnar nerve (PCBUN) (85%), palmar cutaneous branch of median nerve (PCBMN) (71%), medial antebrachial cutaneous nerve (MACN) (65%), and superficial branch of the radial nerve (SBRN) (43%). Bony and soft tissue landmarks were identified for each nerve.

Discussion

Chronic wrist pain can have significant health and economic implications for affected individuals. Percutaneous RFA denervation may be a promising alternative to surgical denervation for chronic wrist pain refractory to conservative management. Our study demonstrated a comprehensive course and distribution of the articular branches supplying TFCC, DRUJ, and RCJ. The target nerves for these potential sources of chronic wrist pains identified in our study were largely consistent with those previously reported (Table 1). Importantly, our findings included bony and soft tissue landmarks corresponding to the articular branches that may be identifiable on US. The detailed documentation of the spatial relationship of the nerve supply to the wrist from this study provides the necessary anatomical information that could potentially optimize current and develop new denervation protocols to manage chronic wrist pain.

References

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2. Kadhum M, Riley N, Furniss D. Is partial wrist denervation beneficial in chronic wrist pain? A systematic review. *J Plast Reconstr Aesthetic Surg* [Internet] Elsevier Ltd; 2020; 1–11 Available from: <https://doi.org/10.1016/j.bjps.2020.03.032>

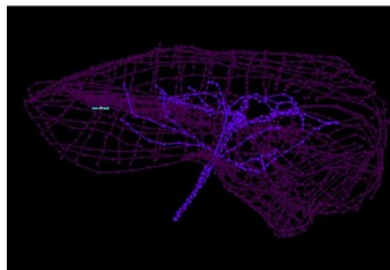
Disclosures

No

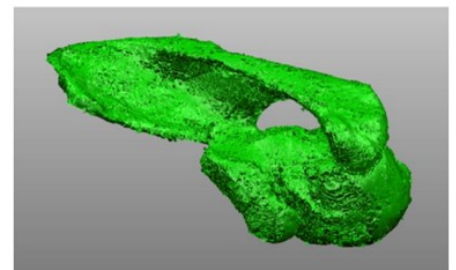
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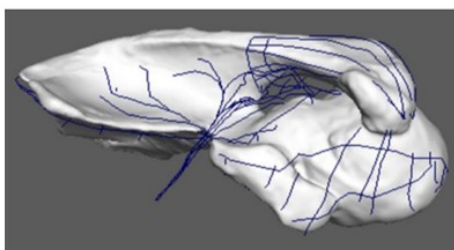
a. Cadaveric Dissection



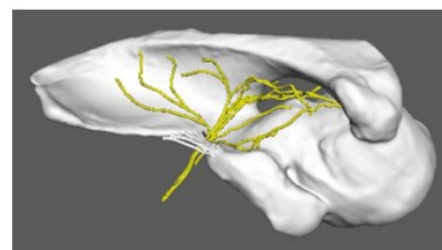
b. Nerve Digitization



c. Bone Surface Laser Scanning



d. Bone Surface Reconstruction & Digitized Nerve Alignment



e. 3D Model Reconstruction

Table 2. Comparison of nerve targets between previous and Potential sources of chronic wrist pain and nerve targets

Source	Nerve Targets
TFCC	PIN, DCBUN, PCBUN, MACN
DRUJ	AIN, PIN
RCJ	PIN, PCBMN, LACN, SBRN