Anomalous Radial Artery as an Incidental Finding During a Routine Carpal Tunnel Release

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Abstract

Background: Compression of the median nerve at the wrist, or carpal tunnel syndrome, is the most commonly recognized nerve entrapment syndrome. Carpal tunnel syndrome is usually caused by compression of the median nerve due to synovial swelling, tumor, or anomalous anatomical structure within the carpal tunnel. **Methods:** During a routine carpal tunnel decompression, a large vessel was identified within the carpal tunnel. **Results:** The large vessel was the radial artery. It ran along the radial aspect of the carpal tunnel just adjacent to the median nerve. **Conclusions:** The unusual presence of the radial artery within the carpal tunnel could be a contributing factor to the development of carpal tunnel syndrome. In this case, after surgical carpal tunnel release, all symptoms of carpal tunnel syndrome resolved.

Keywords: carpal tunnel, radial artery, median nerve compression, carpal tunnel syndrome, carpal tunnel release

Introduction

Compression of the median nerve at the wrist, or carpal tunnel syndrome, is the most commonly recognized nerve entrapment syndrome.^{1,4} This syndrome often presents with tingling, numbness, and pain in the median nerve distribution, and in advanced cases, it presents with weakness and wasting of thenar muscles.^{1,3} Carpal tunnel syndrome is usually caused by compression of the median nerve due to synovial swelling, tumor, or anomalous anatomical structure within the carpal tunnel. It has been suggested that aberrant vessels with an external diameter greater than 2 mm could cause median nerve compression within the carpal tunnel.^{2,4} Here, we present a case where an anomalous radial artery, 3.2 mm in diameter, was discovered as an incidental finding during a routine carpal tunnel release.

Case Report

A 57-year-old African American male initially presented with a classical picture of carpal tunnel syndrome in his right hand experiencing constant tingling, numbness, and pain. He also complained of occasional coldness and pain in his thumb. We did not do a preoperative Allen test. We did perform a postoperative Allen test that was negative, showing good communications of radial and ulnar arteries through superficial and deep palmar arches.

Electromyogram testing confirmed carpal tunnel syndrome. The decision was made to perform surgical release.

After adequate anesthesia was induced, a tourniquet was put on the right arm. A 2.5-cm long incision was made at mid-palmar crease. After partial carpal tunnel release, an unusual bluish structure was noticed. After careful completion of carpal tunnel release, attention returned to the aberrant vessel. The structure appeared to be arterial (Figure 1). The anomalous artery had a diameter of 3.2 mm and was accompanied by venae comitantes.

Initial presumption was that this artery was a persistent median artery. The carpal tunnel incision was extended proximally and radially by an additional 3 cm to identify the course of the vessel (Figure 2). Proximal extension showed that the vessel was actually the radial artery because it turned radially proximal to the transverse carpal ligament and then assumed the usual anatomical course of the radial artery. Arterial course proximal to transverse carpal ligament was ulnar to the brachioradialis and radial to flexor carpi radialis (FCR) and flexor pollicis longus. It appeared that artery had its usual course up to 2 cm proximal to proximal wrist crease. Then instead of continuing radially and passing underneath abductor pollicis longus and extensor

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Figure 1. Initial incision during direct visualization of carpal tunnel release showing anomalous artery on the radial side of the median nerve.

Figure 2. Extended incision of the carpal tunnel release to reveal the course of the radial artery. The blue vessel loop is wrapped around the median nerve.

pollicis brevis, it curved sharply ulnarly crossing over FCR and palmaris longus and diving into the carpal tunnel.

Distally, this radial artery divided into princeps pollicis, radial digital artery of the index finger, and ended in the deep palmar arch.

After surgical carpal tunnel release and recovery, all symptoms of carpal tunnel syndrome resolved including the thumb coldness and pain.

Discussion

Anatomical variations of tendons, nerves, and arteries are all possible around and within the carpal tunnel.⁵ Although vascular aberrations through the carpal tunnel are rare, there are reports of median, ulnar, and radial artery involvement.

The median artery is an embryological remnant that is present in 1.2% to 23% of the population.^{3,6} The ulnar artery may travel superficial to the muscles but deep to the antebrachial fascia, taking a superficial course within the forearm.⁵ The prevalence of a superficial ulnar artery has been reported to be between 0.7% and 9.4%.⁸ By contrast, finding the radial artery within the carpal tunnel is an exceedingly rare anomaly.

In Phalen's prior report of carpal tunnel decompression, Sterling Bunnell described "a large artery substituting for the radial accompanying the median nerve bearing against it."⁷ In addition, Gwynne-Jones and Hartnett⁴ described a case report in which they found what appeared to be "an anomalous superficial palmar branch of the radial artery substituting for the normal radial artery." Beyond these 2 reports, we are not aware of any further publications describing the finding of the radial artery within the carpal tunnel.

In our case, the vessel encountered was the radial artery. While the vessel's diameter was greater than 2 mm, and therefore could itself have been the cause of median nerve compression, this particular patient had additional factors that also likely contributed to his symptoms. The patient is manual laborer working 10 hours a day with drilling tools, pneumatic hammers, and other vibration tools. He also had history of previous wrist fracture dislocation and consecutive posttraumatic osteoarthritic changes with chronic inflammation.

Postoperatively, the patient had complete resolution of carpal tunnel syndrome symptoms. Direct visualization of the carpal tunnel allowed for successful surgery while avoiding arterial injury. Surgeons should be aware of the possible presence of the radial artery within the carpal tunnel to avoid iatrogenic injury to patients during carpal tunnel release.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation

(institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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