Analysis of Vascularity of the Interosseous Ligament Complex

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INTRODUCTION:

Treatment of longitudinal radioulnar dissociation, also known as an Essex-Lopresti injury, involves radial head arthroplasty, fixation of the distal radio-ulnar joint and immobilization of the forearm to allow the native interosseous ligament complex (IOLC) to heal. The literature has provided little evidence that the IOLC can reliably heal even with appropriate treatment. We hypothesize that the blood supply to the IOLC is limited and may contribute to its tenuous ability to heal.

METHODS:

The arterial anatomy of four cadaveric upper extremities was studied with a technique of combined India ink and latex injection, as described by Yamaguchi et al[1]. The axillary artery was identified and cannulated using a 16-french Foley catheter. A transverse incision was made at the PIP joint of the middle finger to observe for adequate perfusion. After flushing the vasculature with normal saline solution, filtered India ink solution (Speedball Art Products, Statesville, NC) was injected into the artery under firm manual pressure. This was followed by injection of red Ward's latex (Ward's, Rochester, NY). Arms were then frozen at -20ºC for forty-eight hours to allow the latex to consolidate. After consolidation, arms were meticulously dissected with emphasis on preservation of the arterial anatomy.

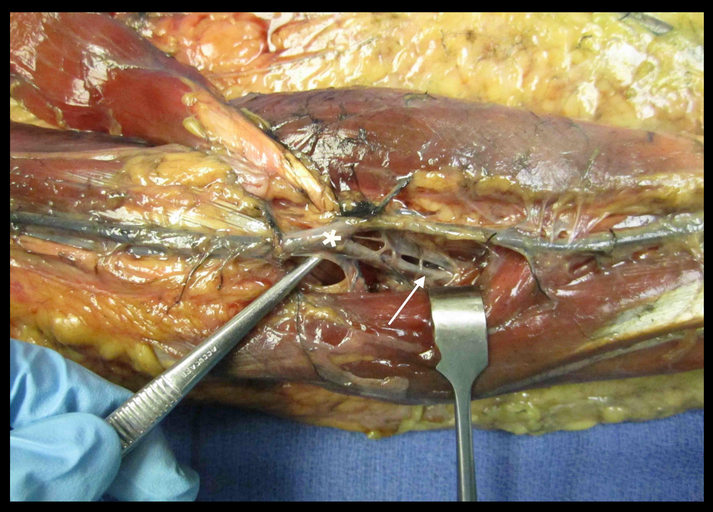


Figure 1: Photo of bifurcation of the brachial artery (asterisk) with the ulnar artery (arrow) traveling deep to the anterior compartment muscles of the forearm.

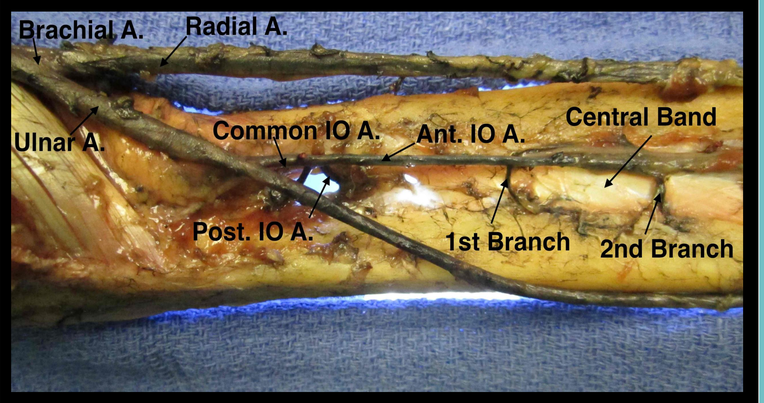


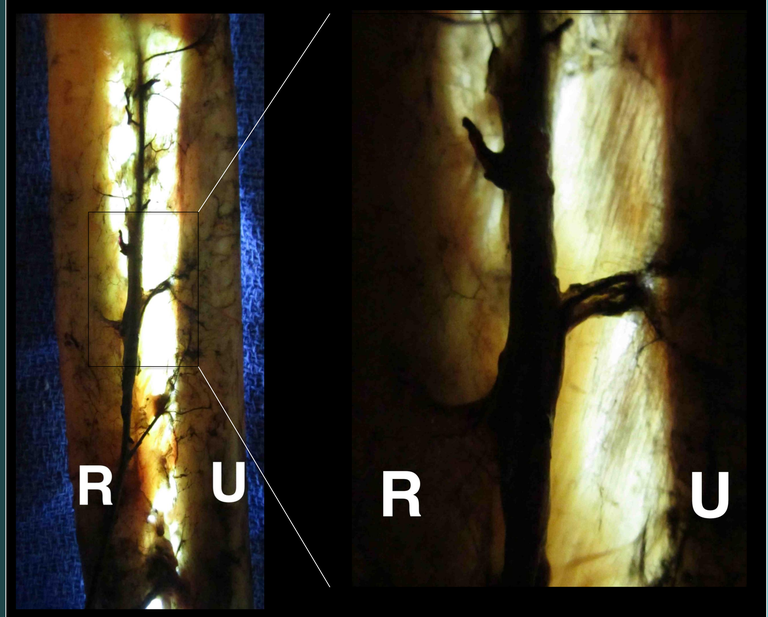
Figure 2: Photo of cadaveric specimen treated with India Ink and Ward's latex demonstrating the arterial blood supply from the brachial artery to the branches feeding the IOLC from the Anterior Interosseous artery (Ant IO A).

RESULTS:

The arterial anatomy was found to be consistent throughout the specimens, and demonstrated a prominent anterior interosseous artery (AIA) supplying much of the vascularity to the surrounding anterior compartment muscles of the forearm. On average, there were 4 branches arising from the AIA (range 2 – 5) coursing along the IOLC with the first branch arising at 3.3 cm from the origin, the second at 6.1 cm, third at 7.4 cm, and fourth at 9.0 cm. The largest span without any small branches was from the first to second branch which corresponds to the central band location. In one specimen, an "accessory" AIA was identified traveling along the ulnar aspect of the IOLC. A smaller posterior interosseous artery was identified supplying the posterior compartment muscles of the forearm with contributions from branches of the AIA perforating through the IOLC to join the posterior vascular network. Backlit images demonstrated sparse vessels within the IOLC itself.

DISCUSSION:

The IOLC derives its blood supply primarily from arteries supplying the surrounding soft tissues with a limited arterial network to the ligament complex itself in this analysis of cadaveric arms using combined India ink and latex. There exists a large watershed area between the first and second branches of the anterior interosseous artery, closely corresponding with the location of the central band.



Figures 3,4: Photo of backlit specimen emphasizing sparse vascularity within the IOLC. The box indicates region of central band, with close up view in figure 4.

SIGNIFICANCE:

The paucity of blood supply to the area of the central band may explain the poor healing potential of the IOLC after injury. This data may be used to support the advancement of central band reconstruction in cases of longitudinal radioulnar dissociation.

REFERENCES:

1. Yamaguchi et.al. J Bone Joint Surg Am. 1997;79:1653-62.

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