A CASE OF PERSISTENT MEDIAN ARTERY SPLITTING THE MEDIAN NERVE

Nicolette Alberti, Ilana Anmuth, Justin Canakis, David Bigley, Maryanne Lubas, Kevin Amuquandoh, Michael McGuinness
Department of Bio-Medical Sciences and Center for Chronic Disorders of Aging, Philadelphia College of Osteopathic Medicine, Philadelphia, PA 19131.

ABSTRACT

Introduction: Development of vascular abnormalities throughout the body are not uncommon. Little insight can be found regarding the clinical manifestations and development of these irregularities in the current data, indicating that further research needs to be done in order to gain full understanding of their implications. Normal vasculature of the forearm proceeds as follows; the brachial artery splits into the radial and ulnar arteries. The common interosseous artery branches off of the ulnar artery and then splits into an anterior and posterior portion. The anterior interosseous artery pierces the interosseous membrane and anastomoses with the posterior interosseous artery on the dorsal surface of the forearm, developing a deep palmar arch along the ulnar side. Little is known on the developmental regulation of the branching of these arteries. The forearm of a 41-year-old female was dissected as part of a gross anatomy course at Philadelphia College of Osteopathic Medicine. Results: A PMA followed the course of the median nerve in the cadaver’s left forearm, splitting the nerve immediately distal to the elbow. The median nerve travels as a single nerve and artery along the nerve’s standard path through the carpal tunnel. This anomaly was found in only the left arm. The radial and ulnar arteries were unremarkable, following their conventional pathways with no additional abnormal branching. Discussion: Clinical applications for the abnormalities concern both carpal tunnel syndrome and neuropathy. A PMA has been noted as a cause for carpal tunnel because of its ability to compress the median nerve. With the unusual splitting of the median nerve, the implications are unknown, but neuropathy seems possible if not likely.

METHOD

The body of a 41-year-old female was donated to the Humanity Gifts Registry of Pennsylvania. This is the anatomical board for the state of Pennsylvania that was established in 1893 by the Anatomical Gift Act of Pennsylvania. Age and cause of death and occupation were obtained from the death certificate. The body was used in fall semester anatomy courses at Philadelphia College of Osteopathic Medicine. Upper limb dissection was conducted with modifications following the procedure in Grant’s Dissector (Tank, 13th ed.). Measurements were taken with a caliper between the origin of the ulnar artery and common interosseous and the origin of the common interosseous and the trifurcation.

RESULTS

Artery & nerve progression through arm:
- Brachial artery runs medial to lateral across the anterior surface of the median nerve
- The Ulnar and Radial branches originate in the median cubital fossa posterior to the promotor larynx muscle and distal to the elbow joint.

Artery & nerve progression through forearm (Figure 1A and 2B):
- Radial artery continues through the arm along a typical path terminating in the hand.
- The ulnar artery traveled 3.8 cm before the common interosseous artery originates.
- The common interosseous artery measures 0.5 cm before trifurcating into anterior and posterior interosseous arteries.
- PMA travels anterior splitting the median nerve.
- Sections of the median nerve not to PMA with no additional branching.
- PMA does not branch through the forearm traveling lateral to the flexor Digitum Superficialis tendons.
- PMA splits median nerve again posterior to anterior, proximal to the wrist and carpal tunnel.

Artery & nerve progression through wrist and hand (Figure 1B and 3):
- The two median nerve branches travel to and terminate in the hand.
- PMA terminate on the superficial palmar arch between the common digital arteries of digits one and two, anterior to the medial branch of the median nerve.

DISCUSSION AND CONCLUSION

Considering the pathway the artery takes, deep to the flexor compartment of the forearm and that the combination of the superficial arch branches at the wrist and forms a PMA rather than a superficial ulnar artery. Other case presentations have however found differing variations of the PMA. Some cases cite branching from the brachial artery, directly off of the ulnar artery, or at a trifurcation off of the ulnar artery, as is seen in this case, where others state presence of a superficial palmar arch accompanying the PMA. Most discussions mark the superficial palmar arch as the termination site for the PMA, as is seen in this case, where others state presence of a superficial palmar arch. The regulation of arterial development in the upper limb is not completely understood. During upper limb development the median artery normally regresses. Since hypoxia stimulates angiogenesis, it is possible that hypoxic inducible factor in the midline of the forearm inhibited regression of this artery. Clinical applications of this anomaly concern both carpal tunnel syndrome, neuropathy, and laceration presentation. The patient in the current case hold a position in clerical work, putting her at an increased occupational risk for carpal tunnel syndrome. PMAs have been noted as a cause for carpal tunnel syndrome because the presence of an additional artery in the confined space of the carpal tunnel would increase the pressure to compress the median nerve. With the patient’s concurrent PMA and occupation, she would have had a higher risk of developing carpal tunnel syndrome than others in similar professions. It is possible that the patient would have presented differently than a typical carpal tunnel patient because of the two bifurcations of the median nerve. It is unknown how the division of the median nerve would have affected function and sensation in the forearm and hand. It is possible that additional neuropathy could be noted with patients presenting with a PMA. Being of comparable diameter to the radial and ulnar artery, the PMA could take some of the shear and build up of significant superfluous bleeding if a patient presented with a laceration to the forearm. This added bleeding could have been incorrectly attributed to a laceration to the possibility of an additional artery not considered by the medical team. It is important to report and educate health care professionals about vascular anomalies to minimize misunderstandings and misinterpretations.

REFERENCES
