



SUPERFICIAL COURSE OF THE ULNAR ARTERY

Anatomy

Dr. Ravikumar R Parmar* Department of Rachana Shareera, P.G. Scholars 2nd year, J.S. Ayurveda Mahavidhyalaya, Nadiad, Gujarat, India. *Corresponding Author

Dr. Seetharama Mithanthaya Department of Rachana Shareera, Reader, J.S. Ayurveda Mahavidhyalaya, Nadiad, Gujarat, India.

ABSTRACT

Variation of the ulnar artery in the upper limb is uncommon. The existence of such a variant is of particular clinical significance, as these arteries are more susceptible to trauma, and can be easily confused with superficial veins during medical and surgical procedures, potentially leading to iatrogenic distal limb ischemia. It has been reported that ulnar artery is a calculable anatomic variation as long as its possible presence is considered during flap harvesting and in such cases; the use of ulnar artery flap is an easy and safe alternative. By careful palpation or by using vascular doppler, the presence of ulnar artery and its course can be diagnosed preoperatively and accidental division of these vessels during the raising of the radial forearm flap can be avoided.

KEYWORDS

ulnar artery, superficial ulnar artery, cubital fossa, brachial artery, vascular variation, radial artery, superficial palmar arch.

INTRODUCTION

Brachial artery is a continuation of axillary artery at the lower border of teres major muscle. It usually terminates at the level of neck of radius in the cubital fossa by dividing into radial and ulnar arteries. The ulnar artery passes inferomedially deep to the median nerve and the muscles arising from the medial epicondyle of the humerus and the coronoid process of the ulna¹. It lies on brachialis and flexor digitorum profundus, meets the ulnar nerve above the middle of the forearm, and descends vertically with it to pierce the deep fascia just proximally to the flexor retinaculum, between the tendons of flexor carpi ulnaris and flexor digitorum superficialis². Both arteries supply the muscles adjacent to them and give palmar and dorsal carpal arteries at the wrist joint. The common interosseus artery is the principal branch of the ulnar artery in the forearm. It passes through forearm above the upper border of the interosseous membrane. Here it divides into anterior and posterior interosseous arteries. The posterior passes above the membrane to the back of the forearm. The anterior interosseous artery gives off the long, slender median artery to the median nerve and then descends on the front of the interosseous membrane b/w flexor pollicis longus and flexor digitorum profundus to pronator quadratus³.

MATERIAL AND METHOD

Instruments required for Cadaver Dissection:

1. Forceps – Artery, Blunt, Pointed, Toothed, Allies, Babcock
2. Scalpel
3. B.P. Handle
4. Scissors
5. Retractor
6. Hacksaw Blade

METHOD

1. A detailed literary review is done by referring anatomy text books and journals related to variation in branching pattern of brachial artery.
2. Dissection of Upper limb region was performed using essential instruments as per Cunningham's Manual of Practical Anatomy⁴.

CASE STUDY

During routine dissection of upper limb in the department of Rachana Shareera, J S Ayurveda Mahavidhyalaya College, Nadiad, India, the superficial course of the ulnar artery in the forearm was observed in 54-year-old male cadaver. There was no history or evidence of any invasive procedure in the upper limbs. A case of unilateral ulnar artery originate from brachial artery has been reported. In the right limb, it branched directly from the brachial artery and in the left limb no such variation are found. In the left upper limb of the cadaver, the brachial artery ended at its normal level of termination by dividing into radial and ulnar artery at the cubital fossa.

The radial artery took a normal course. The brachial artery terminated into ulnar and radial artery in the cubital fossa. The ulnar artery descended posterior to the median nerve initially, and then run medial

to it in the flexor compartment of the forearm in a superficial plane. There were no branches throughout its course in the forearm (figure 1). Proximal to the flexor retinaculum, it was accompanied by the ulnar nerve with which it descended in front of the vomar carpal ligament to reach the palm. In the palm it continued as superficial palmar arch after giving a deep branch.

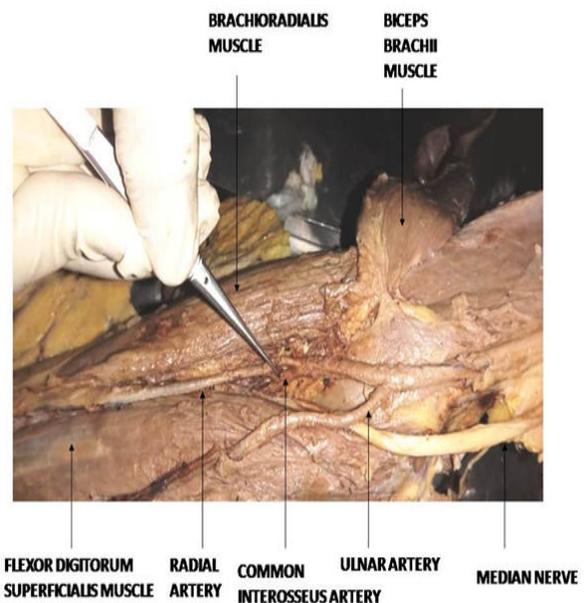


Figure 1. Dissection of the anterior compartment of upper limb showing the high origin of superficial ulnar artery from the brachial artery ; Common interosseous artery; Median nerve ; Radial Artery ; Flexor Digitorum superficialis Muscle; Brachioradialis muscle; Biceps Brachii muscle.

DISCUSSION

Many variety of variations related to Ulnar artery have been reported which includes variations in its origin (from axillary artery in the axilla or from brachial artery in the arm) and its superficial course in the arm and forearm. A case of unilateral ulnar artery originate from brachial artery has been reported. In the right limb, it branched directly from the brachial artery and in the left limb no such variation are found.

Possible impairment of the ulnar artery by mistake during harvesting of fascio cutaneous forearm flaps has been reported by Sieg, Jacobsen, Hakim et al. (2006). It has been reported that ulnar artery is a calculable anatomic variation as long as its possible presence is considered during flap harvesting and in such cases; the use of ulnar artery flap is an easy and safe alternative. By careful palpation or by using vascular doppler,

the presence of ulnar artery and its course can be diagnosed preoperatively and accidental division of these vessels during the raising of the radial forearm flap can be avoided. The incidence of such variation ranges between 0% to 9.38% as reported by different authors (Table no 1).

Table No 1. Variation of superficial ulnar artery according to different authors

Author (year)	Sample	Incidence	%	Specimen	Method
Quain ⁵ (1844)	422	29	6.87%	Cadavers	Dissection
Gruber ⁶ (1867)	700	20	2.86%	Cadavers	Dissection
Breme ⁷ (1899)	388	7	1.8%	Cadavers	Dissection
Muller ⁸ (1903)	100	2	2%	Cadavers	Dissection
Adachi ⁹ (1928)	1198	8	0.67%	Cadavers	Dissection
Miller ¹⁰ (1939)	480	0	0%	Cadavers	Dissection
Hazlett ¹¹ (1949)	188	6	3.19%	Cadavers	Dissection
Hazlett ¹² (1949)	542	15	2.77%	Living subjects (medical & dental students)	Inspection & palpation
McCormack et al. ¹³ (1953)	750	17	2.27%	Cadavers	Dissection
Weatherby ¹⁴ (1956)	451	3	0.67%	Still-born infants	Dissection
Weatherby ¹⁵ (1956)	408	10	2.45%	Cadavers	Dissection
Fuss et al. ¹⁶ (1985)	200	3	1.5%	Cadavers	Dissection
Uglietta and Kadir ¹⁷ (1989)	100	1	1%	Patients	Angiographies
Rodriguez-Baeza et al. ¹⁸ (1995)	160	8	5%	Cadavers (150 adults & 10 full term infants)	Dissection
Devash ¹⁹ (1996)	32	3	9.38%	Cadavers	Dissection
Devash ²⁰ (1996)	76	7	9.21%	Patients	Forearm flaps
Fadel and Amonoo-Kuofi ²¹ (1996)	144	2	1.39%	Cadavers	Dissection
Nakatani et al. ²² (1998)	150	1	0.67%	Cadavers	Dissection
Rodriguez-Niedenfuhr et al. ²³ (2000)	158	8	5.06%	Cadavers	Dissection
Rodriguez-Niedenfuhr et al. ²⁴ (2001)	150	7	4.67%	Embryos	3-D reconstruction
Rodriguez-Niedenfuhr et al. ²⁵ (2001)	384	16	4.17%	Cadavers	Dissection
Latha et al. ²⁶ (2002)	100	1	1%	Cadavers	Dissection

Developmentally, the branches of the dorsal aorta supply upper limb bud. The upper limb mainly receive its blood supply from seventh cervical intersegmental branch. The axis artery persists as subclavian, axillary, brachial, anterior interosseous artery and deep palmar arch.²⁷ Other arteries of the upper limb develop as sprouts of the axis artery. Vascular anomalies in the forearm occur due to successive origin of principal artery.

The embryological basis of arterial variations could be described by modification of normal capillary maintenance and regression²⁸. The developmental reason for the superficial ulnar artery in the present case may be due to the ulnar artery establishing a connection with the axis artery in the arm and the bifurcation of the brachial artery into the radial artery and common interosseous artery may be due to the posterior interosseous artery arising from the axis artery just distal to the

connection of the radial artery with the axis artery in the cubital fossa region and the continuation of the main trunk (axis artery) between the radial and posterior interosseous arteries being the common interosseous artery²⁹. Its clinical importance should not be underestimated as several cases of intra-arterial injection of drugs and subsequent amputations have been reported. Accidental cannulation of such variant artery by an ignorant clinician may lead to ischemia of the hand. It is essential for the surgeons to be aware of such variant vessels and adapt the surgical procedure accordingly, especially during radial forearm flaps³⁰. The possibility of superficial arteries getting mistaken for superficial veins is also well reported. Such mistakes might lead to intra-arterial injections, wrong interpretations of incomplete angiographic images or severe disturbances of hard irrigation during surgical procedures on the arm or forearm³¹.

CONCLUSION

Superficial course of the ulnar artery is rare with immense clinical importance for the proper diagnosis and planning of operative treatment of forearm and hand surgeries. The knowledge of such variation is important; not only for surgeons but also for other medical and nursing staff because intravascular cannulations are commonly performed by them. Also superficial ulnar artery can be mistaken as vein and intravenous medications can be administered in it. The proper understanding and knowledge of variation of arterial systems is helpful for judicious planning of various reconstructive procedures in oncological, orthopaedic and reconstructive surgeries.

Superficial position of the ulnar artery makes it more vulnerable to trauma and thus haemorrhages. Variation in the branching pattern of the brachial artery is of significance in cardiac catheterization for angioplasty, pedicle flaps, arterial grafting or brachial pulse. The occurrence of such superficial ulnar arteries in cadavers is reported to be 9.12% (Devansh, 1996) There are reports of Ulnar artery coursing superficial and deep to bicipital.

REFERENCES

- G.J.Romanes; Cunningham's Manual of Practical Anatomy; 1986; Fifth Edition, Vol 1; p-83
- B D Chaurasia's; Human Anatomy; Regional and Applied Dissection and Clinical; 2004; Fourth Edition, Vol 1; p-107.
- B D Chaurasia's; Human Anatomy; Regional and Applied Dissection and Clinical; 2004; Fourth Edition, Vol 1; p-108.
- G.J.Romanes; Cunningham's Manual of Practical Anatomy; 1986; Fifth Edition, Vol 1; p-76
- Quain R (1844) The anatomy of the arteries of the human body. Taylor and Walton, London.
- Gruber W (1867) Archiv fur Anatomie. Physiologie und Wissenschaftliche Medizin, pp. 668-687.
- Breme G (1899) Casuistischer Beitrag zur Kenntnis der Anomalien der Armerarterien. Z Morphol Anthropol, 1: 483-494.
- Muller E (1903) Beitrage zur Morphologie des Gefasssystems. I. Die Armerarterien des Menschen. Anatomische Hefte, 22: 377-575.
- Hazlett JW (1949) The superficial ulnar artery with reference to accidental intraarterial injection. Can Med Assoc J, 61: 289-293.
- Miller RA (1939) Observations upon the arrangement of the axillary artery and the brachial plexus. Am J Anat, 64: 143-163.
- Hazlett JW (1949) The superficial ulnar artery with reference to accidental intra-arterial injection. Can Med Assoc J, 61: 289-293.
- Hazlett JW (1949) The superficial ulnar artery with reference to accidental intra-arterial injection. Can Med Assoc J, 61: 289-293.
- McCormack LJ, Caudwell EW, Anson BJ (1953) Brachial and antebrachial arterial patterns. A study of 750 extremities. Surg Gynecol Obst, 96: 43-54.
- Weathersby HT (1956) Anomalies of brachial and antebrachial arteries of surgical significance. South Med J, 49: 46-49.
- Weathersby HT (1956) Anomalies of brachial and ante-brachial arteries of surgical significance. South Med J, 49: 46-49.
- Fuss FK, Matula CW, Tschabitscher M (1985) Die Arteria brachialis superficialis. Anat Anz, 160: 285-294.
- Uglietta JB, Kadir S (1989) Arteriographic study of variant arterial anatomy of variant arterial anatomy of the upper extremities. Cardiovasc Intervent Radiol, 12: 145-148.
- Rodriguez-Niedenfuhr M, Vazquez T, Nearn L, Ferreira B, Parkin I, Sanudo JR (2001) Variations of the arterial pattern in the upper limb revisited: a morphological and statistical study, with a review of the literature. J Anat, 199: 547-566.
- Devansh MS (1996) Superficial ulnar artery flap. Plast Reconstr Surg, 97: 420-426.
- Devansh MS (1996) Superficial ulnar artery flap. Plast Reconstr Surg, 97: 420-426.
- Fadel RA, Amonoo-Kuofi HS (1996) The superficial ulnar artery: development and surgical significance. Clin Anat, 9: 128-132.
- Nakatani T, Tanaka S, Mizukami S (1998) Superficial ulnar artery originating from the brachial artery and its clinical importance. Surg Radio Anat, 20: 383-385.
- Rodriguez-Niedenfuhr M, Sanudo JR, Vazquez T, Nearn L, Logan B, Parkin I (2000) Anastomosis at the level of the elbow joint connecting the deep, or normal, brachial artery with major arterial variations of the upper limb. J Anat, 196: 115-119.
- Rodriguez-Niedenfuhr M, Burton GJ, Deu J, Sanudo JR (2001) Development of the arterial pattern in the upper limb of staged human embryos: normal development and anatomic variations. J Anat, 199: 407-417.
- Rodriguez-Niedenfuhr M, Vazquez T, Nearn L, Ferreira B, Parkin I, Sanudo JR (2001) Variations of the arterial pattern in the upper limb revisited: a morphological and statistical study, with a review of the literature. J Anat, 199: 547-566.
- Latha VP, Anuradha L, Narayan K (2002) A case of superficial ulnar artery associated with retrobrachial median nerve. Folia Anat, 30: 49-51.
- B D Chaurasia's; Human Anatomy; Regional and Applied Dissection and Clinical; 2004; Fourth Edition, Vol 1; p-165.
- RODRIGUEZ-NIEDENFUHR, M., VAZQUEZ, T., NEARN, L., FERREIRA, B.,

- PARKIN, I. and SANUDO, JR. Variations of the arterial pattern in the upper limb revisited: a morphological and statistical study, with a review of the literature. *Journal of Anatomy*, 2001, vol. 199, p. 547-566.
29. Adachi B, Haseba K, Das Aereriensystem der Japaner Kyoto: Marumen; 1928 Vol. 1, p. 338-74.
30. DARTNELL, J., SEKARAN, P. and ELLIS, H. The superficial ulnar artery: incidence and calibre in 95 cadaveric specimens. *Clinical Anatomy (New York, N.Y.)*, 2007, vol. 20, n. 8, p. 929-932.
31. KITHSIRI, J., SENANAYAKE, SS., RATHNAYAKE, MJ. FERNANDO, R. and SOMARATHNE, K. A rare variant of the superficial ulnar artery, and its clinical implications: a case report. *Journal of Medical Case Reports*, 2007, vol. 1, p. 128.