



AN ANATOMICAL STUDY OF SUPERFICIAL PALMAR ARCH IN WESTERN RAJASTHAN POPULATION

Leena Raichandani	Senior Professor, Department Of Anatomy, Dr. S. N. Medical College Jodhpur
Dinesh Kumar*	PG, Department Of Anatomy, Dr. S. N. Medical College Jodhpur *Corresponding Author
Sushma Kushal Kataria	Senior Professor And Head Of Department, Department Of Anatomy, Dr. S. N. Medical College Jodhpur

KEYWORDS : Superficial Palmar Arch; Micro-Vascular Anatomy of Hand; Reconstructive Surgeries, variation of SPA

INTRODUCTION –

The superficial palmar arch is an anastomosis formed mainly by the Ulnar artery with variable contribution from branches of radial Artery. It passes medial to the hook of the hamate, then curves laterally to form an arch that is convex distally and level with a transverse line through the distal border of the fully extended pollicis base. About a third of the superficial palmar arches are formed by the ulnar artery alone; a further third are completed by the superficial palmar branch of the radial artery; and a third by the arteria radialis indicis, a branch of either arteria princeps pollicis or the median artery. The superficial palmar arch is covered by palmaris brevis and the palmar aponeurosis and it is superficial to flexor digiti minimi, branches of the median nerve and the long flexor tendons and lumbricals.

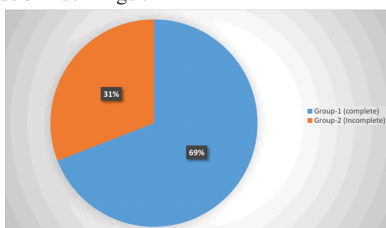
Three common palmar digital arteries and one proper palmar artery arise from the convexity of the superficial palmar arch. The former pass distally on the second to fourth lumbricals, each joined by a corresponding palmar metacarpal artery from the deep palmar arch, and divide into two proper palmar digital arteries. Palmar digital artery for the medial side of the little finger leaves the arch under palmaris brevis. Palmar digital arteries supply the metacarpophalangeal and interphalangeal joints and nutrient rami to the phalanges. They are the main digital supply, because the dorsal digital arteries are minute.

MATERIAL AND METHOD

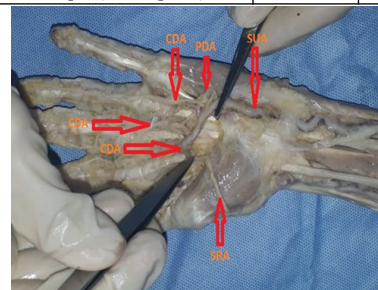
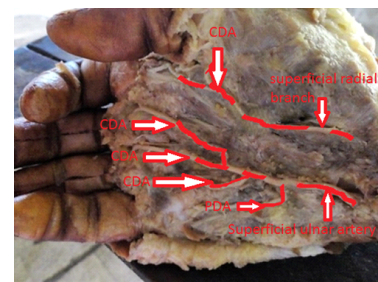
The material (110 upper limb) used in this research were collected from the department of Anatomy Dr. S. N. Medical college Jodhpur. The limbs were be dissected according to the protocol described in the Cunningham's manual [10] and the variations were noted and classified according to the Coleman and Anson classification. Photographs were taken. The collected data was compiled and analysed.

OBSERVATIONS AND RESULTS

Out of 110 specimens, 76 showed the complete SPA. In all these cases the arch were formed by anastomosis between superficial branches of ulnar artery and radial arteries (69.09%). Incomplete superficial palmar arch when the contributing arteries to the superficial arch do not anastomose or when the ulnar artery fails to reach the thumb and index finger, the arch is incomplete, such type of arch was found in 34(30.90%) cases. There was no anastomosis between superficial branches of radial and ulnar arteries. The ulnar artery is giving one proper branch supplying the ulnar side of the little finger and two common palmar digital branches. Each common palmar branch subdivides into two palmar digital branches. They were supplying the radial side of little finger, radial and ulnar sides of ring and middle fingers. The radial artery gave one common palmar digital branch which subdivided into two proper digital branches supplying the radial and ulnar side of index finger.

**Table no. 2 variation in superficial palmar arch**

S.No	Group	Total no	Total %
1.	Group-1(Complete)	76	69.09%
2.	Group-2(Incomplete)	34	30.90%

**Figure 1: Complete Radio-ulnar superficial palmar arch.****Figure 2: Incomplete radio-ulnar superficial palmar arch****DISCUSSION**

SPA is formed by anastomosis between superficial branches of the radial and ulnar arteries. But the variations of superficial palmar arch common are also seen. There may also be absence of SPA seen (2). According to Gellman et al., the SPA classified in the two types and they are: 1) complete variety, 2) incomplete variety. The complete variety arch there will be an anastomosis between radial and ulnar vessels. In the incomplete variety anastomosis is absent (2). The SPA which is formed by the linkage between superficial palmar branches of radial and ulnar arteries is not always the most commonly observed morphology. The incomplete SPA was observed by Loukas, Holdman and Holdman in 10% of cases(3). The incomplete arches reported in 16% of cases by Patnaik, Kalsey and Singla(4) the same observation reported by Al-Turk and Metcalf(5). The in complete forms of SPA is 21.47% cases by Coleman and Anson (6). Ikeda et al. in their study reported 3.6% incomplete forms (7).

Tagil et al. noticed that the most consistent incomplete form was the ulnar artery alone forming SPA which was seen in 20% of subjects (8). Janvski et al. studied 500 hands and reported 75% of them are complete forms of SPA, remaining 25% are incomplete forms of SPA (9).

According to Ottone, et al(10) the present case is Ulnar / Radiopalmar pattern subtype of incomplete SPA. The incidence of this variation reported is 8.3%, 3.2% and 3.6% of cases in studies of Ottone, et al, Coleman et al and Ikeda et al.

Arey is of the view that the anomalies of blood vessels may be due to the choice of unusual paths in the primitive vascular plexuses, the persistence of vessels normally retained, incomplete development or fusion and absorption of parts usually obliterate, the disappearance of vessels normally retained, incomplete development, or fusion and absorption of parts usually distinct(11).

The radial artery is a frequent site for introducing catheter for arterial pressure monitoring or to create arteriovenous fistulae. Furthermore, Acar et al (12) reported the artery has also been used as an alternative for myocardial revascularization. Such techniques are not without risk as they could cause necrosis in different parts of the hand or potential damage to the blood supply of the forearm and hand. The anastomosis between the ulnar and the radial arteries is important for maintaining adequate Blood supply to the palm and its digits.

CONCLUSION

Superficial palmar arch plays a principal role in microsurgeries following crush injuries of hand. It maintains the collateral circulation in case of obstruction of any of the arteries in hand. The plastic surgeons, and surgeons should be aware of these variations before attempting surgical procedure like vascular repair, graft application. Recently, the artery of choice for coronary bypass graft is the radial artery. In case of classical SPA the radial artery can be harvested because of the rich anastomosis between ulnar and radial arteries which can maintain efficient collateral circulation. But in the present cases, the radial artery cannot be harvested because the amount of anastomosis between radial and ulnar arteries is minimal, so the radial side of hand may suffer ischemia leading to gangrene.

Techniques like Doppler's ultra sound, modified Allen test, pulse oximetry and arterial angiography can be used to identify vascular patterns of the palm. In the present case, the communication of arteries only by deep palmar arch. In cases of ulnar side palmar injuries may damage the ulnar artery which causes interference of adequate blood flow to the entire superficial structures of the palm and it may leads to ischemia and ultimately leads to inefficient movements of fingers.

REFERENCES

1. Bianchi H Anatomy of the radial branches of the palmar arch: variations and surgical importance. *Hand Clinics*, 2001; 17: 137–146.
2. Gellman H, Botte MJ, Shankwiller J, Gelbermen RH. Arterial patterns of the deep and superficial arches. *ClinOrthopRelat Res*. 2001;383:41-8.
3. Loukas M, Holdman D, Holdman S. Anatomical variations of the superficial and deep palmar arches. *Folia Morphologica (Warsz)*. 2005;64(2):78-83.
4. Patnaik V.V.G; Kalsey G; Singla RK. Superficial palmar arch duplication : a case report. *Journal of The Anatomical Society of India*. 2000 Jun; 49(1): 63-6
5. Al-Turk M, Metcalf WK. A study of superficial palmar arch using the Doppler ultrasonic flow meter. *J Anat*. 1984;138(1):27-32.
6. Coleman SS, Anson BJ. Arterial patterns in the hand based upon the study of 650 specimens. *SurgGynecol Obstet*. 1961; 113: 409–424.
7. Ikeda A, Ugawa A, Kazlhera Y, Hamada, N, arterial patterns in the hand based on a three dimensional analysis of 220 cadaver hands. *J Hand surgAM*. 1988;13: 501-509.
8. Tagil SM, Cicekeibasi AE, Ogun TC, Buyukmuncu M, Salbacak A. Variations and clinical importance of the, IM, Aktekin M, Denk CC, Onderogly S, Surucu HS. Arteries of the thumb originating from the superficial palmar arch: live cases. *SurgRadiol Anat*. 1999;21: 217-20.
9. Janevski BK. *Angiography of the upper extremity*. The Hague: MartinusNijhoff 1982; pp.73-122.
10. Ottone, Ne., Prum, N., Dominguez, M., Blasi, E., Medan, C., Shinzato, S., Finkelstein, D. And Bertone, Vh. Analysis And Clinical Importance Of Superficial Arterial Palmar Irrigation And Its Variants Over 86 Cases. *International Journal Of Morphology*, 2010, Vol. 28, N. 1, P. 157-164.
11. Arey. *Developmental Anatomy: Development of the arteries* 6th Edition. Philadelphia: W. B. Saunders Co.:1957:375–77.
12. Acarturk TO, TuncerU, Aydogan LB, DalayAC. Median artery arising from the radial artery; its significance during harvest of a radial forearm free flap. *J PlastReconstrAesthet Surg*. 2008; 6:5-8.