

**Morphological Study of Superficial Arterial Palmar Arches in
Kolhapur Region of Western Maharashtra by a Dissection Method**

Mayuri Ghorpade¹, Varsha Bande², Manjusha Raval³, Prafulla Dakhane^{4*}

¹Assistant Professor, Department of Anatomy, Dr. D. Y. Patil Medical college, Nerul,
Navi Mumbai, India

²Associate Professor, Department of Anatomy, Dr. D. Y. Patil Medical college, Nerul,
Navi Mumbai, India

³Assistant Professor, Department of Anatomy, SSPM Medical College and Lifetime
Hospital, Padve, Kasal, Sindhudurg, India

⁴Professor and Head, Department of Anatomy, Dr. Vasanttrao Pawar Medical College,
Hospital and Research Centre, Nashik, India

Corresponding Author- Dr. Prafulla Dakhane, Professor and Head, Department of
Anatomy, Dr. Vasanttrao Pawar Medical College, Hospital and Research Centre, Nashik,
India

E-mail: dr_dakhane@yahoo.co.in

ABSTRACT

Palmar arterial arches are of immense importance as they are the only source of blood supply to the hand and deep arterial arch. Its anatomical variations are described in the literature. Anatomical variations are important as far as surgical procedures are concerned. So detailed morphological study of superficial palmar arches is conducted at the Department of Anatomy, Dr. D. Y. Patil Medical College, Kolhapur, on 100 hands of 50 cadavers. Incomplete palmar arch, complete palmar arch contributed by median artery and ulnar artery, complete arch formed by ulnar artery alone are notable findings. Knowledge of anatomical variations of the arterial pattern of the hand is crucial for safe and successful hand surgery. Although there is number, of variations reported in the arterial supply of palm, present study will be helpful for surgeons.

Keywords: Superficial Palmar Arch, Complete Arch, Incomplete Arch

INTRODUCTION

Palmar arterial arches are of immense importance as they are only source of blood supply to hand along with deep arterial arch. Its anatomical variations are described in the literature. Anatomical variations are important as far as surgical procedures are concerned. So detailed morphological study of superficial palmar arches is conducted at the Department of Anatomy, Dr. D. Y. Patil Medical College, Kolhapur, on 100 hands of 50 cadavers.

OBJECTIVES

- To study Morphology of palmar arterial arches.
- To study Analysis and Clinical Importance of palmar arches and their variation in cadavers.
- To study Anatomical variation of palmar vascular pattern.

MATERIALS AND METHOD

Total 100 hands from 50 cadavers are used for this cross-sectional study. The study is conducted at Dr. D. Y. Patil Medical College, Kolhapur. The hands of bodies of both the sexes are included in the study but deformed, traumatized upper limbs are excluded. Scalpel, Blunt and toothed forceps, painting material, measuring tape, Photography kit are used for the data collection.

The dissection of palm is carried out according to Cunningham's manual of practical anatomy. Skin and subcutaneous tissue covering the flexor surface of palm to the base of the digits will be removed. The palmar aponeurosis will be removed to reveal the superficial palmar arch after the dissection of surrounding adipose tissue. Arches will be colored. The common digital arteries will be dissected up to the base of digits.

OBSERVATIONS AND RESULTS

Among the 100 hands of 50 cadavers, Complete superficial palmar arch is seen in 98 hands and 2 hands incomplete superficial palmar arch. Complete Deep palmar arch is observed in all 100 hands.

Group I –Complete arch (found in 98%) can be further divided into five types

Table 1: Type and side of complete superficial palmar arch

TYPE	TOTAL %	RIGHT	LEFT
Type A	56%	29%	27%
Type B	36%	18%	18%
Type C	4%	3%	1%
Type D	0%	0%	0%
Type E	2%	1%	1%

In 98 % of hands complete superficial palmar arch is seen. Out of these, In 56% hands arch is formed by anastomosis of superficial palmar branch of radial artery and ulnar artery (Fig.1), in 36% arch is formed by ulnar artery alone (Fig. 2), while in 4%, arch is formed by anastomosis of median artery and ulnar artery (Fig. 3), in 2% hands arch is formed by anastomosis of ulnar artery and a vessel derived from deep arch.



Fig. 1- Complete superficial palmar arch formed by radial and ulnar artery

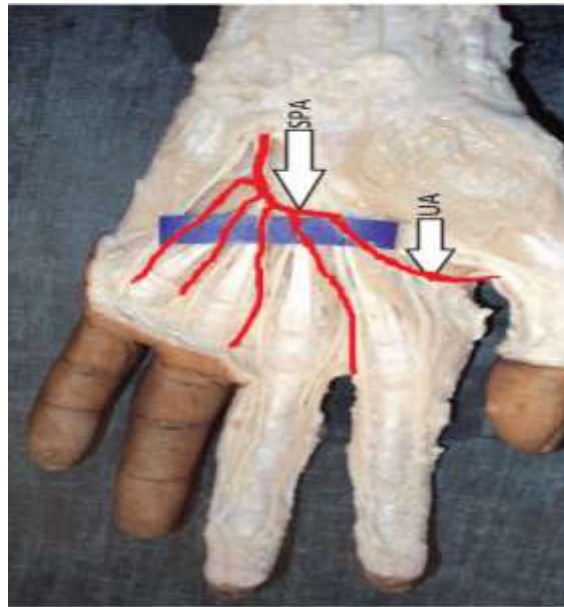


Fig. 2- Complete superficial palmar arch formed by ulnar artery alone

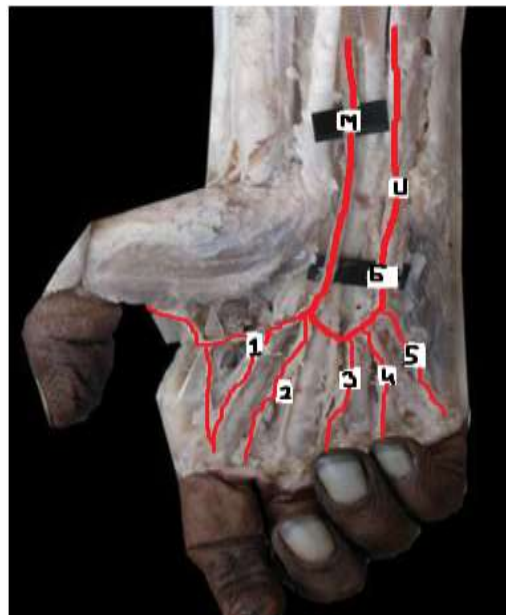


Fig. 3- Complete superficial palmar arch formed by median and ulnar artery

Group II - Incomplete arch found in 2% of hands.

Table 2: Type and side of incomplete superficial palmar arch

TYPE	TOTAL%	RIGHT	LEFT
Type A	1%	1%	0%

Type B	1%	1%	0%
Type C	0%	0%	0%
Type D	0%	0%	0%

Only in 2% hands superficial palmar arch is incomplete. out of these in 1% arch is formed by anastomosis between superficial palmar branch of radial artery and ulnar artery (Fig. 4) but they do not anastomose with each other and in rest 1% arch is formed by ulnar artery alone, it is not supplying the thumb and index finger.

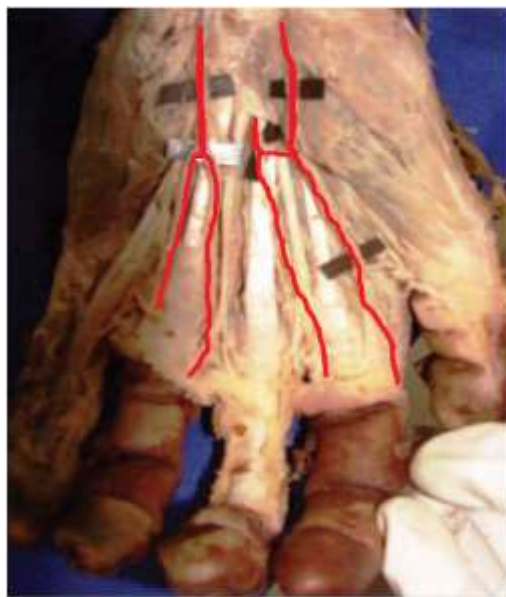


Fig. 4- Incomplete superficial palmar arch formed by radial and ulnar artery

DISCUSSION

Arterial supply to the man's hand, his most important earning tool, is derived from two anastomotic arches, superficial and deep, formed by the anastomosis between two main arteries of the forearm i.e. radial, ulnar & their branches; in the palm. These were studied as early as 1753, by Haller, a swiss anatomist & poet while notable variations were described by Tiedman (1831) which were explained later, on ontogenic basis by Meyer (1881) & Singer (1933). It was Manners Smith (1910) who made a comparative study of arteries of hands in primates & concluded that many of the variations noted in man represent a retention or reappearance of primitive patterns.

Superficial Palmar Arch is fed mainly by the ulnar artery, entering the palm with the ulnar nerve, anterior to the flexor retinaculum and lateral to the pisiform, passing medial to the hamate's hook, then curving laterally to form an arch, convex distally⁵¹ across the middle 1/3 of the palm and in level with a transverse line through the distal border of the fully extended pollicial base⁵¹. About a third of the superficial palmar arches are formed by the ulnar artery alone; a further third is completed by the superficial palmar branch of the radial artery and a third either by the arteria radialis indicis, a branch of arteria princeps pollicis or the median artery². The palmaris brevis and palmar aponeurosis cover it and it is superficial to the flexor digiti minimi, branches of the median nerve, and the long flexor tendons and lumbrical muscles^{1,2}

The present study's superficial palmar arch is complete in 98% of specimens. In 1961 Coleman and Anson³ and 2007 Patnaik⁴ and others observed complete superficial palmar arch in 78.5% and 78%, respectively. In the present study, 56% are of Type A. Weathersby⁵ in 1954, Coleman and Anson² in 1961, Anson¹⁵ in 1966 and Patnaik²¹ in 2007 observed Type A superficial palmar arch in 36%, 34.5%, 30%, 76%, respectively. In present study Type B superficial palmar arch was seen in 36%, Coleman and Anson in 37%, Patnaik in 2% observed Type B superficial palmar arch. Type C superficial palmar arch is seen in 4% in our study whereas Coleman and Anson² in 3.8%, Anson¹⁵ in 8.6% observed Type C superficial palmar arch. In our study Type D is not seen, but Coleman and Anson saw in 1.2%. Type E arch in our study is observed in 2%. Coleman and Anson also observed Type E in 2% of specimen.

The arch is incomplete in our study in 2% hands, Coleman and Anson³ in 21.5%, Patnaik in 16% found incomplete superficial palmar arch. Incomplete superficial palmar arch is again subdivided in 4 subtypes. Type A ,B,C,D. In our study Type A seen in 1%, Coleman and Anson in 3.2%, Patnaik in 12% observed Type A incomplete superficial palmar arch. We observed Type B in 1% while Coleman and Anson⁶ in 13.4% cases. Coleman and Anson² observed Type C superficial palmar arch in 3.8% and Patnaik in 4% cases.

Table 3: Comparison of prevalence of types of single superficial palmar arch

Sr no		Weathersby (1954)	Coleman & Anson (1961)	Anson (1966)	Patnaik (2007)	Present study (2013)
1.	Group I	-	78.5%	-	78%	98%
	A	36%	34.5%	30%	76%	56%
	B	-	37%	-	2%	36%

	C	-	3.8%	8.6%	-	4%
	D	-	1.2%	-	-	-
	E	-	2.0%	-	-	2%
2.	Group II		21.5%		16%	2%
	A	-	3.2%	-	12%	1%
	B	-	13.4%	-	-	1%
	C	-	3.8%	-	4%	-
	D	-	-	-	-	-

CONCLUSION

The knowledge of the frequency of anatomical variations of arterial pattern of the hand is very important for safe and successful hand surgery. In present study, 98% cases showed complete superficial palmar arch out of which 49% left and 49% are of right sided hands. out of this, in 56% cases arch was formed by superficial palmar branch of radial anastomosing with ulnar artery. 36% cases showed arch was formed by ulnar artery alone, while in 4% hands it was the median artery which was anastomosing with ulnar artery to complete the arch. In remaining 2% cases there was anastomosis between the superficial palmar arch and a branch from a deep palmar arch. In 2% cases where the superficial palmar arch was incomplete, in 1% it was formed by radial and ulnar artery but they did not anastomose, while in 1% the arch was formed by ulnar artery. In superficial palmar arch radial artery diameter varied between 2.2 to 2.6, ulnar artery diameter ranged between 2.4 mm to 2.6 mm, while median artery diameter in superficial palmar arch was between 2.2 to 2.3mm.

Knowledge of anatomical variations of the arterial pattern of the hand is crucial for safe and successful hand surgery. Although there are number, of variations reported in the arterial supply of palm, present study will be helpful for surgeons.

REFERENCES

1. Williams, P.L; Bannister, L.H.; Berry, M.M.; Collins, P; Dyson, M; Dussek, J.E; Fergussoin, M.W.J.: Gray's Anatomy In: Cardiovascular System. Gabella, G. Edr. 38th Edn. Churchill Livingstone. Edinburgh, London: 1542-44 (1999).
2. Weathersby H.T. (1954): The Volar arterial arches. Anatomical Record. 118: 365.
3. Coleman SS, Anson BJ. Arterial patterns in the hand based upon the study of 650 specimens. Surg Gynecol Obstet. 1961; 113: 409-424.

Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

4. Patnaik VVG, Kalsey G. and Singla RK, Palmar arterial arches- a morphological study. Journal of Anatomical Society of India, 2002; vol. 51, no 2: 187-193.
5. Anson, B.J. & Maddock, W.G.: Callender's Surgical Anatomy In: The hand-palmar region. 3rd Edn. W.B. Saunders Co. Philadelphia,; p 831 (1952).