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Study of Blood Supply of Hand in Relation to Variation in Superficial Palmer Arches in Indian Population: Original research article

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ABSTRACT:- The superficial palmer arch is an anastomosis between ulnar and radial artery and its branches in the palm. Superficial palmer arch is a matter of anatomical intrest because of its variation noted in cadaveric human hand. The present study has been undertaken to study the superficial palmer arches and its variation in 50 hands and different presentation were noted. This study carried out as per the Coleman and Ansons classification. In this study , the complete palmer arch is noted in 94% and incomplete superficial palmer arch is noted in 6%. So existence of variation in superficial palmer arch helpful in knowledge of vasculature of hand , injury of hand, artificial grafting and reconstructive surgery of hand.

Key words: Superficial palmer arch, Radial artery, Ulnar artery, Accsessory ulnar artery

I. INTRODUCTION

Superficial palmer arch is a vascular structure of the palm present below the palmer aponeurosis. Knowledge of variation in the arterial supply of hand in surgery for revascularisation, replantation and composite tissue transfer. Blood supply of hand is derived from two anastomosis, ie, superficial palmer arch and deep palmer arch which are formed by ulnar and radial artery and their branches. Ulnar artery as entering the palm, it curves laterally and deep to palmer aponurosis and form superficial palmer arch. The superficial palmer arch later on gives four palmer digital arteries. Superficial palmer arch form a terminal plexus formed by ulnar, radial and median artery. Superficial palmer arch is either complete or incomplete which is further subdivided into following subtypes,

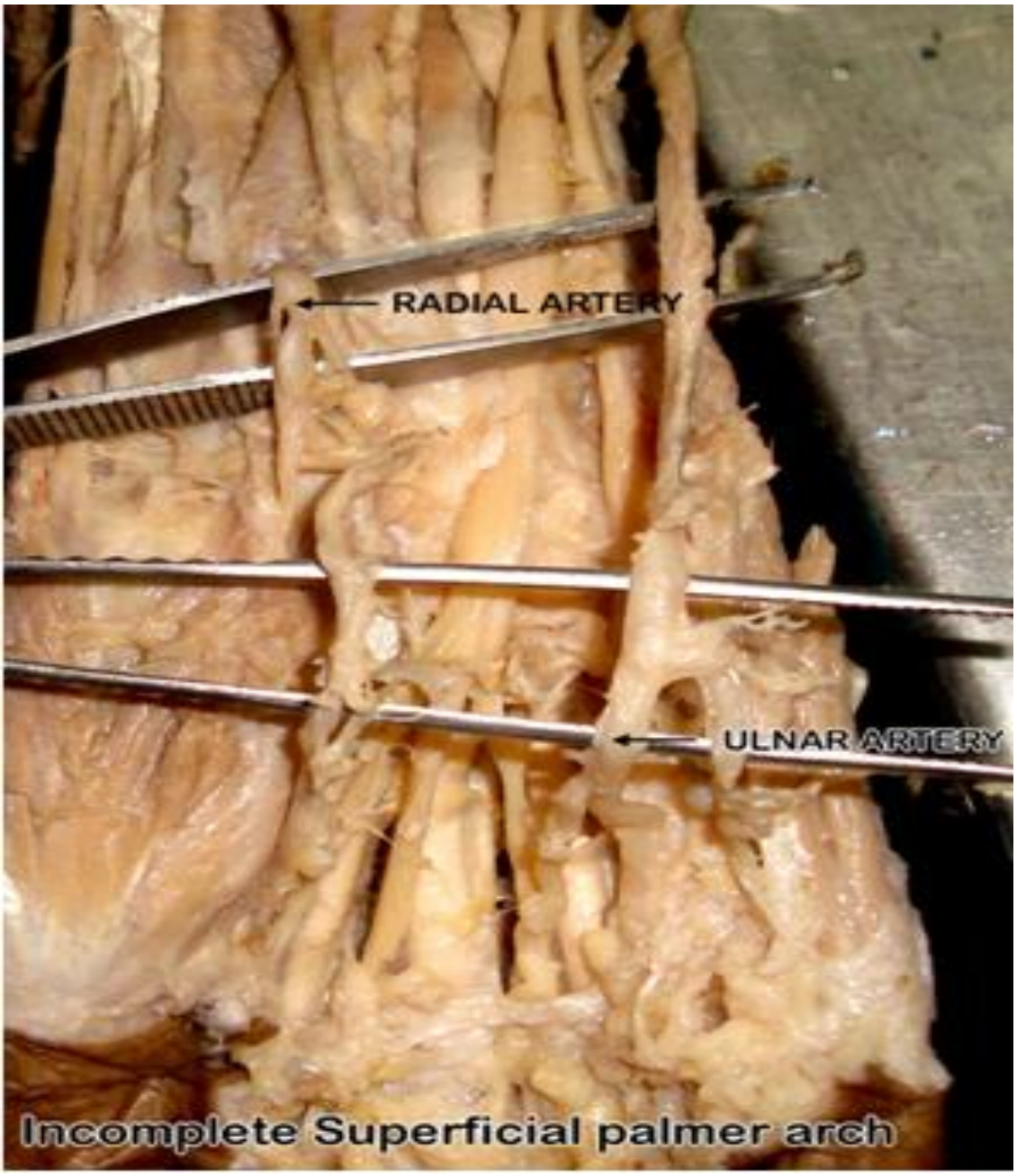
Group 1---- Complete arch
Type A – Classical radioulnar arch
Type B – Ulnar arch
Type C – Medianoulnar arch
Type D – Radio mediano ulnar arch
Type E – Accsesory ulnar urtery

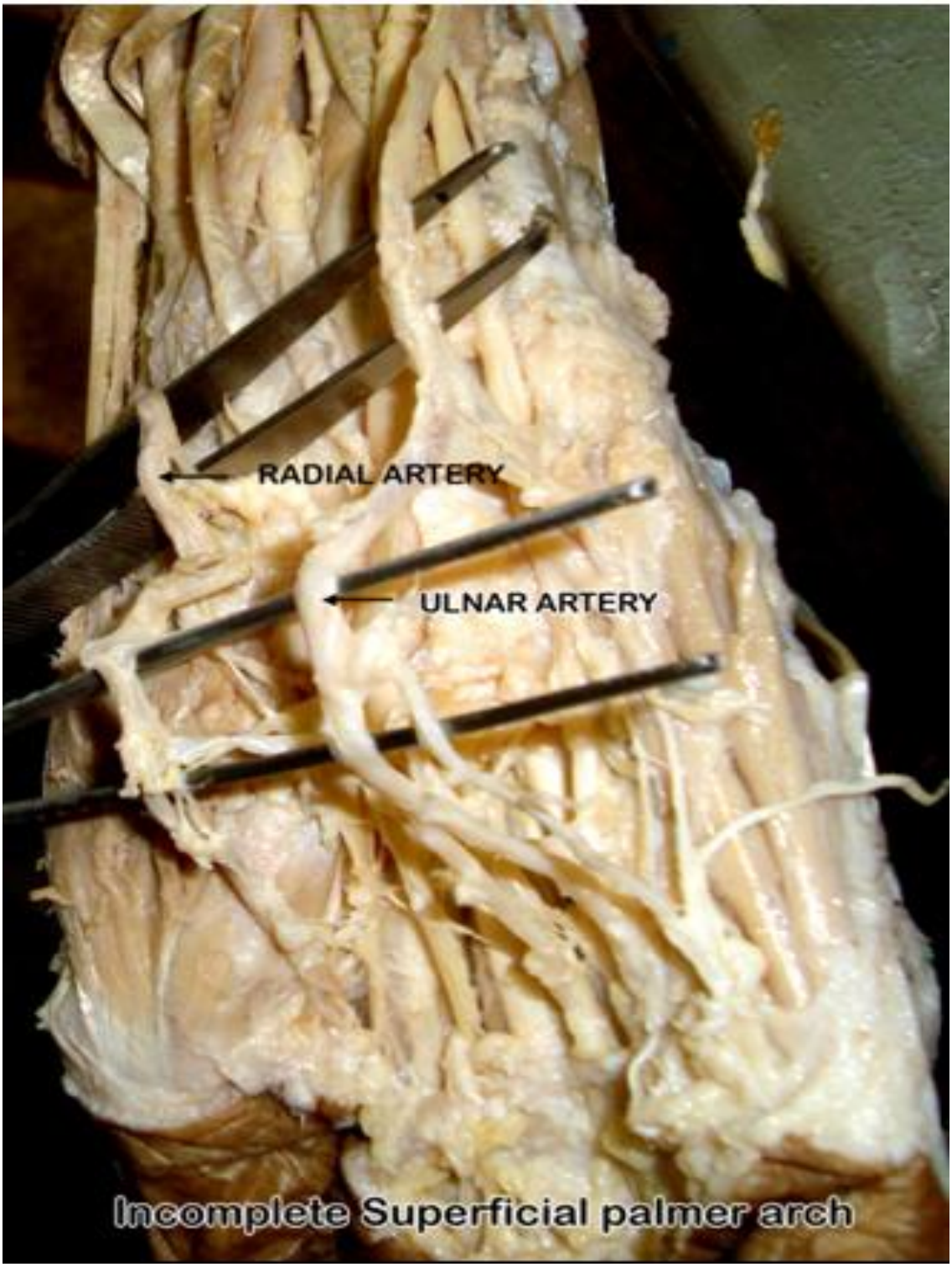
Group 2 --- Incomplete arch
Type F – Radial and ulnar artery without anastomosis
Type G – Only ulnar artery without supply to thumb and index finger
Type H -- Ulnar and median arteries without anastomosis
Type I – Ulnar,radial and median arteries without anastomosis

II. MATERIAL AND METHOD

Material for present study comprised of 50 human cadaveric hand (25 right and 25 left) fixed in 10% formalin solution in deptt. Of anatomy.Macroscopic dissection was carried out according to cunninghams manual of practicle anatomy. Branching pattern and variations of superficial palmer arches was studied. Variation from normal classical pattern were observed and they are compared with similar studies with Coleman and Anson classification


RADIAL ARTERY
ULNAR ARTERY
complete Superficial palmer arch


RADIAL ARTERY
ULNAR ARTERY
Incomplete Superficial palmer arch



III. OBSERVATION

In 50 dissected hands,we found complete superficial palmer arch in 47 hands and incomplete superficial palmer arch in 3 hands.

Table: Percentage of variation of superficial palmer arch in study

Arch Type	No. of hands	Percentage (%)
Complete arch	47	94
Type - A	43	86
Type – B	3	6
Type – E	1	2
Incomplete Arch	3	6
Type – F	2	4
Type – H	1	2

According to coleman and ansons classification, superficial palmer arch with type A seen in 44 hands, 88%.and complete arch with type B seen in 3 hands having 6% and type E having 2%. Superficial palmer arch with incomplete arch seen in 2 hands having 4%.Incomplete arch with type H seen in 1 hand having 2%.

In this study, most of the arches are complete in nature Variation found in complete arches are ulnar arch and accessory ulnar arch. Variations found in incomplete arch are radial and ulnar artery without anastomosis. Ulnar and median artery without anastomosis. Embryological basis is explained by Reddy S, (2007) and Singer E(1933).We compared anatomy of ulnar and radial arteries with Grants atlas of anatomy(1991) and Grays anatomy by William PL (1989).

IV. DISCUSSION

It is very essential for surgeon to identify the functional arterial arch before surgical procedure. Microsurgical techniques for the reconstructing surgery of upper extremity and uses of radial artery graft in coronary bypass, necessary for understanding the vasculature of palm .

There are many developmental anamolies in the palm. These are due to unusual path in primitive vascular plexus, persistant of obliterated vessel and incomplete development. Though , the normal blood supply present in the hand but variations in the superficial palmer arch are well observed in our study and past studies. According to study, complete arch formation is 94% , but Mariosloukas et ai (2005) ,9 complete arch are found which are about 90%.According to Nicholas et al (2010),complete arch are found in 58%. Suleyman et al (2007) also found complete arch in 75% cases .Velerial et al (2004) also observed complete arch in 47.5%. Vidya ramakrishnan et al (2013) also found complete superficial palmer arch in 92%..Similar observation are found by Gellman H in 2001.

In our study, ,type A seen in 43 hands which are about 86%. Similar type seen by Silvial et al (2005) in 67% cases. Type A also observed by Mariosloukas et al (2005) in 40% cases. Vidya Ramakrishnan et al also observed type A in 86%.Patnayak VVG also observed in 76% in year 2002.

Incidence of Type B are observed in 3 hands which are about 6%.Similarv type are observed by Suleyman et al(2007) in 35% cases,Marioloukas et al (2005) in 35% cases,Silvial et al (2003) in 23%cases.Vidya Ramakrishnan et al (2013) observed in6% of cases. Similar observation is found by Madhyastha S (2011) in 28% of cases.

Incidence of Type E is observed in 1 cases in our study which are about 2%. Similar study of type E observed by Elizabeth et al (2002) in 2% of cases. This is rare type of variation not observed by abovementioned researcher.

In this study,we observed incomplete arch in 3 hand which is about 6%. Moriosloukas et al (2005) observed in 10% of cases.Valerial et al (2004) also observed in 52.5%.Suleyman et al (2005) also observed in 20% hand ,Silvias et al (2003) in 33% cases ,Coleman and Anson in 6% cases. Type H found in 1 hand in our study which is about 2%. Similar things were observed by Silvial et al (2003) in 10% cases and Suleman et al (2007) in 17%.Vidhya Ramakrishnan et al (2013) also observed type H in 2% cases.Above are also correlate by Doppler study by Al Turk M (1984) and Keen JA in 1961.

V. CONCLUSION

The hand is supplied by the superficial palmer arch and deep palmer arch and its anastomosis .It is noted that, knowledge of arterial arches are important for surgical procedure. It is also noted that,wound of palm bleed profusely after injury due to collateral circulation. There is minimum complication in radial artery harvesting in bypass.

In our study, we found complete arch in 94%of cases and incomplete arch in 6% 0f cases. We also found existence of rare anatomical variation. This study attempts to analyze the variation in superficial palmer arch. This study was carried out over the period of 2 year and comprise of 50 hands. For the analysis, Coleman and Anson classification was used. These variation were analyzed, compared and with other similar studies. All

attempts has been made to find out whether there is significant correlation between regional, sexual and digital variation.

From this study, following significant conclusions are drawn

1) Variations are found in normal general population.
2) There is no regional variation.
3) There is no significance difference in variation of male and female.
4) There is statistically significant variation found in the superficial palmer arch.

So knowledge of the variation of superficial palmer arch is necessary to avoid or minimize the risk of complication during vascular surgeries or reconstructive hand surgeries.

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