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Anatomy

KEY WORDS: Superficial Palmer Arch; Ulnar artery; Micro-surgery of Hand; Reconstructive Surgeries.

THE STUDY OF VARIATION OF SUPERFICIAL PALMER ARCH AND ITS SURGICAL SIGNIFICANCE IN CENTRAL INDIA POPULATION

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ABSTRACT

Introduction: Knowledge of blood supply of hand is important for operations..The vascular patterns of the palm have a variant structure which is very interesting . Now a days surgeons are very much interested in study the detailed vascular anatomy of palm are due to its complex variations and various microsurgical techniques. The study of superficial palmer arch is done by only few workers. The aim of the study is to know the anatomical variations in the formation of superficial palmer arch.
Materials and Methods: 50 dissected upper limbs specimens, out of which 34 males and 16 females aged between 30– 75years were obtained from Department of Anatomy, Shri Vasantrao Naik Govt. Medical college Yavatmal. The vascular pattern of superficial palmer arch was studied with the help of fine dissection method and photographed.
Results and Discussion: Out of 50 limbs, in 14 limbs superficial palmer arch is formed by ulnar artery without contribution of radial artery. In these cases occlusion of ulnar artery will lead to less blood supply to intrinsic muscles of the hand, due to which there will be formation of various pathological conditions.

Introduction:

Hand is one of the very important as various activities can be done by it . All the skillful and innovative activities are performed with the help of hand. It is a complex highly evolved anatomic structure which provides primary touch input to the brain and enables humans to perform complex fine motor tasks (1). Knowledge of superficial palmer arch is important for surgical procedures of hand. The superficial palmer arch is usually formed by the superficial branch of ulnar artery and completed by one of the branch of radial artery i.e. arteria radialis indicis or arteria princeps pollicis. As Superficial Palmer Arch supplies blood to a large area of palm before any surgical procedures doctor should have knowledge of vascular variations of hands. Johnson et al (1998) on Coronary artery bypass graft (CABG) intensified the use of an arterial graft, as compared to saphenous vein (2). In ulnar dominant formation of superficial palmer arch, the ulnar artery does not anastomose with radial artery and it terminates by supplying thumb and index finger. In the present study, this type of variation was found in 28% of the hands. This is opposite to the normal superficial palmer arch where the arch is completed on the radial side by superficial palmer branch of radial artery. In these cases, where there were absence of an efficient collateral circulation, ulnar artery occlusion may cause poor blood supply, necrosis and gangrene in the digits and has important clinical significance.

Material and method:

Fifty dissected upper limb specimens, out of which 34 males and 16 females aged between 30 - 75 years were obtained from the Departmentof Anatomy, Shri Vasantrao Naik,Govt Medical College, Yavatmal Maharashtra India. The limbs were fixed in 10% formalin solution. The dissection of the hand was performed as per Cunningham's manual of practical anatomy. The limbs were dissected from the level of the wrist joint on the palmer aspect till the web spaces, a horizontal incision was made along the root of the fingers. The skin palm was removed to find the SPA and its branches. The arch and its branches were clearly demonstrated by fine dissection method and by removing the fat. Photographs were taken without paintings. After that palms were painted with red oil paint and again photographs were taken.

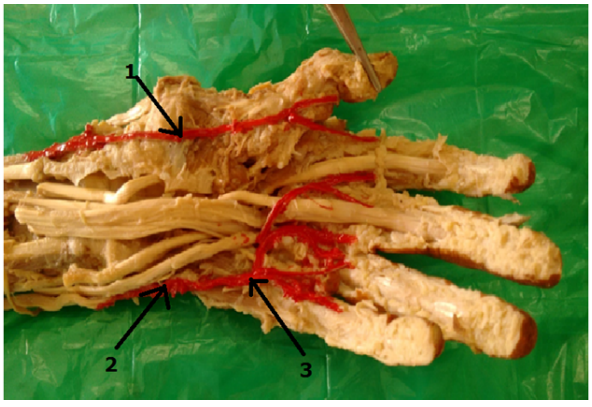
Observation:

Complete superficial palmer arch formed entirely by ulnar artery in 14 palms. Digital branches from ulnar artery supply the thumb and index fingers without contribution from superficial branches from radial artery. In the remaining 36 palms superficial palmer arch was formed by contribution from branches from radial artery.

Observation Table

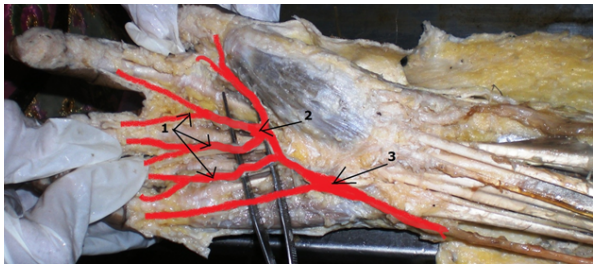
Total no. of specimens 50
SPA formed by ulnar and radial artery(Normal) 36 i.e. 72%
SPA formed by only ulnar artery(Anomalous) 14 i.e. 28%

Figure 1. Superficial palmer arch is formed by ulnar artery as well as radial artery



1. Radial artery
2. Ulnar artery
3. Superficial palmer arch

Figure 2. Superficial palmer arch is formed by only ulnar artery supplying index finger as well as thumb without contribution from radial artery



1. Digital branches of ulnar artery
2. Superficial palmer arch
3. Ulnar artery

Discussion:

Superficial palmer arch is very important for surgeons and

clinicians for vascular graft applications, arterial repairs, free and pedicled flaps. (3) While doing minor surgeries on hands surgeons should be very careful. In the pyogenic infection affecting the various spaces of hands while drainage of pus from the hand, plane of knife should be keen so that incisions are made very carefully after having the proper knowledge of various branches of SPA and superficial position of termination of ulnar artery as well as radial artery. (4). Scientists Coleman SS and Anson BJ (1961) SPA is classified into the complete and incomplete type. In the complete type the contributing arteries to the SPA anastomosis with each other or the ulnar artery itself forms the arch and supplies thumb and index finger. They found the complete arch formed by ulnar artery in 37% of the cases (5). When there is no communication or anastomosis between the vessels which are contributing in the formation of arch it is called as Incomplete arch. While studying the variations of formation of SPA, majority of scientists use above classification. In 1897 Tandler J discovered a new artery in the palm known as first common volar digital artery. He studied 130 specimens of hand and found that the superficial branch of ulnar artery in the palm is terminated as an artery which supplies both radial side of index finger and ulnar side of the thumb and to this artery, he named as first common volar digital artery. (6) . Ikeda et al in1988, demonstrated 96.4% complete and 3.6% incomplete forms. subjects (7). Keen (1961) too discovered that median and palmer artery formed superficial palmer arch in 9% of cases (8). In 2009 Loukas M et al detected a rare case of complete superficial palmer arch which had no contribution from radial artery at all. For Superficial palmer arch ulnar artery had given a complete contribution.(9) They noted that in such a case if there was traumatic injury to the ulnar artery the arterial supply of thumb was totally hampered and it was potentially dangerous as blood supply of palm is hampered due to which there will be gangreneous changes and permanent disability of the patient. Recently in 2010 Mookambica RV et al reported a case where the superficial palmer arch was formed entirely by superficial branch of ulnar artery, without contribution by any other vessel. Ulnar artery ran as the first common digital artery to the interdigital cleft between index finger and thumb (10). In 2014,Suma M.P., Vijay Kumar S, Priya Ranganath found that incidences of complete and incomplete formation of superficial palmer arch are 95% and 5% respectively.(11)

These arterial variations are explained on basis on Classical theory of arterial development. According to this theory on reaching the hand the ulnar artery links with the superficial palmer plexus from which superficial palmer arch originates, during this process median artery loses its distal connections and is reduced to a small vessel. By the 6th week branches from brachial artery progresses downwards to the hand plate to form deep palmer arch. The radial artery later on develops towards the pre-axial side of the limb. After that all the other arteries degenerates. According to scientist Arey 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 (12).

In the hand surgeries like vascular graft applications in burnt patients, plastic surgeries in road accident patients, arterial repairs, surgeons should be aware of these variations because in most of the traumatic events and the surgical procedures of the hand, SPA plays an important role. Superficial Palmer Arch is the main vascular structure of palm. Hence knowledge about the variation in its pattern is important for surgeons dealing with reconstructive hand surgeries and restoration of functional anatomy of hand .We can also find variations in vascular pattern by doing ultrasonography of hands.

In this study, we found formation of SPA completely by ulnar artery ,without contribution of radial artery ,in 28% of cases. In the remaining 72% cases, formation of the SPA is as usual. Therefore, this study is very useful for clinicians.

Table:

Sr. No.	Authors	Percentage of Specimen with Ulnar dominant complete superficial palmer arches
1	Jaschtschinski (13) SN 1896	38%
2	Coleman SS & Anson BJ 1961	37%
3	MJ Mozersky DJ et al 1973	88%
4	Early MJ 1986	20%
5	Gellman H et al (14)	31%
6	S Jayan thi	50%
7	Present Study	28%

Conclusion:

To conclude, it is important to continually and keen fully study and report these type of anatomical variations so that surgeons should have best knowledge of these anomalies and variations and thus they can prevent the potential damages to the patients associated with them.

Abbreviation: SPA- Superficial Palmer Arch

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