MORPHOLOGICAL STUDY OF SUPERFICIAL AND DEEP PALMAR ARCHES AND THEIR VARIATIONS

Abstract

Background: Arterial supply to the hand is provided by the superficial and deep palmar arches. The superficial palmar arch (SPA) and its contributing arteries are highly variable; numbers of anatomic variations are reported in the literature. Deep Palmar Arch is less variable; few authors reported some variations in the formation of DPA. Also the knowledge about anatomical position of SPA with reference to important anatomical landmarks and arterial diameter of arteries contributing in the formation of SPA is necessary for surgeons dealing with reconstructive surgeries of the hand.

Objectives: The present study is planned to find out different types of DPA and SPA, variations in branching pattern of SPA, distance between important landmarks of the hand like Kaplan’s cardinal line and SPA and diameters of important arteries contributing in the formation of SPA.

Methods: The Study was conducted in the Department of Anatomy, Rural Medical College, Loni, over a period of three years. Total 180 hands were collected from dissected cadavers available in the department of Anatomy, out of which three limbs were discarded because of distorted structures of the hand. Total 177 adult human cadaveric hands were dissected. Dissected hands were numbered; photographs were taken and limbs were preserved. The variations in the formation of SPA and DPA were recorded and the important measurements were recorded and entered in Microsoft excel for further analysis.
Results and conclusion: In our study we found classical type of arch formed by anastomosis between ulnar and superficial branch of radial artery in 21.46% of specimens. Out of total 177 SPA dissected 99 specimens (55.93%) were having non-arch type of SPA and 78 specimens (44.07%) were having arch type of SPA. Also we found persistent median artery in 19 hands. Also there is wide variation in classification of SPA and there occurrence which suggest that the more variations may be present in the formation of SPA other than those described in standard books. In our study we found different types of arches on right and left side in 34 cadavers (68 hands). We found variation in branching pattern of SPA and blood supply to thumb and index finger. We observed in majority of the specimens i.e. 77 (43.50%) thumb is supplied by superficial palmar branch of radial artery followed by SPA formed by radial and ulnar artery in 27 (15.25%) hands. We found in majority of specimens i.e. 97 (54.80%) hands the index finger was supplied by superficial branch of ulnar artery followed by superficial palmar arch in 38 (21.46%) hands.

We investigated the location of the SPA in reference to important visible anatomical landmarks in the hand manly skin crease and Kaplan’s cardinal line. We observed the statistically significant difference in distance between Kaplan’s cardinal line and convexity of SPA along the line drawn on ulnar side and radial side of ring finger on right side and left side. We observed complete deep palmar arch in majority of specimens i.e. 98.31% hands having DPA formed by a branch of ulnar artery and radial artery, while in 3 hands (1.69%) it was formed by a branch of ulnar artery and a branch of second dorsal metacarpal artery. We observed the distance between Kaplan’s cardinal line and convexity of SPA along the line drawn on ulnar side of ring finger on right side was more as compared to left side, 24.06mm with SD 1.84 on right side, while on left side the mean distance was 19.01mm with SD 0.86, this difference was statistically significant. Mean distance between Kaplan’s cardinal line and convexity of SPA along the line drawn on radial side of ring was more on right side as compared to left side, 15.02mm with SD
2.62 on right side and 12.14 mm with SD 1.93 on left side which was statistically significant.

The diameters of major arteries contributing in the formation of SPA were studied, the mean diameter of radial artery on right side was 3.49 mm with SD 0.965 and 3.01 mm with SD 0.541 on left side; this observed difference was found statistically significant. Similarly the mean diameter of superficial branch of radial artery on right side was 1.65 mm with SD 0.025 and 1.58 mm with SD 0.081 on left side; this difference was statistically significant. Other variations found during the study include unusual origin of abductor digiti minimi and flexor digiti minimi.

Present study revealed different types of SPA; we found few variations in the formation of SPA which were not reported in literature also we found asymmetry in the formation of SPA. This knowledge may be helpful for hand surgeons and clinicians.

**Key words**: Superficial palmar arch (SPA), deep palmar arch (DPA), persistent median artery (PMA), arch type, Non-arch type, Kaplan’s cardinal line (KCL), distal wrist crease (DWC), carpal tunnel syndrome