Variation of Superficial Palmar Arch: A Case Report

Corresponding Author:
Dr. Liju S Mathew,
Demonstrator, Anatomy, Gulf Medical University, 4184 - United Arab Emirates

Submitting Author:
Dr. Liju S Mathew,
Demonstrator, Anatomy, Gulf Medical University, 4184 - United Arab Emirates

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Author(s): Mathew LS, Ebby S

Abstract

Variation in the anatomical arterial anastomoses of the hand is frequently reported. The present case reports the superficial palmar arch exclusively formed by the ulnar artery and its branches. About the lateral one third of the arch is completed by the median artery, taking its origin from the common interosseous artery. The arch had given off four branches, with an additional branch arising from the median artery. Therefore, knowledge of superficial palmar arch is important for surgical procedures of hand. Identifying the median artery is important, for its presence and participation in the arch completion has anatomical embryological and surgical importance.

Introduction

The vascular patterns of the palmar arches and their interconnecting branches present a complex and challenging area of study. Improvements in microsurgical techniques have made a better understanding of vascular patterns study more validated1. A classic superficial palmar arch is anastomoses along the palmar aspect, fed by direct continuity between the ulnar artery and the superficial palmar branch of the radial artery2. Variations among frequency of the pattern of the arch has been described by Coleman and Fazan et al3,4 as complete, incomplete, and unknown “f” type over the left palm respectively. The median artery takes its origin from common interosseous, anterior interosseous and ulnar arteries5 and rarely from radial artery6 among asymptomatic patients and has developmental importance. Rodriguez et al confirm that the median artery may persist in adult life in two different patterns, palmar and antebrachial, based on their vascular territory. The palmar type, which represents the embryonic pattern, reaches the palm. The antebrachial type, represents a partial regression of the embryonic artery, is slender, short, and terminates before reaching the wrist7. The incidence of palmar type has complications associated with pronator teres syndrome, carpal tunnel syndrome and anterior interosseous nerve syndrome8.

The superficial palmar arch has been the center of attraction for most of the procedures and traumatic events in the hand. The hand surgeon needs to refer the existence of healthy functional arch before surgical procedures such as arterial repairs, vascular graft applications, and free and/or pedicle flaps9, depending on radial or ulnar artery, in order to maintain the perfusion of the hand and digits. Precise knowledge on the branching pattern of the arch provides valuable source of information to the vascular surgeon, and compensation structured in the absence of collateral circulation to meet the metabolic demands of the palmar tissue, resulting in acute ischemia, manifested as pain at rest or gangrene.

Case Report(s)

Routine dissection a formalin-fixed adult male cadaver, keeping the limb continuity with the trunk, for training in human anatomy in the Department of Anatomy, Gulf Medical University, showed variation along the arteries supplying the left hand. The history of the individual and the cause of death were not known. Exposure of the arterial tree of the hand and forearm was achieved following classical incisions and dissection procedures: taking care to preserve all arteries, sacrificing venae comitantes and resecting the muscles while effective exposure of the arteries.

Observations

This superficial palmar arch was an exclusive branch of the ulnar artery and its branches the median artery [Fig 1]. The ulnar artery entered the palm along with the ulnar nerve anterior to the flexor retinaculum, lateral to the pisiform and then curved laterally to form an arch. About the lateral one third of the arch was completed by the median artery branch of common interosseous artery [Fig 2].

The arch gave off four branches, with the additional fifth branch from the median artery. The first branch of the arch arose from its medial aspect; proper palmar digital artery supplies only the medial side of the little finger. The second, third and fourth common palmar digital arteries divided into digital branches to supply the medial and the lateral sides of second, third and fourth web spaces respectively. The fifth common palmar digital artery arose from the median artery, and gave a branch to supply medial side of the thumb and the lateral aspect of the index finger. The deep palmar...
arch formed by the deep branch of the ulnar artery and the radial artery was seen as a faint arch, with only two branches from the radial artery, supplying the radial side of thumb and the index finger.

Discussion

The superficial arch dissected from the male cadaver shows its total contribution was from the ulnar artery and its branches, contrary to the classical ulnar-radial pattern. In this case, the arch was formed by the anastomoses of the ulnar artery with the persistent, patent median artery. The variations of arch have its anatomical, embryological and practical importance in the precision of surgeries and their successful outcome.

The external diameter of a persistent median artery measured by Gassner et al among median artery had a diameter of 3 mm each, using Doppler ultrasound among patients diagnosed with carpal tunnel syndrome. In our dissection the median artery had a diameter of 2.3mm.

The superficial palmar arch is classified into two categories, complete or incomplete. An arch, when the anastomoses are between the vessels contributing to it, a complete arch and an incomplete arch where anastomoses between the vessels constituting the arch are absent. This classification is currently in use till date to provide the understanding of the anatomical distribution of the arches. Coleman and Anson described superficial palmar arch as complete arch group among 80%. In this case report the complete arch was recognized as the median-ulnar type. Median artery, rarely, arose from the radial artery as reported by Acarturk et al; in our dissection the median artery takes its origin from common interosseous artery.

Rodriguez et al described the palmer type of median artery, representing its embryonic pattern as large, long and reaches the palm. In our dissection the median artery followed to the palm from its origin, has shown to play an active role in the formation of the lateral one-third of the arch.

Development evidence shows that on reaching the hand the ulnar artery links with the superficial palmar plexus from which superficial palmar arch originates, while the median artery loses its distal connection and is reduced to a small vessel. The proportion of hands in which the median artery made a contribution to the superficial palmar arch was reported as 8% by Anitha et al.

Conclusion

The arterial variations are identified in the living through latest Doppler techniques.

The median-ulnar pattern of superficial palmar arch is important as its presence has surgical importance where the complications associated with the surgery can be predicted, thereby contributing to confidence with the outcome of the procedure.

Reference

Illustrations

Illustration 1

Fig 1. Superficial Palmar Arch: 1-ulnar artery, 2-median artery, 3-median nerve

Illustration 2

Fig 2. Median artery: 4- median artery, 5- common interosseous artery
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