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CONTENTS

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## ORIGINAL ARTICLES

- Determinants of reproductive tract infections among asymptomatic women in Harare, Zimbabwe  
Enumeration of CD4 and CD8 T-cells in HIV infection in Zimbabwe using a manual immunocytochemical method.....
- Post operative pain therapy: a survey of prescribing patterns and adequacy of analgesia in Ibadan, Nigeria .....
- Prediction of peak expiratory flow rates in stunted children .....

EM Mbizvo, SE Msuya, B Stray-Pedersen, J Sundby, ZM Chirenje, A Hussain .....57

E Gomo, P Ndhlovu, BJ Vennervald, N Nyazema, H Friis .....64

AF Faponle, OA Soyannwo, IO Ajayi ..... 70

Y Zverev .....74

## CASE REPORT

- Superficial brachial artery terminating as radial and superficial ulnar arteries: a case report .....

PVV Prasada Rao, SC Chaudhary ..... 78

## LETTERS TO THE EDITOR

- Topographical relations of the vertebral arteries in the human neck: an anatomical study .....

G Mawera, B Hillen .....81

## OBITUARY

- Dr Evelyn Davey .....

H Goodwin, D Shennan .....83

## ERRATUM

- Antibiotic sensitivity and plasmid profiles of *pseudomonas aeruginosa* .....

.....84

## NOTES AND NEWS

- Instructions to Authors .....

*Central African Journal of Medicine* ..... 84

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**CASE REPORT**

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## **Superficial brachial artery terminating as radial and superficial ulnar arteries: a case report**

PVV PRASADA RAO, SC CHAUDHARY

### **Introduction**

Striking variations in the origin and course of the principal arteries of the upper limb have received the attention of anatomists and surgeons for a long time.<sup>1-5</sup> Departures from this anatomical norm, with respect to origin and course of arteries of the upper extremities occurred in 18.54% of cases.<sup>6</sup> Anatomy textbooks only make reference to vascular aberrations in the main brachio-antebrachial arterial patterns.<sup>7</sup> Accurate knowledge

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of the relationships and course of these major arterial conduits, particularly of their variational patterns, is of considerable practical importance in the conduct of reparative surgery in the arm, forearm and hand.

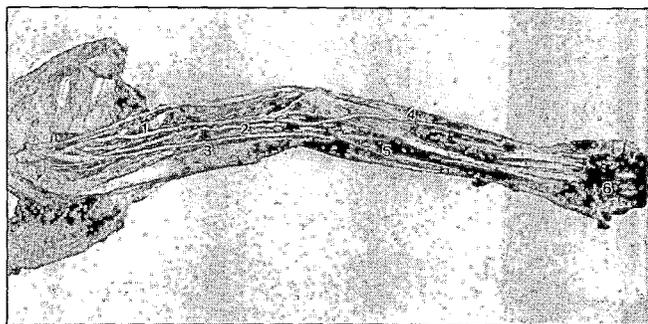
We report a case of superficial brachial artery, its course and distribution in a male Caucasian cadaver. Its presence is discussed in relation to the development of vascular structures in the upper limb and clinical implications.

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## Case Report

During the dissection, an anomalous superficial brachial artery was found in the right upper limb of a white male cadaver aged 87 years. (Figure 1). It originated from the anteromedial surface of the second part of the axillary artery about 0.5 cm distal to the common trunk of the subscapular and lateral thoracic arteries, and passed anteriorly between the two roots of the median nerve. The artery lay superficially along the medial border of the biceps brachii muscle, covered only by fascia and skin, and measured 28.2 cm. It gave four small muscular branches to biceps brachii in the upper half of the upper arm before it passed superficially to the bicipital aponeurosis. It then divided into radial and ulnar arteries about 0.7 cm below the intercondylar line of the humerus.

Figure 1: Photograph of the right upper limb showing the superficial brachial artery (1), Brachial artery (2), Median nerve (3), superficial ulnar artery (4), radial artery (5), superficial palmar arch (6).



At its origin the ulnar artery was slightly larger than the radial artery. It continued medially anterior to the proximal portions of *pronator teres*, *flexor carpi radialis*, and *flexor digitorum superficialis* muscles; reached the medial side of the forearm between the tendons of *flexor digitorum superficialis* and *flexor carpi ulnaris* at the junction of the middle and distal thirds of the forearm. The ulnar artery then crossed in front of the *flexor retinaculum* and continued laterally as the superficial palmar arch. Laterally a small superficial branch of the radial artery completed the arch. The radial artery ran its usual course in the forearm. The superficial branch of the radial artery, which normally arises from the lower part of the forearm, arose after it entered the palm. The radial and ulnar branches did not supply any structures in the forearm until they reached the wrist joint. The forearm structures are supplied by the branches of the brachial artery or by the branches of interosseous arteries.

After crossing the elbow-joint, the definitive brachial artery gave two branches, lateral muscular and a medial branch, which continued as the ulnar recurrent artery after supplying the flexor group. The brachial artery then continued as the common interosseous artery which coursed posterior to the *pronator teres* and divided into large anterior and small posterior interosseous arteries. Both the interosseous arteries ran their usual course. The *palmaris longus* muscle was absent.

## Discussion

The superficial brachial artery begins its course superficial to the plane defined by the median nerve and its two roots.<sup>1</sup> It may originate either from the axillary artery or from the brachial artery. Its frequency was found to be 1% (2/200) by Fuss *et al.*,<sup>3</sup> 1.25% (2/160) by Rodriguez-Baeza *et al.*,<sup>4</sup> and 0.3% (2/610) by Skopakoff.<sup>8</sup> McCormack *et al.*<sup>6</sup> reported eight cases of superficial brachial arteries out of 750 arms (0.01%), and in only one case did it arise from the axillary artery. Rodriguez-Baeza *et al.*<sup>4</sup> reported two cases of superficial brachial arteries originating from the brachial artery and in one case the definitive brachial artery divided into common interosseous artery and median artery at the elbow. Only one case of superficial brachial artery was observed out of 24 upper limbs dissected (4.2%) in our department. This frequency is rather high when compared with the reported literature<sup>4,6,8</sup> which may be due to the dissection of few specimens. The origin of the superficial brachial artery high up in the axilla from the second part of the axillary artery is a rare finding compared to its origin from the proximal part of the brachial artery.<sup>4,6</sup> The definitive brachial artery continued as the common interosseous artery in the forearm as reported in the literature.<sup>6</sup>

The arterial variations in the upper limb can be explained on the basis of embryological development of vascular plexuses in the limb buds.<sup>9</sup> The lateral branch of the seventh cervical intersegmental artery enlarges to form the axial artery of the upper extremity. This artery runs as a single artery in the arm and forearm regions and terminates in a capillary plexus from which digital branches arise.

The superficial brachial artery develops during the stage IV of upper limb vascular development. During the next stage of embryonic development it joins to the axial artery by means of several anastomotic branches at the level of the axilla, and at the elbow<sup>9</sup> thus acquiring a plexiform appearance.<sup>10</sup> The superficial brachial artery in the embryo gives two terminal branches, a lateral branch destined to become the distal part of the radial artery and a medial one that gives two terminal branches, the median and the ulnar

arteries. Each of these terminal branches anastomose with a corresponding branch of the primitive axillary artery, which are trunks of origin of the median and ulnar arteries, respectively.

In the subsequent stages of development, the trunks with a deep origin prevail haemodynamically and the superficial antebrachial artery together with the preanastomotic segment of its terminal branches regress.<sup>4</sup> It is the persistence of the superficial brachial artery at brachial and antebrachial levels that gives rise to arterial variations such as the one observed in this case. The origin of the superficial brachial artery either from the axillary or brachial arteries depends on which of the early trunks of the superficial brachial artery has persisted. Persistence of the superficial antebrachial artery together with an anastomotic segment of the medial branch of the superficial brachial artery results in a superficial location of the ulnar artery in the upper part of the forearm.

High frequency of arterial anomalies in the upper extremity demand accurate diagnostic interpretation for interventional and surgical procedures in the upper extremity. Arteriography, accurate knowledge of the relationships and course of the common variational patterns are, therefore, important both for the vascular radiologist and surgeon. Since the superficial brachial artery arising from the axillary artery is rare, it is important for the clinician to be aware of this anomaly when performing an operation involving the brachium and the surgeon must provide for its suture and restoration as soon as possible. Care must, therefore, be taken to avoid a superficially placed artery such as the superficial brachial artery or its branches, in cases of intended intravenous injection of drugs, in view of the serious and often irreversible consequences of an accidental intra-arterial injection.<sup>11</sup> One way of avoiding this complication is the routine examination of the forearm for unusual pulses before any injection of drugs is undertaken.

The superficial ulnar artery lies superficial to the forearm flexor muscles and subjacent to the superficial vein. This typical course of the anomalous superficial ulnar artery in the forearm renders it more vulnerable to trauma and thus to bleeding, but is also more accessible for cannulation, if needed. Accidental intra-arterial injection of drugs into superficially located variant ulnar arteries mistaken for veins have resulted in thrombosis, gangrene and amputation of the extremity.<sup>12</sup> When a radial forearm flap is raised, the superficial ulnar artery may be accidentally ligated or cut instead of the superficial vein, thus interrupting the circulation of the hand.<sup>13</sup> On the other hand, the presence of a superficial ulnar artery can be advantageous, since it can be used to supply blood to the forearm flap. The superficial ulnar artery is quite easily discovered outlined on the skin surface just below the medial half of the skin crease in front of the elbow, and pulsation is discernible with little difficulty on palpation.<sup>12</sup>

Though the superficial brachial artery occurs rarely, clinicians should be aware of such variation because of its superficial location in the arm and elbow.

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