

THE SUPERFICIAL BRACHIAL ARTERY:

A CASE REPORT

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Case Report

C.B., female, 73 years. The patient had been a diabetic with various complications including gangrene of the right lower limb. The cause of death was ischaemic heart disease.

Routine dissection of the right upper limb in the flexor compartment of the arm, cubital fossa and forearm revealed the presence of a superficial brachial artery.

The brachial artery, 8.7 cms. below the lower border of the Teres major, divided into superficial brachial and deep brachial branches. The superficial brachial branch seemed to be the direct continuation of the true brachial artery and was only slightly smaller in calibre, though it was thicker than the deep brachial branch.

The superficial brachial artery descended through the arm lying superficial (antero-medial) to the median nerve. It divided, 2.5 cms. above the level of the intercondylar line of the humerus, into its two terminal branches—the radial and the ulnar arteries. The radial artery pursued a normal course passing under cover of the Brachio-radialis. The ulnar artery, however, passing superficially through the cubital fossa immediately beneath the bicipital aponeurosis and antebrachial fascia, continued into the forearm superficial to the antebrachial muscles but deep to the deep fascia. In the cubital fossa the ulnar artery was in intimate relation with the median basilic vein and the medial cutaneous nerve of the forearm, the artery

lying at first just deep to the vein and then on its medial side (marked X in figure 3).

The deep brachial artery commenced on the postero-lateral aspect of the brachial artery. It passed deep to the median nerve, by which it was separated from the superficial brachial artery, and then coursed on its lateral side. Passing into the forearm as the common interosseous artery, it ran deep to the Pronator teres and then divided into its two terminal branches, the anterior and posterior interosseous arteries. The anterior interosseous branch passed into the anterior compartment of the forearm and was distributed in the normal fashion. The posterior interosseous branch was small and, passing into the posterior compartment of the forearm, supplied muscles in the proximal part of this compartment and could not then be traced further distally.

The Profunda brachii branch arose from the true brachial artery just before this divided into the superficial and deep brachial arteries; the superior ulnar collateral artery was a branch of the Profunda brachii. The inferior ulnar collateral artery was a branch of the superior brachial artery, arising 2.5 cms. above the intercondylar line of the humerus. The anterior and posterior ulnar arteries arose as two small but distinct vessels from the common interosseous part of the deep brachial artery at the level where this divided into its terminal branches.

Associated with the vascular anomaly was a low formation of the median

nerve, its medial and lateral roots uniting 6.2 cms. below the lower border of the Teres major.

Observations

Tiedemann (1822) was the first to describe a case of superficial brachial artery. Other cases were reported by Schwalbe (1898), Brême (1899), Müller (1903), Adachi (1928) and Schwyzer and Degaris (1935), and more recently (1956) by Weathersby and others.

A superficial brachial artery is an anomalous branch of the brachial artery that runs superficial to the median nerve; it is usually associated with a deep brachial branch that runs deep to this nerve.

The incidence of superficial brachial artery is reported as being 19.7% in 61 dissections (Skopakoff 1959) and 12.3% in 284 dissections (Keen 1961); these figures include cases of high origin of the radial and of the ulnar arteries. The incidence of the type of superficial artery reported here (with division into its two terminal branches — radial and ulnar — in the cubital fossa) is 7% according to Skopakoff (1959), 1.27% according to McCormack *et al.* (1935), and 1% according to Weathersby (1956).

Singer (1933) believes that a superficial brachial artery is a persisting embryonic vessel, its continuation into the forearm being a superficially running median artery. Miller (1939) thinks that a superficial brachial artery is an atavistic condition since a main brachial artery crossing superficial to the median nerve is said to be the usual arrangement in the primates.

Adachi (1928) divides the superficial brachial artery into superior, middle and inferior types according to the point of origin from the main arterial trunk; most frequently it is of the superior type arising from the upper part of the brachial artery. It may replace or be accompanied by an equally, less, or more important trunk situated in the normal position called the deep brachial artery. Both the superficial and the deep brachial arteries have a variable mode of termination. The

superficial brachial artery may continue as the radial artery (high origin of the radial artery), more rarely as the ulnar artery (high origin of the ulnar artery), or, as in the case reported here, may pass into the cubital fossa and there bifurcate into its usual two terminal branches, the radial and ulnar, the ulnar in most cases pursuing a superficial course. The deep brachial artery may terminate by joining the radial artery (as in Schwalbe 1898), it may become suppressed (as in Brême 1899 and Adachi 1928), or as in the case reported here, it may continue into the forearm as the common interosseous artery which then divides into anterior and posterior branches. According to Schwyzer and Degaris (1935) the deep brachial artery usually terminates by becoming suppressed. Prior to 1935, the only cases reported in the literature where the deep brachial artery continued into the forearm as the common interosseous artery to divide into anterior and posterior branches were those of Tiedemann (1822), Müller (1903) and Schwyzer and Degaris (1935). More recently Weathersby (1956) reported 3 similar cases in full-term still-born infants.

The importance of the variational patterns of major arteries lies in the dangers that may arise clinically therefrom.

In reparative surgery, an accurate knowledge of the relationship, course and particularly the possible variations of the brachial artery is of considerable importance. An aberrant superficial brachial artery may prove to be exceedingly confusing if encountered surgically. The calibre of such a vessel could be quite thick, as in the case described here, and the existence of a capacious vessel where it is not ordinarily expected could lead to serious secondary haemorrhage after the surgeon has successfully identified and ligated all those vessels normally encountered in the area. Furthermore, an aberrant superficial brachial artery is usually found in association with formed elements, as the median nerve (*figs 1 and 2*), and this may lead to confusion in establishing proper relationships.

A superficial brachial artery is, as

stated, usually associated with a superficial ulnar artery and the dangers which may result from this can hardly be over-emphasized. Hazlett (1949), Priesching (1956) and Gagnon (1966) have pointed out the dangers of accidental intra-arterial injection into a superficial ulnar artery. Complications have followed the intra-arterial injection of iodides for pyelograms or arteriograms, quinine for malaria, and Sodium Penthotal for induction anæsthesia. The danger lies in the close relationship of a superficial ulnar artery to the superficial veins of the cubital fossa (in the case reported here the superficial ulnar artery was just deep to and then immediately medial to the median basilic vein) so that the artery could be unsuspectedly entered into in attempting a venepuncture. This is especially likely since the application of a tourniquet would obliterate the pulsation of the artery. Careful scrutiny of the antecubital area should therefore always be made preceding simple venepuncture and the possibility of a superficial ulnar artery should always be kept in mind. Complications which have resulted from accidental intra-arterial injection into a superficial ulnar artery have been contraction deformities of the fingers, atrophy of the ante-brachial musculature, gangrene of the fingers or forearm with possible amputation, and even death following intra-arterial injection of Penthotal. Cohen (1948) reported 12 fatal cases which occurred during induction anæsthesia.

Summary

A case is described of a superficial brachial artery. It is of the type where the

artery terminates in the cubital fossa by division into radial and ulnar arteries. It is associated with a superficial ulnar artery, and a deep brachial artery that is continued into the forearm as the common interosseous artery, a rare occurrence. The clinical importance and the dangers of this vascular anomaly are discussed.

(Figures overleaf)

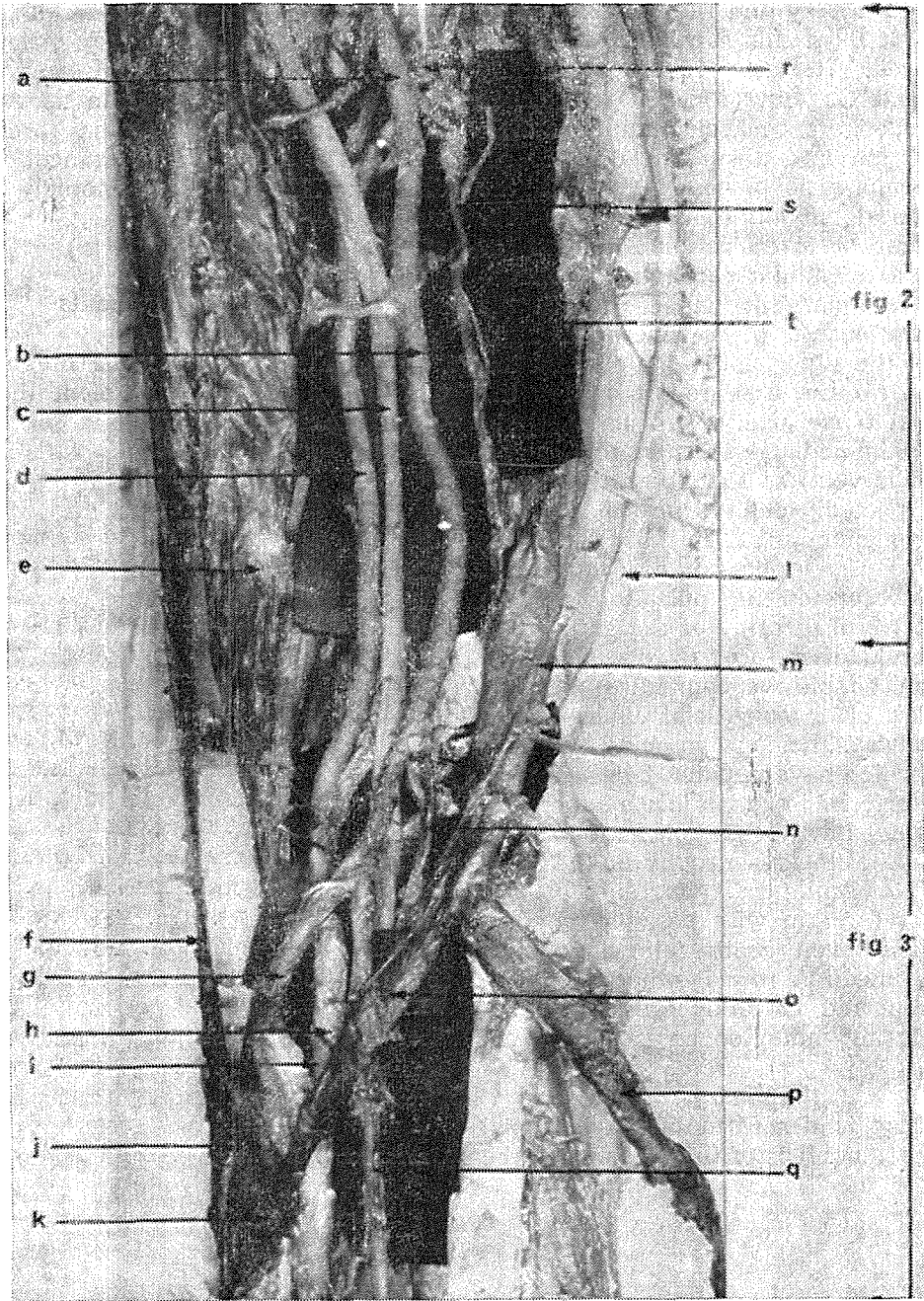
Acknowledgements

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Superficial Brachial Artery Report: Fig. 1.



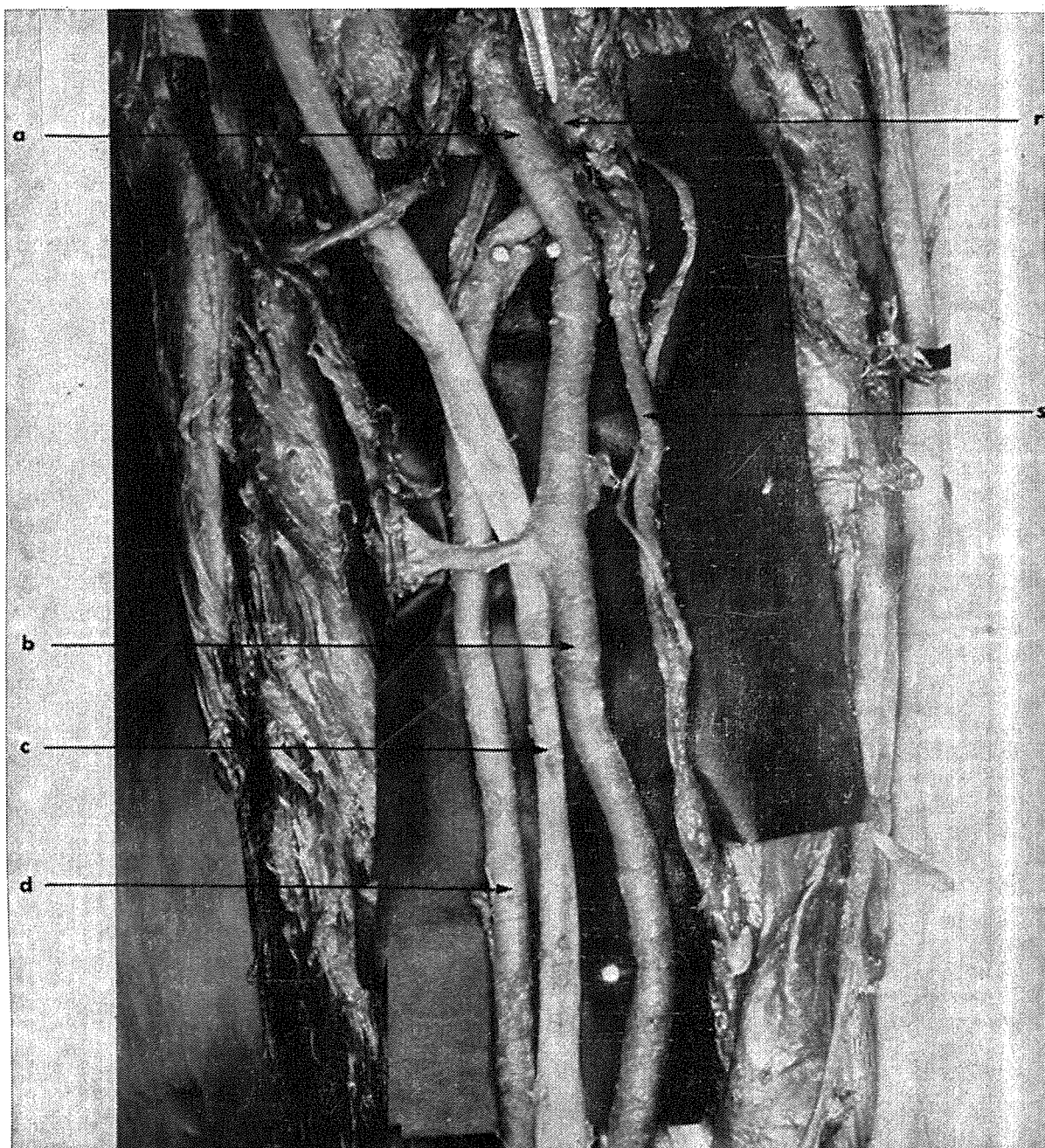
Dissection of the right upper limb showing the flexor aspect of the arm, the cubital fossa and the proximal forearm.

- a. Brachial artery.
- b. Superficial brachial artery.
- c. Median nerve.
- d. Deep brachial artery (continued

as common interosseous in the forearm).

- e. Biceps muscle.
- f. Cephalic vein.
- g. Radial artery.
- h. Anterior interosseous artery.
- i. Posterior interosseous artery.
- j. Median cephalic vein.

Superficial Brachial Artery Report: Fig. 2.

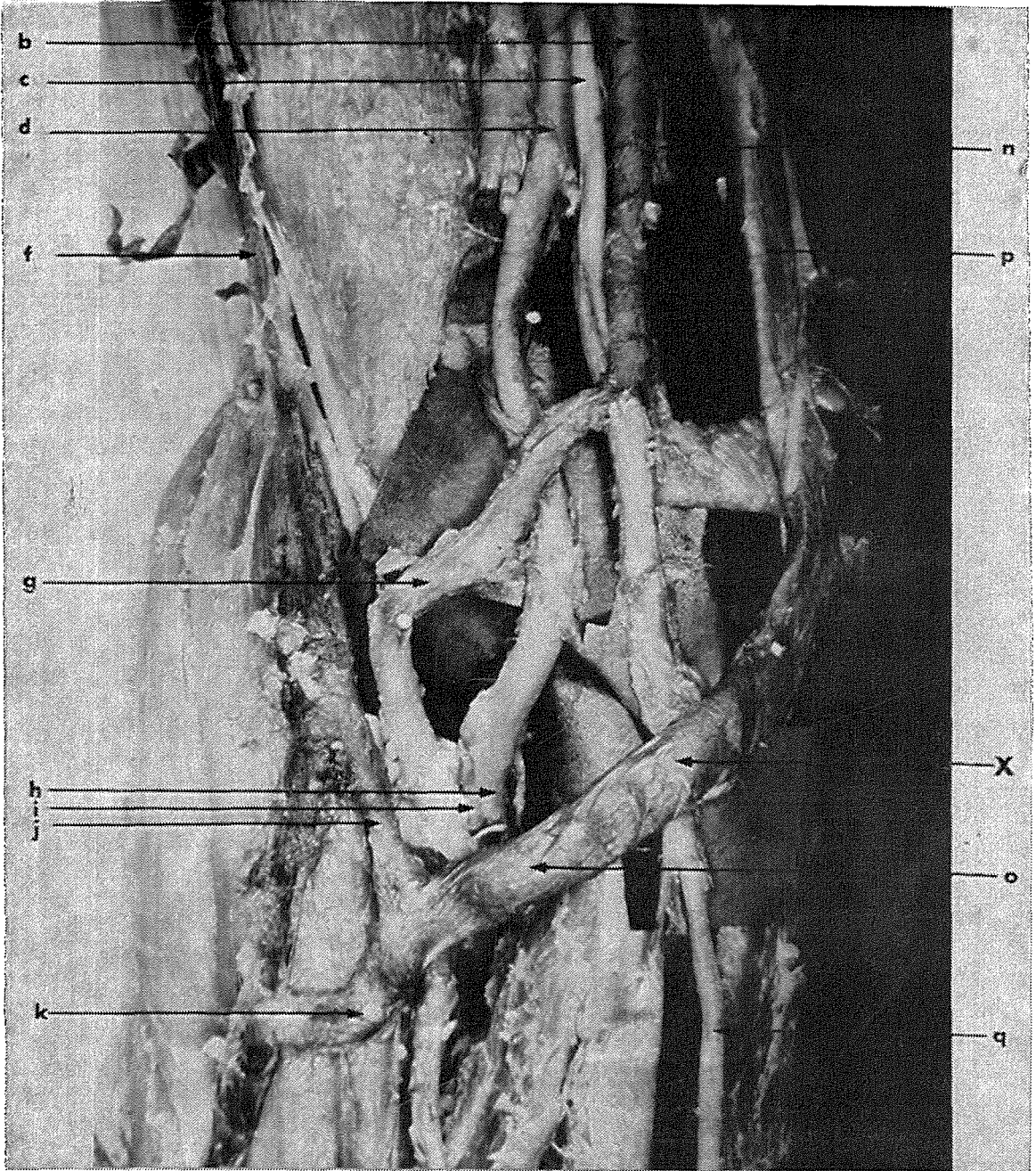


- k. Median vein.
- l. Ulnar nerve.
- m. Medial cutaneous nerve of the forearm.
- n. Inferior ulnar collateral artery.
- o. Median basilic vein.
- p. Basilic vein.
- q. Superficial ulnar artery.
- r. Profunda brachii artery.

- s. Superior ulnar recurrent artery.
- t. Ulnar collateral nerve (of Krause).

The brachial artery, having given off its profunda brachii branch (r), divides into superficial brachial (b) and deep brachial (d) branches. The superficial brachial artery has two terminal branches, the radial (g) and the ulnar (q) arteries; the ulnar artery pursues a superficial

Superficial Brachial Artery Report: Fig. 3.



course. The deep brachial artery passes into the forearm as the common interosseous artery (d) and then divides into anterior interosseous (h) and posterior interosseous (i) arteries.

Note the close relationship of the superficial and deep brachial arteries to the median nerve, the large calibre of both these vessels, the superficial course of the

ulnar artery, and its intimate relation to the median basilic vein and the medial cutaneous nerve of the forearm (*in fig. 1*) lying immediately deep and medial to these two structures. This danger point (X *in fig. 3*) is the site where accidental inter-arterial injection commonly takes place.