

Unilateral Anomalous Arterial Pattern of Human Upper Limb

Anatomical Description and Clinical Implications

*Vandana Mehta, Jyoti Arora, R K Suri, Gayatri Rath

تغاير الإنقسام الشرياني وحيد الجانب في الطرف العلوي للإنسان: توصيف تشريحي مع مقتضياته السريرية

فاندانا ميثا، جيوتي أرورا، رك سوري، جياتري راث

المخلص: نسرده هنا حالة متغايرة أحادية الجانب لإنقسامات الشريان العضدي والعضدي الأمامي. فهناك إنقسام عال للشريان العضدي مع الوجود السطحي لمسار الشريان الزندي. وبالإضافة لذلك. فإن الشريان العضدي العميق وشريان ما بين العظمي المشترك نشنا من الشريان الكعبري بدلاً من الشريان العضدي والشريان الزندي على التوالي. وعليه فإن إمكانية تواجد إنقسامات شريانية غير معهودة تشريحياً في الأطراف العلوية يمكن أن تطرح مشكلة صعبة لجراحي الأوعية الدموية خلال إجرائهم للجراحات الترميمية.

مفتاح الكلمات: الشريان العضدي. متغايرات. تقرير حالة. الهند.

ABSTRACT A unilateral case of variations in the brachial and antebrachial arterial branching pattern of a human upper limb is reported. A high bifurcation of brachial artery along with superficial course of ulnar artery was observed. Additionally, the profunda brachii and common interosseous artery originated from the radial artery instead of brachial and ulnar arteries respectively. An atypical branching pattern of arteries in an upper limb could pose a challenging problem to vascular surgeons while performing reconstructive procedures.

Key words: Brachial artery; Anomalies; Case Report; India.

STRIKING ANATOMICAL VARIATIONS IN THE origin and course of major arteries of the upper limb have always been of interest among anatomists, hand surgeons and radiologists.¹ This study describes a unilateral case of a high division of the brachial artery into a superficially coursing ulnar artery and a relatively deeper radial artery. The high origin of the radial artery is the most frequent anomaly in the arterial pattern of upper limb of human beings (incidence of 14.27% in dissected material),² whereas a superficial ulnar artery has been reported in 2% of cases.³ This case report presents a case from an anatomical perspective and also highlights the clinical implications.

Novel diagnostic procedures such as Doppler pressure studies and ultrasonography are being widely used in vascular surgery;⁴ therefore, anomalies in the vascular pattern of upper extremity are of immense significance for clinicians, especially radiologists and surgeons.

CASE REPORT

The following variations in the arterial pattern of left upper limb was observed in a forty-year-old male cadaver during the course of an undergraduate medical training programme at Varhaman Mahair Medical College, New Delhi, India.

First, a high division of the brachial artery was ob-

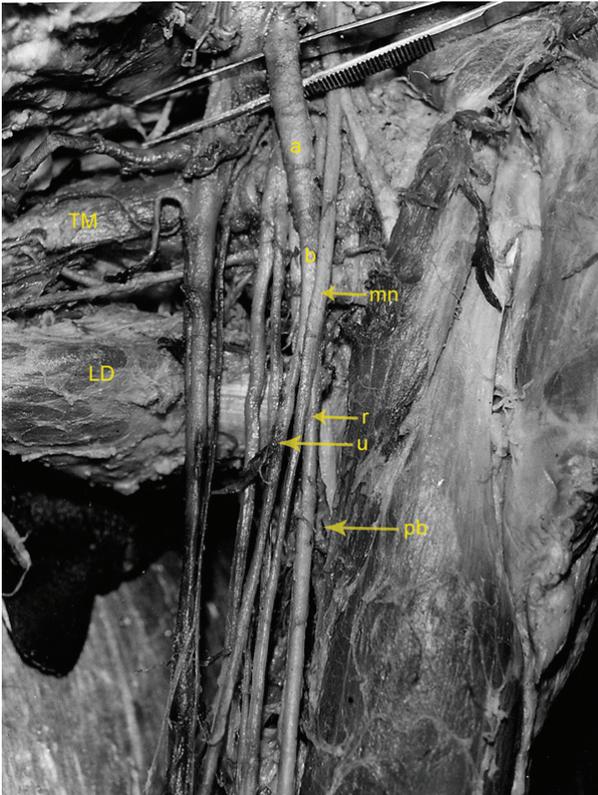


Figure 1: Dissection of the anterior aspect of left axillary region and upper arm showing:

- a* - Axillary artery
- b* - brachial artery
- r* - Radial artery
- u* - Ulnar artery
- pb* - Profunda brachii
- ci* - Common interosseous artery
- mn* - median nerve
- l* - Lateral root of median nerve
- TM* - Teres Major
- LD* - Latissimus Dorsi

Note: High division of brachial artery and lateral root of median nerve (l) passing between radial and ulnar arteries

served. The brachial artery as usual was seen to be a continuation of axillary artery at the lower border of teres major; however, it extended to the upper border of the latissimus dorsi and measured only 1.4 cm in length. It was found to divide into the radial and ulnar arteries, 9.8 cm proximal to the neck of the radius. The lateral root of the median nerve was found to be interposed between radial and ulnar arteries [Figures 1 and 3].

Second, there was an anomaly of the radial artery. It was seen to branch off the profunda brachii artery in the mid-arm and the common interosseous at the

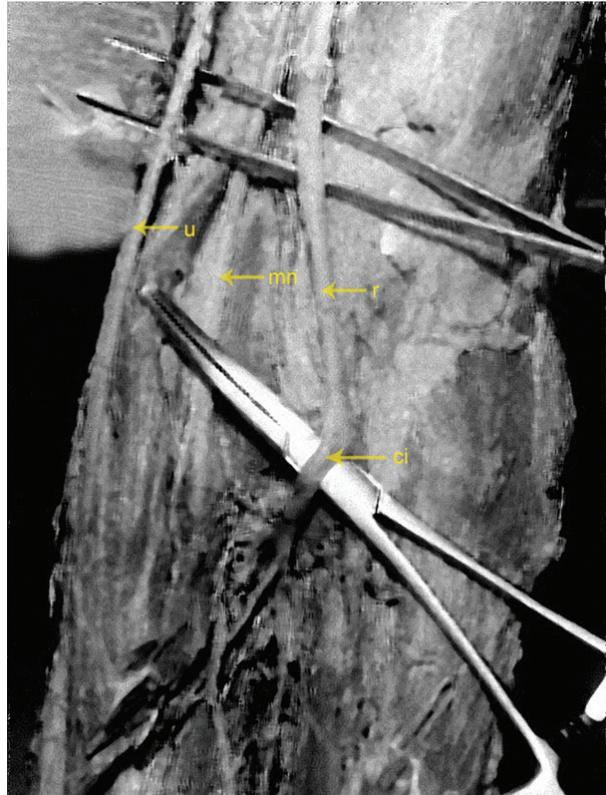


Figure 2: Dissection of the left cubital fossa showing the branching of radial into common interosseous. Note the superficial course of the ulnar artery.

- ci* - common interosseous
- r* - radial artery
- u* - ulnar artery
- mn* - median nerve

level of neck of radius in the cubital fossa [Figure 2]. It then continued as the radial artery in the forearm and hand. The common interosseous artery as usual was found to divide into the anterior and posterior interosseous arteries.

Third, there was an anomaly of the ulnar artery. It traversed superficially to the epitrochlear muscles and continued to be in the same plane in the forearm as well. It was found to be the sole contributor to the superficial arterial arch in the palm.

DISCUSSION

Accurate and detailed knowledge of the relationships and possible anatomical variations of the arterial branching pattern of the upper extremity is vital during reparative surgery in this region. In addition, trauma in this area may lead to a life threatening haemorrhage from these aberrant vessels. Inadequate

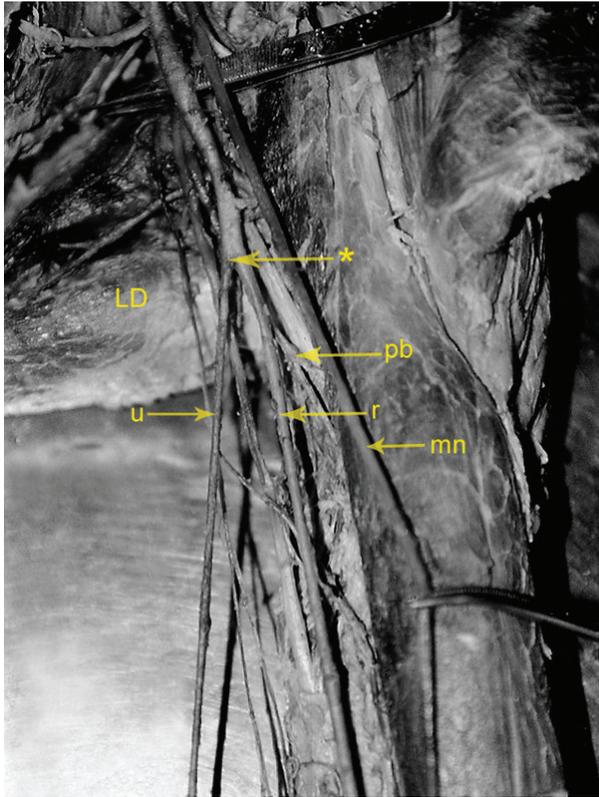


Figure 3: Dissection of the upper arm of left side depicting the following:

- a* - axillary artery
- b* - brachial artery
- u* - ulnar artery
- r* - radial artery
- pb* - profunda brachii artery
- LD*- Latissimus dorsi

* bifurcation of brachial artery

knowledge of the anatomical variations of the arterial pattern may render surgery difficult.

A high origin of the radial artery is reported to be the commonest variation in the arterial pattern of upper limb with an incidence of 14.27% in dissected specimens. It is considered as a kind of persistent superficial brachial artery.⁵ However, a high origin of an ulnar artery is quite uncommon (2.26%).⁶

In the present specimen, the ulnar artery remained superficial to the epitrochlear muscles, and was found to be the sole contributor to the superficial palmar arch. It appears that the superficial course of the ulnar artery in the present case has been referred to as a “superficial ulnar artery”, in earlier studies.⁶

An unusual variation of the superficial ulnar artery was reported where it was found to be rudimentary. Giving only small branches to the biceps in the arm

and in the hand, it anastomosed with the radial artery to complete the superficial palmar arch.⁷ Contrarily, in the present study, the superficial ulnar artery was not rudimentary and, in the hand, was found to be the sole contributor to the palmar arch.

As per standard textbook descriptions, the arrangement of structures in the cubital fossa from lateral to medial side is biceps tendon, brachial artery and median nerve. Interestingly, in the present report, this arrangement differed as the median nerve interposed between the radial and ulnar arteries; therefore, this altered the topographical relationship of vessels in the elbow. This would make simple clinical procedures such as blood pressure recording a complicated ordeal. We also suggest that a surgeon, while performing operations in the arm, would have to exercise extra caution not to injure the lateral root of median nerve since it is interposed between the radial and ulnar arteries.

The anomalies of various blood vessels of upper extremity can be explained on the basis of embryological development of the vascular plexus of limb buds.^{8,9} The lateral branch of the lateral intersegmental artery gets enlarged to form the axial artery of the upper limb, which later terminates in a capillary plexus from which digital branches arise.

The brachial artery is the proximal part of this axial artery beyond the lateral border of teres major while the distal portion, beyond the cubital fossa, is the interosseous artery. The radial and ulnar arteries arise relatively late in development as new vessels branch from brachial and interosseous arteries respectively.¹⁰ Embryologically, the radial artery arises from the brachial artery in the arm, disappearing at a later stage, resulting in one main artery running along the flexor aspect of the limb.¹¹ Thus it may be inferred that the primitive axial and superficial arteries play a role in the embryogenesis of the arteries of the upper limb.

In an earlier study,¹² the axillary artery gave off medial and lateral divisions. The superficial/medial division coursed along the path of ulnar artery. The deep/lateral division provided the branches of brachial artery in the arm while in the cubital fossa it gave branches, which normally arise from the ulnar artery. In the present investigation, we prefer to designate this lateral branch as brachio-radial as it subserves the distribution of brachial artery in the arm and at the level of cubital fossa continues as the radial artery.

The superficial position of the ulnar artery renders

it vulnerable to trauma. However, it also makes it amenable to cannulation if required. Understandably, the superficial position of the artery may also account for its mistaken identity as a vein and accidental injection of drugs may lead to serious consequences.¹³ Further, such vascular anomalies may cause confusion during interpretation of angiographic procedures.

CONCLUSION

The anatomical variations in this case report demonstrates a high bifurcation of the brachial artery into the radial and ulnar artery associated with the origin of the profunda brachii and common interosseous arteries from the radial artery in the arm and forearm respectively, along with superficial course of ulnar artery. Such an aberrant arterial anomaly of the upper limb is an extremely rare finding.

Awareness of variations in the vasculature of upper limb is an important consideration, as a large number of diagnostic and therapeutic procedures are performed in this region. Precise knowledge of arterial anatomy of the region is also vital for logical interpretation of angiograms. Good insight into vascular anatomy of upper limb is imperative for successful reconstructive operations.

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