

Axillary arch and other neurovascular anomalies in a cadaver –

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ABSTRACT

The co-existence of multiple variants in the axilla has been rarely documented. Hence, we report the multiple variations of axillary structures and axillary arch. During a dissection of axilla of adult male cadaver, following variations were encountered. a) One superficial and complete type of axillary arch on left axilla only. b) Venous chiasma between the basilic vein and brachial vein of both sides. c) Abnormal course of intercosto-brachial nerve on left side d) Presence of two medial cutaneous nerve of forearm and the absence of medial cutaneous nerve of arm on left side only. The presence of such variations should be kept in mind while performing various invasive and surgical techniques.

Keywords: Axillary arch, basilic vein, brachial vein, intercosto-brachial nerve, medial cutaneous nerve of forearm.

Anatomical variations are common in axilla but the co-existence of multiple variant in the axilla is rarely documented. Here we present a case where we observed multiple variations in a single cadaver during routine dissection.

Axillary arch: Occasional presence of an anomalous muscle "Axillary arch" and its relative closeness of vital structures are important to the surgeons and also for academic purposes. This variation was described by Carl Langer¹ in 1846 as "Achselbogen" a fibrous thickening of the medial edge of axillary fascia between the pectoralis major and latissimus dorsi. Later, in 1884 Testut² called it as Langer's axillary arch to the muscular variation.

The axillary arch (AA) is a variant muscular slip of latissimus dorsi crossing from the edge of latissimus dorsi to join the tendons of pectoralis major, coracobrachialis or the fascia over the biceps brachii.³ The AA can receive nerve fibers from the lateral pectoral, medial pectoral, intercostobrachial or thoracodorsal nerve.⁴ The AA brought about hyper-abduction syndrome, thoracic outlet syndrome, costoclavicular syndrome, shoulder instability syndrome, median nerve and radial nerve entrapment, and venous thrombosis.^{5,6}

Basilic vein: Usually, the distal basilic vein lying superficially pierces the deep fascia at the elbow and joins the venae comitantes of the brachial artery to form the axillary vein.³

Intercostobrachial nerve (ICBN): Usually lateral cutaneous branch of the second intercostal nerve supplies the axillary floor and upper medial surface of the arm via

communication with the medial cutaneous nerve of arm.³ The ICBN preservation provides a potential anatomical landmark in axillary lymph node dissection and prevent the postoperative arm lymphedema.⁷

Medial cutaneous nerve of forearm (MCNF) pierces the deep fascia along with the basilic vein midway in the arm and divides into anterior and posterior branches.³

MATERIALS AND METHODS

Over a span of two years, during dissection different congenital anomalies were observed and recorded on 24 embalmed cadavers in the Department of Anatomy of Nepal Medical College. Axillary regions and the arm of both sides were dissected as a part of routine dissection. Multiple variants in a single cadaver with presence of axillary arch and other variations regarding the axillary vessels, brachial plexus and its branches along with superficial vein of arm were observed. It is being reported because of its unique nature.

RESULTS

During the dissection of axilla of 45 years old male cadaver, several anomalies were recorded on both arms. Most importantly an unusual muscle band was encountered on left axilla and identified as axillary arch. A venous chiasma between the basilic vein and brachial vein were also observed in both sides. On the left side there were abnormal course of intercosto-brachial nerve; presence of two medial cutaneous nerve of forearm and the absence of medial cutaneous nerve of arm.

Axillary Arch

AA extended from axillary border of the fleshy portion of latissimus dorsi to the inferior surface of pectoralis major and had a small fascial extension to the fascia of coracobrachialis and short head of biceps brachii (Fig. 1). It was rectangular-shaped muscle of 7.5 cm in length and 1.2 cm in width. On the basis of clinical classification of axillary arch, our finding belonged to superficial group as it passed across the axilla, crossing the axillary vein, artery and nerves of brachial plexus.⁴ The AA was in close association with intercosto-brachial nerves near its distal attachment and to median nerve near its proximal attachment. The thoracodorsal nerve innervating LD had supplied this extension.

Variant branchial-basilic vein anatomy:

In the middle of the left arm, we observed the basilic vein receiving the tributaries from lateral vena-comitant of brachial artery in front of median nerve and again got bifurcated into two basilic veins. The lateral vena comitant after sending a tributary to basilic vein runs upward, medial to biceps brachii and coracobrachialis and then rejoined with lateral basilic vein in the middle of coracobrachialis. The bifurcated basilic veins run in the axilla between AA and axillary artery. It received medial vena comitant and united to form a single axillary vein (Fig. 1).

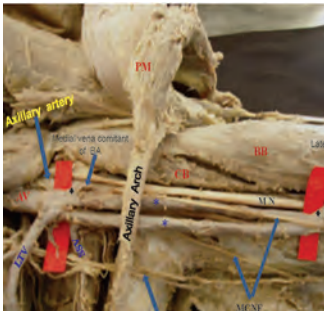


Fig 1: Left axilla showing superficial Arch and complete type of Axillary Arch and upper extremity showing various brachial-basilic vein junction and double basilic veins. AV-Axillary Vein, BB-Biceps Brachii, BV- Basilic Vein, CB- Coracobrachialis, ICBN- Intercostobrachial Nerve, LD- Latissimus Dorsi, LTV- Lateral Thoracic Vein, MCNF- Medial Cutaneous Nerve of Forearm, MN- Median Nerve, PM- Pectoralis Minor, SSV- Subscapular Vein, TDN- Thoracodorsal Nerve..

Note the Double Basilic Veins (**) and brachial- basilic vein junction (♦)

In the right arm, the vena comitants of brachial artery joined with basilic vein, medial to median nerve and coracobrachialis. Subsequently it got divided and after a short distance rejoined with basilic vein forming the axillary vein (Fig. 2). The medial cutaneous nerve of forearm on the right axilla passed through the two divisions of basilic veins and ran medial to basilic vein (Fig. 2).

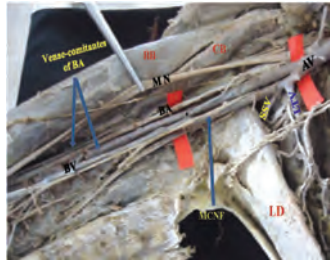


Fig 2: Right upper extremity showing brachial-basilic vein junction and abnormal course of MCNF passing through the two divisions of basilic veins.

AV-Axillary Vein, BA- Brachial Artery, BB-Biceps Brachii, BV- Basilic Vein, CB-Coracobrachialis, LTV- Lateral Thoracic Vein, MCNF- Medial Cutaneous Nerve of Forearm, MN- Median Nerve, SSV- Subscapular Vein. Note the brachial- basilic vein junction (♦) and absence of axillary arch.

Intercostobrachial nerve

ICBN of the left side was seen piercing 2nd intercostal space and divided into anterior and posterior branches, hooking around the lateral thoracic artery (Fig. 3).

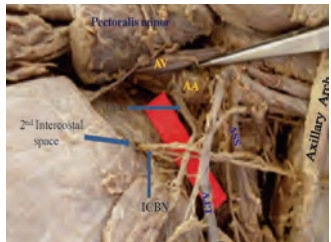


Fig 3: Left axilla showing intercostobrachial nerve hooking around the lateral thoracic artery.

AA- Axillary, AV-Axillary Vein, ICBN- Intercostobrachial Nerve, LTA- Lateral Thoracic Artery, LTV- Lateral Thoracic Vein, SSV- Subscapular Vein.

Anterior division communicated with the posterior division and divided into two branches. The lower branch innervated the medial aspect of arm where as the upper branch joined further with medial cutaneous nerve of forearm and divided in a M shaped pattern and supplied the medial aspect of forearm, while posterior division of ICBN supplied medial aspect of the arm (Fig. 4).

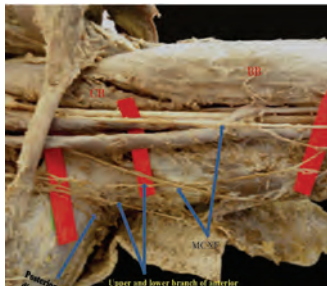


Fig 4: Left upper extremity showing the abnormal course of Intercostobrachial nerve.

BB-Biceps Brachii, CB- Coracobrachialis, ICBN- Intercostobrachial Nerve, MCNF- Medial Cutaneous Nerve of Forearm.

Medial cutaneous nerve of Forearm

In the left arm, two MCNF arose from medial cord of brachial plexus and absence of medial cutaneous nerve of arm (Fig. 4). Upper one innervating the ventral aspect of forearm where as lower one gave cutaneous supply to posterior aspect of the elbow. In spite medial side of arm was innervated by ICBN.

DISCUSSION

Multiple variations in a single body are a rare occurrence. Particularly these variations reported in the same arm are rare.

Table-1: Comparison of the axillary arch cases in the literature

Authors	Total axillae (n)	AA (%)	Complete AA	Incomplete AA	Innervation/ cases
Miguel et al, 8 2001	100	3(3%)	2	1	Thoracodorsal nerve / 3
Merida- Velasco et al, 5 2003	64	4(6.25%)	2	2	Thoracodorsal nerve/ 3 Medial pectoral nerve/ 1
Pai MM et al, 9 2006	68	1(1.47%)		1	Branch from lateral cord
Bertone VH et al, 11 2009	78	9 (12%)	6	3	Intercostobrachial nerve/ 8
Orhan M et al, 10 2012	20	2 (10%)	2		Medial pectoral nerve / 1
Present study	24	1(4.16%)	1		Thoracodorsal nerve

Axillary Arch

In the present study, we found one axillary arch in 24 cadavers i.e. 4.16% within the limited no. of cadavers we studied. The different authors had mentioned about different percentage of AA ranging from 1-12% (Table-1). Miguel *et al*,⁸ reported a frequency of 3% out of 100 cases. Our observation of superficial and complete AA was also described by others.^{5,9,10}

Various authors highlighted the significance of AA. During physical examination, a loss of the normal concavity of the axilla¹² and also can be confused with lymphadenomegaly.¹³ The phylogenetic history suggested it as remnant of panniculus carnosus which is present in low ranking rodents to protect themselves from insects. In human it mostly disappeared since its functional significant being lost.¹³

Venous Chiasma Between Basilic Vein And Brachial Vein:

There were few studies addressing the anatomy of basilic vein but none of them were similar to our findings. Anaya-Ayala *et al.*,¹⁴ have reported 34% variant brachial-basilic vein anatomy in 290 patients. But our finding did not match any of the type mentioned by them. Another observer mentioned the basilic vein and the brachial vein joined with one another in the middle of the arm to form a unique venous chiasma.¹⁵ The unusual position of brachial-basilic junction near the antecubital fossa led to an inadvertent distal brachial vein ligation and failure of subsequent graft placement during basilic vein transposition.¹⁶ As the limb enlarges, the marginal vein gets subdivided and forms the superficial veins. It was suggested that as a result of different hemodynamic influences, some anastomosis develop between superficial and deep vessels, where as others don't develop or regress. In this way, the chiasmatic patterns between superficial and deep blood vessels arise.¹⁷

Intercostobrachial nerve

Our finding belongs to one of the variety of type I reported by Loukas et al.¹⁸ in which ICBN provide a branch to MCNF. In an extensive study, he had observed 8 different pattern of ICBN in 200 axilla.

Medial cutaneous nerve of Forearm

The medial cutaneous nerve of the forearm, which passing through the divisions of basilic veins, could be the result of entrapment of the persistent axonal growth cone within the venous plexus during embryological development.¹⁹ A similar variation was reported by Roy et al.²⁰

CONCLUSION

We are reporting the variations of AA because it is of special interest for the anesthesiologist during nerve block and surgeons during axillary lymph adenectomy. This type of a venous chiasma between basilic and brachial vein may mislead the doctor during cardiac catheterization. The knowledge regarding the variation of ICBN is important in prevention of postoperative arm lymphedema.

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