



Unilateral axillary arch with two slips entrapping neurovascular bundle in axilla and its innervation by the median nerve

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ABSTRACT

Axillary arch is an additional muscle bundle of various dimensions extending usually from the latissimus dorsi in the posterior fold of the axilla, to the pectoralis major or other neighboring muscles and bones. In the present case presence of such unusual axillary arch innervated by the median nerve has been reported. During routine dissection of axilla region in one of the upper limbs, the occurrence of axillary arch was observed. The muscle fibers were arising from the belly of latissimus dorsi and were getting inserted to the tendon of coracobrachialis and lateral lip of bicipital groove. As it passed through the axilla it divided into 2 slips, enclosing the axillary vessels and nerves related to them. The fleshy fibers of the axillary arch were innervated by 2 small twigs from the median nerve. Though the occurrence of the axillary arch is very common, axillary arch with 2 slips getting innervated by the median nerve is not been reported so far. Further, a detailed literature review was done and the surgical and clinical importance of the case was discussed. © *IJAV*. 2009; 2: 113–115.

Key words [axillary arch] [median nerve] [axilla] [latissimus dorsi] [pectoralis major]

Introduction

Axillary arch is described as an additional muscle bundle of various dimensions extending from latissimus dorsi in the posterior fold of the axilla, to the pectoralis major in the anterior fold, to the short head of the biceps brachii or to the coracoid process [1,2]. It was first described by Ramsay in 1795; he gave the description of a muscle bundle connecting pectoral muscle and latissimus dorsi [3]. However, the muscle is named after Langer who gave the first description of the muscle in 1846 [4]. Incidence of axillary arch is reported as 7% of subjects [5,6]. Merida-Velasco et al., have reported 4 cases of axillary arch in their study of 64 upper limbs [7]. Various origin, course, insertion, nerve supply, dimensions; structure have been described by different authors [4,8]. In the present case, one such unusual occurrence of axillary arch with 2 slips was reported with the unique feature of it getting innervated by the branches of median nerve, which is not been reported so far.

Case Report

During a routine dissection of the axilla for preparing specimens for undergraduate teaching in the Department of Anatomy, Faculty of Medicine, Asian Institute of Medicine Science and Technology University, Kedah, Malaysia, an axillary arch with 2 bellies crossing the third part of axillary artery and vein and the nerves related to them was observed at the left upper limb of about 60-year-old male cadaver (Figures 1, 2). The fleshy fibers of axillary arch were arising from the upper edge of the

tendon of the latissimus dorsi. As they passed through the axilla the fibers divided into 2 slips. One of the slips lying in front of third part of axillary artery and axillary vein became tendinous to run deep to the posterior surface of pectoralis major tendon to get inserted into the lateral lip of bicipital groove. Whereas, the other slip passed behind the third part of axillary artery and axillary vein to join the anterior slip and finally got inserted to the lateral lip of bicipital groove deep to the tendon of pectoralis major. The muscular slips were about 7 cm long and about 1.5 cm in breadth. It was also observed that each slip was separately innervated by the small direct branches of median nerve.

Discussion

The axillary arch, which is considered as a common variation in the axillary region, has a prevalence of 7–27% [4]. It was also reported that it was more frequently prevalent among Chinese [4]. The origin, course, insertion, tissue composition, and dimensions of the axillary arch are variable [4]. The presence of axillary arch was reported in Caucasian population also, but with lesser incidence [4]. In addition, the prevalence of a combination of pectoralis quartus and an axillary arch is also reported, in about 9% of cases [4,9]. Lee et al. have reported a case of coexistence axillary arch with the variations of the brachial plexus [10].

The axillary arch may arise from the latissimus dorsi muscle, either directly [4,8], or indirectly with an interposed tendon [4]. An origin from the serratus

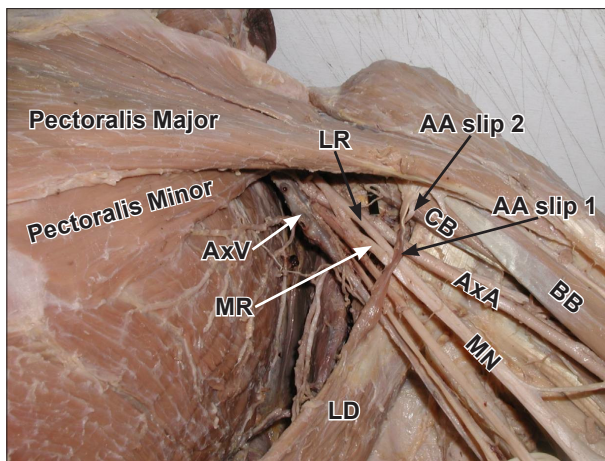


Figure 1. Dissection of the left axilla where the axillary pad of fat and axillary group of lymph nodes have been cleared to expose the axillary arch, axillary artery, axillary vein and brachial plexus. Note that one of the slips of the axillary arch (AA slip 1) passes anterior to the axillary artery, axillary vein and brachial plexus; whereas, the other slip (AA slip 2) passes behind them to entrap the neurovascular bundle between them. (AA slip 1 & AA slip 2: axillary arch; AxA: axillary artery; AxV: axillary vein; LR: lateral root of median nerve; MR: medial root of median nerve; MN: median nerve; CB: coracobrachialis; BB: biceps brachii; LD: latissimus dorsi)

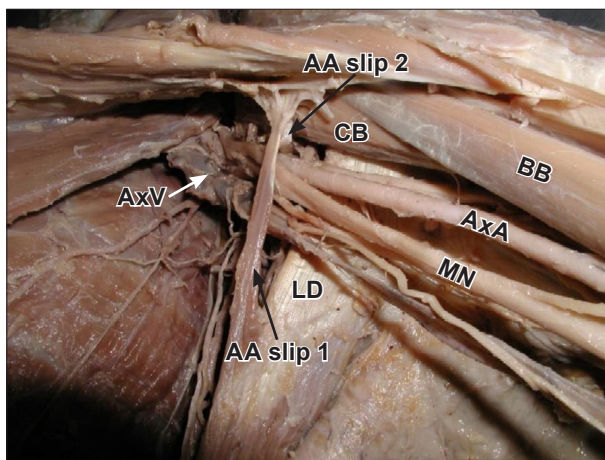


Figure 2. Closer view of Figure 1. (AA slip 1 & AA slip 2: axillary arch; AxA: axillary artery; AxV: axillary vein; LR: lateral root of median nerve; MR: medial root of median nerve; MN: median nerve; CB: coracobrachialis; BB: biceps brachii; LD: latissimus dorsi)

anterior muscle has also been reported [4]. As far as insertion of the fibers of axillary arch is considered, there are number of variable reports reported by different authors. The commonest insertion of axillary arch as a single muscular band into the muscles like pectoralis major, pectoralis minor, coracobrachialis, short head of the biceps brachii, teres major or to the coracoid process or to the neighboring axillary or brachial fascia [4,8,11]. Similarly, the cases of multiple insertions were also reported by some of the authors. Loukas et al. have observed a case where it was inserted into the pectoralis major, pectoralis minor and coracoid process [12]. Tobler reported couple of cases where in one it was inserted into

the fascia covering the biceps brachii and the coracoid process; in the other, the insertion was into the pectoralis major tendon (muscular part) and coracoid process (aponeurotic part) [4]. Similarly, the case of up to three tendinous insertions was reported by Dharap [13] and Langer [4]. An axillary arch reported by Turgut et al., [14] was unique in its attachment. It was originating from the coracoid process of the scapula and extending to the long head of triceps brachii muscle. However, the observations in the present case, that is, the muscular fibers of axillary arch dividing into 2 slips and one of the slips passing in front and the other behind the neurovascular bundle in the axilla and then fusing with each other to get inserted to the lateral lip of bicipital groove is being reported for the first time.

The axillary arch is most frequently innervated by the lateral pectoral nerve [4]. However, Dubreuil-Chambardel found that the nerve supply is variable with five different patterns of innervation in 32 axillary arches [4]. Innervation of axillary arch muscle by a direct branch of pectoral loop was reported by Afshar and Golalipur [15]. In present case it was innervated by median nerve which is being reported for the first time.

Regarding the phylogenetic origin of axillary arch, different theories have been proposed by various authors [4]. The most commonly proposed view is that the axillary arch is a remnant of the panniculus carnosus found in mammals [4]. According to Cihak there are 4 fundamental phases in the ontogenesis of muscle pattern [16]. The axillary arch could have arisen during phases 3 and 4 of ontogenesis of the muscles in the axilla. During phase 3 some muscle primordia from different layers fuse to form a single muscle. However, Grim stated that some muscle primordia disappear through cell death, despite the fact that the cells within them have differentiated to the point of containing myofilaments [17]. Persistence of some cells between latissimus dorsi and teres major may account for the muscular slip in the form of axillary arch. During phase 4, one of the prominent features is the formation of connective tissue elements and their integration with the muscle fibers; the multiple connective tissue attachments in the present case probably formed during this stage.

Awareness of possible variations in this region of axilla especially axillary arch is essential for the clinicians and surgeons during the clinical examinations and when dealing with any investigative surgical procedures or a case of injury to the axilla. Petrasek et al., [18], Bertone et al., [3], Miguel et al., [19] have reported the importance of the awareness of the axillary arch muscle during axillary lymphadenectomy –as it may obscure lymph nodes– and also for differential diagnosis in compressive pathologies of the axillary vessels and brachial plexus. It may also present with axillary vein obstruction [20], because the axillary arch crosses the vessels and nerves as described in several reports [1,4]. In patients in whom the axillary artery is ligated, the arch may distort the anatomy and perhaps confuse the surgeon [4,8]. A case of contracture of the axillary arch has also been reported by Lin [21]. An axillary arch muscle may be palpable

in living subjects and should be borne in mind during clinical examination of the axilla as it may be mistaken for a tumor [4]. In addition, it is necessary for the radiologist to note the possible variations in the axillary arch as it can be recognized as a soft tissue shadow [22]. Compression by the muscular axillary arch should be considered in the differential diagnosis of patients with thoracic outlet and hyperabduction syndromes [23]. The potential presence of an axillary arch presents several clinical considerations for the physical therapist. The existence of an axillary arch should be considered in patients with signs and symptoms consistent with upper extremity neurovascular compromise similar to thoracic outlet syndrome. Inclusion of this variant in the differential diagnostic process may assist physical therapists in the management of patients with signs and symptoms consistent with thoracic outlet syndrome [24]. According to Ucerler et al., presence of muscular axillary arch causes difficulties in staging lymph nodes, axillary surgery, thoracic outlet syndrome, shoulder instability or cosmetic problems; it should be kept in mind for axillary pathologies [25].

The case reported in the present article gains even more importance because of its complexity. This case of

axillary arch with large number of muscle fibers splitting at its origin to enclose the neurovascular bundle can lead to compression of these nerve and vessels. Such patient would present with parasthesia, wasting of flexor compartment muscles of the arm and forearm. In such patients with entrapment syndrome, surgeon who is aware of the possible variations of the arch can diagnose the case with much ease and safely resect the arch as no functional value for the muscle belly [26]. Being in close relationship with the axillary artery, during any surgical intervention in the axilla, the axillary arch may mislead the surgeons for the application of a ligature. Accidental ligation of the vessels and the nerves may occur during dissection of the axilla, if such a variant is not thought for.

To conclude, we would like to state that the case axillary arch reported above is unique in its gross morphology, insertion and nerve supply. It is very essential not only for the anatomists but also for the clinicians and surgeons to be aware of the probable variations of the axillary arch for proper diagnosis and planning of operative treatment. Our observations in the present case will supplement the knowledge of variations.

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