

Axillary Arch Muscle and Its Effect on Various Structures in Axilla

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Abstract

Introduction: Out of different variations in axilla, the most understood is a muscular or fibromuscular slip known as Axillary Arch Muscle. Different studies have shown presence of this muscle having incidence of 7-8%. **Material and Method:** The present study was conducted in Department of Anatomy, Dr. D.Y. Patil Medical College, Kolhapur, and Maharashtra. **Result:** The axillary arch was found unilaterally in two cadavers (one male and one female) and bilaterally in two female cadavers. All the 6 arches arose from the anterior border of the latissimus dorsi muscle, crossed over the neurovascular bundle in the axilla and inserted to the fascia covering the deep surface of pectoralis major or on inferior surface of clavicle. In Female cadaver found on left side, the axillary arch muscle was compression the axillary vein. The axillary vein showed dilatation proximally with narrowing at the site of crossing of the axillary arch muscle while distally the vein showed normal calibre. Very interesting Arch was noted in male cadaver of 58 years. Unilateral on left side Axillary Arch muscle was seen along with variation in Posterior cord of brachial plexus. Axillary Arch muscle is more common in female group. **Conclusion:** There is increase in number of females suffering from Carcinoma of Mammary gland, so it is need of the time oncosurgeons, plastic surgeons and radiologist know the details of this muscle. This muscle variant can lead to compression of vessels also nerves, so it is very important to understand signs and symptoms of the same.

Keywords: Axillary Arch; Axillary Vein; Posterior Cord.

Introduction

While performing surgery in axilla, like carcinoma of breast, reconstruction of axilla, axillary bypass, etc., it is must that surgeons understand the importance of Anatomical variations in the axilla [1]. In axilla, muscular variations described are chondroepitrochlearis, dorso-epitrochlearis, costo-coracoideus, and etc. [2]. The chondroepitrochlearis is an anomalous muscular slip which is responsible for limiting range of motion of the upper limb [3].

Out of different variations, the most understood is a muscular or fibromuscular slip which courses

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Received | 20.07.2017, Accepted | 12.08.2017

from the latissimus dorsi muscle to different areas of pectoral region. The muscles or fibromuscular slip described by various authors extend from latissimus dorsi to tendons, muscles or fasciae of pectoral region near the upper end of the humerus [4]. The studies have shown an incidence of 7-8% [5]. It was first described by Ramsay in 1795. This variation was confirmed later by Langer in 1864, so also called as axillary arch of Langer. Sachatello named his variation as the axillopectoral muscle in 1977 [6].

Axillary Arch muscle is a muscular slip, arising from the upper border of the latissimus dorsi. It extends to the deep surface of the pectoralis major, the coracobrachialis or the fascia over the biceps brachii. It crosses over the neurovascular bundle of the axilla. It can be of varying dimension [7].

Materials and Methods

The present study was done in Anatomy Department, D.Y. Patil Medical College, Kolhapur,

Maharashtra. The study was conducted over 4 years from 2013- 2017. In total 60 cadavers, that is 120 upper limbs we dissected to locate the axillary arch muscle. Wherever found, the arch was dissected meticulously from its origin to its insertion. The nerve supply and blood supply was noted, the dimensions of the arch were measured, its relations to the structures in the axilla were studied in detail. Any additional related variations were investigated.

Observation and Results

The axillary arch was found unilaterally in two cadavers (one male and one female) and bilaterally in two female cadavers. In our study all arches arose from the anterior border of the latissimus dorsi muscle. They were found to cross the neurovascular bundle in the axilla. Their insertion were to the fascia covering the deep surface of pectoralis major or on inferior surface of clavicle.

In our study out of 120 upper limbs it was found in 6 upper limbs that is 5%. The muscle slips measured 09 to 15 cm in length and 6 to 9 mm in thickness, as shown in Table 1. Blood supply was derived from either a branch from circumflex scapular artery or any other branch from the third part of axillary artery. Nerve supply was derived from medial pectoral nerve or thoracodorsal nerve.

In female cadaver of 68 years, axillary arch muscle was found on left side. The muscular slip originating from the anterior border of left latissimus dorsi muscle, measuring 10 cm in length and 2cm in width at its broadest point. The axillary arch muscle was directed towards the humerus, crossing anteriorly over the axillary vein, axillary artery and the brachial plexus. The axillary arch muscle was divided into two slips; an upper and lower. The upper slip was larger and fleshier and was continuous with the fascia on the medial aspect of the short head of biceps brachii muscle. The lower slip was smaller and less fleshy and was continuous

with the fibres of pectoralis major muscle on the deeper surface. The axillary vein also showed gross changes in the vessel wall in this region suggestive of compression effect by the axillary arch muscle. The axillary vein showed dilatation proximally with narrowing at the site of crossing of the axillary arch muscle while distally the vein showed normal calibre [8].

Very interesting Arch was noted in male cadaver of 58 years. Unilateral on left side Axillary Arch muscle originated from Latissimus Dorsi by two slips, which were aponeurotic. Insertion of the muscle was found on inferior surface of clavicle near insertion of subclavius muscle and into clavipectoral fascia. Total length was 9cms, upper aponeurotic slip was 2.5cms while lower aponeurotic slip was 3 cms (Figure 1).

Between the two aponeurotic slips structures passing were Subscapular artery, Axillary nerve. Subscapular artery arises from 3rd part of axillary artery. Axillary nerve branch arises from posterior cord. In this specimen we found variation in Posterior cord of brachial plexus also. Posterior cord was formed 5cms below the clavicle in front of Axillary Arch muscle by union of two roots. We labelled these as upper and lower roots. These roots encircled the Axillary Arch muscle to form posterior cord. Later it continued as Radial nerve (Figure 2). Upper root of posterior cord gave Upper subscapular, Lower subscapular, Nerve to Latissimus Dorsi and axillary nerve. Nerve to Latissimus Dorsi after arising from upper root pierced the Axillary Arch muscle, after supplying the muscle descended downwards on subscapular muscle to supply Latissimus Dorsi muscle.

Axillary nerve after arising from upper root of posterior cord was found to pass posterior to Axillary Arch muscle and later emerged between two aponeurotic bands of Axillary Arch muscle (Figure 3). Axillary nerve later entered quadrangular space along the posterior humeral circumflex artery toward surgical neck of humerus.

Table 1: Measurements of Axillary Arch Muscle

Sr. No	Sex	Age years	Side	Length CMS	Thickness MM
1	Female	68	Left	10	7
2	Male	58	Left	9	6
3	Female	64	Left	12	8
4	Female	64	Left	12	8
5	Female	62	Left	15	9
6	Female	62	Left	15	9
6 out of 120 - 5%				73	47
Mean				12.16	7.833

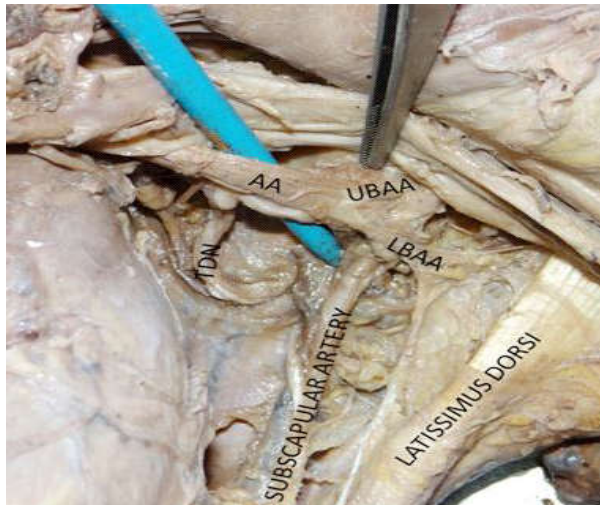


Fig. 1: AA -Axillary Arch Muscle
UBAA-Upper band Axillary Arch Muscle
LBAA-Lower band Axillary Arch Muscle

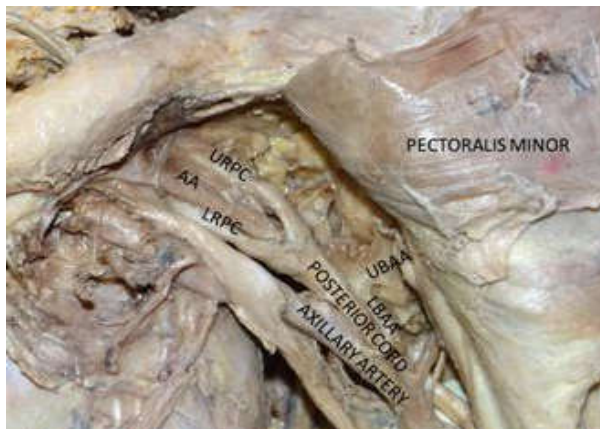


Fig. 2: AA- Axillary Arch Muscle
URPC- Upper Root of Posterior Cord
LRPC- Lower Root of Posterior Cord
UBAA- Upper band Axillary Arch Muscle
LBAA- Lower band Axillary Arch Muscle

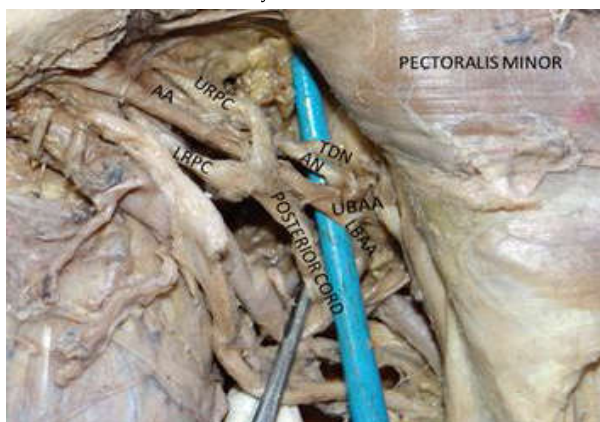


Fig. 3: AA- Axillary Arch Muscle
URPC- Upper Root of Posterior Cord
LRPC- Lower Root of Posterior Cord
UBAA- Upper band Axillary Arch Muscle
LBAA- Lower band Axillary Arch Muscle
TDN- Thoraco Dorsal Nerve
AN- Axillary Nerve

Discussion

An axilla or the armpit is the space between the upper part of the arm and the side of the thorax. It contains neurovascular bundle and lymph nodes draining the upper limb and the lateral wall of thorax.

Axillary arch muscle is an accessory muscle typically crossing the axilla from latissimus dorsi inserting into pectoralis major. Axillary arch muscle can receive nerve fibres pectoral nerve either medial or lateral, intercostobrachial nerve or thoracodorsal nerve [9]. This muscle has been implicated in axillary vein compression, deep vein thrombosis of upper limb and neurovascular compression syndromes [10]. It also plays an important role in the management and kinesiology of the overhead shoulder mobility [11].

Its embryonic origin is not clear but some Anatomists consider muscular arches of the axilla as rudimentary phylogenetic remnants of the panniculus carnosus [12]. Panniculus carnosus, sheet of skin along with muscle lying in subcutaneous fat just deep to superficial fascia is an embryological remnant [13]. In man it has regressed because its functional importance is decreased during evolution in favour of wider range of mobility of upper limb. Others suggest that, limb muscles generally arise in situ from the somatopleuric layer of lateral plate mesoderm around the developing bones [14].

Different studies have found out Axillary Arch muscle to be present in 7-8% of subjects [7,15]. Population wise frequency differs. Literature shows about 1.7% in the Turkish population [16] and 43.8% in the Chinese population [17]. Axillary arch muscle in cases reported during surgery are less [18] ranging from 0.25% to 4.3% [19].

Clinical Importance

Surgeons operating in axilla need to have information of anatomical variations, particularly Axillary Arch muscle. Pressure by the muscle during contraction can cause axillary vein entrapment, lymphatic compression with subsequent venous thrombosis or lymphoedema [20]. Due to its close proximity to the neurovascular structures it can cause shoulder instability by neurovascular compression. Gradual contracture of the axillary arch muscle results in the patient inability to abduct the shoulder joint beyond 95° [21].

The axillary arch can be misdiagnosed as tumour while looking at enlargement of lymph nodes [22],

even while physical examination the palpation of the lymph nodes could be difficult [12,15,23].

During imaging investigations, lymph nodes in axilla could be missed or not seen due to the axillary arch muscle [12,23]. As axilla has important structures, entrapment of structure may lead to the compression of the brachial plexus, resulting in hyper abduction syndrome [24], also costoclavicular compression syndrome and to axillary vein entrapment [25].

During breast reconstructive surgery when using a musculocutaneous flap from latissimus dorsi, if Axillary arch muscle is present could lead to complications, as it is closely related to the neurovascular structures [26].

History from patients complaining of swelling in the axilla like discolorations of the arm, starting especially when physically active (e.g. swimmers) this muscular variant should be considered [27].

If we can see a visible axillar fullness, careful palpable of the muscle in shoulder abduction and can be absent in adduction [15,18,27,28].

In case post-operative subject develops a contracture, and the subject has presence of this muscle, the subject faces severe difficulties in elevating or even moving their arms.

If this muscle causes compression symptoms, operatively removal of this muscular slip cures the problem [29,30].

Conclusion

Surgeons operating in axilla need to have information of anatomical variations, particularly Axillary Arch muscle. Axillary Arch muscle is more common in female group. There is increase in number of females suffering from Carcinoma of Mammary gland, so it is need of the time oncosurgeons, plastic surgeons and radiologist know the details of this muscle. This muscle variant can lead to compression of vessels also nerves, so it is very important to understand signs and symptoms of the same. If correct diagnosis is made than removal of this muscle operatively will help the subjects.

References

1. Minnie Pillay, Suja Mary Jacob. Bilateral Presence of Axillary Arch Muscle Passing through the Posterior Cord of the Brachial plexus; *Int. J. Morphol.* 2009; 27(4):1047-50.

2. Brash JC. *Cunninghams' textbook of Anatomy*. 9th edition, Oxford University Press, London; 1951:479.
3. Serpell J.W., Baum M. Significance of Langer's axillary arch' in Axillary dissection. *Aust N Z J Surg*, 1991;61:310-2.
4. S. Nayak, G. Singh, T. Paul, D. Meher, R. Biswal, C. Mohapatra. Anatomical Study of the Axillary Arch. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* e-ISSN: 2279-0853, p-ISSN: 2279-0861. 2015 Feb;14(2,Ver.V):50-53.
5. Loukas M, Noordeh N, Tubbs RS, Jordan R. Variation of the axillary arch muscle with multiple insertions. *Singapore Med J* 2009;50:e88-90.
6. Sachatello CR. The axillopectoral muscle (Langer's axillary arch): a cause of axillary vein obstruction. *Surgery* 1977;81:610-2
7. Standring S. *Gray's Anatomy: The Anatomical Basis of Clinical Practice*: Elsevier Health Sciences UK. 2008.
8. Nikam VR, Patil PS, Patil AD, Pote AJ, Gune AR. Axilla; a rare variation: axillary arch muscle. *Int J Res Med Sci* 2014;2:330-2.
9. Jeleu L, Georgiev GP, Surchev L. Axillary arch in human: common morphology and variety. Definition of "clinical" axillary arch and its classification. *Ann anat.* 2007;189:473-481.
10. Magee C, Jones C, McIntosh S, Harkin DW. Upper limb deep vein thrombosis due to Langer's axillary arch. *J Vasc Surg* 2012;55:234-6.
11. Clarys JP, Provyn S, Cattrysse E, Snoeck TH, Van Roy P. The role of the axillary arch (of Langer) in the management and the kinesiology of the overhead shoulder mobility. *J Sports Med Phys Fitness* 2008; 48:455-65.
12. Besana-Ciani I, Greenall MJ. Langer's axillary arch: anatomy, embryological features and surgical implications. *The surgeon: journal of the Royal Colleges of Surgeons of Edinburgh and Ireland*. 2005; 3:325-327.
13. Sharma T, Singla RK, Agnihotri G, Gupta R. Axillary arch muscle; *Kathmandu University Medical Journal*. 2009;7(28):432-4.
14. David Johnson, Pectoral girdle. Shoulder region and Axilla, In: Susan Standring, eds. *Gray's Anatomy*. 40th ed. London, UK: Churchill Livingstone, Elsevier; 2010:811.
15. Guy MS, Sandhu SK, Gowdy JM, Cartier CC, Adams JH. MRI of the axillary arch muscle: prevalence, anatomic relations, and potential consequences. *AJR Am J Roentgenol*. 2011;196:W52-57.
16. Kalaycioglu A, Gümüşalan Y, Ozan H. Anomalous insertional slip of latissimus dorsi muscle: arcus axillaris. *Surg Radiol Anat*. 1998;20:73-75.
17. Wagenseil F. Muskelbefunde bei Chinesen. 4 Sonderheft (Verhandlungen der Gesellschaft für physische Anthropologie, Band 2). *Anthropol Anz*. 1927:42-51.

18. Georgiev GP, Jeleu L, Surchev L. Axillary arch in Bulgarian population: clinical significance of the arches. *Clin Anat*. 2007;20:286-291.
 19. Daniels IR, Della Rovere GQ. The axillary arch of Langer—the most common muscular variation in the axilla. *Breast Cancer Res Treat*. 2000;59:77-80.
 20. Bharambe VK, Arole V. The axillary arch muscle (Langer's muscle): Clinical importance. *Med J DY Patil Univ* 2013;6:327-30.
 21. Lin C. Contracture of the chondroepitrochlearis and the axillary Arch muscles. *J Bone Joint Surg*, 1988;70: 1404-6.
 22. Clarys JP, Barbaix E, Van Rompaey H, Caboor D, Van Roy P. The muscular arch of the axilla revisited: its possible role in the thoracic outlet and shoulder instability syndromes. *Man Ther*. 1996;1:133-139.
 23. Probyn S, Balestra C, Delobel A, Wilputte F, Leduc O, Pouders C, et al. Are there hemodynamic implications related to an axillary arch? *Clin Anat*. 2011;24:964-967.
 24. Merida Velasco JR, Rodríguez Vázquez JF, Mérida Velasco JA, Sobrado Pérez J, Jiménez Collado J. Axillary arch: Potential Cause of neurovascular compression syndrome. *Clin Anat* 2003;16:514-96.
 25. McWhirter D, Malyon A. The axillary arch: a rare but recognised variation in axillary anatomy. *J Plast Reconstr Aesthet Surg*. 2008;61:1124-1126.
 26. Spinner RJ, Carmichael SW, Spinner M. Infraclavicular ulnar nerve Entrapment due to a chondroepitrochlearis muscle. *J Hand Surg Br*. 1991;1.
 27. Shinohara H. Does the nerve supply to both the superficial and deep surfaces of pectoralis major imply two separate developmental origins? *J Anat*. 1996;188:263-268. 6:315-317.
 28. Suzuma T, Sakurai T, Yoshimura G, Umemura T, Shimizu Y, Yang QF, et al. Magnetic resonance axillography for preoperative diagnosis of the axillopectoral muscle (Langer's axillary arch): a case report. *Breast cancer*. 2003;10:281-283.
 29. Boolean Grant JC, Basmajian JV. *Grant's Method of Anatomy*. 7th edn. Baltimore: The Williams & Wilkins Company. 1965.
 30. Afshar M, Golalipour MJ. Innervation of muscular axillary arch by a branch from pectoral loop. *Int J Morphol*. 2005;23:279-280.
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