Unusual Axillary Arch and Accompanying Musculofascial Variations: Case Report

Olağandışı Aksiller Ark ve Eşlik Eden Muskulofasiyal Varyasyonlar

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ABSTRACT During the dissection of the left thoracoaxillary region of a 55 year-old male cadaver, a "pectoralis quartus muscle" and an "axillary arch" were encountered. Both complete and incomplete forms of arch were observed in this case. These structures that show variation are known to be the remnants of "panniculus carnosus" and were discussed with their innervation patterns. A foramen and a pouch which were formed by the axillary arch and the accompanying fascial structures were encountered at the axillary region in this case. These structures which have not been described in the literature previously were named "axillary foramen" and "axillary fascial pouch", respectively. We suggest that the surgery of the region which already has the pectoralis quartus muscle and the axillary arch becomes more complicated in cases with the axillary foramen and axillary fascial pouch.

Key Words: Anatomy; axilla

ÖZET Ellibeş yaşındaki erkek kadavranın sol torako-aksiller bölge disseksiyonu sırasında "pectoralis quartus kası" ve "aksiller ark" ile kaşılaşıldı. Aksiller arkın komplet ve inkomplet formu aynı olguda birlikte bulunuyordu. Panniculus carnosus kalıntısı olduğu bilinen bu varyatif yapılar, inervasyon paternleri ile birlikte tartışıldı. Olguda, aksiller bölgede aksiller ark ve eşlik eden fasiyal yapılar tarafından oluşturulmuş bir foramen ve bir cebe rastlandı. Daha önce literatürde tanımlanmamış olan bu yapılar "aksiller foramen" ve "aksiller fasiyal cep" olarak adlandırıldı. Aksiller ark ve pectoralis quartus kası bulunan vakalarda zaten karmaşık olan bölge cerrahisinin, bu fasiyal cep ve foramenin katılımıyla daha da karmaşık bir hale geleceği düşünüldü.

Anahtar Kelimeler: Anatomi; aksilla

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"Pectoralis quartus muscle" (PQ), is a variation lying parallel to the lateral border of the pectoralis major muscle (PM). Frequency of this muscle is reported as 11–16% in the literature.[1] It originates from the costochondral junction of the 5-6th ribs, the lateral border of PM or the rectus sheath, and inserts into the bicipital groove or to the fascia covering the coracobrachial muscle.[1]

The muscular arches in the axillary region are thought to be rudimentary remnants of the "panniculus carnosus", a phylogenetically well-developed muscular structure found in lower mammalians.[2,3] The axillary arch (AA), which is also called the "axillopectoral arch", "Achselbogen", "Langer's muscle" or "axillopectoral muscle", is another variative structure encountered in the axillary region.[1,4,5] AA usually originates from the lateral

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border of the latissimus dorsi muscle and extends to the humeral insertion of PM (Langer's arm arch or axillopectoral muscle) or the coracoid process (Langer´s axillary arch).[6] It was reported with a frequency of 1.47-11.54%.[2,7-10] It was reported that coexistence of AA and PQ was 9% according to the study of Wagenseil in 1937.[1,11]

In this article, a case with an axillary foramen and an axillary fascial pouch accompanied a variative PQ and an unusual AA were presented.

CASE REPORT

Multiple variations of musculofascial structures were encountered during the dissection of the left thoracoaxillary region of a 55-year-old male cadaver; 1) pectoralis quartus muscle, 2) accessory anterior muscular slip of the latissimus dorsi muscle 3) axillary arch, 4) axillary fascial pouch, and 5) axillary foramen.

The PQ originated from the costochondral junction of the 5th rib, ran upwards, separately and parallel to the lateral border of the PM, then joined a variative muscular slip splitting off the axillary part of the latissimus dorsi muscle 4 mm below the PM tendon, and was finally inserted onto the superficial layer of the axillary fascia. Width, thickness and length of this muscle were 10.6mm, 4.2mm and 21cm, respectively (Figure 1-3). Its nerve supply was from a branch of the medial pectoral nerve.

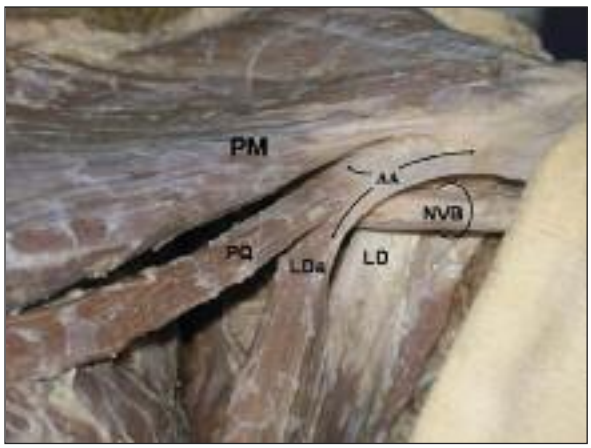

FIGURE 1: Anterolateral view of the left axillary region. PM: pectoralis major muscle, PQ: pectoralis quartus muscle, LD: latissimus dorsi muscle, LDa: accessory slip of the latissimus dorsi muscle, AA: axillary arch, NVB: neurovascular bundle.

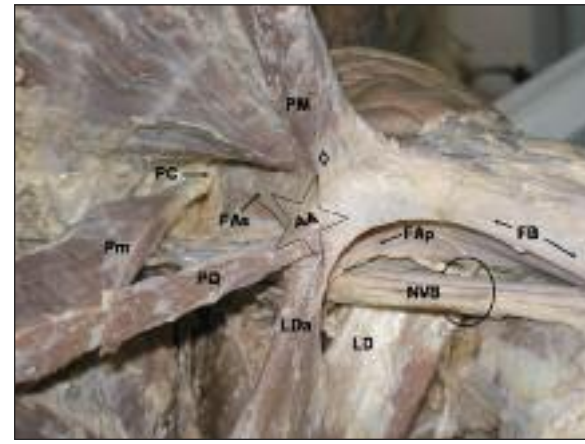

FIGURE 2: Anterolateral view of the left axillary region. Pectoralis major muscle is elevated. PM: pectoralis major muscle, Pm: pectoralis minor muscle, PC: coracoid process, PQ: pectoralis quartus muscle, FAs: superficial layer of the axillary fascia, FAp: deep layer of axillary fascia, FB: brachial fascia, AA: axillary arch, LD: latissimus dorsi muscle, LDa: accessory slip of the latissimus dorsi muscle, NVB: neurovascular bundle, ◊: twisting of the pectoralis major muscle.

Another structure with variation in this case was the accessory slip of the latissimus dorsi muscle which was connected to the arch formation. It was 9.2mm in width and 4.3mm in thickness. This muscular slip joined with PQ and attached into the axillary fascia (Figure 1-3). The nerve supply of this muscle was from a branch of the thoracodorsal nerve.

The pectoralis major muscle folded on itself at its insertion; the clavicular part and the upper group of the sternocostal part inserted onto the crest of the greater tubercle. The abdominal part and the lower group of the sternocostal part ran beneath the upper group. After uniting with the axillary fascia, they reached to the crest of the greater tubercle and the coracoid process, spreading like a wide fan (Figure 2).

The superficial layer of the axillary fascia ran downwards as brachial fascia and attached superolaterally to the crest of the greater tubercle and the intertubercular groove and superomedially to the coracoid process. Three structures; PQ, the variative band of the latissimus dorsi muscle and the lower group of the PM (which attached to the axillary fascia) united with the layers of the axillary fascia (which ran to the humerus and the coracoid process) to form the star-shaped musculofascial AA (Figure 2).

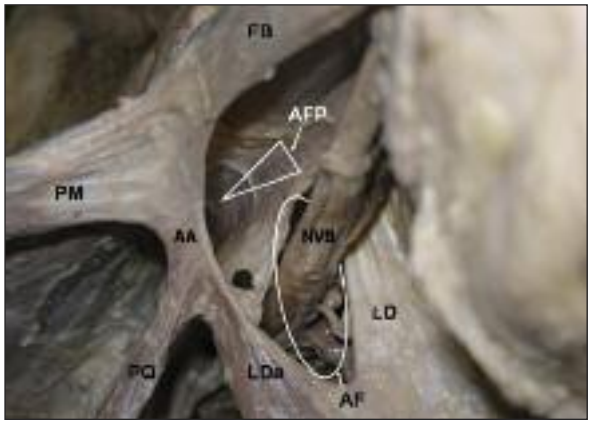

FIGURE 3: The axillary foramen and axillary fascial pouch are shown from the lateral view. PM: pectoralis major muscle, PQ: pectoralis quartus muscle, AA: axillary arch, LD: latissimus dorsi muscle, LDa: accessory slip of the latissimus dorsi muscle, NVB: neurovascular bundle, AF: axillary foramen, AFP: axillary fascial pouch, FB: brachial fascia.

The deeper layer of the axillary fascia which covered the short head of the biceps brachii and the coracobrachial muscles at the inferolateral aspect ran medially to attach the posterior surface of AA. Thus, the cavity behind AA was separated into two parts by the deeper layer. This layer continued with the superficial layer superomedially and attached to the coracoid process. Behind AA, at the upper part of the cavity, there was a funnel-shaped chamber between the superficial and deep layers, which was approximately 8.5 cm deep and 2 cm wide. This chamber, with its base located inferolaterally and apex located at the coracoid process was named as the "axillary fascial pouch" (Figure 3).

Behind AA, inferior to the fascial compartment formed by the deeper layer, there was an aperture through which the neurovascular bundle passed. This aperture, which was bordered by the variative band of the latissimus dorsi muscle anteriorly and the tendon of the latissimus dorsi posteriorly and the deeper layer of the axillary fascia superiorly was named as "axillary foramen". This foramen measured 17.6 mm and 39.4 mm at the narrowest and widest parts, respectively (Figure 3).

DISCUSSION

Smart et al. reported that AA represented a group of muscular abnormalities in the axillary region rather than a single muscle.[12] AA was reported to be muscular in 3-9% and tendinous in 17% of subjects.[8,13] In some cases, it was reported to have a musculotendinous structure,[12] similar to our case.

Testut divided AA into two groups as complete and incomplete. In the complete type, AA extends from the axillary part of latissimus dorsi to the insertion of PM tendon on the humerus. In the incomplete type, AA may insert to the axillary fascia, biceps brachii muscle, coracobrachialis muscle, lower border of the pectoralis minor muscle, lower part of the intertubercular groove or to the coracoid process without joining PM.[14] The present case differs from the previous ones in literature with its concordance with both groups. Similar to complete type, AA inserted on the humerus, joining the tendon of the PM and similar to the incomplete type, it attached to the coracoid process, brachial fascia and the axillary fascia.

Coexistence of these structures may affect the morphology of the other structures. It has been known that PQ joins AA if arch exists.[1] In this subject, the PQ contributed to the formation of AA, similar to the other cases reported in the literature. It has also been reported that, if PQ exists, twisting of PM (formed by extension of the lower part beneath the upper one at the insertion) is not usually seen.[15] However in our case, twisting of the PM was observed in the presence of PQ.

Langworthy has stated that panniculus carnosus (the superficial musculature of the trunk) is a muscle which is only found in mammals as a broad and thin layer beneath the skin, in thoracal and abdominal regions as well as the posterior part of the proximal extremities. Panniculus carnosus which is known as "skin muscle" is a structure derived from skeletal muscles and has a secondary relation with the skin.[5] The variative band of latissimus dorsi, the pectoralis quartus, intermedius and sternalis muscles are the remnants of panniculus carnosus in humans. It is innervated by the anterior thoracic nerve (medial and lateral pectoral nerves) in mammals.[5] The variative band of latissimus dorsi, which is the remnant of panniculus carnosus, was reported to be innervated by the thoracodorsal nerve while PQ was innervated by the lateral pectoral nerve.[1,5] In the present case, the variative

band of latissimus dorsi was innervated by the thoracodorsal nerve while PQ was innervated by the medial pectoral nerve.

Axillary arch was reported to cause compression of the neurovascular bundle and restrict particularly the abduction and lateral rotation of the shoulder joint.[10] Furthermore, during axillary lymphadenectomy or lymph node biopsy, AA has been reported to prolong surgery and cause difficulty in reaching the lymph nodes lying deeply. In such cases, surgeons are obliged to cut the arch to avoid both the omission of the lymph nodes posterior to it and the local recurrence of the disease.[1,4,7,8,11,12,16] On the other hand, various disorders like costoclavicular compression syndrome, hyperabduction syndrome, thoracic outlet syndrome, shoulder instability syndrome, thrombosis of upper extremity, and lymphodermia were reported due to AA.[4]

In the present case, axillary foramen and axillary fascial pouch have been described for the first time. Different from the other reported AA cases,[1,8,17] the large aperture below AA was divided by the fascial folding of the lower wall of fascial pouch. Thus, a foramen through which the neurovascular structures passed, was constituted in the axillary region (Figure 3). Aperture of the pouch was located just above the foramen. Axillary fascial pouch might develop by joining of the regional fascia to the variative muscles. Existence of the axillary foramen and the axillary fascial pouch in addition to PQ and AA increases the complexity of an already complicated region. It is thought that the axillary fascial pouch, which has not been defined yet may have clinical significance with its potential for cystic formation due to trauma, surgery or infections.

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