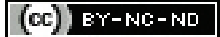


# Unilateral Double Subscapular Artery: A Case Report

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## ABSTRACT

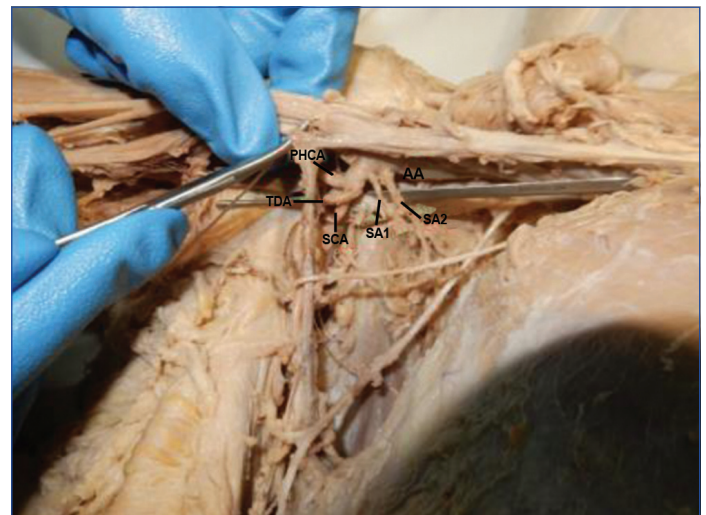
Variations in the Subscapular Artery (SA) are among the most common variations in the Axillary Artery (AA) and its branches. However, the occurrence of a common trunk from the third division is unusual. Hereby, authors report an atypical variation in the distal division of the axillary artery found during routine dissection of an elderly female cadaver. In this donor, the third portion of the AA gave rise to an SA, a common trunk, and the anterior circumflex humeral artery. In addition, the common trunk gave rise to a second SA, the posterior circumflex humeral artery, the scapular circumflex artery, and the thoracodorsal artery. Both SA branches appeared to irrigate the subscapularis muscles. Comprehension of the diverse anatomical variations of the subscapular artery is critically important in surgical procedures and therapeutic interventions for the upper limb.

**Keywords:** Arterial variation, Axillary artery, Humeral artery

## CASE REPORT

A formalin fixed Hispanic-Latinx elderly female cadaver was obtained through a body donation program. During routine dissection procedure by first year medical students, an unusual anatomical variation in the right arm was observed. This case report describes an unusual variation in which a common origin in the third division of the Axillary Artery (AA) bifurcated in the Subscapular Artery (SA1) which gave rise to a second Subscapular Artery (SA2), the Posterior Circumflex Humeral Artery (PCHA), the Scapular Circumflex Artery (SCA), and the Thoracodorsal Artery (TDA) [Table/Fig-1]. Both SA branches of the third portion of the AA supply to the subscapularis muscle, which is not commonly known for dual supply by two SAs [Table/Fig-2]. The TDA emerged to irrigate both the latissimus dorsi muscle and the serratus anterior muscle, providing the primary source of blood supply because the lateral thoracic artery arises from a different location than the second portion of the AA. The third portion of the AA was found to give rise to a proximal SA, a common trunk with four ramifications on the medial side and distal to the anterior circumflex humeral artery [Table/Fig-1-2].

Both SA branches were found to supply the subscapularis muscle, indicating a dual and collateral supply to the muscle. First, the posterior circumflex humeral artery was identified as it traversed



**[Table/Fig-2]:** Anatomical variation of branching pattern in the right arm. The third part of the Axillary Artery (AA) shows a common trunk consisting of the second Subscapular Artery (SA2), Posterior Circumflex Humeral Artery (PCHA), Scapular Circumflex Artery (SCA), and Thoracodorsal Artery (TDA).

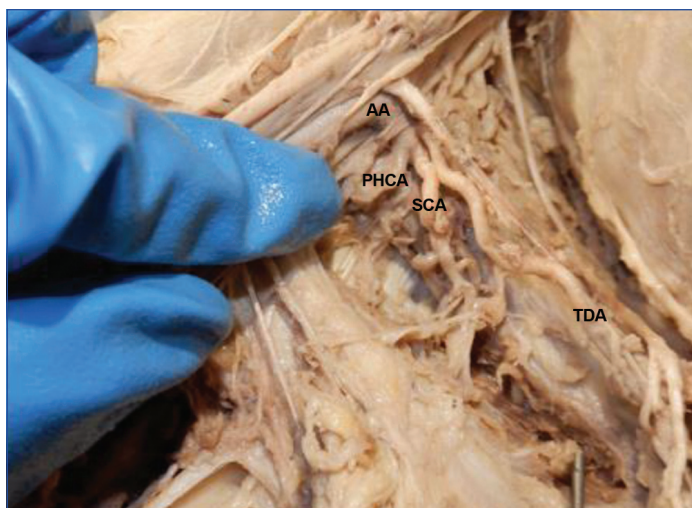


**[Table/Fig-1]:** Diagram of the anatomical variation described in the case report. A common trunk arising from the third part of the Axillary Artery (AA) bifurcating in the subscapular artery (SA1) which gives rise to a second Subscapular Artery (SA2), the Scapular Circumflex Artery (SCA), the Posterior Circumflex Humeral Artery (PCHA), and the Thoracodorsal Artery (TDA). The origin of the Anterior Circumflex Humeral Artery (ACHA) is anatomically normal.

posteriorly to reach the surgical neck of the humerus through the quadrangular space along with the axillary nerve. Subsequently, the scapular circumflex artery was identified as it passed posteriorly around the lower border of the scapula into the triangular space. Finally, the thoracodorsal artery gave off a branch to the latissimus dorsi muscle. It continued along the lateral thoracic wall, giving off multiple extensions to the serratus anterior muscle. The thoracodorsal branch appears to be the main source of blood supply to the serratus anterior muscle because the lateral thoracic artery arose from a different location on the AA. The vascular anatomical structures from the third division of the axillary artery in the left arm were anatomically normal [Table/Fig-3].

## DISCUSSION

The axillary artery is a continuation of the subclavian artery and is divided into three parts by the pectoralis minor muscle. The first part, proximal to the muscle, provides one branch of the superior thoracic artery. The second part, posterior to the muscle, gives rise to two arteries: the thoracoacromial artery and the lateral thoracic artery. The third part, distal to the muscle, gives rise to anterior humeral circumflex artery, posterior humeral circumflex artery, and the Subscapular Artery (SA) [1-5]. The anatomical



**[Table/Fig-3]:** Anatomically normal branching pattern in the left arm.  
AA: Axillary artery; PHCA: Posterior circumflex humeral artery; SCA: Scapular circumflex artery; TDA: Thoracodorsal artery

variation reported is significant because it is considered a rare event, as stated by Dimovelis I et al., which is a common origin of the posterior common humeral circumflex artery, subscapular artery, and lateral thoracic artery accounts for approximately 4.7% of cases in the population [6].

According to literature, the third division gave rise to various branches that supply the shoulder region in a highly variable branching pattern [5-10] [Table/Fig-4]. The emergence of a common trunk from the third division is rare [10]. However, in addition to a common trunk, the current case report also noted the duality of the subscapularis muscle.

Authors	Year of publication	Findings
Ramesh RT et al., [5]	2008	Subscapular, anterior, and posterior circumflex humeral, profunda brachii artery and ulnar collateral arteries share a mutual trunk.
Saralaya V [10]	2008	Discovered two branches off the AA arose from the proximal (first) part and no branches from its remaining distal (second and third) parts.
Bagoji IB et al., [9]	2013	Identified variations on the third part of the AA giving rise to the subscapular arterial trunk, superficial brachial artery, and deep brachial artery.
Aastha et al., [7]	2015	Found two variations of the AA, a Superior thoracic branch branching off the first part, and a common trunk from the third part divided into a posterior circumflex humeral, subscapular and profunda brachii artery.
Singh R [8]	2017	Illustrated that AA gave off an uncommon common trunk, bifurcated into subscapular and posterior circumflex humeral arteries on their third division.
Dimovelis I et al., [6]	2017	The AA showed a 4 split of the subscapular artery.
Present study	2022	Illustrated that the AA gave a unique variety on the third division and gave rise to a second subscapular artery.

**[Table/Fig-4]:** Review and comparison of Axillary Artery (AA) variations [5-10].

Multiple studies have identified common trunks that emerge from the third segment of the AA [6-10]. Aastha et al., described a common trunk arising from the third part of the AA, which was divided into the Anterior Circumflex Humeral Artery (ACHA), Posterior Circumflex Humeral Artery (PCHA), Subscapular Artery (SA), and Profunda Brachii artery [7]. Subsequently, Singh R observed a common trunk arising from the third portion of the AA that bifurcated into the subscapular artery and posterior circumflex humeral artery [8]. Thus, Saeed M et al., also reported a common subscapular-circumflex humeral trunk emerging from the third portion of the AA. Moreover, Saeed M et al., recognised that the trunk rises to two posterior circumflex humeral arteries, then to the subscapular artery, followed by the anterior circumflex humeral artery [11]. Similar to the present

study findings, Saeed M et al., reported that the anterior circumflex humeral artery emerges directly from the third portion of the AA [11]. Saralaya V also reported a common trunk that provided rise to the circumflex scapular artery, thoracodorsal artery, ACHA, PCHA, profunda brachii artery, and ulnar collateral artery [10].

The present case differs from the described earlier reports on branching patterns and the course of these arteries [Table/Figure 1-2]. Accordingly, the present report is the implication that the thoracodorsal artery serves as the main blood supply for the latissimus dorsi muscle, and the absence of the lateral thoracic artery arising directly from the second portion of the AA. The variation described by Saeed M et al., [11] is comparable to that described here, except that all arteries bifurcate from the common trunk at approximately the same anatomical location in cadaver as in the present study. The common trunk we describe also differs in the specific branches that rise to one of the PCHA, two subscapular arteries, and the scapular circumflex artery, but not the anterior circumflex humeral artery. In addition, the thoracodorsal artery arises as a separate branch from the subscapular artery rather than as a continuation from the subscapular artery.

Other studies have reported common trunks in the second segment of the AA [5,12]. Chitra PS and Anandhi V reported a common trunk arising from the second part of the AA and gives rise to the lateral thoracic artery, posterior circumflex humeral artery, and subscapular artery. The subscapular artery gives rise to the circumflex scapular artery and continues as the thoracodorsal artery, and the anterior circumflex humeral artery arises separately from the third part of the AA [12]. The present case diverges because the common trunk appears as well as in the way in which the arteries emerge from the trunk. In our case, we did not observe the lateral thoracic artery arising directly from the second portion of the AA or the common trunk; in fact, the area usually irrigated by the lateral thoracic artery was seen to be supplied by the thoracodorsal artery.

**Embryological basis:** The development of the arterial pattern in the upper limb could be inferred from our findings and provide a possible description of the anatomical abnormalities, such as those highlighted in this report. The present theory concerning the development of the vascular system of the upper limb states that development begins at week 12 [13]. Initially, a capillary plexus enters the limb bud and develops in a distal direction as the limb grows. Following the embryological stages, only one trunk, named the axial artery, supplies the limb and terminal capillary plexus [13]. After the initial vascular network develops, vessels undergo a maturation and remodelling phase involving sprouting angiogenesis and vessel pruning [14]. The differentiation of this capillary plexus of mesoderm tissue into endothelial cells gives rise to arterial variations in the definite arterial pattern [15].

The subclavian artery arises from the fourth aortic arch and the seventh intersegmental artery and continues to develop as the limb bud grows [16]. According to Rodriguez-Baeza A et al., the arterial network of the upper limb, specifically the axillary artery, does not originate in a pre-existing direction or form, but rather from a capillary micronetwork based on the growth of the surrounding bones, vessels, and nerves [17]. The frequent variations found in the axillary artery can be due to the choice of unusual paths within the primitive vascular plexuses, the persistence of vessels that are typically obliterated during development, or incomplete development, fusion, and absorption of the parts that usually remain distinct [18]. Another possibility for AA variations could be correlated to environmental factors rather than a natural process that altered the normal growth and division of the artery during the embryonic stage, as emphasised by Rosario MG et al., [19].

**Clinical significance:** Awareness of the branching framework of the axillary artery is critical in preventing complications in medical interventions involving the axilla and pectoral region. Certain surgical procedures involve the branches of the AA such as antegrade

cerebral perfusion while treating axillary artery thrombosis, reconstructing the axillary artery after trauma, managing axillary sheath haematoma, and brachial plexus palsy [9,20].

## CONCLUSION(S)

This case report exemplifies an unusual deviation of the axillary artery in a Hispanic-Latinx female specimen. SA is commonly the largest branch of the AA and provides a significant source of blood supply to the posterior wall of the axilla. The suitability of the SA system as a source of microvascular grafts during the restoration of upper limb circulation is of crucial clinical importance. Several reasons are related to the bulkiness, angle of rotation, and large and stable diameter of the SA system arteries render them appropriate for a large variety of flaps in plastic surgery. Therefore, it is imperative to report these anatomical deviations. Awareness of vascular anatomical variations might help prevent clinical diagnostic misinterpretation, influence surgical strategies, enhance interventional procedures, and avoid complications during surgery of the axillary region.

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