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Direct Origin of a Thick Accessory Subscapular Artery of the Second Part of the Axillary Artery

Origen Directo de una Arteria Subescapular Accesoria Gruesa a Partir de la Segunda Porción de la Arteria Axilar

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SUMMARY: The axillary artery, serving as the continuation of the subclavian artery, typically extends from the lateral margin of the first rib to the inferior margin of the teres major muscle. This case report describes a rare anatomical variation observed in the right axillary artery of a 70-year-old female cadaver. During routine anatomical dissection, we identified an anomalous arterial branch originating from the second segment of the axillary artery that directly vascularized the subscapularis muscle. Notably, the third segment of the axillary artery maintained a conventional subscapular artery with typical branching patterns, including the thoracodorsal artery, circumflex scapular artery, and regular muscular branches to the subscapularis muscle. We provide an additional clarification on the variant branching patterns of the nutrient arteries supplying the subscapularis muscle, and the clinical implications of this variation are discussed with particular emphasis on surgical approaches to the axilla and shoulder reconstruction procedures.This finding underscores the importance of recognizing anatomical variations in axillary artery branching patterns, as such knowledge is critical for optimizing surgical outcomes and prognosis in shoulder interventions.

KEY WORDS: Axillary artery; Subscapular artery; Anatomical variation; Clinical significance.

INTRODUCTION

The axillary artery, a continuation of the subclavian artery, extends from the first rib's lateral margin to the teres major's inferior margin and later transitions to the brachial artery. It is divided into three segments by the pectoralis minor. Segment I spans from the first rib to the superior margin of the pectoralis minor and gives rise to the superior thoracic artery. Segment II lies posterior to the pectoralis minor and branches into the lateral thoracic and thoracoacromial arteries. Segment III extends from the inferior margin of the pectoralis minor to the inferior margin of the teres major, emitting the subscapular artery and circumflex humeral arteries (Kocbek & Rakusa, 2018). As the largest branch of the axillary artery, the subscapular artery typically originates from Segment III near the distal portion of the subscapularis. It courses inferomedially and bifurcates into the circumflex scapular artery (supplying the infraspinatus, teres major, and teres minor) and the thoracodorsal artery (supplying the latissimus dorsi), giving off small muscular branches to the subscapularis muscle before bifurcation.

The subscapularis muscle, a critical stabilizer of the glenohumeral joint, occupies the subscapular fossa with its medial two-thirds attaching to the scapular costal periosteum and lateral fibers (emerges from tendinous septa traversing osseous ridges) converging into a broad tendon inserting at the lesser tubercle of the humerus and the anterior joint capsule. This musculotendinous structure, separated from the scapular neck by the subscapular bursa, primarily mediates internal shoulder rotation through innervation by the subscapular nerves (O'Kane & Toresdahl, 2014). The subscapularis muscle receives vascular supply from the suprascapular artery, axillary artery branches, and terminal subscapular artery branches. Its primary functions are to stabilize the scapula and assist in shoulder joint movement,

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thereby enabling proper coordination with the upper limb to support normal shoulder function. Poor development or dysfunction of this muscle may lead to shoulder problems such as instability, pain, and rotator cuff tendon injuries. When the subscapularis fails to provide adequate support and stability, the rotator cuff tendons become subjected to additional stress and pressure, significantly increasing the risk of rotator cuff tears (Wickham *et al*., 2014).

This case report documents a novel anatomical variation identified during routine dissection at the Department of Anatomy, Medical College of Wuhan University of Science and Technology. We present an aberrant arterial branch originating from the second segment of the right axillary artery in a female cadaver, which directly supplied the subscapularis muscle while preserving conventional third-segment subscapular artery branching. This finding enhances understanding of axillary arterial variability and its implications for shoulder surgical approaches.

CASE REPORT

The variant structure was identified during routine dissection performed by medical students in a regional anatomy course. The cadaver was a 70-year-old female donor obtained from the Wuhan Red Cross Body Donation Reception Station at Wuhan University of Science and Technology. The donor's medical history included diabetes mellitus and hypertension, with pancreatic cancer listed as the cause of death. The authors confirm that all possible measures were taken to comply with local and international ethical guidelines and regulations regarding the use of human cadaveric donors in anatomical research. The Research Ethics Committee of the Medical School of Wuhan University of Science and Technology approved this research, under protocol 2025152.

During dissection, a notable anatomical variation was observed in the second portion of the right axillary artery, where a large direct branch (herein designated as the accessory subscapular artery) was found to supply the subscapularis muscle without giving off any collateral branches. This variant artery measured 1.87 mm in diameter and originated 17.97 mm distal to the thoracoacromial artery. In the third portion of the axillary artery, the conventional subscapular artery was identified as a robust, short trunk measuring 3.93 mm in diameter. This vessel coursed inferomedially along the inferior margin of the subscapularis muscle, initially giving off two small muscular branches (measuring 1.17 mm and 0.89 mm in diameter, respectively) to the subscapularis before terminating in its two principal branches. The circumflex scapular artery (2.58 mm in diameter), which traversed the triangular space, and the thoracodorsal artery (2.18 mm in diameter), which supplied the latissimus dorsi muscle, arose as its two principal branches (Figs. 1, 2 and 3).

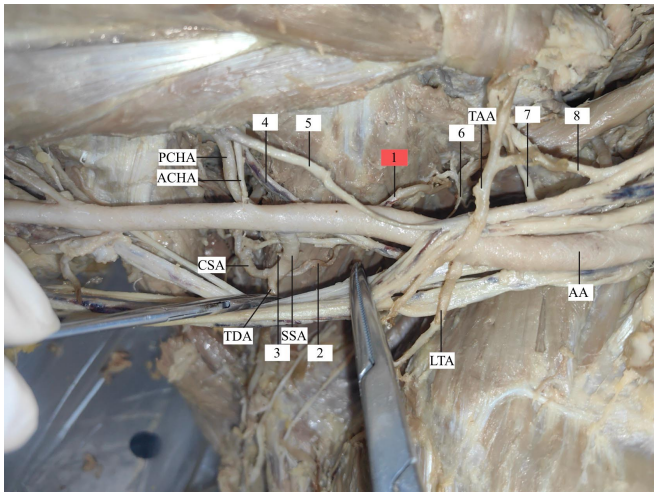

Fig. 1. Second branch of the axillary artery to the subscapularis muscle. 1. Accessory subscapular artery (second branch of the axillary artery); 2. Subscapularis muscle branch I; 3. Subscapularis muscle branch II; 4. Axillary nerve; 5. Musculocutaneous nerve; 6. Subscapular nerve; 7. Suprascapular nerve; 8. Lateral thoracic nerve.

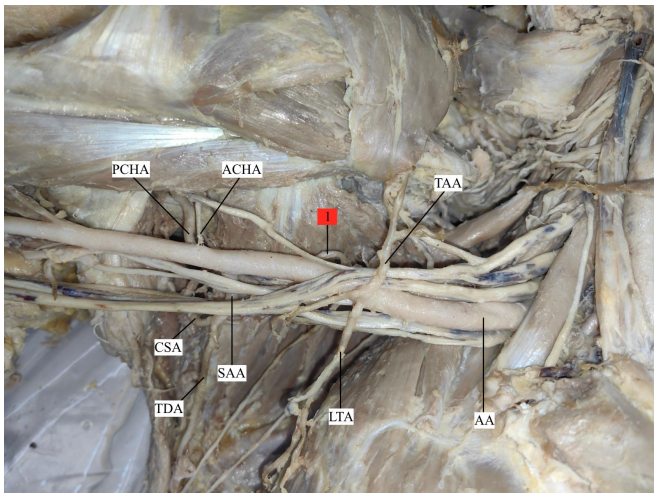

Fig. 2. Remaining part of the second branch of the axillary artery to the subscapularis muscle. 1. Accessory subscapular artery (second branch of the axillary artery).

Abbreviations:
ASSA: accessory subscapular artery
TDA: thoracodorsal artery
CSA: circumflex scapular artery
SSA: subscapular artery
AA: axillary artery
PCHA: posterior circumflex humeral artery
ACHA: anterior circumflex humeral artery
TAA: thoracoacromial artery
LTA: lateral thoracic artery

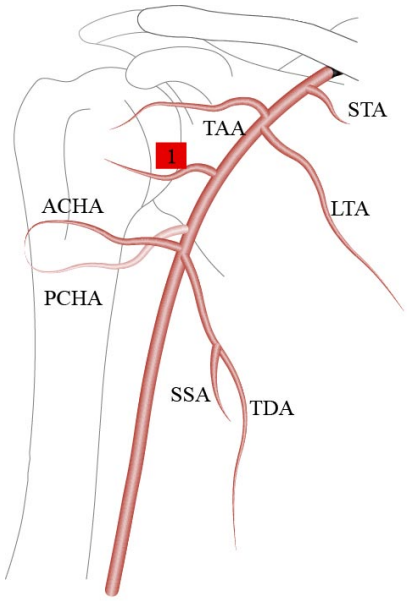

Fig. 3. Topography of the axillary artery. 1. Accessory subscapular artery (second branch of the axillary artery).

Notably, the muscular branches from the SSA to the subscapularis were relatively small, whereas the anomalous nutrient branch from the second segment of the axillary artery was larger and targeted the mid-to-upper portion of the muscle. We hypothesize that this branch offers superior nutritional support to the muscle and have designated it the "accessory subscapular artery" (ASSA) to underscore its importance.

DISCUSSION

This case report describes a prominent branch that arises directly from the second segment of the axillary artery, supplying the subscapularis muscle without any additional vascular branches. However, in this instance, the subscapular artery (SSA) originated from the third segment of the axillary artery, as a thick, short trunk. It coursed inferomedially near the inferior margin of the subscapularis muscle, initially giving rise to small branches that supply the subscapularis before bifurcating into the circumflex scapular artery and the thoracodorsal artery. These branches provide vascular supply to the subscapularis, teres major, serratus anterior, and latissimus dorsi muscles.

Numerous anatomical records from the axillary region reveal significant variations in axillary artery branching patterns, indicating that textbook descriptions are not universally applicable. While standard anatomy textbooks typically describe the SSA as originating from the third segment of the axillary artery, this pattern is not absolute. For some individuals, the SSA may more commonly originate from a more proximal segment. (Yang *et al*., 2021). For example, Swamy *et al.* (2013) reported a case where the right SSA, a large branch from the second segment of the axillary artery, gave off the lateral thoracic and posterior circumflex humeral arteries. Odeh *et al*. (2024) described a common trunk from the second segment dividing into the SSA and lateral thoracic artery. Conversely, our anatomical observations revealed that the SSA originated from a more distal segment.

Moreover, Siddiqui *et al*. (2023) observed in 32 axillary artery dissections that 15.6 % of SSAs originated from the second segment, with these SSAs potentially issuing multiple branches, including the circumflex scapular and thoracodorsal arteries, further confirming the variability of SSA origins. Saeed *et al*. (2002) reported a 3.1 % incidence of SSA originating from the first segment and noted cases of SSA absence, where compensatory blood supply arose from multiple axillary artery branches, suggesting possible embryonic regression or remodeling. Jesus *et al*. (2008) documented a case of complete SSA absence, with the circumflex scapular and thoracodorsal arteries directly originating from the third segment of the axillary artery. This highlights the potential for individualized scapular blood supply patterns, including compensatory vascularization. Additionally, Kumar *et al*. (2015) described a unique variant where a thick branch from the second segment of the axillary artery primarily supplied the infraspinatus and teres major muscles rather than the subscapularis, indicating diverse regulatory factors in SSA branching. However, the anatomical configuration we observed does not appear in the aforementioned classifications—an isolated second-division arterial branch supplying exclusively the subscapularis muscle, without collateral branches to neighboring structures. Such morphological specialization implies that the embryogenesis of the upper limb vasculature may be less complex than is commonly acknowledged.

Our findings suggest a variant which alters the SSA's perfusion territory, potentially creating dual vascular supply to the subscapularis. In rotator cuff repair, subscapularis muscle flap transfer, or shoulder reconstruction, the SSA is the primary blood source for the subscapularis, while the ASSA may provide supplementary flow, enhancing postoperative tissue survival and surgical success (Kim *et al*., 2017). The ASSA's proximal origin increases its vulnerability during axillary lymph node dissection, axillary artery ligation, or trauma repair, raising risks of intraoperative bleeding or postoperative ischemia (Thigpen *et al*., 2016). Thus, any surgery involving the third portion of the axillary artery, axillary vein, or brachial plexus risks damaging the SSA or its variants. Surgeons must avoid mistaking

aberrantly coursing SSA or ASSA for fascial or soft tissue structures to prevent iatrogenic injury. Preoperative imaging (e.g., CT angiography, MR angiography) combined with 3D reconstruction can improve detection of SSA variations, optimize surgical planning, and reduce complication risks.

Future studies should investigate the prevalence and functional significance of the ASSA variant. We aim to explore its potential universality through systematic dissection series and correlate its presence with clinical scenarios involving shoulder surgery or vascular pathology. Meanwhile, we will continue to conduct anatomical studies to explore the novel branching pattern of the subscapular artery, aiming to provide evidence for improving the theory of blood supply in the scapular region.

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ZHANG, C.; PAN, J.; HUANG, J.; LI, J.; HE, Z.; CHENG, J.; LIU, S.; LIU, X.; WANG, T. & LI, M. Origen directo de una arteria subescapular accesoria gruesa a partir de la segunda porción de la arteria axilar. *Int. J. Morphol., 44(1)*:188-191, 2026.

RESUMEN: La arteria axilar, que es la continuación de la arteria subclavia, se extiende típicamente desde el margen lateral de la primera costilla hasta el margen inferior del músculo redondo mayor. Este caso clínico describe una rara variación anatómica observada en la arteria axilar derecha de un cadáver femenino de 70 años. Durante una disección anatómica rutinaria, identificamos una rama arterial anómala que se originaba en el segundo segmento de la arteria axilar y que vascularizaba directamente el músculo subescapular. Cabe destacar que el tercer segmento de la arteria axilar mantuvo una arteria subescapular convencional con patrones de ramificación típicos, que incluyen la arteria toracodorsal, la arteria circunfleja de la escápula y ramas musculares regulares del músculo subescapular. Aclaramos los patrones de ramificación variables de las arterias nutricias que irrigan el músculo subescapular y analizamos las implicaciones clínicas de esta variación, con especial énfasis en los abordajes quirúrgicos para la reconstrucción de la axila y el hombro. Este hallazgo subraya la importancia de reconocer las variaciones anatómicas en los patrones de ramificación de la arteria axilar, ya que dicho conocimiento es crucial para optimizar los resultados quirúrgicos y el pronóstico en las intervenciones de hombro.

PALABRAS CLAVE: Arteria axilar; Arteria subescapular; Variación anatómica; Importancia clínica.

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