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Uncommon Trunk of the Third Part of the Axillary Artery: A Cadaveric Case Report

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HIGHLIGHTS

What is already known?

- Anatomical variations of the axillary artery are common.
- These variations impact clinical and surgical procedures.
- The third part of the axillary artery is the most affected region.

What has been shown?

- The deep brachial artery arose from an uncommon trunk of the axillary artery.
- The trunk in the 3rd part of the axillary artery gave off its branches.
- This variation may increase the risk of complications in vascular procedures.

How can the study contribute to the literature?

- Contributes a unique report of axillary artery anatomical variation.
- Emphasizes the need to recognize such variations for safe procedures.
- Early identification may improve diagnosis and surgical planning.

ABSTRACT

Introduction: The axillary artery presents anatomical variations that can directly impact clinical and surgical procedures, requiring prior knowledge to minimize complications. Changes in its course, branches, and bifurcations are important for safe diagnoses and interventions. Objectives: This study aims to report a unique anatomical variation observed during cadaveric dissection, in which the deep brachial artery originated from an unusual arterial trunk in the third part of the axillary artery. This trunk initially gave off branches typically arising from the third part of the axillary artery before continuing as the deep brachial artery, which then followed its normal subsequent course. Methods: Dissection was performed on a preserved cadaver, followed by a detailed analysis of the arterial branches and course. Results: The identified variation has clinical implications, increasing the risk of complications during procedures such as angioplasty and cannulation. It may also lead to diagnostic errors, intraoperative hemorrhage, and brachial plexus injury during axillary surgeries. Conclusion: Prior knowledge of anatomical variations, such as the one observed in this study, is essential for clinical practice, especially in procedures involving the axillary artery and adjacent structures. Early identification of these anomalies, supported by imaging studies, is crucial for safe surgical planning, promoting more effective and personalized medical practice.

Keywords: Anatomical variations; Axillary artery; Case reports; Uncommon arterial trunk; Surgical complications.

Abbreviations: Axillary Artery (AA)

INTRODUCTION

The axillary artery (AA) is an anatomical structure responsible for supplying blood to the upper limb, extending from the lateral margin of the first rib to the inferior border of the teres major muscle. Its course is closely related to the brachial plexus, making it an important reference point in clinical procedures involving the axillary region. The axillary artery is traditionally divided into three parts by the pectoralis minor muscle: the first part gives rise to the superior thoracic artery; the second part gives rise to the thoracoacromial and lateral thoracic arteries; and the third part gives rise to the subscapular, anterior circumflex humeral, and posterior circumflex humeral arteries (Moore, Dalley, Agur, 2018[6]). After this division, the axillary artery continues as the brachial artery but may occasionally present bifurcations, such as the accessory brachial artery. The deep brachial artery, the main branch of the brachial artery, runs along the radial groove of the humerus accompanied by the radial nerve.

Medical literature documents that anatomical variations of the AA are common and directly impact surgical and diagnostic procedures. These variations involve changes in the course, number of branches, and bifurcation patterns (Hur et al., 2024[5]). In the study by Thiele et al., the typical branching pattern was identified in fewer than 20% of the cases examined, while Brilakis et al. (2023)[3] observed that most variations occur in the third part of the AA. Such anomalies are clinically relevant, as they may increase the occurrence of intra- and postoperative complications and make surgical planning more difficult (Naveen et al., 2014[7]). Therefore, recognizing and reporting cases of these anatomical variations is crucial in medical practice.

This study aims to describe an unprecedented anatomical variation identified during dissection of a preserved cadaver. The variation consists of an uncom-

mon arterial trunk arising from the third part of the axillary artery, which gives off branches in this region and continues as the deep brachial artery. Detailed knowledge of the axillary artery's anatomy helps prevent complications, improve diagnostic accuracy, and enable safer surgical interventions.

METHOD

Study design

This is a descriptive observational study based on anatomical analysis obtained through cadaveric dissection.

Participants

The study was conducted during dissection sessions at a medical school located in Belo Horizonte, using a male cadaver voluntarily donated for educational purposes. The individual was estimated to be 65 years old at the time of death and was preserved through conventional embalming using preservative substances. The dissection focused on the axillary region, with emphasis on the axillary artery and its branches. No identifiable information, such as personal data or clinical history, was included in the research.

Instruments

The following instruments were used for the dissection:

- Sterile dissection blades
- Anatomical forceps and tweezers
- Surgical scissors
- High-resolution digital camera for photographic documentation
- Anatomy textbooks for comparison of anatomical patterns

Procedures

Cadaver preparation followed strict safety and bioethical standards. The body was properly positioned on a dissection table, and the axillary region was exposed after the removal of the skin and subcutaneous tissues. This procedure enabled a clear visualization of the axillary artery and its branches.

The axillary artery was identified and dissected along its three parts, with special attention to possible anatomical variations in the branches, particularly in the third part. During the process, an uncommon anatomical variation was observed: branches of the third part of the axillary artery and the deep brachial artery originated from an atypical arterial trunk of the axillary artery. This trunk was carefully isolated, and its branches were meticulously mapped.

To ensure accurate documentation of the findings, high-resolution digital photographs were taken, highlighting the anatomical variations observed. The images were later compared with standard anatomical references. After the dissection, a comparative analysis was conducted between the identified pattern and available descriptions in the literature, aiming to assess similarities and differences with previously documented variations.

Statistical Analysis

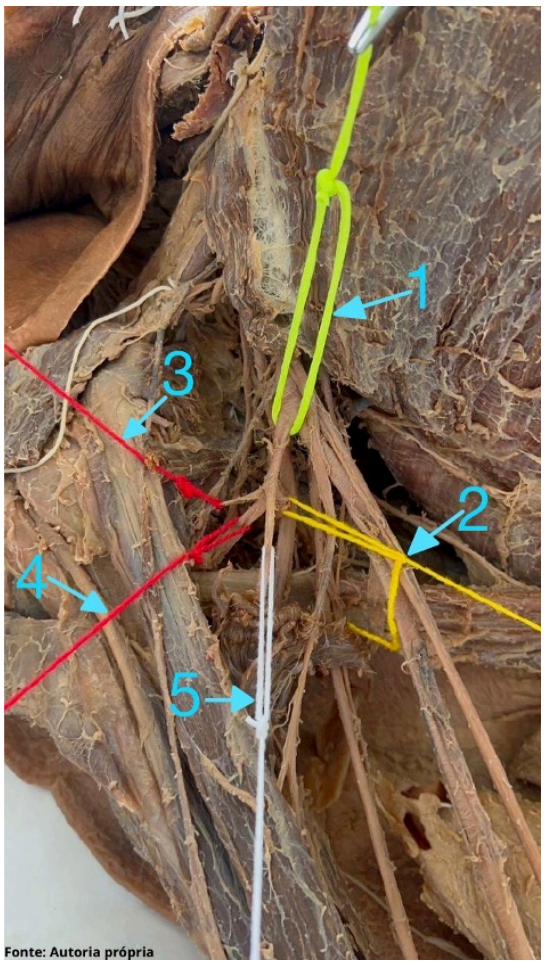
As this study is descriptive in nature and based on a single cadaveric dissection, no statistical analysis was applied. However, the observations were analyzed qualitatively, considering the variations found in the axillary artery and comparing them with patterns described in the literature. A detailed description of the anatomical variation was provided to ensure a clear and precise report that may be useful for future studies and clinical practice.

Ethical Statement

This study was carried out using a human cadaver donated for educational and scientific purposes, in accordance with institutional authorization. Therefore, submission to a Research Ethics Committee was waived, in compliance with Resolution CNS No. 510/2016, as it involved a non-identifiable cadaver.

RESULTS

During routine cadaveric dissection of a male specimen, a remarkable anatomical variation was identified in the branching pattern of the third part of the axillary artery (Figure 1). Instead of the independent origin of its collateral branches, a single, robust arterial trunk (1) was observed.



Fonte: Autoria própria

From its origin, this common trunk gave rise sequentially to three main branches: the Subscapular Artery (2), the Anterior Circumflex Humeral Artery (3), and the Posterior Circumflex Humeral Artery (4).

After these branches, the main trunk continued distally, assuming the identity and course of the Deep Brachial Artery (5). The latter followed the radial groove of the humerus in close association with the radial nerve, showing no other anomalies in its path or branching pattern.

It is important to note that the remaining branches of the axillary artery, as well as the rest of the arterial tree of the upper limb, exhibited a conventional anatomical pattern. The configuration observed represents a centralization of the origin of the main branches of the distal portion of the axillary artery - a finding of significant relevance for surgical and radiological procedures involving the axillary and brachial regions.

DISCUSSION

In the present study, an uncommon arterial trunk originating from the third part of the axillary artery was identified, from which the classical branches of this region emerged (Moore, Dalley & Agur, 2018[6]). This trunk continued its proximal-distal course as an artery corresponding to the Deep Brachial Artery. This variation differs from the classical pattern described in anatomical literature, though somewhat similar variations have been documented in other studies, such as those by Astik et al. (2012)[2], Naveen et al. (2014)[7], Oza et al. (2023)[8], Astha et al. (2015), and Farfán et al. (2022)[4], compared below.

Vascular variations in the upper limb, particularly in the axillary artery, are quite common and well-documented, highlighting the diversity of branching patterns in this structure. However, although some reports describe the presence of an arterial trunk in the axillary artery with similar features, none depict a variation exactly like the one observed in this study.

Astik et al. (2012)[2] reported a common arterial trunk in the third part of the axillary artery that gave rise to the anterior and posterior circumflex humeral arteries, the subscapular artery, and the deep brachial artery in five male cadavers. However, in the present study, the trunk gave rise only to the subscapular and circumflex humeral arteries before continuing as the deep brachial artery - a pattern not previously described.

A similar case was described by Naveen et al. (2014)[7], in which the arterial trunk originated from the third part of the axillary artery and coursed posteriorly and inferiorly, passing between the two roots of the median nerve. This trunk gave rise to all branches of the third part of the artery before continuing as the deep brachial artery. However, in the current analysis, the trunk followed its usual course within the radial groove, without any relation to the median nerve, distinguishing this case from the previous report.

Oza et al. (2023)[8] described a common arterial trunk arising from the posterolateral region of the second part of the axillary artery, at the level of branching of the musculocutaneous nerve and the lateral root of the median nerve. This trunk ran deep to both nerve branches and gave off the anterior and posterior circumflex humeral arteries before continuing as the deep brachial artery. Moreover, no branches originated from the third part of the axillary artery - unlike the present case, in which the trunk arose from the third portion and gave off the subscapular artery.

Astha et al. (2015)[1] identified a common trunk originating from the inferolateral aspect of the third part of the axillary artery. This trunk passes between the two roots of the median nerve, then posterior and inferior to the medial root of the median and ulnar nerves. It gave rise to the subscapular, anterior circumflex humeral, and posterior circumflex humeral arteries before continuing as the deep brachial artery, which entered the radial groove alongside the radial nerve. However, this configuration differs from the one found in the present study, as no posterior-inferior passage relative to the medial root of the median nerve and the ulnar nerve was observed.

Farfán et al. (2022)[4] reported a large arterial trunk arising from the second part of the axillary artery, which branched into the subscapular, anterior circumflex humeral, and posterior circumflex humeral arteries before conti-

nuing as the deep brachial artery. In their case, the third part of the axillary artery gave off no branches. This finding differs from ours, as the arterial trunk in the present study originated from the third part of the axillary artery.

Recognition of anatomical variations of the axillary artery - such as the one documented here - is essential not only in cadaveric dissections but also during surgical procedures involving the axillary region. Interventions such as humeral fracture repairs, tumor resections, and aneurysm surgeries depend on a detailed understanding of vascular variations, especially in atypical patterns like the one observed in this case (Moore, Dalley & Agur, 2018[6]; Hur et al., 2024[5]). The close relationship between the axillary artery and the brachial plexus further underscores the importance of precise anatomical knowledge, as such variations may increase the risk of nerve injury during anesthetic blocks, resulting in motor or sensory deficits (Astik & Dave, 2012[2]; Naveen et al., 2014[7]).

In vascular procedures such as catheterizations and angioplasties, anatomical variations can complicate the insertion and handling of devices such as catheters or intra-aortic balloons, thereby increasing the risk of complications or procedural failure. Moreover, these variations may alter the interpretation of imaging studies, leading to diagnostic errors and, consequently, to inadequate therapeutic approaches (Thiele et al., 2020 [9]).

Limitations

The present report is limited to the anatomical description observed in a single cadaveric specimen, with no possibility of inferring its population prevalence or establishing direct functional and clinical correlations.

CONCLUSION

This report describes the uncommon origin of a trunk of the axillary artery, from which branches corresponding to the third part of the axillary artery and the deep brachial artery emerge. This finding reinforces the occurrence of anatomical variations within the axillary arterial system and highlights their clinical relevance due to the potential impact on diagnostic and surgical procedures. The documentation of this case expands the existing anatomical literature and may serve as a foundation for future investigations regarding the incidence and implications of such variations.

Conflict of Interest Statement:

The authors declare that they have no conflicts of interest.

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Ethics Statement:

The study protocol was approved by the Research Ethics Committee of the Faculdade Ciências Médicas de Minas Gerais (CEPCM-MG), CAAE no. 67124822.0.0000.5134, and the requirement for Informed Consent was waived.

Declaration of Artificial Intelligence Use:

The authors declare that no artificial intelligence tools were used in the preparation of this manuscript.

Declaration of Medical Writing Assistance:

The authors declare that no medical writing assistance was used in the preparation of this manuscript.

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