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VARIANT BRANCHING PATTERN OF AXILLARY ARTERY AND ITS CLINICAL SIGNIFICANCE: A CASE REPORT

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ABSTRACT
Variations in the branching pattern of the axillary artery are not uncommon. The knowledge of these variations is of anatomical, radiological, and surgical interest to explain unexpected clinical signs and symptoms. Axillary artery pulsations serve as a landmark for clinical procedures like brachial plexus block and subclavian vein puncture. It is also increasingly being utilized as a graft for coronary artery bypass. The present article reports a variant branching pattern of 1st and 2nd part of axillary artery. This variation may have important clinical implications while performing reconstructive surgeries and also the common trunk from 2nd part of artery can be used for bypass. Moreover, the injuries of the brachial plexus are quite common and require exploration and repair. During such repair surgeries the abnormal arterial branch may be a matter of definite concern if its presence is not kept in mind.

KEYWORDS: Axillary artery, brachial plexus block, subclavian vein puncture, coronary artery bypass, common trunk.

INTRODUCTION
Axillary artery is a continuation of subclavian artery, extending from the outer border of first rib to the lower border of teres major muscle where it continues as brachial artery. The pectoralis minor muscle is related anteriorly to the axillary artery and it divides axillary artery into three parts, first part extending from outer border of first rib to the upper border of pectoralis minor muscle, second part lies behind the pectoralis minor muscle, and third part extending from lower border of pectoralis minor muscle to lower border of teres major muscle. Axillary artery normally gives off six branches. These are superior thoracic artery from the first part, lateral thoracic artery and thoracoacromial artery from the second part, and subscapular, anterior circumflex humeral and posterior circumflex humeral arteries from the third part.[1]

The origin of anomalies in the branching pattern of the upper limb arteries is attributed to defects in the embryonic development of the vascular plexus of the upper limb buds. An arrest at any stage of development, showing regression, retention or reappearance, may produce various variations in the arterial origins and courses of the major upper limb vessels.[2]

Better anatomical knowledge about the branches of brachial artery and their variations are essential in avoiding iatrogenic injuries by surgeons and also during interpretations of angiograms by radiologists. So, the present work is done to study the origin, course, branching pattern and termination of axillary artery.

MATERIALS AND METHODS
In the present study we found a unilateral variant of the branching pattern of axillary artery during routine gross anatomy dissection of axillary region in a 60 years old female cadaver with heavy built at Department of Rachana Sharir, SDM College of Ayurveda and Hospital, Hassan, Karnataka. The dissection of axilla was done carefully, photographs were taken and observations were noted.

CASE REPORT
During routine dissection of the left upper limb in an adult female cadaver, unilateral variation in the branching pattern of axillary artery was observed. The variation was observed in the branches of 1st and 2nd part. There was no variation in the 3rd part.

Variation observed in first part of Axillary artery
Superior thoracic artery was seen to arise from the lateral aspect of the 1st part of axillary artery as shown in [Fig-

1]. It coursed between the two divisions forming the lateral cord of the brachial plexus. It then continued downwards towards the axilla passing posterior to the cords of the brachial plexus.

Variation observed in second part of Axillary artery

The second part of the axillary artery gave a common trunk behind the pectoralis minor muscle, from which thoracoacromial artery and lateral thoracic artery arises [Fig-1].

The thoracoacromial artery soon divides into the following four terminal branches.

(a) Pectoral branch
(b) Deltoid branch
(c) Acromial branch
(d) Clavicular branch

The lateral thoracic artery gives off lateral mammary branches to the breast.

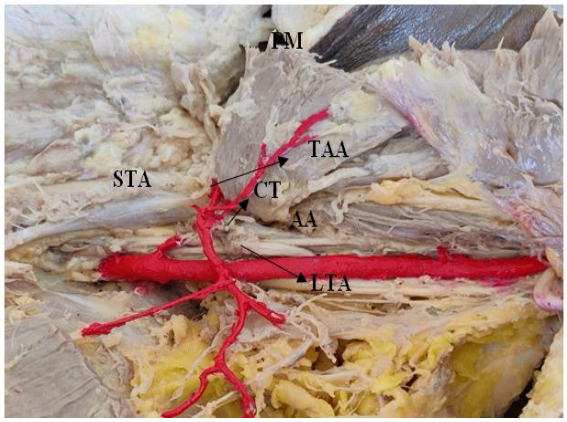

Fig. 1: Shows superior thoracic artery and the common trunk of left axillary artery. PM- pectoralis minor, AA- axillary artery, CT- common trunk, STA- superior thoracic artery, TAA- thoracoacromial artery.

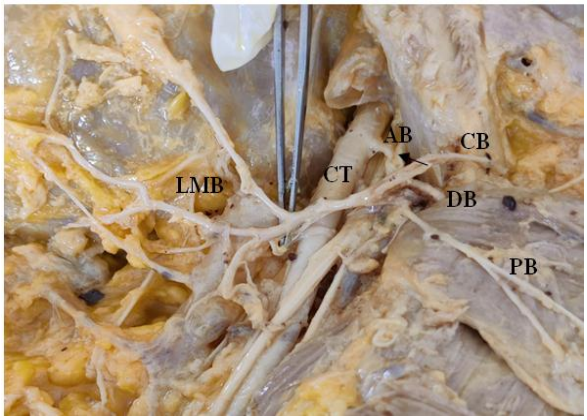

Fig. 2: Shows branches of superior thoracic artery (AB-acromial branch, CB-clavicular branch, DB-deltoid branch, PB-pectoral branch) and thoracoacromial artery (lateral mammary branches) arising from commom trunk-CT.

DISCUSSION

The anatomical variation of branching pattern of axillary artery is not uncommon. Various types of variation in branching pattern of axillary artery are reported by different authors from different parts of the world. Many of its branches may arise by a common trunk or a branch of the named artery may arise separately.[3] The vascular variations of the region should be well known. The course and branching pattern of the axillary artery may vary with race, sex and ethnic groups.[4]

De Garis and Swartley in their study of 512 cases on white and Negro stocks documented 5-11 branches originating from axillary artery, whereas the textbooks description gives the named branches as six.[5]

Aastha et al. also reported in their origin of superior thoracic artery from the lateral aspect of the 1st part of axillary artery in their case study.[6]

According to Samta et al. the second part of axillary artery illustrated two to three extra branches in 6% of cases called as alar arteries. They also documented that in 4% cases subscapular artery originated from the second part of axillary artery.[7]

Vasudha et al. reported Superior thoracic and collateral branch from first and no branches from rest of the axillary artery. The collateral branch was the origin of several important arteries as the circumflex scapular, thoracodorsal, posterior circumflex humeral, thoraco-acromial and lateral thoracic arteries.[8]

Syed Rehan et al. reported that lateral thoracic artery was the first branch arising from first part of the axillary artery, two thoracoacromial arteries; one from the first part and other from the second part, two posterior circumflex humeral arteries arose from the third part. There was high origin of radial artery from the second part of axillary artery. Early division of the subscapular artery was also observed.[9]

Patnaik et al. described lateral thoracic artery arising from second part of axillary artery in 92% of the limbs and in 6% directly from first part.[10]

Huelke in his study reported that subscapular artery arises from the first part of axillary artery in 0.6% cases, from the second part in 15.7% cases, and from the third part in 79.2% cases.[11]

Rajesh Astik and Urvi Dave found variant branching pattern of the axillary artery in 43 out of 68 limbs (63% limbs) in males and 7 limbs out of 12 limbs (58% limbs) in females. The variant branching pattern was found in 26 male cadavers (76.4%), unilaterally in 9 cases (five right, four left) and bilaterally in 17. It was found in four female cadavers (66.7%), with one unilateral case on the right side and three bilateral. Consequently, the total incidence of variant branching pattern of the axillary

artery was 30 out of 40 cadavers (75%) or 50 out of 80 upper limbs (62.5%).[12]

In the present study the superior thoracic artery was seen to arise from the lateral aspect of the 1st part of axillary artery instead of medial aspect and also variant in 2nd part of axillary artery, it gave a common trunk of origin for thoracoacromial artery and lateral thoracic artery.

The lateral branch of the seventh intersegmental artery gave rise to axial artery of which proximal part transformed into the axillary and brachial artery. These different types of variations may occur due to arrest at any developmental stage of vessels of the upper limb such as regression, retention, or reappearance of new blood vessels.[2]

It is very essential to have accurate knowledge of the normal and variant anatomy of the axillary region to diagnose any underlying pathology. This knowledge becomes the prerequisite for the subsequent clinical procedures of utmost significance for the vascular surgeons, radiologists and clinical anatomists.

Injuries of brachial plexus are very common at present, which requires urgent exploration of axilla and repair. [13] During surgeries around pectoral and axillary regions, knowledge about these variations plays a significant role in reduction of uneventful complications.

Variations in branching pattern of axillary artery should be kept in mind while performing bypass between the axillary and subclavian artery in surgical treatment of subclavian artery occlusion.[14] The common trunk as in the present case can be used for bypass.

Aneurysm and trauma of axillary artery may require reconstructive operation and variations as in the present case may present difficulties in the procedure. Aneurysm of the axillary artery and its branches may appear in baseball pitchers.[15] Repetitive positional compression of the axillary artery in athletes can cause focal intimal hyperplasia, aneurysm formation, segmental dissection, and branch vessel aneurysm. These conditions favour thrombosis and distal embolism and may need positional arteriography for diagnosis.[16] Variant branches of axillary artery as in the present case are also prone for such conditions.

The axillary arteries have been successfully used as the cannulation site in cardiopulmonary bypass, thoracic, and aortic procedures, for insertion of intra-aortic balloon pumps and it is under consideration for use as an inflow vessel in coronary artery surgery.[17] Variant common trunks from axillary artery can be considered for cannulation. Radiological studies can thus be performed before proceeding to the above- mentioned procedures. All these applications make present variation noteworthy.

Knowledge of branching pattern of axillary artery is also useful during antegrade cerebral perfusion in aortic surgery.[18]

CONCLUSION

Knowledge of variant pattern of axillary artery is important for understanding the surface landmark for the anatomists, orthopaedics, surgeons and radiologists in performing various interventional techniques to avoid unwanted damage and consequences. Axillary artery is increasingly being utilized as a graft for coronary artery bypass. The present article reports a variant branching pattern of 1st and 2nd part of axillary artery. This variation may have important clinical implications while performing reconstructive surgeries and also the common trunk from 2nd part of artery can be used for bypass. Moreover, the injuries of the brachial plexus are quite common and require exploration and repair. During such repair surgeries the abnormal arterial branch may be a matter of definite concern if its presence is not kept in mind.

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