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Rare Variation in Branching Pattern of the Axillary Artery: A Cadaveric Study

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Abstract:
Introduction: *Variations in the course and the branching pattern of the axillary artery is not rare. Knowledge about the aberrations of the axillary artery is very important in the fields of radiology, surgery, anatomy and orthopaedics. These variations in the axillary artery should be kept in mind during surgeries in the axillary region and pectoral region.*
Material and Methods: *The study was conducted in the Postgraduate Department of Anatomy, Government Medical College, Jammu. The dissection was carried out on an embalmed male cadaver. The dissection was done for routine educational purposes in the dissection hall. The branching pattern of the axillary artery along with its various branches was studied with keen observation.*
Results: *In the present study, an anomalous common thoraco humeral trunk arose on the right side from the second part of the axillary artery which branched into lateral thoracic, anterior and posterior circumflex humeral, subscapular and thoracodorsal vessels. On the left side there were no aberrations in the axillary artery.*
Discussion*: Any deviation from the normal course and branching pattern of the axillary artery are of importance for radiologists, anatomists, orthopaedicians and surgeons. These variations in the branching pattern are of help to the orthopaedic surgeons while attempting reduction of old dislocations especially when axillary artery is adhered to the capsule.*
Keywords: *Axillary artery, thoraco humeral trunk, variation, upper limb.*

INTRODUCTION

The axillary artery being a continuation of the subclavian artery arises from the first rib's outer border to the lower border of teres major muscle, further distally it itself continues as brachial artery.It gives six branches [1].The pectoralis minor muscle aids in the division of axillary artery into three parts [2].The axillary artery gives rise to superior thoracic artery from its first part, lateral thoracic and thoracoacromial arteries from its second part and from third part three branches arise i.e. subscapular, anterior circumflex humeral and posterior circumflex arteries [3].

Variations in the anatomy of the arteries of the upper limb are not rare [4-7].Primary anomalies of the axillary artery are less frequent than that of the subclavian artery [8,9]. Variations can be in the form of its complete agenesis, its duplication or variations in its branching patterns [10-15]. The course of the axillary artery along with its branching pattern varies with sex and race [11,13,16].

Variations can be in the form that subscapular artery can arise from a common trunk along with the posterior circumflex humeral artery. Other variation is that the subscapular, anterior circumflex humeral, posterior circumflex humeral and profunda brachii arteries arise in common [1].

The branches arising from the axillary artery can exhibit wide variation: two or more of usual branches can originate from a common trunk [17].

Exact knowledge about the normal and variant branching pattern of the axillary artery is of utmost importance to the clinicians[10]. The knowledge about the variations of the axillary artery is important for anatomists, orthopaedicians, radiologists and cardiologists[2].

These variations in the branching pattern are of help to the surgeons while attempting reduction of old dislocations especially when axillary artery is adhered to the capsule [1].

MATERIAL AND METHODS

The study was conducted in the Postgraduate Department of Anatomy, Government Medical College, Jammu. The dissection was carried out on male cadaver which was embalmed by means of formalin. The dissection was done for routine educational purposes in the dissection hall. Exposure of the axillary artery along with its branches was achieved following classical incision as dissection procedures. The branching pattern of the axillary artery along with its various branches was studied with keen observation. Variation was also noticed. Moreover photographs were taken for recording the variation.

OBSERVATIONS AND RESULTS

In the present study, white dissecting the right upper extremity of a male cadaver, an anomalous common thoraco humeral trunk (Figure-1 and Figure-2) arose on the right side from the second part of the axillary artery. This trunk was observed when the pectoralis minor muscle lying over it was removed. The first part of the axillary artery on the right side with its one branch i.e. superior thoracic artery was normal.

The second part of the right axillary artery gave one normal branch from the upper aspect i.e. acromiothoracic artery. On the inferior aspect thoraco humeral trunk arose which is an anomaly. This trunk gives branches as lateral thoracic vessels, subscapular, thoraco dorsal artery, anterior and posterior circumflex humeral vessels (Figure-1 and Figure-2). It followed an arched course in the deep region of the axilla, convexity being inferiorly.

Lateral thoracic vessels traverse under the pectoralis minor muscle. Thoracodorsal artery ends up in latissimus dorsi and supplies it. Moreover, anterior circumflex artery traverses anteriorly on surgical neck of humerus. The posterior circumflex humeral artery enters the quadrangular space.

On the left side of the same cadaver, the axillary artery was explored which had normal branching pattern and course. No anomalous branch was observed.

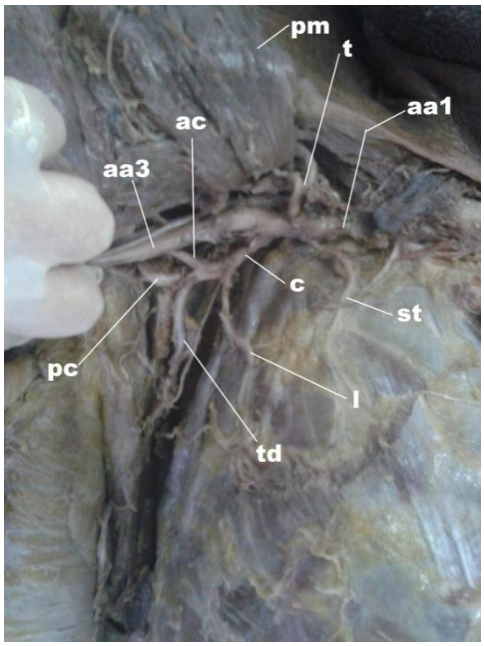

Fig 1: Showing common throrcohumeral trunk arising fron the second part of the axillary artery
aa1- axillary artery
pm-pectoralis minor
aa3-third part of axillary artery
c-common thoracohumeral trunk
l-lateral thoracic artery
pc-posterior circumflex humeral artery
st-superior thoracic artery
td-thoracodorsal artery
ac-anterior circumflex humeral artery

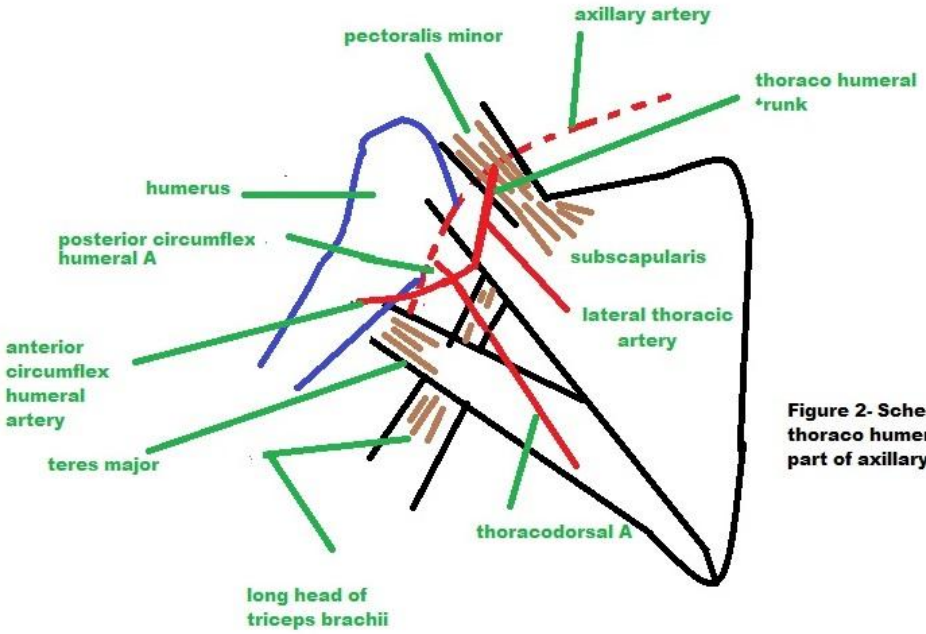

Figure 2- Schematic diagram of common thoraco humeral trunk arising from second part of axillary artery

DISCUSSION

The complexity of the embryology of the vascular system often land in various aberrations in the course of the arteries and their branches[8]. Variations in axillary artery are due to improper embryological development of vascular plexus of limb bud of upper extremity. It takes place because development of vessels is seized at any stage which is followed by regression or reappearance, hence causing aberrations in the arterial origin and their course. The knowledge about these variations in the arteries is important for vascular radiologists and surgeons. Ignorance in these matters can lead to difficulties in surgeries in areas of axilla and pectoral region [18-20].

Due to the clinical significance of the axillary artery, we have made an attempt to provide additional information about its aberrations in branching and its course to coeval the rich anatomical literature.

Uglietta (1989) provided data regarding the variations found in the major arteries of the upper extremity and recorded this variation to be 11-24% [21]. The branching pattern of the axillary

artery along with its course was found to vary between race and sex [11]. Huelke (1959) observed that origin of the subscapular artery from the first part of the axillary artery was seen in 0.6% cases; from second part in 15.7% cases and in 79.2% cases from the third part. He found that lateral thoracic artery arises from the first part of axillary artery in 10.7% cases, from second part in 52.2% cases and from third part in 1.7% of the cases [6].

Saeed et al.,(2002) detected origin of common subscapular circumflex humeral trunk from third part of axillary artery which further branched into subscapular, anterior circumflex humeral and posterior circumflex humeral arteries in 3.8% of cases [22]. Ramesh et al.,(2008) also noticed commencement of a common trunk from the third part of left axillary artery, from which subscapular, anterior circumflex humeral, posterior circumflex humeral, profunda brachial and ulnar collateral arteries arose [23].

Vijaya et al.,(2006) observed a common trunk arising from the third part of the axillary artery from which origin of anterior circumflex humeral, posterior circumflex humeral, subscapular, radial collateral, middle collateral and superior ulnar collateral arteries took place [24]. Daimi et al., (2010) traced the origin of two posterior circumflex humeral arteries from the third part of the axillary artery: one of them goes laterally with axillary nerve and appeared in quadrangular space and other appeared on dorsal surface of scapula after piercing teres minor muscle [25].

Variations were noted by Pandey and Shukla (2004) in origin of branches of thoracoacromial trunk, mostly on right side and these variations were divided in three groups. In the first group, thoracoacromial trunk was absent and origin of deltoacromial and clavipectoral subtrunks was from second part of axillary artery. In the second group, all branches had their origin from thoracoacromial trunk except clavicular branch which arose from second part of axillary artery. In the third group, thoracoacromial trunk was absent and all its branches arose directly from second part of axillary artery [26].

The thoracodorsal artery may have its origin from lateral thoracic artery or from common trunk with anterior circumflex humeral vessel, posterior circumflex humeral artery, circumflex scapular artery and lateral thoracic artery. Thoracodorsal artery can be double or triple [27]. The anterior circumflex humeral and posterior circumflex humeral vessels may arise from a common trunk [28]. The posterior circumflex artery can arise from subscapular artery [29].

Yamada [30], gave two group classification of subscapular arteries. The first group arising from the axillary artery proximal to the point of it passing between medial and lateral cords of brachial plexus and the 2nd group arose distal to it. Aizawa et al.,[9] named the subscapular and related arteries of deep region of the axilla, as subscapular artery system (Sbs system) and grouped them into 3 groups; S-type, I-type and P-type. In the S-type Sbs system, the Sbs artery arose from the lateral thoracic, which itself rose from the 2nd part of the axillary artery. In the I-type and P-type Sbs systems, the Sbs artery branches from the proximal and distal segments of the 3rd part of the Axillary artery. The anomalous thoraco humeral trunk (Figure-1 and Figure-2) observed in the present study which is the only anomaly in the present case showed similarity with Yamada's [30] Arteria subscapularis superficialis and Aizawa's [9] S-type Sbs system.

This type of anomalous thoraco humeral trunk was found by Saeed et al., (2002) [22] in a female cadaver. In that case it was present bilaterally but in present study it is present unilaterally. Moreover the branching vessels from thoracoacromial trunk in their case were lateral thoracic, posterior circumflex humeral, subscapular and thoracodorsal arteries but in the present study there is in additional anterior circumflex humeral artery arising from it.

Knowledge of branching pattern of axillary artery is of importance in antegrade cerebral perfusion for aortic surgery, while treating the axillary artery thrombosis for. Its tracing is important for its reconstruction after trauma. Its branching pattern

is taken into consideration for the use of microsoft graft for replacement of damaged arteries, for several procedures on axillary artery where catheters and cannulas are required, during surgical interventions for shoulder dislocations and fracture upper end of humerus, for creating the axillary- coronary bypass shunts.

Anomalous origin of subscapular and circumflex humeral arteries make them prone to get damaged. These anomalies create difficulties for invasive cardiologists in cannulation and for surgeons in raising free flaps of serratus anterior muscle for reconstruction purposes.

CONCLUSION

The present case provides information on branching pattern of axillary artery along with some of its variations. Data of such abnormalities in the axilla is highly significant for aneurysms and trauma surgery where all interventions should be performed carefully due to possibility of injury and further medicolegal issues. The significance of axillary artery and its branches lies in its use in coronary bypass and flaps in reconstructive surgeries. Vascular surgeons ought to know the variations in axillary artery while attempting reduction of old dislocations. Therefore, both normality as well as abnormality of axillary artery should be known for surgical and diagnostic procedures.

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