

Variation in the branching pattern of right axillary artery in a malaysian adult male cadaver – a case report.

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Abstract—Upper limb arterial variations are of potential clinical implications as it is a frequent site of injury and also involved in many invasive and surgical procedures. During routine dissection of the right upper limb of an adult male cadaver in the department of Anatomy, Aims University, Malaysia variations in the branching pattern of third part of axillary artery were found. It was observed that a common trunk arose from third part of axillary artery which gave rise to lateral thoracic artery, anterior and posterior circumflex humeral arteries. However subscapular artery took its origin separately from the third part of axillary artery. Common trunk was found to be arising from medial side of third part of axillary artery. Some embryological explanations are available with regard to such anomalies. Knowledge of such arterial variations is most importance in carrying out surgical procedures in arm and axilla, also for accurate interpretation of angiography reports by radiologists.

Keywords—arterial variations, axillary artery, branching pattern, clinical importance.

I. INTRODUCTION

Axillary artery is the direct continuation of the subclavian artery from the outer border of the first rib. The course of the axillary artery is anatomically divided into three parts by the pectoralis minor muscle. The first part begins at the lateral border of the first rib and extends to the medial border of the pectoralis minor muscle. The second part of the axillary artery lies deep to the pectoralis minor muscle. The third part lies between the lateral border of the pectoralis minor muscle and the inferior border of the teres major muscle beyond which it continues as brachial artery.¹

The axillary artery normally gives off six branches – one from its first part (superior thoracic artery), two from its second part (lateral thoracic and thoracoacromial arteries) and three from its third part (subscapular artery, anterior circumflex humeral and posterior circumflex humeral arteries).¹

The superior thoracic artery is a small vessel which arises from the first part of the axillary artery, supplies the pectoral muscles.

The thoraco-acromial artery is a short branch which arises from the second part of the axillary artery, emerges at the upper border of the pectoralis minor divides into pectoral, acromial, clavicular and deltoid branches, which supply pectoralis major minor and the anterior portion of deltoid.

The lateral thoracic artery also arises from the second part of the axillary artery. Following the lateral border of pectoralis minor, it passes to the deep surface of pectoralis major as far distally as the fifth intercostal space. It supplies serratus anterior and the pectoral muscles, the axillary lymph nodes and subscapularis.

The subscapular artery is the largest branch of the axillary artery. It usually arises from the third part of the axillary artery at the distal (inferior) border of subscapularis. It runs on the posterior wall of the axilla. It

supplies the latissimus dorsi and serratus anterior and terminate at inferior angle of scapula. It gives a large branch, circumflex scapular artery which passes through the triangular space and takes part in the anastomosis round the scapula..

The anterior circumflex humeral artery arises from the lateral side of the third part of the axillary artery at the distal border of subscapularis. It winds round the surgical neck of humerus and anastomoses with the posterior circumflex humeral artery, it sends an ascending branch to supply the humeral head and shoulder joint.

The posterior circumflex humeral artery is larger than the anterior, It branches from the third part of the axillary artery at the distal border of subscapularis. It accompanies the axillary nerve and passes through the quadrangular space. It supplies the deltoid, the triceps and shoulder joint. It gives a descending branch which anastomoses with ascending branch of profunda brachii artery. It terminate by anastomosing with the anterior circumflex humeral artery around surgical neck of the humerus.

II. CASE REPORT

During routine dissection of an adult male cadaver in the Department of Anatomy, AIMST University, Semeling, Bedong, Malaysia, anomalous branching pattern of the third part of the left axillary artery was observed. The right axillary artery was subdivided into three parts by the pectoralis minor muscle. The third part of the axillary artery, however, gave off a common trunk which again trifurcated into anterior circumflex humeral, posterior circumflex humeral and lateral thoracic artery. This Common trunk was found to be arising from medial side of third part of axillary artery. Caliber of the aforesaid common trunk was noted to be same as the caliber of the right axillary artery.

After running downwards and medially for about 2.5 cm from its origin, this common trunk gave off the anterior and posterior circumflex humeral and lateral thoracic arteries from its posteromedial aspect. Traced further, the course of anterior and posterior circumflex humeral arteries and lateral thoracic artery. The subscapular artery arising from third part of axillary artery, the course of the artery found to be normal. Near the inferior angle of scapula, It gives off circumflex scapular artery, which passes through the triangular space.

Normally the anterior circumflex humeral artery arises from the lateral side of the third part of the axillary artery but in the present case it is arising from posteromedial aspect of third part of axillary artery. Further traced the course the anterior circumflex humeral artery. The artery wind round the surgical neck of humerus and anastomosing with the posterior circumflex humeral artery.

After taking origin from the common trunk, the posterior circumflex humeral artery accompanies the axillary nerve and passes through the quadrangular space. Further it terminated by anastomosing with anterior circumflex humeral artery.

Lateral thoracic artery arises from common trunk in between the origin of anterior and posterior circumflex humeral artery, the further course of artery found to be normal. Normally lateral thoracic artery arising from second part of axillary artery but in the present case it is arising from third part of axillary artery along with anterior and posterior circumflex humeral vessels and sharing common origin. After giving origin to the common trunk, the third part of the right axillary artery continued as brachial artery at the distal border of teres major muscle. (Fig. 1, 2).

The course and distribution of the first and second parts of the left axillary artery were normal. The left axillary and anterior, posterior circumflex humeral and subscapular arteries revealed no abnormality.

III. DISCUSSION

Many variations observed in the branching pattern of all the three parts of the axillary artery have been documented by earlier workers. The lateral thoracic artery from the second part of axillary artery may be completely absent. The subscapular artery can arise along with the posterior circumflex humeral artery from a common trunk stemming out from the third part of axillary artery. Occasionally the subscapular artery, circumflex humeral artery and profunda brachii artery arise in common from the third part of axillary artery. The profunda brachii artery instead of arising from brachial artery can originate in common with posterior circumflex humeral artery from the distal part of the axillary artery. Embryological explanations are available with regard to such anomalies.

Upper limb arterial tree variations are most common. The third part of the axillary artery shows great variations in its branching pattern. The anterior and posterior circumflex humeral arteries may arise usually alone or rarely together with the profunda brachii and muscular branches from a common trunk which stems out from the third part of the axillary artery. Very rarely, this common trunk may give rise to the anterior and posterior circumflex humeral, subscapular, profunda brachii and ulnar collateral arteries.²

George et al (2007) pointed out a rare variation in the branching pattern of the axillary artery. The axillary artery bifurcated into two trunks of same caliber, one superficial to another. The superficial one continued as the brachial artery. The deep trunk bifurcated into a common circumflex humeral-subscapular

trunk and profunda brachii artery. The common circumflex humeral-subscapular trunk further divided to give off anterior and posterior circumflex humeral arteries and subscapular artery.³

In up to 30% of cases, the subscapular artery can arise from a common trunk with the posterior circumflex humeral artery. Occasionally the subscapular, anterior and posterior circumflex humeral and profunda brachii arteries arise in common, in which case, branches of the brachial plexus surround this common vessel instead of axillary artery. The posterior circumflex humeral artery may arise from the profunda brachii artery and pass back below the teres major instead of passing through the quadrangular space.⁴

The anomalous branching pattern of third part of the axillary artery can be explained in the light of embryogenic development. It is pertinent to mention here that the normal vascular development including the patterning of the blood vessels is influenced greatly by local hemodynamic factors. Altered hemodynamic environment may give rise to variant patterning of blood vessels.⁵

The anomalous branching pattern of axillary artery explained on the basis of observations made by Arey in 1957 where he highlighted that, there may be persistence of vessels which normally obliterate and disappearance or failure of development of vessels which normally persist.⁶ This reversal of the normal process of vascular development is largely due to altered local hemodynamic environment.⁷ Anomalies of upper limb arterial tree is mainly because of their multiple and plexiform sources, the temporal succession of emergence of principal arteries, anastomoses and periarticular networks and functional dominance followed by regression of some paths.¹

The developing arteries of the limb bud are separated from the outer ectodermal sleeve of the limb by an avascular zone of mesenchyme. This avascular region contains an extracellular matrix consisting largely of hyaluronic acid. Removal of this hyaluronic acid by hyaluronidase results in vascularization of the tissue since partial degradation products of hyaluronic acid are angiogenic. Thus ectodermal-mesenchymal interactions and extracellular matrix components are controlling the initial patterning of blood vessels within the limb.⁸ Branches of the upper limb arteries have been used for coronary bypass and flaps in reconstructive surgery. Accurate knowledge of the normal and variant arterial pattern of the human upper extremities is important both for reparative surgery and for angiography.⁹

Awareness about details and topographic anatomy of variations of the axillary artery may serve as a useful guide both for surgeons, vascular surgeons, radiologists. Hence, a high level of suspicion, in conjunction with knowledge of sensitive and specific clinical signs is paramount for an accurate and timely diagnosis.

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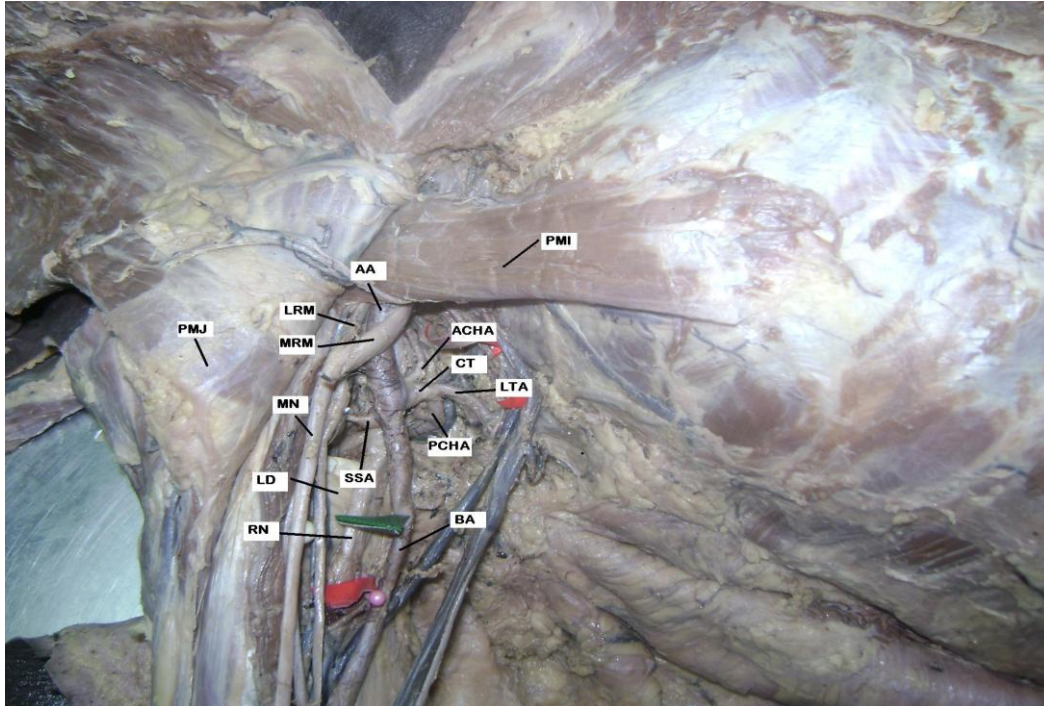


Figure 1. Showing the third part of the axillary artery, pectoralis minor muscle, anterior and posterior circumflex humeral and lateral thoracic, subscapular arteries.

AA = Axillary Artery, CT = Common Trunk, ACHA = Anterior Circumflex Humeral Artery, PCHA = Posterior Circumflex Humeral Artery, LTA= Lateral thoracic artery, SSA = Subscapular artery, BA = Brachial Artery, LRM = Lateral Root of Median Nerve, MRM = Medial Root of Median Nerve, MN = Median Nerve, RN = Radial Nerve, PMI = Pectoralis Minor, PMJ = Pectoralis Majour, LD = Latissimus Dorsi muscle.

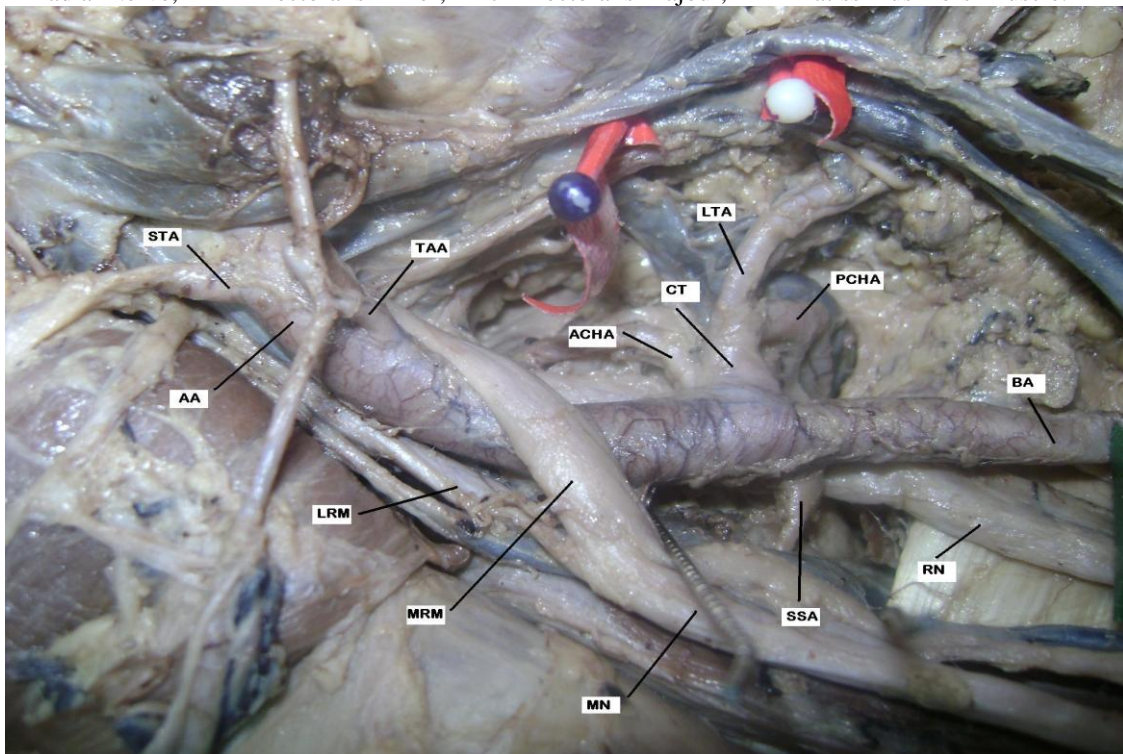


Figure 2: Showing a common trunk arising from the third part of the axillary artery and giving off anterior and posterior circumflex humeral arteries and lateral thoracic artery from its posteromedial aspect.

AA = Axillary Artery, CT = Common Trunk, STA = Superior thoracic artery, LTA = Lateral thoracic artery, TAA = Thoracoacromial Arteries, ACHA = Anterior Circumflex Humeral Artery, PCHA = Posterior Circumflex Humeral Artery, SSA = Subscapular artery, BA = Brachial Artery, LRM = Lateral Root of Median Nerve, MRM = Medial Root of Median Nerve, MN = Median Nerve, RN = Radial Nerve.