Original Article

Anatomical Study of Axillary Artery Variation.

Thaer M. Farhan* **FIBMS**
Mohammad O. Selman* **FIBMS**

Summary:

Background: The axillary artery is a direct continuation of the subclavian artery. The axillary artery is usually described as giving off six branches. The first part gives superior thoracic artery. The second part gives lateral thoracic (LT) and thoracoacromial(TAC) arteries. The third part gives three, subscapular(SS), anterior circumflex humeral(ACH)and posterior circumflex humeral(PCH) arteries. Anatomical variations in the branching pattern of axillary artery are quiet common and typically include the subscapular artery(SS), lateral thoracic artery(LT) and the posterior circumflex humeral artery(PCH). The variation of the axillary artery branching pattern has anatomical as well as clinical and surgical relevance given the proximity to the shoulder joint and humerus.

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Patients & Method: Bilateral axilla dissection was conducted on 26 embalmed axillae (13 cadavers) to allow examination of the axillary artery and its branches. The study was carried out in Department of Human Anatomy, College of Medicine.

Results: The classical branching pattern of the LT originating from the axillary artery posterior to the pectoralis minor muscle and the SS producing the circumflex scapular (CS) artery and thoracodorsal(TD) occurred in 77%. The SS was observed originating from the LT 7% of the time. The LT was observed originating from the SS 5% of the time. The LT was observed producing the circumflex scapular artery and TD in the absence of SS 2.5% of the time. The PCH originated from four different sources, from the third part of axillary artery as is classically described in 77%. From the SS 11%. From deep brachial artery DB 9% and from LT 2%.

Conclusion: Vascular variation in the axillary artery and its branches is quiet common **,** This variation should be considered seriously as will implicate risk of bleeding during surgery in the axilla and also the difficulty in interpretation of the angiography after axillary catheterization.

Keywords: axillary artery, vascular variation, variation in axilla, anatomy of axilla.

Introduction:

The axillary artery is a direct continuation of the subclavian artery from the outer border of the first rib to the lower border of teres major muscle. The course of the axillary artery is anatomically divided into three parts by pectoralis minor muscle. The first part is proximal to, the second part is behind and the third part is distal to, the muscle. (1) The axillary artery is usually described as giving off six branches. The first part gives superior thoracic artery. The second part gives LT and TAC arteries. The third part gives three, SS, ACH and PCH arteries. There is an extensive collateral circulation associated with the branches of subclavian and axillary arteries, particularly around the scapula. This clearly becomes of clinical significance during injury of the axillary artery. (1, 2) It is common to find variations in the branching pattern of axillary artery. Many of its branches may arise by a common trunk or a branch of the named artery may arise separately (3). Anatomical variations in the branching pattern of axillary artery are quiet common and typically include SS, LT and PCH (4). Specimen dissections describe the PCH originating from SS Artery with the CS and TD arteries. Saeed et al(2002) report, a bilateral common subscapular-circumflex humeral trunk(3.8%) emerging from the 3rd part of the axillary artery, branching into the circumflex humeral and thoracodorsal arteries and a bilateral thoraco-humeral trunk arising from the 2nd part of the axillary artery (1.9%)and branching into the lateral thoracic, circumflex humeral, subscapular and thoracodorsal arteries. (5) Trotter and her associates in contrast found a sex difference (common origin of two or more branches being more frequent in females), but no significant differences between the races in males. (6) The variation of the axillary artery branching pattern has anatomical as well as clinical and surgical relevance given the proximity to the shoulder joint and humerus as well as the neurovascular supply to the deltoid muscle. (7)

**Dept. of Human Anatomy, College of Medicine, Al-Nahrain University.*

Patients &Methods:

Bilateral axilla dissection was conducted on 26 embalmed axillae (13 cadavers) to allow examination of the axillary artery and its branches. There were 6 specimens belonging to female cadavers and 20 specimens belong to male cadavers. Data were collected regarding the origin, position and course of

the subscapular artery, lateral thoracic artery and posterior circumflex humeral artery. The study was carried out in Department of Human Anatomy, College of Medicine, Al-Nahrain University and the Medical College, Al-Anbar University

Results:

Several variations in the branching pattern of the axillary artery were observed. With respect to the SS and LT, there were four distinct variation patterns in addition to the classical branching pattern (Table 1). The classical branching pattern of the LT originating from the axillary artery posterior to the pectoralis minor muscle and the SS producing the CS artery and TD artery occurred in 77% of the time and was observed bilaterally in 87% of those instances. The TD was observed originating from the LT 7.5% of the time and was bilateral in 66.7% of those instances. The SS was observed originating from the LT 7% of the time and was bilateral in 45% of those instances. The LT was observed originating from the SS 5% of the time and was bilateral in 59% of those instances. Finally the LT was observed producing the CS artery and TD in the absence of SS 2.5% of the time and was bilateral in 55% of those instances. The PCH originated from four different sources (Table2). The PCH originated from the third part of axillary artery as is classically described in 77% of the time and was bilateral 86.5% of those instances. The PCH originated from the SS 11% of the time and was bilateral 39%of those instances. The PCH originated from deep brachial artery DB 9% of the time and was bilateral 72%of those instances. Finally the PCH originated from LT 2% of the time and was not observed doing so bilaterally. The course and distribution of the PCH along its path to the deltoid muscle was recorded. Classically the PCH will traverse the quadrangular space along with the axillary nerve as it travels to supply the deltoid muscle. Four possible sources for the PCH were observed in this study, as listed in previous paragraph: the axillary artery, SS, and LT. however, when the PCH originated from the DB, the PCH only traveled through the quadrangular space approximately 15% of the time. In about 85% of the cases when the PCH arose from the DB,. it traversed the triangular space and when traveled superiorly to supply the deltoid muscle.

Table 1: Frequency of variability of LT and SS

Bilateral frequency	Frequency	Variation
87%	77%	Classic SS/LT
66.7%	7.5%	TD off LT
45%	7%	SS off LT
59%	5%	LT off SS
55%	2.5%	No SS all LT

Table 2: Frequency of variability of the PCH

Bilateral frequency	Frequency	Variation
86.5%	77%	Classic PCH
39%	11%	PCH off SS
72%	9%	PCH off DB
0%	2%	PCH off LT

Table 3: Course and distribution of the PCH

Through triangular space	Through quadrangular space	Variation
0%	100%	Classic PCH
0%	100%	PCH off SS
85.7%	14.3%	PCH off DB
0%	100%	PCH off LT

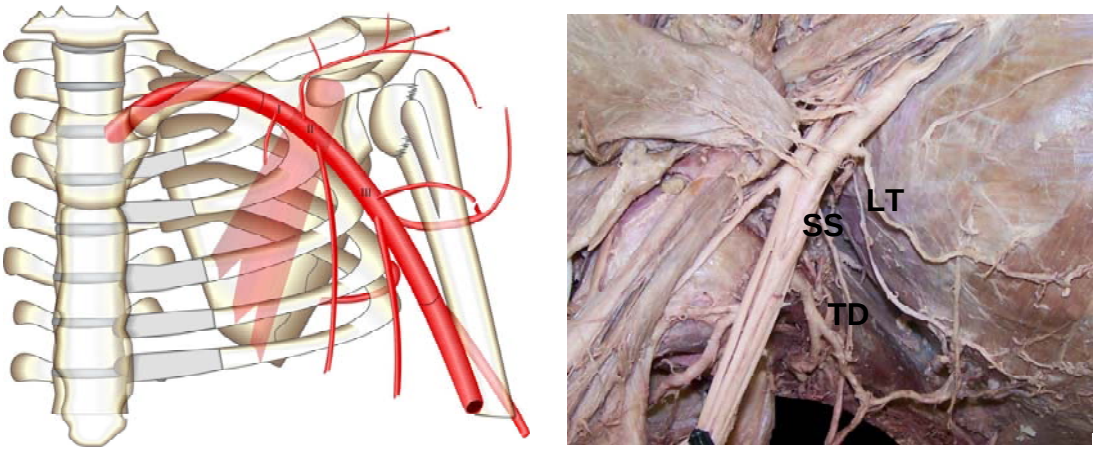

Figure 1: Classic Axillary Artery (77%)

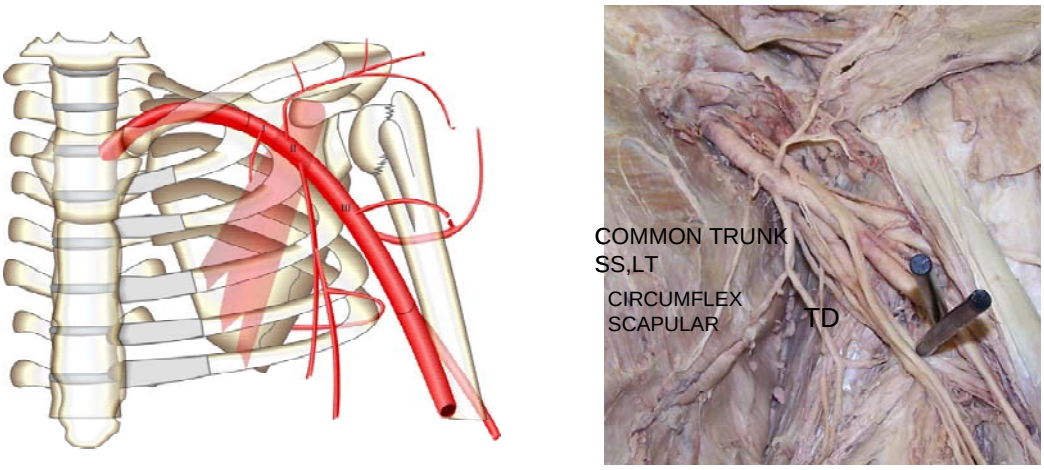

Figure 2: SS OFF LT (7%)

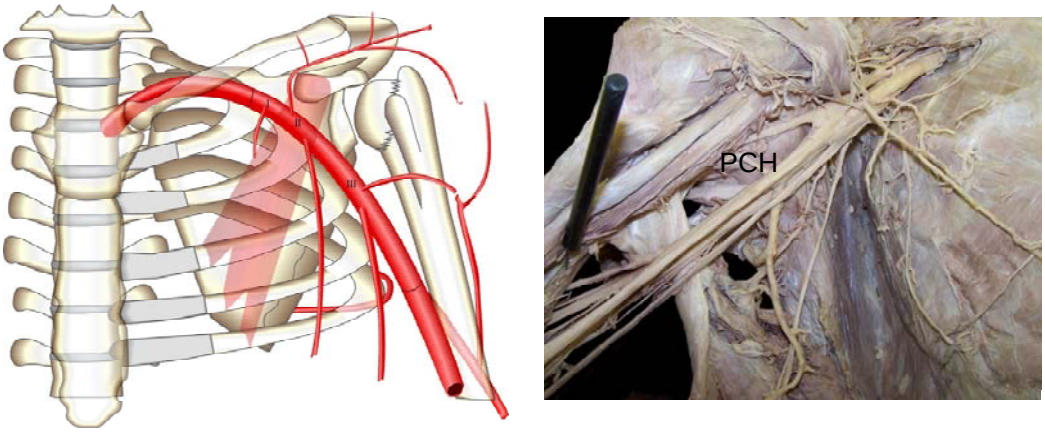

Figure 3: PCH OFF DB (9%)

Discussion:

Earlier studies by many observers showed that variations in the branching pattern of the axillary artery are very common (8). We try to consolidate and emphasize on such clinically important vascular variations. Jurjus et al (1999) showed the presence of an unusual bilateral variation in the arterial pattern of the axilla (9). The branches of the third part of the axillary artery are subject to great variation. The two circumflex arteries may arise from a common trunk. (10) Such anomalous branching pattern may represent persisting branches of the capillary plexus of developing limb buds and their unusual course may be a cause for concern to the vascular radiologists and surgeons and may lead to complications in surgeries involving the axilla and pectoral regions. The seventh cervical segmental artery gives rise to axillary artery and any abnormality during development results in the unusual branching pattern. Normally, in embryos of 11mm length, the seventh cervical intersegmental Artery enlarges and becomes the dominant vessel of axilla. C6, C7 and T1 segmental arteries and most of the longitudinal anastomoses that link up the intersegmental arteries degenerate slowly. The numerous alternatives that exist during the formation of upper limb vessels seem to be responsible for anomalous arterial branching patterns (11). In figure 2, one can say that there is a common trunk of origin for LT and SS rather than it is the SS originated from the LT, this is more convenient with Hollinshead opinion. (3) These finding in the current study are relevant to the anatomical field as they demonstrate frequency of the alternate origins for the LT, TD and PCH, as well as the course and distribution of the vessel to its destination. These finding are relevant to the clinician as given the potential for the PCH to traverse the triangular space instead of the quadrangular space along its course to the deltoid muscle. Sound knowledge of the vascular variations is important for surgeons who practice mastectomy with axillary

clearance for CA-breast, to anesthesiologist and orthopedic surgeons considering the frequency of procedures done in this region for instance on the humerus, the axillary artery is more frequently lacerated by violence than any other artery, being more susceptible when diseased. It has been ruptured in attempt to reduce old shoulder dislocation. (12) Accurate knowledge of the normal and variant arterial pattern of the human upper extremities is important both for reparative surgery and angiography (13).

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