

**THE STUDY OF AXILLARY ARTERY, ITS BRANCHING
PATTERN AND ITS VARIATIONS**

Submitted to

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

**In partial fulfilment for
M.D. DEGREE EXAMINATION
BRANCH – XXIII (ANATOMY)**

STANLEY MEDICAL COLLEGE, CHENNAI



THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL 2017

CERTIFICATE

This is to certify that the dissertation work done on “ **The study of axillary artery, its branching pattern and its variations** ” is the bonafide work done by **Dr.C.Sasikala** in the department of Anatomy, Stanley medical college, Chennai - 600001 during the year 2014 - 2017 under my supervision and guidance in partial fulfilment of the regulation laid down by the Tamilnadu Dr. M.G.R. Medical university, for the M.D. Anatomy (Branch code XXIII) degree examination to be held in April 2017.

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CERTIFICATE OF THE GUIDE

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DECLARATION

I solemnly declare that this dissertation , “**The study of axillary artery , its branching pattern and its variations**” was written by me in the Department of Anatomy, Government Stanley Medical College and Hospital, Chennai under the guidance and supervision of Prof..Dr. S.CHITRA M.S., Professor and head Of the Department of Anatomy, Government Stanley Medical College, Chennai-600 001.

This dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the university regulations of the award of Degree of M.D. Anatomy (Branch XXIII) examination to be held in April 2017.

Place: Chennai -1

Date:

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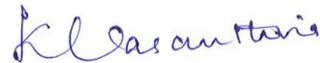
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The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 10.06.2015 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

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THE STUDY OF AXILLARY ARTERY, ITS BRANCHING PATTERN AND ITS VARIATIONS

INTRODUCTION

The axillary artery extends from outer border of the first rib to the lower border of teres major muscle and then continues as brachial artery. It becomes straight when the arm is abducted at 90 degree, concave upwards when the arm is raised above the head ; convex upwards when arm is by the side of the body.

The axillary artery is divided by pectoralis minor muscle into three parts. The first part of axillary artery is above , the second part is beneath and third part is below the muscle.

Relation of the first part of axillary artery :

The axillary artery is related anteriorly to the skin , structures below the skin like platysma , supra clavicular nerves, pectoralis major, clavipectoral fascia and structures piercing it.

Posteriorly it is related to external intercostal nerve, serratus anterior muscle, long thoracic nerve, medial pectoral nerve and the medial cord of brachial plexus.

Laterally, related to posterior cord of brachial plexus . Antero - medially to the axillary vein.

The first part of artery lies within axillary sheath along with axillary vein and brachial plexus.

Relations of second part of axillary artery:

Anterior relations are skin, superficial fascia, pectoralis major and minor muscles. Posterior cord of brachial plexus, and subscapularis muscle are posterior. Medially, medial cord of brachial plexus and medial pectoral nerve and axillary vein. Laterally, there is lateral cord of brachial plexus and coracobrachialis.

In fact the cords of brachial plexus are named posterior, lateral and medial cords because of the relation they bear to second part. They separate it from axillary vein and adjacent structures.

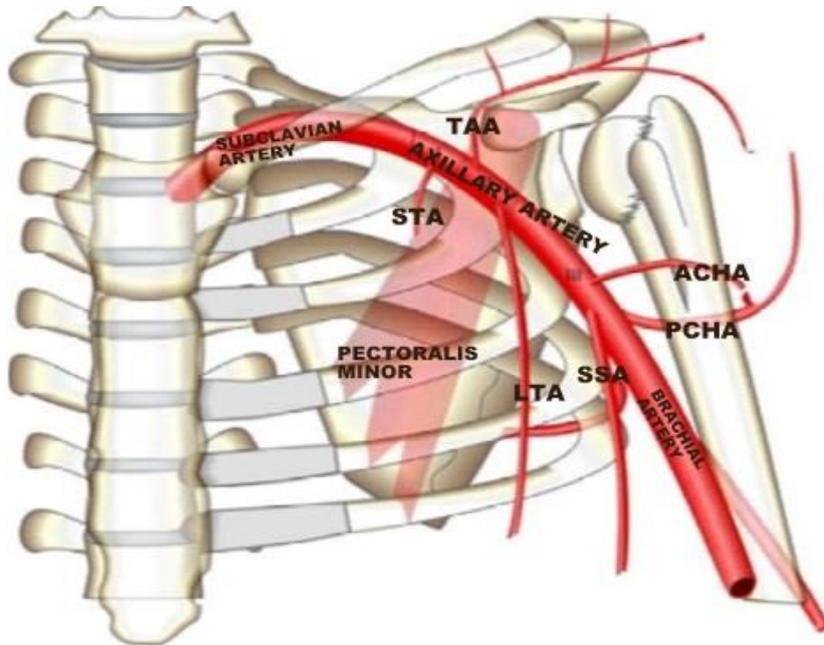
Relations of third part of axillary artery :

Anteriorly, skin, superficial fascia and pectoralis major; Posteriorly, subscapularis, latissimus dorsi and teres major muscles; Laterally, coracobrachialis muscle and medially axillary vein are related to it.

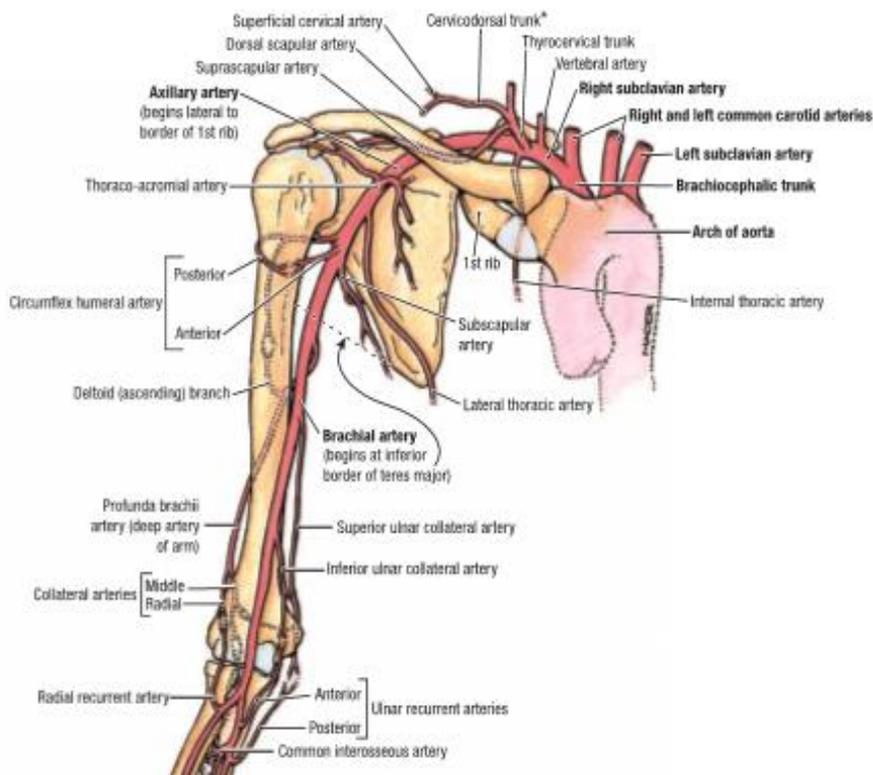
Branches of brachial plexus are related to third part as follows :

Lateral root and trunk of median nerve, and musculocutaneous nerve are in lateral aspect for a short distance. Medial cutaneous nerve of forearm is in between axillary artery and axillary vein anteriorly, ulnar nerve is between these vessels posteriorly in medial aspect. Medial root of median nerve is anterior to third part. Radial and axillary nerves are posterior to it. Axillary nerve is related to it only at the lower border of subscapularis muscle.

PICTURE -1a .Origin and course of axillary artery



PICTURE – 1b :



BRANCHES OF AXILLARY ARTERY :

Axillary artery usually gives off **six** branches ;

- First part gives **one** branch
 - superior thoracic artery.
- Second part gives **two** branches
 - lateral thoracic artery and
 - thoraco-acromial artery.
- Third part gives **three** branches
 - subscapular artery ,
 - anterior circumflex humeral artery, and
 - posterior circumflex humeral artery.

SUPERIOR THORACIC ARTERY :

It is a branch from first part of artery near the lower border of subclavius muscle. It runs medially above pectoralis minor , passes between two pectoral muscles to enter into the thoracic wall to supply.

THORACO – ACROMIAL ARTERY :

It arises as a short branch from second part of axillary artery and covered by pectoralis minor , it encircles the medial border of it and then pierces the clavipectoral fascia , dividing into pectoral, acromial, clavicular and deltoid branches. They supply pectoralis major and minor muscles, skin over the clavipectoral fascia and deltoid muscle.

- i) Pectoral branch is largest branch and runs downward along with lateral pectoral nerve in deep surface of pectoralis major.
- ii) The acromial branch is small vessel, passes under cover of deltoid, it supplies the muscle and then pierces it and ends on the acromion process.
- iii) Clavicular branch ascends between the pectoralis major and clavipectoral fascia. It supplies sternoclavicular joint and subclavius muscle.
- iv) Deltoid branch often arises with acromial branch, crosses pectoralis minor to accompany the cephalic vein in deltopectoral groove and supplies both deltoid and pectoralis major.

LATERAL THORACIC ARTERY :

It originates from second part of axillary artery and follows pectoralis minor. It passes deep to pectoralis major upto fifth intercostal space. It supplies serratus anterior, pectoral muscles, axillary lymph nodes and subscapularis. In females it is larger and has lateral mammary branches which supply the mammary gland. In both males and females, it gives off cutaneous branches to supply the skin overlying pectoral region.

SUBSCAPULAR ARTERY :

It is largest branch of axillary artery arising from third part, at lower border of subscapularis muscle. It accompanies the nerve to latissimus dorsi and supplies adjacent muscles and thoracic wall. At about

4 cm away from origin it divides into circumflex scapular and thoracodorsal arteries.

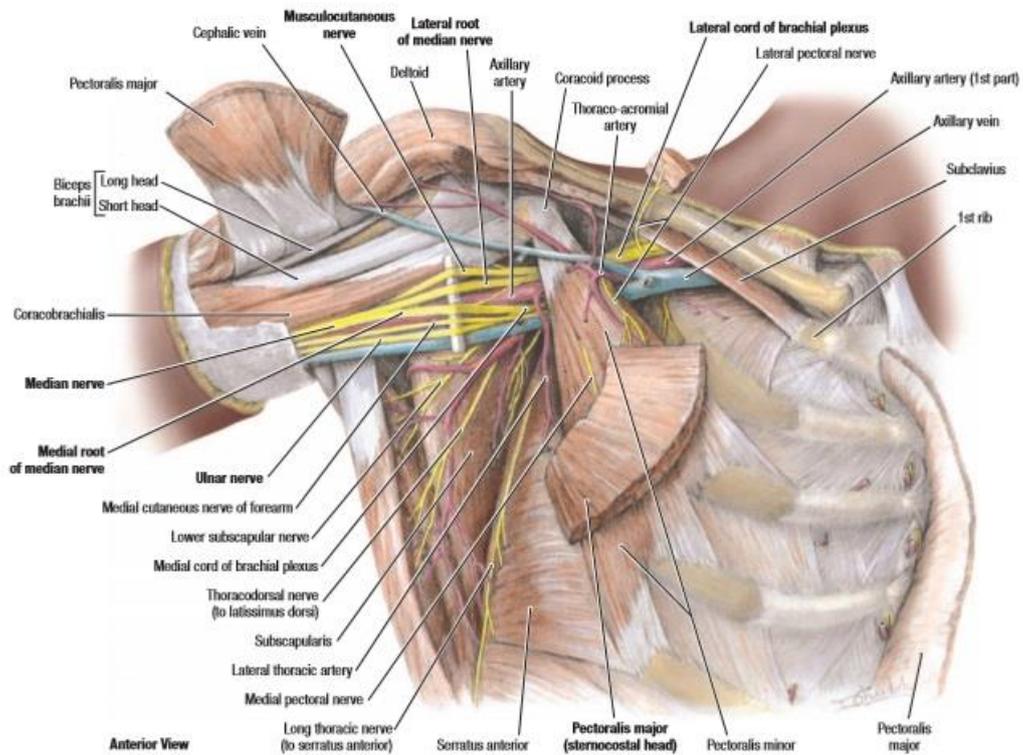
ANTERIOR CIRCUMFLEX HUMERAL ARTERY :

It arises from third part of axillary artery at inferior border of subscapularis . It goes behind the muscles arising from coracoid process anterior to surgical neck of humerus. In the intertubercular sulcus it gives ascending branch to supply head of humerus and shoulder joint and then continues laterally under long head of biceps and deltoid to anastomose with posterior circumflex humeral artery.

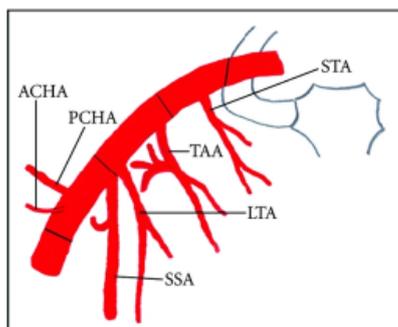
POSTERIOR CIRCUMFLEX HUMERAL ARTERY :

It is bigger than anterior circumflex humeral artery. It arises from third part at the lower border of subscapularis . It passes backwards along with axillary nerve through quadrangular space. It curves around the surgical neck of humerus, and supplies the shoulder joint, deltoid, teres major, teres minor and triceps. It gives a descending branch which anastomoses with deltoid branch of profunda brachii and anterior circumflex humeral arteries , acromial branches of suprascapular and thoraco – acromial arteries.

PICTURE –1c : Course and relations of axillary artery



PICTURE - 2: Branches of axillary artery



- STA - SUPERIOR THORACIC ARTERY
- TAA - THORACO ACROMIAL ARTERY
- LTA - LATERAL THORACIC ARTERY
- SSA - SUBSCAPULAR ARTERY
- ACHA - ANTERIOR CIRCUMFLEX HUMERAL ARTERY
- PCHA - POSTERIOR CIRCUMFLEX HUMERAL ARTERY

AIM OF STUDY

Continuation of subclavian artery is axillary artery, the major artery supplying upper limb. Knowledge of normal and variant arterial anatomy is very important, since it serves as a useful guide for the Surgeons, Anaesthetists, Orthopedicians, Radiologists and Vascular surgeons.

The axillary artery is used for arterial cannulation in cardiac surgery, particularly in aortic aneurysmal dissection and in replacement of ascending and arch of aorta. The lateral mammary branches of axillary artery are used for coronary bypass graft. In plastic surgery, the branches are used to prepare pedicle graft in various reconstructive procedures.

The awareness of possible variations in the branching pattern will reduce the risk of complications like bleeding during surgical procedures. It may help to prevent diagnostic errors in interventional procedures and during interpretation of angiograms.

Direct blow and blunt injury to the shoulder girdle may produce injuries to axillary artery. Anterior dislocation of shoulder joint may stretch the axillary artery. Reduction of shoulder dislocation or fracture of surgical neck of humerus can cause arterial rupture with subsequent thrombosis. Injury to the vessel is increased in patients with atherosclerotic disease.

Improper use of crutches cause thrombosis and may result in axillary arterial aneurysm. These patients may present with ischemic fingers and occlusion of radial and ulnar arteries secondary to thromboembolism.

The axillary artery's third part is occasionally covered by muscular slip called 'axillary arch muscle'. It is derived from upper part of the tendon of latissimus dorsi which is stretching from pectoralis major to latissimus dorsi and teres major like an arch. It is always present during the early foetal life, but it usually atrophied later. Sometimes this may persist and become clinically significant by causing compression over the underlying axillary vessels and nerves. This may cause axillary lymphnode swelling during violent exertion. Alexander Ramsey discovered it in 1975, and well studied by Langer so it is otherwise called Langer's muscle, but more suitable name is Ramsay's muscle.

Since the axillary artery and its branches are involved in so many important procedures which are mentioned above, the study of axillary artery and its branching pattern along with its variations is selected for analysis under the following parameters:

1. Length and extent of axillary artery.
2. Course in relation with axillary vein, brachial plexus and adjacent structures to each part of axillary artery.
3. Number of named branches arising from it.
4. Origin of superior thoracic artery.
5. Origin of thoraco acromial artery.
6. Origin of lateral thoracic artery.
7. Origin of subscapular artery.
8. Origin of anterior circumflex humeral artery.
9. Origin of posterior circumflex humeral artery.

EMBRYOLOGICAL ANATOMY

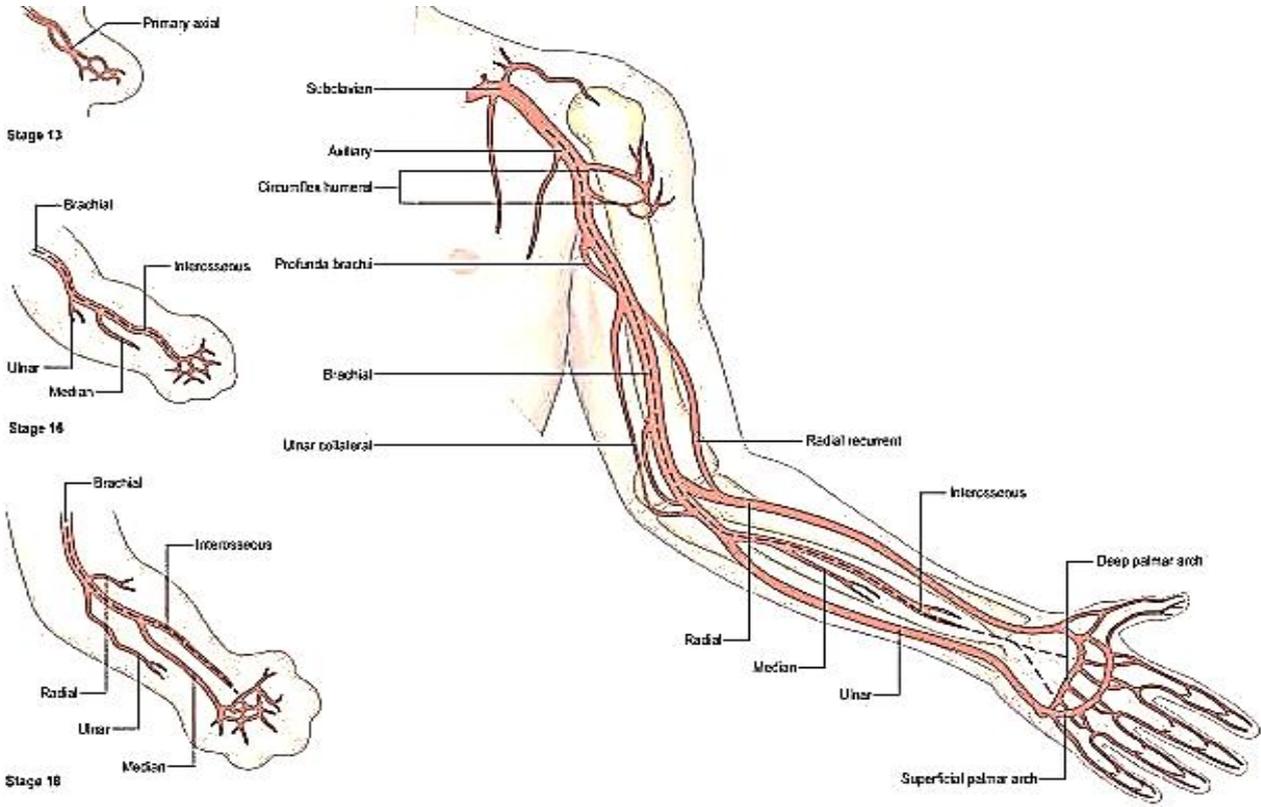
The upper limb buds are formed during the fourth week of intra-uterine life. Many small arteries arise from the dorsal aortae and pass through the limb buds to form capillary network. Out of which only one arterial trunk remains as the axis artery of the upper limb. It represents a branch of seventh cervical intersegmental artery.

Axis artery grows along ventral axial line and runs deeper to flexor muscle mass. It terminates into superficial and deep capillary plexuses in developing hand.

The proximal part of axis artery forms axillary artery and brachial artery. The distal part of artery gives rise to anterior interosseous artery and deep palmar arch. The radial and ulnar arteries appear later.

The radial artery arises proximal to ulnar artery. The ulnar artery joins with the capillary plexus of palm, which becomes superficial palmar arch. Median artery regresses or decreases in size. In the middle of the arm, the axis artery gives proximal radial artery which joins with a branch from axis artery to form permanent radial artery. Proximal part of radial artery above this level disappears. The radial artery joins with deep capillary plexus of hand and forms the deep palmar arch.

PICTURE – 3: The development of arteries of upperlimb.



REVIEW OF LITERATURE

I. EXTENT AND LENGTH OF AXILLARY ARTERY :

(i). Extent of axillary artery:

Sir Henry Gray(1858) stated that “the axillary artery is the continuation of subclavian artery. It begins at the outer border of first rib and ends at the inferior border of teres major where it becomes brachial artery.”

Cunningham’s (1902) quoted that “the axillary artery begins as the continuation of subclavian artery at the outer border of first rib at the apex of axilla to the lower border of teres major where it becomes the brachial artery.”

Henry Hollinshed (1969) stated that “the subclavian artery becomes axillary artery where it crosses the first rib and leaves the axilla at the lower border of teres major muscle as brachial artery.”

T.S. Ranganathan (1982) observed that “the axillary artery starts at the outer border of the first rib and ends at the lower border of teres major.”

Asim Kumar Datta (1992) quoted that “axillary artery begins as a continuation of third part of subclavian artery at the outer border of first rib and ends at the lower border of teres major where it continues as the brachial artery.”

I. B. Singh (1996) stated that “axillary artery is the continuation of subclavian artery. It begins at the outer border of first rib and ends at the lower border of teres major as brachial artery.”

Richard S. Snell (2004) observed that “the axillary artery begins at the lateral border of first rib as the continuation of subclavian artery and ends at lower border of teres major muscle as brachial artery.”

Chummy S. Sinnatamby (2011) stated that “the axillary artery commences at the outer border of the first rib and enters the apex of axilla by passing over the first digitation of serratus anterior behind the midpoint of clavicle. At the lower border of teres major it becomes brachial artery.”

Rajesh Astik (2012) observed, “the axillary artery extends at outer border of first rib to lower border of teres major muscle that continues distally as brachial artery.”

Raju Jetti (2013) stated that “the axillary artery is the continuation of subclavian artery. It begins at outer border of the first rib and ends at the lower border of the teres major muscle as the brachial artery.”

Sudeshna Majumdar (2013) observed that “the axillary begins at outer border of the first rib and ends at the lower border of the teres major muscle.”

Jain S R (2013) stated that “the axillary artery begins at the outer border of the first rib as a continuation of subclavian artery and extends upto the lower border of the teres major and then continues as brachial artery.”

Vatsala A R et al (2014) stated that “the axillary artery is the continuation of the subclavian artery. It commences at the outer border of the first rib and ends at the lower border of teres major muscle where it takes the name of brachial artery.”

ii).Length of the axillary artery :

Mohammed Ahmad Abdulla (2007) in his study used the following method for measuring the length of axillary artery . The upperlimb is kept in abducted position, and the following two points were taken :

a). Midpoint of width of axillary artery where it crosses outer border of first rib.

b). Midpoint of width , where it crosses lower border of teres major muscle.

The axillary artery was found to have the average length of 10.7 cm , with the range of 7 - 13.6 cm in a study of 50 upper limbs as follows:

Table 1. Length of the axillary artery – M.A.Abdalla study :

Length in centimetre	No. of specimens	Percentage (%)
➤11 cm	7	14
10-11 cm	24	48
9 - 10 cm	9	18
8 - 9 cm	7	14
7 - 8 cm	3	6

Sudeshna Majumdar (2013) in his study of 140 upper limbs , observed that commonest length of axillary artery was 9.5 cm , with average length as 10.15 cm, and the range was 8 - 13.3 cm

II. COURSE IN RELATION WITH AXILLARY VEIN , BRACHIAL PLEXUS AND ADJACENT STRUCTURES TO EACH PART OF AXILLARY ARTERY.

According to Sir Henry Gray (1858), “ the pectoralis minor muscle crosses the axillary artery and divides it into three parts which are proximal, posterior and distal to it.”

Relations of first part of axillary artery are :

“ Anteriorly , the skin, superficial fascia, platysma , supraclavicular nerves, deep fascia, pectoralis major and clavipectoral fascia and structures piercing it . Posteriorly , the first intercostal space , external intercostal muscle, upper two digitations of serratus anterior, long thoracic nerve, medial pectoral nerve , and medial cord of brachial plexus are present. Laterally, the posterior cord of brachial plexus and antero-medially , it is related to axillary vein .”

Relations of second part of axillary artery are :

“Anteriorly, skin, superficial and deep fascia , pectoralis major and minor are related to it; posteriorly the posterior cord of brachial plexus ; medially , the axillary vein which in turn is separated by medial cord of brachial plexus and medial pectoral nerve and laterally , the lateral cord of brachial plexus which separates the artery from coracobrachialis .”

Relations of the third part of axillary artery are :

“ Anteriorly the skin , superficial fascia, and pectoralis major; posteriorly subscapularis , tendon of latissimus dorsi and teres major ;

Laterally coracobrachialis and medially axillary vein are related to this part of artery. The branches of brachial plexus are arranged as follows: Laterally, the lateral root, then the trunk of median nerve and musculocutaneous nerve; medially, the medial cutaneous nerve of forearm is in anterior aspect and ulnar nerve in posterior aspect in between the axillary artery and vein; anteriorly, medial root of median nerve and posteriorly, the radial and axillary nerves are related to it.”

G.J. Romanes (1964) stated that “first part of axillary artery is enclosed along with axillary vein and cords of brachial plexus within the axillary sheath derived from prolongation of the deep cervical fascia. The sheath is related to superior slip of serratus anterior, first intercostal space and nerve to serratus anterior, posteriorly. Medial cord of brachial plexus and medial pectoral nerve lie behind the artery within the sheath. Anteriorly it is related to clavipectoral fascia, cephalic vein, branches of lateral pectoral nerve, branches of thoraco-acromial artery, pectoralis major and loop of communication between lateral and medial pectoral nerves. Laterally and above, it is related to the lateral and posterior cords of brachial plexus and lateral pectoral nerve. Medially and below it is the axillary vein and the medial pectoral nerve lies in between.”

“The second part of axillary artery is related to pectoralis minor and major muscles anteriorly; the posterior cord of brachial plexus and subscapularis posteriorly; Laterally lies the lateral cord and medially the medial cord of brachial plexus intervenes between it and axillary vein.”

“The third part of axillary artery is related to subscapularis, latissimus dorsi and teres major, axillary and radial nerves posteriorly; the upper half of the axillary artery lies under pectoralis major muscle, lower half is covered by skin and superficial fascia then it is crossed by

medial root of median nerve, anteriorly. Laterally by median nerve, musculocutaneous nerve, and coracobrachialis. Medially it is related to axillary vein which is separated by medial cutaneous nerve of forearm in front and ulnar nerve behind.”

According to Hollinshead (1969) “the axillary artery is the central structure of axilla. It passes behind the pectoralis minor which forms the basis of dividing it into three parts. First part lies before the muscle, second part lies behind it and third part beyond the muscle. The cords of brachial plexus are named posterior, lateral and medial cords because of their relation to the second part of the axillary artery.”

“The first part of the artery lies on the upper digitation of serratus anterior, the medial cord of the brachial plexus lie in between the artery and muscle. The lateral and posterior cords are above the artery.”

“The second part lies on the subscapularis muscle and surrounded by the cords of brachial plexus as indicated by their names.”

“The third part is related to subscapularis and teres major posteriorly. It is surrounded by the major nerves of the upper limb. Anteriorly the artery is accompanied by axillary vein and intervened by medial cord of brachial plexus and its branches.”

According to Asim Kumar Datta (2010), “the pectoralis minor crosses in front of the axillary artery and divides it into three parts. The first part proximal to the muscle, second part behind and the third part distal to the muscle and having the following relations:

The first part of axillary artery is related to the skin, superficial fascia, supra clavicular nerves, pectoralis major muscle, loop of

communication between the medial and lateral pectoral nerves, cephalic and thoraco-acromial veins anteriorly. The first two digitations of serratus anterior, long thoracic nerve, medial cord of brachial plexus with medial pectoral nerve posteriorly. Laterally, lateral and posterior cords of brachial plexus and medially, the axillary vein.

The second part of axillary artery is related to the skin, superficial fascia, pectoralis major and minor anteriorly; Posterior cord of brachial plexus and subscapularis posteriorly; lateral cord is lateral and medial cord of brachial plexus is medial.

Relations of the third part of axillary artery:

Anteriorly: pectoralis major, medial root of median nerve crosses from medial to lateral in the upper part, skin and fascia in the lower part.

Posteriorly: Subscapularis, latissimus dorsi, teres major muscles, axillary and radial nerves.

Laterally: lateral root of median nerve, musculocutaneous nerve, and coracobrachialis.

Medially: Axillary vein, medial cutaneous nerve of forearm in front and ulnar nerve behind in between the artery and axillary vein.”

Chummy S. Sinnatamby (2011) quoted that “the axillary artery is conveniently divided into three parts by pectoralis minor, which crosses in front of it. The first part before, the second part behind, and the third part below the pectoralis minor.

The lateral and posterior cords of brachial plexus are superolateral, medial cord of brachial plexus is posterior and a loop

connecting the lateral and medial pectoral nerves is anterior to the first part of axillary artery. The second part has the three cords of the plexus lateral, posterior and medial to it as their names indicate.

The third part has the branches from the cords of brachial plexus, and having the similar relation to it as their parent cords. The medial root of median nerve crosses in front of it to join with the lateral root and forms the median nerve, which lie lateral to the artery. The axillary vein lies anteromedial to all the three part of the artery.”

Richard S. Snell (2012) quoted that “ the pectoralis minor muscle crosses in front of the axillary artery and divides it into three parts.

The first part of the artery has the following relations :

Anteriorly : skin, cephalic vein and pectoralis major muscle .

Posteriorly : long thoracic nerve of bell .

Laterally : the three cords of brachial plexus, and

medially : the axillary vein.

The second part lies behind the pectoralis minor muscle having the following relations:

Anteriorly: skin , pectoralis major and minor.

Posteriorly : posterior cord of brachial plexus, subscapularis muscle and shoulder joint.

Laterally : lateral cord of brachial plexus and
medially : medial cord of brachial plexus and the
axillary vein.

The third part of axillary artery extends from the lower border of the pectoralis minor to the lower border of teres major. It is related to the following structures :

Anteriorly, pectoralis major and medial root of median nerve.

Posteriorly, subscapularis , latissimus dorsi and teres major muscles, radial and axillary nerves.

Laterally, coracobrachialis , biceps brachii , lateral root of median nerve and musculocutaneous nerve.

Medially, ulnar nerve, axillary vein and medial cutaneous nerve of arm.”

Variation in the course of brachial plexus :

N. Sathyanarayana (2009) observed that “ all the three cords namely lateral, medial and posterior cords of brachial plexus were lateral to the third part of axillary artery. It was also noted that they maintained the same relations with the first and second parts of axillary artery. The formation of brachial plexus and branches of three cords of brachial plexus were found to be normal . The ulnar nerve arose from medial cord at a lower level than usual, overlapped by the junction of medial and lateral roots of median nerve.”

III .NUMBER OF NAMED BRANCHES ARISING FROM THE AXILLARY ARTERY.

Degaris and Swartley (1928) in their study of 512 upper limbs among White and Negro stocks, mentioned that “the axillary artery has 511 branches. And the commonest number is 8 against the textbook document of 6 branches.”

Donald F. Huelke (1959) observed “the number of branches of axillary artery in 150 upperlimb specimens ; the number ranges from 2- 7 ” the results are as follows : (Table-2)

Table 2: Number of named branches from the axillary artery – Huelke’s study

Number of branches	Percentage (%)
7	26.7
6	37.3
5	24.6
4	8.7
3	2.0
2	0.7

G. J .Romanes (1964) quoted that “the named branches of axillary artery is six in number, namely highest thoracic artery from the first part. Thoraco - acromial and lateral thoracic arteries from the second part, and subscapular artery, posterior circumflex humeral and anterior circumflex humeral arteries from third part of axillary artery.”

According to Hollinshead(1969), “the axillary artery is usually described as giving off six branches ; one from the first part, two from the second and three from the third part of the artery.”

John E. Skandalakis (2004) quoted that “ the branches from the axillary artery are six in number ; one branch from the first part, two from the second part and three branches from the third part of the axillary artery.”

Charles A Rockwood (2004) quoted that “ the usual number of branches of each of the three sections corresponds to the name of the parts of axillary artery . The first part has one branch , the second part has two branches, and third part has three branches.”

Mohammad A. Abdalla (2007) in his study of 50 upperlimbs observed that the commonest number being five branches . And the branches encountered during his study was as follows : (Table -3).

Table :3. Number of named branches from axillary artery – M. A. Abdalla study

Number of named branches	Number of specimens (50)	Percentage (%)
5	19	38
6	18	36
4	5	10
3	2	4
7	2	4
8	2	4
2	1	2
9	1	2

According to Sir Henry Gray (1858), “ the branches of the axillary artery are six in number. They are: 1. Superior thoracic artery 2.

Thoraco - acromial artery 3. Lateral thoracic artery 4. Subscapular artery
5. Anterior circumflex humeral artery and 6. Posterior circumflex humeral
artery.”

Ramesh Rao (2008) stated that “the axillary artery is usually described as having 6 branches. The first part gives superior thoracic artery. The second part of the artery gives lateral thoracic artery and thoraco-acromial artery. And the third part gives off subscapular artery, anterior circumflex humeral artery and posterior circumflex humeral artery.”

Chummy S.Sinnatamby(2011) stated that “the named branches of axillary artery are six in number, from the first part one branch, from the second part two and from the third part, three branches.”

Sudeshna Majumdar (2013) observed that “the number of branches of axillary artery varied from 5- 7 and the commonest number being 6.”

Mohanty S. R (2013) quoted that “the axillary artery usually gives off six branches. Instead the number of branches varies from 5- 11, because of two or more arteries often arise together or two branches of the artery may arise from the common trunk.”

IV. ORIGIN OF SUPERIOR THORACIC ARTERY :

Sir Henry Gray (1858) quoted that “the superior thoracic artery is a small vessel which arises from the first part of the axillary artery. It arises near the lower border of subscapularis. Occasionally it arises from the thoraco-acromial artery.”

Degaris and Swartley (1928) observed in their study of 512 upperlimb specimens that “the superior thoracic artery arises from first part of axillary artery in 96.9% , and from thoraco - acromial artery in 3.1%.”

Adachi (1928) reported that “the superior thoracic artery arose directly from the axillary artery in 70% of cases and it originated from other arteries , mostly from the thoraco-acromial artery in 30% of cases.”

Donald F. Heulke (1959) observed that “the superior thoracic artery present usually as a branch of first part of axillary artery (97.8 %). It rarely originates from the terminal part of subclavian artery, or from second part of axillary artery or from the thoraco-acromial artery or lateral thoracic artery.”

G. J. Romanes (1964) stated that “the highest (superior) thoracic artery is small and it arises from the first part of the axillary artery.”

Hollinshead (1969) stated that “the first part of axillary artery gives off the superior thoracic artery.”

Charles A. Rockwood (2004) quoted that “the first part of axillary artery gives off only the superior thoracic artery , which supplies the first, second and sometimes the third intercostal spaces.”

John E. Skandalakis (2004) quoted that “the superior thoracic artery arises from the deep side of axillary artery, on the surface of the thoracic wall, slightly distal to the passage of axillary artery beneath the clavicle.”

Mohammad Ahmad Abdalla (2007) in his study of 50 upperlimbs observed that “the superior thoracic artery arises from the first

part of axillary artery in 82% of upperlimbs, from third part of subclavian artery in 6%, while in 10% of the limbs it was absent.”

Table 4:ORIGIN OF SUPERIOR THORACIC ARTERY

Origin	Huelke (%)	Degaris&Swartly (%)	Adachi(%)
Axillary artery			70
I part	86.6	96.9	-
II part	2.2	-	-
Subclavian artery	5.6	-	-
Thoracoacromial artery	1.7	3.1	30
Lateral thoracic artery	1.7	-	-
Absent	2.2	-	-

Chummy S .Sinnatamby (2011) quoted that “ the superior thoracic artery arises from the first part of the axillary artery.”

Richard S. Snell (2012) observed that “ the highest thoracic artery is a small branch arising from the first part of the axillary artery.”

Sudeshna Majumdar et al (2013) observed in his study of 140 upper limbs, “ the superior thoracic artery was constantly arising from the first part of the axillary artery.”

V. ORIGIN OF THORACOACROMIAL ARTERY

Sir Henry Gray (1858) “ the thoraco acromial artery is a short branch which arises from the second part of axillary artery . It is overlapped by

pectoralis minor, then it encircles its medial border and pierces the clavipectoral fascia to divide into pectoral, acromial, clavicular and deltoid branches.”

Degarís and Swartley (1928) found that “the thoraco-acromial artery arose most frequently from the first part of axillary artery only and in 12.1% of cases it arose from the second part of the artery.”

Donald F. Heulke (1959) observed that “the thoraco-acromial artery was a branch of the second part of the axillary artery and it usually arises near the medial border of the pectoralis minor.”

G.J.Romanes (1964) stated that “the thoraco - acromial artery arising near the upper border of pectoralis minor from the second part the axillary artery . It is a short , wide trunk, which pierces the clavipectoral fascia and ends by dividing into four terminal branches ,the acromial , clavicular, deltoid, and pectoral.”

Hollinshead (1969) quoted that “the short thoraco- acromial artery originates close to the upper border of pectoralis minor from the axillary artery. It runs forward to pierce the clavipectoral fascia and divides into clavicular, pectoral, acromial and deltoid branches.”

Charles A. Rockwood (2004) quoted that “the first branch to be given off from the second part of the axillary artery is the thoracoacromial artery. It pierces the clavipectoral fascia and then gives off four terminal branches. It has two large branches namely deltoid and pectoral and two small branches, the acromial and clavicular.”

Mohammad Ahmad Abdalla (2007) observed in his study of 50 upper limbs that “the thoraco acromial artery was a constant branch found in

98% of cases. In 88% of cases it arose from second part of axillary artery, 10 % of cases from first part of the artery and in 2% it was absent.”

Chummy S.Sinnatamby (2012) stated that “ the thoracoacromial artery arise from the second part of axillary artery . It skirts the upper border of pectoralis minor to pierce the clavipectoral fascia , often separately by its four terminal branches , clavicular, deltoid, acromial and pectoral. These branches radiate at right angles from each other in directions indicated by their names.”

Sudeshna Majumdar et al (2013) observed that “ the thoraco acromial artery is a short branch which arises from the second part of axillary artery. It is overlapped by pectoralis minor muscle. It has the following branches; deltoid, pectoral, acromial and clavicular.”

Table 5: Comparision of origin of thoraco – acromial artery.

Origin	Huelke (%)	Degarisswartley (%)	Mohammad A.Abdalla (%)
Axillary artery			
I part	29.8	85.7	10
II part	68.5	12.1	88
III part	-	1.2	-
Brachial artery	0.6	-	-
Absent	1.1	1.0	2

VI. ORIGIN OF LATERAL THORACIC ARTERY.

Donald F. Heulke (1959) observed that “ the lateral thoracic artery arose most frequently from the second part of axillary artery and was more often a direct branch of the axillary artery.”

G.J.Romanes (1964) quoted that “ the lateral thoracic artery arises from the second part of axillary artery. It descends along the lateral border of the pectoralis minor . It supplies the adjacent muscles and sends lateral mammary branches to mammary gland.”

Hollinshead (1969) observed that “ the lateral thoracic artery arises from the second part of axillary artery , close to the lower border of pectoralis minor. It runs downward over the serratus anterior muscle. It was known as “External mammary” artery because through its lateral mammary branches, it becomes the chief source of blood supply to the breast.”

Charles A. Rockwood (2004) quoted that “ the second branch that arises from the second part of axillary artery is the lateral thoracic artery. It has variable origin and in about 25% of cases it takes origin from subscapular artery.”

According to Gray’s text book of anatomy - Susan Standring (2008), “ the lateral thoracic artery arises from the second part of axillary artery , runs along the lateral border of pectoralis minor and passes deep to pectoralis major upto the 5th intercostal space . In females it is large and has lateral mammary branches, which curves around the lateral border of pectoralis major to the breast.”

Chummy S.Sinnatamby (2011) stated that “ the lateral thoracic artery, branches from the second part of the axillary artery . It follows the

lower border of pectoralis minor and it is the important contributor of blood supply to the mammary gland in case of female.”

Table 6: Comparison of origin of lateral thoracic artery

Origin		Huelke (%)	Degaris &swartley(%)	Adachi (%)	Pelligirini (%)
First Part of axillary artery	directly	10.7			
	TAA	2.8	36.5		
	STA				1.0
Second part of axillary artery	directly	52.2	55.9	40	70.2
	TAA	3.9	6.4		14.4
	SCA or TDA	14.1	1.2	60	7.7
Third part of axillary artery	directly	1.7	-	-	-
	SCA or TDA	14.6	-	-	1.0
Absent		-	-	-	5.8

Mohammad Ahmad Abdalla (2007) observed that “ the lateral thoracic artery arises from the second part of axillary artery” in most of the upperlimbs in his study of 50 upperlimbs . The results are as follows:

Table 7: Origin of lateral thoracic artery – M.A.Abdalla study

Sl.no	ORIGIN	PERCENTAGE (%)
1	I PART OF AA	6
2	II PART OF AA	92
	Directly	82
	Common trunk	
	- LTA & SCA	6
	- LTA ,SCA & PCHA	4
3	ABSENT	2

Sudeshna Majumdar et al (2013) in the study of 140 upperlimbs observed that “the lateral thoracic artery was the constant branch arising from the second part of axillary artery.”

Mohanty S.R et al (2013) observed “a common trunk origin of lateral thoracic artery, along with subscapular and posterior circumflex humeral arteries, all these from the second part of axillary artery in 1.7% of specimens.”

Table : 8 Origin of lateral thoracic artery

Origin of LTA	Gray's (%)	C.S.Sinnatamby (%)	Sudeshna Majumdar (%)
From I part	-	-	-
II part	100	100	100
III part	-	-	-

VII. ORIGIN OF SUBSCPULAR ARTERY

Sir Henry Gray (1858) quoted that “the subscapular artery is the largest branch of the axillary artery. It arises from the third part of axillary artery at the distal border of subscapularis . At 4 centimetre from its origin it divides into circumflex scapular and thoracodorsal arteries.”

Donald F. Heulke (1959) observed that “the subscapular artery was the largest branch of axillary artery and being the common stem for the circumflex scapular and thoracodorsal arteries ” in all specimens of his study.

G.J.Romanes (1964) quoted that “the subscapular artery is the largest branch of axillary artery, arising from the third part opposite to the lower border of subscapularis. It descends along the lower border of that muscle, gives off the circumflex scapular artery and continues as thoracodorsal artery.”

Hollinshead (1969) stated that “the subscapular artery is the largest branch of the axillary artery. It passes backward to descend on the subscapularis and soon divides into two trunks . The circumflex scapular artery that passes around the lateral border of scapula continues downward along the muscles of posterior axillary fold as thoracodorsal artery.”

Charles A Rockwood (2004) quoted that “the largest branch of axillary artery , the subscapular artery takes origin from the third part of axillary artery. It gives off the circumflex scapular artery and then it continues as the thoraco dorsal artery.”

Mohammad Ahmad Abdalla (2007) observed that “the subscapular artery emanating from third part of axillary artery as a direct branch in 58% , common trunk origin with posterior circumflex humeral artery in 18 % , or with profunda brachii in 2% or with deep brachial artery in 2% of cases. It arises from the second part of the artery directly in 6%, in common with lateral thoracic artery in 6% or posterior circumflex humeral artery in 4% and it was absent in 4%.”

Table 9: Mohammad A. Abdalla study - Origin of Subscapular artery

II Part of axillary artery		III part of axillary artery				Absent (%)	
Direct branch (%)	Common trunk (%)	Direct (%)	Common trunk (%)				
	LTA	PCHA		PCHA	PBA	DBA	
6	6	4	58	18	2	2	4

Chummy S. Sinnatamby (2011) quoted that “the subscapular artery arises from the third part of axillary artery and it is the largest branch of the axillary artery, runs downwards on the posterior axillary wall and gives off a dorsal branch, the circumflex scapular artery. Distal to this, the subscapular artery changes its name to thoraco dorsal artery.”

VIII . ORIGIN OF ANTERIOR CIRUMFLEX HUMERAL ARTERY

Sir Henry Gray (1858) stated that the anterior circumflex humeral artery arises from lateral side of axillary artery at the distal border of subscapularis. It runs horizontally behind coracobrachialis and short head of biceps, anterior to the surgical neck of humerus. It continues laterally under the long head of biceps and deltoid muscles and then it anastomoses with the posterior circumflex humeral artery.

Donald F.Heulke (1959) stated that the anterior circumflex humeral artery was more frequently a direct branch from the third part of the axillary artery (80.3%). It may arise commonly with posterior circumflex humeral artery (11.2%), or directly from deep brachial artery in 1.7%, or from others in 0.6% and it was absent in 6.2%.

G.J.Romanes (1964) stated that “the anterior circumflex humeral artery is a small branch of the third part of axillary artery and passes deep to coracobrachialis and between the two heads of biceps brachii around the surgical neck of humerus and ends by anastomosing with posterior circumflex humeral artery.”

Charles A. Rockwood (2004) quoted that “the anterior circumflex humeral artery is smaller than the posterior circumflex humeral artery. It is

an important landmark , because it travels laterally at the inferior border of the subscapularis tendon, where it marks the border between the upper tendinous insertion and lower muscular insertion of subscapularis.”

Mohammad Ahmad Abdalla (2007) observed that “ the artery arises from the third part of axillary artery in most of the cases either directly or in common with posterior circumflex humeral artery. In few cases it arises from profunda brachii or brachial artery if they arise from the third part of axillary artery.”

Chummy S. Sinnatamby (2011) stated that the anterior circumflex humeral artery arises from the third part of axillary artery runs deep to coracobrachialis and both the heads of biceps , passes around the surgical neck of humerus to anastomose with the posterior circumflex humeral artery.

VIII. ORIGIN OF POSTERIOR CIRCUMFLEX HUMERAL ARTERY

Sir Henry Gray(1858) quoted that “ the posterior circumflex humeral artery is larger than the anterior circumflex humeral artery . It branches from the third part of axillary artery at the distal border of subscapularis and runs backward along with axillary nerve through quadrangular space , through its descending branch it anastomoses with the anterior circumflex humeral artery.”

Donald F.Huelke (1959) observed that “ the posterior circumflex humeral artery arose from the third part of axillary artery , usually as an independent branch and in few cases it branched from the subscapular artery.”

G.J.Romanes (1964) stated that “the posterior circumflex humeral artery arises from third part of axillary artery. It passes backwards, accompanied by axillary nerve through the quadrangular space. It runs around the surgical neck of humerus under cover of the deltoid and anastomoses with anterior circumflex humeral artery and thoraco acromial artery.”

Hollinshead (1969) stated that “the posterior circumflex humeral artery arises independently or by a common trunk from the third part of axillary artery. It skirts the surgical neck around its posterior aspect, where it is joined by the axillary nerve, both the structures run under the deltoid muscle and supplies it. Both anterior and posterior circumflex humeral arteries anastomose around the humerus.”

Charles A. Rockwood (2004) quoted that “the posterior circumflex humeral artery comes off posteriorly from the third part of axillary artery and descends into the quadrangular space with axillary nerve.”

Mohammad Ahmad Abdalla (2007) observed that “the posterior circumflex humeral artery directly arises from the third part of axillary artery in most of the cases. It originates from a common stem with subscapular artery or anterior circumflex scapular artery or profunda brachii and brachial artery if they emanated from the third part of the artery. It also arises from a common stem along with subscapular and lateral thoracic arteries from the second part of axillary artery in few specimens.”

Chummy S. Sinnatamby (2011) quoted that “the posterior circumflex humeral artery is much larger than the anterior circumflex humeral artery and is a branch of the third part of axillary artery. It passes through the quadrangular space accompanied by the axillary nerve.”

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy and Department of Radiology , Government Stanley Medical College and Hospital , Chennai during the period of July 2014 to September 2016 .

MATERIALS USED :

- ❖ 40 upperlimb specimens from 20 embalmed adult human cadavers including 15 males and 5 females were studied in the Department of Anatomy , Stanley medical college , by conventional dissection method.
- ❖ 10 upper limb radiological images , Computed Tomogram - angiographic images of the patients were taken for this study in the Department of Radiology, Stanley Medical Collage, Chennai after getting proper consent from the patients.

METHODS USED :

- A). Conventional dissection method
- B). Radiological method

A). CONVENTIONAL DISSECTION METHOD :

The dissection was carried out carefully according to the

Cunningham's practical manual to expose the axillary artery and its branches . The skin incisions were made, skin, superficial fascia , deep

fascia over pectoralis major and deltoid were reflected. The attachments of muscles were defined. The clavicular head of pectoralis major below the clavicle was cut and reflected towards its insertion.

The branches of lateral pectoral nerve and thoracoacromial artery pierce the clavipectoral fascia to enter into it. The pectoralis major was cut across and reflected. The clavipectoral fascia covering the pectoralis minor muscle was removed. The origin of thoracoacromial artery was noted. The loose connective tissue, fat and lymph nodes were removed to expose the axilla and its contents. The coracobrachialis and short head of biceps were exposed. The axillary artery and the median nerve lie medial to these muscles, and the musculocutaneous nerve enters into the deep surface of the coracobrachialis.

Medial to the axillary artery is the axillary vein with medial cutaneous nerve of forearm and the ulnar nerve. The lateral thoracic artery and the long thoracic nerve descend over the serratus anterior to supply it. The smaller tributaries of the axillary vein were removed to get clear view of the nerves in relation with the artery. The origin of all the branches of axillary artery and variations in its branching patterns were observed. The relation of the axillary artery with the axillary vein and brachial plexus were noted and the photographs were taken.

The lengths of all the 40 axillary arteries were measured by keeping the upper limbs in abduction. The length of each artery was measured between the midpoint of the width of the axillary artery from the outer border of the first rib to the midpoint of the width of the artery at the lower border of teres major. After placing ties at these two points, measurements were taken by using the inch tape.

RADIOLOGICAL METHOD :

By the use of adult clinical 64 slice Computed Tomogram – angiography.

Computed Tomogram – angiographic images of upper limb of 10 patients were taken for the study in the Department of Radiology at Government Stanley Medical College, Chennai. The patients who underwent the procedure for various vascular problems in the upper limb were selected without revealing their names and identity ,after getting consent from them . Their Computed tomogram - angiographic images were collected for study.

The Computed Tomogram- angiography combines conventional scan with angiography to provide best images of blood vessels . It is the special type of X-ray machine with movable bed which will move into the scan tunnel with the patient lying over the bed and the images were taken. The whole body scan can be obtained within 30 seconds. It can capture the high resolution multi-dimentional images from different angles within few seconds.

The upper limb Computed Tomogram-angiography is performed with intravenous injection of 100 ml of non-ionic contrast medium – Omnipaque , followed by 40 ml saline flush which is given just before the patient is sent into the scan tunnel . Then the images are taken rapidly , reconstructed by the computer in three dimentional view for reading.

LEGENDS

AA - AXILLARY ARTERY

ACHA – ANTERIOR CIRCUMFLEX HUMERAL ARTERY

AV – AXILLARY VEIN

BA – BRACHIAL ARTERY

BP- BRACHIAL PLEXUS

CB- CORACOBRACHIALIS

CT- COMMON TRUNK

DBA – DEEP BRACHIAL ARTERY

LC- LATERAL CORD

LTA – LATERAL THORACIC ARTERY

MC-MEDIAL CORD

MCN – MUSCULOCUTANEOUS NERVE

MCNA – MEDIAL CUTANEOUS NERVE OF ARM

MCNFA- MEDIAL CUTANEOUS NERVE OF FOREAM

MN – MEDIAN NERVE

PCHA – POSERIOR CIRCUMFLEX HUMERAL ARTERY

RN – RADIAL NERVE

STA – SUPERIOR THORACIC ARTERY

SSA / SCA - SUBSCAPULAR ARTERY

TAA –THORACO ACROMIAL ARTERY

UN – ULNAR NERVE

OBSERVATION

The axillary artery in 40 upper limb specimens preserved in formalin are taken for the study. By the conventional dissection method all the specimens are studied in detail and the findings are as follows.

I. LENGTH AND EXTENT OF AXILLARY ARTERY

A. In all the 40 specimens the length of the axillary artery was measured and tabulated as follows: **(PICTURE:4)**

Table : 10 . Length of axillary artery.

Length of AA	No.of specimens	Percentage
➤ 11 cm	5	12.5 %
10 – 11 cm	20	50 %
9 - 10 cm	9	22.5 %
8 – 9 cm	6	15 %

The length of axillary artery ranges from 8.9 – 11.5 cm,

The most common length of axillary artery is 11 cm,

The average length of axillary artery is 10.45cm.

PICTURE – 4: Length of axillary artery



PICTURE – 5 (a) : Relations of axillary artery

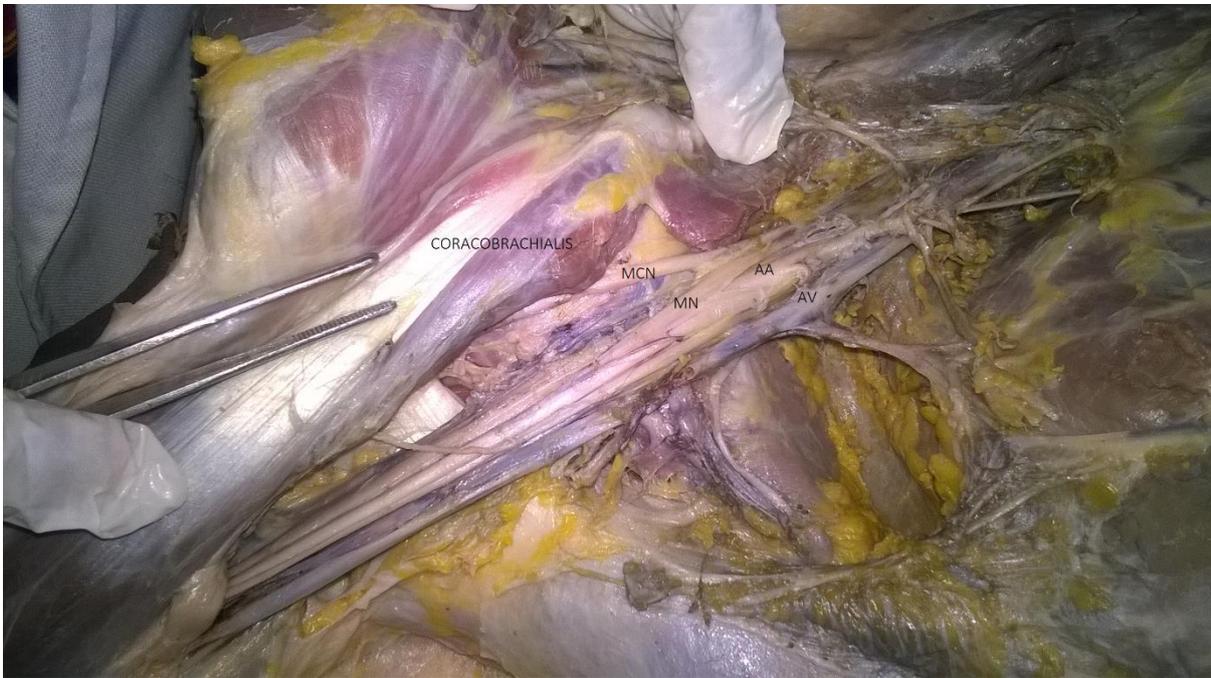
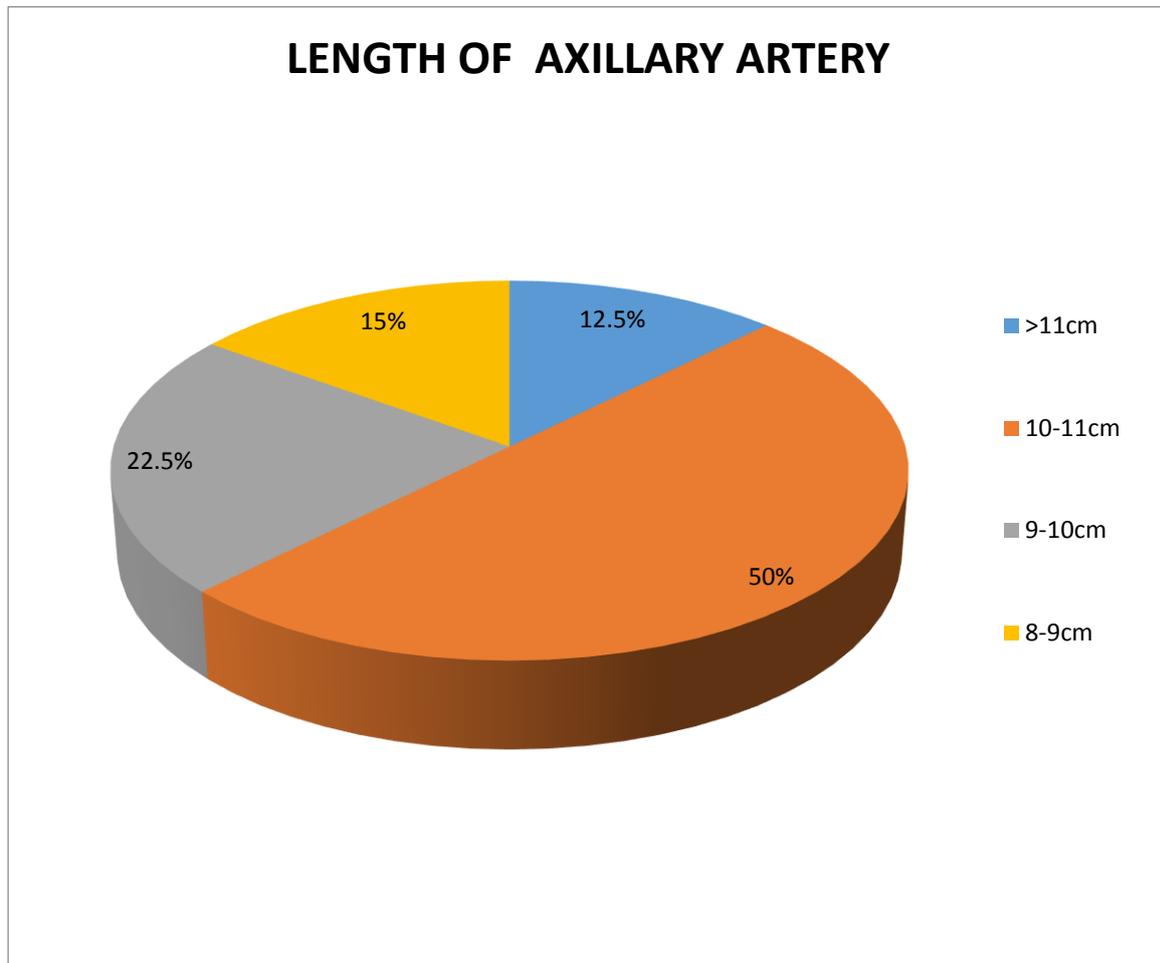


CHART - 1. Length of the axillary artery:



B .Extent of the axillary artery :

The axillary artery extends from the outer border of first rib as the continuation of subclavian artery to the lower border of teres major where it becomes brachial artery in all the 40 upper limb cadaveric specimens (100%) studied.

II. COURSE OF AXILLARY ARTERY IN RELATION WITH AXILLARY VEIN, BRACHIAL PLEXUS AND ADJACENT STRUCTURES TO EACH PART OF THE ARTERY

In the 40 upperlimb specimens the axillary artery has the following relations.

a). Relation of the axillary artery to the axillary vein :

In all the 40 specimens (100 %) the axillary vein lies anteromedially to all the three parts of the axillary artery throughout its course.

b). Course of the axillary artery in relation with the brachial plexus :

In all the 40 specimens (100 %) the artery had the following course .

i).To the first part of the axillary artery :

Posterior to the first part of axillary artery are medial cord of brachial plexus and the medial pectoral nerve and lateral to it is the posterior cord of brachial plexus .

ii). To the second part of the axillary artery:

The medial cord lies medially , lateral cord laterally and the posterior cord lie posterior to the axillary artery.

iii).To the third part of the axillary artery :

The medial cord of median nerve crosses the artery anteriorly . The axillary nerve and radial nerves are posterior to the artery. The lateral root of median nerve and musculocutaneous nerve lie lateral to it. The ulnar nerve and medial cutaneous nerve of forearm lie in between the artery and vein.

c). Course and relation with adjacent structures

In all the 40 specimens (100%) the artery has the following relation with the adjacent structures :

The pectoralis minor muscle crosses the axillary artery and classically divides it into three parts . The first part of the axillary artery is before , the second part of the axillary artery is behind and third part of axillary artery is beyond the pectoralis minor muscle.

The anterior relations to the first part of axillary artery are skin, superficial fascia , platysma, supraclavicular nerves , deep fascia, pectoralis major , clavipectoral fascia , lateral pectoral nerve , loop of communication between the lateral and medial pectoral nerves and the thoracoacromial and cephalic veins.

To the second part of the artery , skin , superficial fascia , deep fascia pectoralis major and pectoralis minor muscles are related.

To the third part of the artery skin , superficial fascia, deep fascia and pectoralis major are related anteriorly.

The posterior relations are first intercostal space , external intercostal muscle , the first two digitations of serratus anterior, long thoracic nerve are related to the first part of the artery. The second part

lies over the subscapularis muscle and the third part lies over the lower part subscapularis muscle , tendon of latisimus dorsai and teres major muscles.

The axillary vein is medial to the axillary artery in all the three parts . The lateral relations are the posterior cord to the first part, the lateral cord to the second part and coracobrachialis muscle to the third part of the artery.(PIC - 5)

PIC- 5 (b). Relation of axillary artery to pectoralis minor



III. NUMBER OF NAMED BRANCHES ARISING FROM THE AXILLARY ARTERY.

In the 40 upperlimb specimens the number of named branches arising from the axillary artery range from 4 – 9 . The most common number of named branches of axillary artery is 6 (60%). (PIC – 6).

The results are as shown in the table 11.

Table 11: number of named branches from axillary artery

No .of named branches	No of specimens (40)	Percentage (%)
9	1	2.5
7	3	7.5
6	24	60
5	9	22.5
4	3	7.5

PICTURE - 6 : Named branches arising from axillary artery

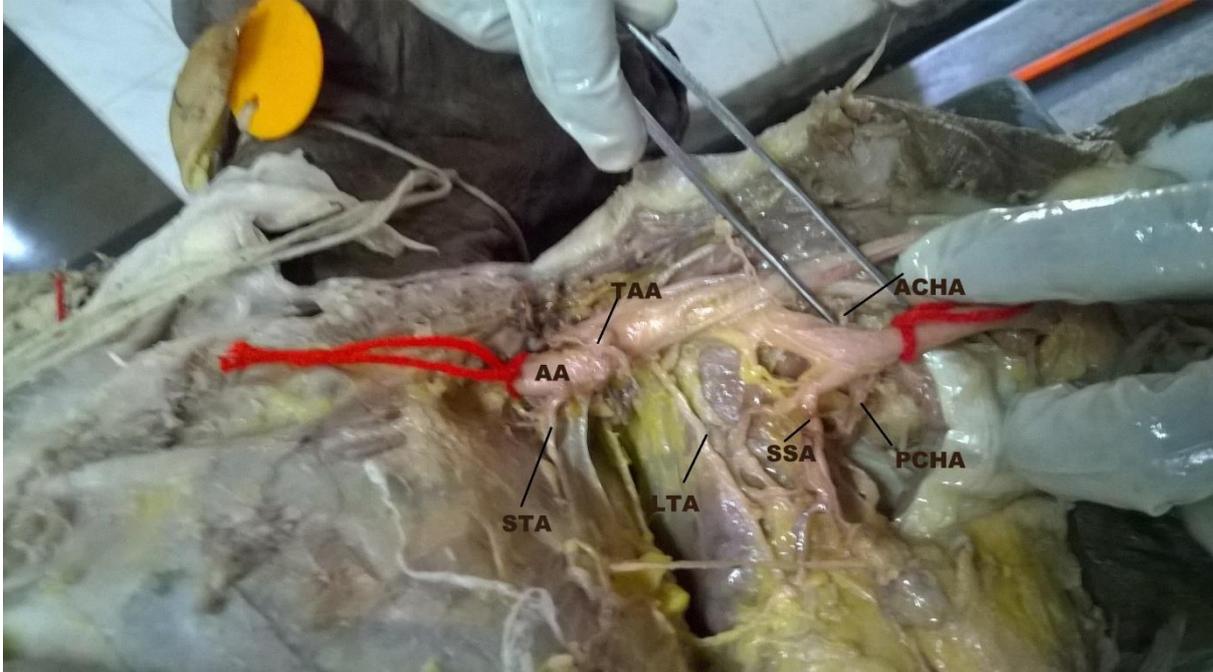
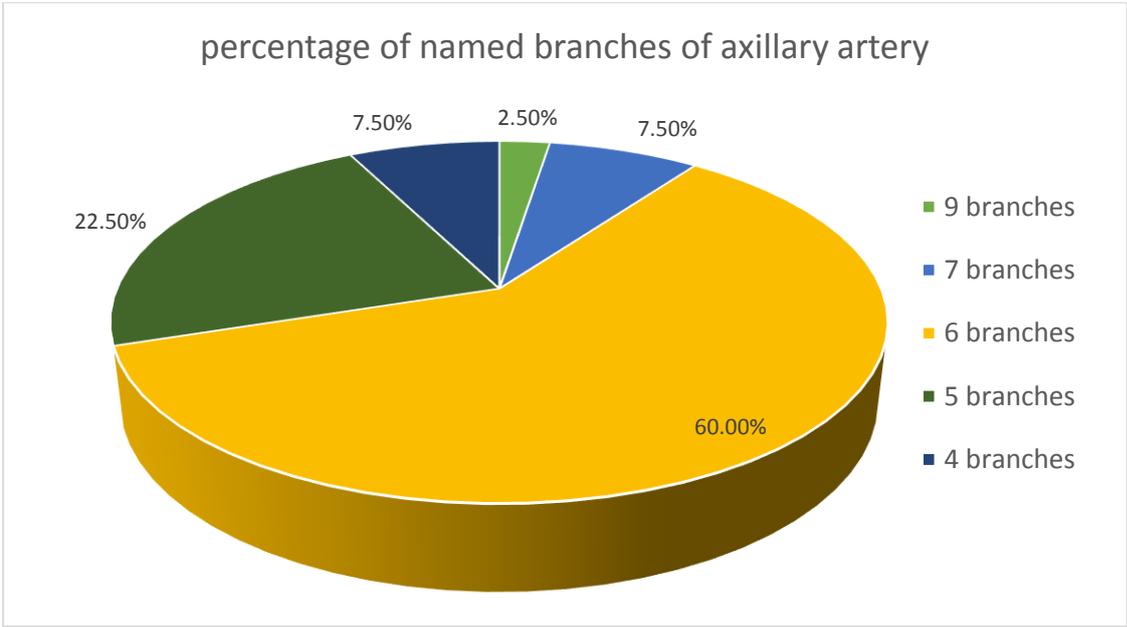


CHART :2 Number of named branches of axillary artery



III. ORIGIN OF SUPERIOR THORACIC ARTERY

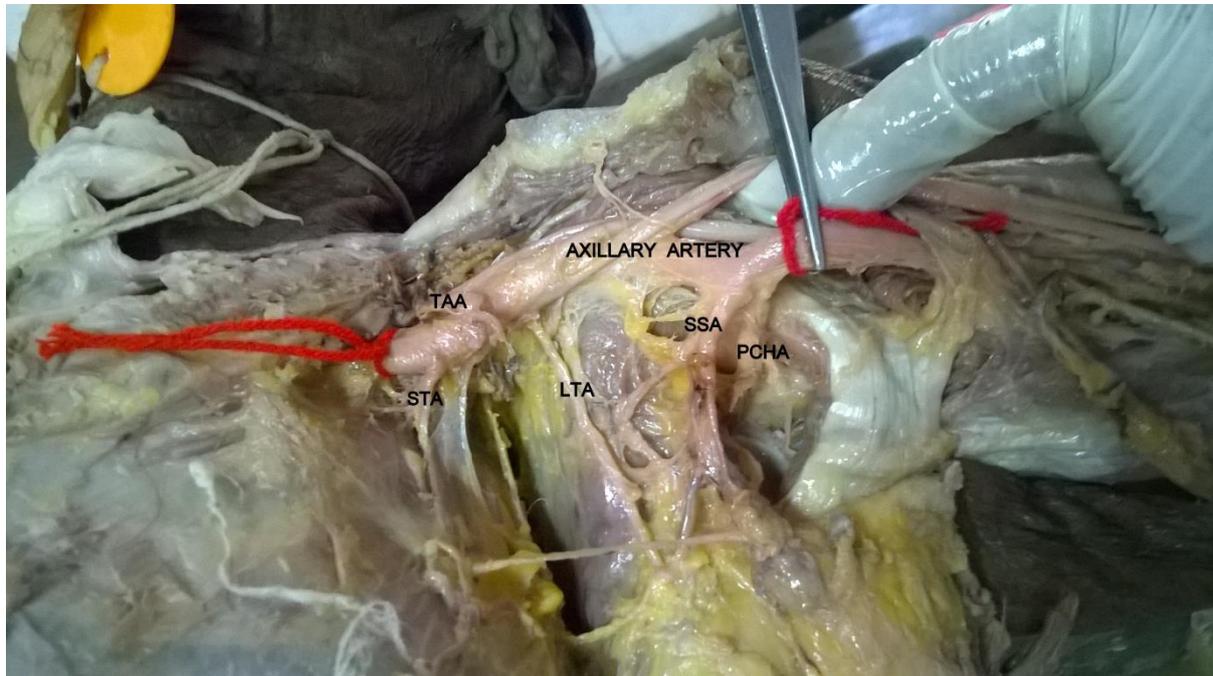
In the study of 40 upper limb specimens the superior thoracic artery was present in 39 specimens (97.5%) and it was absent in 1 specimen (2.5%).

In all the 39/40 specimens, the superior thoracic artery originates from the first part of axillary artery (97.5%).(PIC – 7).

PICTURE – 7. Origin of superior thoracic artery, thoraco acromial and lateral thoracic artery.



PICTURE – 8. Origin of superior thoracic, thoraco acromial , lateral thoracic, subscapular and posterior circumflex humeral arteries.



V. ORIGIN OF THORACO ACROMIAL ARTERY .

In the 40 specimens studied, the presence of the thoraco acromial artery is 39 specimens (97.5%) and it arises from the second part of axillary artery.(PIC-7)& (PIC – 8).

In one specimen (2.5%) it was absent.

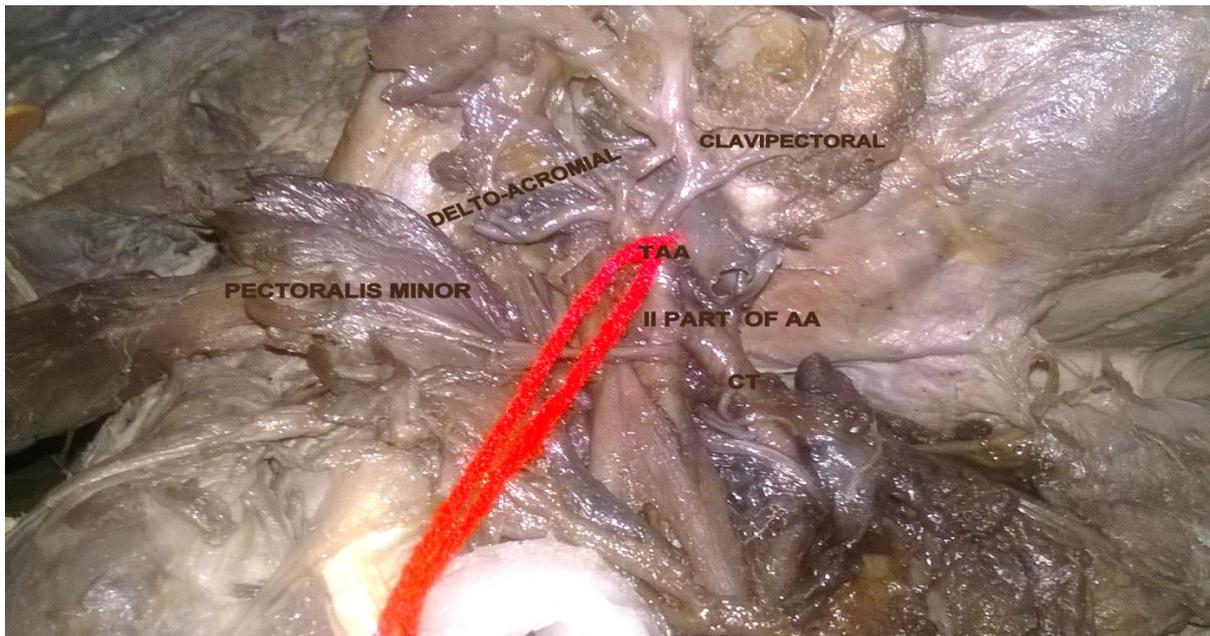
Branching pattern of thoraco acromial artery:

In 37/40 (92.5%) specimens the artery arises directly from the second part of axillary artery and then it divides into four terminal branches namely deltoid , acromial , clavicular and pectoral .

In 2 /40 (5%) specimens the artery divides into two trunks , the delto- acromial and clavi - pectoral . Then each trunk further divide into two named branches .(PIC – 9.a)

In 1/40 specimen (2.5 %) , the thoraco acromial trunk is absent and the four terminal divisions of the artery, namely deltoid, acromial , clavicular and pectoral branches arise from the second part of axillary artery individually .(PIC – 9.b)

PICTURE – 9 (a) : Thoraco – acromial artery dividing into two subtrunks, clavipectoral and deltoacromial.



PICTURE- 9 (b). Direct origin of terminal branches of thoraco-acromial artery from axillary artery.

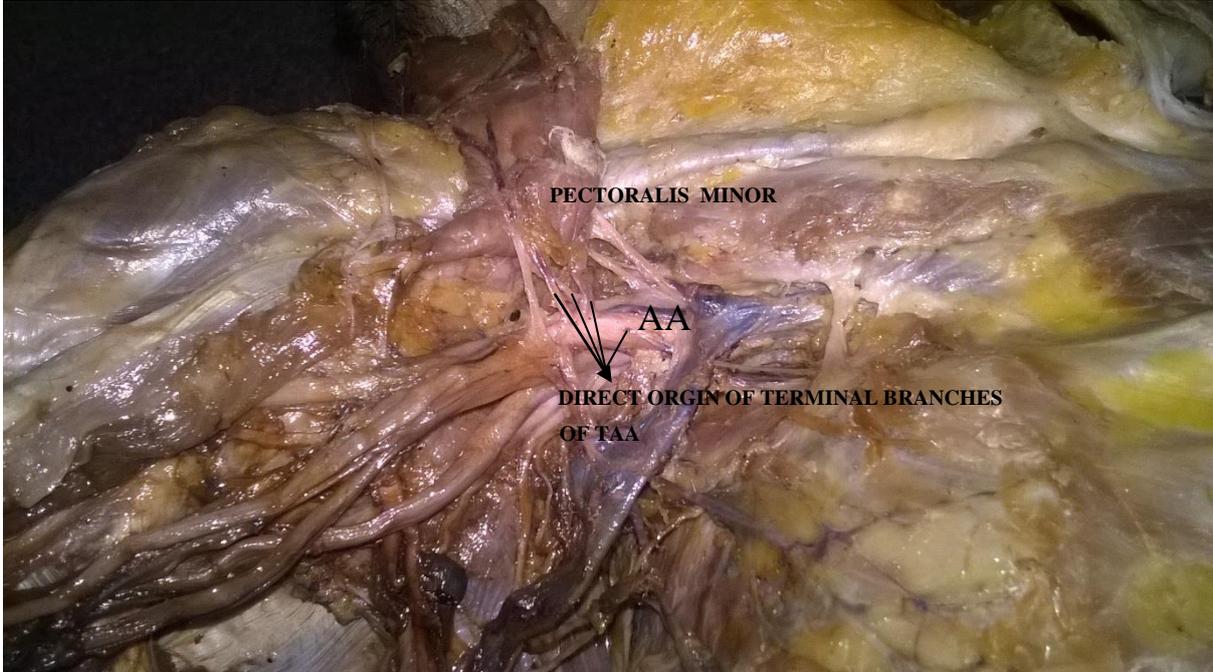


CHART : 3 . Origin of thoraco acromial artery from the second part of axillary artery.

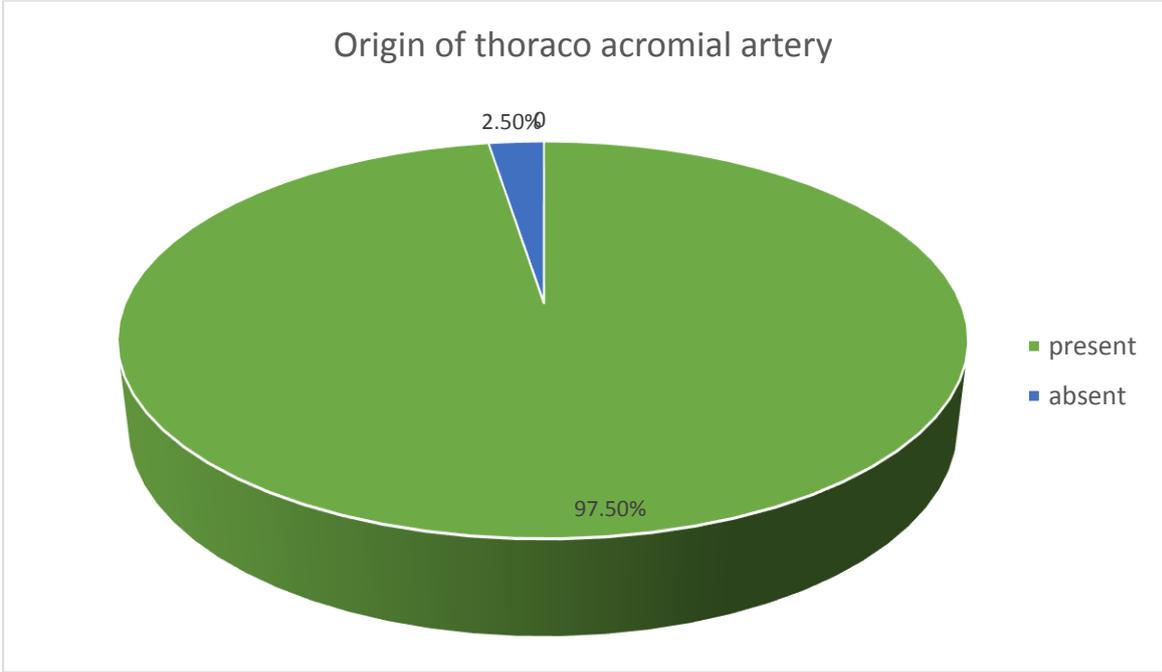
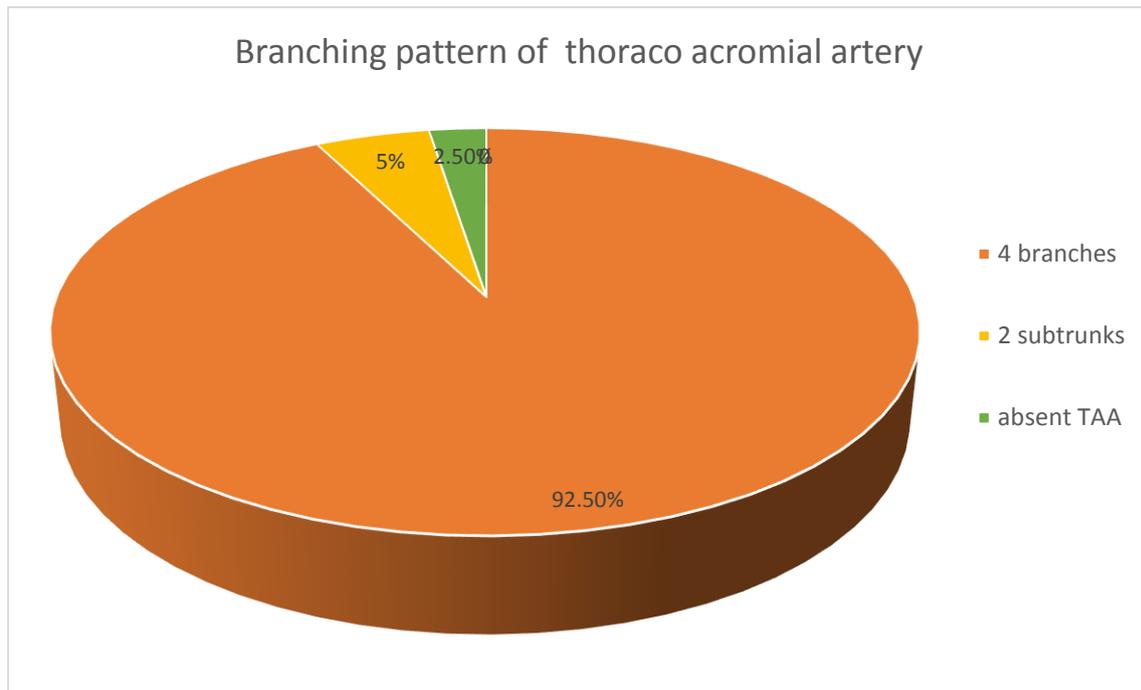


CHART - 4. Branching pattern of thoraco acromial artery .



VI.ORIGIN OF LATERAL THORACIC ARTERY

In the 40 upperlimb specimens studied , the lateral thoracic artery is present in 39/40 cases (97.5%).

In 1/40 specimen (2.5%) it is absent.

Out of the 39 specimens, the artery arises directly from the second part of the axillary artery in 38 cases (95%). (PIC - 10)

In one specimen (2.5%) it arises as a large common trunk from the second part of the axillary artery for subscapular and posterior circumflex humeral arteries. (PIC – 11)

PICTURE – 10. Origin of lateral thoracic artery



PICTURE – 11. Common trunk origin of LTA, SSA and PCHA from II part of AA.

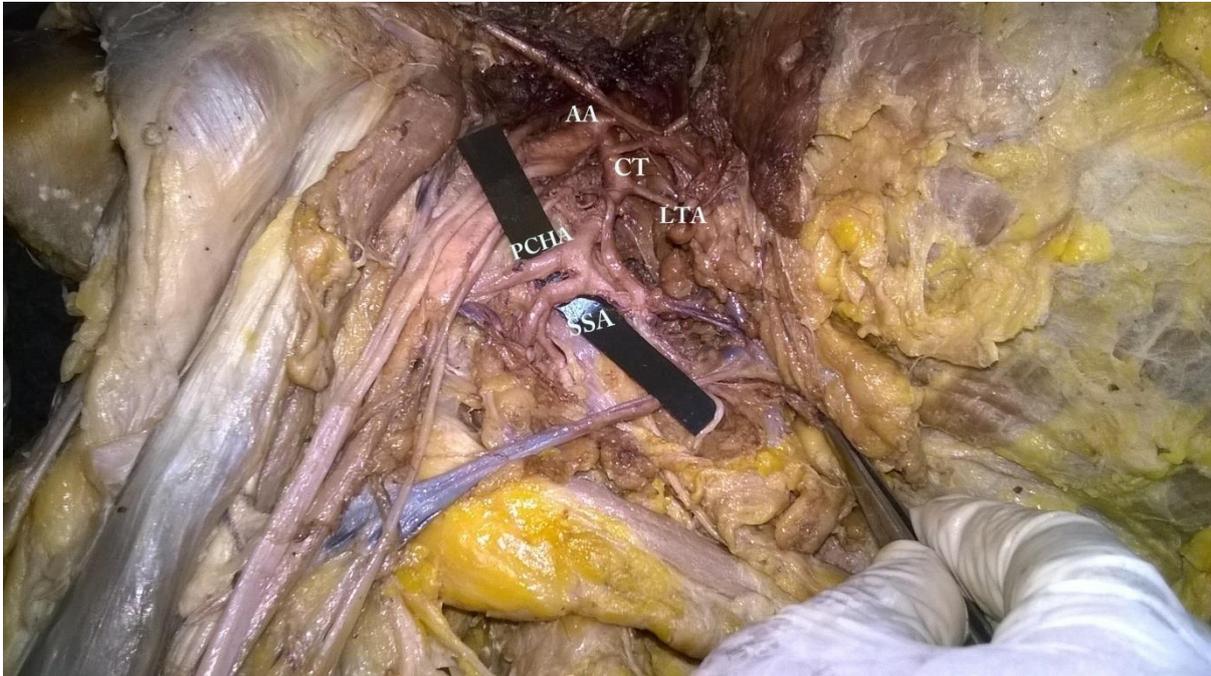
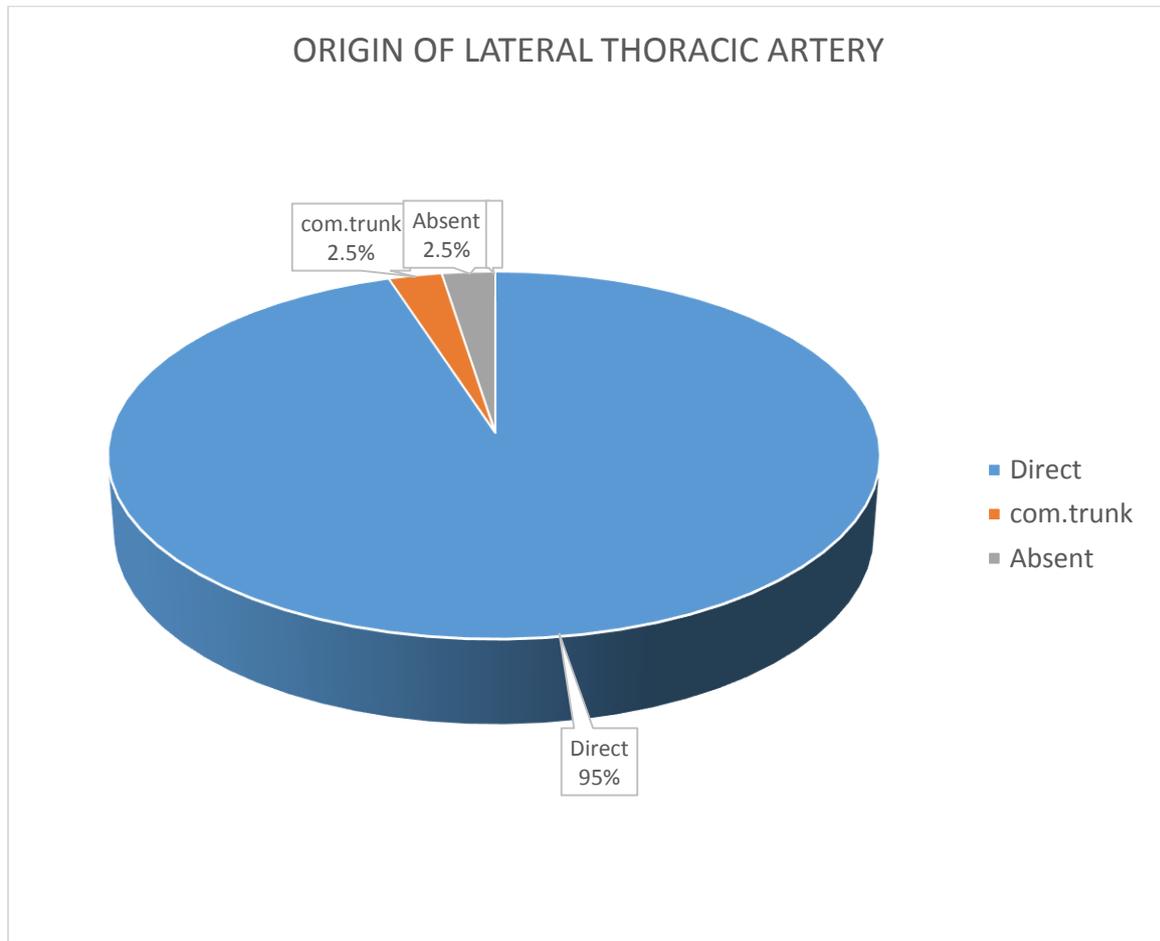


CHART: 5. Origin of lateral thoracic artery from second part of axillary artery:



VII. ORIGIN OF SUBSCAPULAR ARTERY

Out of 40 specimens, the subscapular artery is present in all the specimens (100%).

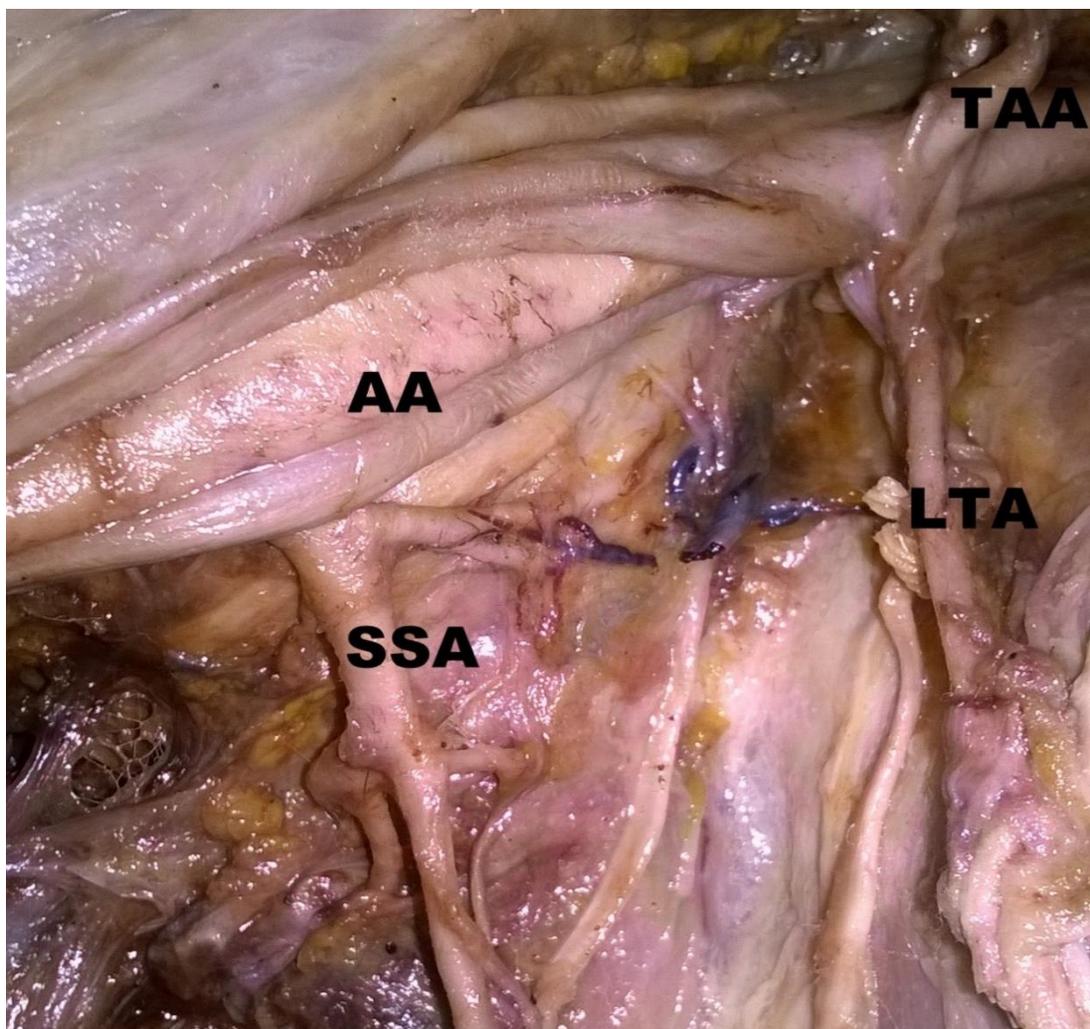
In 38/40 of specimens (95%), the subscapular artery arises from the third part of axillary artery.

The subscapular artery branches directly from the third part in 33/40 specimens (82.5%).(**PIC -12**)

In 4/40 (10%) of specimens it arises from the common trunk for subscapular and posterior circumflex humeral artery.(**PIC – 13**)

In 1/40 (2.5%) specimen,it arises in common with anterior circumflex humeral and posterior circumflex humeral arteries. (**PIC – 14**)

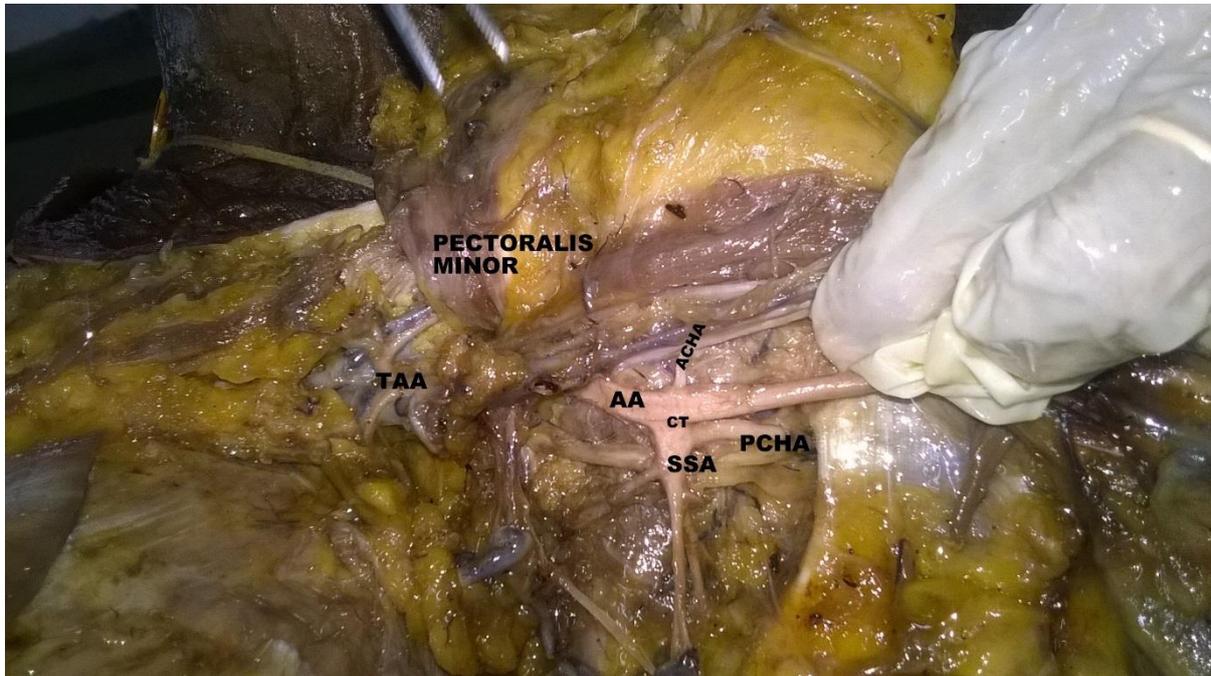
PICTURE – 12. Origin of subscapular artery from third part of AA.



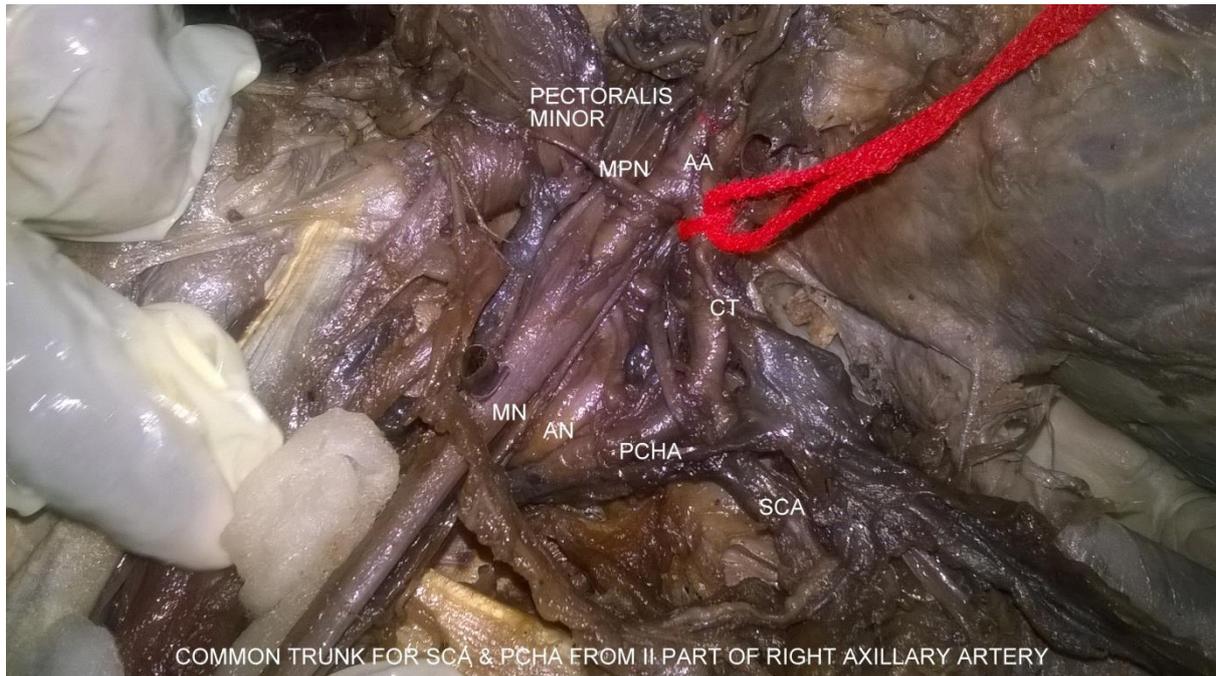
PICTURE – 13. Common trunk origin of SCA & PCHA.



PIC - 14: Common trunk origin of SSA along with ACHA & PCHA



PIC - 15 : High origin of common trunk for SSA & PCHA from II part.



HIGH ORIGIN OF SUBSCAPULAR ARTERY:

In 1/40 (2.5%) specimen the artery arises from the common trunk with posterior circumflex humeral artery, from the second part of the axillary artery. (PIC – 15)

In 1/40 (2.5%) specimen it arises from a large common trunk along with lateral thoracic artery and posterior circumflex humeral artery from the second part of the axillary artery.(PIC - 11)

TABLE 12:ORIGIN OF SUBSCAPULAR ARTERY

Axillary artery		No.of specimens (40)	Percentage (%)	
III part	Direct branch	33	82.5	
	Com.trunk	PCHA & SSA	4	10
		ACHA & PCHA	1	2.5
II part	Com.trunk – PCHA & SSA	1	2.5	
	Com.trunk – LTA,SSA &PCHA	1	2.5	

VIII. ORIGIN OF ANTERIOR CIRCUMFLEX HUMERAL ARTERY.

In the study of 40 upperlimb specimens , 37 specimens (92.5%) show single anterior circumflex humeral artery.In about 3/40 specimens (7.5%) show two anterior circumflex humeral arteries. (PIC - 18)

All the 40 upper limb specimens show the presence of the anterior circumflex humeral artery (100%) .

It arises from the third part of the artery in all the 40 specimens (100%) and as a direct branch in 35 /40 specimens (87.5%).(PIC - 16)

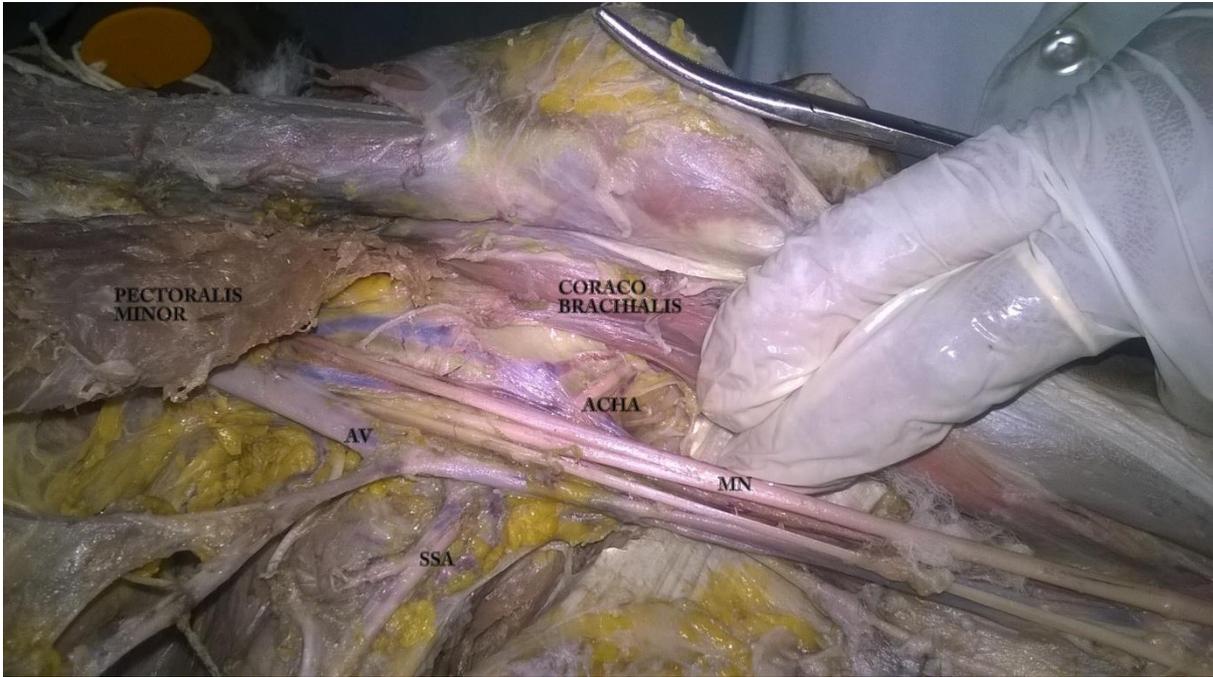
In 4/40 specimens (10%) it originates in a common trunk with posterior circumflex humeral artery. (PIC - 17)

In 1/40 specimen (2.5%) it arises from the common stem for subscapular artery and posterior circumflex humeral artery.(PIC - 14)

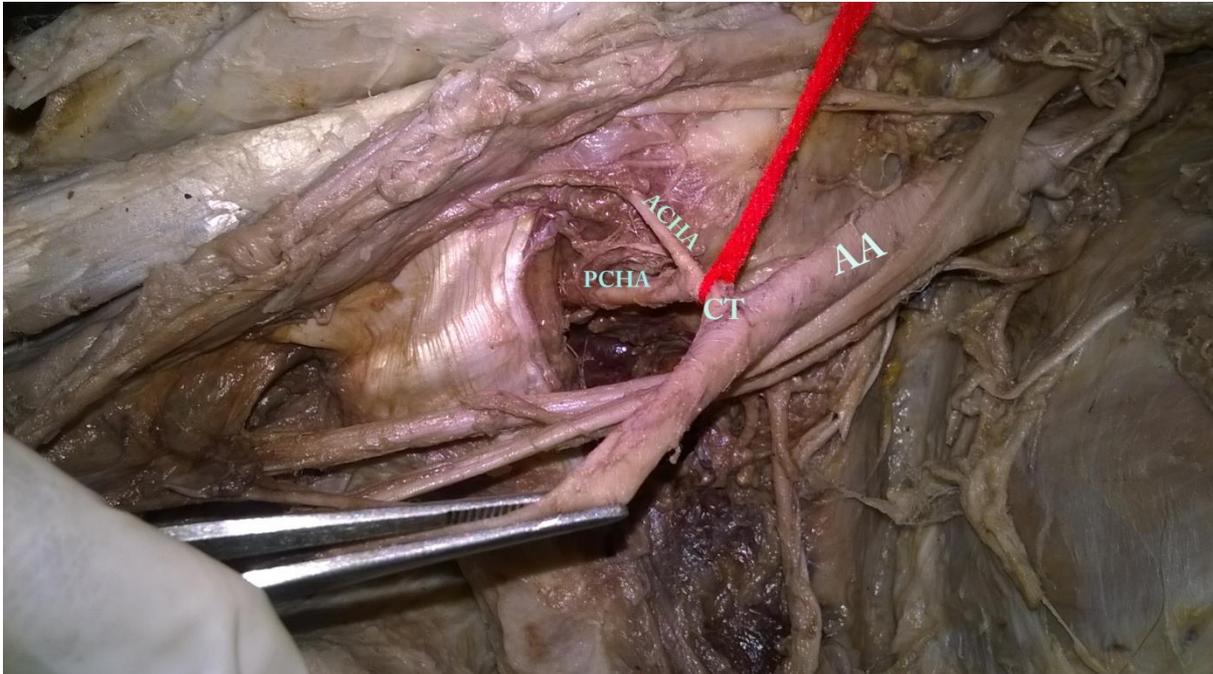
Table 13: Origin of anterior circumflex humeral artery.

Axillary artery		No of.specimens (40)	Percentage (%)
From III part	directly	35	87.5%
	Common trunk	PCHA	4 10%
		SSA & PCHA	1 2.5%

PICTURE – 16. Origin of anterior circumflex humeral artery from third part of AA.



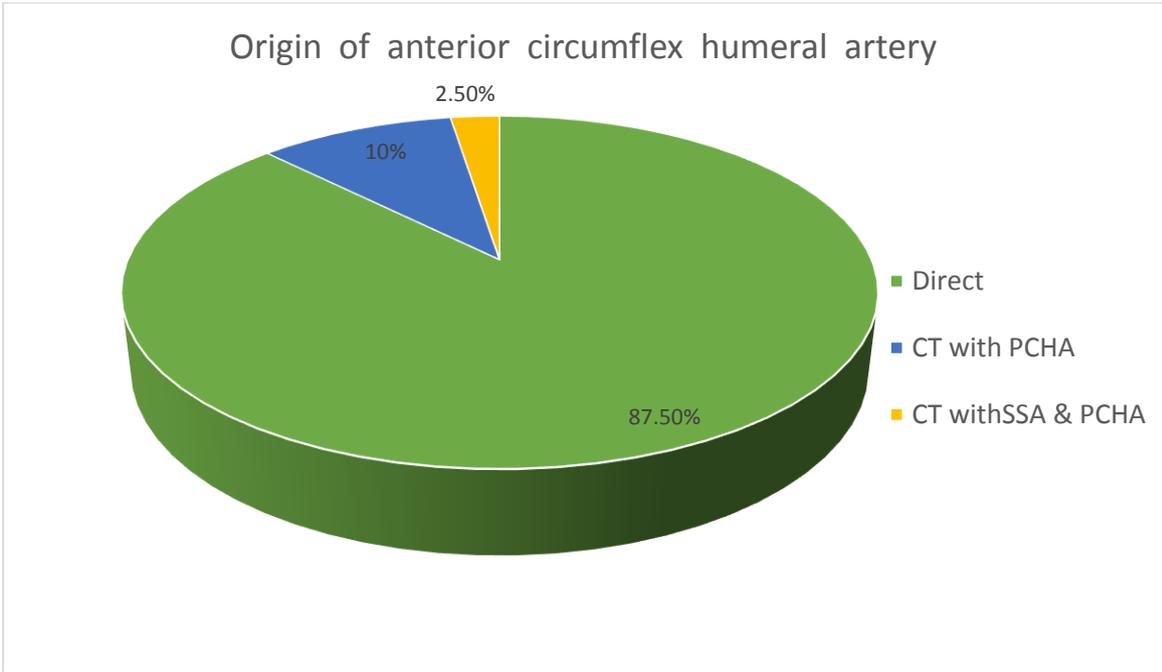
PICTURE -17 : Common trunk origin of ACHA &PCHA.



PICTURE - 18 : Two anterior circumflex humeral arteries arising from third part of axillary artery.



CHART- 6 : Origin of anterior circumflex humeral artery from third part of axillary artery :



IX. ORIGIN OF POSTERIOR CIRCUMFLEX HUMERAL ARTERY.

In the 40 specimens studied the posterior circumflex humeral artery is observed in all cases.

It directly arises from the third part of the axillary artery in 29 /40 specimens (72.5%). (PIC - 19)

In 4 /40 specimens (10%), it arises from the third part of artery from a common trunk with the subscapular artery.(PIC - 13)

In 4/40 specimens (10%) it arises from the third part of axillary artery from a common trunk along with anterior circumflex humeral artery. (PIC - 17)

In 1/40 specimen (2.5%) it arises from a common trunk from third part of axillary artery along with subscapular artery and anterior circumflex humeral artery.(PIC – 14)

HIGH ORIGIN OF POSTERIOR CIRCUMFLEX HUMERAL ARTERY :

In 1/40 specimen (2.5%) , the artery arises from a common trunk from the second part of the axillary artery along with subscapular artery.(PIC – 15)

In 1/40 specimen (2.5 %) it originates from a large common trunk for lateral thoracic artery , subscapular artery and posterior circumflex scapular artery from the second part of axillary artery.(PIC – 11)

Table 14: Origin of posterior circumflex humeral artery

Axillary artery		No.of specimens (40)	Percentage (%)	
III Part	Directly	29	72.5	
	Common trunk	SSA & PCHA	4	10
		ACHA & PCHA	4	10
		SSA, ACHA & PCHA	1	2.5
II Part	Common trunk with SSA	1	2.5	
	Com. trunk with SSA & PCHA	1	2.5	

PICTURE - 19. Origin of posterior circumflex humeral artery from third part of axillary artery.

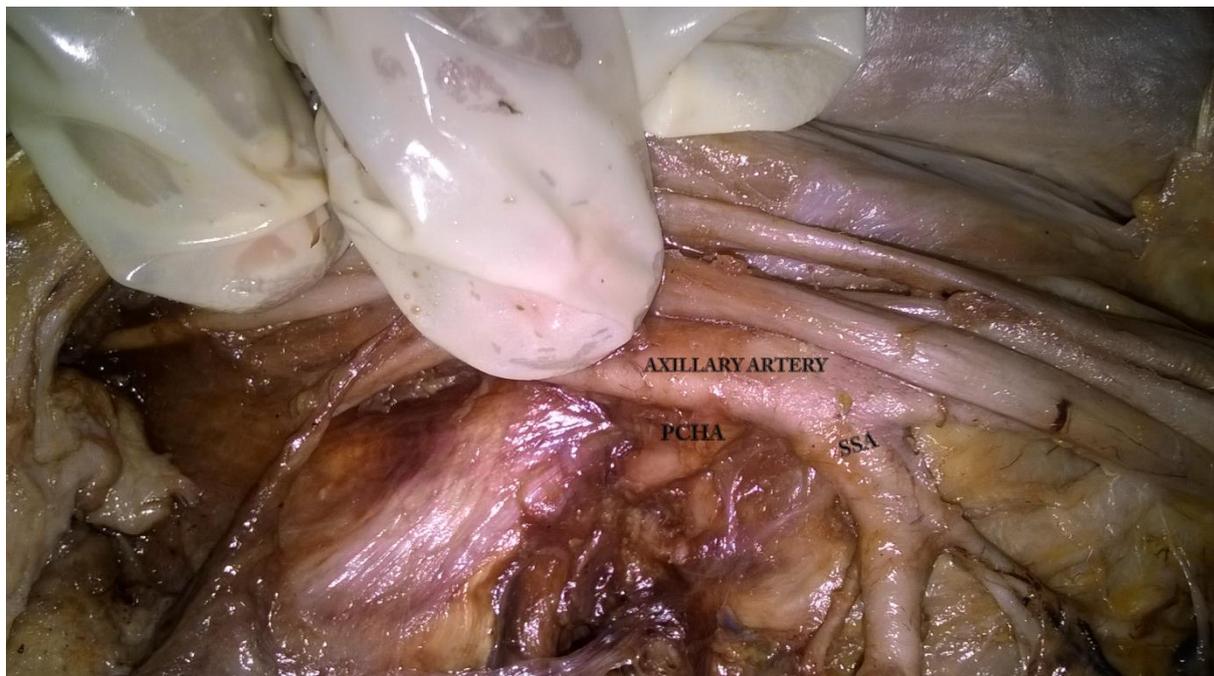
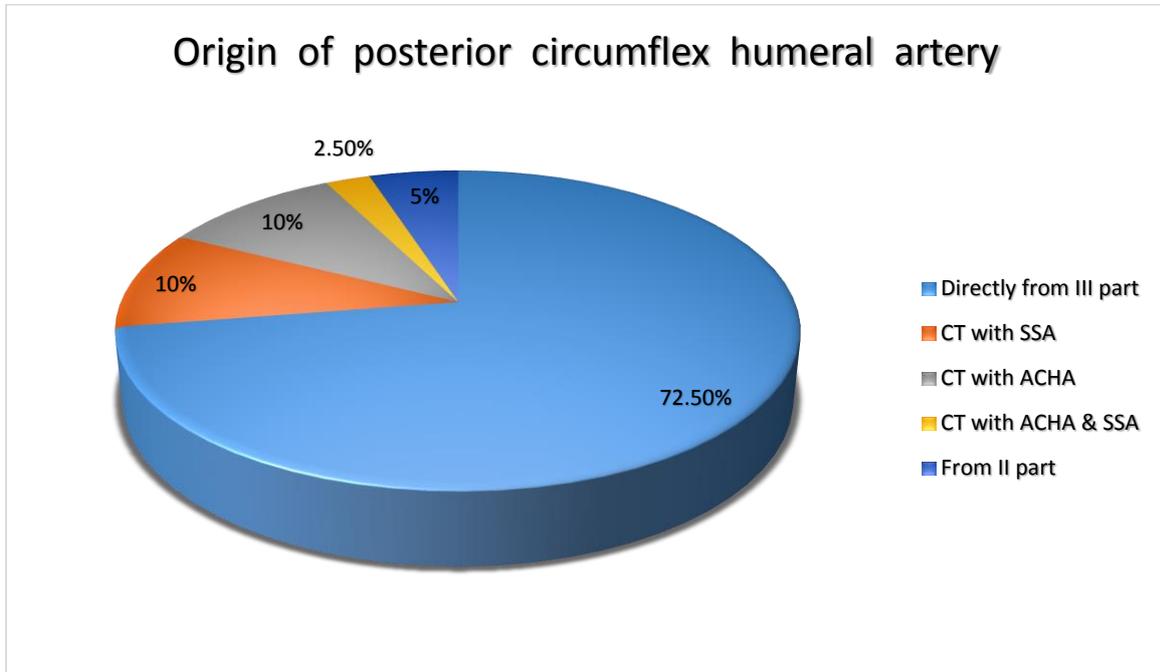


CHART – 7 : Origin of posterior circumflex humeral artery .



RADIOLOGICAL METHOD :

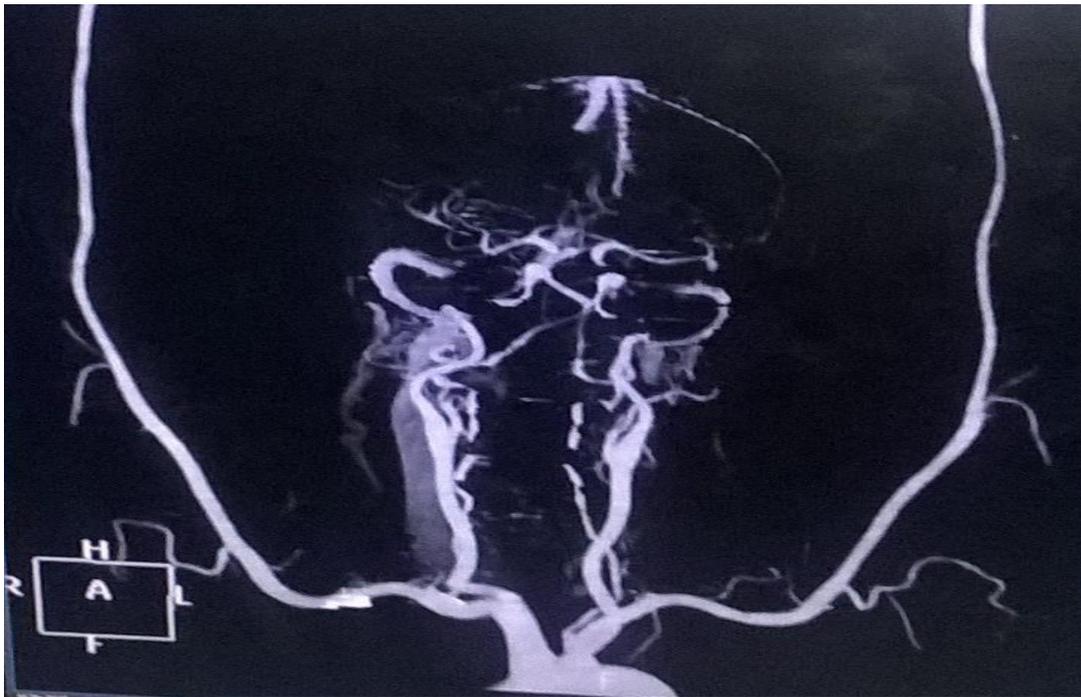
In the study of 10 radiological Computed Tomogram - Angiographic images, 9/10 images (90%) show normal pattern of the axillary artery .(PIC – 20)

In one image (10%) of a 50 year male shows bilateral high origin of both radial and ulnar arteries from the axillary artery. It begins as the continuation of subclavian artery and ends by dividing into two terminal branches namely radial and ulnar arteries on both sides. (PIC – 21)

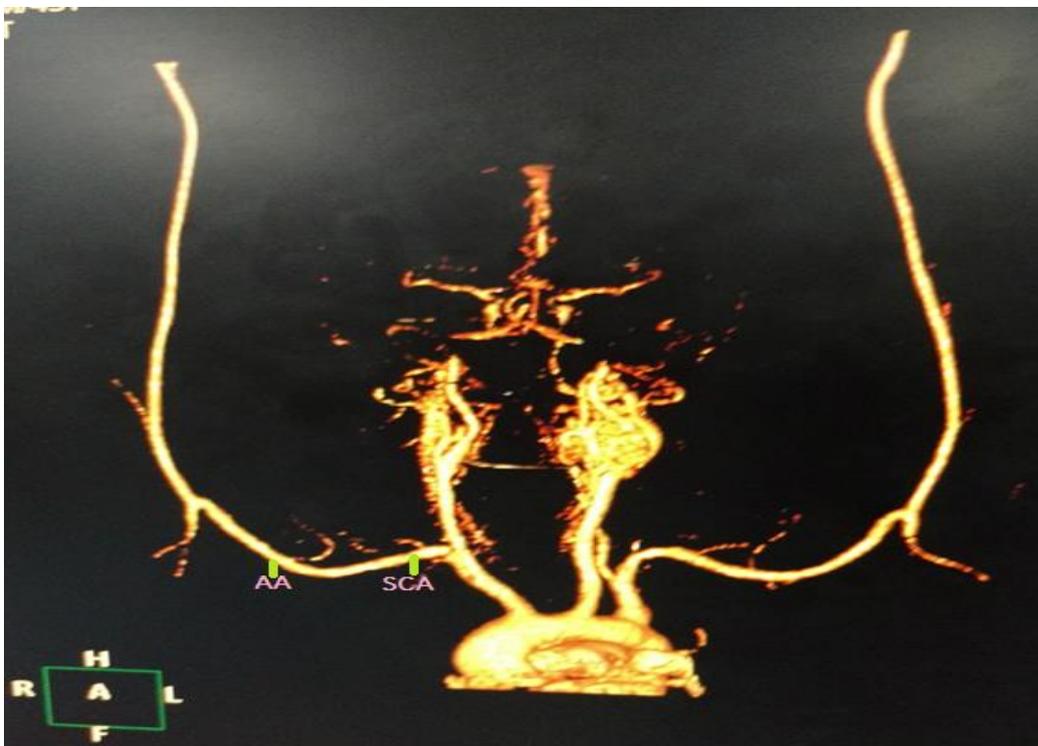
Table 15:Termination of axillary artery into radial and ulnar artery.

Axillary artery	No .of images (10)	Percentage (%)
With normal pattern	9	90
With variation	1	10

PICTURE – 20. a) .Normal CT - Angiogram image



PICTURE – 20 .b).



PICTURE – 21 : Bilateral high origin of radial and ulnar arteries from axillary artery.

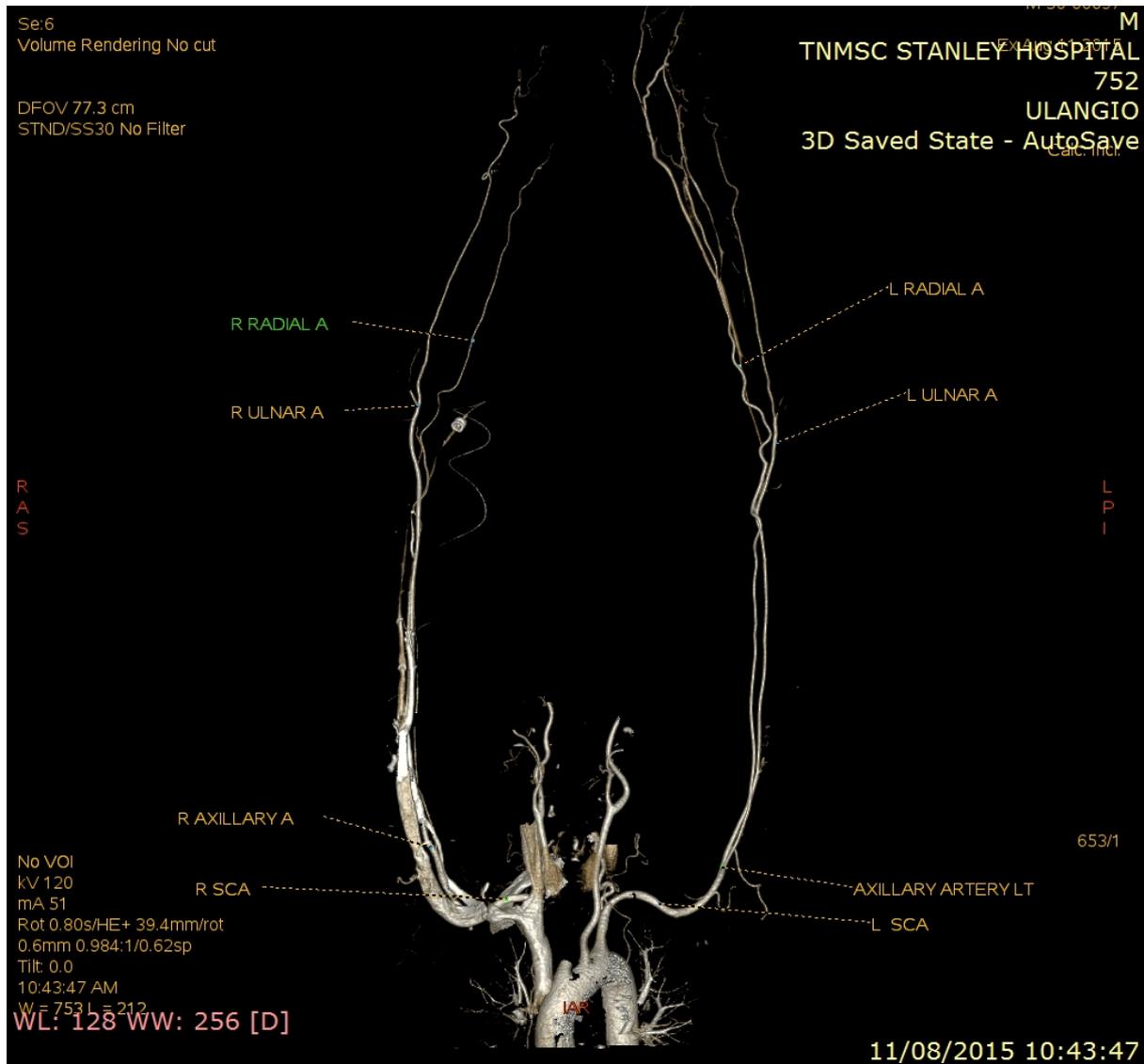
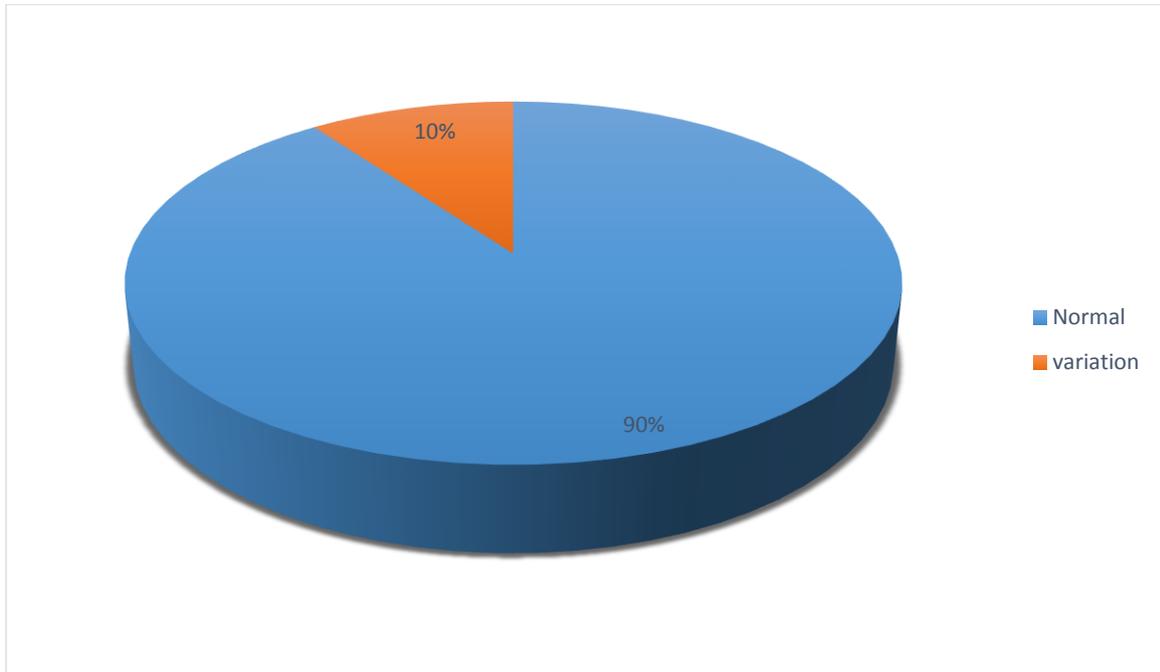


CHART – 8 : Incidence of radiological images showing normal and variant pattern .



DISCUSSION

The origin , course , relation and number of named branches arising from the axillary artery and variations in the branching pattern of axillary artery in this study were analysed and compared with those described by previous authors.

I. LENGTH AND EXTENT OF AXILLARY ARTERY

a). Length of the axillary artery.

Mohammad Ahmad Abdalla (2007) observed that the average length of axillary artery is 10.17 cm , with the range of 7 – 13.6 cm.

Sudeshna Majumdar et al (2013) studied that the most common length of axillary is 9.5 cm and the average length of axillary artery is 10.15cm.

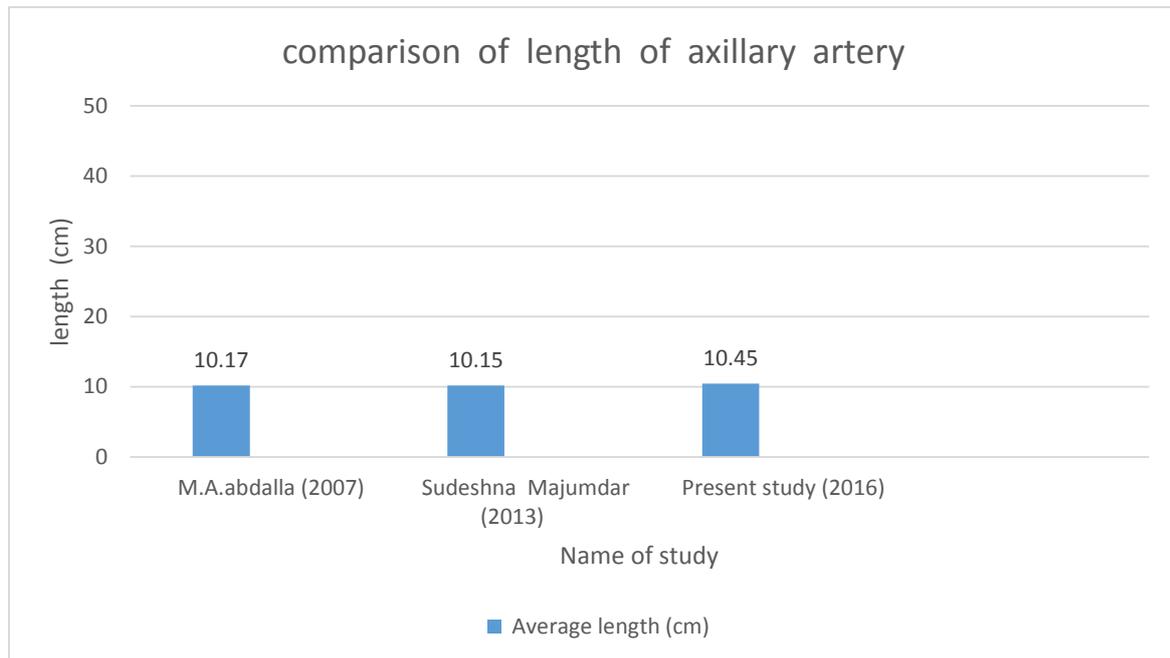
In the present study (2016) , the average length of the axillary artery is 10.45 cm, with the range of 8.9 – 11.5 cm .

So this study coincides with that of the above authors.

Table 16 : Comparison of average length of axillary artery :

Study	Length (cm)
M.A. Abdalla (2007)	10.17
Sudeshna Majmdar (2013)	10.15
Present study (2016)	10.45

CHART:9 .Comparison of length of axillary artery :



b). Extent of the axillary artery :

Sir Henry Gray , Hollinshead, G.J. Romanes, Chummy S. Chinnatamby Richard S. Snell, and Sudeshna Majumdar et al observed that the axillary artery is the continuation of subclavian artery and it extends from the outer border of first rib to the lower border of the teres major as brachial artery .

In the present study , all the cadaveric specimens (100%) show the extent of the axillary artery similar to the above mentioned authors.

Ugurbozlar et al (2013) in the Computed Tomogram-Angiographic images of upperlimb vasculature observed that the high origin of radial artery from the axillary artery is more frequent (5.9-12.1%) than that of the ulnar artery (0.17 -2.0%).

In the present study 9/10 (90%) of computed tomographic images the axillary artery continues as a single brachial artery, whereas in 1/10 (10%), it bifurcates into radial and ulnar arteries bilaterally which is greater than the above author.

II. COURSE OF THE AXILLARY ARTERY IN RELATION WITH AXILLARY VEIN, BRACHIAL PLEXUS AND ADJACENT STRUCTURE TO EACH PART OF THE ARTERY.

According to Sir Henry Gray, Richard S. Snell, Hollinshead, G.J. Romanes, and Chummy S. Sinnatamby, the pectoralis minor muscle crosses the artery and divides it into three parts. The first part of the artery is before, the second part behind and the third part lies below the pectoralis minor.

The axillary vein is anteromedial to the axillary artery throughout its course.

The medial pectoral nerve, the medial cord of brachial plexus are posterior and the posterior cord of brachial plexus is lateral to the first part of the artery.

The cords of brachial plexus surround the second part of axillary artery, the medial cord medially, lateral cord laterally and the posterior cord posteriorly.

The medial root of median nerve crosses the artery anteriorly and joins with the lateral root at the third part of axillary artery.

The axillary nerve and radial nerves are posterior to the third part of the axillary artery.

In the present study, in all the specimens (100%) the axillary artery follows the same course and relation as described by the above authors.

III. NUMBER OF NAMED BRANCHES ARISING FROM THE AXILLARY ARTERY.

According to G.J,Romanes, Susan Standring, Hollinshead , E.Skandalakis, Richard S. Snell, six named branches are arising from the axillary artery , one branch from the first part, two branches from the second part, three branches from the third part of axillary artery .

Donald F Huelke (1959) observed the number of named branches from the axillary artery ranges from 2-7 , most common number is 6 (37.3%).

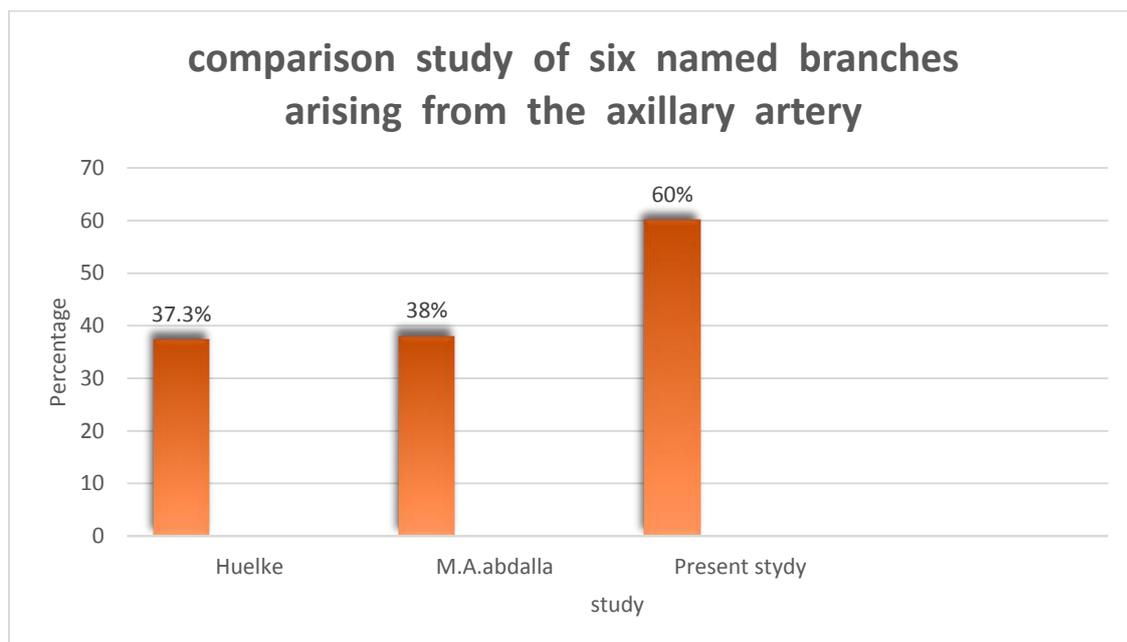
Mohammad A. Abdalla (2007) observed 2-9 branches and the commonest number was 5 branches . He also observed that the second common number was 6 branches in 38% of cases.

In the present study , the number of named branches of axillary artery ranges from 4-9 and the most common number being 6 (60%) which is greater than Heulke and M.A. Abdalla and less than G.J. Romanes , Susan Standring and Hollinshead.

Table 18: Comparison of studies of six named branches from the axillary artery.

Study	Axillary artery with six branches (%)
Huelke	37.3
M.A.Abdalla	38.0
Present study	60.0

CHART – 10:



IV. ORIGIN OF SUPERIOR THORACIC ARTERY

G.J. Romanes (1964), Hollinshead (1969), Susan Standring (2008), Chummy S. Sinnatamby and Richard S Snell observed that the superior thoracic artery arises from the first part of axillary artery .

Degarís and Swartey (1928) observed , the superior thoracic artery arising from the first part of axillary artery in 96.9% of specimens.

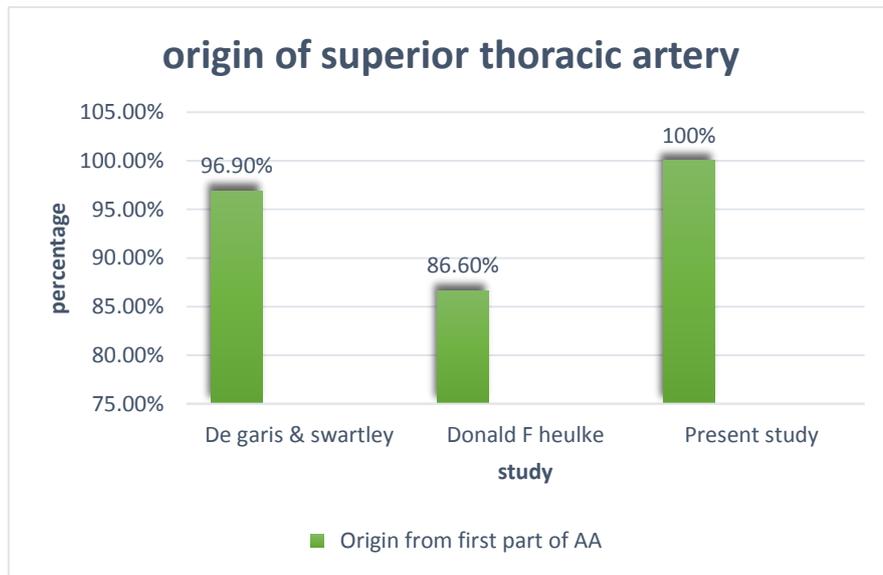
Donald F .Huelke (1959) reported that the superior thoracic artery arises from the first part of axillary artery in 86.6% of specimens.

In the present study (2016) , the superior thoracic artery arises from the first part of the artery in all the specimens (100%) which is greater than the above authors.

Table 19: Origin of STA from first part of AA

Study	Origin of STA from first part of AA (%)
De garis&swartley	96.9
Donald F heulke	86.6
Present study	100

CHART -11:



V. ORIGIN OF THORACO ACROMIAL ARTERY

G.J. Romanes (1964), Hollinshead (1969), Susan Standing (2008) and Chummy S. Sinnatamby (2012) quoted that the thoraco - acromial artery arises from the second part of axillary artery and pierces the clavipectoral fascia and divides into clavicular, pectoral, acromial, and deltoid branches.

Donald F Huelke (1959) observed that the thoraco acromial artery arose from the second part of axillary artery in 68.5% of cases.

Mohammad Ahmad Abdalla (2007) observed that the thoraco acromial artery arises from the second part of the axillary artery in 88% of cases.

In the present study (2016) the thoraco–acromial artery arises from the second part of axillary artery in 97.5% of cases. Which is greater than the studies of Donald F. Huelke (1959) and Mohammad Ahmad Abdalla (2007) and more or less equal to the studies of G.J. Romanes (1964) , Hollinshead(1969) Susan Standring (2008) and Chummy S .Sinnatamby (2012).

Rajesh Astik (2014) observed that the thoracoacromial artery was absent in 10% of cases, where all the four classical terminal branches of the thoraco acromial artery arise directly from the second part of the artery. He also noted that in 5% of cases the thoraco acromial artery divided into two subtrunks namely delto - acromial and clavi – pectoral , each of them further divided into two branches.

In the present study (2016) the thoracoacromial trunk is absent and its terminal branches namely clavicular, pectoral, acromial and deltoid branches arise directly from the second part of axillary artery in 2.5% of cases which is lower than that of above study. The thoracoacromial trunk divided into two subtrunks , delto-acromial and clavi-pectoral branches in 5% of cases which is equal to the above author.

Table 20:Origin of thoraco acromial artery from the second part of axillary artery

Name of Study	Origin from II part of AA(%)
Donald F huelke	68.5
Mohammad A.Abdalla	88.0
Present study	97.5

CHART - 12 :

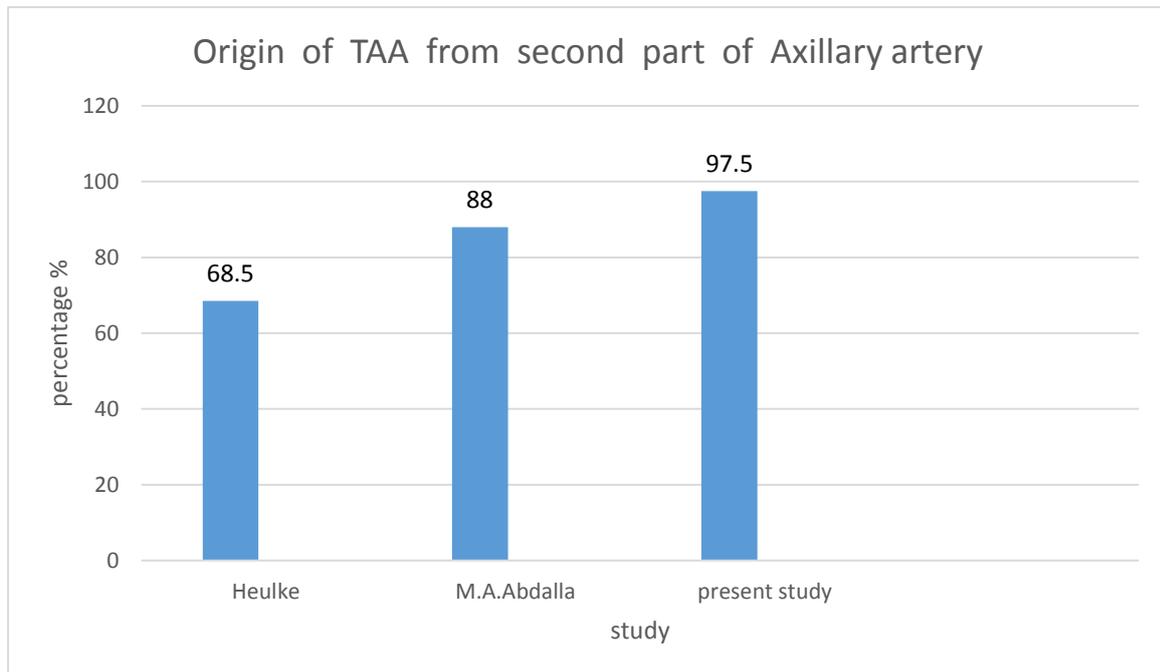


Table 21: Incidence of absent thoraco - acromial artery & origin of its terminal branches directly from the second part of axillary artery.

Name of study	Absent TAA / direct origin of terminal branches (%)
Rajesh Astik	10
Present study	2.5

CHART - 13:

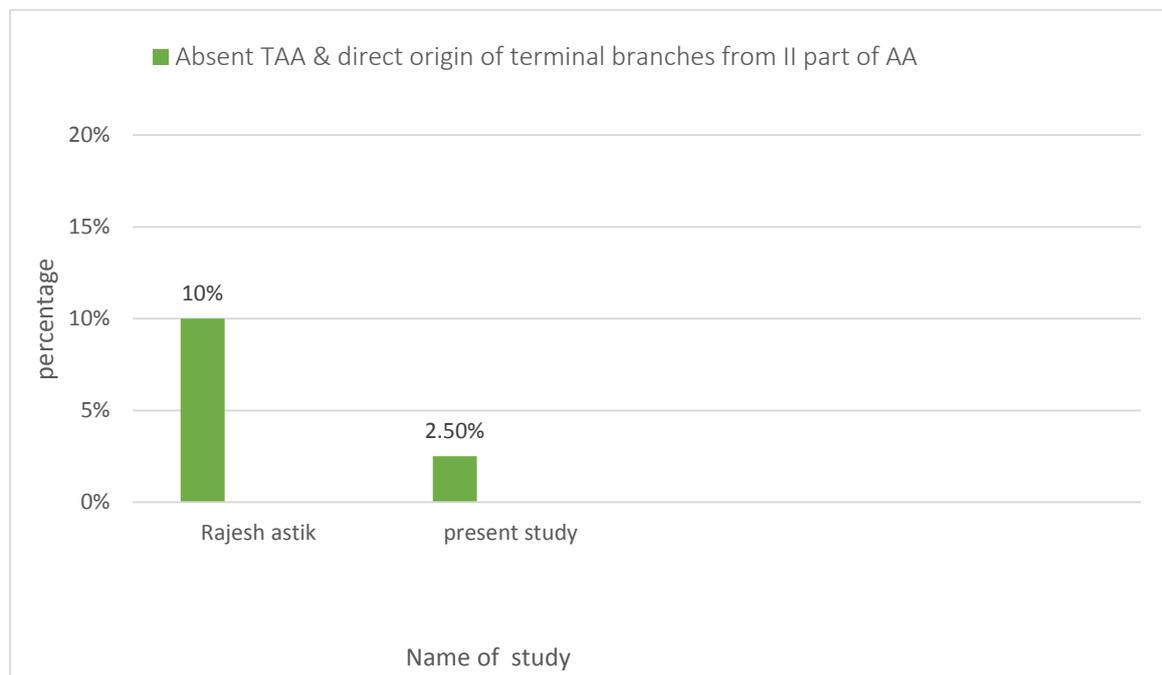
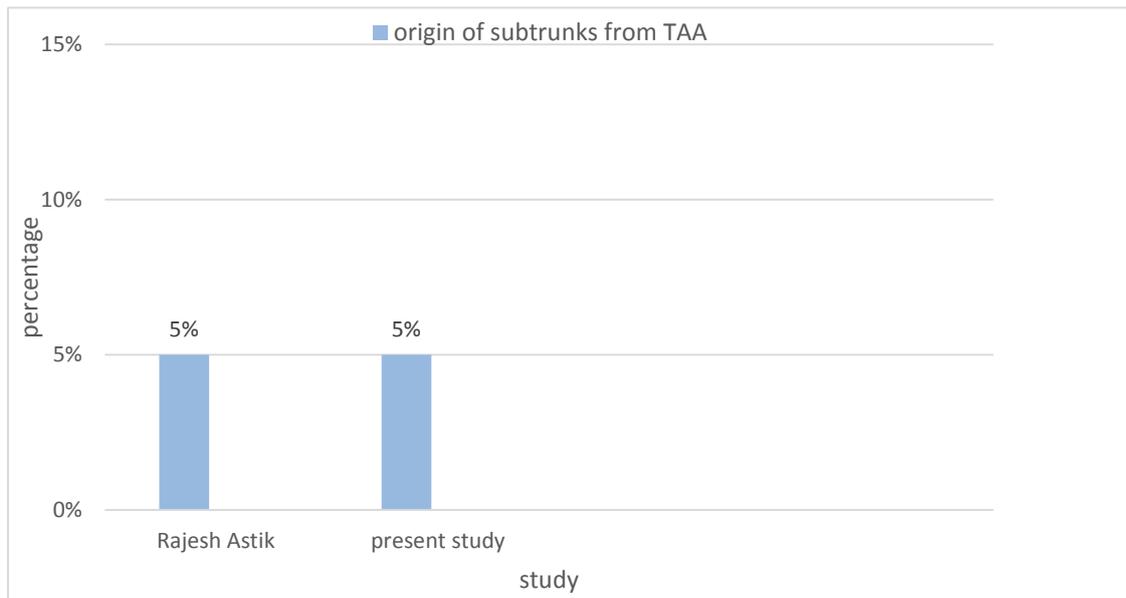


Table 22: Origin of subtrunks from the thoraco acromial artery

Name of study	Subtrunks from TAA (%)
Rajesh Astik	5
Present study	5

CHART -14 :



VI. ORIGIN OF LATERAL THORACIC ARTERY

G.J. Romanes (1964), Hollinshead (1969), Susan Standing (2008) and Chummy S. Sinnatamby (2011) quoted that the lateral thoracic artery is a branch from the second part of axillary artery, it runs along the lower border of the teres minor muscle.

Donald F Huelke (1959) observed , the lateral thoracic artery arising directly from the second part of axillary artery in 52.2% of specimens and from a common trunk along with subscapular artery from the second part of axillary artery in 14.1 % of upperlimb specimens.

Mohammad Ahmad Abdalla (2007) noted that the lateral thoracic artery arises directly from the second part of axillary artery in 82% of cases. Common trunk origin of lateral thoracic artery with

subscapular and posterior circumflex humeral artery in 4% of cases. It was absent in 2% of specimens.

Rajesh Astik et al (2012) in his study of 80 upperlimbs observed that the origin of lateral thoracic artery from subscapular artery is 20%.

In the present study the lateral thoracic artery arise directly from the second part of axillary artery in 95% of specimens which is similar to G. J. Romanes, Hollinshead, Susan Standring and Chummy S Sinnatamby and is greater than the studies of Donald F. Huelke (1959) and M.A. Abdalla (2007) . It arises from a common trunk with subscapular and posterior circumflex scapular arteries in 2.5% of specimens, which is slightly less than the study of M.A. Abdalla (2007). The lateral thoracic artery was absent in 2.5% of specimens, which coincides with M.A. Abdalla (2007) .

Table -23: Comparison of origin of lateral thoracic artery from second part of axillary artery.

Name of study	Origin of LTA from II part (%)
Huelke (1959)	52.2
M.A.Abdalla (2007)	82
Present study (2016)	95

Table -24:Common trunk origin of lateral thoracic artery ,subscapular artery and posterior circumflex humeral artery from second part of axillary artery.

Name of study	CT origin of LTA, SSA & PCHA (%)
M.A.Abdalla	4
Present study	2.5

VII .ORIGIN OF SUBSCAPULAR ARTERY

G.J. Romanes (1964), Hollinshead (1969), Charles A. Rockwood (2004), and Chummy S. Chinnatamby (2011) quoted that the subscapular artery is the largest branch , takes origin from the third part of axillary artery.

Degaris and Swartley (1928) noted that the subscapular artery arises from the third part of axillary artery in 94.1% of cases and rarely from the second part in 5.1% of cases .

Donald F.Huelke (1959) observed that the subscapular artery arises directly from the third part of axillary artery in 79.2% . It arise from the second part of the axillary artery in 15.7%.

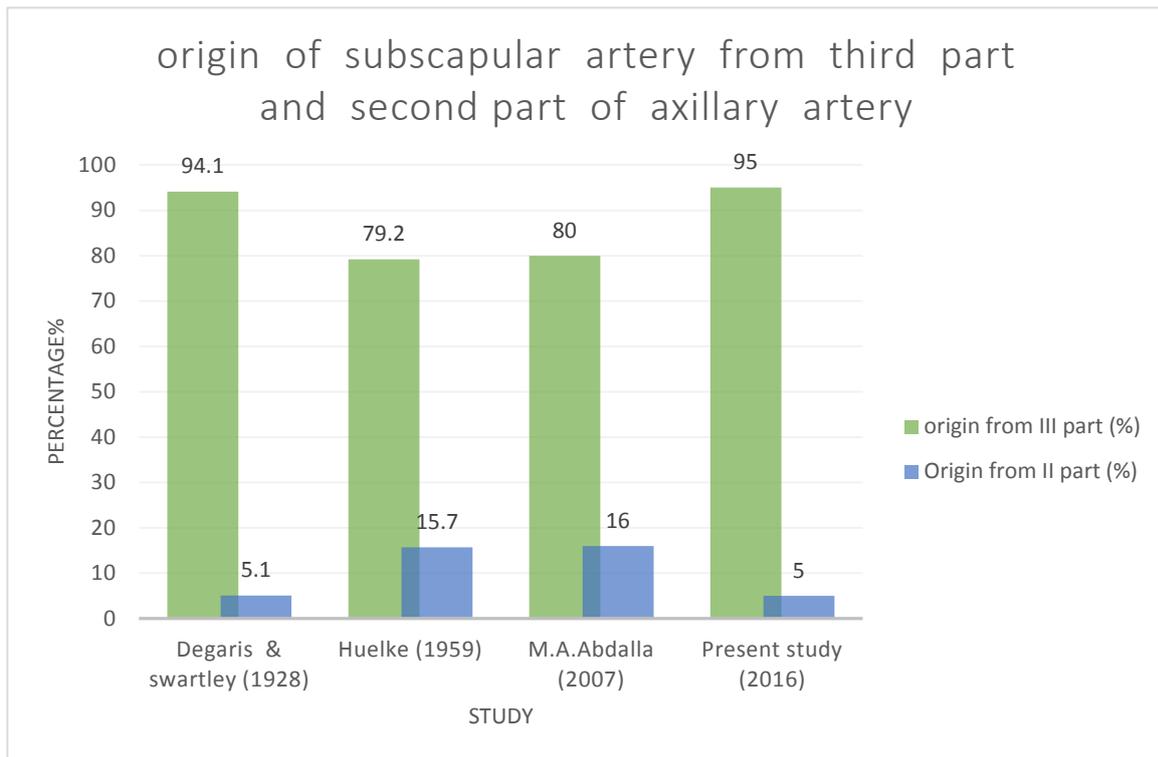
Mohammad A.Abdalla (2007) observed that the subscapular artery arises from the third part of the axillary artery in 80% and from the second part of axillary artery in 16% of cases.

In the present study(2016) , the subscapular artery arises from the third part of axillary artery in 95 % and from the second part of axillary artery in 5% of cases. This is greater than the studies of Heulke (1959) and M.A.Abdalla (2007) ;and coincides with the study of Degaris and Swartley (1928) .

Table -25 :Comparison of the origin of subscapular artery

Name of study	Orgin from third part of axillary artery (%)	Origin from second part of axillary artery (%)
Degaris&swartley (1928)	94.1	5.1
Huelke(1959)	79.2	15.7
M.A.Abdalla (2007)	80	16
Present study (2016)	95	5

CHART – 15 :



Common trunk origin of subscapular artery with posterior circumflex humeral artery :

Huelke (1959) observed the common trunk origin of subscapular artery with posterior circumflex humeral artery in 15.2% of specimens.

According to Johnson & Ellis (2005), subscapular artery arises from a common trunk along with posterior circumflex humeral artery in 30% of specimens.

Mohammad.A. Abdalla(2007) in his study noted subscapular and posterior circumflex humeral arteries arise from a common trunk from the third part of axillary artery in 18% of specimens.

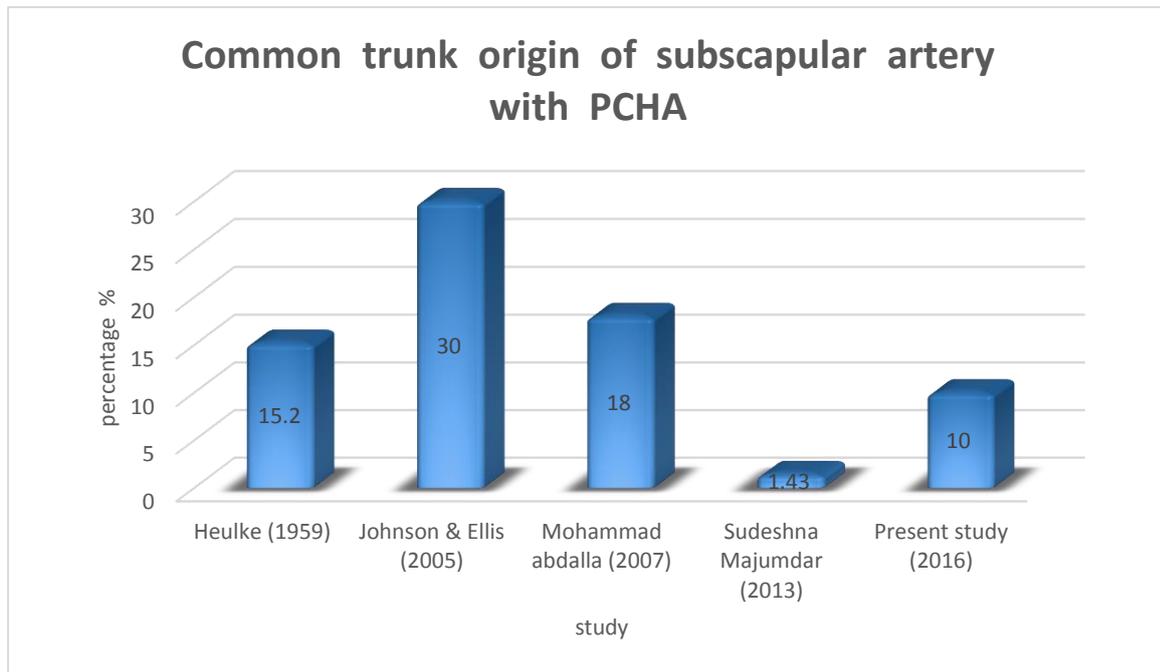
Sudeshna Majumdar et al 2013) observed the common trunk origin of subscapular artery with posterior circumflex humeral artery in 1.43% of specimens.

In the present study (2016) the common trunk for subscapular and posterior circumflex humeral arteries from the third part of axillary artery is 10% of cases which is less than the studies of Huelke , Johnson & Ellis, M.A.Abdalla and more than the study of Sudeshna Majumdar.

Table -26:Incidence of common trunk origin of subscapular and posterior circumflex humeral arteries.

Name of study	Percentage (%)
Heulke (1959)	15.2
Johnson & Ellis (2005)	30
Mohammad Abdalla (2007)	18
Sudeshna Majumdar (2013)	1.43
Present study (2016)	10

Chart : 16



High origin of subscapular artery along with lateral thoracic and posterior circumflex humeral arteries from second part of axillary artery:

Saeed. et al (2002) observed bilateral thoraco humeral trunk arising from the second part of the axillary artery (1.9%) and branching into the lateral thoracic, posterior circumflex humeral and, subscapular arteries.

Mohanty et al (2013) observed in 1 out of 60 upperlimb specimens (1.7%) a common trunk origin from the second part of axillary artery which divides into lateral thoracic artery, subscapular artery and posterior circumflex humeral artery .

Jain SR et al(2013), Sreeja M.T (2014) reported in their studies that the large common trunk arising from the second part of axillary artery, which gives rise to lateral thoracic artery, subscapular artery and posterior circumflex humeral arteries.

In the present study (2016) high origin of subscapular artery along with lateral thoracic and posterior circumflex humeral arteries from the second part of axillary artery is 2.5% of cases which is more or less coincides with the above authors.

Table :27. High origin of subscapular artery with lateral thoracic and posterior circumflex humeral arteries:

Name of study	Percentage (%)
Sayed et al (2012)	1.9
Mohanty SR (2013)	1.7
Present study (2016)	2.5

Common trunk origin of subscapular, anterior circumflex humeral and posterior circumflex humeral arteries from third part of axillary artery:

Saeed et al (2010) , observed common subscapular- circumflex humeral trunk arising from the third part of the axillary artery, dividing into subscapular artery, anterior circumflex humeral and posterior circumflex humeral arteries in 3.8 % of cases.

In the present study(2016) , the common trunk for subscapular , anterior circumflex humeral and posterior circumflex humeral

arteries arising from third part of axillary artery is 2.5% cases which is slightly less than the above author.

Table -28: Incidence of common trunk origin of subscapular, anterior circumflex humeral and posterior circumflex humeral arteries:

Name of study	Common trunk for SSA,ACHA& PCHA (%)
Saeed et al (2010)	3.8
Present study (2016)	2.5

VIII. ORIGIN OF ANTERIOR CIRCUMFLEX HUMERAL ARTERY

D.J. Romanes (1964), Hollinshead (1969), Charles A. Rockwood (2004), Susan Standring (2008), and Chummy S. Sinnatamby (2011) quoted that the anterior circumflex humeral artery is a small branch arises from lateral side of the third part of axillary artery.

Donald F. Huelke (1959) observed that the anterior circumflex humeral artery arises as a direct branch from the third part of axillary artery in 80.3% and in common trunk with posterior circumflex humeral artery in 11.2% of specimens.

Mohammad A. Abdalla (2007) observed the anterior circumflex humeral artery arising from the third part of axillary artery as a direct branch in 80% of limbs and in common trunk with posterior circumflex humeral artery in 16% .

In the present study (2016), the anterior circumflex humeral artery arises from the third part of axillary artery as a direct branch in 87.5% of cases which is slightly greater than the studies of above authors. The common trunk origin with posterior circumflex humeral artery is in 10% of cases, which is less than the above authors .

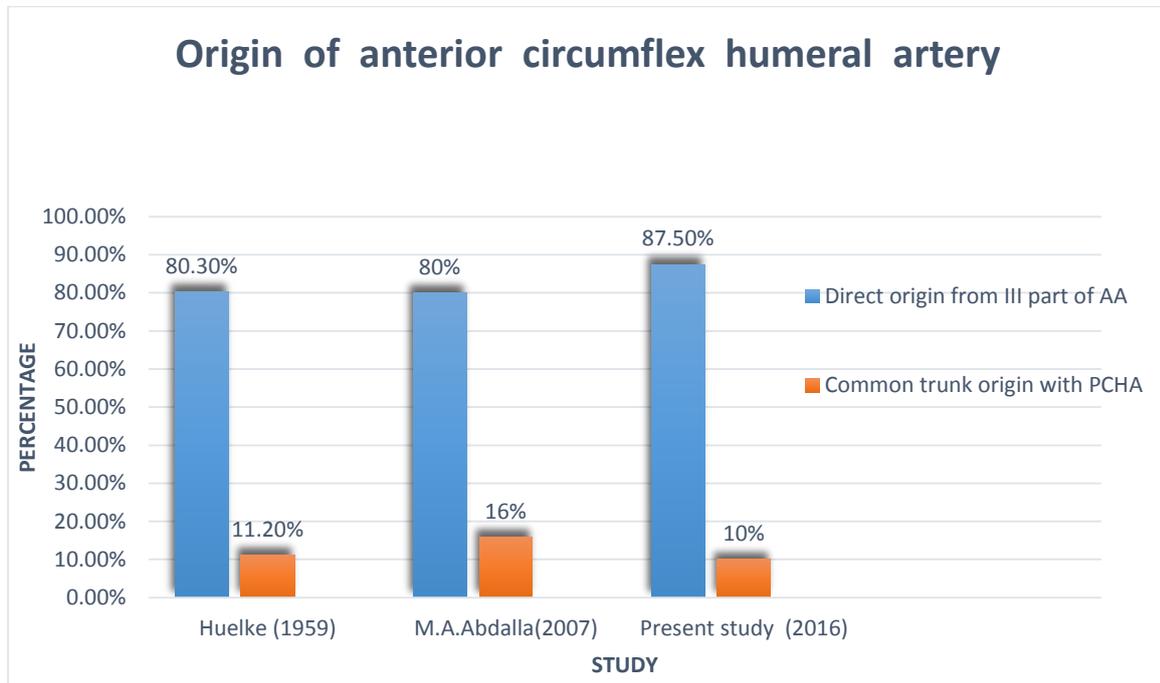
Samta Gaur (2012) observed that the incidence of two anterior circumflex humeral arteries in 4% of specimens.

In the present study (2016) the percentage of two anterior circumflex humeral artery is 7.5% , which is higher than the above study.

Table -29: Comparision of origin of anterior circumflex humeral artery from third part of axillary artery :

Study	Direct origin (%)	Common trunk origin with PCHA (%)
Huelke (1959)	80.3	11.2
M.A.Abdalla(2007)	80	16
Present study (2016)	87.5	10

CHART - 17 (a) : Origin of anterior circumflex humeral artery from third part of axillary artery.



Common trunk origin of anterior circumflex humeral artery with subscapular and posterior circumflex humeral arteries :

Saeed et al (2010) observed , the common trunk origin of anterior circumflex humeral artery with posterior circumflex humeral and subscapular artery in 3.8 % of cases.

In the present study (2016) , the common trunk origin of anterior circumflex humeral artery with subscapular and posterior circumflex humeral arteries is 2.5% which is more or less coincides with the above study.

Table -30 : Incidence of common trunk origin of ACHA, SSA & PCHA.

Name of study	Percentage (%)
Saeed et al (2010)	3.8
Present study (2016)	2.5

CHART -17 (b) : Common trunk origin of anterior circumflex humeral artery along with subscapular and posterior circumflex humeral arteries from third part of axillary artery.

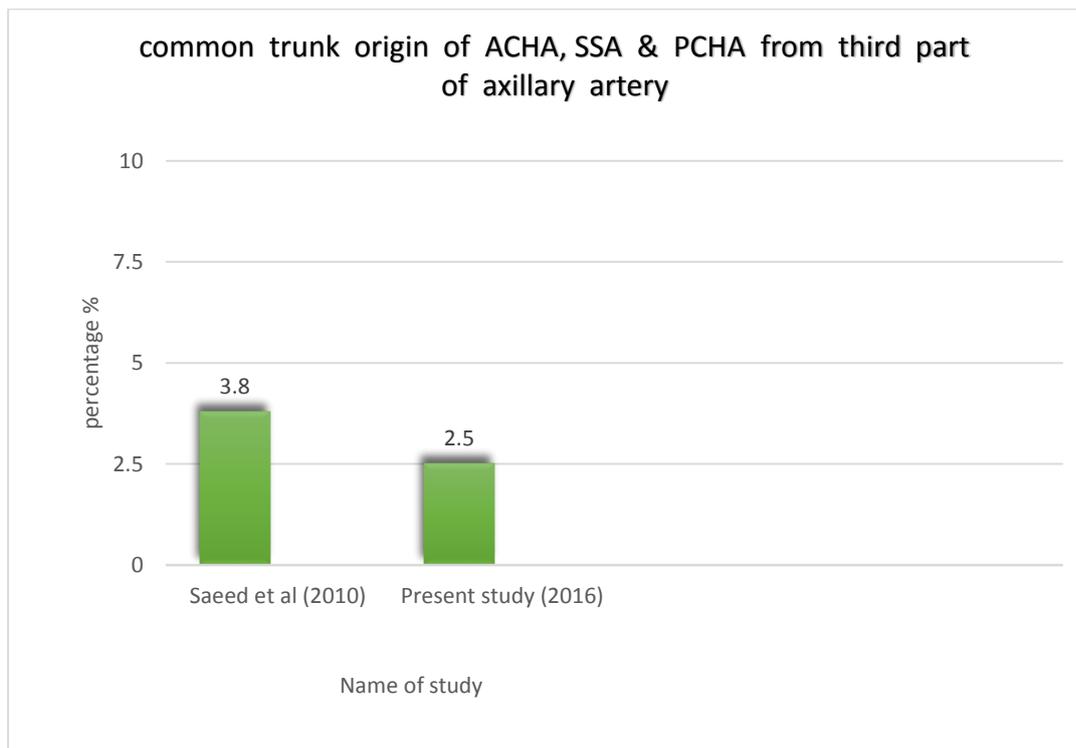
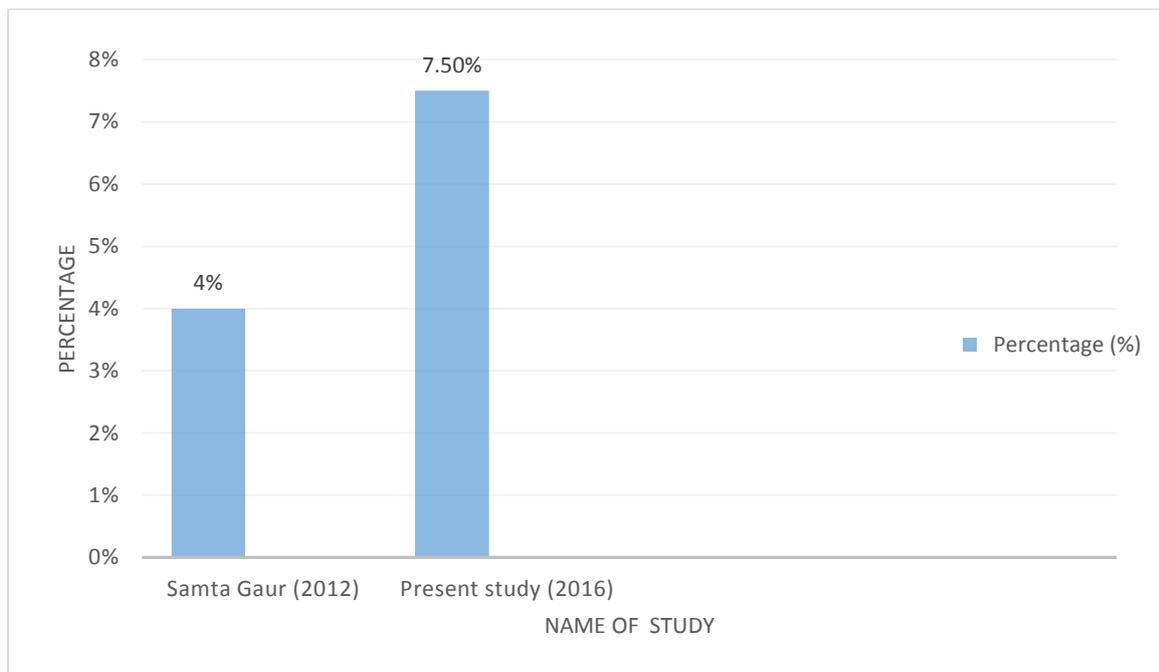


Table : 30. Incidence of two anterior circumflex humeral arteries from third part of axillary artery:

Name of study	Percentage (%)
Samta Gaur (2012)	4
Present study (2016)	7.5

Chart :18. Incidence of two anterior circumflex humeral artery from third part of axillary artery.



IX. ORIGIN OF POSTERIOR CIRCUMFLEX HUMERAL ARTERY

D.J.Romanes (1964), Hollinshead (1969), Susan Standring (2008) Chummy S. Sinnatamby (2011) quoted that the posterior circumflex humeral artery is a larger branch than the anterior circumflex humeral artery, arises directly or by a common

trunk with anterior circumflex humeral artery from the third part of axillary artery.

Donald F. Huelke (1959) observed that the posterior circumflex humeral artery arose from the third part of axillary artery in 78.7% of limbs as a direct branch and in common trunk of origin with anterior circumflex humeral artery in 11.2% of cases .

Mohammad A. Abdalla (2007) observed that the posterior circumflex humeral artery arising from the third part of axillary artery as a direct branch in 58% of specimens . In common with anterior circumflex humeral artery in 16% of specimens and with subscapular artery in 18% of specimens it arises from the third part of axillary artery.

Samta Gaur (2012) observed in 4% of specimen posterior circumflex humeral artery is a large trunk arises with the subscapular artery .

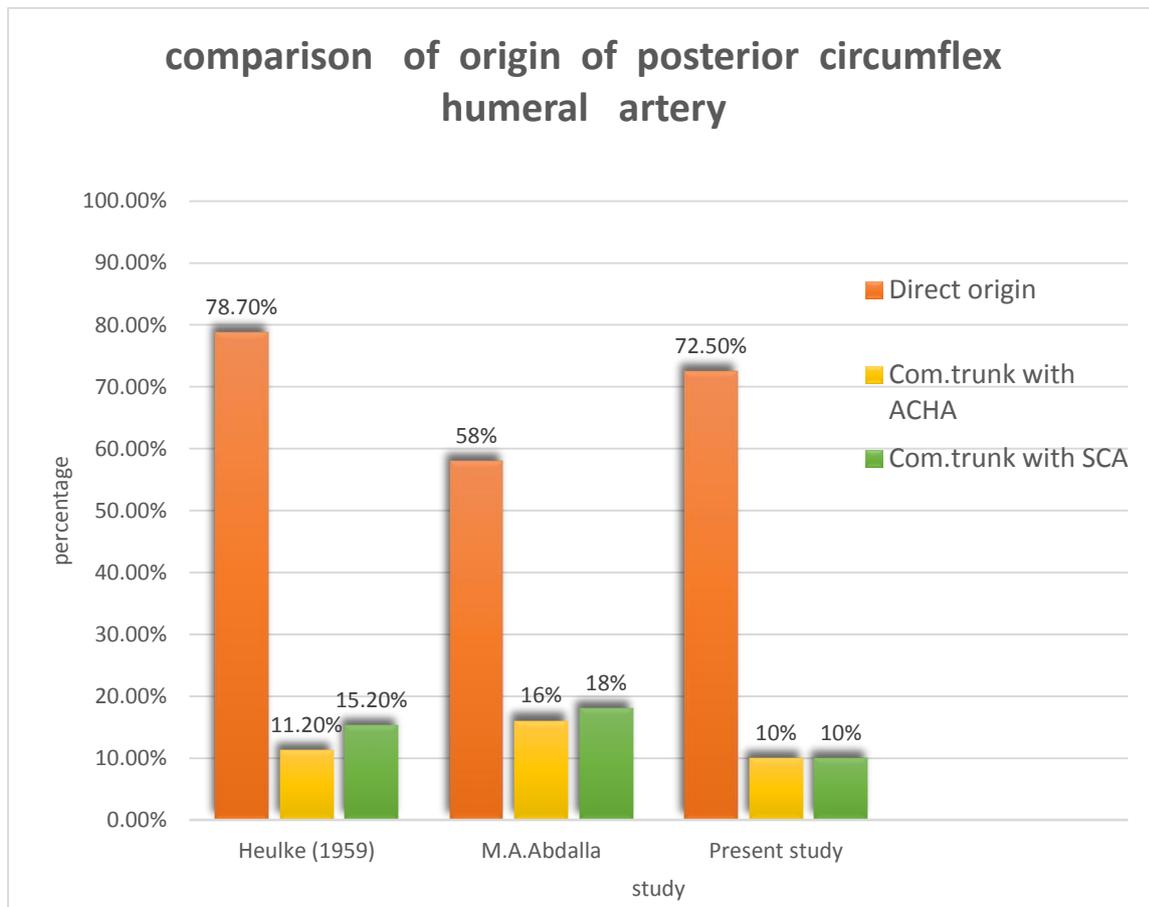
In the present study (2016) , the posterior circumflex humeral artery arises from the third part of axillary artery as a direct branch in 72.5% of specimens which is more or less equal to Heulke (1959) and greater than M.A.Abdalla (2007).

It arises in common with anterior circumflex humeral artery in 10% of specimens which is less than the above authors . In common trunk origin with subscapular artery in 10% of specimens which is higher than that of Samta Gaur (2012).

Table -31: Origin of posterior circumflex humeral artery from third part of axillary artery:

Name of study	Direct origin(%)	Com. trunk with ACHA(%)	Com. Trunk with SCA(%)
Heulke (1959)	78.7	11.2	15.2
M.A.Abdalla	58	16	18
Present study	72.5	10	10

CHART – 19:



High origin of posterior circumflex humeral artery from second part of axillary artery:

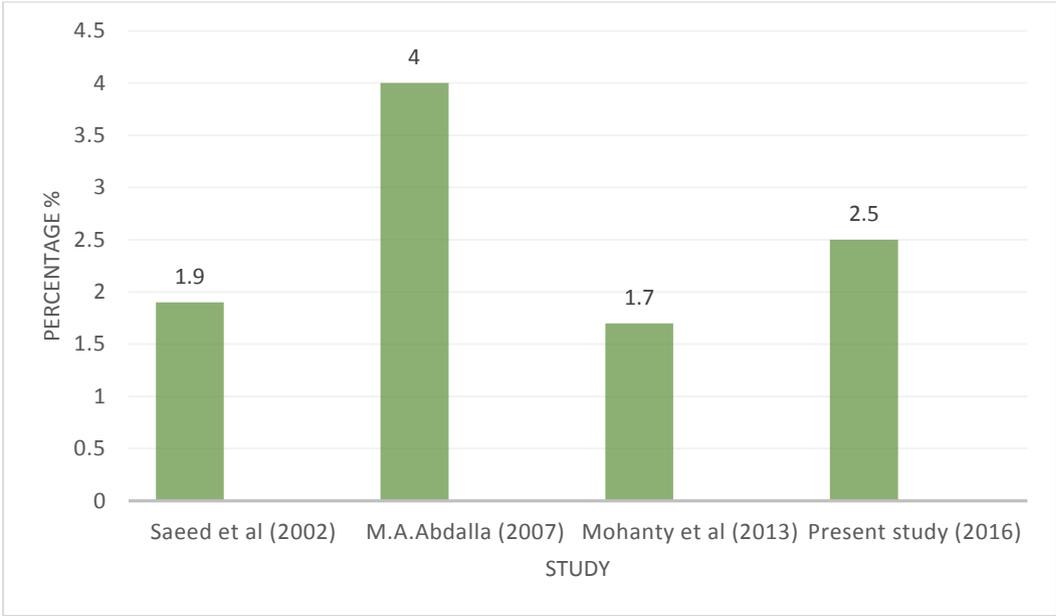
Saeed et al (2002) observed bilateral thoraco humeral trunk arising from the second part of the axillary artery (1.9%) and branching into the lateral thoracic, subscapular and posterior circumflex humeral arteries.

Mohammad A. Abdalla (2007) observed in 4 % of specimens , the posterior circumflex humeral artery arose from second part of axillary artery in common with subscapular and lateral thoracic arteries.

Mohanty et al (2013) observed in 1 out of 60 upper limb specimens (1.7%) a common trunk origin from the second part of axillary artery which divides into lateral thoracic artery, subscapular artery and posterior circumflex humeral artery .

In the present study high origin of common trunk from the second part of axillary artery for subscapular and posterior circumflex humeral arteries is 2.5% . Also the high origin of common trunk for lateral thoracic artery , subscapular and posterior circumflex humeral arteries from the second part of axillary artery is 2.5% , which is more or less equal to Saeed et al (2002) and Mohanty et al (2013) and less than M.A. Abdalla (2007).

Chart :20 High origin of posterior circumflex humeral artery from second part of axillary artery from common trunk origin with lateral thoracic and subscapular arteries.



CONCLUSION

The axillary artery in the upper limb of 40 adult cadaveric specimens have been studied in detail by dissection method and 10 radiological images of axillary artery were studied. The study was carried out under the following parameters.

1. Length and extent.
2. Course in relation with axillary vein, brachial plexus and adjacent structures.
3. Number of named branches.
4. Origin of superior thoracic artery.
5. Origin of thoraco acromial artery.
6. Origin of lateral thoracic artery.
7. Origin of subscapular artery.
8. Origin of anterior circumflex humeral artery.
9. Origin of posterior circumflex humeral artery.

The findings were observed and correlated with the studies of many workers. The following conclusions were derived from this study.

The axillary artery extends from the outer border of first rib to lower border of teres major. The average length of axillary artery was 10.45 cm.

The course of axillary artery was normal. The axillary vein accompanied the artery antero medially throughout its course.

The cords of brachial plexus carried the usual course in relation with three parts of axillary artery.

Number of named branches arising from the axillary artery ranges from 4 - 9 , and the most commonly observed number was 6 in 60% of specimens.

The superior thoracic artery arose from the first part of axillary artery in 97.5% and absent in 2.5% of specimens.

The thoraco acromial artery arose from the second part of axillary artery in 97.5% . In 2.5% the thoraco acromial trunk was absent and the terminal branches arose directly from second part of the axillary artery. And termination of thoraco acromial trunk into two sub-trunks were noted in 2 specimens (5%).

The lateral thoracic artery arose directly from the second part of axillary artery in 95% . Common stem origin with subscapular and posterior circumflex humeral arteries was observed in 2.5% and absent in 2.5% of specimens.

The subscapular artery arose directly from third part of axillary artery in 82.5 % , from common stem origin with posterior circumflex humeral artery in 10 % and along with anterior and posterior circumflex humeral arteries in 2.5 % of specimens.

In 2.5% of specimens the subscapular artery arose from second part of axillary artery as a common stem along with posterior circumflex humeral artery and in 2.5% of specimens from a common stem for lateral thoracic and posterior circumflex humeral arteries.

The anterior circumflex humeral artery arose from third part of axillary artery as a direct branch in 87.5% , from a common stem with posterior circumflex humeral artery in 10% and from a common stem

along with subscapular and posterior circumflex humeral arteries in 2.5% of specimens.

There was two anterior circumflex humeral arteries seen in 3 out of 40 specimens, which is about 7.5% and only one anterior circumflex humeral artery is present in 37/40 specimens (92.5%).

The posterior circumflex humeral artery arose from the third part of axillary artery as a direct branch in 72.5% , common stem with subscapular artery in 10% , with anterior circumflex humeral artery in 10% and from a common stem along with subscapular and anterior circumflex humeral arteries in 2.5% . High origin of posterior circumflex humeral artery from second part of axillary artery was observed in 5% of specimens that is, in 2.5% from a common stem along with subscapular artery and in 2.5% along with lateral thoracic and subscapular arteries.

The variations in the branching pattern of axillary artery were due to defect in the development of vascular plexus of upper limb bud .This occurred due to arrest in the development of vessels followed by regression , retention or reappearance which result in variations in the origin and course of the arteries.

Knowledge of the axillary artery , branching pattern and its variation is important during antegrade cerebral perfusion in aortic surgery, in treating the axillary artery thrombosis ,medial arm skin flap, in reconstruction of axillary artery in case of traumatic injury and in axillary – coronary bypass shunt procedures .

So the normal anatomy and variations of axillary artery are very important to the Anatomists, Surgeons, Anaesthetists, Radiologists,

Cardiologists and Plastic surgeons for accurate diagnostic and therapeutic interventions.

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