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### RESEARCH ARTICLE

#### MORPHOLOGICAL VARIATION IN BRANCHING COURSE AND DISTRIBUTION OF AXILLARY ARTERY IN NORTH INDIAN POPULATION

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#### Abstract

Anomalous arterial pattern are having significant importance for anatomist, vascular reconstruction surgeons and radiologists. The present study was conducted on 22 formalin fixed cadavers. Out of which 4 cadavers showed variation in the course and branching pattern of superior thoracic artery. In 2 male cadavers, superior thoracic artery showed unusual course and other 2 cadavers showed variations in the branching pattern of lateral thoracic and subscapular arteries. Knowledge of these arterial patterns is useful in determining pathology of arteries, their proper surgical procedures and proper diagnostic interpretation.

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#### Introduction:-

Variation in the branching pattern of axillary artery was found frequently. The axillary artery is a continuation of the subclavian artery at the outer border of the first rib to the lower border of teres major muscle and then, further continues as brachial artery. Usually, it divided into 3 parts by pectoralis minor muscle. First part gives off superior thoracic artery, 2<sup>nd</sup> part gives; lateral thoracic artery and thoracoacromial artery and 3<sup>rd</sup> part gives; subscapular, anterior circumflex humeral and posterior circumflex humeral arteries. The arteries of the limbs arise as a number of vessels contributing to a primitive capillary plexus but eventually only one trunk persists as subclavian and it has the positions and relations of the intersegmental artery. Any deviation in the development of the vascular plexus of the upper limb bud may be responsible for the variations in the branching of axillary artery.<sup>1,2</sup> Knowledge of the variations in branches of axillary artery is important for surgeons and orthopedic for avoiding complications during vascular and other surgeries in the pectoral regions for angiography. Most of the times, anatomical variations would not cause any symptoms or harm to the subject who have it. Various genes like ephrin B2 for arteries and neuropilin-2 for veins are the vital factors for the branching morphogenesis in blood vessels.<sup>3</sup>

#### Materials and Methods:-

The present study was carried out in the Department of Anatomy, PGIMS Rohtak, Haryana. The present study on variations in course and branching pattern of axillary artery was observed during routine dissection. This study conducted on 22 formalin fixed both male and female cadavers bilaterally. Dissection was done according to the steps described in Cunningham's manual of practical anatomy volume – 1.

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**Result:-**

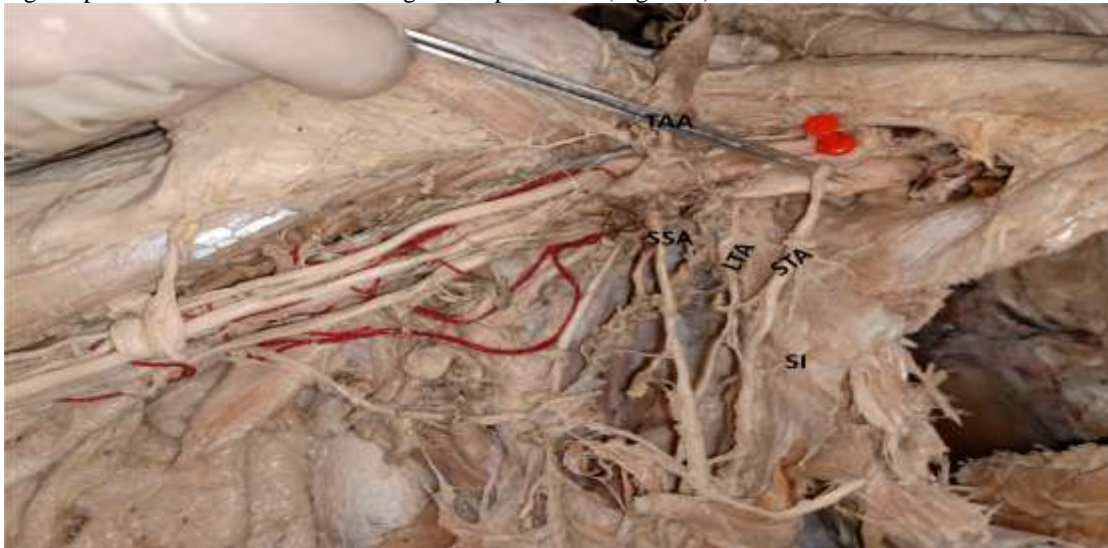
In present study, variations in the branches and their branching courses of axillary artery were observed in 4 male cadavers. Out of 4 cadavers, 2 specimens showed unusual course of superior thoracic artery and 2 specimens showed variations in branching pattern of axillary artery. In the remaining upper limbs of 18 cadavers, the course and branching pattern of the axillary artery were found usual as per described in the standard textbook of anatomy.

**Unusual Course of Superior thoracic artery:**

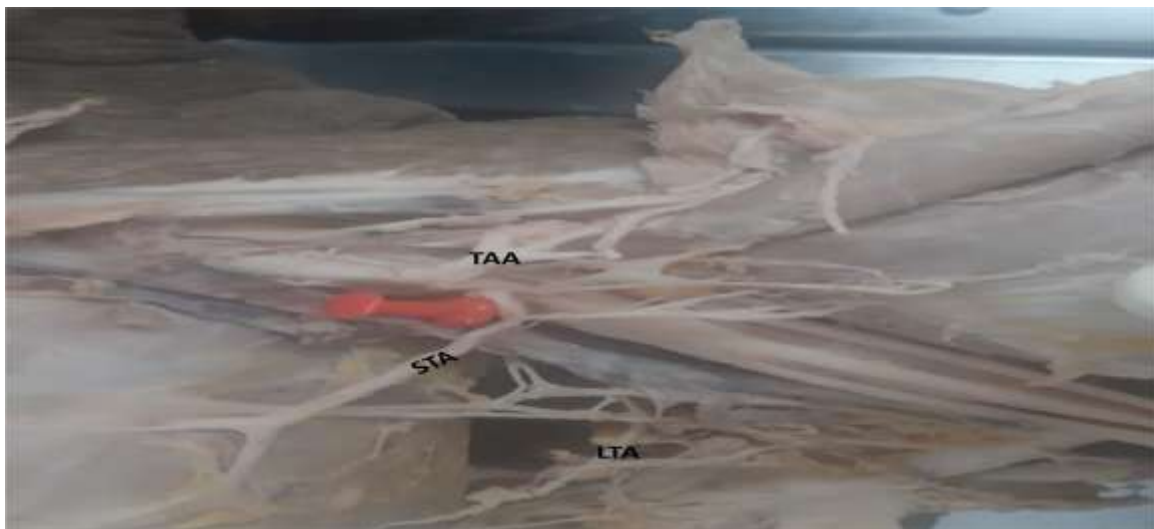
In the present study, the superior thoracic artery which is the branch of 1<sup>st</sup> part of axillary artery showed a different course in 2 cadavers unilaterally.

In 1<sup>st</sup> male cadaver it seen on the right side, STA was observed to be originated from the 1<sup>st</sup> part of axillary artery. Then, after taking origin it was followed unusual course & runs downwards, backwards and laterally towards the axilla below the pectoralis minor muscle and it was found to be terminated under the serratus anterior muscle. (Figure 1)

In 2<sup>nd</sup> male cadaver it seen on the left side, STA was found to be originated from the 2<sup>nd</sup> part of axillary artery just below and lateral to thoraco-acromial artery. Then, extends downwards, forwards and medially and ends by supplying the pectoralis minor muscle through it deep surface. (Figure 2)



**Figure 1:-** Unusal course of Superior thoracic artery (STA) on the right side of a cadaver.



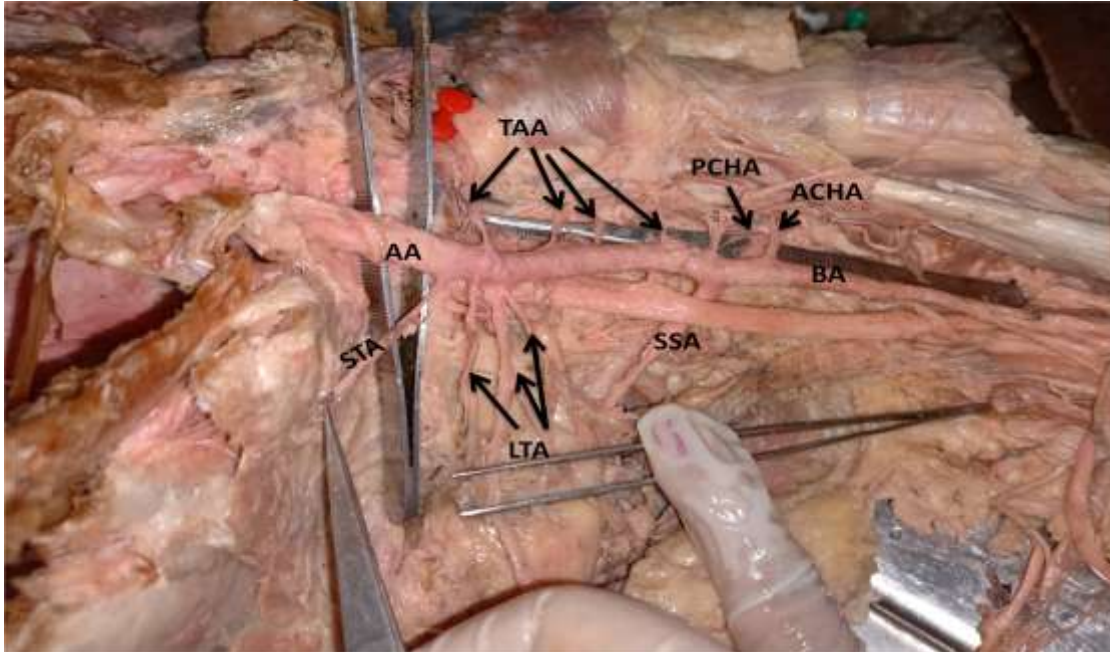
**Figure 2:-** Showing origin of Superior thoracic artery (STA) from 2<sup>nd</sup> part of Axillary artery.

**Variations in course of branches of axillary artery:**

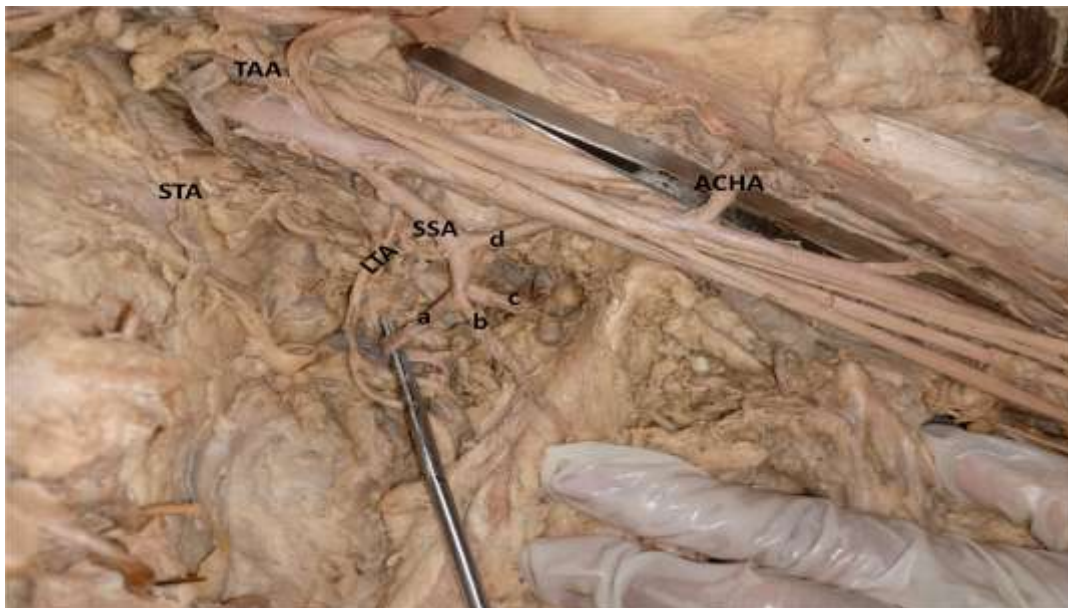
In the present study, 2 male cadavers showed variations in the branching pattern of lateral thoracic and subscapular arteries which are corresponding branches of 2<sup>nd</sup> and 3<sup>rd</sup> part of axillary artery. These variations were seen unilaterally on the left side of 2 male cadavers.

In 1<sup>st</sup> cadaver, trunk of thoraco-acromial artery was absent and all its branches arises directly from the 2<sup>nd</sup> and 3<sup>rd</sup> part of axillary artery. In this, LTA also originated as 3 branches from the 2<sup>nd</sup> part of axillary artery. (Shown in Figure 3)

In second cadaver, subscapular artery was found to be originated from the 2<sup>nd</sup> part of axillary artery and divided into 4 terminal branches. (Shown in Figure 4)



**Figure 3:-** Showing absence of thoraco-acromial trunk (TAT) and origin of its branches directly from axillary artery and LTA arising as 3 branches.



**Figure 4:-** Showing division of Subscapular artery into 4 branches as a,b,c,d.

**Discussion:-**

In the present study, the most frequent number of branches arising from axillary artery were 4 to 8 which were similar to the findings of Astik R (2012)<sup>4</sup> et al while DeGaris & Swartley<sup>5</sup> observed 5 to 11 branches arising directly from the axillary artery and Heulke<sup>6</sup> et al found 2 to 7 branches that were rising directly from the axillary artery which were not similar to the present study. Subscapular artery was originated from the second part of axillary artery in present study which was similar to Huelke (1959)<sup>6</sup> et al observed in 52.2% cases and Gaur S<sup>7</sup> (2012) et al observed subscapular artery arose from 2<sup>nd</sup> part in 4% cases. Any type of deviations in the vascular plexus during embryonic development of the upper limb bud may cause the variations in the branching pattern of axillary artery. These deviations were followed by regression, retention or reappearance and cause variations in the arterial pattern of upper limb vessels. Presence of variations in the arterial patterns may be a matter for concern to the radiologists and vascular surgeons which may lead any type of complications in the surgeries of axilla and pectoral regions.<sup>3</sup>

Thus, knowledge of these variations are important for surgeons during antegrade cerebral perfusion in aortic surgery, reconstructing the axillary artery, treating thrombosis of axillary artery, use of branches of axillary artery for microvascular graft to replace the damaged arteries, shoulder dislocations etc. lack of knowledge of the variations can lead to the ruptured and bleeding during surgery of dislocation of shoulder joint. The present study observed different, unique and significant variations in course and branching pattern of axillary artery. These variations in the formation/development of blood vessels, genetic regulation play a significant role at the early stage of development. However, presence of anatomical variations may complicate the surgical procedure to be performed or the surgeon may need to modify the surgical approach.

**Conclusion:-**

Variations in the branching pattern and course of axillary artery are very common but some variations are unusual and play a significant role for the radiologists, orthopaedic surgeons and for vascular surgeons for the accurate diagnosis of pathology in the axilla and pectoral regions of upper limb. Due to this clinical significance of axillary artery, the present research made an attempt to provide additional and useful information to the vascular surgeons and radiologists about the variations in the branching pattern and its course. The significance of axillary artery and its branches lies in its use in coronary bypass and flaps in reconstructive surgeries. Hence, the normality as well as abnormality of axillary artery and its branches should be known for accurate surgical and diagnostic procedures.

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