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Anatomical Study on Posterior Circumflex Humeral Artery

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Abstract

To study the variations in the origin of posterior circumflex humeral artery and note its pattern. 54 axillae from embalmed cadavers allotted for dissection were used for the study. There were 22 male and 5 female cadavers, with ages ranging from 60-80 years, specimens of both sides were used. The commonest variation was common trunk for posterior circumflex humeral and subscapular arteries (20.4%), followed by posterior and anterior circumflex humeral arteries (14.8%) posterior circumflex humeral and profunda brachii arteries (14.8%). The posterior circumflex humeral artery is prone to degeneration, aneurysm formation thrombosis in elite volleyball players and baseball pitchers. Hence awareness of variation of posterior circumflex humeral artery and its branching pattern is important for radiologists and vascular surgeons.

INTRODUCTION

Posterior circumflex humeral artery branches from the third part of axillary artery at the distal border of subscapularis and runs backwards with the axillary nerve through a quadrangular space. It curves round the humeral neck and supplies the shoulder joint, deltoid, teres major and minor long and lateral heads of triceps.

It gives off a descending branch which anastomoses with the deltoid branch of the profunda brachii artery and with the anterior circumflex humeral artery and acromial branches of the supra scapular and thoraco-acromial arteries^[1].

Variations:

- Origin of anterior and posterior circumflex humeral arteries by a common stem.
- Origin of posterior circumflex humeral artery from the arteria profunda brachii or subscapular artery, instead of the axillary artery.
- Common origin of subscapular, circumflex humeral and arteria profunda brachii^[2].

Embryo logical Basis: Proximal part of the main trunk of axis artery of upper limb forms the axillary and brachial arteries and its distal part, the anterior interosseous artery^[3].

Variations in branching pattern of axillary artery are due to defects in embryonic development of the vascular plexus of upper limb bud. This may be due to an arrest at any stage of development of vessels followed by regression, retention or reappearance, thus leading to variations in the arterial origin and course of major upper limb vessels^[4].

Elite volleyball players frequently have cold, discolored painful fingers in the dominant hand, which might be the result of emboli derived from the posterior circumflex humeral artery (PCHA) in the ipsilateral shoulder^[5].

MATERIALS AND METHODS

54 axillae from embalmed cadavers allotted for dissection in the Department of Anatomy for a duration of 3 years were used for the study. There were 22 male and 5 female cadavers, with ages ranging from 60-80 years

The axillary region was dissected and exposed according to the methods described in Cunningham's Manual of Practical Anatomy. The arterial pattern and variations of PCHA were noted down^[6].

Photograph of each specimen was taken after dissection, with digital camera and labelled.

RESULTS AND DISCUSSIONS

For males, Left v/s Right: $X^2 = 5.75$, $p = 0.22$, ns
For females, Left v/s Right: $X^2 = 2.00$, $p = 0.57$, ns

In male cadavers, PCHA was arising alone in 8 specimens (36.2%) and 12 specimens (54.5%) belonging to left and right side respectively. It arose in combination with SSA in 6 specimens (27.2%) of left side and 3 specimens (13.6%) of right side. In common with ACHA in 4 specimens (18.2%) of left and 2 specimens (9.2%) of right side. In common with PBA in 2 specimens (9.2%) and 5 specimens (22.7%) belonging to left and right side respectively. In combination with CSA in only left sided 2 specimens (9.2%).

In female cadavers, PCHA was found emanating alone in 2 specimens (40%) each of right and left side. In common with ACHA as well as SSA, 1 specimen (20%) each of both sides. In combination with PBA in only one specimen (20%) belonging to left side where in common with CSA, right sided 1 specimen (20%).

The X^2 and p values for males was 5.75 and 0.22 respectively where as in females it was 2.00 and 0.57 respectively.

A comparison of sites of origin of PCHA with earlier studies is shown in the above table which indicates that this artery arises directly from III part of AA in percentage range of 26%-73.4% as compared with present study finding of 44.4%. PCHA in common with SSA was seen in percentage range of 1.4%-39.8% as compared to 20.4% in present study. The incidence of common trunk with PBA ranked second in present study (14.8%) as compared to previous percentage range of 2%-27.2%.

DeGaris CF and Swartley WB (1928) on the basis of 512 dissections of the axillary artery described twenty-three patterns of branching.

Pattern A: The anterior and posterior humeral circumflex come off close together, sometimes by a common trunk, near the surgical neck of the humerus. This pattern was observed in about 14.8% in our study.

Pattern H: The posterior circumflex was derived from the subscapular, the anterior circumflex arising distally from the axillary, this was observed in 20.4% in our study^[8].

Based on observations made by Trotter M and co-authors (1930), on dissections of 384 arms reported that the anterior and posterior circumflex arteries came from a common trunk (ninety cases), in our study we observed in 8 cases.

When the posterior circumflex came from the subscapular (in fifty one) whereas in our study it was seen in 11 cases.

Adachi found no sex difference, but did find a probably significant difference between the two sides of the body, viz., the posterior humeral circumflex originated in conjunction with or from the subscapular more often on the right side than on the left. In our study it was more common on left side than right^[9].

In a study conducted by Ming-Tzu P (1940) on 70

axillae of Chinese population made observations based on mode of origin of posterior circumflex humeral artery as direct branch of axillary artery in only 35.7%, whereas in our study it was 44.4%.

Of the 20 types, the type with both circumflex humerals combine (20.7%) in comparison to our study was 14.8%. The posterior circumflex humeral joining the subscapular (15%) whereas in our study it was 20.4%^[10].

The posterior circumflex humeral artery was a direct branch of the third part of the axillary artery in 68% of sides, in our study it was 44.4%. In 11% of sides the circumflex humeral arteries arose by a common stem whereas in our study it was 14.85. In 15% of sides the posterior circumflex humeral artery arose from the subscapular artery, which was little higher in our study 20.4%^[11].

A common trunk for the subscapular and posterior circumflex humeral arteries is another frequent abnormality. It occurred 88 times in 284 dissections, i.e., $31\% \pm 2.7\%$, in our case it was observed in 20.4%^[12]. Anson BJ (1966) stated that Anterior circumflex humeral artery may arise in a common stem with posterior circumflex humeral artery. Posterior circumflex humeral may arise as common trunk with the subscapular artery (15 percent) which was 20.4% in our study^[13].

The branches of the third part of axillary artery are subject to great variation. The two circumflex arteries may arise from a common trunk (Poynter 20%, Quain 6%, Pellegrini 22%, Hitzrot 16%), usually alone or rarely together with the profunda brachii and muscular branches. In a study of 610 limbs, the anterior artery had a common origin with the posterior artery (13.4%), which we saw as 14.8%. The posterior artery has an origin most frequently with the subscapular (Poynter, 10%) in comparison to 20.4% in our study. The posterior circumflex humeral may be doubled, as seen in one case of our study^[14].

Daimi SR reported a case with two trunks of PCHA, the diameter of which were larger as compared to diameter in ACHA. This correlated with present study (Specimen 32 ML)^[15].



Fig. 1: Shows normal Posterior Circumflex Humeral Artery arising from third part of axillary artery



Fig. 2: Showing Common trunk for Posterior Circumflex Humeral artery and Subscapular Artery



Fig. 3: Showing Common trunk for Posterior Circumflex Humeral Artery and Anterior Circumflex Humeral Artery



Fig. 4: Showing Common trunk for Posterior Circumflex Humeral artery and Profunda Brachii Artery

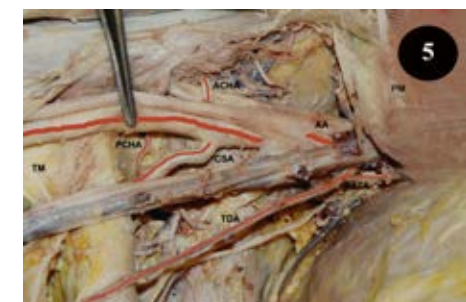


Fig. 5: Showing Common trunk for Posterior Circumflex Humeral artery and Circumflex Scapular artery

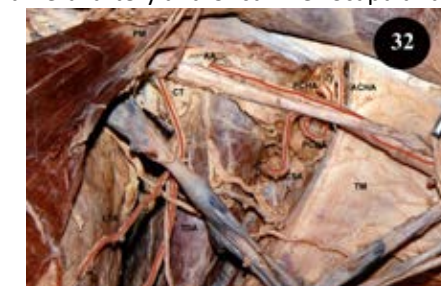


Fig. 6: Showing double posterior circumflex humeral artery

Table 1: Arterial pattern of posterior circumflex humeral artery (PCHA)

Arterial pattern	Male		Female			
	Left (n=22)	Right (n=22)	Left (n=5)	Right (n=5)		
	No.	%	No.	%	No.	%
PCHA+ACHA	4	18.2	2	9.2	1	20
PCHA+PBA	2	9.2	5	22.7	1	20
SSA +PCHA	6	27.2	3	13.6	1	20
PCHA+CSA	2	9.2	-	0	-	1
PCHA alone	8	36.2	12	54.5	2	40

Table 2: Comparison of sites of origin of PCHA7

Sl. No.	Name of Author	Site of origin in (%)				
		Directly from III part of AA	In common with ACHA	In common with SSA	In common with PBA	Others
1.	Pellegerini	37.5	2.1	22.1	11.5	4.8
2.	Adachi	33	-	39.8	27.2	-
3.	DeGaris	73.4	15.8	1.4	4.7	4.7
4.	Trotter	63.3	23.4	13.8	-	-
5.	Pan	35.7	33.6	28.6	2.1	-
6.	Huelke	67.5	12.3	15.2	2.8	2.2
7.	Keen	26	30	31	13	-
8.	Patnaik	58	16	22	2	2
9.	Present study	44.4	14.8	20.4	14.8	5.6

List of Abbreviations Used

AA	Axillary artery
ACHA	Anterior circumflex humeral artery
BA	Brachial artery
CSA	Circumflex scapular artery
CT	Common trunk
PBA	Profunda brachii artery
PCHA	Posterior circumflex humeral artery
PM	Pectoralis minor
SSA	Subscapular artery

CONCLUSION

- The following conclusions can be made from the present study.
- Variation pattern was encountered in 56% cases with a greater frequency in male specimens and the percentage of variation was greater on left side than right.
- A common trunk for both circumflex humeral arteries were found most on left side of male cadavers.
- Subscapular artery originated in conjunction with posterior circumflex humeral artery more often on left side than on right.
- The origin of subscapular artery in conjunction with posterior circumflex humeral artery was the commonest variation (20.4%) encountered during the study, followed by common trunk for anterior and posterior circumflex humeral arteries in 14.8% and posterior circumflex humeral with profunda brachii artery in 14.8% of specimens.
- In the present study, double posterior circumflex humeral artery was seen in 1.9% specimens.

The possibility of variations in the branching of PCHA is enormous and it includes variations of the circumflex arteries. Many pathologies, procedures and techniques require the knowledge of this anatomy. Well-prepared professionals must be familiar to these variations.

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