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# A Study of the Attachments of human Brachialis Muscle

KEYWORDS: brachialis , radial nerve, cadaver

**Shalini Chaudhary**

assistant professor, department of anatomy, B.P.S.G.M.C. Khanpur Kalan,sonepat , Haryana

**ABSTRACT** *Anatomy of human Brachialis muscle has been studied previously by different authors in Australian ,Caucasian, Chinese and Thai population. Present study was aimed to describe gross morphology and nerve supply of brachialis muscle and to elucidate racial differences between Indian and other population .40 upper limbs of twenty embalmed Indian cadavers were dissected. In all specimens , the brachialis had 2 heads , superficial and deep. The larger , superficial head had more proximal origin and distal insertion than deep head. In all specimens, brachialis was supplied by musculocutaneous nerve while only 70% (28/40) cases received branch from radial nerve. Aforementioned results in Indian population are different from previous studies in some aspects reported in other populations. These anatomical facts are important for humeral surgery including both anterior and anterolateral approaches especially for orthopedic intervention on the Indian population.*

**Introduction**

Human brachialis muscle has a long- running controversy regarding its gross morphological characterstics and manner of innervation .Most anatomical text books (Gray's anatomy 40th ed. and Last's anatomy 7th edition ) [1,2] have described origin of brachialis muscle from the lower half of the front of the humerus, starting on either side of the insertion of deltoid, and extending distally to within 2.5 cm. of the cubital articular surface. It also arises from the intermuscular septa, more from the medial than the lateral. Its fibers converge to a thick, broad tendon which is attached to the ulnar tuberosity and on the anterior aspect of the coronoid process. Regarding the nerve supply to brachialis many previous authors have vaguely alluded to a dual innervation to this muscle, whereas some have either considered the musculocutaneous nerve as the sole supply or thought the radial nerve contribution entirely sensory. While some workers (Hollinshead WH ,1958; Mahakkanukrauh and Somsarp, 2002; Spinner , 2003 ) [3,4,5] have claimed radial nerve supply to be motor in function by observing contraction in a part of the brachialis muscle in a patient with completely severed musculocutaneous nerve after giving intra operative stimulation. Leonello DT et.al.(2007)[6] carried out cadaveric study in Australian population to clarify brachialis muscle anatomy in order to refine surgical techniques around elbow. Distal attachment of brachialis muscle was studied by Hatice Tuba Sanel[7] with anatomical dissection & M.R.I. study in U.S.A . Because of the scarcity of such reports in Indian population , present study was performed to investigate gross morphology and innervations of human brachialis muscle. The embryonic origin of the brachialis is also discussed.

**Materials and methods**

Twenty embalmed cadavers (40 upper limbs) including 11 males and 9 females were dissected on both right and left side . The brachialis muscle was completely visualized during dissection, and its length was visually divided into three equal segments to allow comparision with previous studies ( Mahakkanukraauh and Somsarp, 2002 ). The segment into which branches from radial and musculocutaneous nerve entered was recorded. We also noted the course of the branches after they arose from the main trunk.

For each arm , a tape measure was used to measure the distance from the tip of the acromion process to the proximal part of the tip of the lateral epicondyal of the humerus. Measurements of the total length of the brachialis muscle and length of its extramuscular tendinous part were expressed as a percentage of the distance between the lateral epicondyal and acromion. Histological sections were made of 5 branches of the radial nerve to brachialis to confirm the presence of nerve tissue.

**RESULTS AND OBSERVATION:**

Brachialis muscle was seen uniformly to be consisting of 2 heads, superficial and deep. The superficial head forming the main bulk of the muscle originated from the anteromedial and anterolateral surface of the middle third of humerus ,embracing the deltoid insertion. In addition it also had attachement to the adjoining part of the lateral intermuscular septum. Its fibers ran vertically and terminated in a thick tendon to be inserted onto the ulnar tuberosity. Fibers of the deep head could be seen arising from the anterormedial and anterorlateral suaface of the distal third of the humerus. In addition fibers were seen to be attached to the medial and lateral intermuscular septum. Fibers of the deep head coming from anterolateral surface ran obliquely across the elbow joint crossing from lateral to medial side .Some of these fibers invaginated the tendon of the superficial head and rest converged to form a thickened aponeurosis with the vertically running fibers of the deep head (coming from anterior-medial surface) to be inserted on to the medial side of the coronoid process .The mean of the total length of the superficial head of the muscle as a percentage of the distance between lateral epicondyle and acromian process was 67.13% ( range 60 -72% ) and for deep head was 28%( range 22-34%).The mean length of the extramuscular tendon as a percentage of distance between lateral epicondyle to acromion process for superficial head was 54.9%(range 50-56.7%) and for deep head was 22.75%(range 18-28%).

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All specimens of superficial head and 27.5% (11/40) specimens of deep head were supplied by branches from musculocutaneous only.

70% (28/40) specimens of brachialis were innervated by a branch from the radial nerve . Regarding all the parameters, there were no statistically significant differences between male and female cadavers or between the right and left side.

**DISCUSSION**

Our findings suggest that brachialis muscle uniformly consists of 2 heads, superficial and deep. Which differs from many of the anatomical textbooks describing 2 heads as a variation and not a regular feature. Whereas it goes in favour of 2 previous studies (Leonello et al.,2007 and Hatice Tuba Sanel, 2007 ). The differing morphology of these 2 heads indicates that they may have different developmental origins, nerve supply and function . Embryological basis for double innervations of the brachialis muscle by branches from musculocutaneous nerve and radial nerve in 70% (28/40) specimens can be explained by union of hypomere (flexor) and epimere ( extensor ) muscle masses derived from two different embryonic muscular primordial (Mahakkanukrauh, Somsarp) . In the remaining muscles ( 30% ) specimens, the brachialis must havebeen contributed to , solely by the ventral muscle mass which is innervated by the musculocutaneous nerve only. Our findings of 70% dual innervation in 40 limbs in Indians differs from t he 100% incidence of 16 limbs reported by Ip and Chang in Chinese population (1968) [8], 81.6% cases of 152 limbs by Mahakkanukrauh (2002) in Thai cadavers and 67%cases of 42 limbs by Blackburn et al.(2007) [9] in Caucasians . It may reflect a difference in the sample size or ethnic differences.

Exhaustive study of literature did not yield any functional aspect of 2 heads of brachialis muscle even though Leonello et. al. claims that the deep head is more important for the initiation of flexion from full extension and the superficial l head provides greater power once the elbow is flexed. Before planning humeral surgery , the variations regarding prevalence of brachialis innervations by radial nerve in different racial population should be considered so that injury may be avoided with an awareness of the potential presence of such a radial contribution & by carefully searching for and protecting the branch when operating in the plane between brachialis and brachioradialis.

A detailed and clear understanding of the true internervous plane could be used to improve the current anterior and anterolateral surgical approaches to the humerus so that the brachialis muscle can be split without either portion beings significantly denervated.


**FIG 1 : Dissected specimen of arm showing superficial and deep head of human brachialis muscle.**

**REFERENCE**

1.Standring S, Borley NR , Collins P, Crossman AR, Gatzoulis MA, Healy JC,Johnson D, Mahadevan V, Newell RLM, Wigley CB. (eds.) ,2008. Gray's Anatomy . 40th Ed. New York: Churchill Livingstone. P 826 2.Last RJ.1984 Anatomy, Regional and Applied. 7th Ed. Edinburgh: Churchill Livingstone. P 74 3.Hollinshead WH.1958Anatomy for surgeons.Vol.3.London:Cassell and Co.p 365 4.Mahakkanukrauh p,Somsarpv.2002.Dual innervation of the brachialis muscle. Clin Ant15;206-209 5.Spinner RJ, PichelmannMA,Birch R.2003.Radial nerve innervation to the inferolatral segment of the brachialis muscle ;From anatomy to clinical reality.Clin Anat 16: 368-369 6. LeonelloDT,GalleyD, BainGI,CarterCD.2007.Brachiais muscle anatomy .A study in Cadavers.J Bone Joint Surg Am 89;1293-1297 7.Sanal HT, Chen L,Negrao P,Haghighi P, Trudell DJ, Resnick DL; Distal attachment of the brachialis muscle: anatomic and M.R.I. study in cadavers Am j Roentgenol., 2009; 192 (2): 468-472 8.Ip Mc,ChangKS1968.Astudy on the radial supply of the human brachialis muscle. Anat Rec162;363-371 9. Blackburn SC,Wood CP ,EvansDJ,Watt DJ.2007.Radial nerve contribution to brachialis in the UK Caucasian population: position is predictable on surface landmark.clin anat20;64-67