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Establishment of Anatomical Variations in Upper Limb

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Abstract

The subject of anatomy is wide and the content sets its history. It deals with the normal morphology of the bodily structures found in an organized pattern. Each individual differ in appearance along with lots of internal variations at cellular levels. These anatomical variations are found in size, shape, in form of attachments, course etc. of a structure. They impart genetic variation (or termed as congenital abnormalities or birth defects) other than the racial or sexual differences. For every event a hidden cause is present and same is here with variations that may be result of an embryological event of development. Individual variation must be considered in physical examination, diagnosis and treatment of pathology. This work has been shaped for creating a resource of anatomical variation existing especially in upper limbs.

Keywords

Variations, Anatomy, Embryology, Mesoderm, Upper Limb, Applied, Dissection, Morphology

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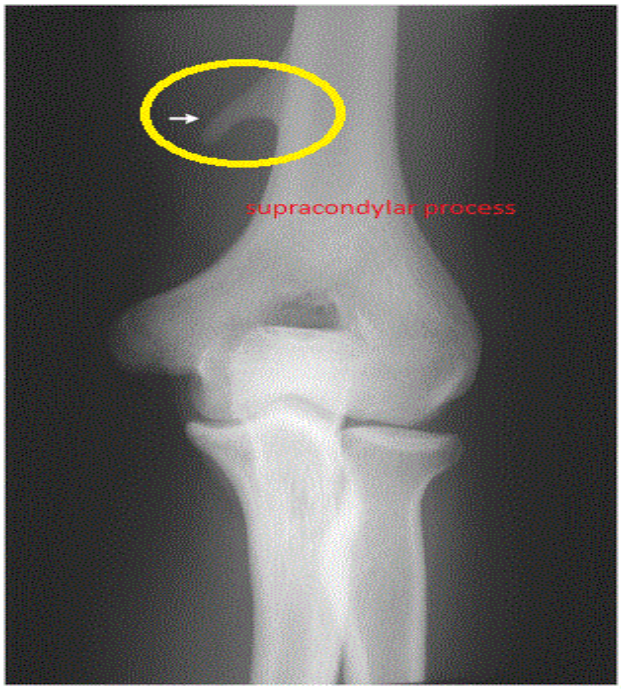
INTRODUCTION

Human limbs (upper-lower) are involved in daily activities including maintenance of body balance. The limbs motion is very important for daily activities like drinking, eating, walking, and standing, running and performing any manual work. Upper limb is the region extending from deltoid region to hand including arm, axilla, and shoulder[1].Being a scholar of the subject, I just want to address the fact that while performing cadaveric dissection many noticeable variations comes in the way. Often students ignore variations or unintentionally damage them by attempting to produce conformity. The bodies kept for dissection or examining sometimes do not confirm with the atlases or text (Bergmann et al; 1988)[2].Therefore, one should accept anatomical variations while dissecting or studying a prosected section. An ample of variations is observed in the limbs. Here only upper limb related differences are demonstrated and categorized under bones, muscles, arteries, veins and nerves.The bone section includes supracondylar process of humerus, clavicle and sesamoid bones. Among arteries, the normal division of brachial artery into radial and ulnar along with a median branch and variation to origin of radial artery. The references of muscles relate to unusual heads of biceps brachii, Palmaris longus. Sir Keith L Moore, elucidated that "veins vary the most and nerves the least"[3].So veins related to upper limb vary clearly in cubital region. Here, most of the variations mentioned are related to brachial plexus. The formation, branching and innervations differ in many aspects.

Table1.1 Listed below, gives detailed information on variations [4-12]

Sr. No.	ANATOMICAL PART	VARIATION ASSSOCIATED	APPLIED ASPECT
1.	Supracondylar process of humerus [4]	On the anteromedial aspect; A fibrous band Struthers ligament connect to medial epicondyle(1% of cases)	Found in radiographs, may compress brachial artery or median nerve. Leads to pain, ischemia, parathesia.
2.	Sesamoid bones[5]	2 bones traced in distal portion of 1st and 2nd meta carpal bones	Due to limited blood supply, on injury leads to avascular necrosis.
3.	Clavicle[6]	Vary in shape, even absent	Thicker in manual workers and cleidocranialdysostosis
4.	Heads of Biceps brachii[7]	Attachment of third head from common belly	Works as flexors, assists supination of forearm.

5.	Palmaris longus[8]	Small tendon between flexor carpi radialis and flexor carpi ulnaris. Visible in middle of wrist (14% of cases)	Most popular for the tendon grafts.
6.	Median artery[9]	Present occasionally between radial and ulnar branch (8% of cases)	Similar course and supply as of median nerve.
7.	Radial artery[10]	May be proximal than usual, may be branch of axillary or brachial or from both arteries.	Pulsations, and even used for cardiac catheters.
8.	Veins in cubital fossa[11]	medianantebrachial vein divides into 2 median basilic vein and median cephalic vein. Forms M-structure. (20% of cases)	They are used for drawing blood and not for injecting drugs due to brachial artery relation.
9.	Brachial plexus[12]	Contributions may be from C4 or T2; related to cords, trunks etc. in relation to axillary artery, scalene muscles etc.	Supply different muscles and associated to surgical and clinical relevance.



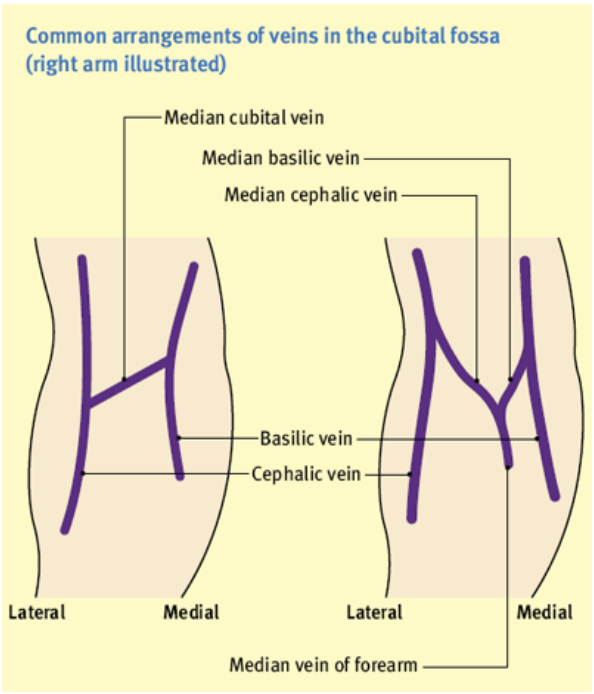


Figure 1.1 Showing Process of Humerus **Figure 1.2** Showing Cubital Veins

DISCUSSION

The above referred variations are not only morphological but they must be included for clinical interpretation. There are reports that a substantial proportion of clinical malpractice may be attributed to ignorance of anatomical variations. A continuous

appraisal for emphasis on anatomical variations and their frequencies must be brought to knowledge. The variations can be related to events in embryological development. The bones of upper limb develop from somatic layer of lateral plate of mesoderm. During 5th week, mesenchymal cells migrate along central axis of limb bud and condenses to form mesenchymal models of bones. These models further undergo chondrification and later ossification occur to form bones.That's why condition like Amelia (absence of limbs), Phocomelia (limbs attached to trunk), Mecromelia (short segments of limbs) and Polydactyl (supernumerary digits) occurs[13] . The development of artery for limbs is done by axis artery derived from intersegmental arteries. For upper limb it is derived from 7th cervical inter segmental(Subclavian) artery. Median artery develops later from anterior interosseous artery[14].Musculardevelopment takes place during 5th week and from myotomes[15]. They migrate to limb buds and form anterior and posterior condensations. Mostly all plexuses result from union of ventral primary rami (anterior). Later, dorsal and ventral divisions unite to form large dorsal –ventral nerves. Thus, radial nerve supplies to extensors muscles (dorsal division) and ulnar, median nerves supplies flexors (ventral division)[16].

CONCLUSION

Anatomical variations are also very important. They may influence the interpretation of any structure during operation or surgeries. All types of variations must be catalogued, reported online and should be renewed in texts because of their frequencies of occurrence. These can also prevent operative damage to structure involved in affected region. Discovering variations and even congenital anomalies are the resultant of better research work in the subject. This is further beneficial to students performing cadaveric dissection or surgeries.

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