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Architecture of arm muscles of sloth bear (*Melursus ursinus*)

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Abstract
The present study was undertaken to systematically establish the myological characteristics of the arm region of sloth bear which might help to carryout morphological assessments. Carcasses of sloth bears were obtained from the Bannerghatta Bear Rescue Centre of Bannerghatta Biological Park, Bangalore. In this study it was observed that M. Biceps brachi was principally made up of the long head and its tendon coursed within bicipital groove. M. brachialis lodged in the musculo spiral groove and coursed in a spiral like fashion. M. triceps comprised of five heads with M. triceps longus and medialis again subdivided two parts, got inserted on the olecranon process. M. triceps lateralis was smaller than M. triceps longus which run diagonally across the outer surface of arm. M. anconeus lied deep to the distal part of the M. triceps. In sloth bear attachment of muscle was more proximally compared with other carnivore which may account for the slow gait of bears.

Keywords: arm region, mycological characteristic, sloth bear

1. Introduction

Sloth bears are nocturnal, insectivorous species. They belong to ursidae family which includes eight species, viz., Giant Panda, Spectacled Bear, Sun Bear, Sloth Bear, Asiatic Black Bear, American Black Bear, Brown Bear and Polar Bear. Each species shows remarkable variations in their physical features and habits. They exhibit morphological variation within and between species and the differences in behaviour, as well as habitual and specific activities are due to their anatomical peculiarities [1]. The scientific name for the sloth bear is *Melursus ursinus*. Sloth bear is classified as "Vulnerable" in the 1996 IUCN Red List of Threatened Animals and is listed on Appendix I of CITES. In India, trade and export of sloth bear is illegal and the bear is completely protected under Schedule I of the Indian Wildlife Protection Act of 1972 that is amended in 1986 [2].

Locomotion and animal posture greatly influence the anatomy of a muscle due to the high frequency and high loads of forces involved. Skeletal musculature constitutes the active part of the locomotor system [3]. Each movement of a body part is produced by the involvement of several muscles either simultaneously or one after another. The action of a muscle depends on its origin, course, insertion and point of rotation. Based on the action muscles are classified as extensors, flexors, adductors, abductors, supinator, pronator, rotator etc [4].

The gross myological similarities, differences and functional adaptations of muscle may serve as a basis for study of the functional morphology of locomotion as well as phylogenetics and systematics at various taxonomic levels [5]. However the information concerning sloth bear locomotor system is scanty and no detailed information is available on the muscular system. Hence, the present study was to study the gross morphological features of muscles of the arm region in sloth bear.

2. Materials and Methods

Dissections were conducted on the left and right forelimbs of three captive adult sloth bears lived at the Wildlife SOS, Bannerghatta Bear Rescue Centre of Bannerghatta Biological Park, Bangalore, Karnataka. Following necropsy, the forelimbs were stored in 10% formalin and dissections were carried out. Then skin and superficial fascia overlying the forelimb muscles were removed. Prior to the removal of muscles, observations were made on origin, insertion, position and relationship of each muscle. Since connective tissue function in binding all other structures together, major work in dissection was the removal of connective tissues. Deep muscles were exposed by transecting the more superficial ones and reflecting them.

A transection was made only after careful study of superficial characters of muscles under consideration. The transection was carried out at about midway between origin and insertion in most cases. By following this procedure neither the origin nor insertion was cut into and it was possible to replace the cut edges for later observations of transected muscle. Each muscle had to be reflected to its points of attachments. The terminology used conforms to standards of Nomina Anatomica Veterinaria [6].

3. Results and Discussion

3.1 Craniolateral muscles of Arm

3.1.1 M. Biceps brachi

M. Biceps was a large fusiform muscle in flexor compartment of the upper arm region (Fig. 1-j). Biceps brachi was principally made up of a long head designated as M. biceps brachi caput longus (Fig.4-c). M. Biceps brachi arose from top of glenoid cavity (Fig.3-a) and its tendon coursed within bicipital groove (Fig.3-b). Later, muscle soon expanded into a large fleshy belly which ended in a strong tendon near elbow which was inserted on the bicipital tubercle of radius (Fig.4-d). Bicipital tubercle was observed just below the neck of the radius on medial border which had the form of a rough ridge. It's function was to extend the shoulder joint and flex the elbow joint. In addition, it stabilized the elbow joint when standing.

A remarkable difference between sloth bear and other primates was with a short head. Our study revealed that in sloth bear, it was absent which was contrary to the records in primates where in it took origin from the coracoid process of scapula. According to some authors both head of M. biceps brachi of primates ran over shoulder giving a biarticular function (crossing shoulder and elbow joint) [7]. So in sloth bear this muscle might have less flexion capacity in shoulder level.

3.1.2 M. Brachialis

M. brachialis was lodged in the musculo-spiral groove and it coursed in a spiral like fashion towards the cranial aspect of humerus (Fig.5-a). Our findings were supported by some of the authors who stated that muscle originated from the caudolateal aspect of humerus and coursed towards cranial aspect of brachium [8]. Tendinous origin of M. brachialis anticus was positioned external to insertion of M. deltoideus. During its course, it was closely connected with lateral head of M. Triceps (Fig.2-e), covered cranial part of humerus and was inserted onto proximal part of ulna.

There was no significant difference in origin of brachialis with any other species. This muscle was significantly larger in orangutans and interpreted as a morphological specialization to arboreal locomotion [9].

3.2 Caudomedial muscles of Arm

3.2.1 M. Triceps brachi

M. triceps comprised of five heads viz., M. triceps longus anterius (Plate 6-e), M. triceps longus posterius (Fig.1-e), M. triceps lateralis (Fig.7-a), M. triceps medialis longus (Fig.8-b), M. triceps medialis brevis (Fig.8-c). M. triceps longus was a large triangular mass lying along posterior side of arm. It's origin extended along whole axillary border of scapula, from infraglenoid tubercle to vertebral angle. At it's origin M. triceps longus was subdivided into anterior and posterior parts, of which anterior part was considerably larger. Anterior head arose by fleshy fibers, from proximal 3/4th of axillary border of scapula and from prominent crest separating infraspinous fossa from postscapular fossa (Fig.6-d). Posterior head continued line of origin of anterior head along crest separating fossa, but did not attach to bone. It arose from fascia covering M. subscapularis minor lying directly deep into it and from fascia covering M. infraspinatus and M. teres major (Fig.1-e). Origin extended posteriorly to the vertebral border of scapula. At about middle of the arm, M. triceps longus fused with M. triceps lateralis and remained distinct from M. triceps medialis.

M. triceps lateralis (Fig.6-f) was smaller than M. triceps longus which run diagonally across the outer surface of the arm. On its deep surface throughout it's length it was intimately united with M. triceps medialis. M. triceps lateralis arose almost exclusively from surface of M. brachialis lying immediately beneath (Fig.6-i). Distal half of M. triceps lateralis was fused with adjacent surface of M. triceps longus.

M. triceps medialis was composed of a long head and a small intermediate head, which were separated by M. coracobrachialis brevis at their origins but fused below at middle of the arm. Long head (Fig.1-g) originated from a triangular area on posterior surface of shaft of humerus. Long head was separated from M. triceps lateralis only for a very short distance beyond their origin. Intermediate head (Fig.1-f) took a tendinous origin from a short line on postero-medial edge of shaft of humerus, immediately beneath and behind the tendinous insertion of M. latissimus dorsi. M. triceps medialis was inserted by fleshy fibers, into medial surface of the olecranon.

Giant panda was the only other carnivore wherein subdivision into anterior and posterior was recorded. In contrast, american black bear, possessed only four heads [10] and in other bears three heads [11]. Such a recorded notable difference in size of triceps indicating that enlargement of this muscle group was associated with locomotion.

In giant ant eater triceps was very extensive and predicted that wider origin could be an indication of muscle strength required for habits of animals [11]. In sloth bear, M. triceps longus posterius was extending along whole axillary border of scapula. However in other carnivores, origin of this muscle was restricted to proximal half or less of axillary border, except in giant panda, in which it extended nearly as far as in bears. As these muscles were inserted on olecranon process they will assist in extension of the elbow joint and act against flexor rotational forces.

3.2.2 M. Anconeus

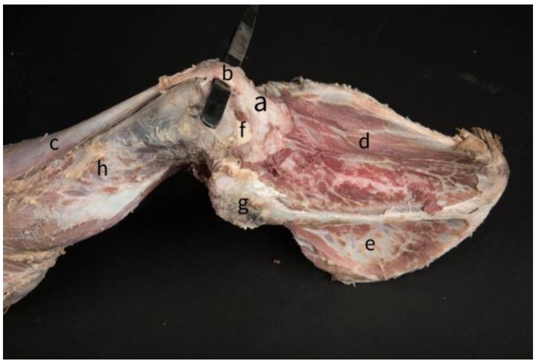
We observed anconeus as a single, flat triangular muscle which arose from posterior side of distal end of the humerus and was fused with elbow joint capsule and fanned out to insert extensively on entire width of caudal part of olecranon and proximal ulnar shaft (Fig.9-b). Anconeus muscle was insignificant muscular portion derived from triceps muscle[7]. In sloth bear, it was a single muscle, but this muscle was splited into two layers and united at about axial line of humerus in other bears [12]. It was inserted on entire width of posterior of olecranon in red panda [8]. Its function was to extend elbow joint and it's contraction may also tense joint capsule thereby preventing its entrapment between humerus and ulna.

a – M. Subscapularis proper
b - M. Subscapularis minor
c – M. Teres major
d – M. Lattisimus dorsi
e – M. Triceps longus posterius
f – M. Triceps medialis brevis
g - M. Triceps medialis longus
h – M. Coracobrachialis longus
i - M. Coracobrachialis brevis
j – M. Biceps brachi
k – M. Supraspinatus
l – Tendon of M. subscapularis

Fig 1: Medial surface of shoulder and arm

a – M. Supraspinatus
b – M. Infraspinatus
c – M. Deltoideus pars acromialis
d – M. Deltoideus pars scapularis
e – M. Triceps lateralis
f – M. Triceps longus
g – M. Brachialis
h – scapular spine
i – deltoid tuberosity

Fig 2: Lateral surface of shoulder and arm



a – Point of origin
b – Tendon of M. Biceps
c – Muscle belly
d – Supraspinous fossa
e – Infraspinous fossa
f – Glenoid cavity
g – Acromion process
h – Humerus

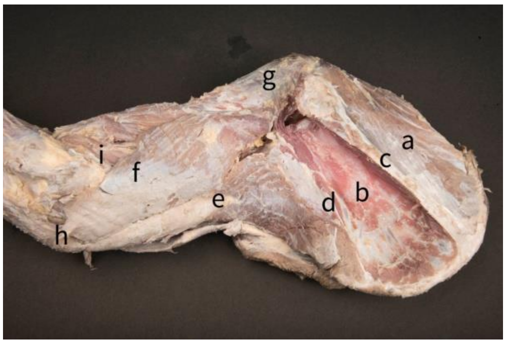
Fig 3: Origin of M. Biceps brachi

a – Point of origin
b – Tendon of M. Biceps
c – Muscle belly
d – Bicipital tubercle

Fig 4: Origin and insertion of M. Biceps brachi

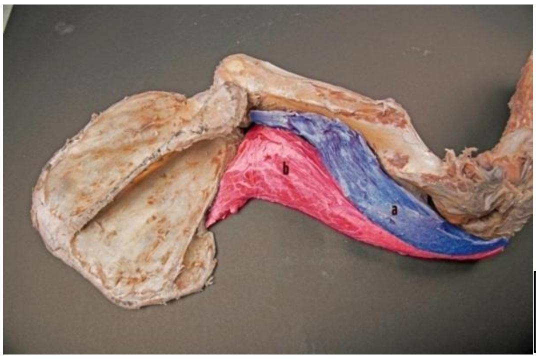
a – M. Brachialis
b – Humerus
c – M. Anconeus

Fig 5: Caudal aspect of arm region



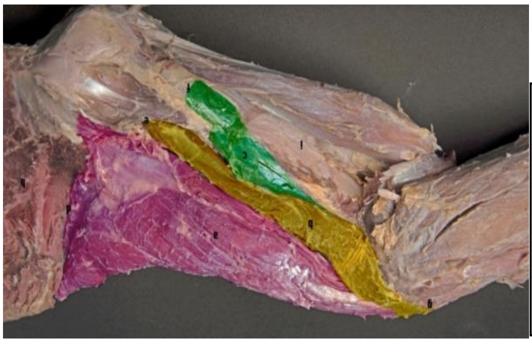
a – M. Supraspinatus
b – Infraspinous fossa
c – Scapular spine
d – Inferior scapular spine
e – M. Tricpes longus anterius
f – M. Triceps lateralis
g – Humerus
h – olecranon process
i – M. Brachialis

Fig 6: Caudo-lateral aspect of shoulder and arm region



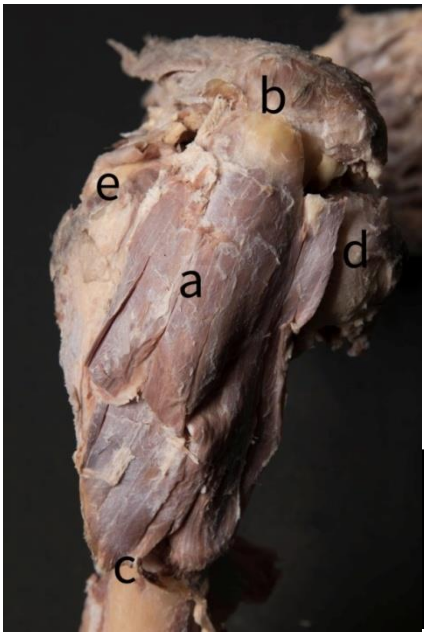
a – M. Triceps lateralis
b – M. Triceps longus anterius

Fig 7: Origin and insertion of M. Triceps brachi



a – M. Triceps longus anterius
b – M. Tricpes medialis longus
c – M. Triceps medialis brevis
d – Origin of M. Triceps longus
e – Origin of M. Medialis longus
f – Origin of M. Medialis brevis
g – Olecranon process
h – Scapula

Fig 8: Origin and insertion of M. Triceps brachi



a – M. Anconeus
b – Olecranon process
c – Humerus
d – Lateral condyle
e – Medial condyle

Fig 9: Origin and insertion of M. Anconeus

Conclusion

The present study was conducted with the objective of generating more data on morphology of arm muscles in sloth bear. The sloth bear's front legs are longer than its hind legs. They are capable of galloping faster than running humans. They are capable of climbing on smooth surfaces. They are good swimmers, and primarily enter water to play. Because of their locomotory behaviour the muscles have some similarities with primates and with brachitors. M. brachialis lodged in the musculo spiral groove and coursed in a spiral like fashion. M. triceps was having five heads. Heavy mass and long fascicle length of fibres produced more force which moving. So the animal exhibit more walking habit compared with that of other primates.

References

1. Drapeau M. Enthesis bilateral asymmetry in humans and African apes. Journal of Comparitive Human Biology. 2008; 59:93-109.
2. IUCN red list of threatened animals., Version 2014.2
3. Konig HE, Liebich HG. Text book and colour atlas of Veterinary Anatomy of Domestic Mammals. Ed 6, Schattauer, Germany, 2004, 23-27.
4. Williams PL, Warwick R. Grays Anatomy. Ed 38, Churchill Livingstone, 2008, 526-529.
5. Hudson PE, Corr SA, Davis RCP, Clancy SN, Lane E, Wilson AM. Functional anatomy of the cheetah (*Acinonyx jubatus*) forelimb. Journal of Anatomy. 1969; 218(4):375-385.
6. Waibl H, Gasse H, Hashimoto Y. Nomina Anatomica Veterinaria. Hannover: International Committee on Veterinary Gross Anatomical Nomenclature, World Association of Veterinary Anatomists, 2005.
7. Michilsens F, Vereecke EE, Daout K. Functional anatomy of the gibbon forelimb: adaptations to a brachiating lifestyle. Journal of Anatomy. 2009; 215:335-354.
8. Fischer RE, Adrian B, Barton M, Holmgren J, Tang SY. The phylogeny of the red panda (*Ailurus fulgens*): evidence from the forelimb. Journal of Anatomy. 2009; 215:611-635.
9. Oishi M, Ogihara N, Endo H, Ichihara N, Asari M. Dimensions of forelimb muscles in orangutans and chimpanzees. Journal of Anatomy. 2009; 215(4):373-382.
10. Shepherd FJ. Short notes on the Myology of the American Black bear (*Ursus americanus*). Journal of anatomy and physiology. 1883; 188:103-117.
11. Davis DD. The shoulder architecture of bears and other carnivores. Chicago natural history museum. 1949; 31(34):5.
12. Kelley EA. Myology of *Ursus maritimus*. Proceedings of the Academy of Natural Sciences of Philadelphia. 1888; 40:141-154.