The Peculiarities Of The Front Limb Muscles At Muskrat (Ondatra Zibethica)

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Abstract. The study conducted by the dissection on the front limb muscles at muskrat has showed to develop muscle mass and its insertions in conjunction with the development of the prominences and bone depressions that appear followed the muscle action. Thus, one’s can signal the development of the brahiocefalic muscle consists of m. cleidobrahial, m. clido-mastoidian and m. cleidooccipital, muscles with effective involved in the chest member abduction. On the other hand, there is development deltoid muscle with its three parts: scapularis, acromialis and claviculairis, inserted on the deltidoidal ridge extremely deployment, the muscles that act as powerful abductor of the arm.

Forearm muscles are remarkable by muscle belly that is developed with the short and strong tendons. The pronation and supination are favored to form ligament structures of elbow joints are produced by muscles pronator teres, m. pronator quadratus and m. supinator. They are developing, demonstrating the high efficiency of switching from pronation to supination and vice versa.

Key words: muscle, tendon, bone, action, flexion

INTRODUCTION

The skeletal muscle is the active support of motion and where the action agonist or antagonistic movements contribute to the coordination necessary for adaptation to habitat conditions (1, 3, 6).

The comparative morphological descriptions of skeletal muscles led to the elucidation of the morpho-functional particularities of each muscle or muscle groups that acting together. Thus, the force of contraction of a muscle is dependent by the muscle forms, the morphological development of muscle belly, the tendon thickness and the eminences of the bone development of the thrust exerted by the muscle inserts and bone deep depressions result of pressure during muscle contractions. By the type of the action that can do a muscle depends on: the articulation surfaces, reports distance and insertion of muscle from articulated action concomitant muscle groups, the formation of the rings fascial distance tendons, etc.

MATERIALS AND METHODS

The study on the muscles of the thoracic member at muskrat was performed using dissection in successive plans on the thoracic limbs from three muskrat shot of fish ponds in the county of Iasi. During the dissection one’s can see the appearance and extent of areas of marrow insertion of muscles, the bone structures of the muscle action and continue the active role of movement in both swimming in the movement on the ground, moving through the gallery crawl and dig them. For example, the results were made after them the photos of the dissect pieces. Also, some of the parts to dissect pieces are preserved by formoling. Research
results were correlated with those obtained from literature in the field, mainly from the harbor, with rodent-like dimensions and muskrat habitat.

OBSERVATIONS AND DISCUSSION

To be able to move easily by swimming, by digging for galleries or for movement on land, the front legs have short and heavy bones, being mobilized by the strong muscles, good balance in an antagonistic muscle groups. By the sterno-clavicular and acromio-clavicular joints, clavicle ensures the consolidation the member thoracic to the trunk, while performing movements favoring a large abduction and adduction of the front leg. For production and for direction the movements on the shoulder belt, in particular action the muscles brachio-cephalicus (Fig. 1).

M. cleidocephalicus is represented by two highly developed muscles that occupy the lateraly side of the neck: cleido-occipital muscle and cleido – mastoidian muscle.

M. cleidooccipitalis covers the cleido-transversus, its insertion is at the half of clavicle and at the clavicle angle. Muscular fibers are ascending towards the occipital distance where dusk through a common aponevrosis on the occipital protuberance and the nuchal crest (2, 3).

M. cleidomastoideus inserts on the cranio-medial edge of the clavicle, ventral by the origin of the cleido-occipital muscle. The muscular fibers insert on the edge of the nuchal crest and the mastoid process by a long tendon together with m. sterno - mastoidien (2). The movement is continued by the cleido-brahial muscle that is inserted between the caudal ridge of the clavicle and deltoidal crest, causing the extension of the shoulder joint and the arm extension, too. Also, a muscular large band is detaches from the cervical part of the rhomoid muscle and form the levator scapulae muscle, producing the tipping scapulae. Its origin is through a common aponevrosis with the other muscles on the occipital, on the middle third of the cuchal crest till the bubble drum and wing of the atlas (Fig. 1).

![Fig. 1. The neck ventral muscles at muskrat](image)

1- m. clidooccipitalis, 2- m. cleidomastoidus, 3- m. levator scapulae, 4- omotransversus, 5- m. clido-brachialis, 6- m. pectoralis transversus, 7- m. pectoralis ascendens, 8- m. latissimus dorsi, 9- m. status ventralis thoracis, 10- m. sternohioidus, 11- m. occipitomandibularis, a- clavica, b- sternum, c- occipital, d- auricula

The muscle fibers are the ventro-caudal orientation, they look like a band that distinguishes at the cervical edge of the scapulum by the cervical rhomoid muscle. It exceeds
the cervical angle of the scapulum and inserts through the fascial fibers on spina scapularis up close to the acromion and the margo epifizaris about the middle of its (3, 5, 7).

Coordination of movements is provided by the muscles and m. omotransvers, m. subclavicular and the antagonist muscles, too.
M. omotransversarius originates on the wing of the atlas and the transverse processes of the cervical vertebrae II and III, and insertion on the acromion, jointing capsule claviculo-acromiale and anterior edge of clavicle. The muscles fibers interpenetrate to the insertion on the scapulum to the m. trapezius thoracic and the muscle cleido-cephalicus. Tipper has the role of the scapulum, tensor of the jointing capsule, neck tilted sideways, when acting synergistically with the other muscles of the neck (Fig. 1).

M. subclavius occupies the entire medial edge of the clavicle, the muscle fibers are more numerous at the clavicle angle. Are triangular layout, and its insert at the lower end of the first rib and its articulation costocondralis. Has adductor role of the thoracic member.

The front limb retropulsion, during swimming, is produced mainly by the wide M. latissimus dorsi that is big and bulky at muskrat and insert on the medial middle part of the humerus as a band. Muscle contraction produces flexion of the scapulo-humeral joint, and retropulsion and adduction of the chest member (4). The maximum abduction amplitude occurs at stilocapitulare level, the scapulum is long and flat extending to the sixth ribs and the clavicle is mobile jointed to the sternum and acromion (Fig. 2).

M. deltoideus is formed, as in other species of rodents, in three parts (1, 3, 7): scapular, acromial and clavicular parts. The scapular portion originates on spina scapularis, from the tuberosity to the acromion and fascia scapularis lateralis and insertion along with the rest of portion on the deltoidian tuberosity. Th acromial portion originates on th acromion and paracromion side. The clavicular portion is triangular in shape, originating on the ventral part of the clavicle. The deltoid muscle contraction with supraspinosus and teres major muscles together determine mainly the flexion of the shoulder and lateral rotation of the arm.

The supraspinosus and the infraspinosus muscles are equal in volume and force, which demonstrated the ratio of 1:1 over the supara and infraspinosis fossa. Concerning the male, spina scapularis is perpendicular, and to the female is bent over the infraspinosis fossa. The insertion of the supraspinosus muscle is through a short and strong tendon on the front side of the large tuber, which passes over the top with a joining sinovial purse. The infraspinatus muscle is insert to the all the infraspinatus fossa without the thoracic angle of the scapulum, and insertion by a tendon on the proximal extremity of the humerus. By the insertion on the lateral face of the proximal extremity of the humerus the muscle acting in arm abduction (Fig. 2).

M. biceps brachii, as to Myocastor, presents two portions (1, 2): the short portion with the origin on the chorachoid process, and the long portion, more developed than first, with the origin ton the supraglenoidal tubercle (1, 6, 7). These portions are differentiated from muskrat. The two portions merging into a single muscle belly at the middle part of the arm. Distal tendon is bifid insert: with a powerful beam on the proximal extremity of the ulna bone and a thin tendon on the radius. Its distance from the angle of extension of the shoulder joint and its insert on the medial face of the proximal extremity of the radius and ulna is to act as developer of the extension shoulder joint and flexion of the elbow and forearm rotating sideways (Fig. 2, 3, 6). M. brachialis originates distal by the humeral head, the caudal face of the humerus, follows through the torsion seeks moat to insert, with the biceps muscle on the forearm bones. The brachial groove is deep and is bounded by the deltoidal ridge powerful detached from humerus and the lateral epicondylar ridge, high and sharp, too. It actions the elbow joint flexion and rotation of the forearm (Fig. 4, 6). The independent movement of radius around the ulna is produced by muscles pronators and supinator that cause the transition from pronation to the supination and vice versa especially on the palm. Thus, muscle pronator quadratus is well developed, acting as the antagonist supinator muscle, has the origin on the epitrochlea and insertion on the antero-medial face of the radius in the third
The pronator quadratus muscle, like carnivores (5), comes into intimate contact with the membrane of the forearm interbones (Fig. 5, 6).

The supinator muscle is a developed muscle, inserted on the humeral epicondyle and its lateral sides: cranial and medial half proximal part of the radius. Forearm extension is produced by the four parts of the triceps muscle (M. triceps brachii). It is bulky and strong.
Long portion originates on the caudal edge and distal half part of the scapulum and wthrough
the fascia scapularis on the spina scapularis and insertion on the olecran. Lateral portion
originates under the teres major of the humerus with a short and wide tendon and insertion on
the olecran. Medial portion originates from the distal 1 cm of small tubers of th humrus and
insertion on the olecran. Parts merging in common with the anconeus muscle (Fig. 6).

At muskrat, the anconeus muscle is highly developed, has two distinct parts: lateral
ridge disposed between epicondy land olecran and medial portion, more developed, from the
epitrohlearis crest to olecran.

M. tensor fasciae antebrachialis at the muskrat is highly developed, are triangular
shaped, acting synergistically triceps muscle.

Forearm muscle is represented by powerful muscles, fusiform in shape, acting on each
finger. Thus, from the common belly muscle the fine tendons loose, being contentionate by
the fascial rings structures that tunneling them and to distribute their powerful to the each
finger.

M. extensor carpi radialis consists of two parts adherent muscle, bounded by
conjunctive septes. In the distal third of the forearm two muscles continues each with a tendon
passing through a precarpal sheath. Medial tendon insert on the distal extremity of second
metacarp and the lateral tendon, at the proximal metacarpal intersecting in sharp angle the
tendons of the common digital extensor muscle and extensor of the second fingers, passing
under them and insert to the limit of third middle and distal part of the third metacarpal (Fig.
2, 4).

M. extensor digitorum communis has a single muscle belly that in the proximal third
of the muscle belly fusions with the extensor carpo-radial muscle. In the distal third of the
forearm, muscle belly continues with a four tendon that insert on the third phalanx of the
fingers II, III, IV, V. Through the carpian sheath the distal tendons slide together with the
tendons of the finger extensor muscles and extensor II digital side (Fig. 2, 4, 5).

M. extensor digitorum II originates the on the uln ar line and along radio-ulnar space
near by the abductor muscle of the first finger. The distal tendon accompanies the common
extensor tendon muscle and insert on the proximal extremity of the third phalanx of the
second finger.

M. extensor digitorum lateralis originates from the humeral epicondyle to fourth and
fifth fingers, the tendon for fifth finger is more powerful and its tendon for fourth finger
tendon meets common digital extensor m. (Part for fifth finger), then goes parallely with the
digital extensor tendon muscle for fourt finger to the third phalanx of fourth and fifth fingers.

M. abductor policis longus has its origins on radio-ulnar ligament, its tendon passing
over the extensor muscle carpo-radial, medial side of the carp bones to be inserted on first
metacarpal bone.

M. extensor digitorum is a reduced muscle, with origin in common with the abductor
of the first finger muscle, which he leaves at the distal, for insertion on the shield cartilage
palm web.

M. extensor carpi ulnaris proximal originates on the lateral epicondyle side and the
lateral side of the olecran. In the distal third of the forearm, the muscle continues by a tendon
that crosses the osteo-fibrous sheath to the lateral side of the carp side and forearm, passes
over the tip of the first metacarpal bone where it is inserted (Fig. 2, 4).

M. flexor carporadialis appears fusiform as aspect, originates on the medial ridge of th
humeral epitrochlea. At the distal third of the forearm, its belly muscle is continued by a fine
tendon passing through a long fibrous sheath, through the groove on the medial side of the
distal extremity of the radius and carpal complex, insert on the proximal extremity of the third metacarpal bone (Fig. 3, 5).

M. flexor carpi ulnaris is fusiform, originates the olecranon tuberosity near the m. palmaris longus, and the insertion on the pisiform.

M. flexor digitorium superficialis are bifid origin: on the epitrochlea and the medial side of the olecran, its tendon in the distal third of the forearm and the carpal region is trifurcate, insert on the second, third and fourth fingers.

M. flexor digitorium profundus is composed of two parts: the superficial and deep. Superficial portion originates on the medial face of the olecran and humeral epitrochlea, these two parts converging in a common mass which continues with a short tendon. At the distal part of forearm it passes through the vast postcarpien shath, together with the flexor superficialis muscle. Distally, the common tendon is separated in four tendons for insert on second, third, fourth and fifth fingers (Fig. 3, 5).

M. palmaris longus is a specific muscle for Miocastor and Ondatra (1). It origin is on the medial face of the olecran and insertion on the web fibrous of the palm.

The short muscles of the fingers are visible on the palmary. They are represented by the fusiform muscles, well individualized, between the fingers and on the palmary faces of the metacarpal bones placed.

M. palmaris brevis is short and wide muscle, shallow place, between the pisiform and facoid bones and transversely oriented to the palmary aponevrosis.

Mm. lumbricales are developed, they look fusiform in shapes, the origin being on the web aponevrosa palmaris, covering the interfingers spaces II, III, IV, V. Their distal tendons insert on the middle phalanx and the tendon of the common digital extensor.

Mm. interossei are placed into the deep layer, in contact with the palmary faces of the II-V metacarpal bones. Their origin is on the proximal extremity of the metacarpal bones and the insertion on the medial faces of the bigger sesamoides.

The short muscles, particular to each finger, were higher development at the fifth finger, evidencing in particular the adductor and the adductor muscles (1).

For the first finger the best developed is the adductor muscle, the short abductor muscle and the short flexor muscle of thumb are more reduced.

The third and fourth fingers are devoid of muscle own shorts.

The palmary fascia is formed by the conjunctive fibers that central cross at the III-IV fingers level, the level at which is visible a fibro-cartilage thickened. This waving provides place insertion of the lumbricales muscles and consolidates the interfingers membrane (Fig. 5).

CONCLUSIONS

1. The action in contraction of the cleido-cephalic, cleido-transversus and omotransversum muscles insert on the clavicle bone determine the abduction and propulsion of the thoracic member.

2. Deltoid muscle, through the three muscle portions, abduction act effectively in a broad arm, the muscle strength is related to deployment the deltoidian crest.

3. At muskrat, the triceps muscle is massive, dominant, forms a massive muscle with the anconeus muscle, being very efficient in contractions for short time but very powerful as demonstrated by massive belly and tendon of the olecran insertion short and large.
4. The forearm muscles, both extensor and flexor muscles, the muscle belly are long, fusiform in shape and massive that it continues with strong tendons and short, acting focused on each finger.

5. The pronation and the supination are large, in principal being determined by the m. pronator teres, m. pronator quadratus and m. supinator, which are highly developed and the origin on the epicondylar and epistrochlear crests that are high and sharp.

6. M. palmaris longus, through its insertion on the palmary fascia, acting in the fingers flexion add in adduction to the axial plane.

REFERENCES: