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For his very generous assistance and guidance
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Borucki of the Biology Department of Marquette University.

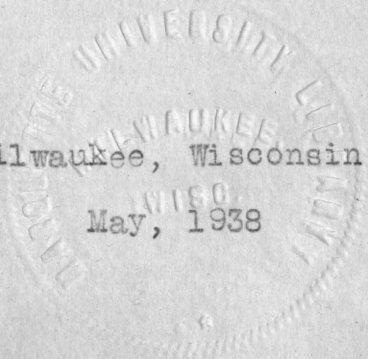
A STUDY OF THE MUSCLES OF THE ARM
AND UPPER SHOULDER OF THE CAT

By

Joseph Andrew Arena

A Thesis submitted to the Faculty
of the
College of Liberal Arts of Marquette University
in
Partial Fulfillment of the Requirements
for the
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PREFACE

For his very generous assistance and guidance in the work connected with the gathering of information presented in this paper, I wish to thank Father F. A. Bautsch of the Zoology Department at Marquette University. I am also indebted to Charles Wilber, a Liberal Arts senior at the same university, for his aid in the preparation of my materials and the excellent plates he prepared for me. I also wish to thank the persons who have given me valuable criticisms and corrections of statements in this work.

Joseph A. Arena

B.S.

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TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
Preparation and Preservation of Materials for Dissection	1
Dissection of Muscles of the Fore-limb	2
The Kinds and Origin of Muscles	5
Gross Structure of Muscles	6
Muscles of the Lateral Surface of the Shoulder	9
Muscles of the Medial Surface of the Shoulder	14
Summary	25

LIST OF TABLES

	<u>Page</u>
Lateral Surface of Scapula, with Points of Insertion of Muscles	1
Medial Surface of Scapula, with Points of Insertion of Muscles	2
Ventral Surface of Humerus, with the Areas of Attachment of Muscles	3
Medial Surface of Humerus, with the Areas of Attachment of Muscles	4
Dorsal Surface of the Left Humerus, with the Areas of Attachment of Muscles	5
Lateral View of the Fore-Limb	6

INTRODUCTION

The work undertaken in this thesis is a study of the muscles of the shoulder and upper arm of the cat, special attention being paid to the origin, insertion, relations, action, innervation and blood supply of the muscles.

In the year 1891-92, Professor Reighard prepared a partial account of the anatomy of the cat which has since been used, in typewritten form, in University of Michigan classes. It has been used also at the Universities of Illinois, Nebraska, and West Virginia, and in Dartmouth College, and has proven so useful for college work in Mammalian Anatomy that it was decided to complete it and prepare it for publication. This has been done by Dr. Jennings.

The monumental work of Jayne in 1898 on the anatomy of the cat forms the best repository for a description of variations and abnormalities.

Libbie Henrietta Hyman of The University of Chicago published a laboratory manual for comparative anatomy in 1922 that is an excellent laboratory guide.

Preparation and Preservation of Materials for Dissection

An adult cat was killed by placing it in a bell jar with a bit of cotton saturated with ether. When the cat was dead, it was removed to a tray and placed on its back. The limbs were tied loosely, so that they

would remain outspread. A five per cent solution of formalin was used for embalming. The embalming fluid was introduced into the femoral artery. The artery was exposed by an incision through the integument on the medial side of the thigh from the region of the pubic symphysis to the knee. After locating the femoral artery, a canula was introduced into it and directed toward the body. The canula was then tied in place.

The gravity method for embalming was the first to be tried. The fluid was placed in a receptacle about four feet above the cat and was allowed to run to the canula and into the vessel through a rubber hose provided with a stopcock.

This method, though advantageous in some respects, required too much time and it was difficult to embalm the specimen at hand in this manner. Thereafter, the cats were killed, skinned, a slit was made in their abdomen and they were placed in a tin box containing a five per cent solution of formalin. This method took less time and it was found that the muscles remained satisfactory for dissection.

Dissection of the Muscles of the Fore Limb

The arm was removed from the body and the dissection was made on the separated arm.

The clavobrachialis was raised up, but not transected.

After consulting figures and descriptions, the coracobrachialis was searched for, care being taken not to injure the long head of the muscle and its tendon. The coracobrachialis was dissected, cut and reflected.

The subscapularis. Near its glenoid end, its glenoid and coracoid borders are separated by triangular intervals from the adjacent muscles. The muscle was transected by a line connecting the apices of these triangles. An incision was carried from the middle of this one to the middle of the vertebral border of the scapula, and the muscle was reflected on both sides of the incision--thus its area of origin was determined. Then, the humeral end was reflected without injuring its area of origin.

The supraspinatus was dissected. The strong fascia was cut free from the border of the scapula and its spine. Then the muscle was transected and reflected. Care was taken not to injure the capsule of the joint.

The spinocleltoideus. Its two borders were found, beginning with the caudal one. The very short cranial border was freed. The acromiodeltoideus was not injured in doing this. The spinodeltoid was transected and reflected.

The acromiodeltoideus was also transected and reflected.

The infraspinatus. Its borders were located in the region of the great scapular notch. It was difficult

to separate the glenoid border from the adjacent teres minor. The separation was begun at the humerus. The muscle was transected at the great scapular notch and reflected. Care was taken not to injure the teres minor.

The teres major was cut near its junction with the latissimus dorsi.

The teres minor was not cut.

The epitrochlearis was dissected out.

The triceps.

(a) The long head of the triceps. First its medial border was found and separated from the medial head. The union of its lateral surface with the dorsal border of the lateral head by strong fascia was noted, and then the fascia was cut.

(b) Lateral head.

(c) Medial head. The medial head was separated into its three component parts; the long head, the medial head, and the short head.

The amoneus muscle was observed and dissected.

The biceps. The capsule of the shoulder joint was opened in order to expose its origin. The insertion could not be seen at this time.

The brachialis. Worked under it near its union with the clavobrachial; it was cut at that point and reflected.

The Kinds and Origin of Muscle

The muscles of the vertebrate body may be divided into two general classes, the involuntary and the voluntary. The involuntary or smooth muscles occur in the walls of the digestive tract and other viscera, and in the skin and certain derivations thereof. They originate through the transformation of mesenchyme cells which may be of various origins. The majority of the smooth musculature, however, is produced by the mesenchyme of the hypomere, since in development the hypomere closes around the archenteron and its derivatives. The voluntary or striated muscles, on the other hand, with certain exceptions, arise from the myotomes. The myotomes are those portions of the epimeres remaining after the epimeres have given rise to the sclerotomes and dermatomes. From their original dorsal positions the myotomes grow down between the hypomere and the skin and those of opposite sides meet in the median ventral line. In this way there is produced a complete coat of voluntary muscles, lying beneath the skin. This muscle coat is divided into dorsal and ventral parts by the horizontal skeletogenous partition which intersects the skin at the lateral line. The muscles dorsal to this septum are called the epaxial muscles, those below the septum, the hypaxial muscles.

All of the muscles originating from the myotomes are voluntary muscles and are designated as

parietal or somatic muscles. Not all of the voluntary muscles are, however, of this kind. In the gill region of vertebrates a system of voluntary muscles is developed for moving the gill arches. Since the gills and related parts are of entodermal origin, the muscles in the walls in the gill region are homologous with the muscles of the rest of the digestive tract and are, in fact, derived from the mesenchyme of the hypomeres. These gill arch muscles are consequently designated as visceral muscles, although unlike the muscles of the viscera, they are striated and voluntary. There are consequently two kinds of voluntary muscles, identical in structure but different in origin--the parietal or somatic muscles derived from the myotomes and distributed widely over the body and the visceral muscles derived from the hypomeres and found only in the gill region.

Gross Structure of Muscles

Muscle is built up by a multiplication of cells that have the ability to contract and relax under nervous stimulus. Each cell is a complicated unit made up of a nucleus and numerous branching fibrils, surrounded by a wall, the sarcolemma, and filled with a fluid, the sarcoplasm. These units in turn make up bundles and finally individual muscles, which in connection with the skeletal system and other parts, make movement possible. The shape of a muscle depends on the work it has to do and on its point of origin and its point of

insertion. Thus sheet muscles, such as the diaphragm, separate cavities; fusiform muscles found in the limbs are in positions where only a small space is available for origin and insertion and where mechanical problems demand nothing more; triangular muscles, such as the trapezuis, appear where there are broad faces for origin or insertion; fan shaped muscles, such as the pectoralis major, have extensive origins and rather limited insertions. The muscles of the intestinal tract consist of two types, one circular and the other longitudinal. Sphincters surround openings, such as the mouth, eyes, and anus.

In order to become acquainted with the terminology applied to muscles, it is best to study the parts of some convenient muscle. For this purpose the external oblique is selected. On closely inspecting the cleaned surface of the external oblique, the muscle will be observed to consist of numerous pinkish stripes directed obliquely ventrad and caudad.

The pinkish stripes are bundles of muscle fibers, called fasiculi. The white material between the fasiculi which binds them together into a muscle and which dips down between them is part of the deep fascia. It forms a sheath, the perimysium, for each fasciculus. The part of the muscle which is composed of fasciculi with their perimysia is known as the fleshy part of the muscle, or the belly. The fasciculi do not extend completely to the ends of a muscle, but the deep fascia does. Consequently, the ends of muscles are non-fleshy,

composed of connective tissue only. These connective tissue ends of muscles commonly form tough shining bands or cords, known as tendons. When the tendon is very broad and flat, it is often called an aponeurosis, or the name fascia may be retained for such broad tendons. The attachments of muscles are always by means of tendons, aponeuroses or fasciae, never by the muscle fibers. Muscles are attached to bones or to tendons, aponeuroses, or fasciae, which themselves are attached to bones. The purpose of the voluntary muscle is to move the bones of the skeleton.

The fixed points of attachment of a muscle are called its origin. When there is more than one origin, each one is known as a head. When there are a number of points of attachments, segmentally arranged, they are generally designated as slips. The moveable points of attachment of a muscle on which it exerts its effect are called its insertion. The function of a muscle is called its action.

It is inserted by a flat tendon upon the deltoid ridge of the humerus, nearly parallel to that of the pectoralis major.

Its outer surface is related with the acromion, and at the insertion with the acromioclavicular joint.

The inner surface with the infraspinatus, teres minor, and long head of the triceps muscle.

Its action is to flex the humerus and rotate it outward.

The innervation is by the 5th, 6th, and 7th nerves.

I Muscles of the shoulder.

A. Muscles on the lateral surface of the shoulder.

M. deltoideus -- The deltoid muscle of the cat is divided into two (or three) portions. Together they are equivalent to the human deltoid. These are the following: the spinodeltoid, the acromiodeltoid, and possibly the clavobrachial, frequently called the clavodeltoid.

M. spinodeltoideus -- This is a rather thick, flat muscle between the scapular spine and the deltoid ridge of the humerus. It forms a chord of the angle between the glenoid border of the scapula and the humerus. The origin of the spinodeltoideus is by short tendon-fibers from the glenoid border of somewhat more than middle third of the spine of the scapula and from a tendinous raphe between the spinotrapezius, acromiotrapezius, and infraspinatus. The origin may pass toward the vertebral border of the scapula onto the infraspinatus muscle.

It is inserted by a flat tendon upon the deltoid ridge of the humerus, nearly parallel to that of the pectoralis major.

Its outer surface is related with the integument and at the insertion with the acromiodeltoideus. The inner surface with the infraspinatus teres minor, caput laterale, and caput longum of the triceps muscle. Its action is to flex the humerus and rotate it outward.

The innervation is by the N. axillaris.

It receives its source of blood from the posterior humeral circumflex artery and is drained by the posterior humeral circumflex vein.

M. Acromiodeltoideus is a flat muscle which overlies the distal end of the spinodeltoideus. It connects the acromion with the humerus.

It originates from the glenoid border of the acromion, and sometimes the adjacent metacromion as far as the tip.

Its insertion is mostly upon the outer surface of the spinodeltoideus. The outer fibers are continued to the bone, especially at the lateral border of the muscle, and are inserted along a line ventrad of the line of insertion of the spinodeltoideus, and extending farther distally. Some of the outer fibers pass into the brachialis.

The outer surface is related with the integument and the clavobrachial. The inner surface with the infraspinatus, teres minor, spinodeltoid, and caput laterale of the triceps.

Its action is to flex the humerus and rotate it outward.

The innervation is by the N. axillaris.

It is fed by the posterior humeral circumflex artery and is drained by the vein having the same name.

M. Clavobrachialis is a flat triangular muscle on the cranial surface of the shoulder, forming a

direct continuation of the clavotrapezius. These two are often described as constituting a single muscle, the cephalohumeral or cephalobrachial.

It receives its origin by superficial fibers which are continuations of the clavotrapezius; other fibers have origin from the clavicle and from a raphe lateral of the clavicle which is common to this muscle and the clavotrapezius. It passes distad along the cranial surface of the arm, growing narrower as it approaches the convexity of the elbow.

It is inserted as follows: Eight to ten millimeters from the ulna it joins the brachialis muscle to be inserted with it by a flat tendon upon a rough area on the medial surface of the ulna just distad of the semi-lunar notch, and about midway between the dorsal and ventral borders.

The outer surface is in relation with the integument. The inner surface with the pectoralis major, biceps, lateral head of the triceps, acromiodeltoid and brachialis. Medial border with the pectoantibrachialis. The lateral border is free except near the insertion, where it is in relation with the brachialis.

Its action is to flex the antibrachium.

The innervation is by the axillary nerve.

It is fed by the posterior humeral circumflex artery and drained by the corresponding vein.

M. Supraspinatus -- occupies the whole of the supraspinatus fossa of the scapula. It is covered by a

strong fascia which stretches from the free edge of the spine to the coracoid border of the scapula and to the coracoid half of its vertebral border.

Its origin is by fleshy fibers from the whole surface of the supraspinatus fossa, from the fascia mentioned above and from the subscapularis cranial of the coracoid border of the scapula.

It is inserted by passing over the capsule of the shoulder joint, to which it is closely attached, and is inserted into the free border of the great tuberosity ventrad of the fossa for the infraspinatus.

Its outer surface is related with the spinotrapezius, levator scapulae ventralis, clavotrapezius, and cleidomastoid. Inner surface with the scapula. The distal end of the coracoid border is closely related to the pectoralis minor. The glenoid border is related to the origin of the deltoidei.

Its action is to extend the humerus after it has been flexed on the scapula.

The supraspinatus is innervated by the N. suprascapularis. It is fed by a branch of the transverse scapular or suprascapular artery, and is drained by a corresponding branch of the subclavian vein.

M. Infraspinatus -- This fills the infraspinatus fossa, its fibers converging to the insertion on the great tuberosity of the humerus.

It takes its origin by fleshy fibers from the whole infraspinatus fossa, and by a raphe between it and

the teres major, and sometimes by fibers from the teres minor, triceps, spinodeltoideus, spinotrapezius, and subscapularis.

The insertion is by a flat tendon which passes over the capsule of the joint, into the ventral half of the infraspinatus fossa on the greater tuberosity of the humerus. (The dorsal half of the fossa is covered by a synovial bursa).

Its outer surface is related with the spino-trapezius, spinodeltoid, acromiodeltoid, teres major and levator scapulae ventralis. Inner surface with the scapula. Glenoid border with the teres minor, the teres major and the long head of the triceps.

This muscle rotates the humerus outward.

The innervation is by the suprascapular nerve.

It receives its blood supply from the anterior humeral circumflex artery and is drained by the corresponding vein.

M. teres minor -- a small muscle from the glenoid border of the scapula to the proximal end of the humerus.

The origin is by a sheet of tendinous fibers from the glenoid border of the scapula beginning about one-fifth the length of the border from the glenoid fossa and extending to its middle. It is often attached to the infraspinatus and the caput longum of the triceps.

Its insertion is by a short tendon into the

tubercle just distad of the infraspinatus fossa on the great tuberosity of the humerus. Its outer surface is in relation with the spinodeltoideus, acromiodeltoideus, and the infraspinatus. Inner surface with the lateral and long heads of the triceps and the capsule of the joint.

Its action is to assist the infraspinatus in rotating the humerus outward.

It is innervated by the axillary nerve.

The teres minor receives its blood supply from a branch of the subscapular artery. It is drained by the corresponding vein.

B. Muscles on the medial surface of the shoulder.

M. Subscapularis -- a triangular mass from the subscapular fossa to the lesser tuberosity of the humerus. Receives its origin from the whole subscapular fossa except along the fusiform area for the attachment of the levator scapulae and the serratus anterior near the vertebral border, and except over a quadrangular area about one centimeter long near the glenoid angle.

The origin is by fleshy fibers directly from the periosteum except along two or three lines marked by oblique ridges. To these lines are attached tendinous fibers. At the glenoid border the area of origin sometimes occupies part or whole of the surface of the fossa for the origin of the teres major, so that the teres arises from the fascia on the surface of the subscapularis. At the coracoid border some of the fibers may take origin

from the adjacent fascia of the supraspinatus. Inserted as follows: The fibers converge to the glenoid border, and the insertion is by a strong, flat tendon into the dorsal border of the lesser tuberosity of the humerus.

The lateral surface is related with the scapula and the capsule of the shoulder-joint. Medial surface with the levator scapulae, serratus anterior, part of the scalenus, the transverse costarum, and the coracobrachialis. Cranial border with the supraspinatus. Caudal border with the teres major and infraspinatus.

Its action is to pull the humerus inward.

Innervated by the subscapular nerve. (Cranial division).

The subscapularis muscle is fed by the subscapular artery and drained by the corresponding vein of the same name.

M. teres major -- a thick muscle, triangular in cross-section, lying parallel with the glenoid border of the scapula.

Its origin is from the vertebral one-third of the glenoid border of the scapula, and from fascia covering the subscapularis and the infraspinatus over a small area near the Glenovertebral angle of the scapula. It may touch the insertion of the rhomboideus.

It is inserted by a tendon common to it and the latissimus dorsi.

Its outer surface is related with the caput

longum and the long portion of the caput mediale of the triceps, the latissimus dorsi, and the cutaneus maximus. Inner surface with the serratus anterior, the scalenus, the transverse costarum and the biceps. Dorsal border with the subscapularis and infraspinatus.

The action is as follows: Rotates the humerus inward and flexes it in opposition to the infraspinatus, teres minor and the deltoidei.

Innervation is by the subscapular nerve. (Middle division).

It is fed by a branch of the subscapular artery, the thoracodorsal artery and is drained by the corresponding vein.

II Muscles of the Brachium or Upper Arm

M. Coracobrachialis -- This is a very short muscle covering the inner (medial) surface of the capsule of the shoulder-joint. It extends from the coracoid process to the proximal end of the humerus.

Its origin is by a round tendon from the tip of the coracoid process.

It is usually inserted by fleshy fibers on an area five to eight millimeters long and about half as wide, which lies on the medial side of the humerus parallel with the ridge which runs from the dorsal end of the lesser tuberosity to the shaft and close to it. The proximal end of the area is about one centimeter from the proximal end of the head of the humerus.

Its medial surface is related with the biceps, pectoralis minor, and teres minor, and teres major.

Lateral surface with the capsule of the shoulder-joint. Dorsal border with the subscapularis and the long portion of the caput mediale of the triceps.

This muscle adducts the humerus.

The part of the coracobrachialis just described is known as the short head. A long head is sometimes found. It is a conical bundle of fibers of varying size, which arises from the tendon of origin of the short head. It passes distad into a long and extremely slender tendon, the insertion of which varies greatly in different individuals. It is commonly on the humerus in the region of the supracondyloid foramen.

M. epitrochlearis or extensor antibrachii longus. This is a thin, flat muscle on the inner or medial side of the brachium, from the lateral surface of the latissimus dorsi to the olecranon process of the ulna.

It originates from the lateral or outer surface of the ventral border of the latissimus dorsi near the insertion of the cutaneus maximus. Fibers are often attached to the teres major and pectoralis minor.

The insertion of the epitrochlearis is by a flat tendon which is closely connected with that of the pectoantibrachialis and is continuous with the general antibrachial fascia, into the caudal border of the cutaneous (dorsal) surface of the olecranon process of the ulna.

The outer (medial) surface is in relation with the integument, the latissimus dorsi, and the cutaneus

maximus. The inner surface with the biceps, caput longum and caput mediale of the triceps.

Its mode of action is to supinate the hand by rotating the ulna.

It is innervated by the radial nerve.

The epitrochlearis muscle is fed by the deep brachial artery which follows the radial nerve and is drained by the corresponding branch of the subclavian vein.

M. biceps brachii -- a thick, fusiform muscle lying on the front (ventral) surface of the humerus.

Its origin is by a strong, round tendon from the bicipital tubercle of the glenoid angle of the scapula, at its coracoid margin. The tendon passes through the capsule of the joint and then along the bicipital groove, which is converted into a canal by a strong ligament.

The insertion is by a rounded tendon on the bicipital tuberosity of the radius.

Relations. -- The tendon of origin passes through the capsule of the joint, which is covered by a part of the pectoralis minor. The muscle is then spanned for the middle part of its course by the bicipital arch, this arch is described below. Farther distad it is covered by the clavobrachial and epitrochlearis. At its distal end the muscle passes between the pronator teres on the radial side and the conjoined tendon of the brachialis and clavobrachial on the other. The biceps lies throughout most of its length on the ventral surface

of the humerus, and touches along the medial border of its inner surface the coracobrachialis, the teres major, the intermediate portion of the caput mediale of the triceps, and the short portion of the same. Its lateral border touches the pectoralis minor and the brachialis.

The biceps brachii flexes the forearm, and tends to supinate the hand.

The innervation is by the musculocutaneous nerve.

The bicipital arch is a tendinous arch formed over the biceps muscle. Its outer or lateral pillar is formed by the tendon of the pectoralis minor to which may be added part of the latissimus tendon. Its inner or medial pillar is formed by the conjoined tendon of the teres major and latissimus dorsi, while the xiphi-humeralis, cutaneus maximus, and epitrochlearis are connected with one or the other pillar or with the muscles composing them. The caudal portion of the deep layer of the pectoralis major may be connected with the inner pillar.

M. brachialis.--- From the lateral surface of the humerus to the ulna.

Its origin is from a long V-shaped line two to four millimeters wide on the lateral surface of the humerus. The apex of the V is just distad of the teres minor tubercle. Its dorsal limb extends along the lateral supracondyloid ridge to a point opposite the

proximal margin of the supracondyloid foramen; its ventral limb extends in the direction of the deltoid ridge to the middle of the bone. No muscle-fibers take origin between the two limbs. The fibers converge and end in a flat tendon which joins the tendon of the clavobrachial.

It is inserted on the dorsal portion of the depressed rough area on the lateral surface of the ulna just distad of the semilunar notch.

The outer surface of the brachialis is in relation with the acromiodeltoid, the caput laterale of the triceps, the brachioradialis, and the proximal end of the extensor carpi radialis longus. Inner surface with the humerus. Medial edge with the pectoralis major and the biceps.

It is the flexor of the antibrachium.

Innervated by the musculocutaneous nerve.

M. triceps brachii -- The triceps muscle of the cat, like that of man, is divisible into three main portions. These are a lateral portion (caput laterale), an intermediate or long portion (caput longum), and a medial portion (caput mediale). The first two correspond to the similarly named heads in man; the medial portion falls into a number of subdivisions whose homologues are uncertain.

Caput laterale (anconeus lateralis) -- The lateral portion is a flat muscle (most of it subcutaneous) on the lateral side of the brachium, connecting

the proximal end of the humerus with the olecranon process of the ulna. Its origin is by a flat tendon from the proximal portion of the deltoid ridge and the distal border of the teres minor tubercle.

It is inserted by a thin, flat tendon into the lateral border of the dorsal surface of the ulna between a point opposite the distal margin of the semilunar notch and the proximal end of the olecranon.

Relations. -- Lateral surface with the integument, and at the proximal end with the spinodeltoid and acromiodeltoid. Medial surface with the brachialis, the caput longum, the caput mediale, the brachiordialis, the anconeus, and the origins of the extensor carpi radialis longus, the extensor communis digitorum, and the extensor digitorum lateralis.

The caput laterale is innervated by the radial nerve.

It is fed by the posterior humeral circumflex artery and is drained by the posterior humeral circumflex vein.

Caput longum -- A prismatic, fusiform mass connecting the scapula with the olecranon.

Its origin is by a thick, flat tendon from a triangular area one or two centimeters long at the glenoid end of the scapula on the glenoid border. The base of the area is about one millimeter from the margin of the glenoid fossa.

The muscle ends in a thick tendon which passes over the bifurcated ventral end of the olecranon and is inserted upon the rounded tuberosity which forms the dorsal angle of the olecranon.

The lateral surface is related with the caput laterale, a portion of the caput mediale, the spinodeltoid, the infraspinatus, and the integument. The medial surface with the epitrochlearis and the conjoined portions of the latissimus dorsi and teres major. The ventral border is related with the caput mediale.

This muscle is innervated by the radial nerve.

It receives its blood supply from the posterior humeral circumflex artery and is drained by the corresponding vein bearing the same name.

The caput mediale.— The medial head consists of three portions: the long portion or anconeus posterior, the intermediate portion or anconeus internus and the short portion.

The long portion originates from a triangular area on the dorsal surface of the humeral shaft. The base of the area is against the articular head, and its apex about one-sixth the length of the humerus from the head. It is between the coracobrachialis and the lateral head of the triceps.

The muscle ends in a long, slender tendon which passes through the furrow on the ventral angle of the olecranon and is inserted into an oblique ridge which forms the dorsal limit of the furrow. The tendon

is separated from the floor of the furrow by a synovial bursa.

The intermediate portion (anconeus internus) originates by fleshy fibers from a triangular area proximal of the middle of the dorsomedial surface of the humerus. The length of the area equals about one-fourth the length of the bone. Its apex points proximal and is almost continuous with the apex of the area of origin of the long portion.

It is inserted by short tendon-fibers into the medial border of the ventral and proximal surfaces of the olecranon. It is connected with the tendon of the long portion.

The short portion of the caput mediale originates from the outer surface of the bony bar which encloses the supracondyloid foramen of the humerus, as far as the medial epicondyle.

Its insertion is by fleshy fibers into the medial border of the olecranon distal of the tuberosity for the insertion of the caput longum.

The relations of the caput mediale are as follows: lateral surface with the caput laterale, the humerus, and the anconeus. Dorsal surface with the caput longum, the epitrochlearis, and the teres major. Ventral surface with the biceps.

The caput mediale has the same innervation, blood supply and is drained by the same vein as the two preceding muscles, the caput laterale and caput longum.

The entire triceps group forms a powerful extensor of the forearm. The short portion of the medial head tends also to rotate the arm outward, so as to supinate the hand.

M. anconeus. -- a triangular muscle on the outside of the elbow-joint from humerus to the ulna.

Its origin is from an irregular triangular area at the distal end of the dorsal surface of the humerus. The area of the origin is limited laterally by the sharp lateral supracondyloid ridge. It sometimes extend onto the lateral epicondyle.

It is inserted on the lateral surface of the ulna from the distal margin of the semilunar notch to the proximal end of the olecranon. The muscle covers the capsule of the joint and is closely adherent to it.

Its outer or dorsal surface is related with the caput laterale and the intermediate portion of the caput mediale. Inner surface with the bones and the capsule of the joint.

This muscle keeps the capsule tense and probably rotates the ulna slightly so as to pronate the hand.

The anconeus muscle is innervated by the radial nerve.

It receives its blood supply from the ulnar collateral artery and is drained by the corresponding vein.

SUMMARY

The voluntary muscles are of two kinds -- the somatic or parietal muscles which are produced by the epimeres and the visceral muscles which arise from the hypomeres. Voluntary muscles of hypomeral origin occur only in connection with the gill arches, from which, however, they may spread to cover considerable areas.

In primitive vertebrates the somatic muscles exist in the form of muscle segments or myotomes which are repeated at regular intervals along the longitudinal axis. Each myotome extends from the mid-dorsal to the mid-ventral line. The myotomes are bounded by connective tissue partitions, the myosepta.

The myotomes are divided into dorsal or epaxial halves and ventral or hypaxial halves by the horizontal skeletogenous septum.

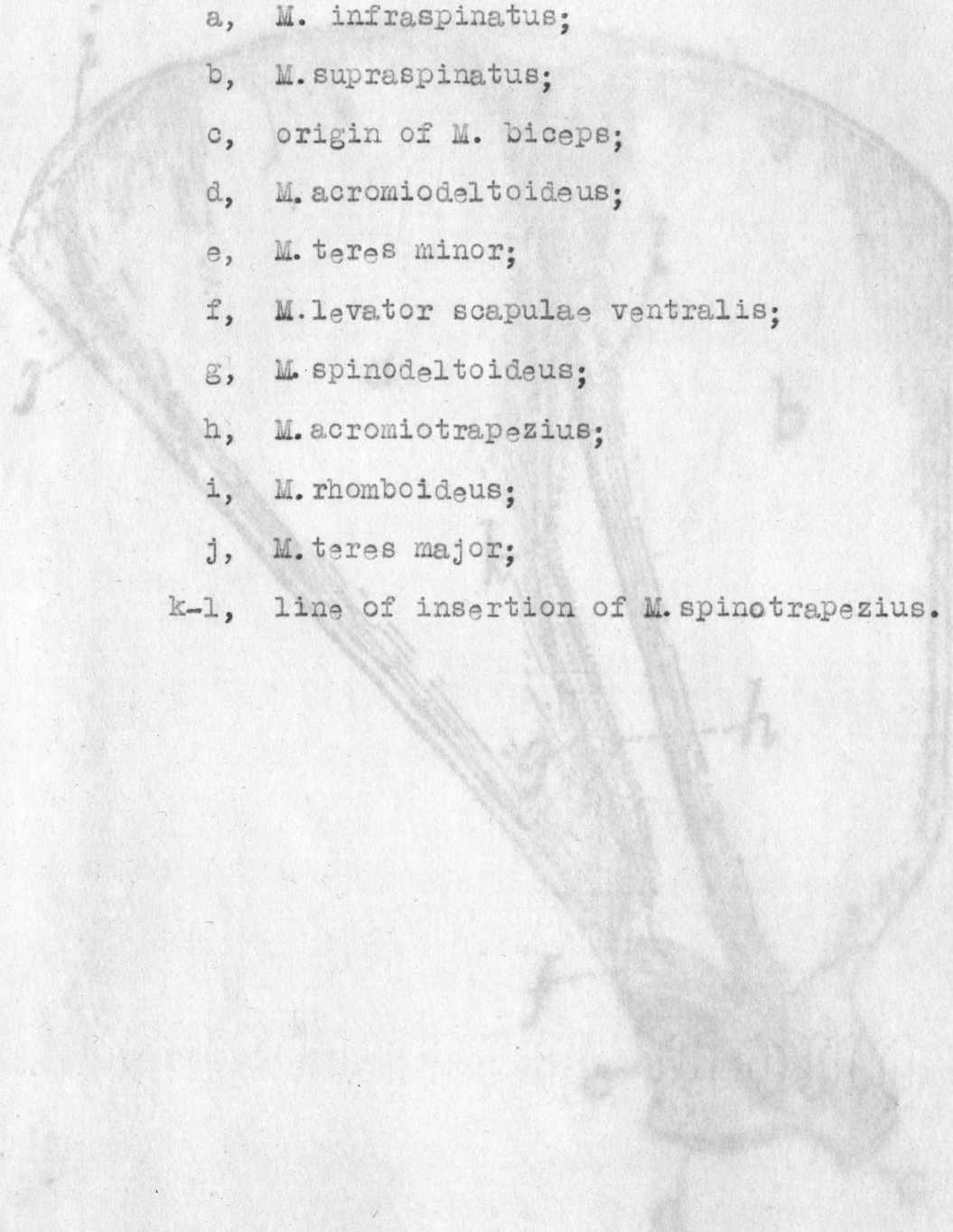
The muscular system is very closely associated with the parts of the skeleton. The dynamic units of the system are contractile cells, which are united into groups, forming bundles and eventually muscles. The tough, smooth tissue that ties the bundles together and sheathes the muscle is called fascia. Striated muscles, except those forming the heart are under control of the central nervous system; in striated muscles are under control of the autonomii system. Muscles may be fusiform, fan-shaped, triangular, sheet-like (diaphragm), or circular (sphincters). Muscles usually have an

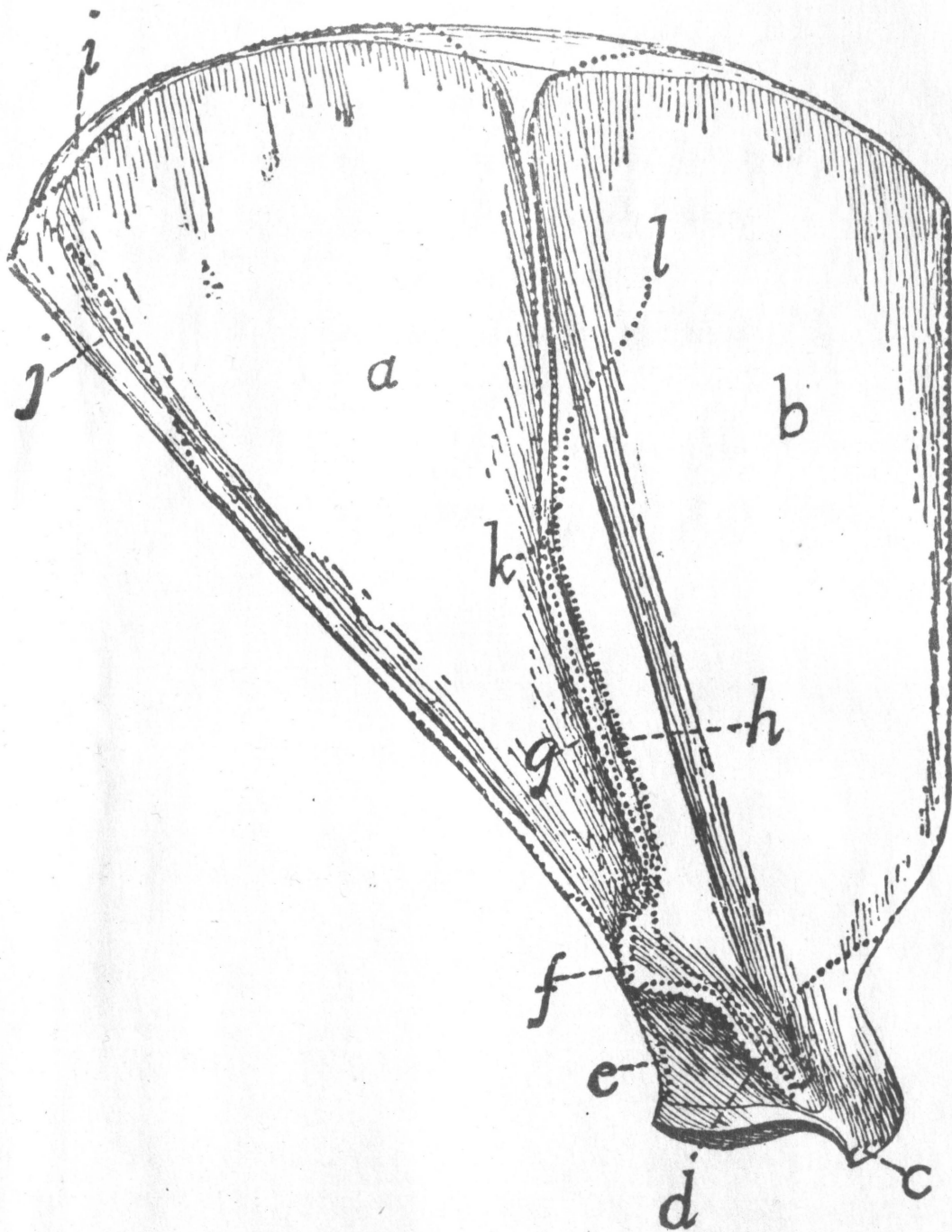
origin on a fixed part of the skeleton and on insertion on a moveable part. The insertion may be by direct attachment or by means of fascia forming an aponeurosis or by a tendon.

- 1. M. levator scapulae
- 2. M. rhomboides major
- 3. M. rhomboides minor
- 4. M. serratus anterior
- 5. M. latissimus dorsi
- 6. M. trapezius
- 7. M. trapezius minor
- 8. M. trapezius major
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- 97. M. trapezius minor
- 98. M. trapezius major
- 99. M. trapezius minor
- 100. M. trapezius major

Plate No. I

Lateral Surface of the Scapula, with the Areas of Attachment of Muscles.

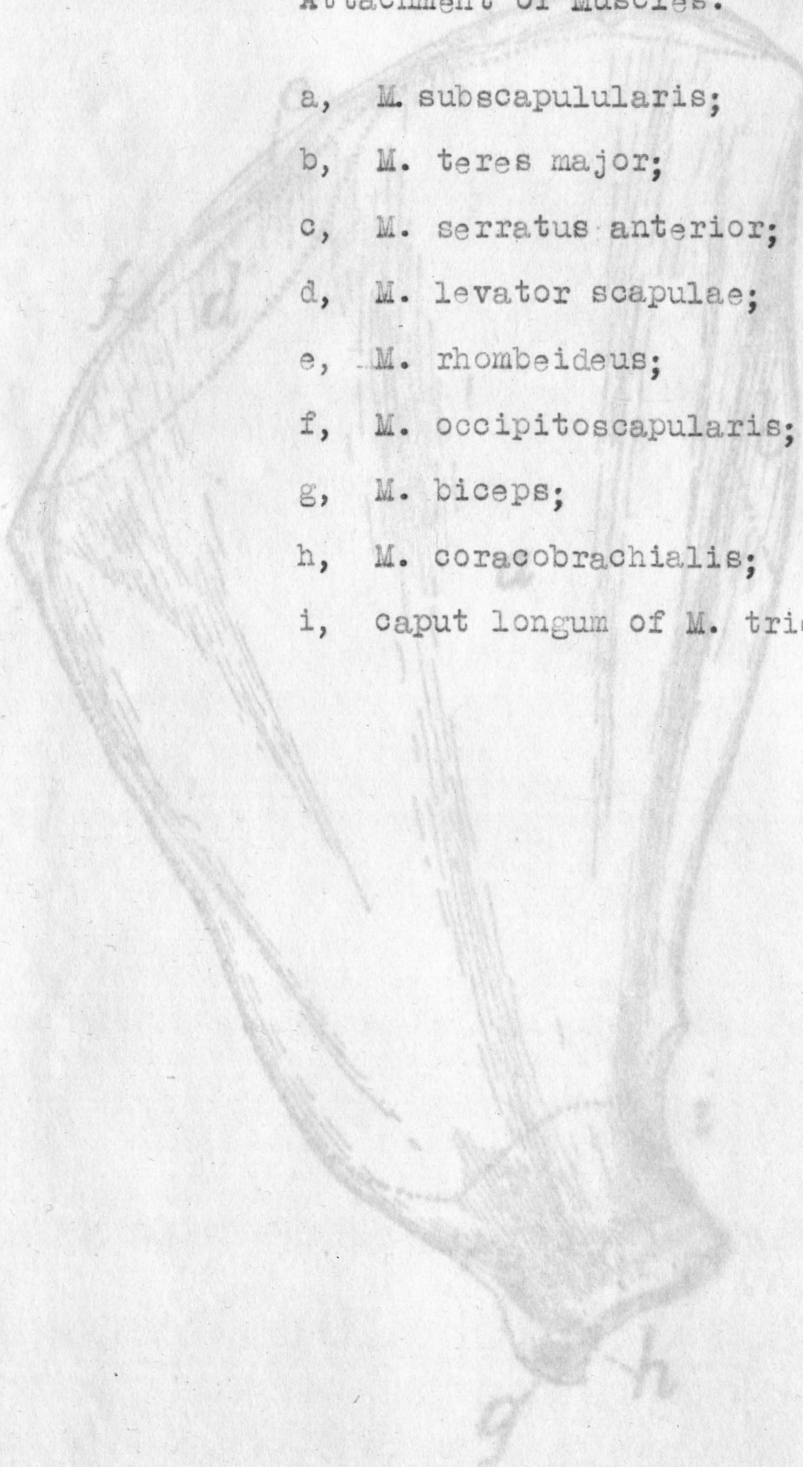
- 
- a, *M. infraspinatus*;
 - b, *M. supraspinatus*;
 - c, origin of *M. biceps*;
 - d, *M. acromiodeltoideus*;
 - e, *M. teres minor*;
 - f, *M. levator scapulae ventralis*;
 - g, *M. spinodeltoideus*;
 - h, *M. acromiotrapezius*;
 - i, *M. rhomboideus*;
 - j, *M. teres major*;
 - k-1, line of insertion of *M. spinotrapezius*.

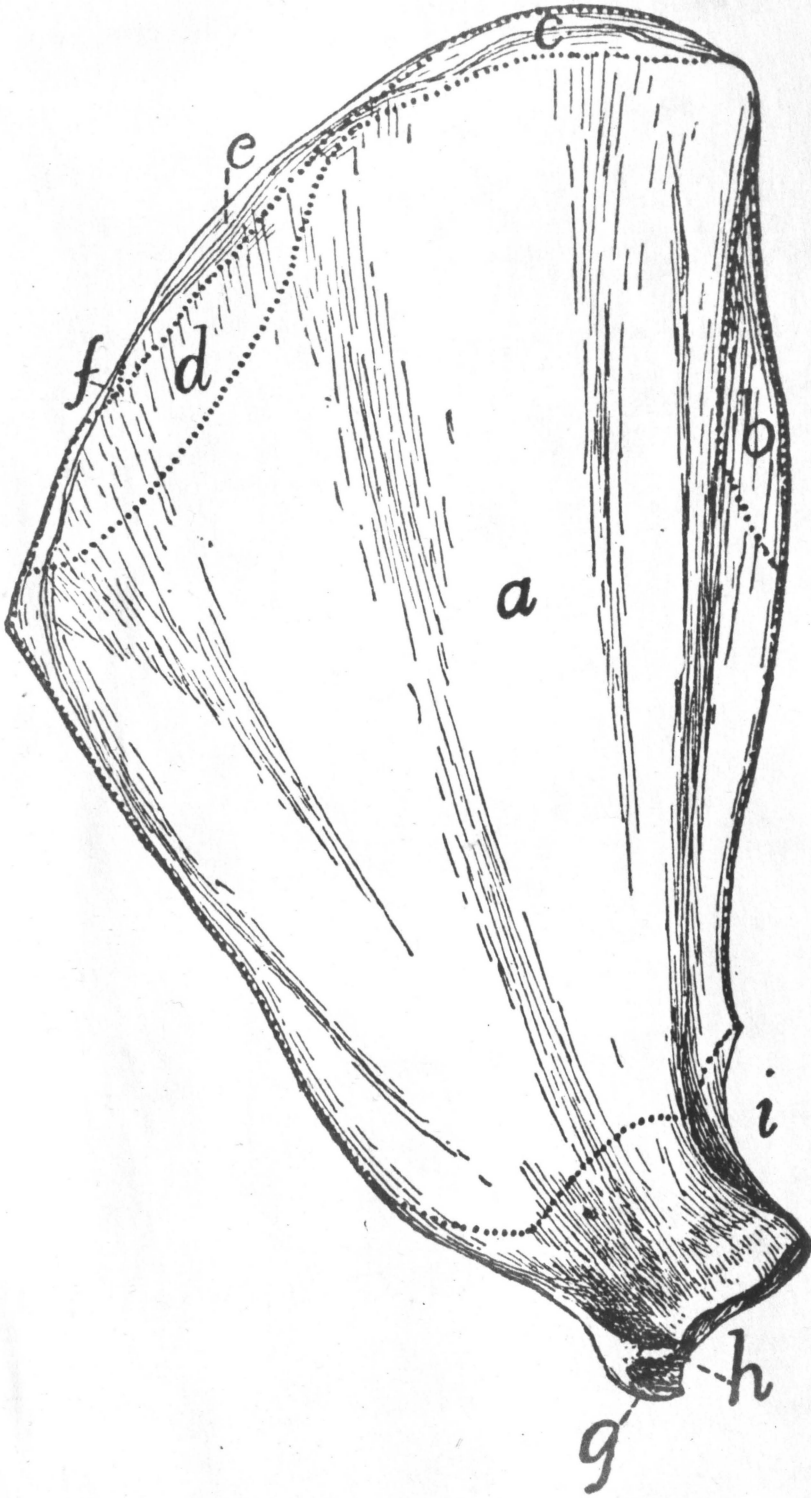


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Plate No. II

Medial Surface of the Scapula with the Areas of Attachment of Muscles.

- 
- a, M. subscapularis;
 b, M. teres major;
 c, M. serratus anterior;
 d, M. levator scapulae;
 e, M. rhombeideus;
 f, M. occipitoscapularis;
 g, M. biceps;
 h, M. coracobrachialis;
 i, caput longum of M. triceps.



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Plate No. IIIVentral Surface of Humerus, with the Areas of
Attachment of Muscles.

Fig. 81.

- a, M. subscapularis;
- b, M. supraspinatus;
- c, Mm. teres major and
latissimus dorsi;
- d, M. pectoralis minor;
- e, deep layer of M. pectoralis
major;
- f, superficial layer of M.
pectoralis major;
- g, M. acromiodeltoideus;
- h, M. spinodeltoideus;
- h', caput laterale of M. triceps;
- i, M. brachialis;
- j, second portion of M. brachialis;
- k, M. extensor carpi radialis
longus;
- l, M. extensor carpi radialis
brevis;
- m, M. extensor communis digitorum;
- n, M. extensor lateralis digitorum;
- o, M. extensor carpi ulnaris;
- p, short portion of caput mediale
of M. triceps;
- q, M. pronator teres;
- r, M. palmaris longus;
- s, third and fourth parts of M.
flexor profundus digitorum;

Dorsal Surface t, M. flexor carpi radialis;
 u, second head of M. flexor
 profundus digitorum.

Medial Side of Humerus, with the Areas of
 Attachment of Muscles.

Fig. 82.

- a, M. supraspinatus;
- b, M. subscapularis;
- c, M. pectoralis minor;
- d, M. long portion of caput
 mediale of M. triceps;
- e, M. coracobrachialis;
- f, Mm. teres major and latissimus;
- g, intermediate portion of caput
 mediale of M. triceps;
- h, deep layer of M. pectoralis
 major;
- i, superficial layer of M. pectoralis
 major;
- j, M. anconeus;
- k, short portion of caput mediale
 of M. triceps;
- l, M. pronator teres;
- m, M. flexor carpi radialis;
- n, M. second head of M. flexor
 profundus digitorum;
- o, third and fourth heads of M. flexor
 profundus digitorum;
- p, M. palmaris longus;
- q, M. flexor carpi ulnaris.

Dorsal Surface of the Left Humerus, with the
Areas of Attachment of Muscles.

Fig. 83.

- a, *M. supraspinatus*;
- b, *M. subscapularis*;
- c, *M. infraspinatus*;
- d, *M. teres minor*;
- e, long portion of caput mediale
of *M. triceps*;
- f, *M. coracobrachialis*;
- g, g', *M. brachialis*;
- h, intermediate portion of caput
mediate of *M. triceps*;
- i, *M. anconeus*;
- j, short portion of medial head of
M. triceps;
- k, *M. pronator teres*;
- l, second and third heads of flexor
profundus digitorum;
- m, *M. palmaris longus*;
- n, *extensor carpi ulnaris*.



Fig. 83. — Dorsal surface of the left humerus, with the areas of attachment of muscles.

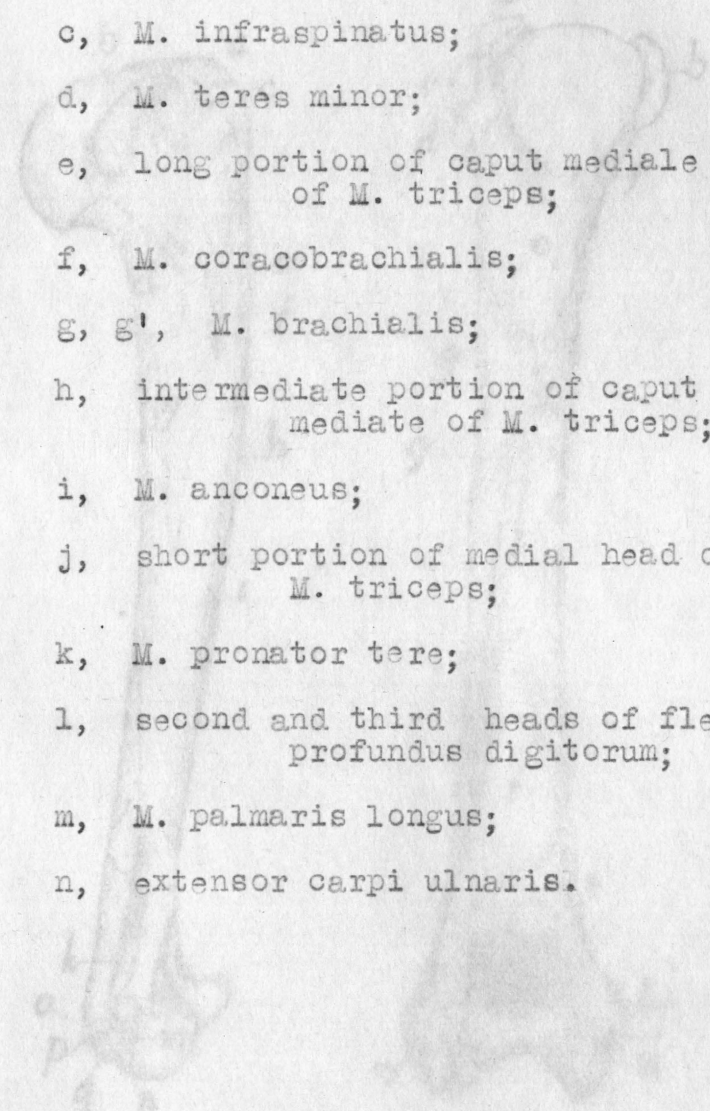


Fig. 83. — Dorsal surface of the left humerus, with the areas of attachment of muscles.

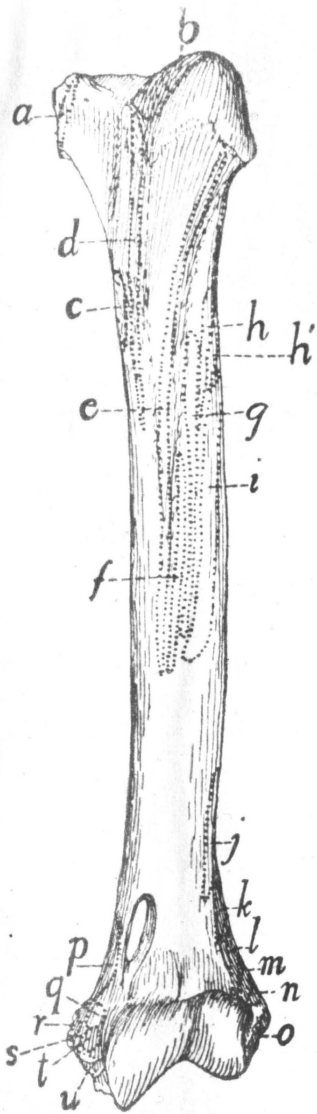


FIG. 81.—VENTRAL SURFACE OF HUMERUS, WITH THE AREAS OF ATTACHMENT OF MUSCLES.

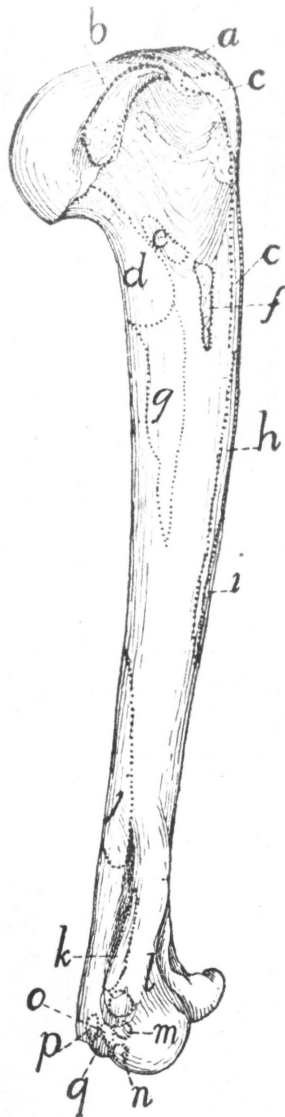


FIG. 82.—MEDIAL SIDE OF HUMERUS, WITH THE AREAS OF ATTACHMENT OF MUSCLES.

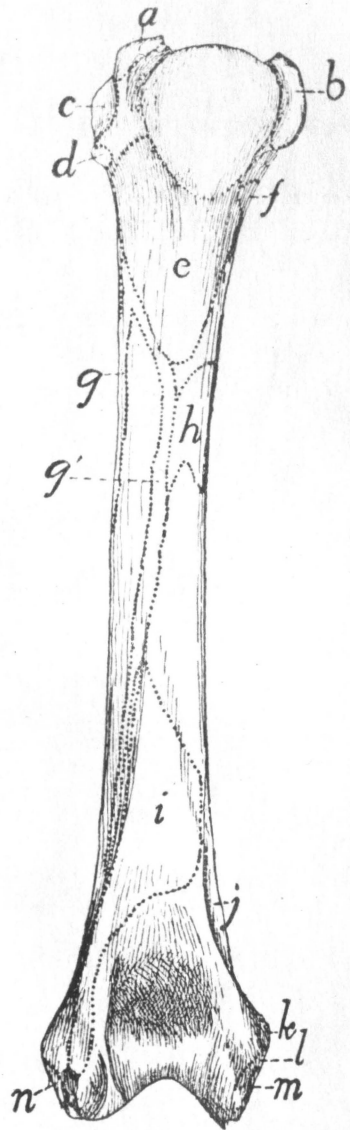


FIG. 83.—DORSAL SURFACE OF THE LEFT HUMERUS, WITH THE AREAS OF ATTACHMENT OF MUSCLES.

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Plate No. IV

Muscles of the Lateral Surface of the Upper Arm.

- a, M. supraspinatus
 - b, M. spinodeltoideus
 - c, Caput laterale of M. triceps brachii
 - d, Caput longum of M. triceps brachii
 - e, M. teres major
 - f, M. brachiordialis
 - g, M. extensor carpi radialis longus
 - h, M. brachialis
 - i, M. acromiodeltoideus
 - j, M. spinodeltoideus
 - k, M. infraspinatus
-
- 1, Olecranon
 - 2, Greater tuberosity of humerus



Lateral Surface of the Forelimb

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Approved

F. A. Bantock, Jr.
Major Professor

H. J. Keegan, Jr.
Dean

Date 10/10/38