Color Atlas of Surgical Approaches to the Bones and Joints of the Dog and Cat

Thoracic and Pelvic Limbs

R. Latorre • F. Gil • S. Climent • O. López • R. Henry
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Preface

Many surgeons usually choose to review regional anatomy when planning for surgery. Anatomical review is more likely while learning new surgical techniques, as identification of anatomical structures is not as routine. This atlas provides an answer to traumatologists who have been asking for a collection of colour anatomical images of the most common surgical approaches to the limbs. The selected images have been used in continuing education courses for traumatologists with great success and availability in text book format is often asked.

The approaches to the thoracic limb are presented in three sections. The first includes the scapula, shoulder and humerus of the dog, the second contains the elbow, radius, ulna and manus of the dog, and a third section includes selections on the cat. The pelvic limb begins with the hip joint and thigh and continues with the knee, leg and pes of the dog. It concludes with the corresponding approaches in the cat. Images of the articulated bones of the region are presented at the beginning of each section. All approaches were completed on fresh tissue (no fixation) for more natural colour. Cadaver vessels were highlighted by colour injection. Superficial to deep views of preparations are presented with the relevant muscles, ligaments, nerves and vessels identified. Additionally, several videos of the thoracic and pelvic limbs with 3D reconstruction, obtained from live specimens at the *Minimally Invasive Surgery Centre Jesús Usón* (Cáceres, Spain) with a "BV Pulsera 3D-RX Option. Philips. S. A." device, are included. Indications for each approach are referenced at the beginning of each chapter. All approaches were carried out on left limbs - with the exception of some in the manus and pes- , and sequenced from proximal to distal. Footnotes indicate the commonly used protocol for each surgical approach.

We would like to conclude with a very special reference to *Prof. Dr. Francisco Moreno Medina,* who had to leave his career in anatomy early and retire due to illness. He founded the Anatomy and Embryology group at the University of Murcia and from him we inherited a large part of our anatomical knowledge and passion for working in the dissection room.

THE AUTHORS

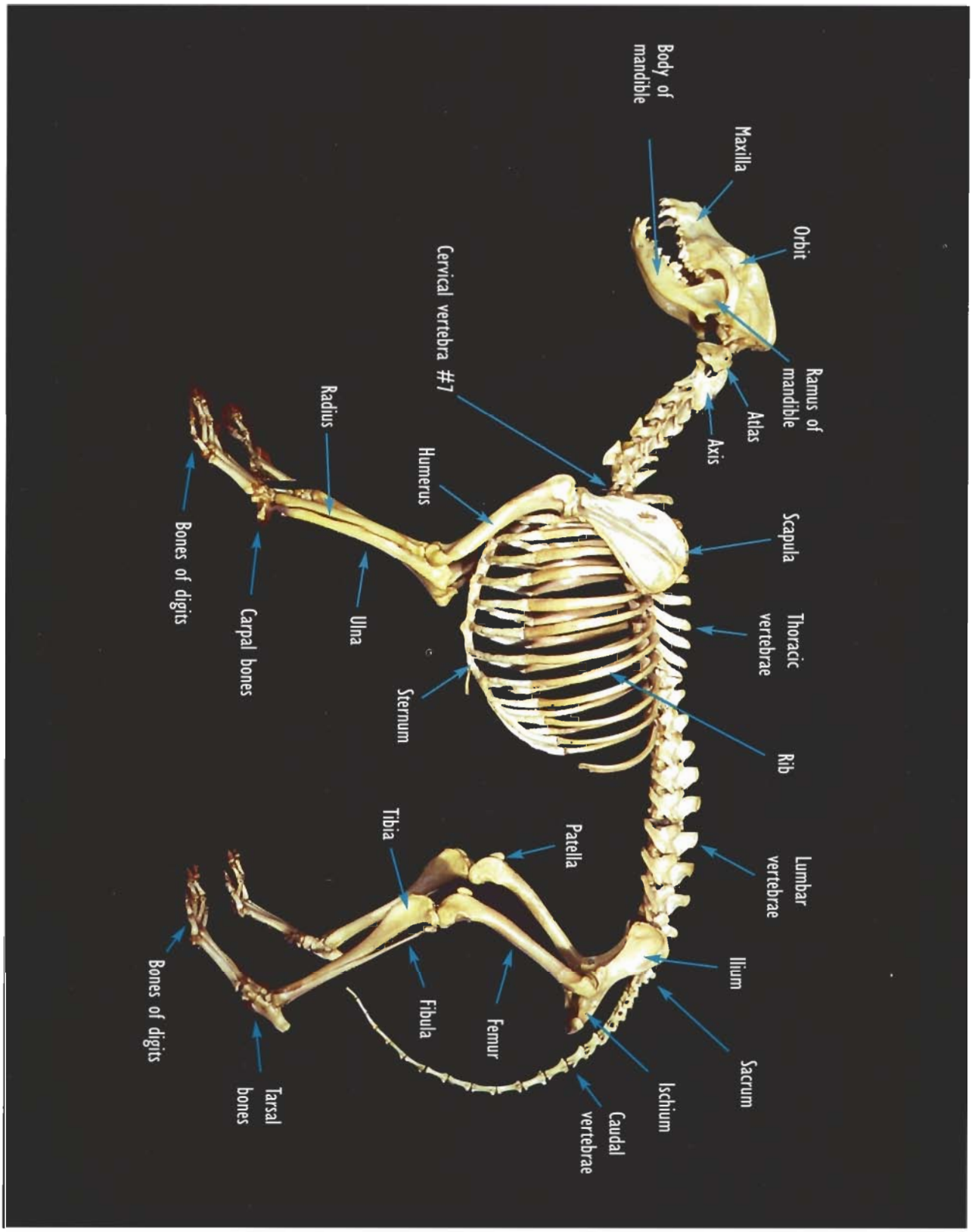
"Anatomy without clinic is dead,
clinics without anatomy is deady"
(Platzer)

(None of the specimens was euthanatized for dissection purposes. All cadavers were obtained from the Animal Facility of the University of Murcia, which oversees all protocols for Animal Healthcare and is accredited by the European Bureau for protection of research risks in animals. Most cadavers were perfused with coloured chemicals for a better identification of arteries and veins).

Contents

Thoracic limb

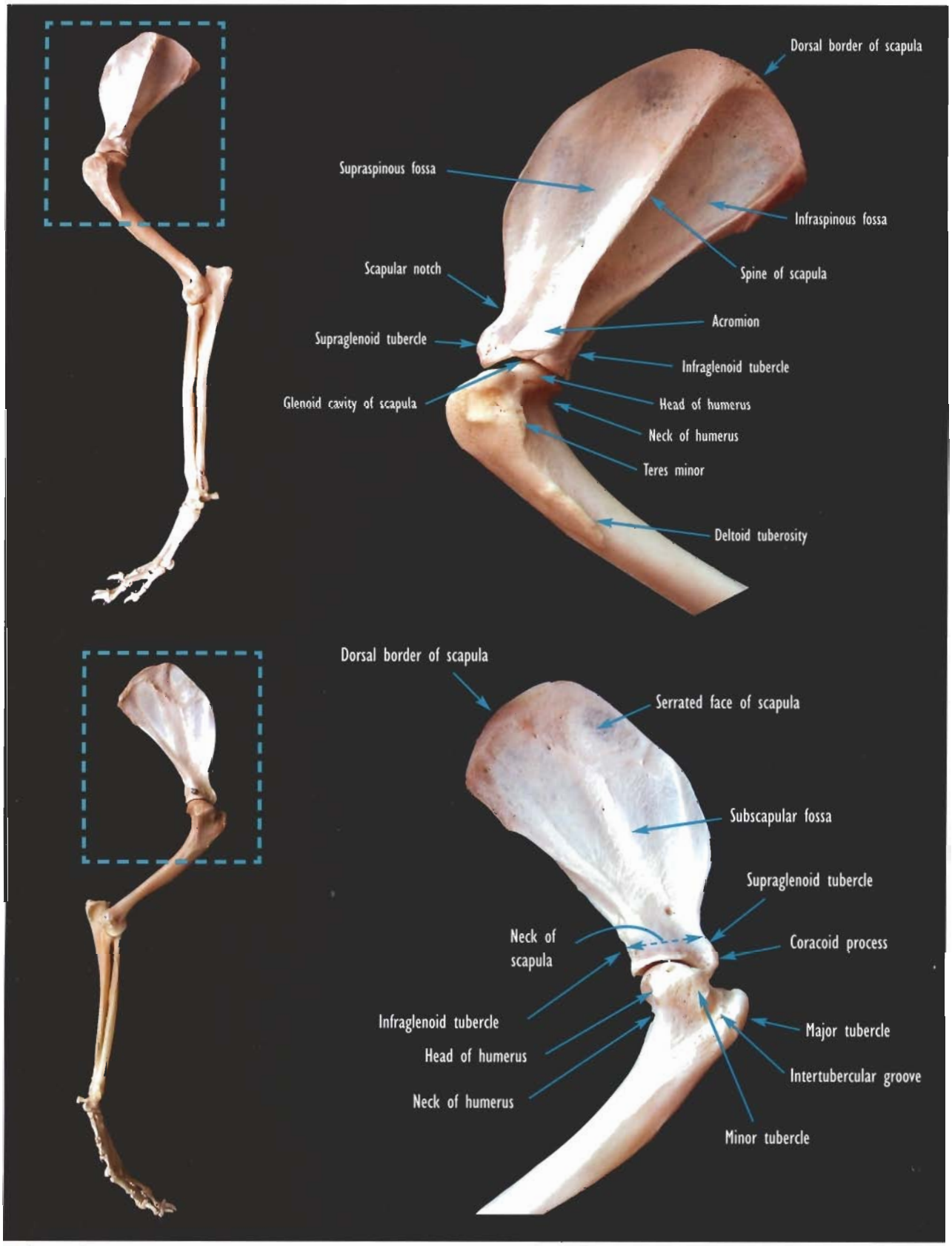
1



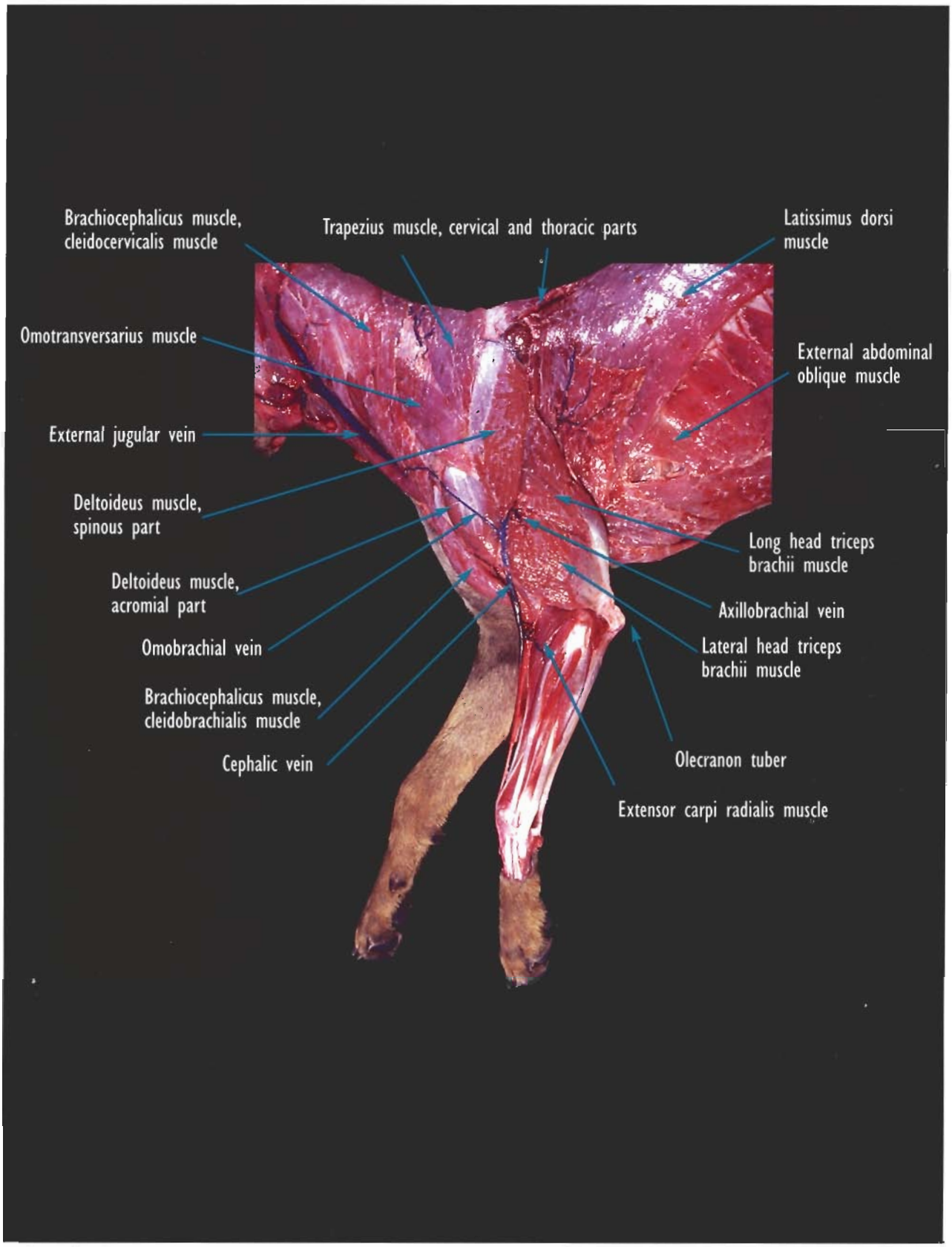
Skeleton of dog, left view

Scapula, shoulder joint and humerus

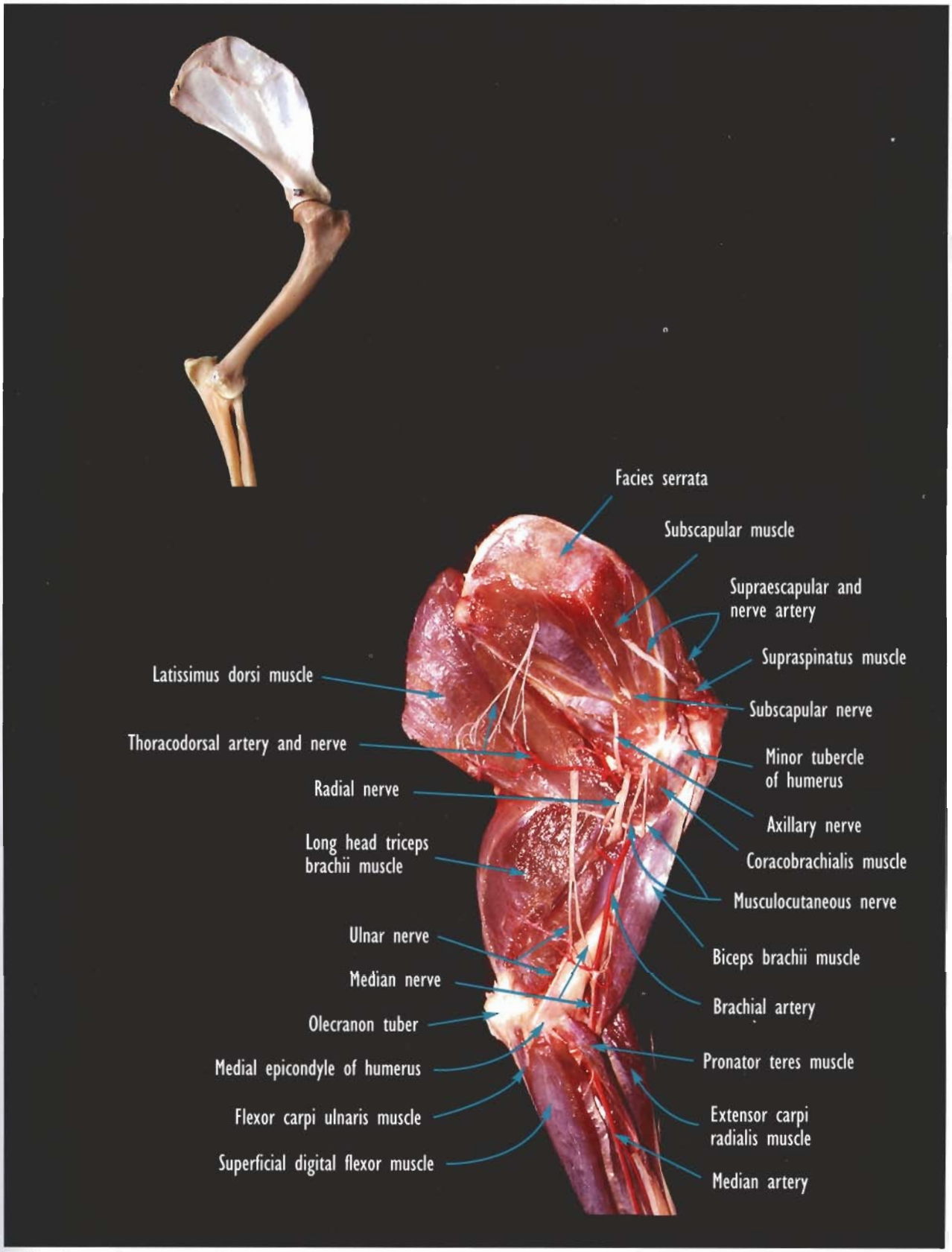
Anatomical considerations



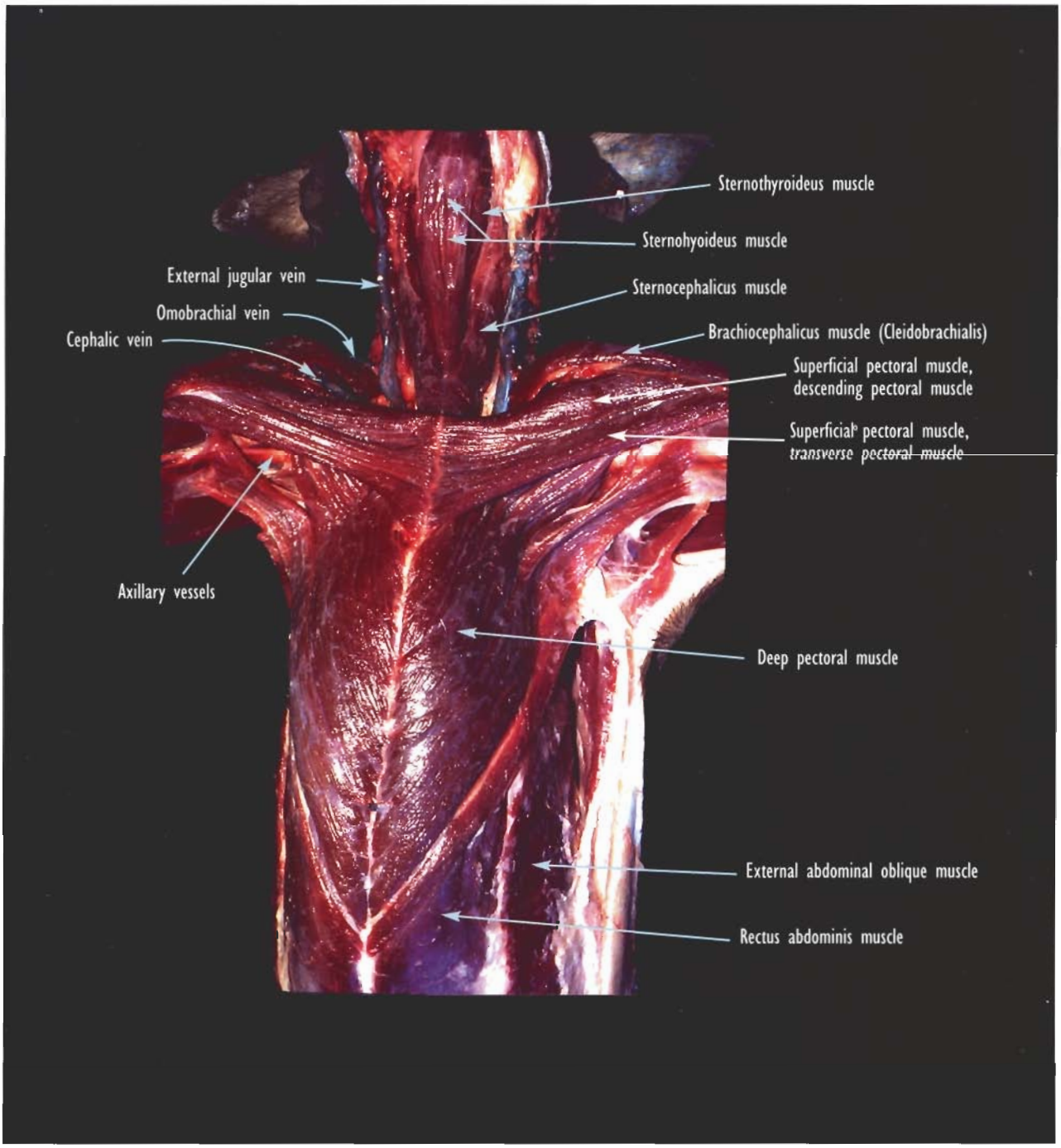
Lateral and medial views of the left scapula and humerus.



Superficial muscles of the neck and left thoracic limb.



Muscles and neurovascular pathways of the left shoulder and arm. Medial view.

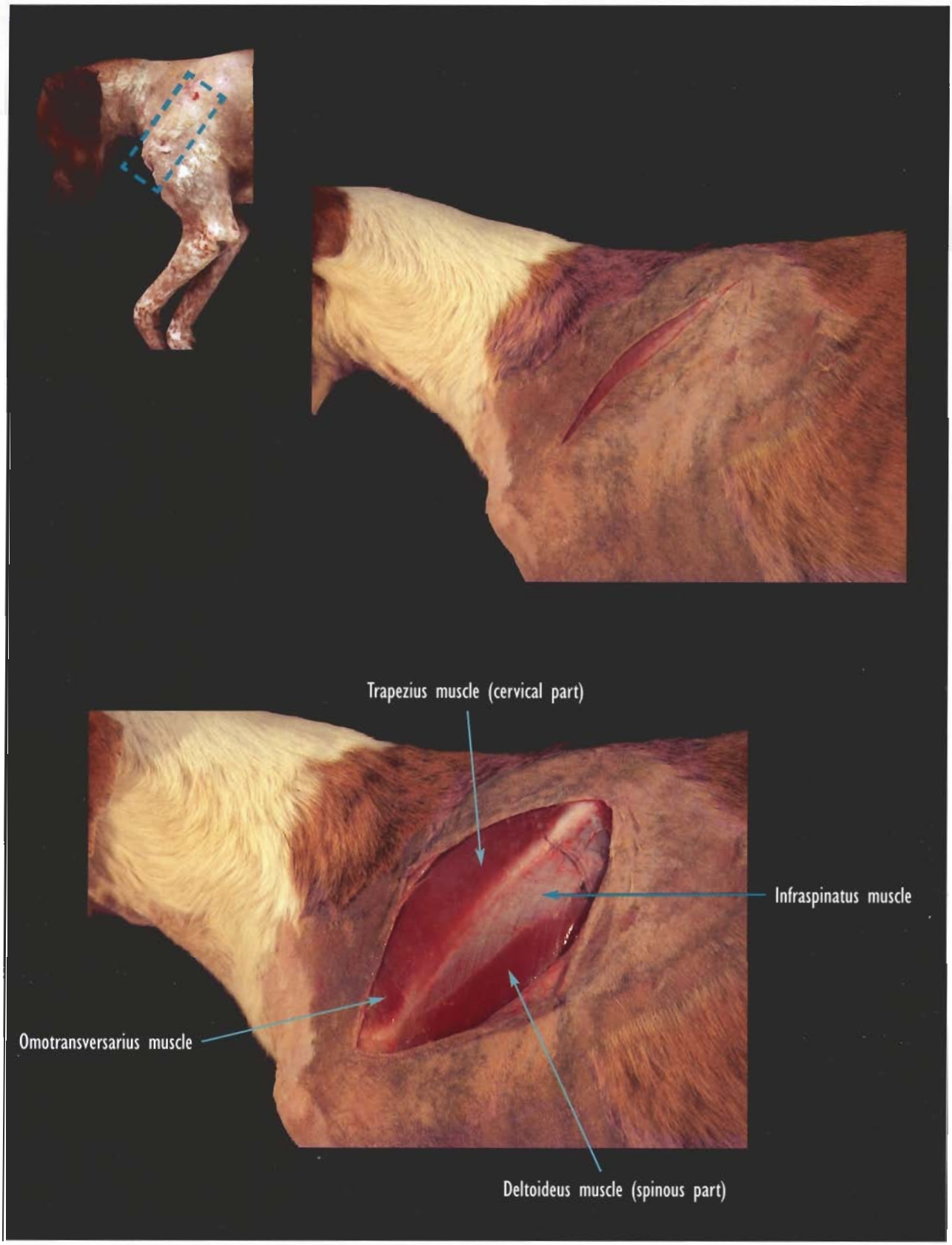


Ventrolateral muscles of the neck and pectoral region.

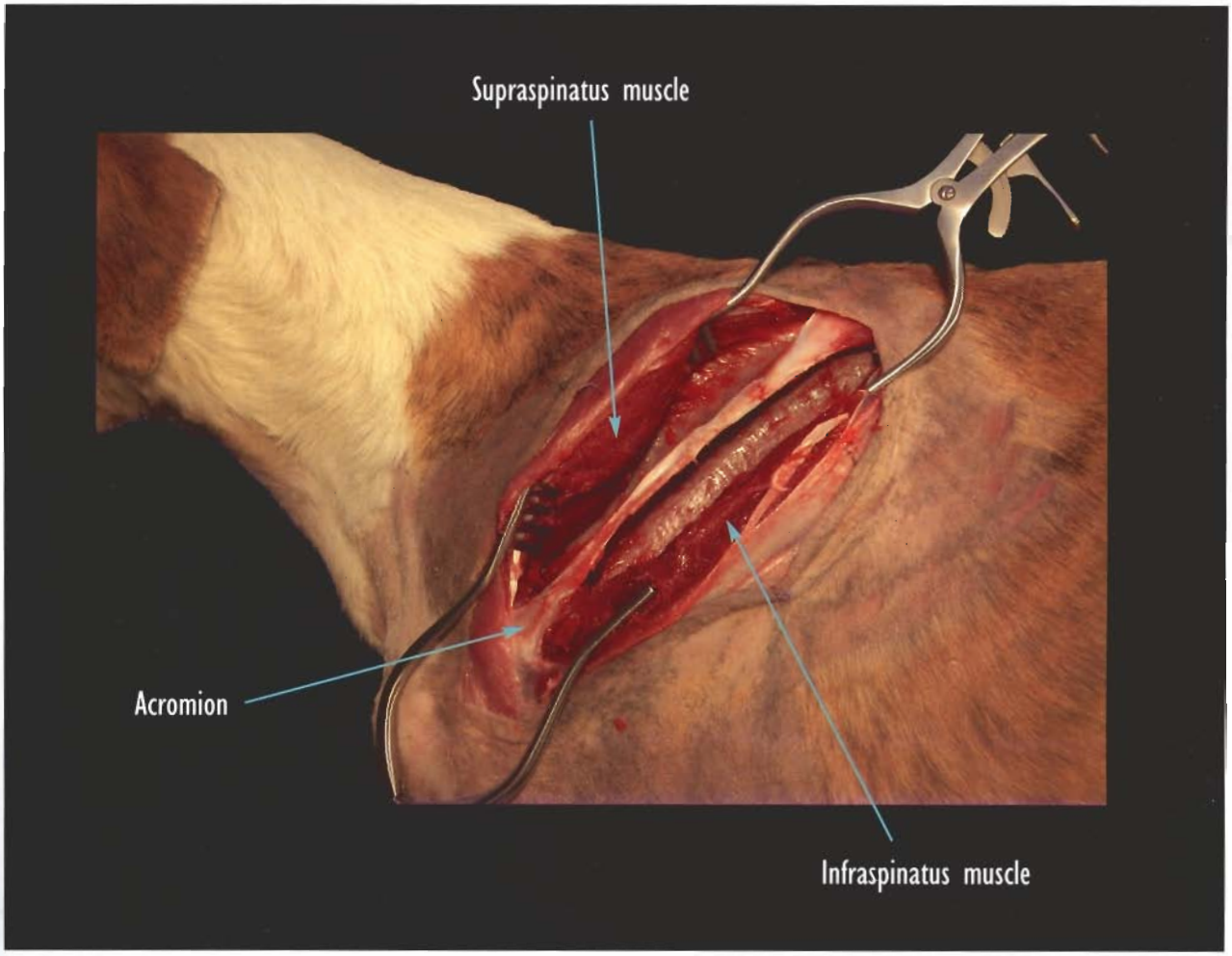
Approach to the lateral surface, spine and acromion of the scapula

Indications:

Amputation of the thoracic limb with removal of the scapula.
Treatment of fractures of the body of the scapula with fragments and severe dislocation.



- *Upper image:* the skin incision starts at the proximal end of the scapular spine and extends distally to the acromion.
- *Lower image:* after skin incision, the superficial muscles of the scapula are identified. These muscles will need to be reflected from their spinous attachment.

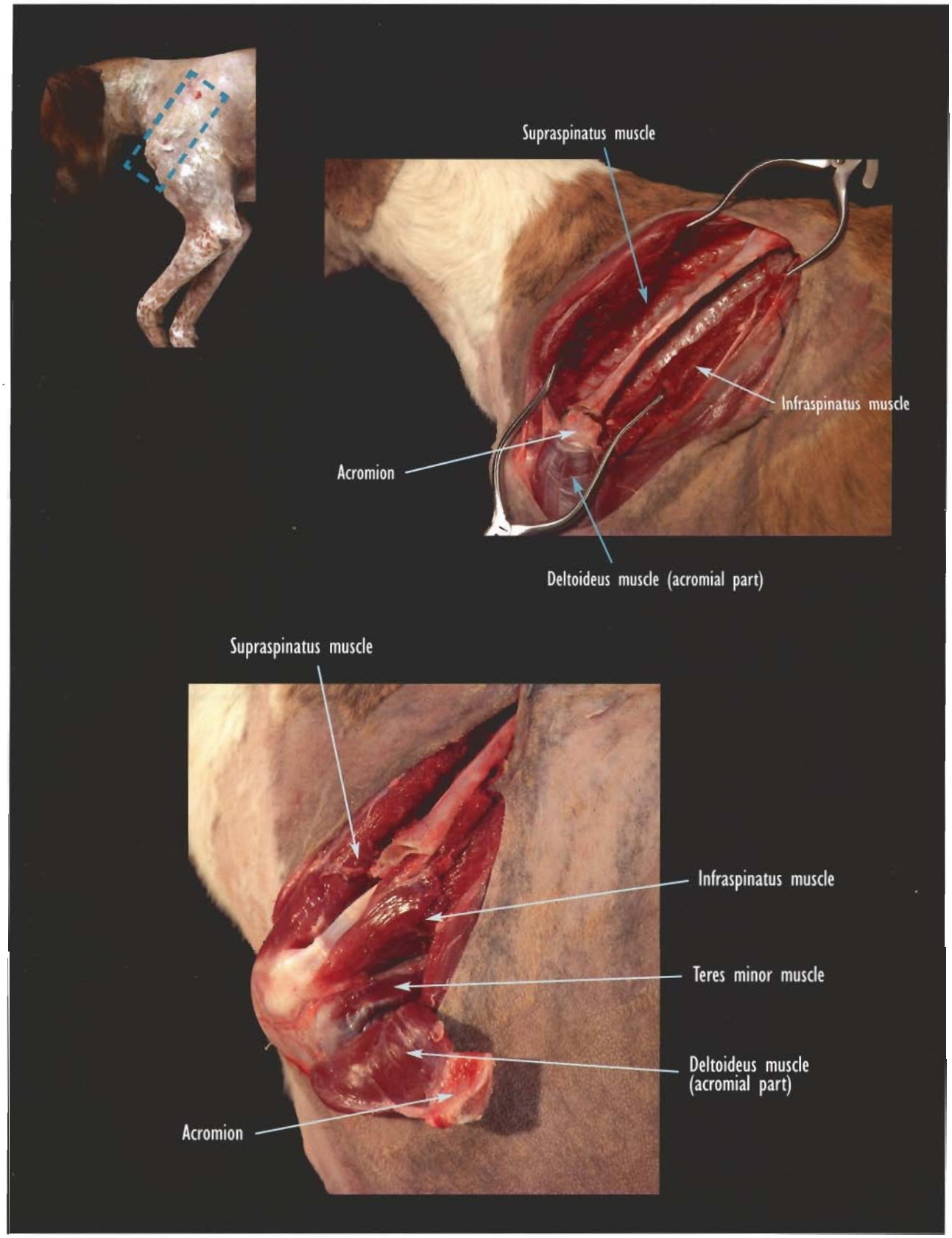


■ After reflection of the muscles, the spine, acromion and supraspinous and infraspinous fossae are exposed.
CAUTION: Distally, at the acromion, the suprascapular neurovascular bundle must be preserved as it courses around the scapular notch. In the cat, the suprahamate process on the acromion makes reflection of the infraspinatus muscle difficult.

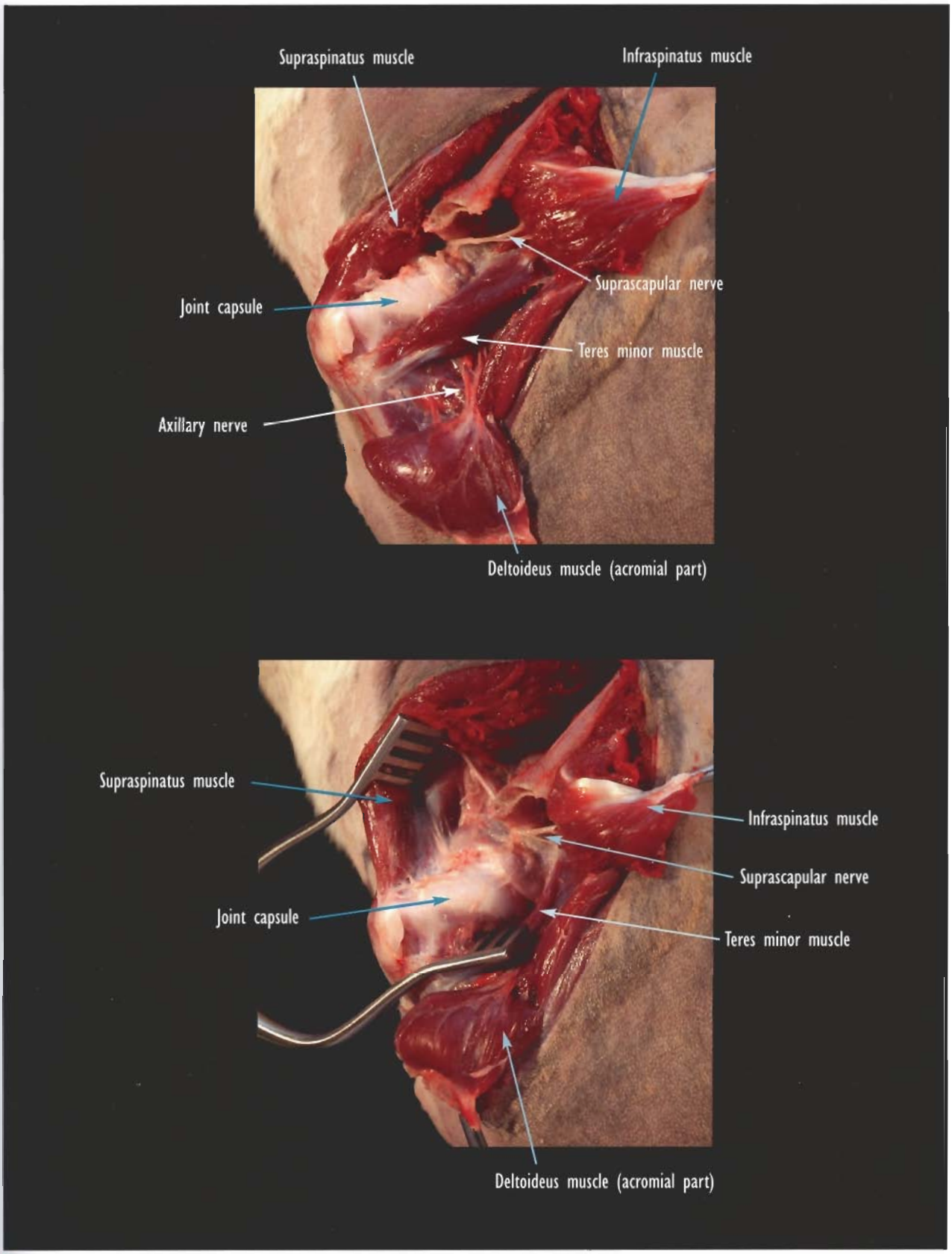
Craniolateral approach to the shoulder joint by acromial osteotomy

Indications:

Treatment of fractures of the glenoid cavity.
Treatment of fractures of the head of the humerus.
Surgical reduction of shoulder luxations.
Relevant deformations in cases of osteochondritis dissecans.
Arthrodesis of the shoulder joint.



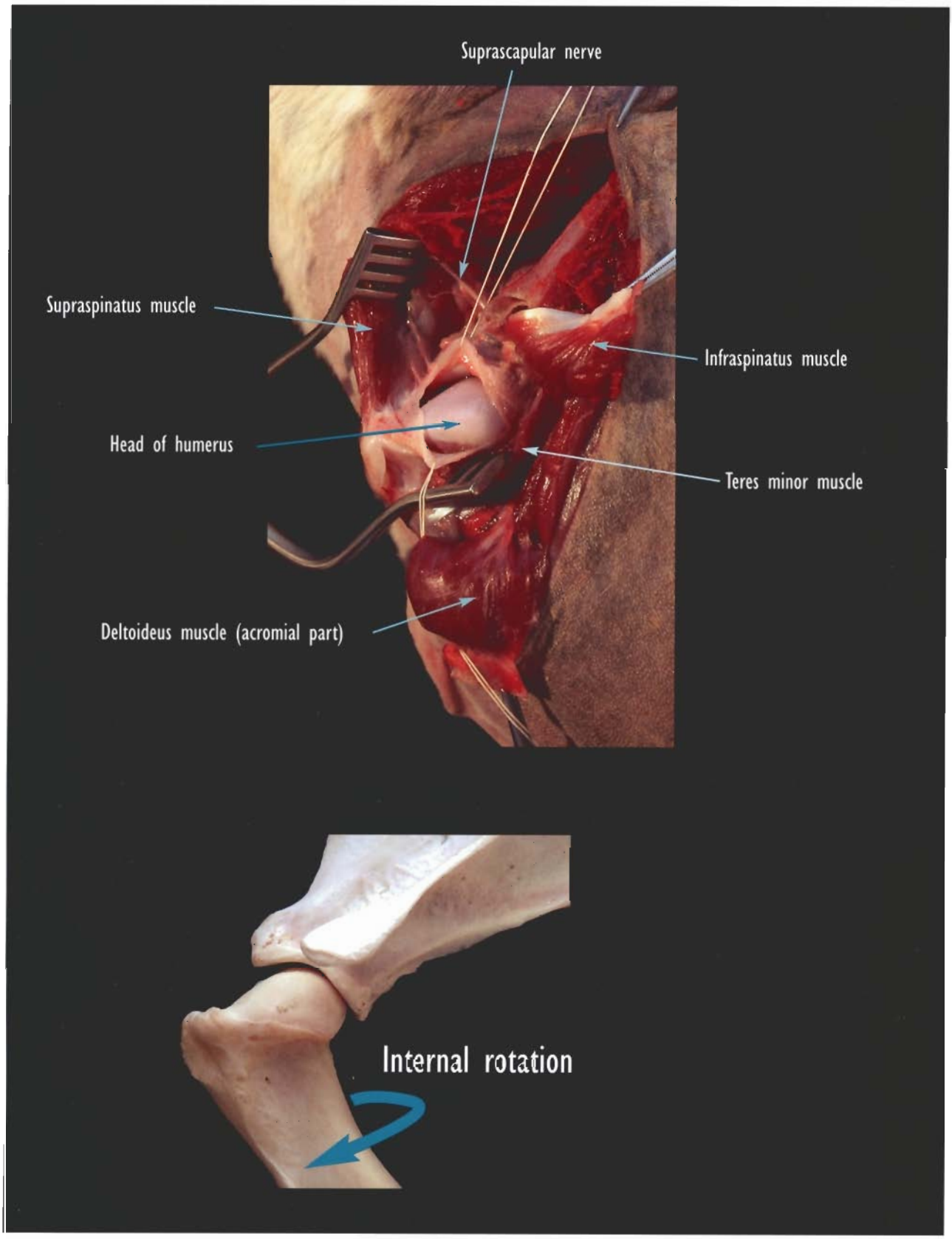
- *Upper image:* for exposure of the craniolateral shoulder joint, after completion of the spinous approach, the incision may be extended distally to the deltoid tuberosity. The acromial part of the deltoideus muscle is freed of the underlying muscles prior to acromial osteotomy.
- *Lower image:* after reflection of the deltoideus muscle, the teres minor muscle and the tendon of the infraspinatus muscle can be seen and prepared for tenotomy.



- *Upper image:* after infraspinatus tenotomy and caudal reflection of the tendon, the joint capsule and suprascapular nerve are exposed.

CAUTION: the suprascapular nerve must be preserved as it passes ventrally to the acromion. As the cut acromion with the acromial deltoid attached is reflected ventrally, the branches of the axillary nerve need to be preserved.

- *Lower image:* for greater joint capsule exposure, the supraspinatus muscle can be retracted dorsally and the teres minor muscle retracted ventrally.

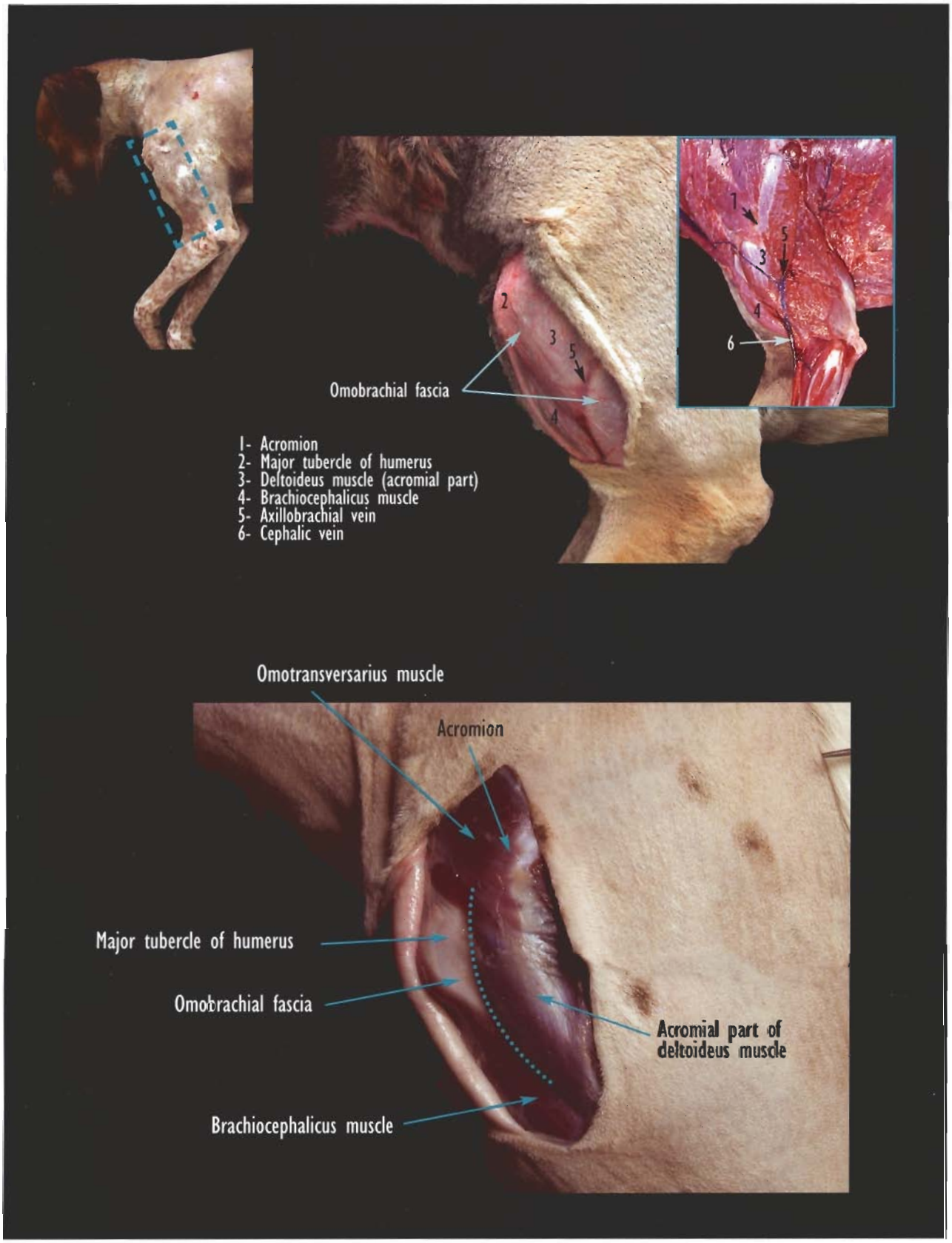


After the incision of the joint capsule, the humeral head and glenoid labia are exposed. Internal rotation of the humerus provides greater exposure of the joint as illustrated by the osteological image.

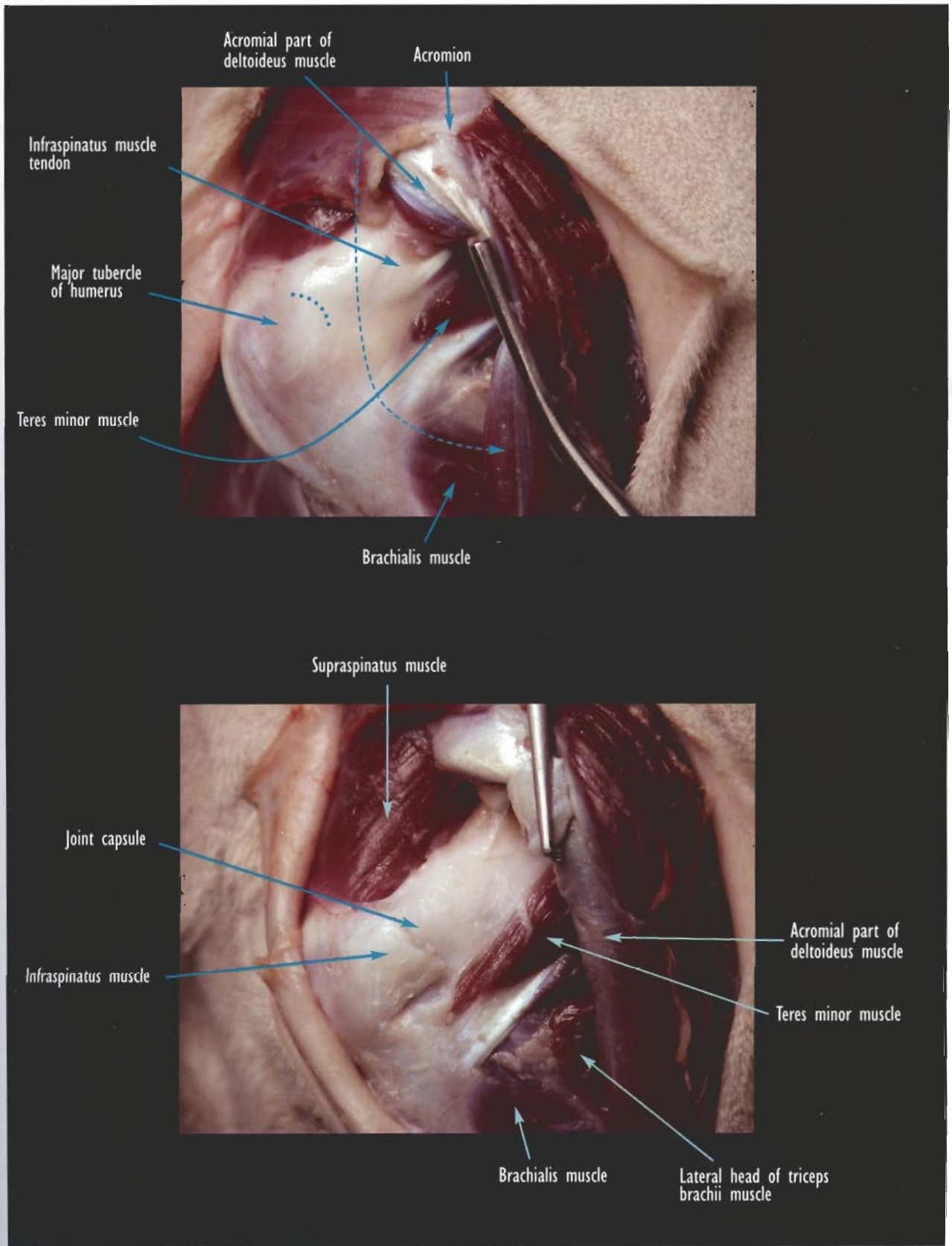
Craniolateral approach to the shoulder joint after tenotomy of the infraspinatus muscle

Indications:

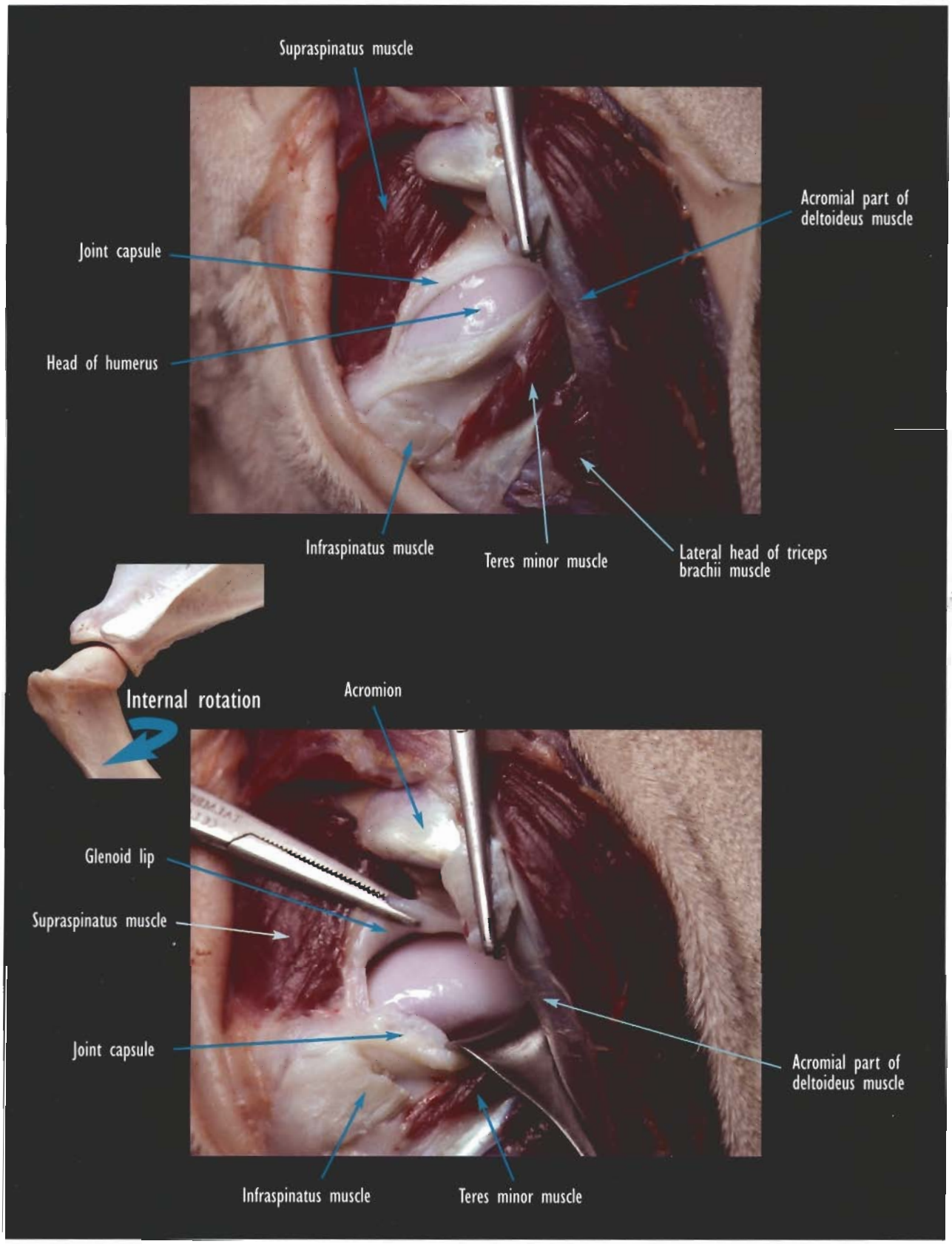
Treatment of articular fractures of the glenoid cavity.
Treatment of articular fractures of the head of the humerus.
Surgical reduction of shoulder luxations.
Relevant deformations in cases of osteochondritis dissecans.
Arthrodesis of the shoulder joint.
Infraspinatus tenotomy for muscle contracture.



- *Upper image:* the line of incision is from the major tubercle of the humerus toward the lateral epicondyle of the humerus. Preserve the cephalic vein and its branches. If necessary, the omobrachial vein may be ligated and transected for better exposure.
- *Lower image:* The cranial border (dotted line) of the acromial part of the deltoideus muscle is freed for caudal retraction.



- *Upper image:* caudal retraction of the acromial part of the deltoideus muscle exposes the teres minor muscle and the infraspinatus muscle tendon for tenotomy (dotted line).
- *Lower image:* the infraspinatus muscle tendon is reflected dorsocaudally to expose the joint capsule.



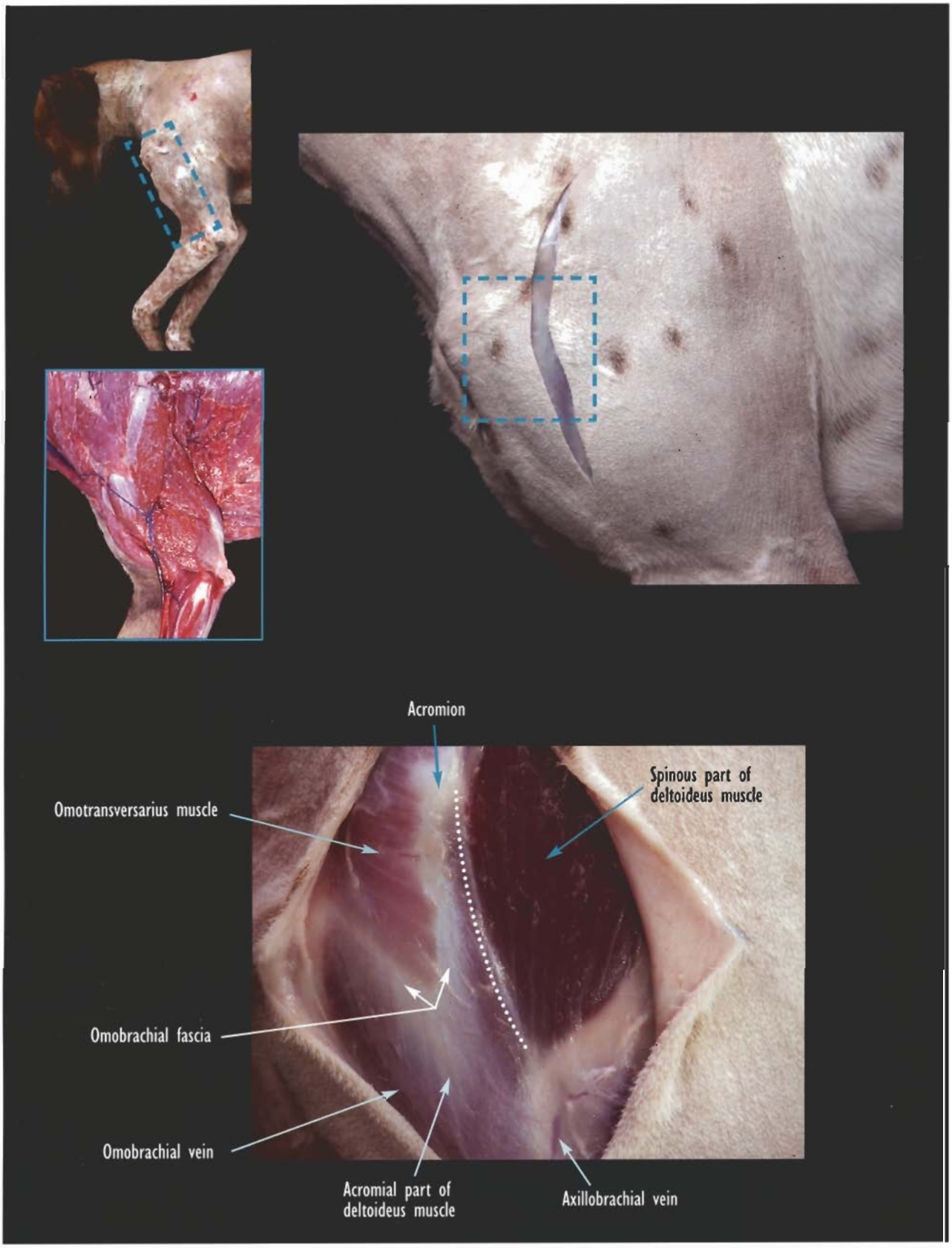
- *Upper image:* the joint capsule is incised to examine the joint cavity and articular surfaces.
- *Lower image:* for greater joint capsule exposure, the teres minor muscle is retracted ventrally or transected. Internal rotation of the humerus provides greater exposure of the articular surface as illustrated by the osteological image.

Caudolateral approach to the shoulder joint

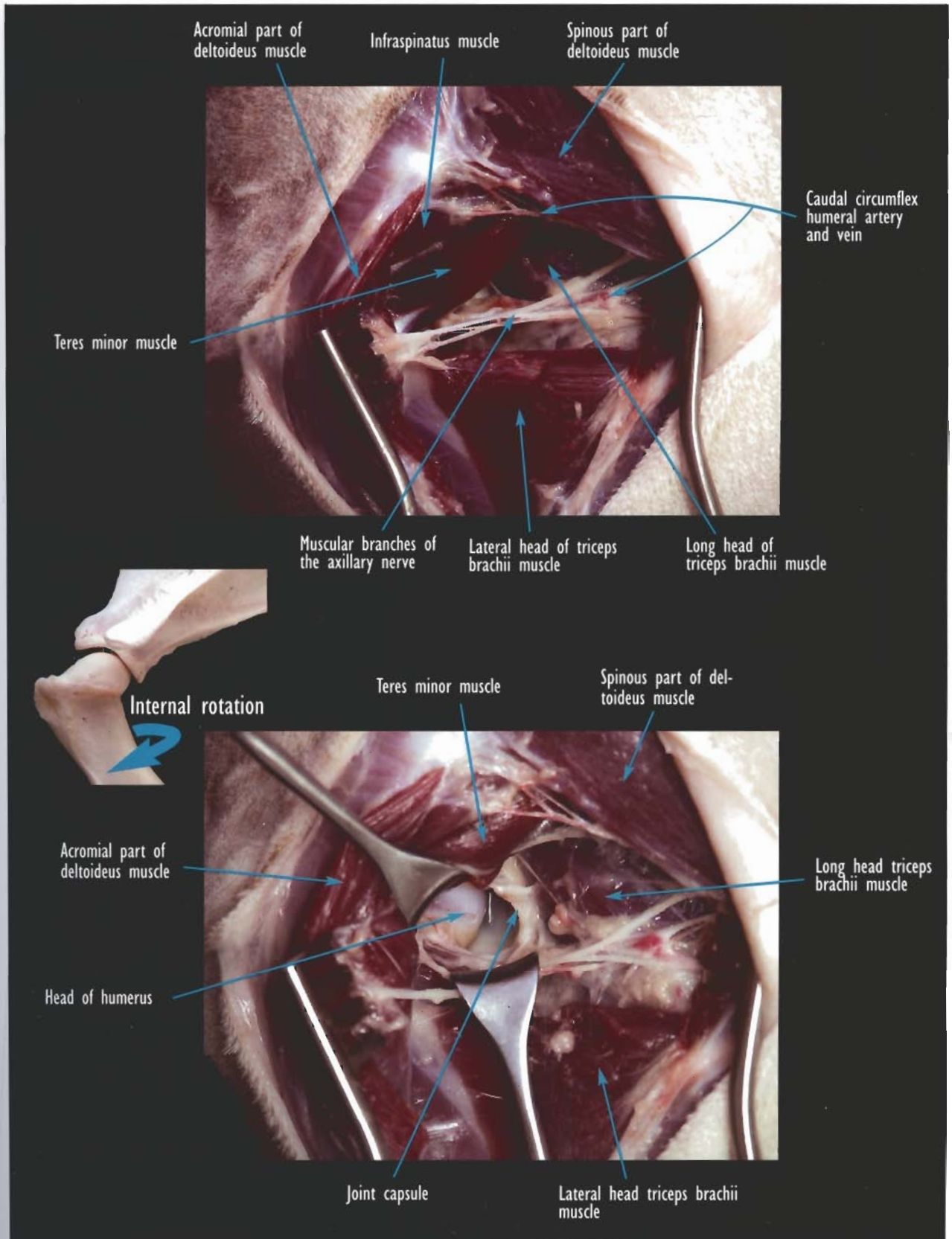
Indications:

Osteochondritis dissecans.

Removal of fracture fragments in the caudal glenoid cavity.



- *Upper image:* the skin incision is from the distal end of the scapular spine curving toward the mid humerus.
- *Lower image:* in preparation for separation of the two parts of the deltoideus muscle, scapular (spinous) and acromial, dissect the omobrachial fascia to delimit the two portions (dotted line).



- *Upper image:* after retraction of the two parts of the deltoideus muscle, the joint capsule can be viewed. Identify the muscular branches of the axillary nerve and caudal circumflex humeral vessels.
- *Lower image:* after incising the joint capsule and internal rotation of the humerus as in the osteological image, the view of the caudal aspect of the humeral head is complete.

CAUTION: preserve the muscular branches of the axillary nerve between the two parts of the deltoideus muscle.

Craniomedial approach to the shoulder joint

Indications:

Biceps tenodesis.

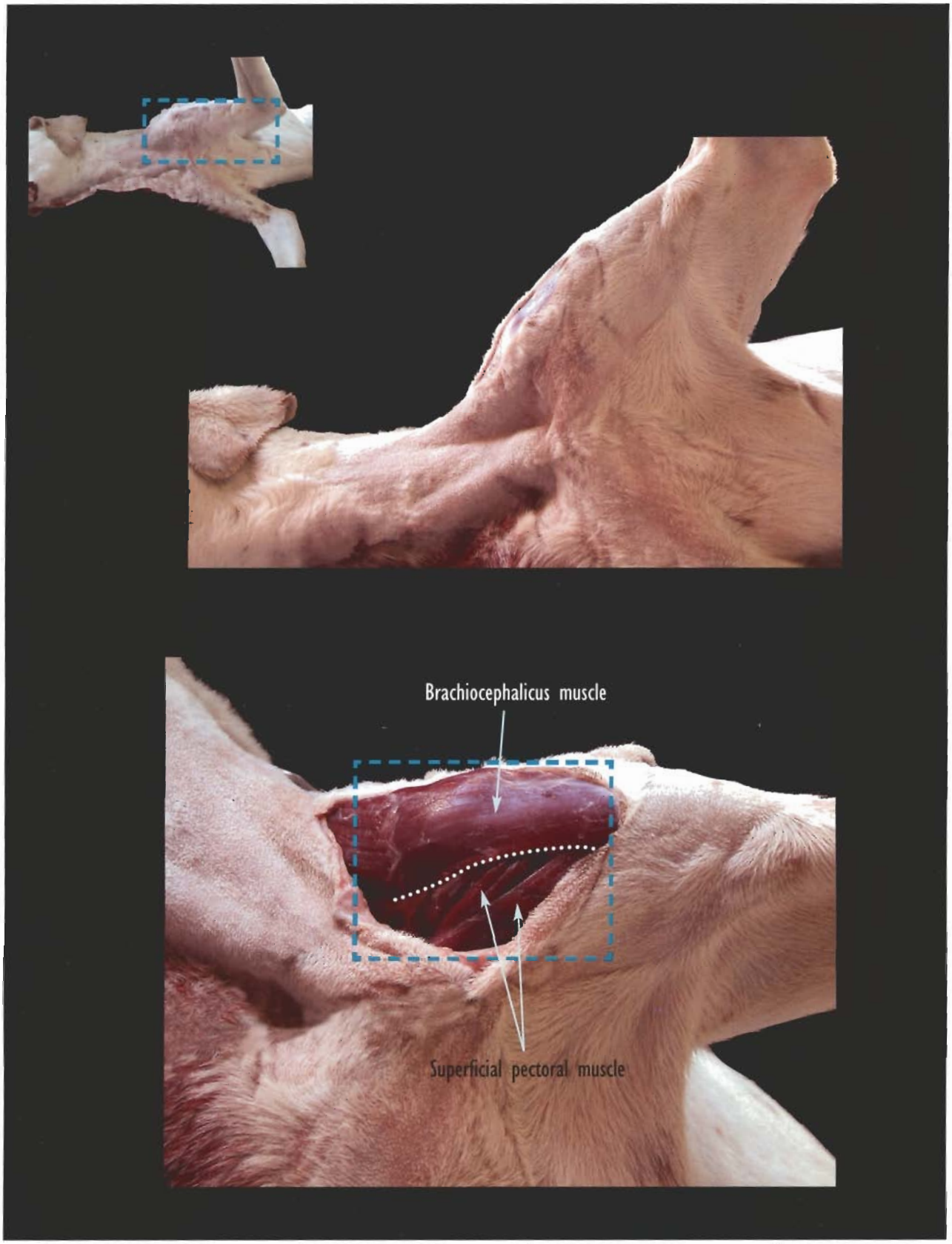
Repair of the transverse humeral ligament.

Imbrication of the articular capsule to correct medial instability of the shoulder joint.

Surgical reduction of medial luxation of the shoulder joint.

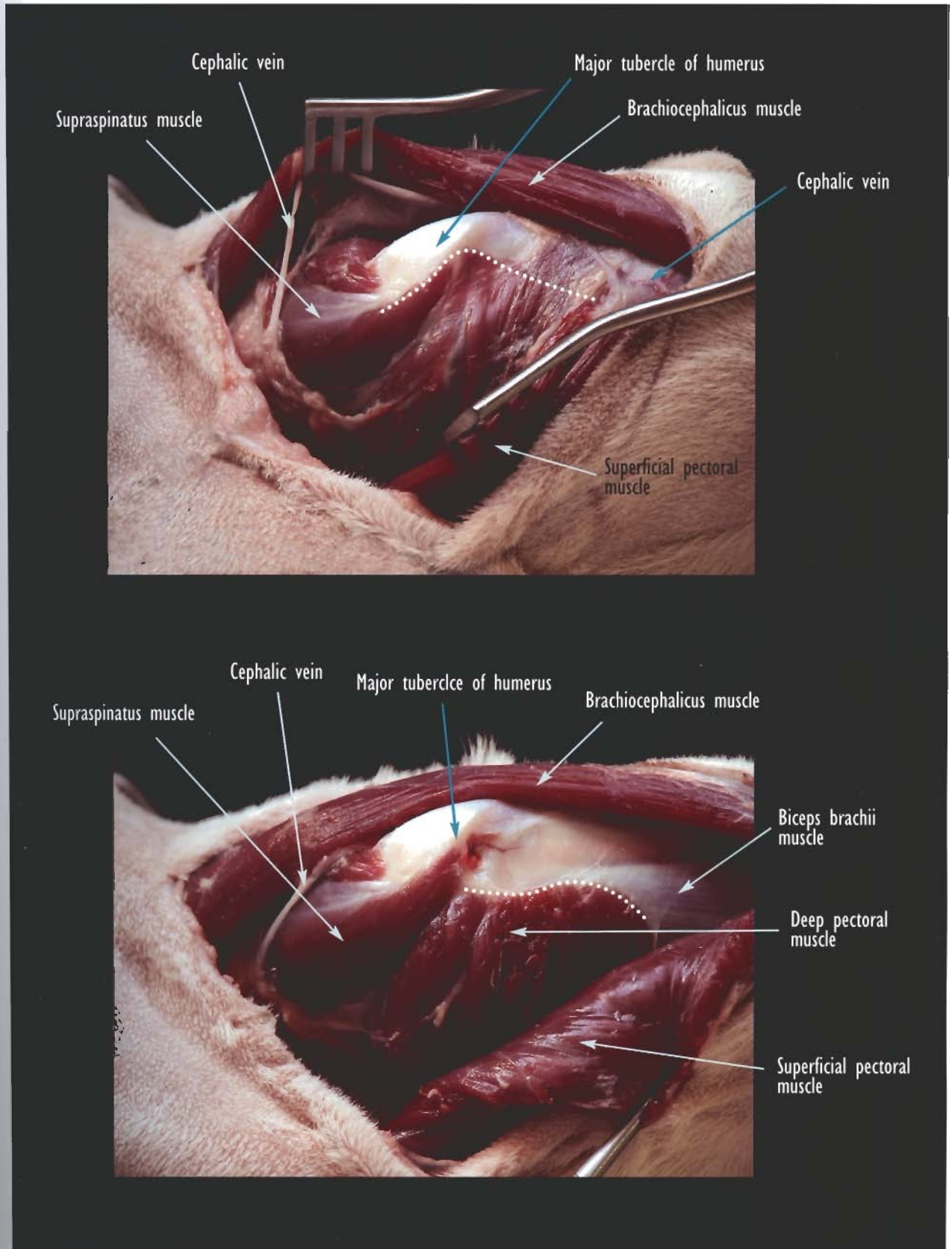
Medial transposition of the biceps tendon to correct medial luxation of the shoulder joint.

Treatment of fractures of the medial border of the glenoid cavity.



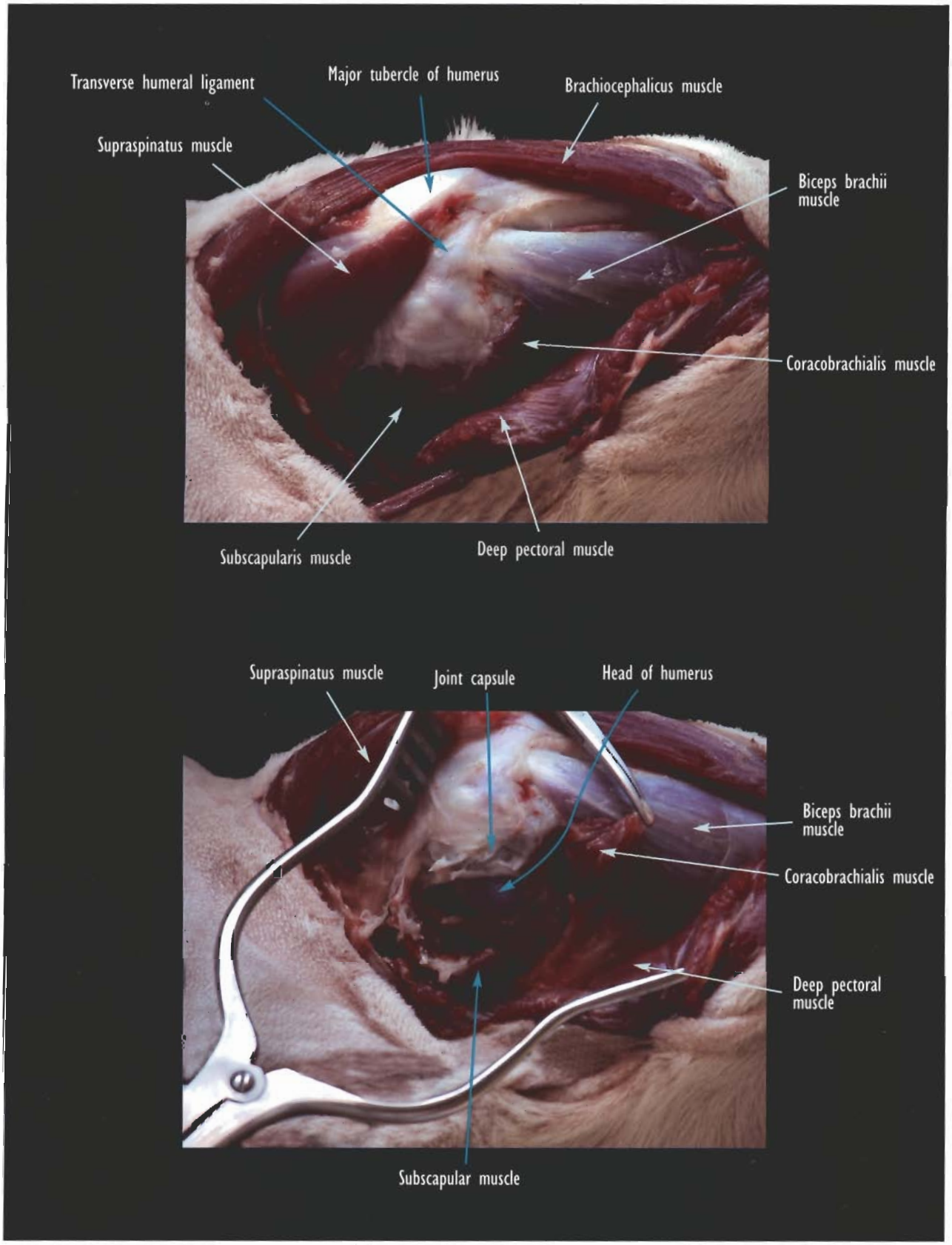
- *Upper image:* the animal is positioned to view the medial aspect of the left shoulder and arm region. The skin is incised over the major tubercle of the humerus and is extended proximally and distally.
- *Lower image:* separate the brachiocephalicus and superficial pectoral muscles at their junction as indicated by the dotted line.

CAUTION: preserve the chephalic vein.

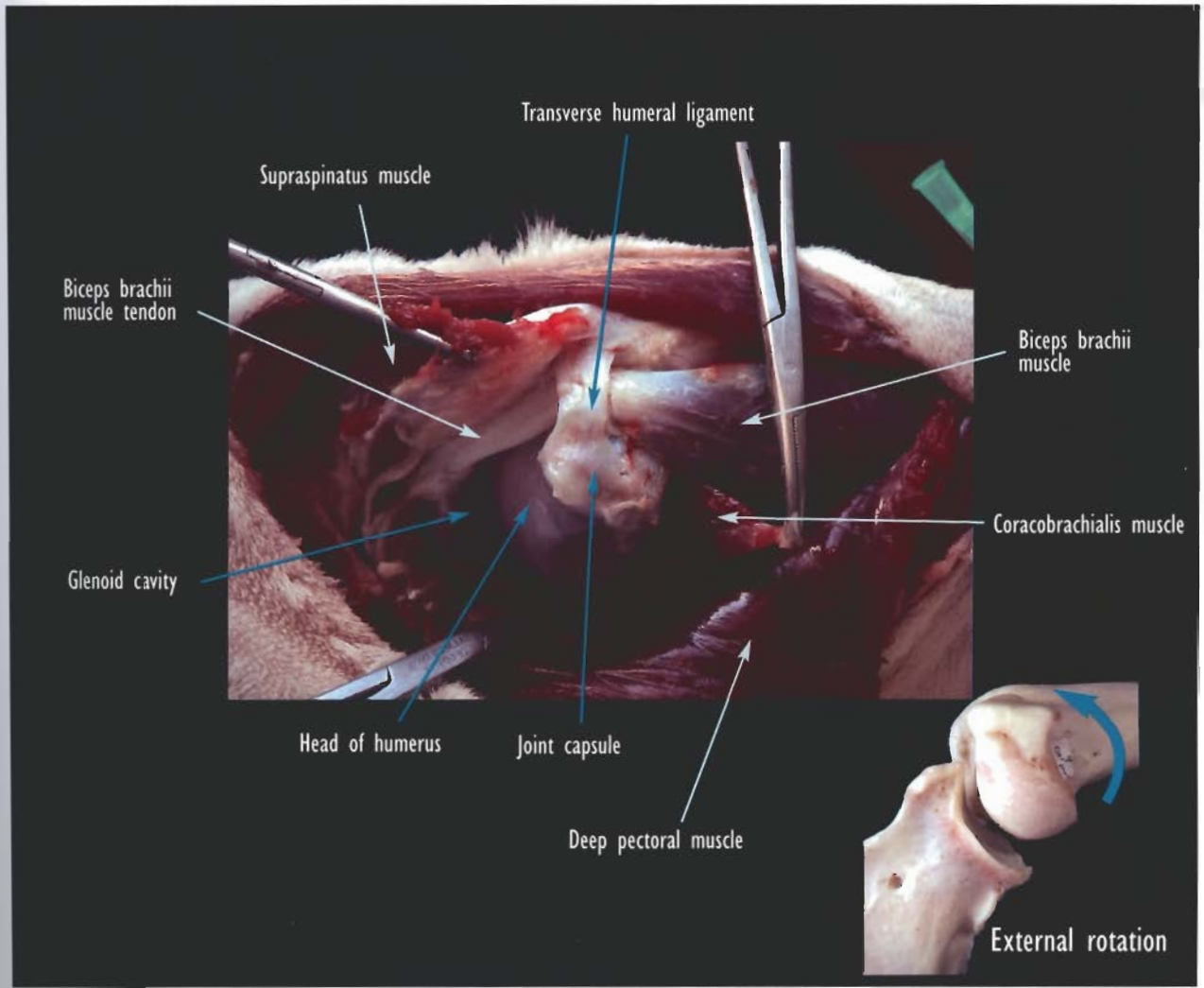


- *Upper image:* the brachiocephalicus muscle is retracted laterally and the attachment of the superficial pectoral muscle to the humerus has to be transected (dotted line). Medial view.
- *Lower image:* Superficial pectoral muscle is reflected medially and will expose the supraspinatus muscle attaching to the major tubercle and the deep pectoral muscle attaching to the humerus wich will need to be transected (dotted line).

CAUTION: preserve the cephalic vein.



- *Upper image:* after transection and medial retraction of the deep pectoral muscle, the subscapular and coracobrachialis muscles are exposed laying over the joint capsule. Medial view, left shoulder.
- *Lower image:* then the tendon of insertion of the subscapular muscle and the tendon of origin of the coracobrachialis muscle are cut. The joint capsule is now exposed and may be opened to explore the joint cavity and view the humeral head.



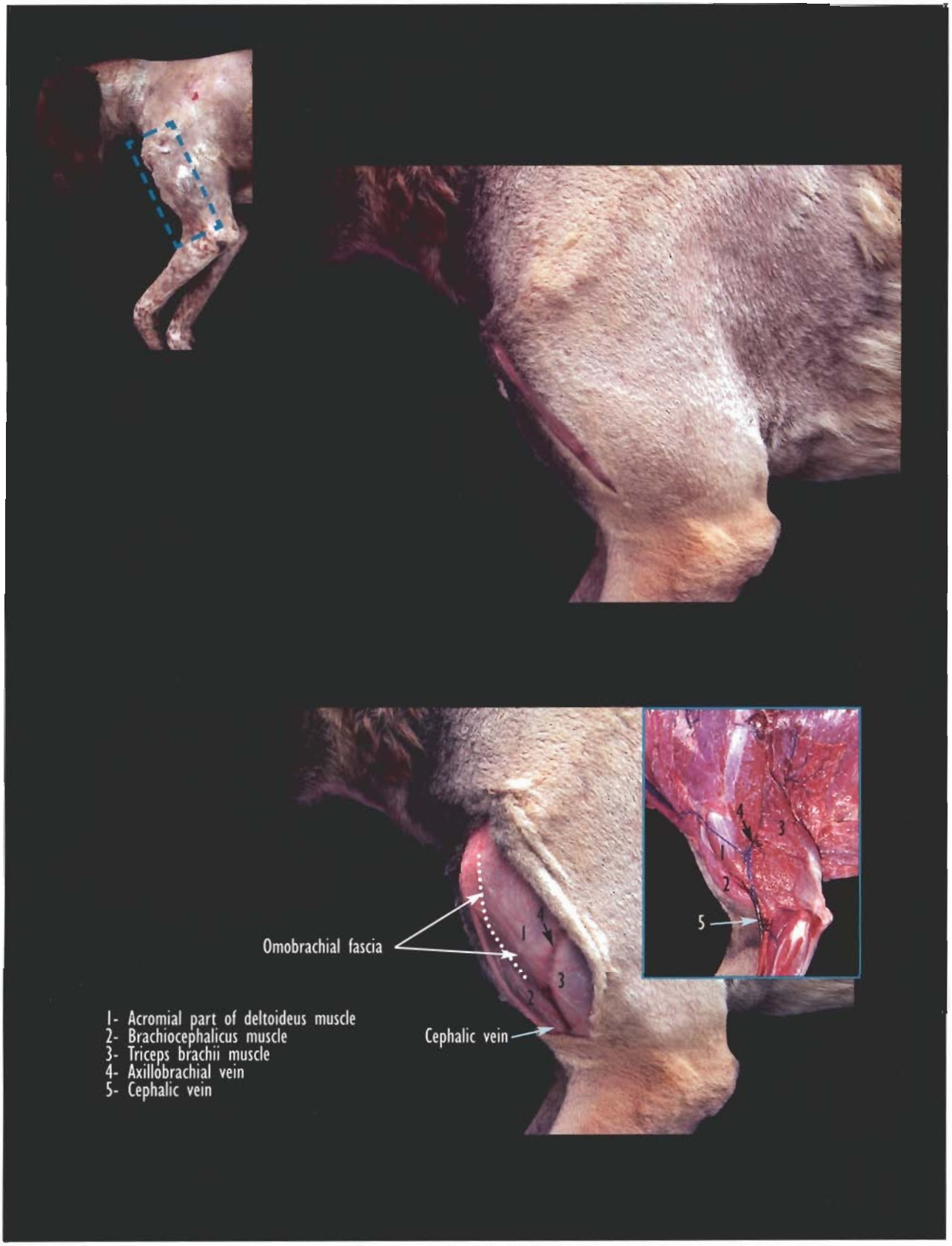
■ Medial view of the externally rotated humerus, as indicated in the osteological specimen, to view the entire joint space. The partial separation of the supraspinatus muscle tendon insertion allows exposure of the attachment of the biceps brachii tendon onto the supraglenoid tubercle.

Approach to the proximal diaphysis of the humerus

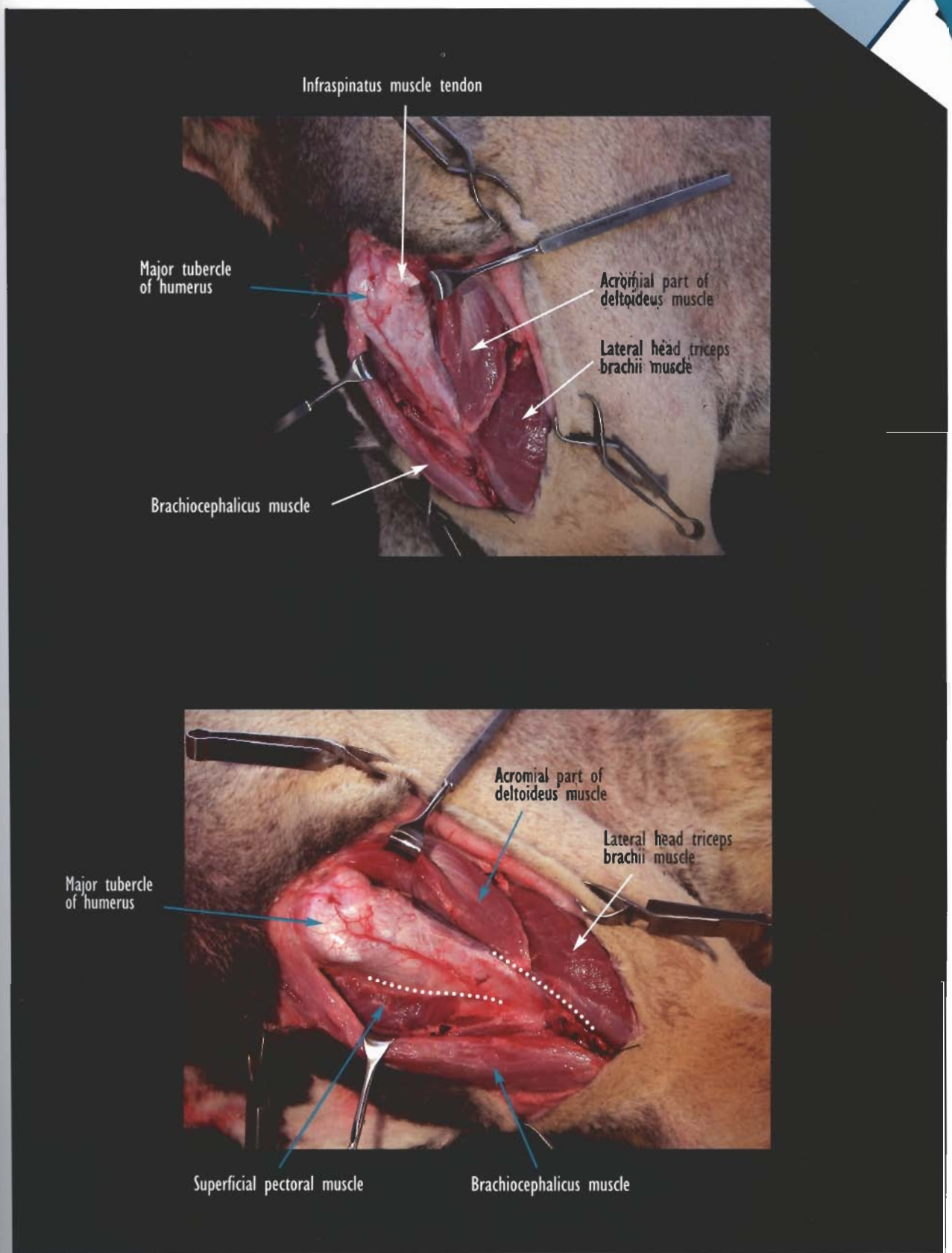
Indications:

Open reduction and fixation of fractures of the proximal third of the humerus.

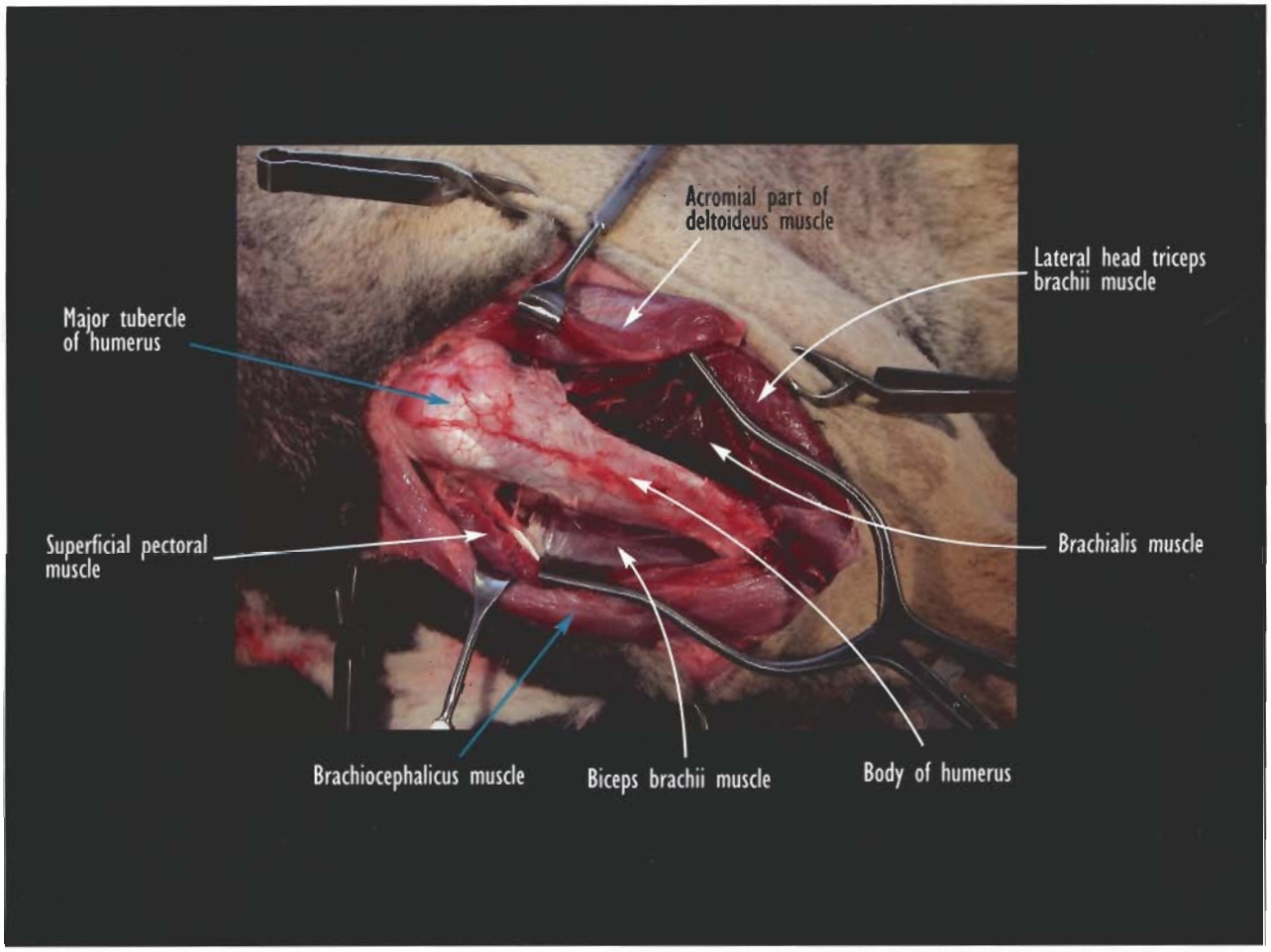
Obtaining spongy bone tissue.



- *Upper image:* the skin incision starts over the major tubercle of the humerus and extends distally to the mid humerus.
- *Lower image:* separate the skin to identify the course of the cephalic, omobrachial and axillobrachial veins. The brachiocephalicus and acromial part of deltoideus muscles need to be separated (dotted line).



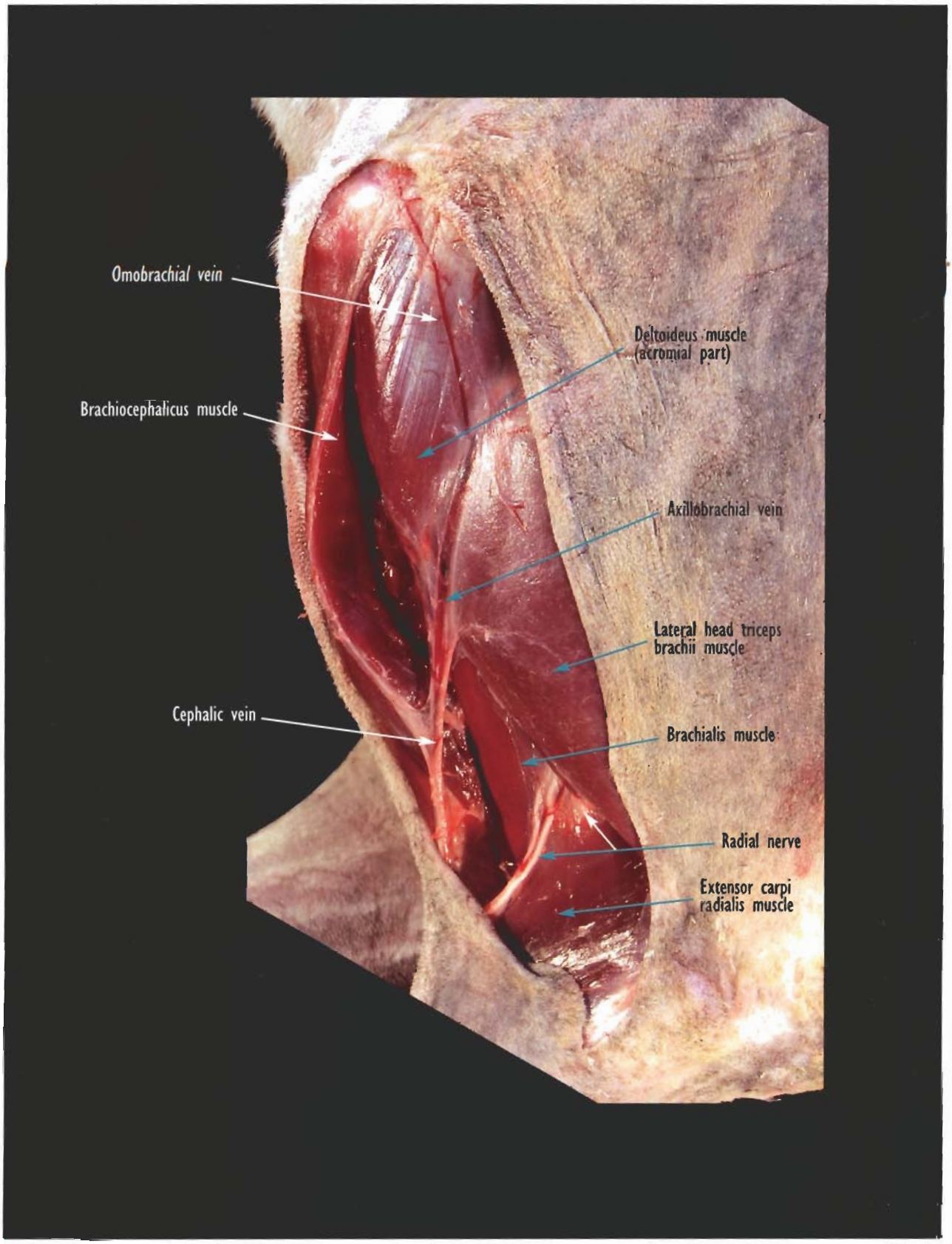
- *Upper image:* separate and retract the acromial portion of the deltoideus muscle from the brachiocephalicus muscle for exposure of the proximal humerus. Lateral view.
- *Lower image:* if more exposure is needed, the insertion of the acromial portion of the deltoideus muscle may be cut. The humeral attachments of the superficial pectoral and the lateral head of the triceps brachii muscles are exposed and will need to be transected (dotted lines) to complete the approach. Craniolateral view.



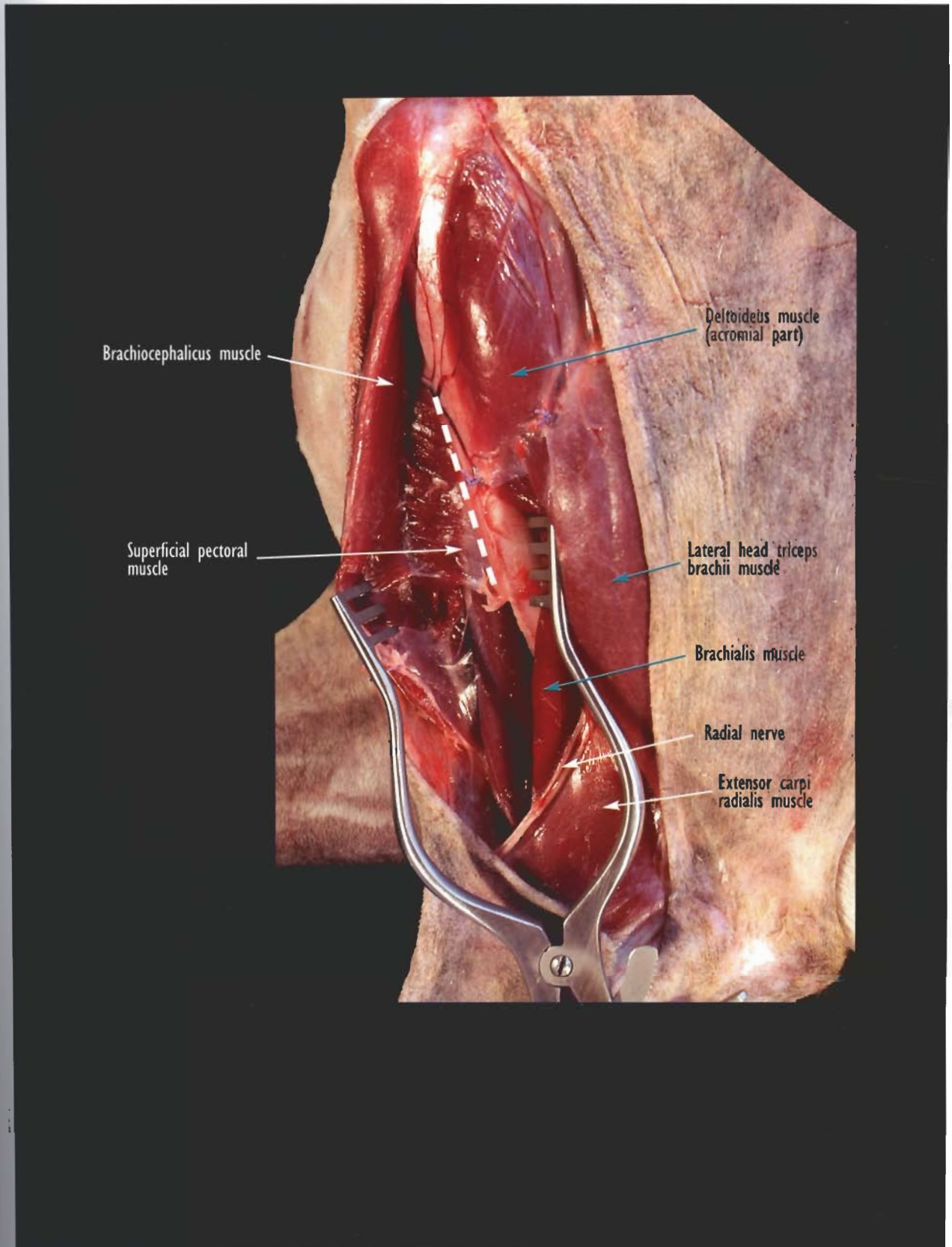
The superficial pectoral and biceps brachii muscles are retracted ventromedially and the brachialis and lateral head of triceps brachii muscles are retracted laterally for complete exposure of the humerus. Craniolateral view.

Approach to the medial humeral diaphysis via a craniolateral incision

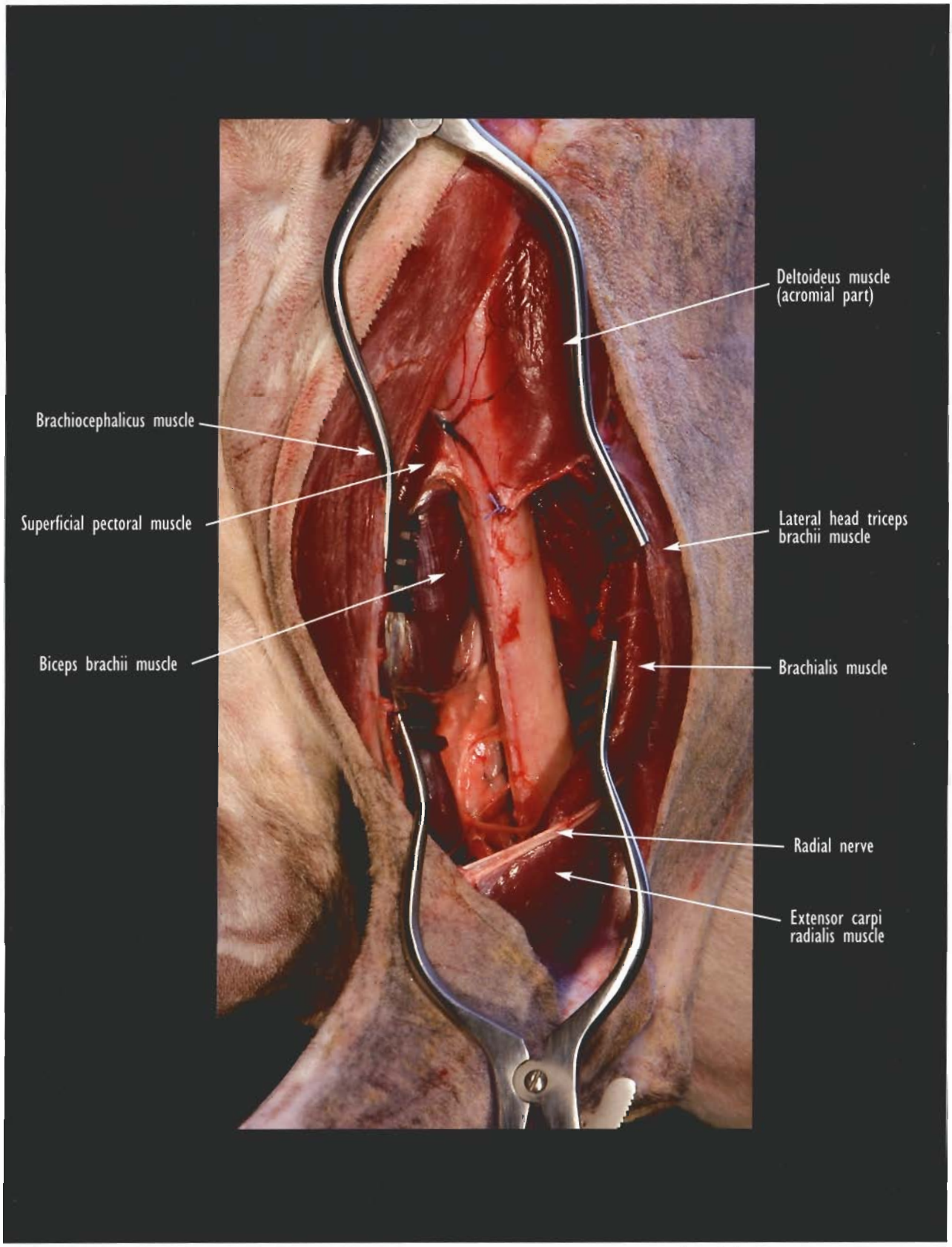
Indications:
Open reduction and fixation of fractures of the middle third of the humerus.



■ The line of the skin incision is from the major tubercle to the lateral epicondyle along the body of the humerus. Identify and preserve the cephalic, axillobrachial and omobrachial veins in the superficial fascia. Distally, preserve the radial nerve passing between the brachialis, extensor carpi radialis and lateral head of triceps brachii muscles. Lateral view.
CAUTION: radial nerve.



The cranial border of the humerus is exposed by medial retraction of the brachiocephalicus muscle and caudal retraction of the brachialis and lateral head of triceps brachii muscles. The axillobrachial vein may be ligated and transected from the cephalic vein for better exposure of the superficial pectoral muscle before freeing the insertion of the muscle to the humerus (dotted line). Craniolateral view.



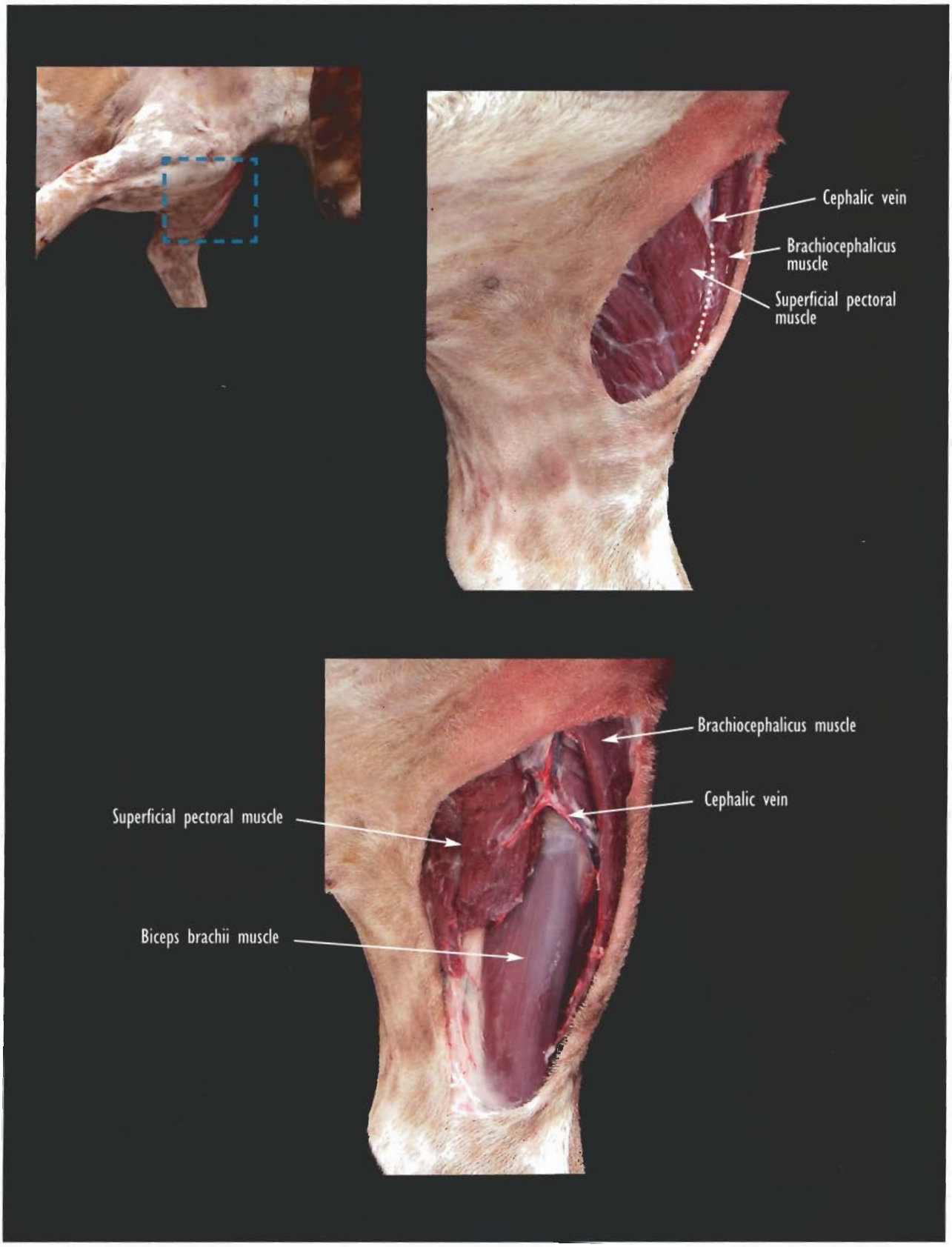
■ After freeing the superficial pectoral muscle, exposure of the humerus is accomplished by lateral retraction of the brachialis muscle and medial retraction of the biceps brachii muscle. Craniolateral view.

CAUTION: protect the radial nerve.

Approach to the diaphysis of the humerus via a medial incision

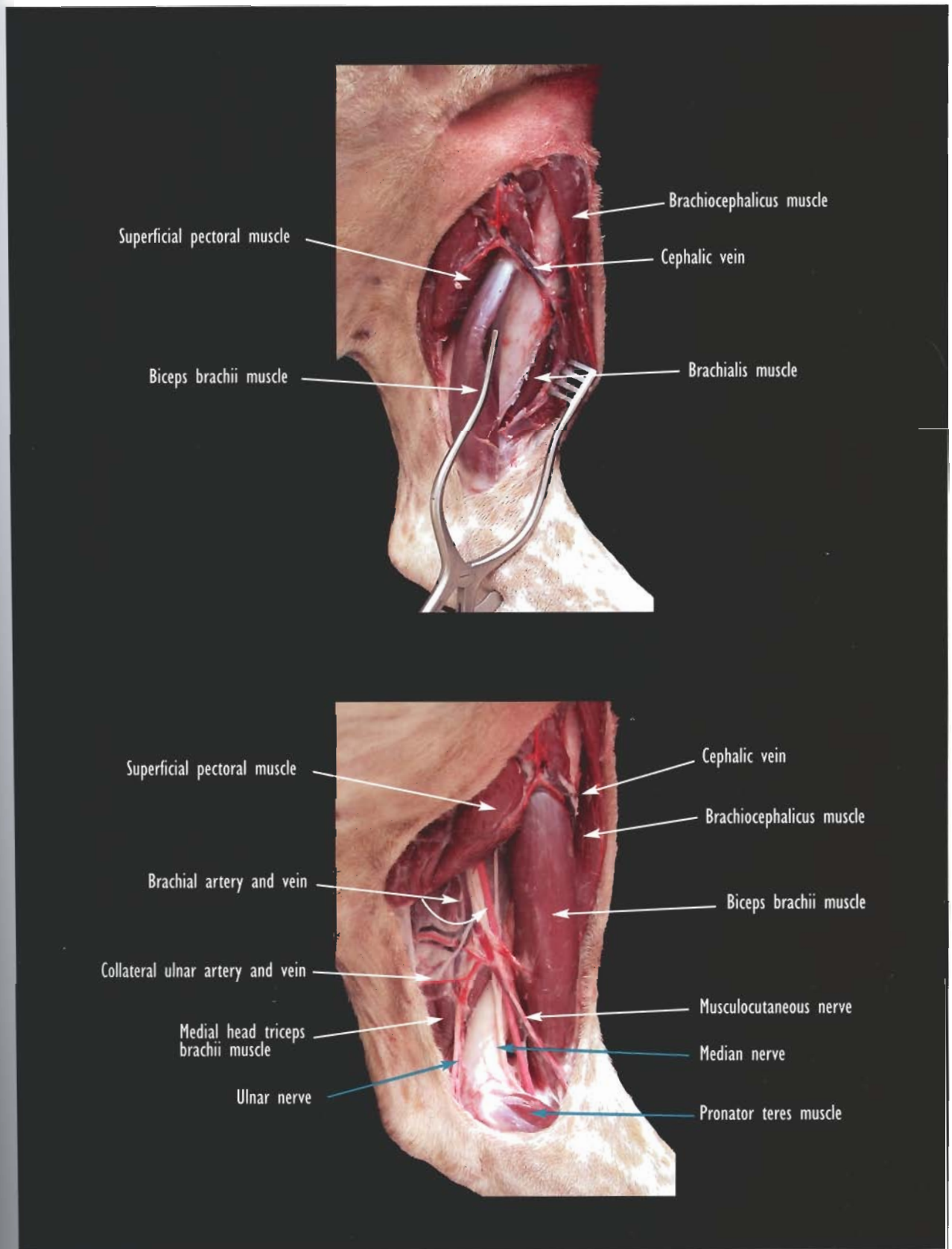
Indications:

Open reduction and fixation of fractures in the middle third of the humerus.



- *Upper image:* the skin incision extends from the major tubercle to the medial epicondyle of the humerus. The brachiocephalicus and superficial pectoral muscles are exposed. The superficial pectoral muscle insertion must be freed from the humerus (dotted line). Medial view.
- *Lower image:* freeing of the brachiocephalicus and pectoral muscles exposes the biceps brachii muscle which covers the medial aspect of the humerus.

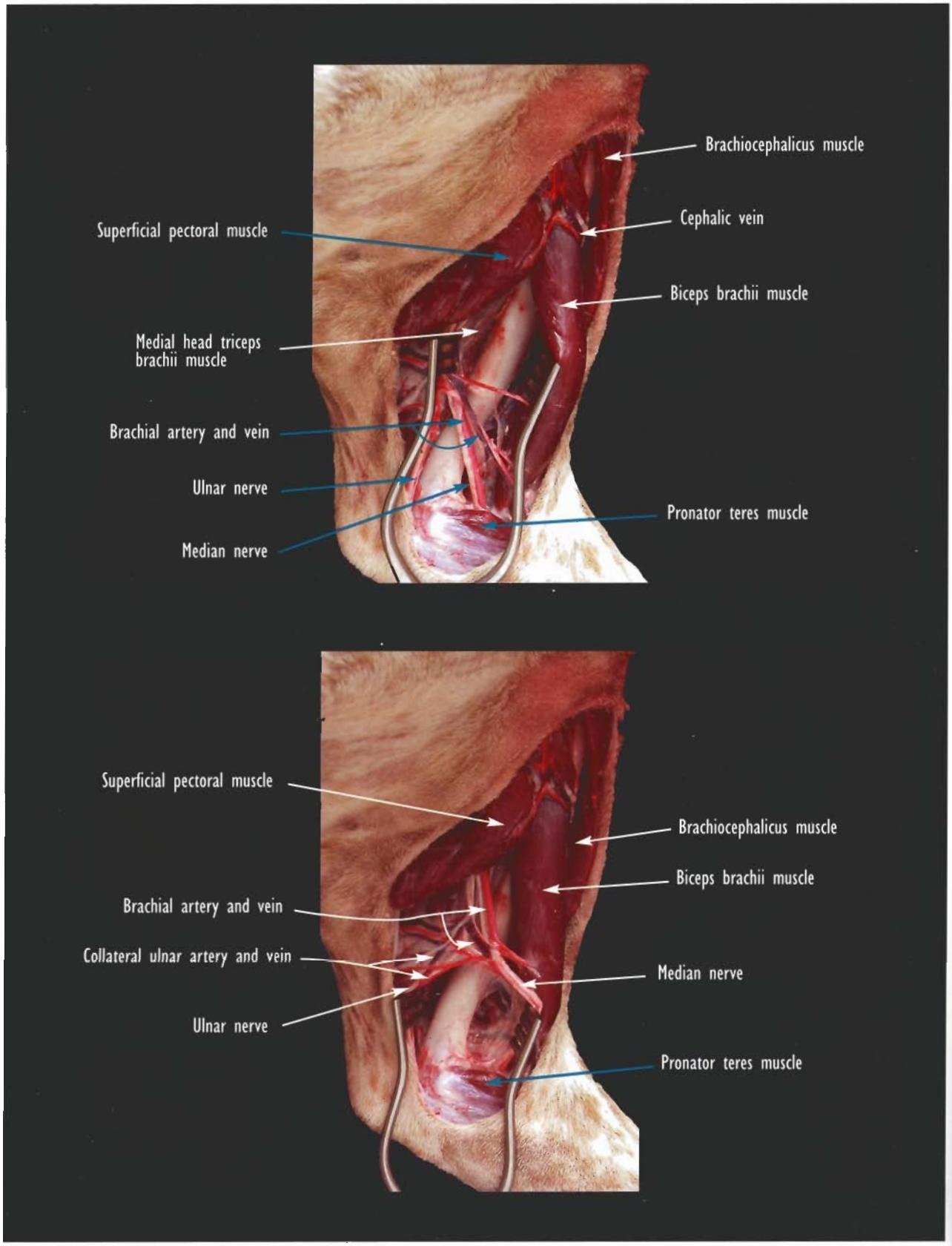
CAUTION: preserve the cephalic vein.



■ *Upper image:* to expose the craniomedial humeral body, the biceps brachii muscle is retracted medially and the brachiocephalicus muscle laterally. Medial view.

CAUTION: protect the vessels and nerves located caudally to the biceps brachii muscle.

■ *Lower image:* a distal extension of this approach exposes the distal third of the medial humerus. The brachial vein and artery and the musculocutaneous, median and ulnar nerves are caudal to the biceps brachii muscle.



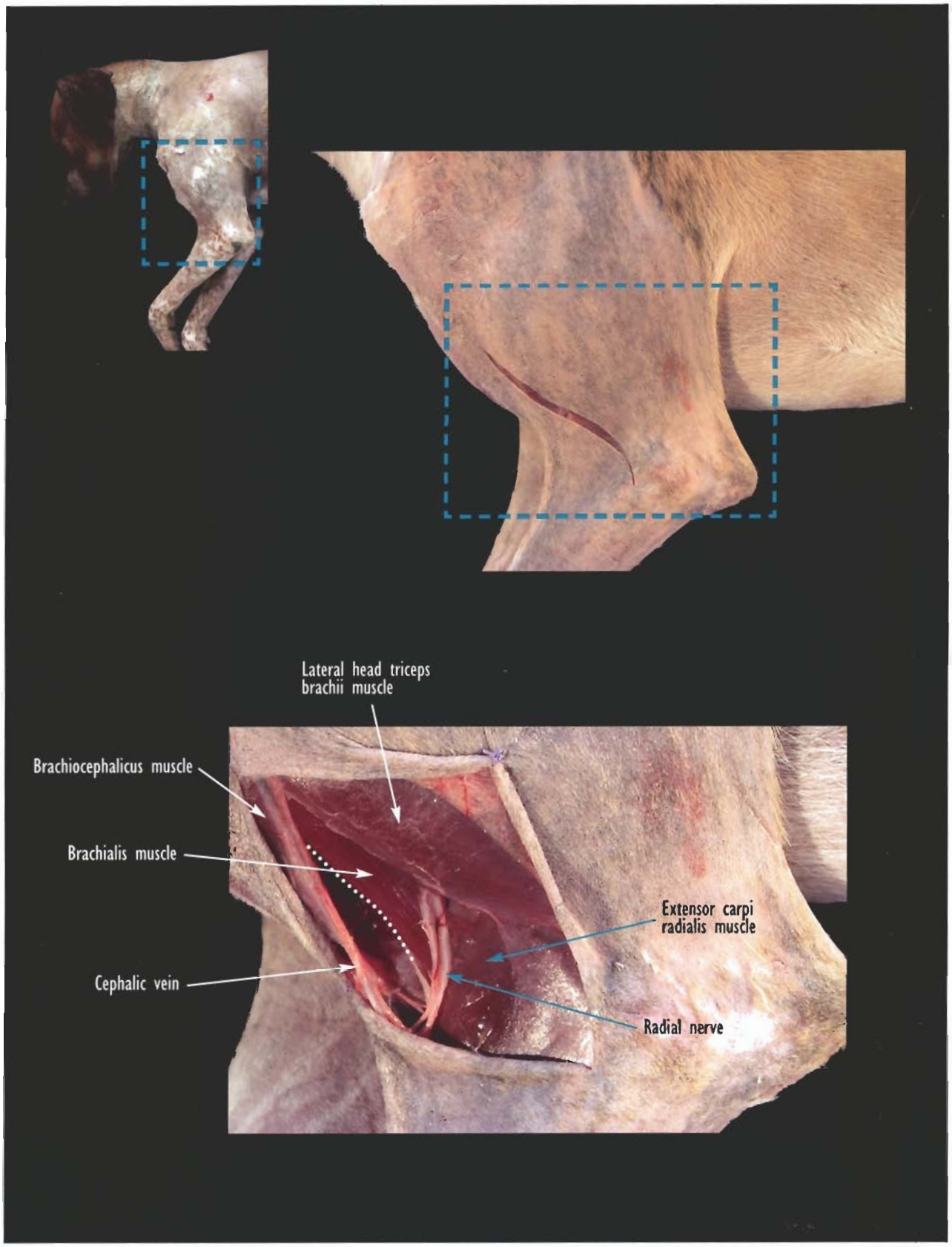
■ *Upper image:* a more proximal approach to the humerus is facilitated by retracting the biceps brachii muscle cranially.
CAUTION: protect the vessels and nerves located caudally to the biceps brachii muscle.
■ *Lower image:* cranial retraction of the brachial vessels and the median nerve provides the best approach to the medial epicondyle of the humerus.
CAUTION: protect the vessels and nerves in this area.

Humerus: approach to the distal part of the diaphysis via a craniolateral incision

Indications:

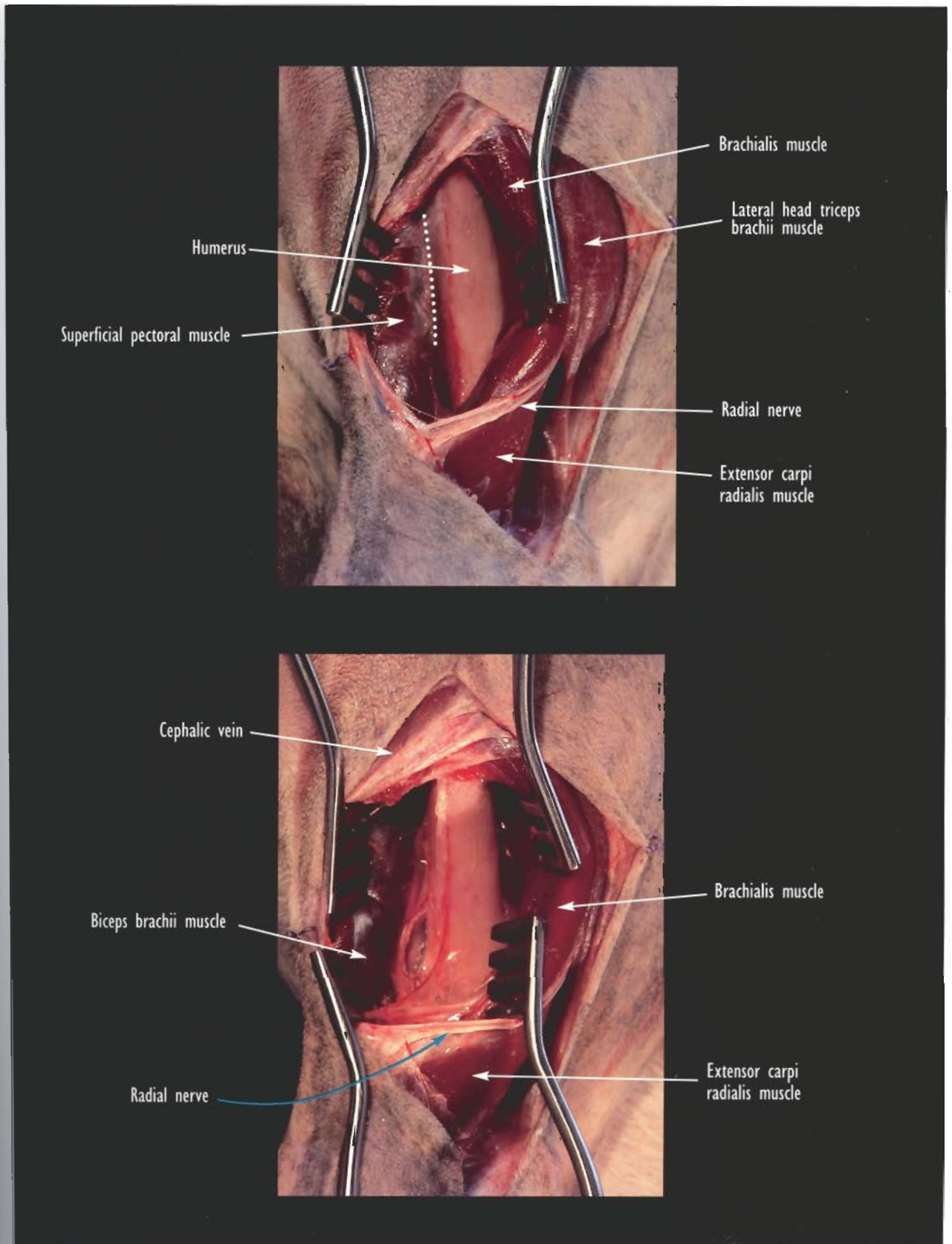
Open reduction and fixation of humeral fractures located between the diaphysis and the distal epiphysis.

epi-



- *Upper image:* a curved skin incision from the deltoid tuberosity to the lateral epicondyle of the humerus is made. Lateral view.
- *Lower image:* careful dissection of the fascia, exposes the superficial muscles. Continue blunt dissection between the brachiocephalicus and brachialis muscles (dotted line). Protect the radial nerve passing over the brachialis muscle.

CAUTION: protect the cephalic vein and radial nerve.

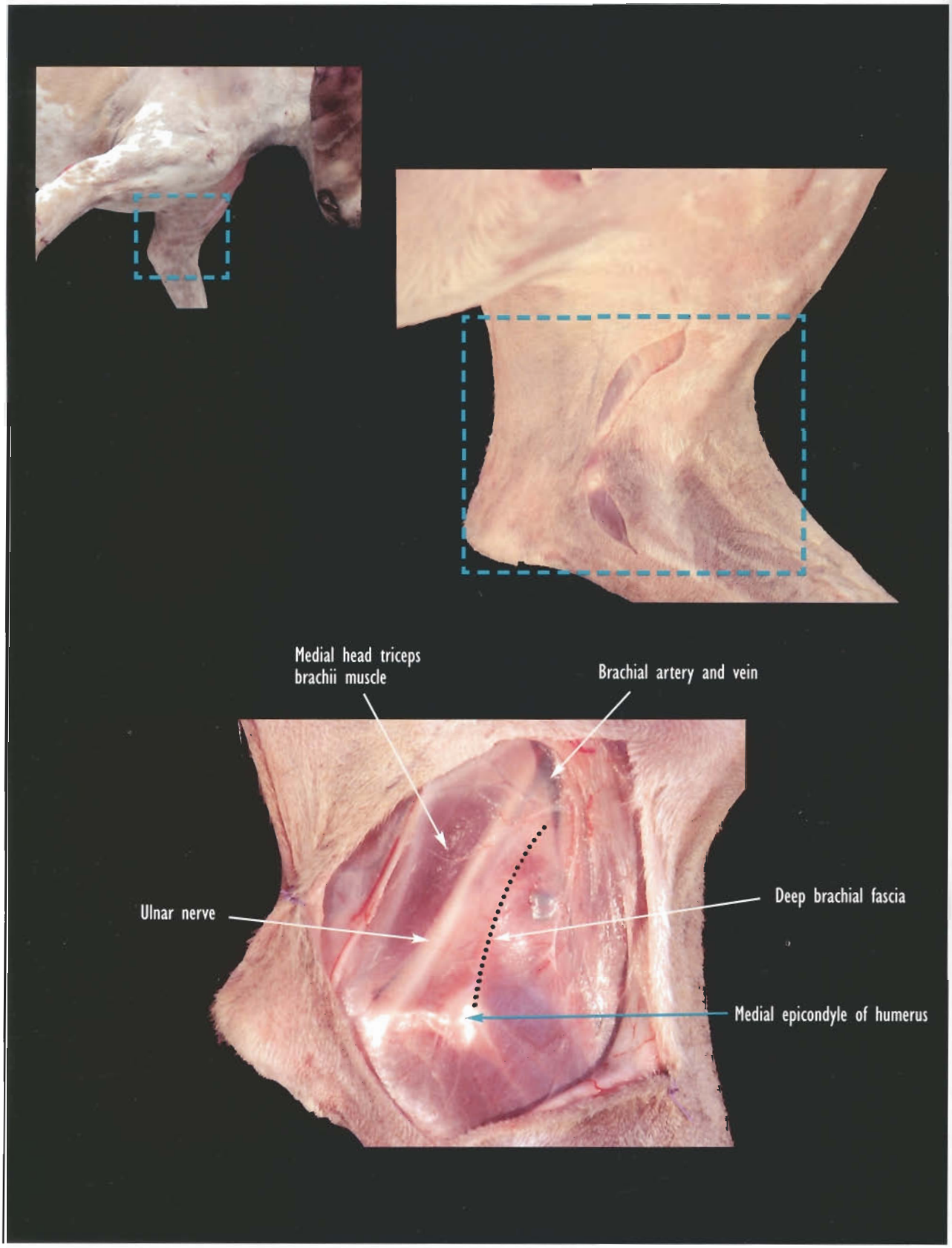


- *Upper image:* the distal third of the humerus is exposed by retracting the brachialis muscle and the radial nerve caudally and the brachiocephalicus muscle cranially. Access to the humerus is improved by freeing the superficial pectoral muscle insertion (dotted line). Lateral view.
- *Lower image:* after separation of the superficial pectoral, retract the superficial pectoral and biceps brachii muscles cranially for better exposure of the distal third of the humerus.

CAUTION: protect the radial nerve.

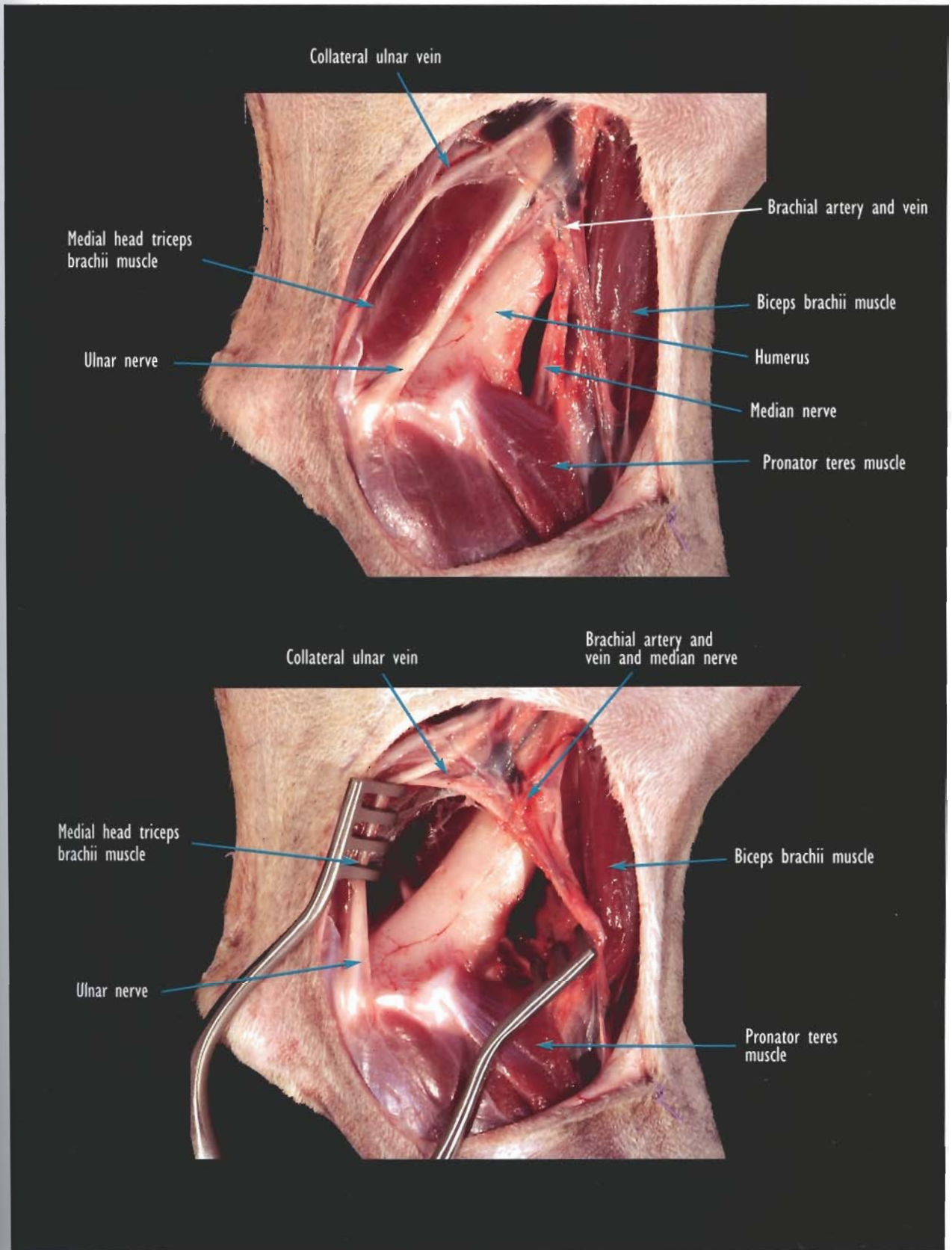
Approach to the distal part of the diaphysis and to the supracondylar region of the humerus via a medial incision

Indications:
Open reduction and fixation of distal (supracondylar) humeral fractures.



- *Upper image:* a curved skin incision from the distal third of the humerus passes over the medial epicondyle distally to the proximal third of the radius. Medial view.
- *Lower image:* after retracting the skin, identify the medial head of the triceps brachii muscle and the ulnar nerve caudal to the medial epicondyle. The deep brachial fascia will be incised near the cranial margin of the ulnar nerve (dotted line).

CAUTION: protect the ulnar nerve.

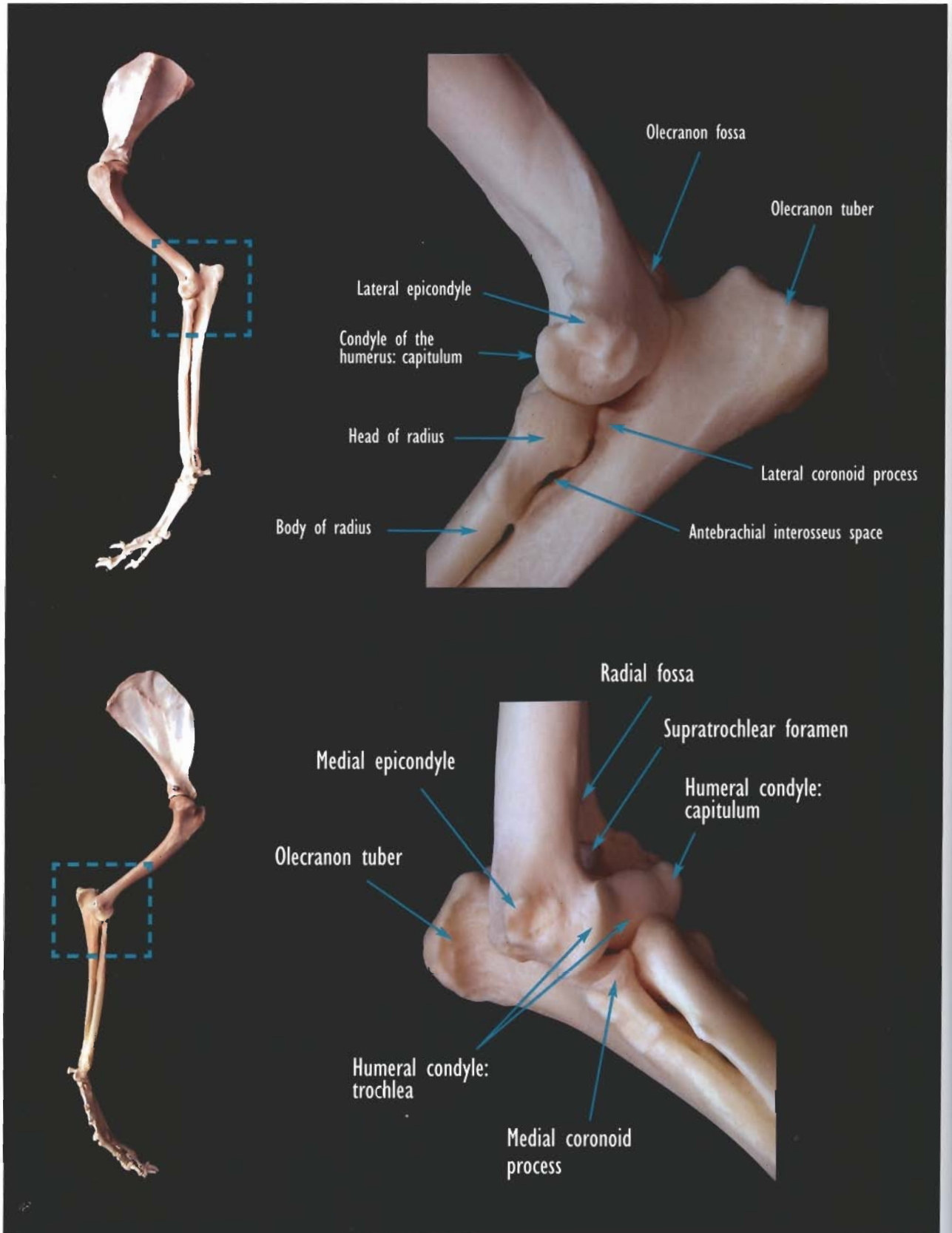


- *Upper image:* after incision of the deep brachial fascia, the supracondylar region of the humerus, the tendon of the biceps brachii and the brachialis vessels are exposed. Medial view.
- *Lower image:* the exposure is enlarged by retracting the biceps brachii muscle, the brachial vessels and the median nerve cranially and the medial head of triceps brachii muscle and the ulnar nerve caudally.

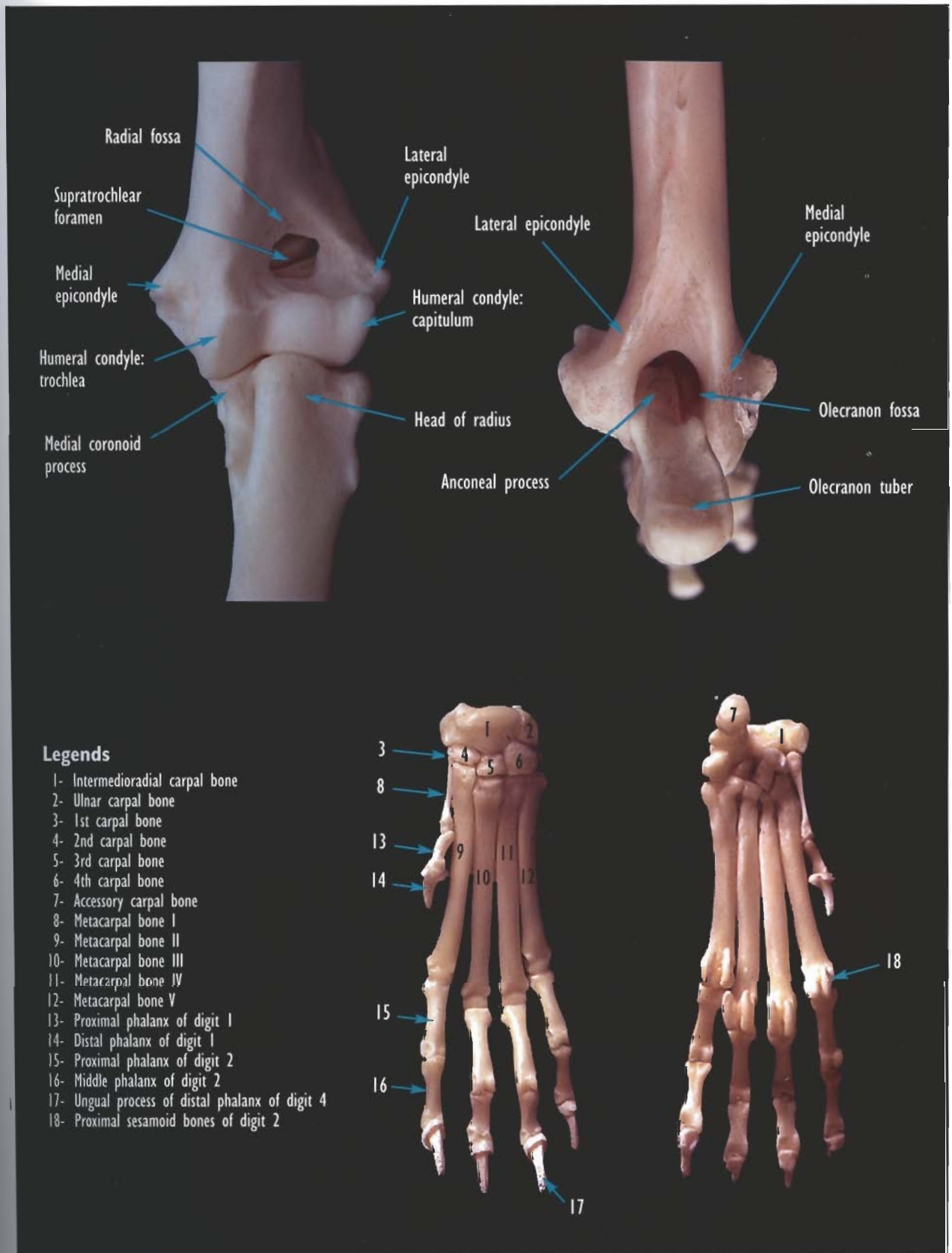
CAUTION: protect the vessels and nerves in this area.

Elbow, ulna and manus

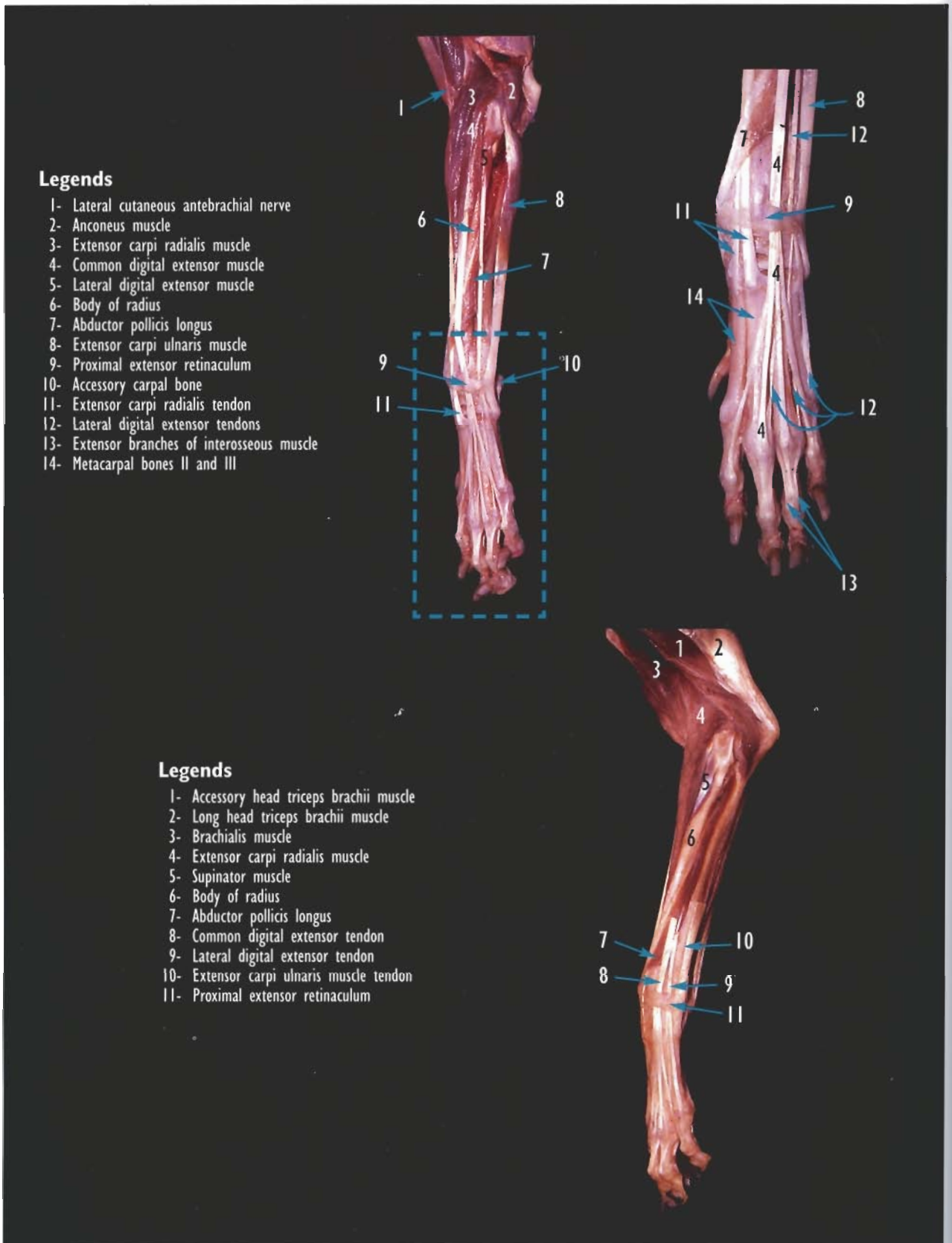
Anatomical considerations



- *Upper image:* lateral aspect of the bones of the left elbow joint.
- *Lower image:* medial aspect of the bones of the left elbow joint.

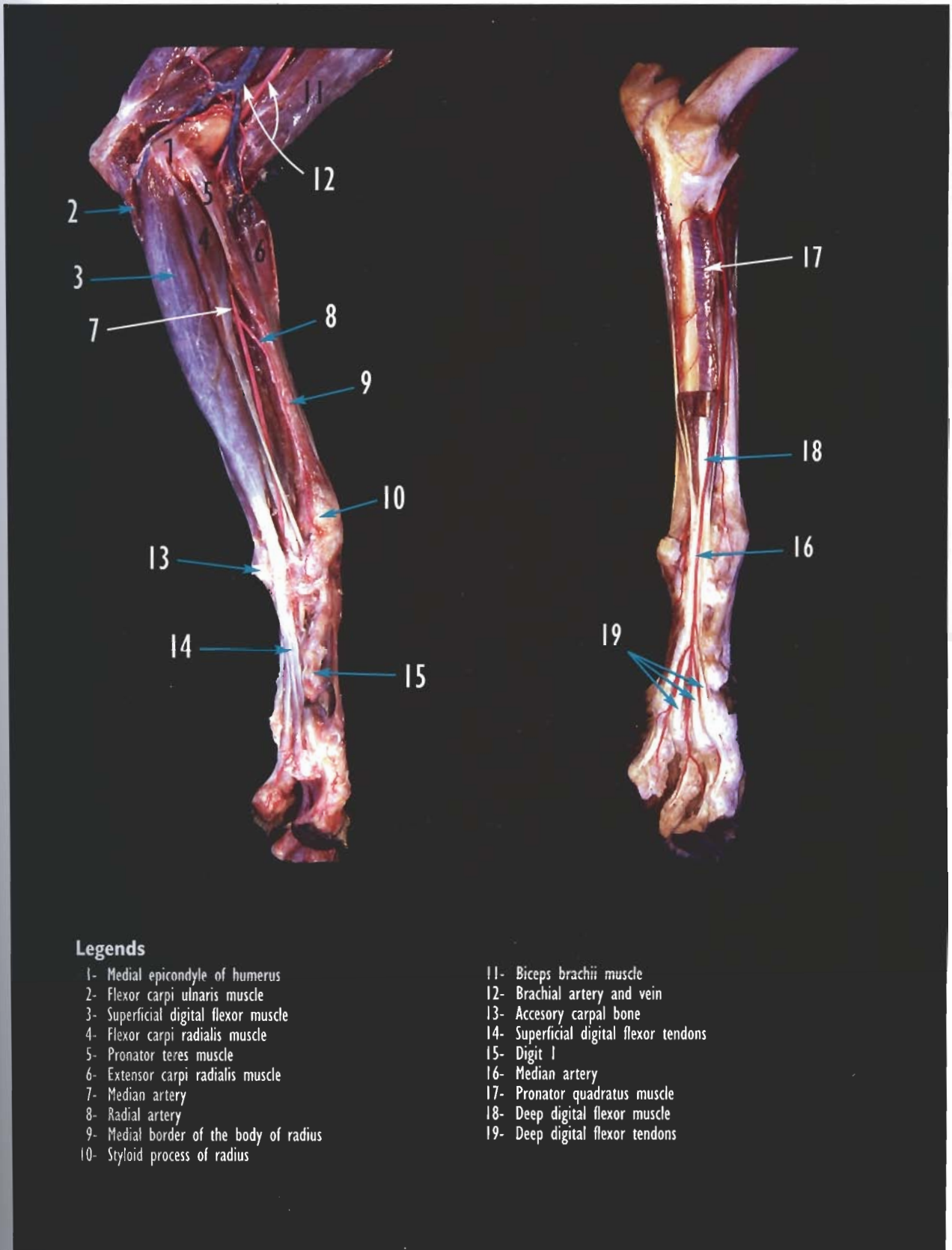


- Upper images: cranial and caudal aspects of the bones of the left elbow joint.
- Lower images: dorsal and palmar aspects of the bones of the left manus.



■ *Upper image:* dorsolateral and dorsal views of the muscles and tendons of the left forearm and the tendons of the left manus respectively.

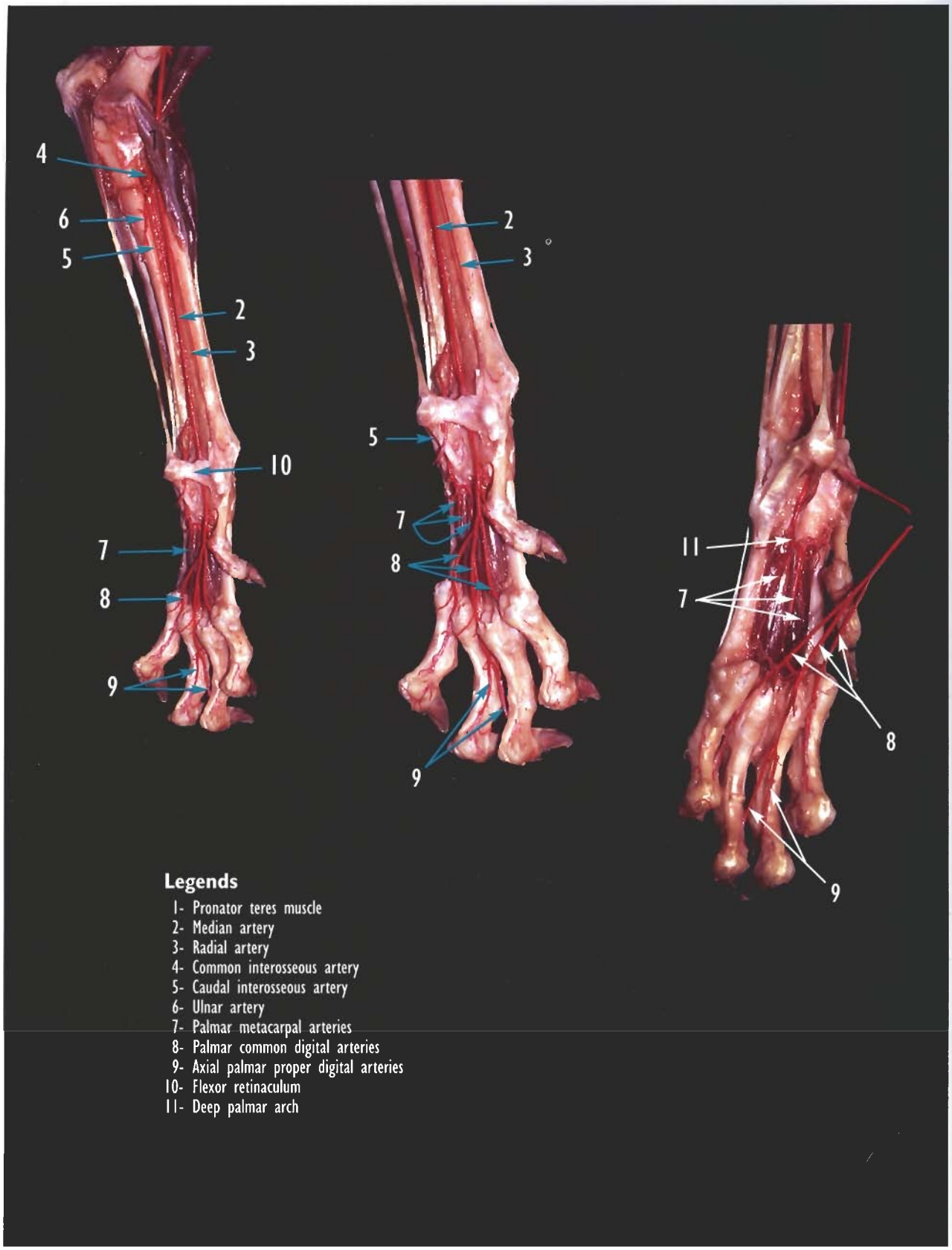
■ *Lower image:* to view the deep muscles of the left forearm, the common digital extensor and the extensor carpi ulnaris muscles have been removed.



Legends

1- Medial epicondyle of humerus
2- Flexor carpi ulnaris muscle
3- Superficial digital flexor muscle
4- Flexor carpi radialis muscle
5- Pronator teres muscle
6- Extensor carpi radialis muscle
7- Median artery
8- Radial artery
9- Medial border of the body of radius
10- Styloid process of radius
11- Biceps brachii muscle
12- Brachial artery and vein
13- Accesory carpal bone
14- Superficial digital flexor tendons
15- Digit I
16- Median artery
17- Pronator quadratus muscle
18- Deep digital flexor muscle
19- Deep digital flexor tendons

■ *Left image:* the medial muscles and vessels of the left forearm are exposed.
■ *Right image:* to view the deep structures of the left forearm and manus, the superficial muscles have been removed.



Legends

1- Pronator teres muscle
2- Median artery
3- Radial artery
4- Common interosseous artery
5- Caudal interosseous artery
6- Ulnar artery
7- Palmar metacarpal arteries
8- Palmar common digital arteries
9- Axial palmar proper digital arteries
10- Flexor retinaculum
11- Deep palmar arch

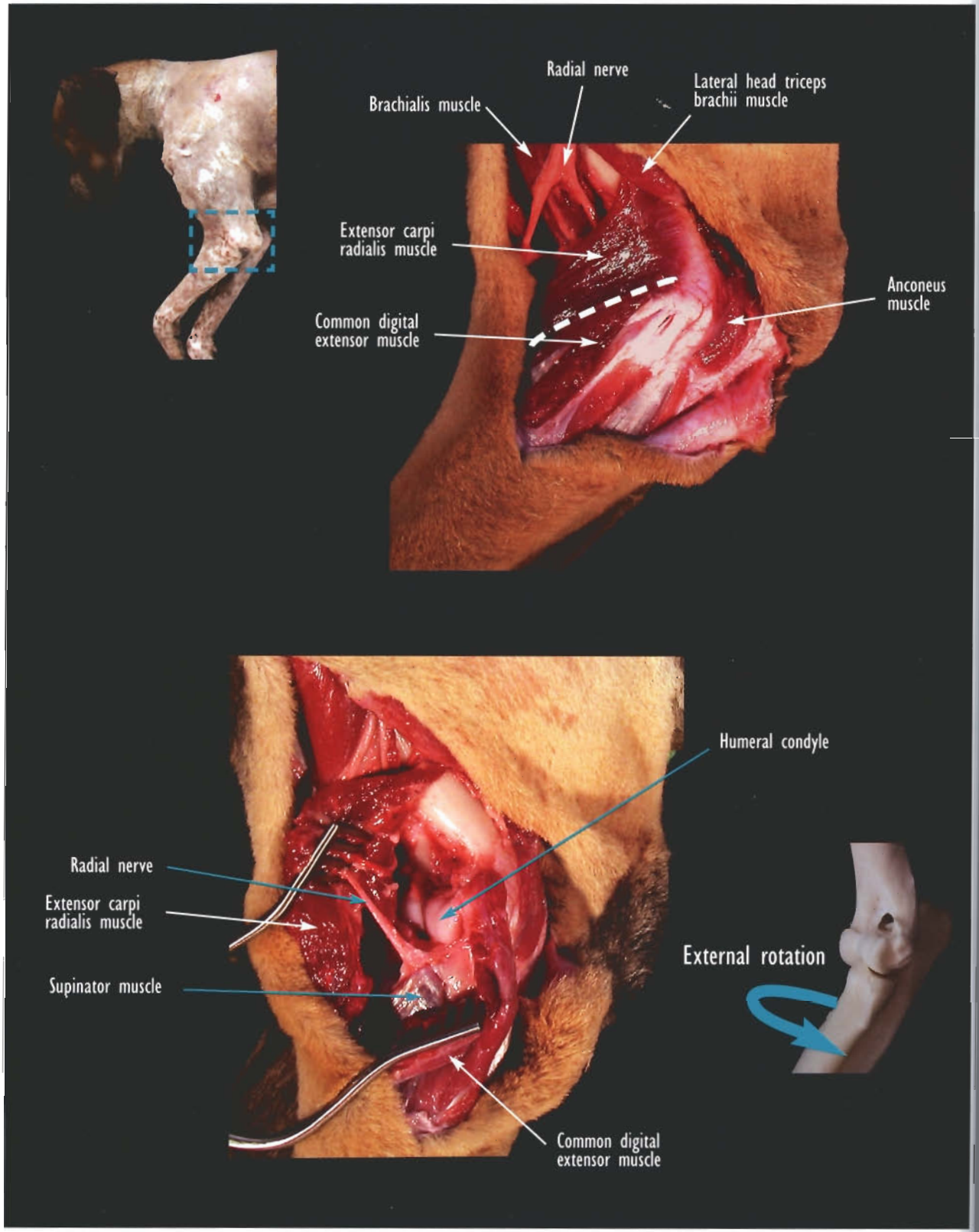
- *Left image:* the deep arteries of the left forearm are exposed.
- *Middle image:* close up of left image.
- *Right image:* palmar view of the arteries of the left manus.

Lateral approach to the humeral condyle and epicondyle

Indications:

Open reduction and fixation of fractures of the humeral head.

Open reduction of lateral elbow luxations.



■ *Upper image:* the skin incision extends over the distal third of the humerus to the proximal third of the forearm, passing over the lateral epicondyle of the humerus. The fascia of the forearm is incised and the extensor carpi radialis and the common digital extensor muscles are identified. The approach continues by separating these muscles (dotted line). Lateral view.

CAUTION: protect the radial nerve when the extensor carpi radialis muscle is retracted cranially.

■ *Lower image:* the craniolateral aspect of the joint and the supinator muscle are exposed. An improved view of the joint is obtained by forced supination of the forearm, as shown in the osteological image.

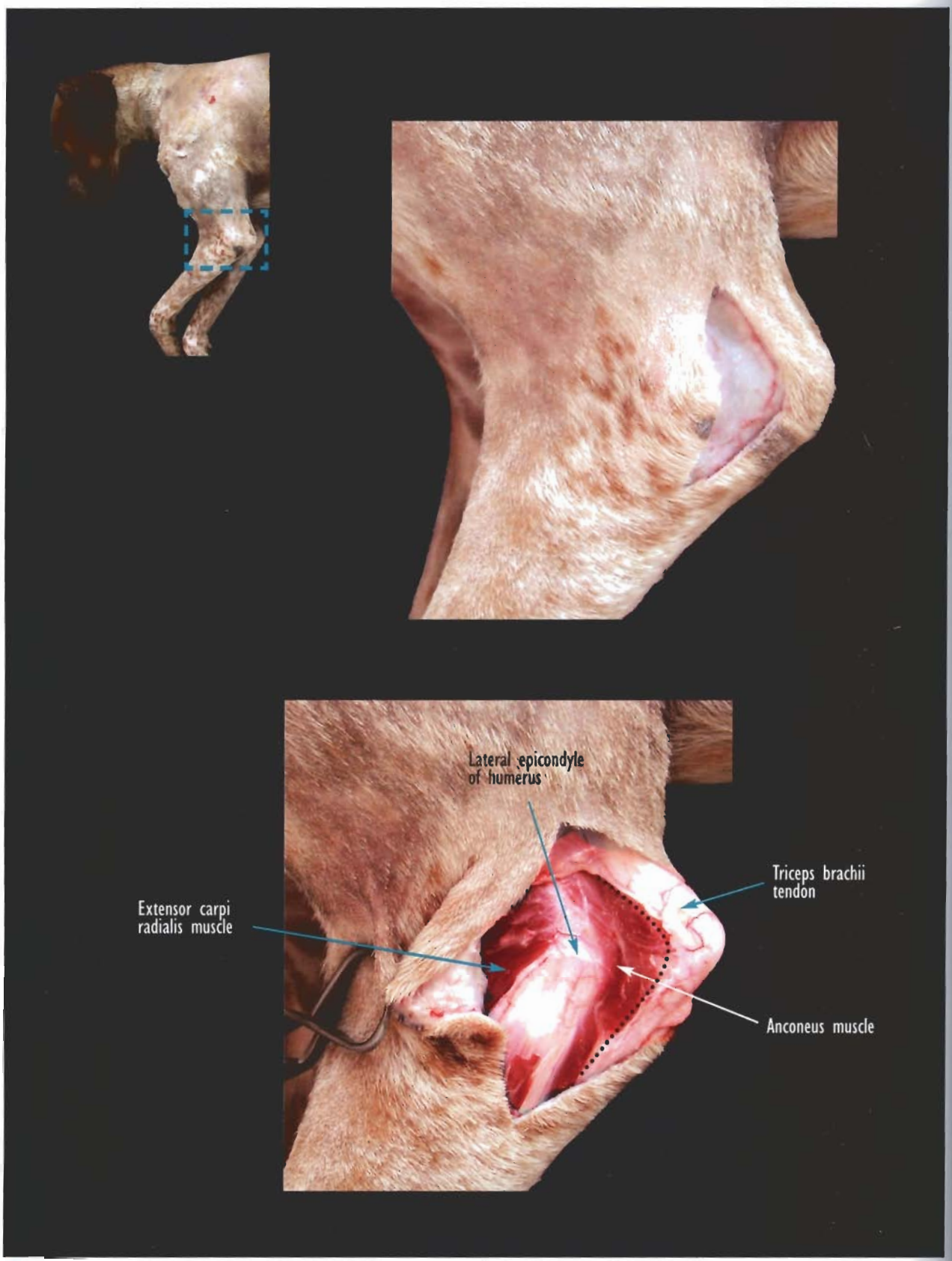
CAUTION: protect the radial nerve as it passes under the supinator muscle.

Approach to the supracondylar portion of the humerus and to the caudal part of the elbow joint

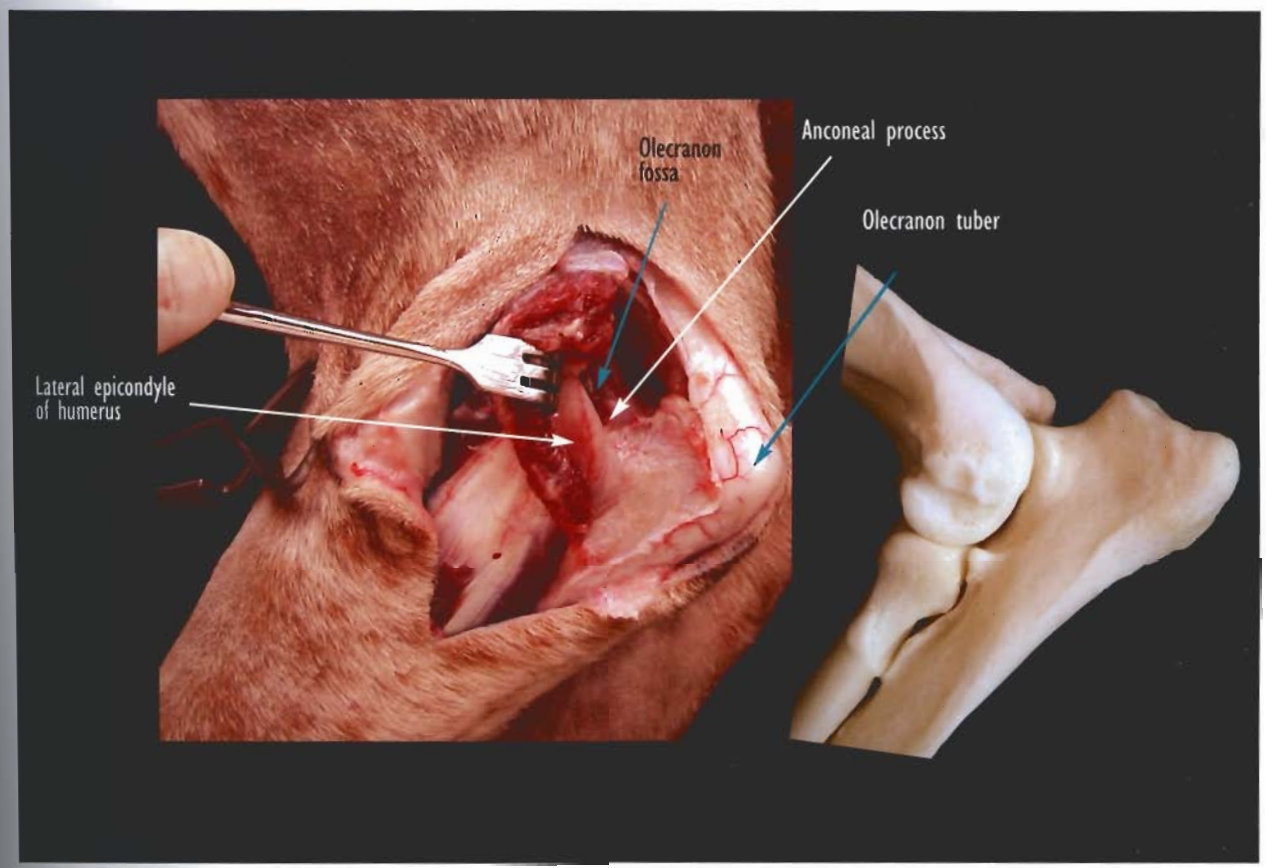
Indications:

Open reduction and fixation of anconeal process fractures.

Open reduction of elbow luxations.



- *Upper image:* to explore the olecranon fossa, a curved incision passes between the lateral epicondyle and the olecranon tuber.
- *Lower image:* the fascia of the elbow is incised to delimit the tendon of the triceps brachii muscle and the borders of the anconeus muscle. The caudal insertion of the anconeus to the ulna must be freed (dotted line).



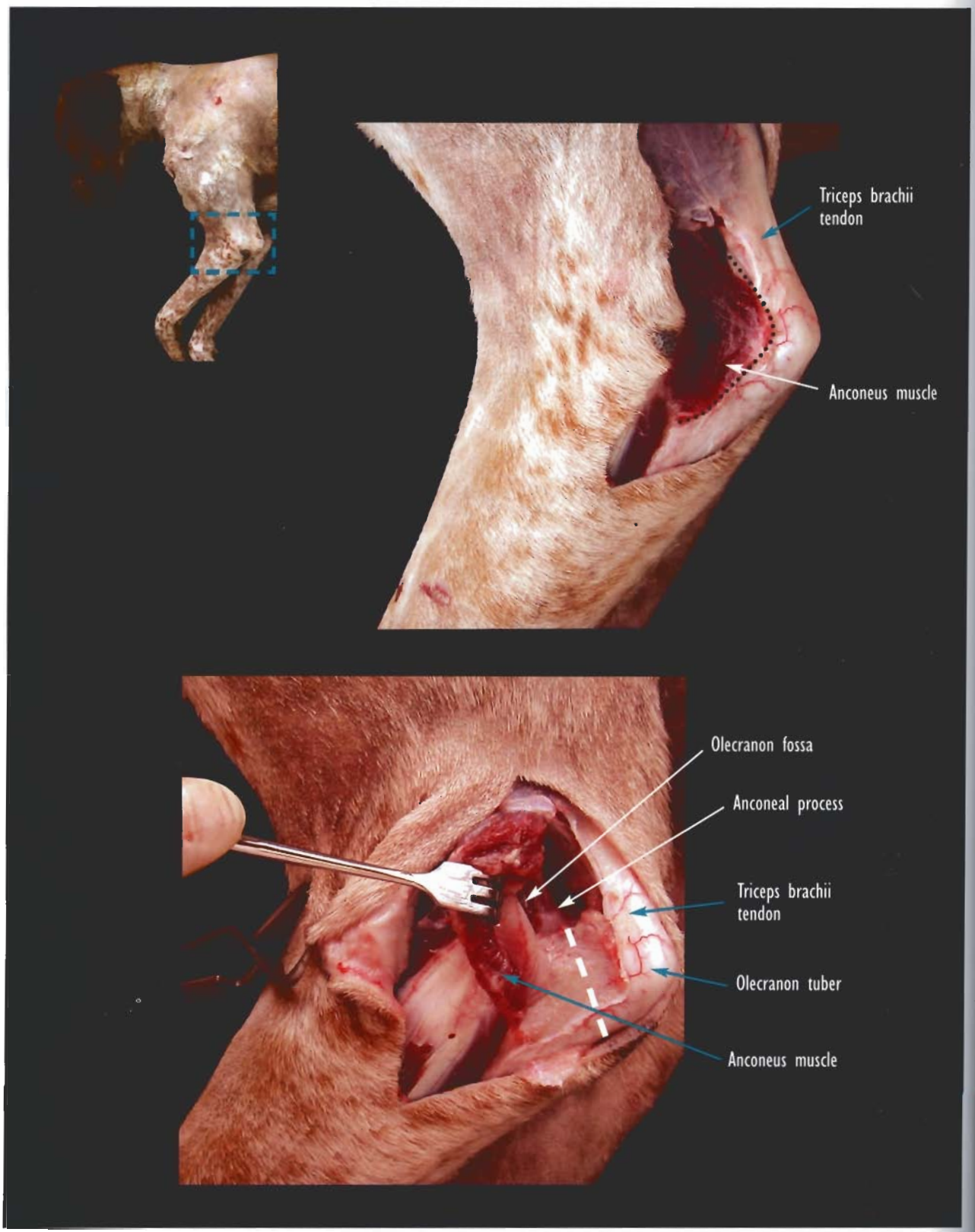
■ Once the anconeus muscle is freed, the caudal aspect of the elbow joint is exposed. A better view of the anconeal process and the olecranon fossa is obtained if the joint is flexed and the tendon of the triceps brachii muscle retracted medially. Caudolateral view.

Approach to the humeroulnar part of the elbow joint by olecranon osteotomy

Indications:

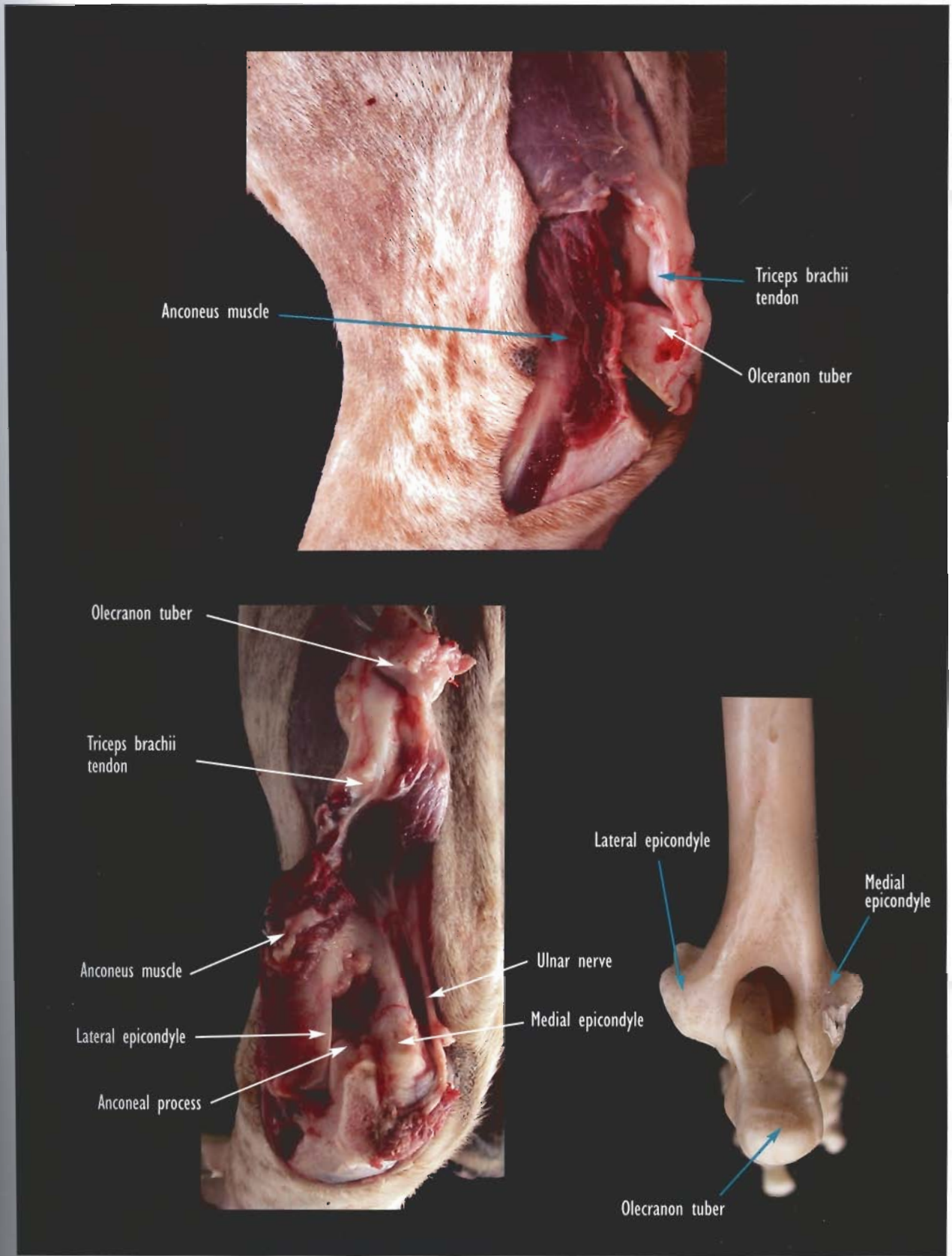
Open reduction and fixation of complex fractures of the elbow.

Open reduction of chronic elbow luxation.



- *Upper image:* the incision extends from the supracondylar region of the humerus distal to the olecranon tuber. The anconeus muscle is delimited and its insertion cut from the ulna (dotted line). Lateral view.
- *Lower image:* the anconeus muscle is retracted cranially and the triceps brachii tendon as well as the olecranon tuber exposed. The olecranon tuber is transected at a 45° angle (dotted line).

CAUTION: the insertion of the triceps brachii tendon remains with the transected part of the olecranon. Also, during osteotomy, preserve the ulnar nerve on the medial surface of the elbow joint.



■ *Upper image:* the caudal approach to the joint progresses by raising the transected olecranon tuber and the tendon of the triceps brachii muscle. Caudolateral view.

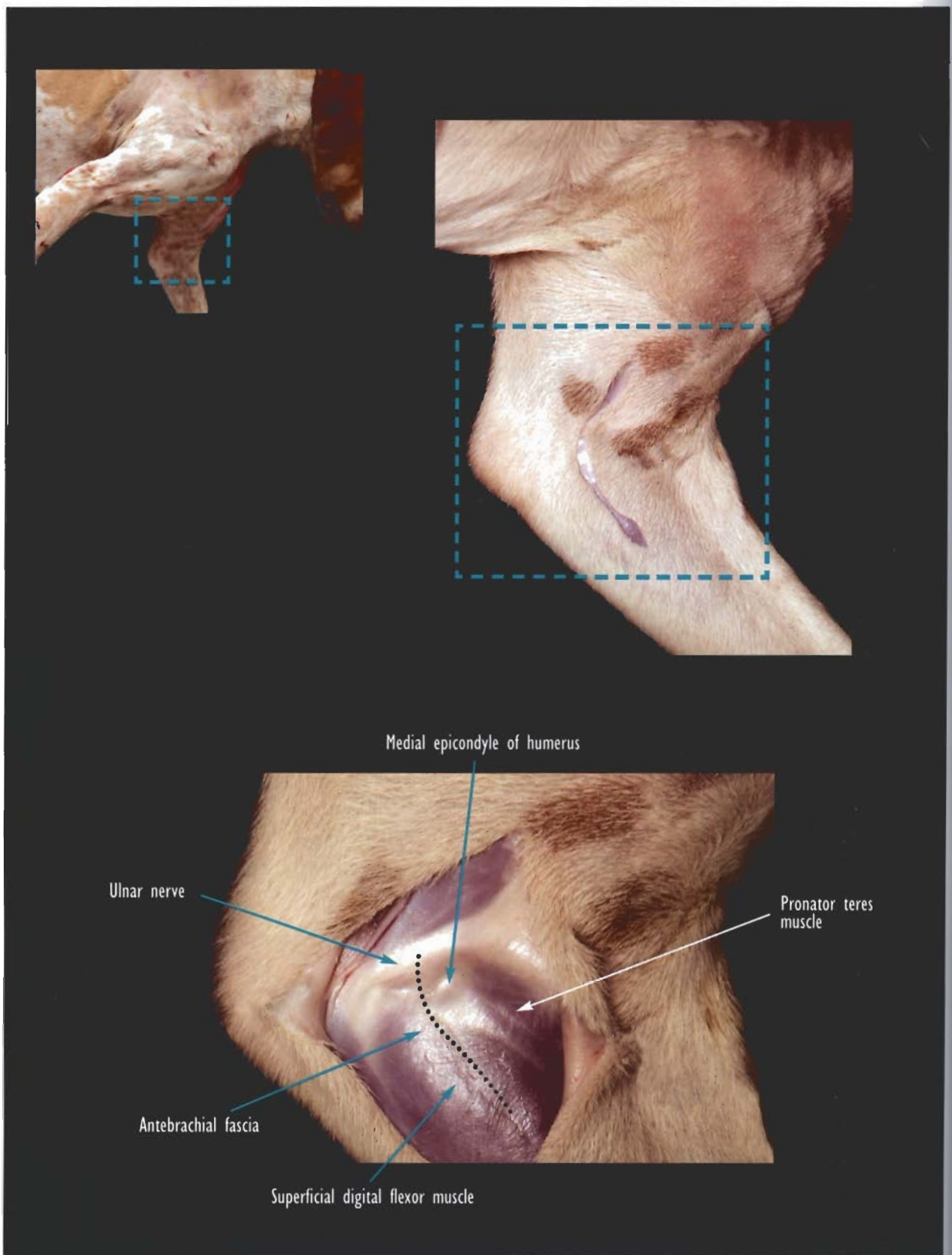
■ *Lower image:* the proximal displacement of the olecranon tuber and the tendon of the triceps brachii combined with a flexion of the elbow joint provide better exposure of the bony structures of the joint (see osteological detail). Dorsal view.

CAUTION: preserve the ulnar nerve medial to the surgical field.

Approach to the medial coronoid process and medial aspect of the humeral condyle via intermuscular incision

Indications:

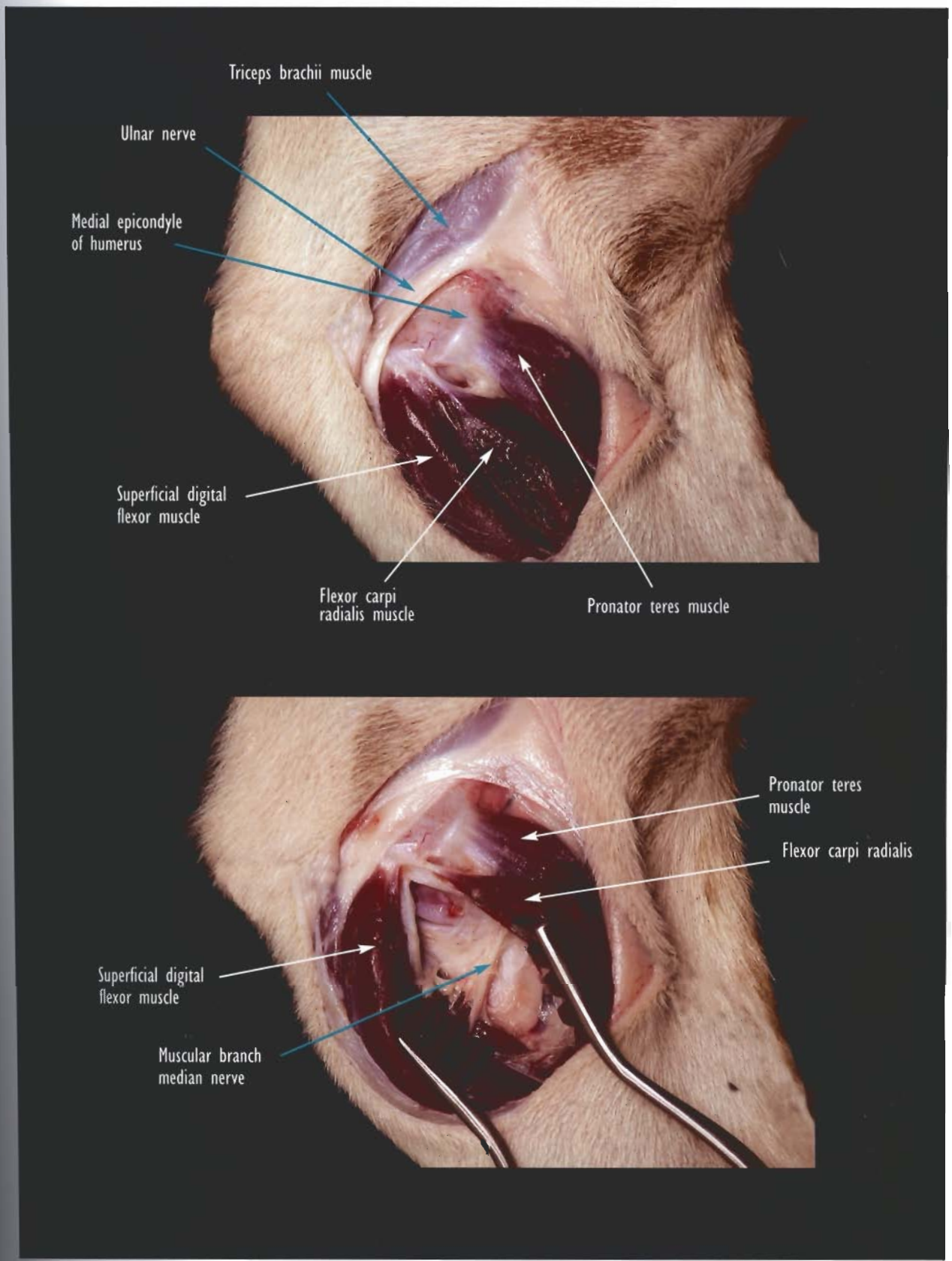
Removal of the medial coronoid process of the ulna.
OCD osteochondritis dissecans of the humeral throchlea.
Open reduction and fixation of fractures of the humeral trochlea.
Open reduction of medial luxations of the elbow.



- *Upper image:* a curved incision over the medial epicondyle extends from the distal third of the humerus to the proximal third of the forearm. Medial view, left limb.

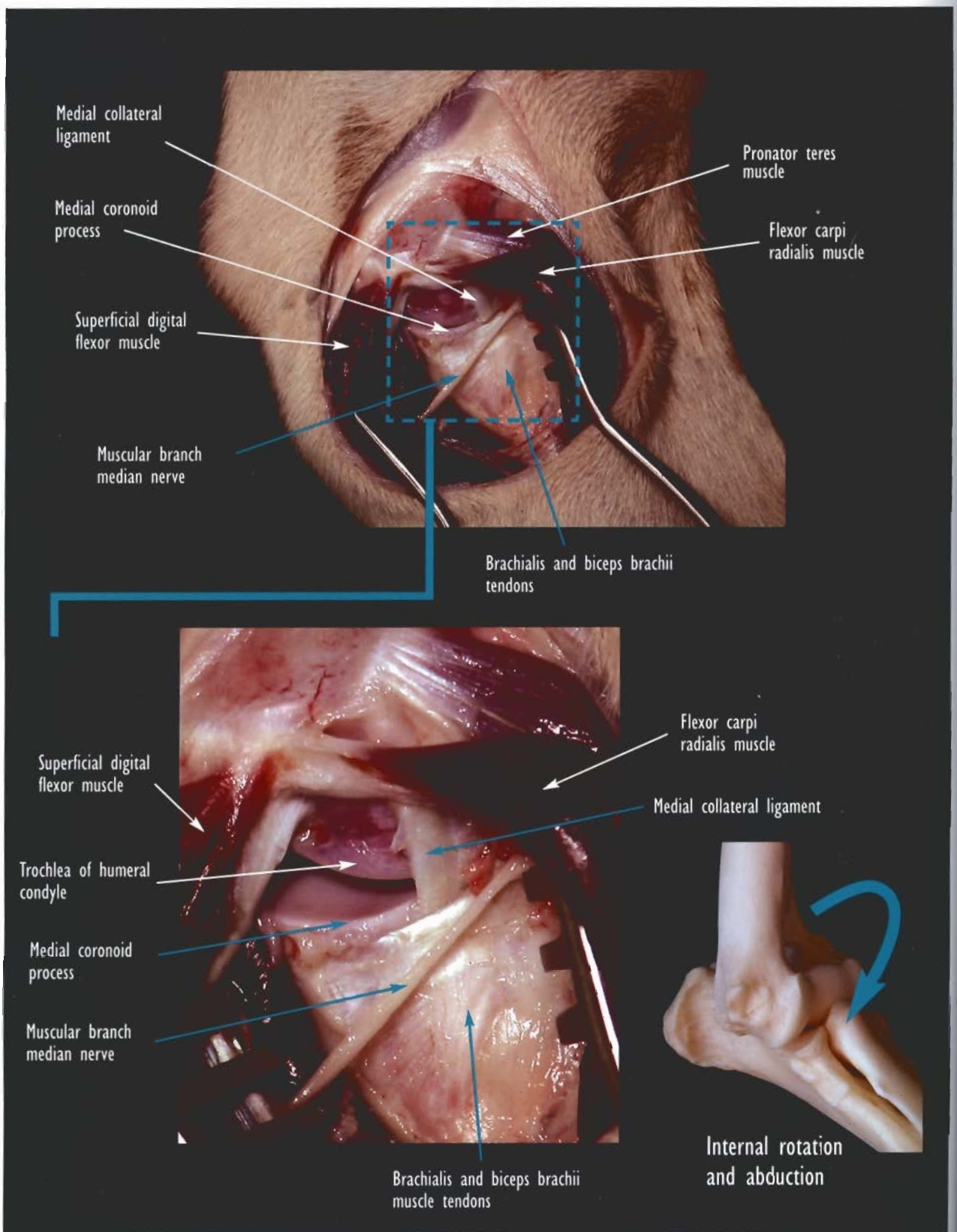
CAUTION: protect the ulnar nerve.

- *Lower image:* the antebrachial fascia and the course of the ulnar nerve are shown. The fascia should be incised to expose the flexor muscles of the antebrachium (dotted line).



- *Upper image:* the junction of the flexor carpi radialis and flexor superficial digital muscles (dotted line) is located in preparation for division. Medial view.
- *Lower image:* the flexor carpi radialis muscle is retracted cranially and the superficial digital flexor muscle together with the humeral head of the deep digital flexor muscle are retracted caudally, to view the joint capsule.

CAUTION: preserve the median nerve while ligating or cauterizing the numerous blood vessels of the region.



- *Upper image:* the joint capsule is incised and the caudal border of the medial collateral ligament is identified. Distal to the joint, the insertion of the biceps brachii and brachialis muscles tendon are observed. Medial view.
- *Lower image:* greater exposure is obtained with pronation (internal rotation) of the forearm and concomitant abduction (see osteological inset). This manipulation allows a better view of the articular surface of the medial coronoid process.

CAUTION: protect the median nerve.

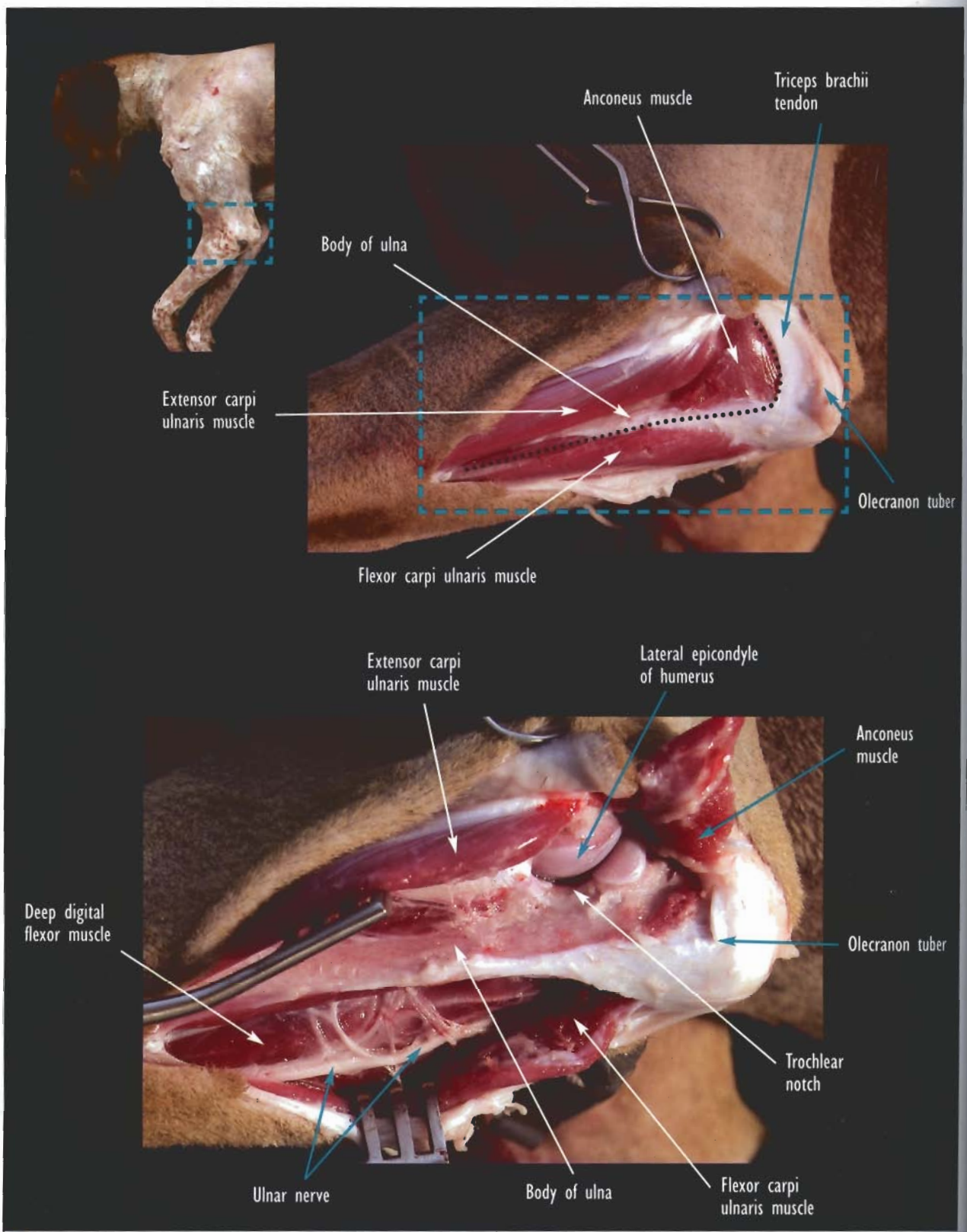
Approach to the proximal ulnar diaphysis and the trochlear notch

Indications:

Open reduction and fixation of fractures affecting the trochlear incisure of the ulna.

Open reduction and fixation of Monteggia fractures.

Osteotomy to lengthen or shorten the ulna.



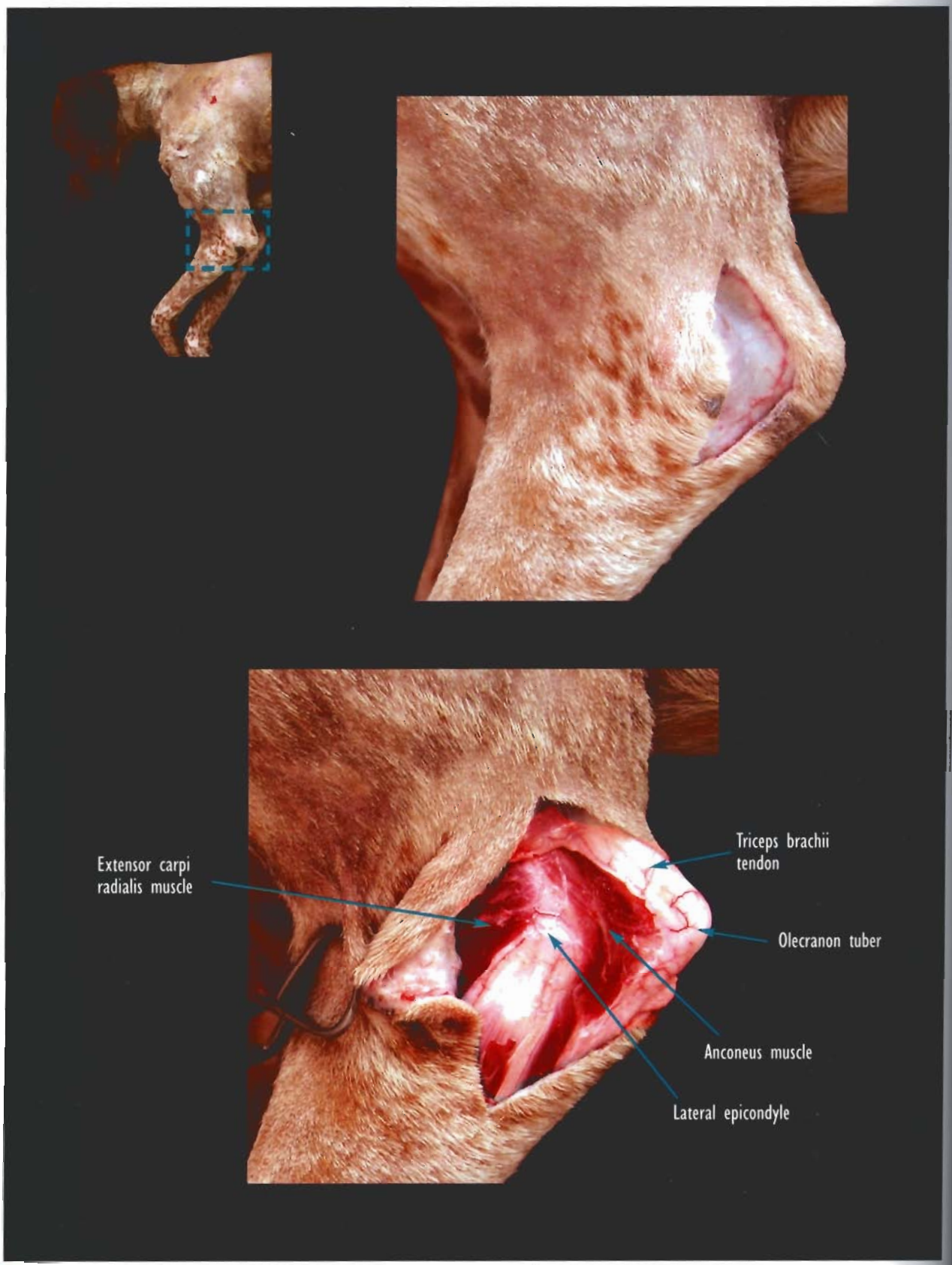
- *Upper image:* the skin is incised over the caudal limit of the ulna, from the olecran tuber to the mid-third of the antebrachium. The deep antebrachial fascia is opened and the anconeus, flexor carpi ulnaris and extensor carpi ulnaris muscles are identified. These muscles should be freed from the proximal ulna (dotted line).
- *Lower image:* the flexor carpi ulnaris muscle is retracted caudally, the extensor carpi ulnaris muscle cranially and the anconeus muscle proximally. Thus, the trochlear notch of the olecranon and the body of the ulna are exposed.

CAUTION: protect the ulnar nerve while displacing cranially the flexor carpi ulnaris muscle.

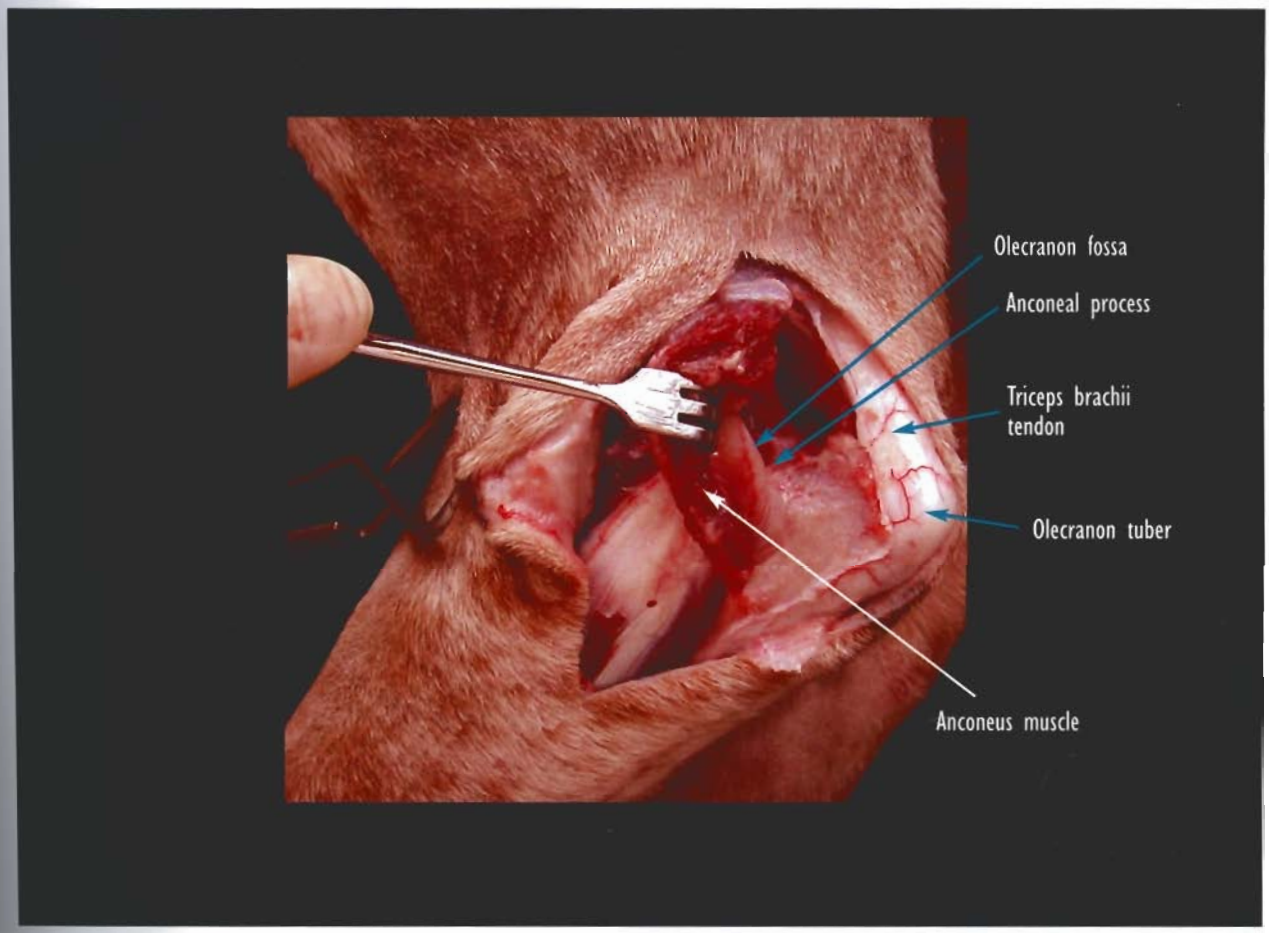
Approach to the olecranon tuber

Indications:

Open reduction and fixation of fractures of the olecranon tuberosity.
Open reduction and fixation of fractures of the anconeal process.
Removal or fixation of an ununited anconeal process.



- *Upper image:* the skin is incised from proximal to distal over the olecranon fossa. Lateral view, left limb.
- *Lower image:* the lateral fascia of the elbow is opened and the caudal attachment of the anconeus muscle will be freed from the olecranon.

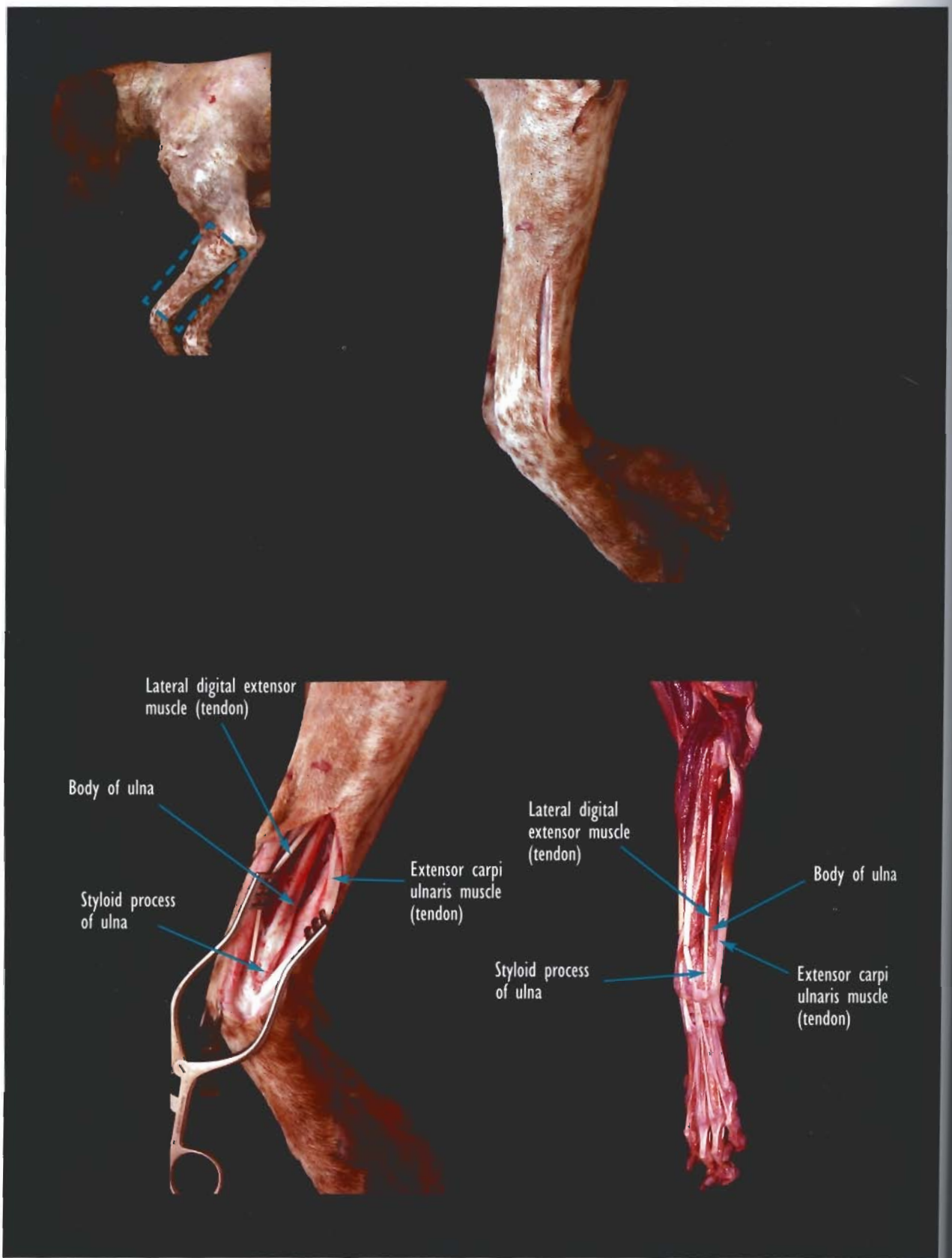


■ Retraction of the transected anconeus muscle cranially, will expose the tendon of the triceps brachii muscles and the olecranon tuber and fossa. Lateral view.

Approach to the distal ulnar diaphysis and ulnar styloid process

Indications:

Open reduction and fixation of the styloid process of the ulna.
Osteotomy or ostectomy of the ulnar styloid process in cases of early closure of the distal ulnar physis resulting in valgus.



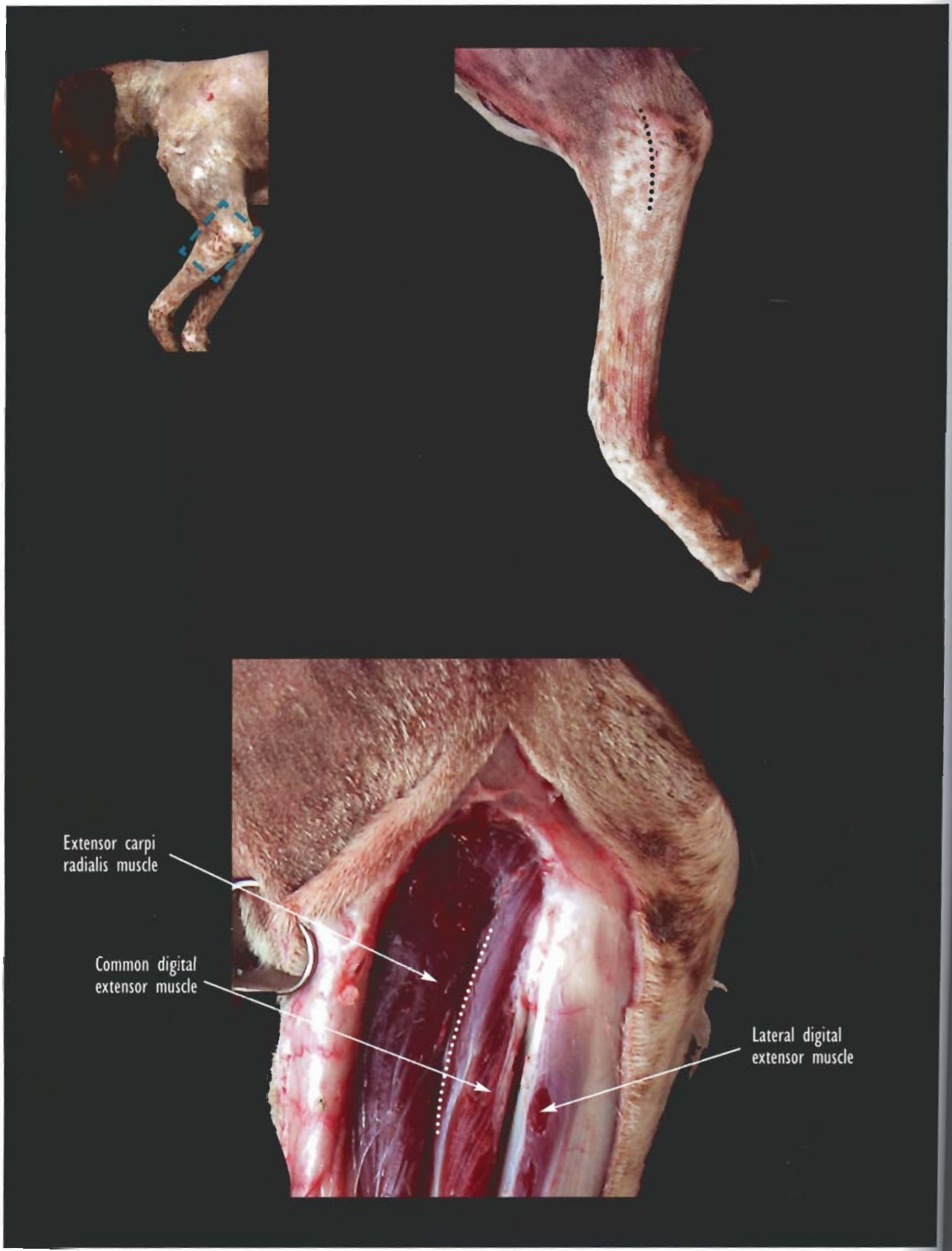
- *Upper image:* the skin incision projects from the middle third of the lateral forearm to the palpable ulnar styloid process. Lateral view, left limb.
- *Lower image:* to expose the distal third of the body of the ulna and the styloid process, the antebrachial fascia is incised and the tendons of the extensor carpi ulnaris and lateral digital extensor muscles are separated. Muscle inset: view of the lateral muscles of the left forearm and manus.

Lateral approach to the head, proximal extremity and dyaphisis of the radius

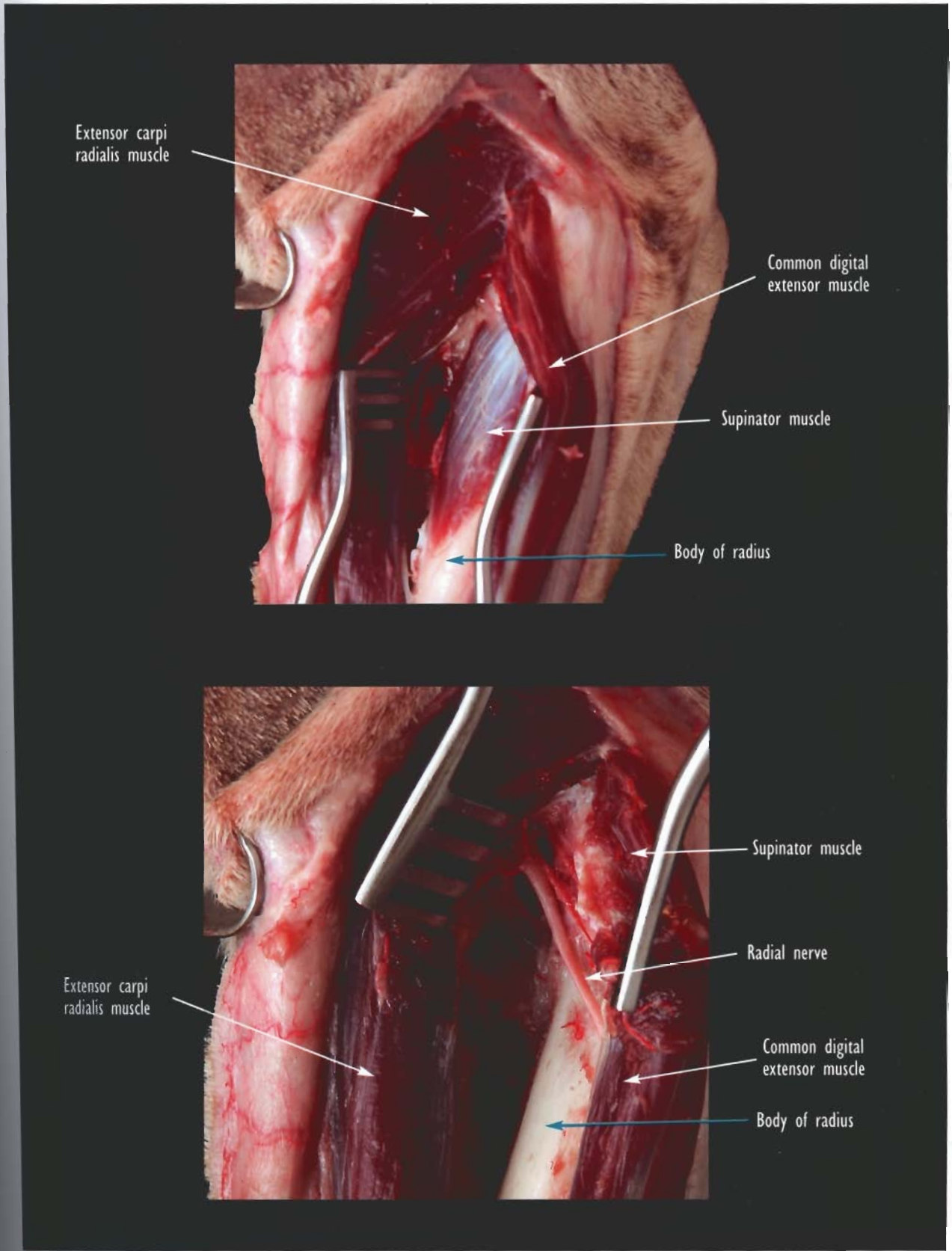
Indications:

Open reduction and fixation of proximal fractures of the radius.

Open reduction and fixation of the radial head in cases of a torn of the annular ligament (Monteggia fracture).



- *Upper image:* the skin incision starts proximally to the lateral epicondyle of the humerus and continues distally through the proximal third of the antebrachium. Lateral view.
- *Lower image:* the deep fascia of the forearm is opened and the approach to the radius continues between the extensor carpi radialis and the common digital extensor muscles (dotted line).



■ *Upper image:* the extensor carpi radialis muscle is retracted cranially and the common digital extensor caudally. The proximal radial extremity and the supinator muscle are exposed. If a greater exposure is required, the supinator may be freed from the radius (dotted line). Lateral view.

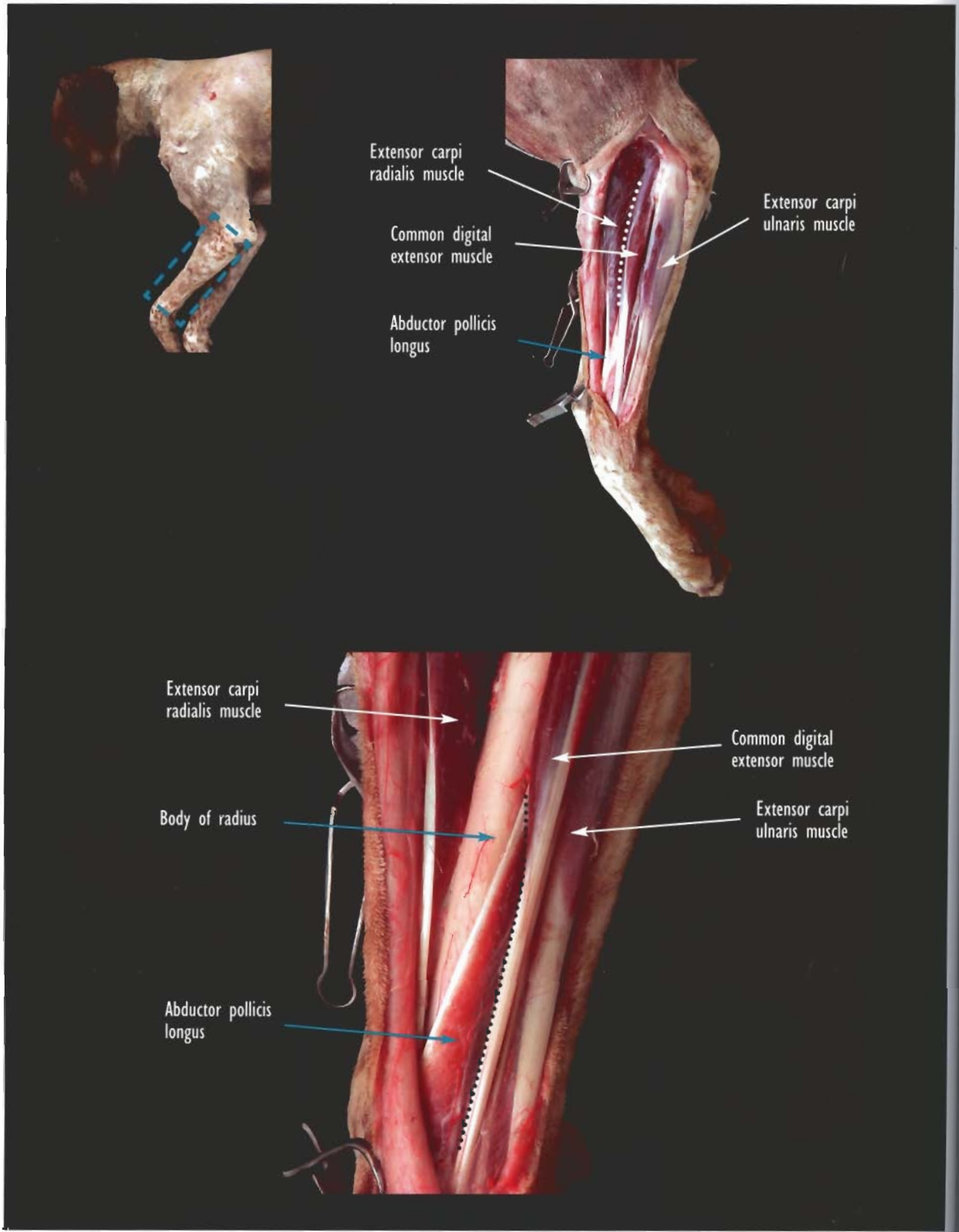
■ *Lower image:* the supinator muscle has been freed and retracted caudally.

CAUTION: preserve the radial nerve between the supinator and the radius.

Approach to the diaphysis of the radius via a lateral incision

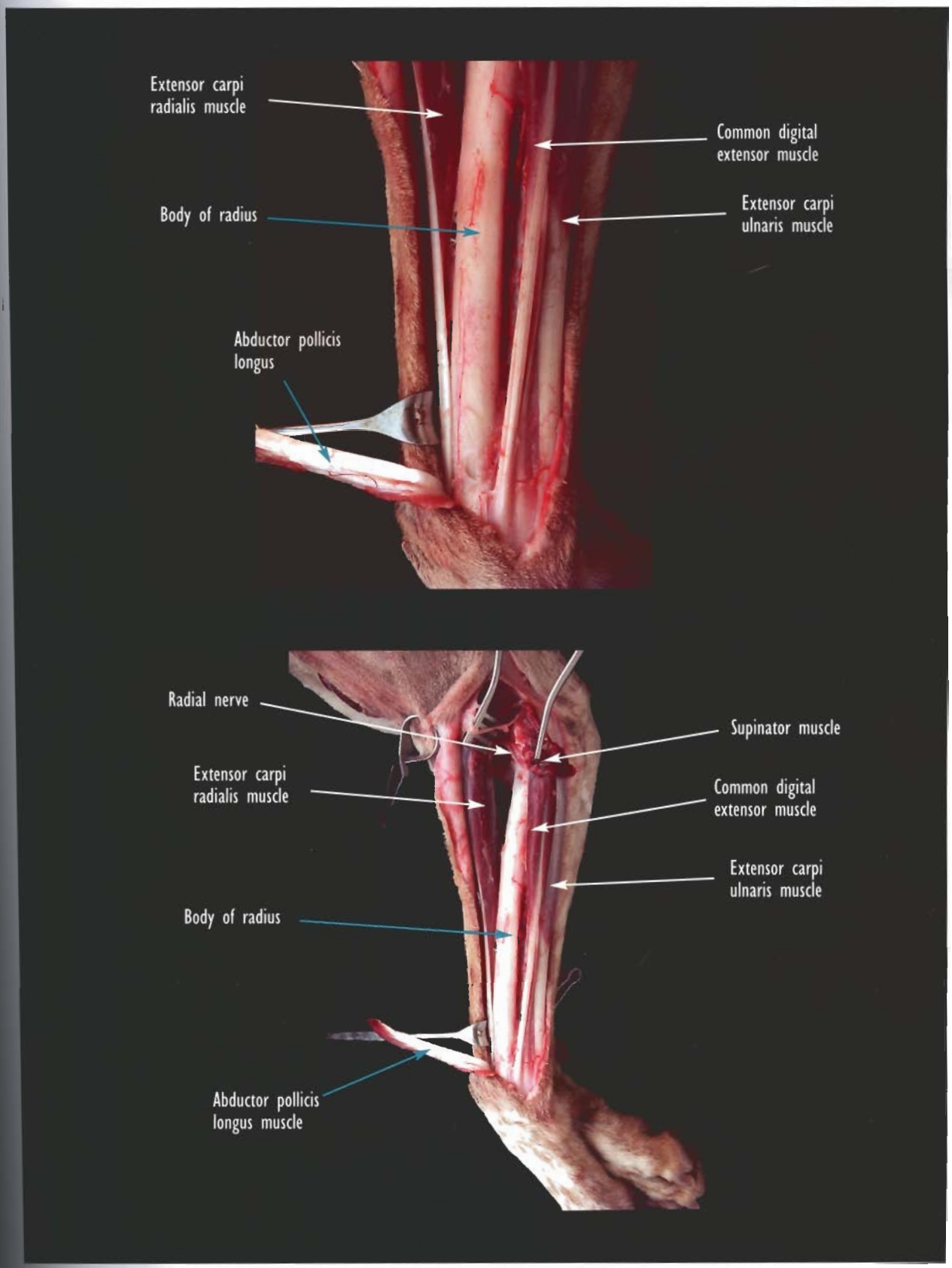
Indications:

Open reduction and fixation of proximal fractures of the radius.
Open reduction and fixation of the radial head in cases of a torn of the annular ligament (Monteggia fracture).
Open reduction and fixation of fractures of the radius.
Corrective osteotomy of the radius with growth disorders or pseudoarthrosis.



■ *Upper image:* the skin incision projects distolaterally from the lateral epicondyle of the humerus to the carpus. The fascia of the forearm is incised and the extensor carpi radialis and common digital extensor muscles are separated (dotted line). Lateral view.

■ *Lower image:* the extensor carpi radialis muscle is retracted cranially and the common digital extensor caudally. This exposes the body of the radius and the long abductor muscle of the digit 1. If more exposure is required, the long abductor muscle may be displaced, or even sectioned (dotted line).

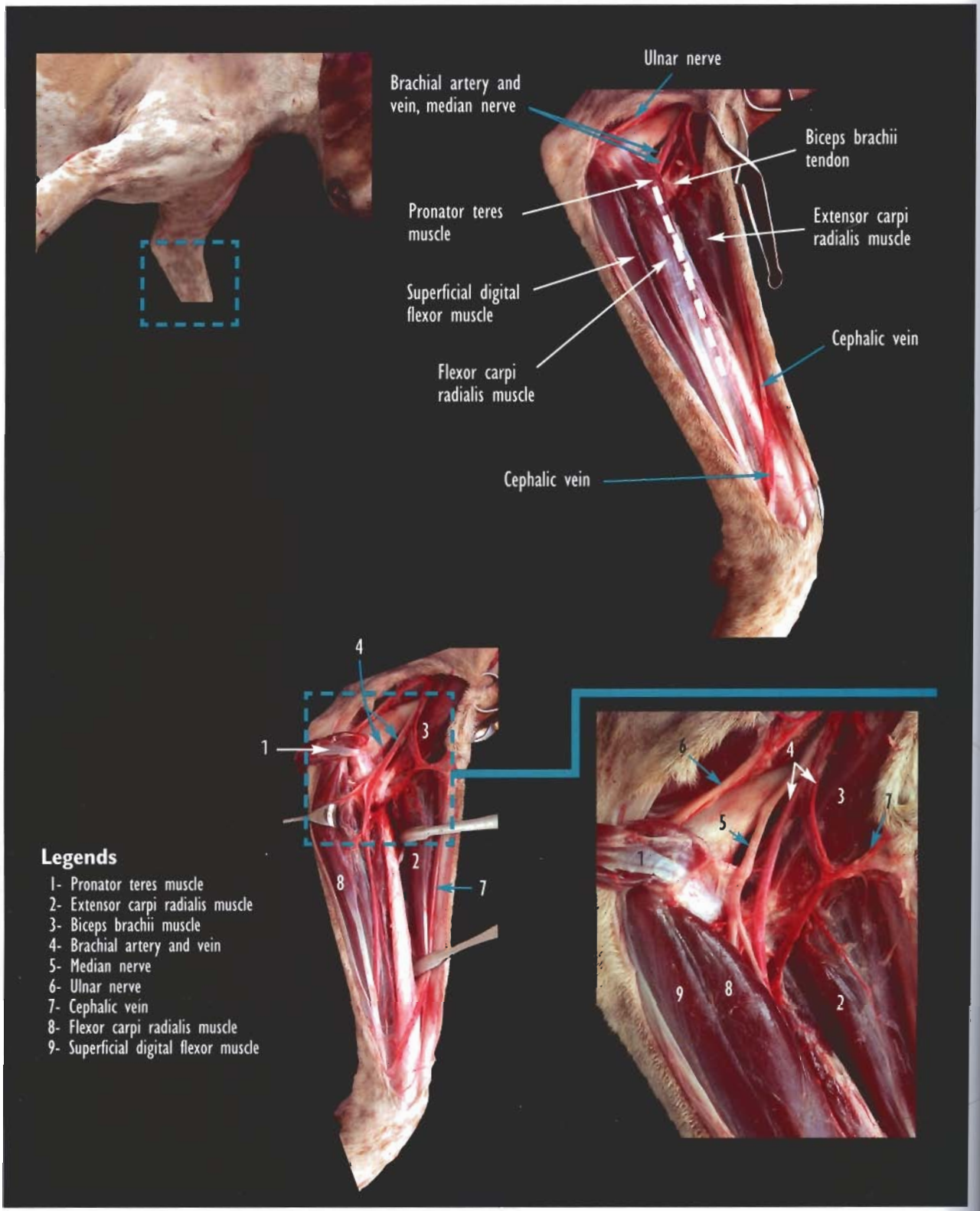


- *Upper image:* the abductor pollicis longus muscle has been sectioned and displaced cranially. This allows a complete view of the distal portion of the radius. Lateral view.
- *Lower image:* after freeing the supinator muscle, this approach can be extended proximally towards the head of the radius for complete exposure of the radius.

Approach to the diaphysis of the radius via a medial incision

Indications:

Open reduction and fixation of fractures of the radius.
Corrective osteotomy of the radius with growth disorders or pseudoarthrosis.



- *Upper image:* the skin incision of the craniomedial antebrachium extends over the elbow to the styloid process of the radius. The antebrachial fascia is incised and the extensor carpi radialis and the pronator teres muscles are identified to prepare for separation (dotted line) of these muscles. The insertion of the pronator teres muscles to the radius will be freed. Medial view, left forearm.
- *Lower image:* the extensor carpi radialis is retracted cranially and the pronator teres (sectioned) caudally to expose the proximal third of the radius.

CAUTION: preserve the brachial vessels and the median nerve which are covered by the pronator teres muscle. In the distal radius preserve the cephalic and accesory cephalic veins.

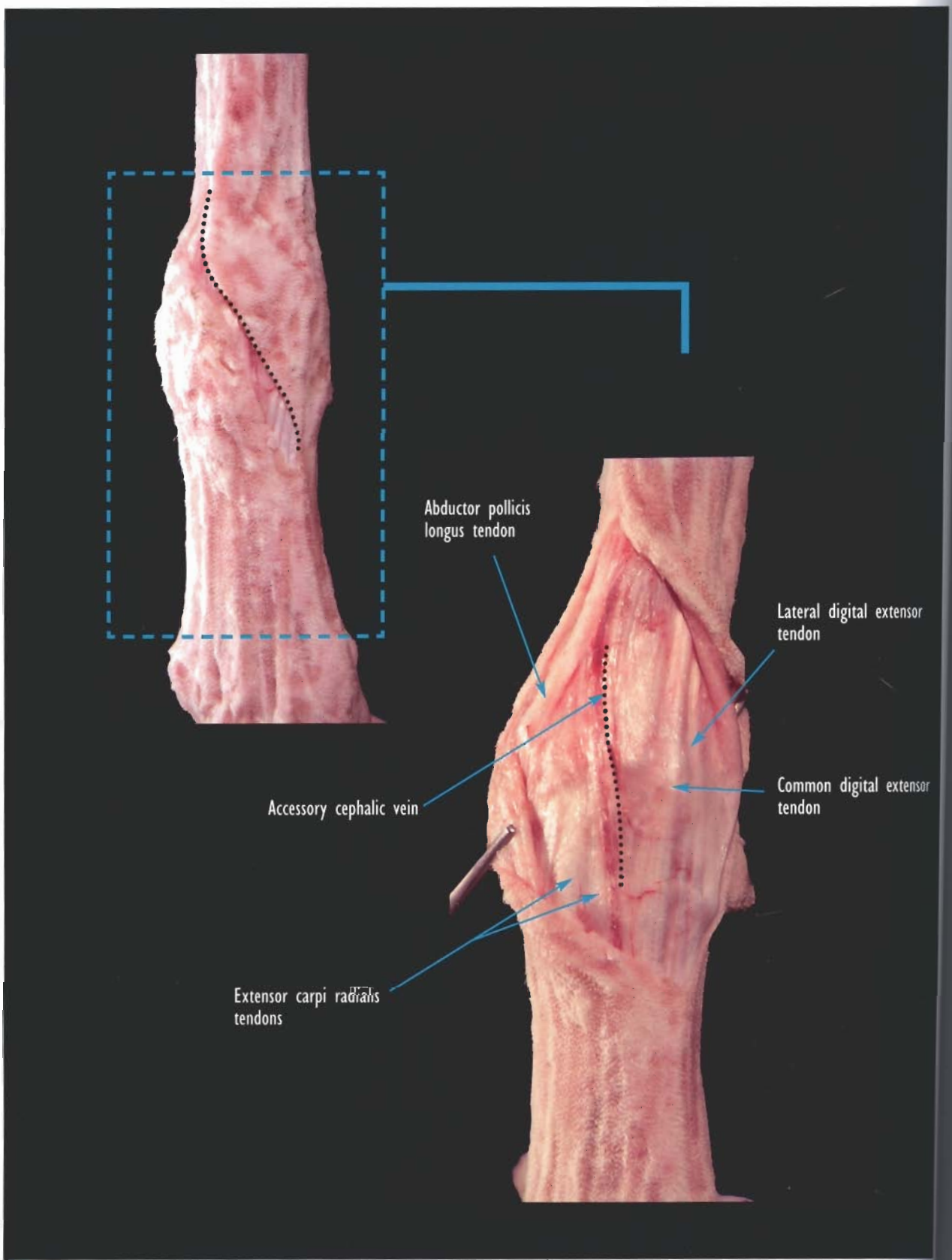
Legends

1- Pronator teres muscle
2- Extensor carpi radialis muscle
3- Flexor carpi radialis muscle
4- Biceps brachii muscle
5- Brachial artery and vein
6- Median nerve
7- Ulnar nerve
8- Cephalic vein
9- Supinator muscle

■ Close up of the previous image. Greater exposure of the cranial aspect of the head of the radius is obtained if the insertion of the supinator muscle is partially sectioned. Craniolateral view, left limb.

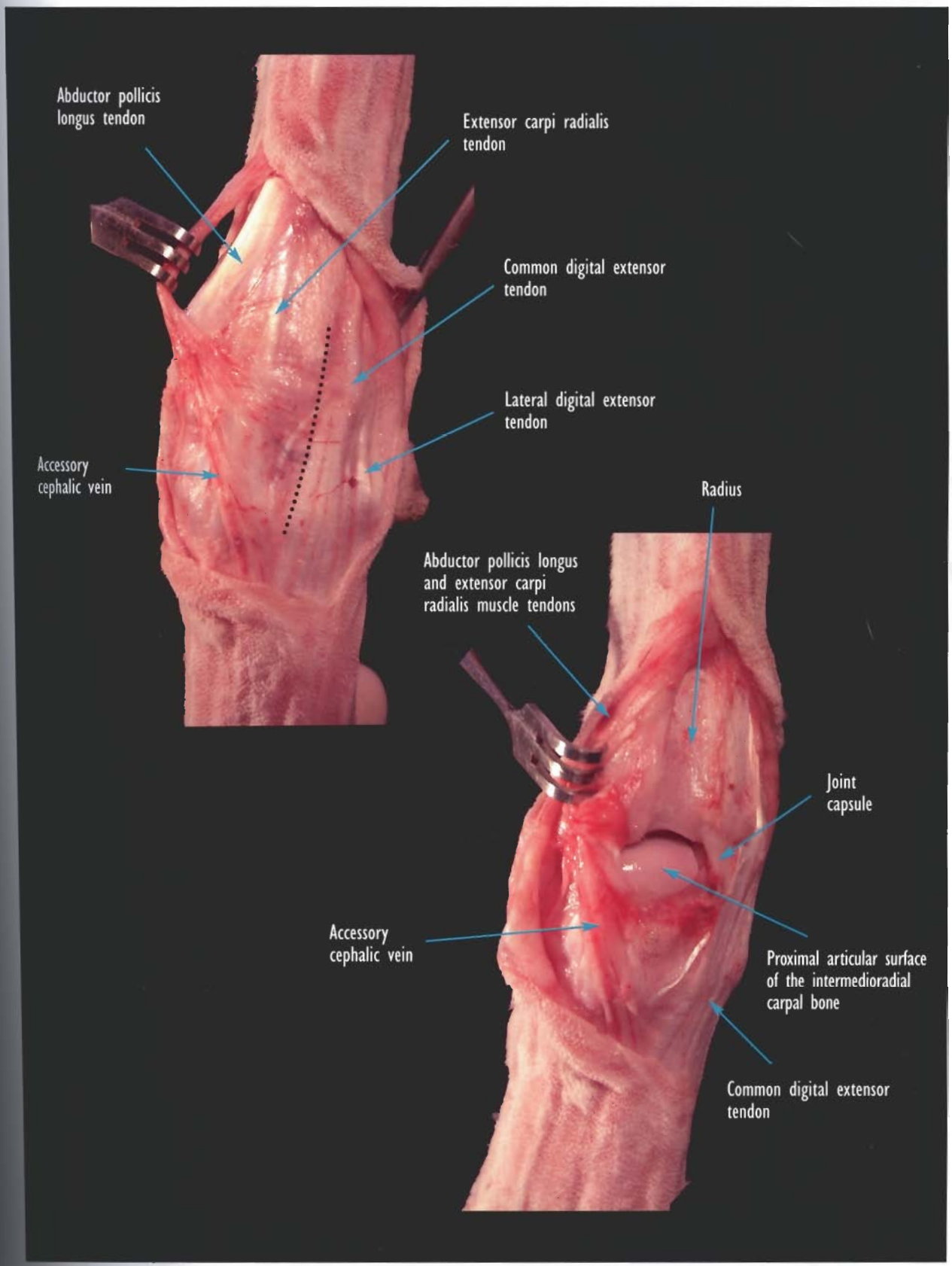
Dorsal approach to the carpal joint

Indications:
Carpal arthrodesis.
Surgical reduction of distal radial fractures.
Surgical reduction of carpal dislocations.



- *Upper image:* the dorsal skin incision (dotted line) passes over the dorsum of the carpus from the medial forearm to the lateral surface of metacarpal bone V. Left manus, dorsal view.
- *Lower image:* identify the tendons of the abductor pollicis longus, extensor carpi radialis, common digital extensor and lateral digital extensor muscles which lie in the subcutaneous tissue. The superficial carpal fascia and vessels of the dorsum of the carpus will be retracted medially by incising the superficial fascia (dotted line).

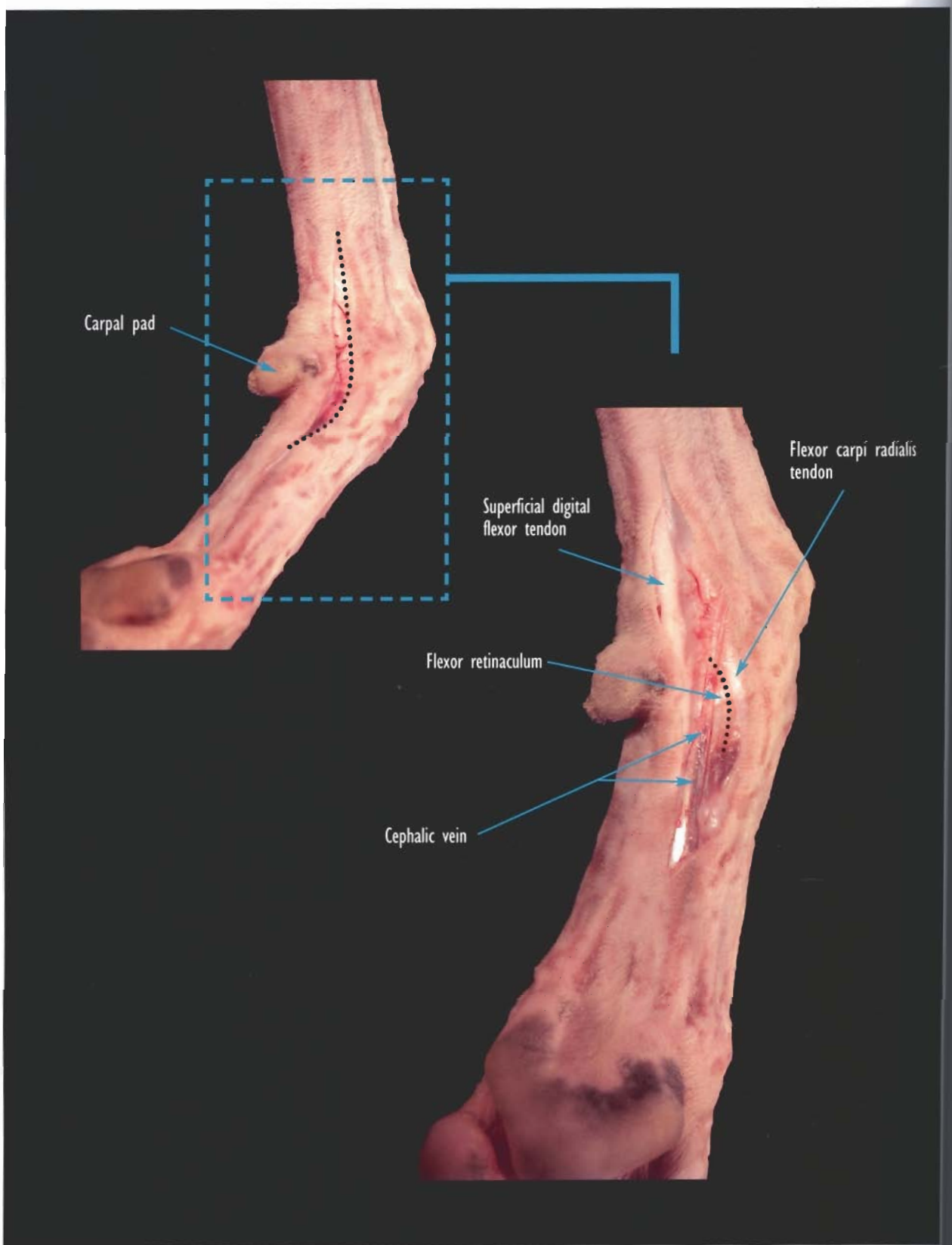
CAUTION: preserve the accessory cephalic vein.



- *Upper image:* after the accessory cephalic vein and fascia have been retracted medially, the joint capsule is exposed and opened (dotted line) between the extensor carpi radialis and common digital extensor muscle tendons.
- *Lower image:* after the joint capsule has been opened, the abductor pollicis longus and extensor carpi radialis muscle tendons are reflected medially, the common digital extensor muscle tendon is reflected laterally, and the antebrachial carpal joint is partially flexed to view the articular surface of the carpal bones.

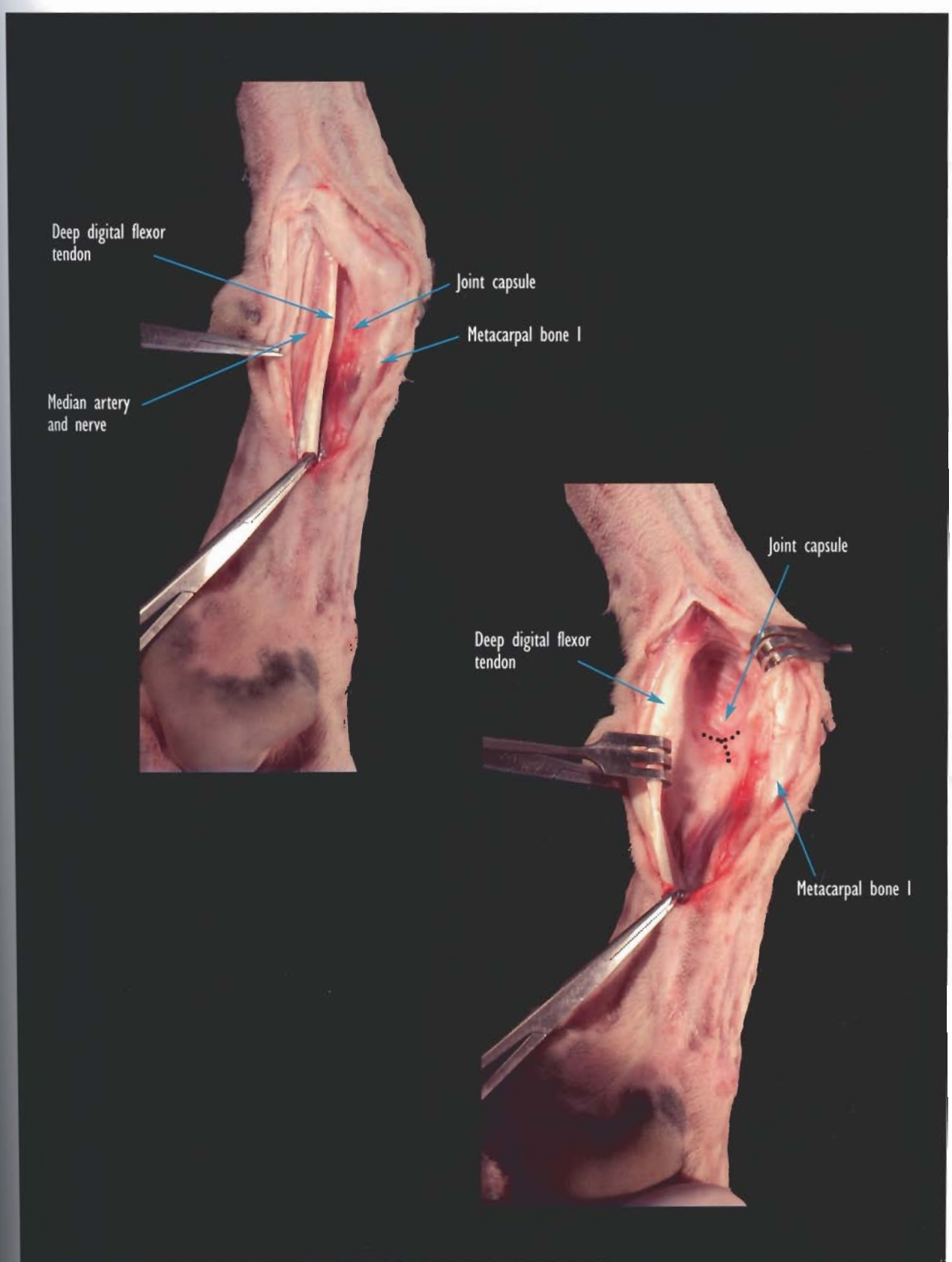
Mediopalmar approach to the carpal joint

Indications:
Palmar carpal arthrodesis.
Fixation of distocaudal radial fractures.
Fixation of intermedioradial carpal bone fractures.
Bone fragment extraction.

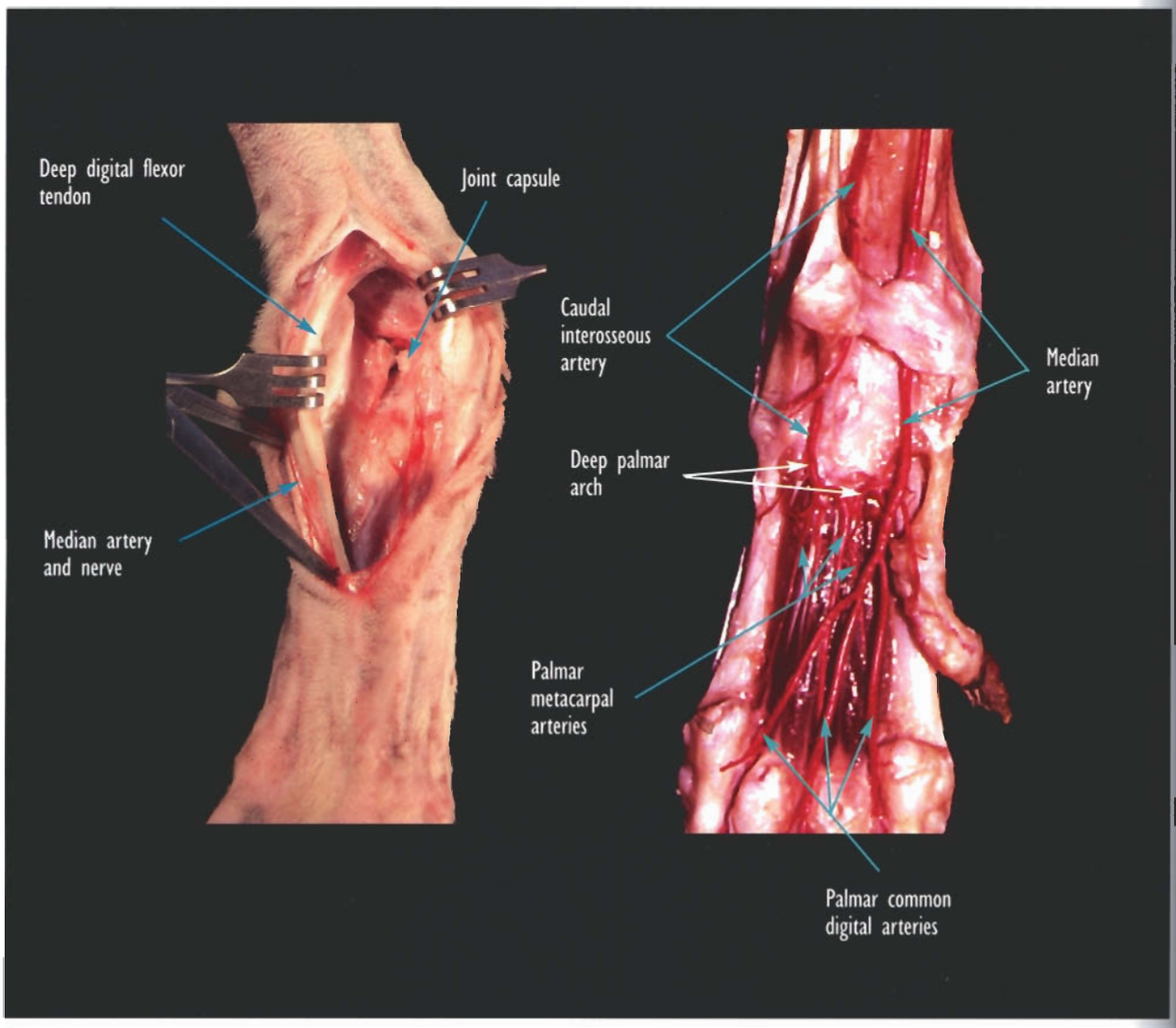


- *Upper image:* the skin incision (dotted line) begins over the distomedial radius and crosses the medial border of the carpus and continues into the palmar metacarpus. Left manus, mediopalmar view.
- *Lower image:* in the subcutaneous tissue, identify the superficial digital flexor and flexor carpi radialis muscle tendons, the flexor retinaculum (dotted line) and double ligate and transect the cephalic vein.

CAUTION: pay attention to the course of the cephalic vein.



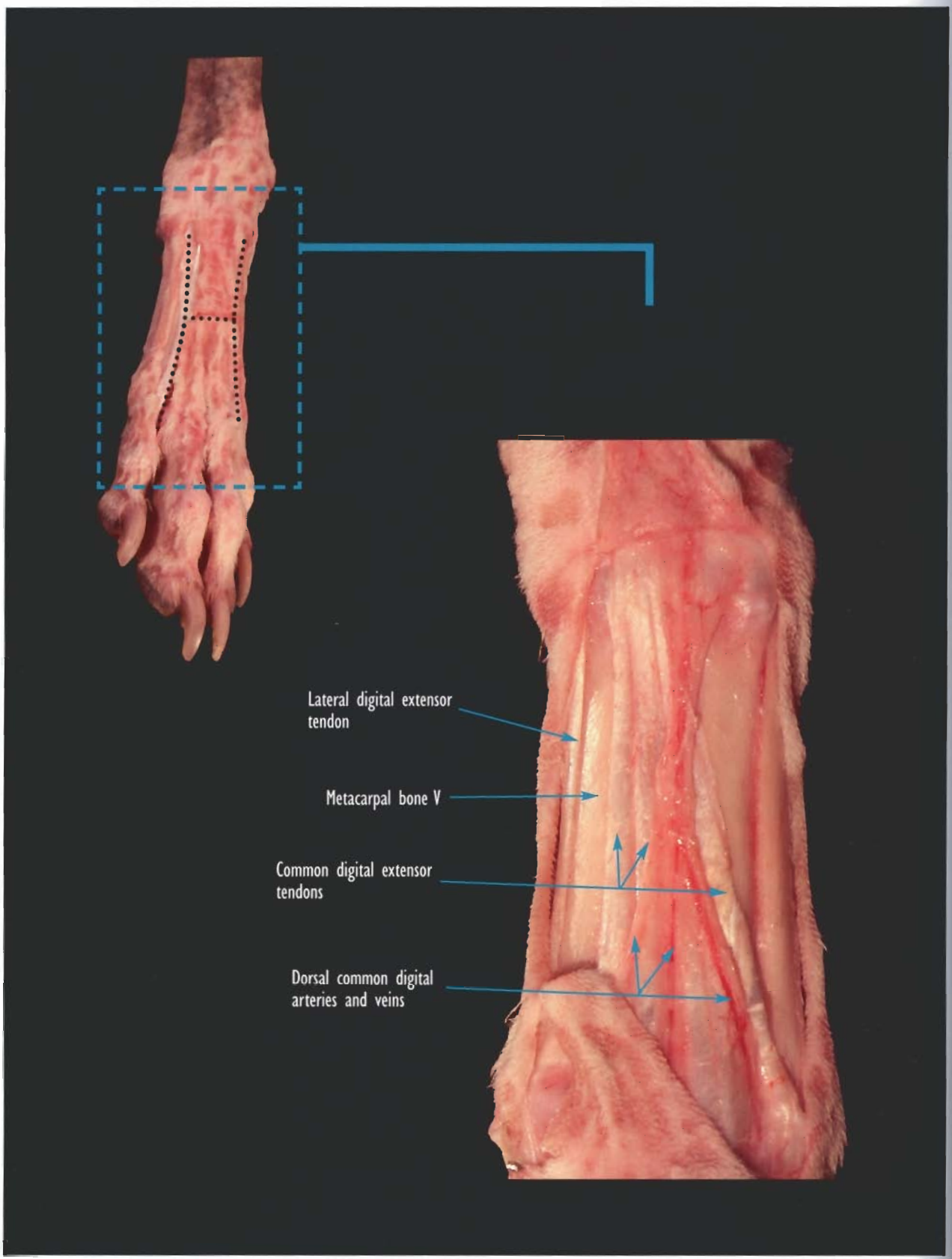
- *Upper image:* opening the flexor retinaculum exposes the contents of the carpal canal: deep digital flexor muscle tendon and the median artery, vein and nerve. Mediopalmar view, left manus.
- *Lower image:* the tendons of the superficial and deep digital flexor muscles and the median neurovascular bundle are retracted laterally to expose the palmar surface of the carpal joint. After palpation of the interosseous spaces between the carpal bones and the radius, the joint capsule and palmar carpal ligament are cut (dotted line).



■ *Left image:* after cutting the joint capsule, the carpal bones are exposed. Mediopalmar view, left manus.
CAUTION: preserve the deep palmar arch and the metacarpal vessels while sectioning the joint capsule.
■ *Right image:* dissection of the arteries of the palmar aspect of the manus. Superficial and deep digital muscle tendons are removed. The more superficial median artery and the palmar common digital arteries have been displaced medially. Palmar view, left manus.

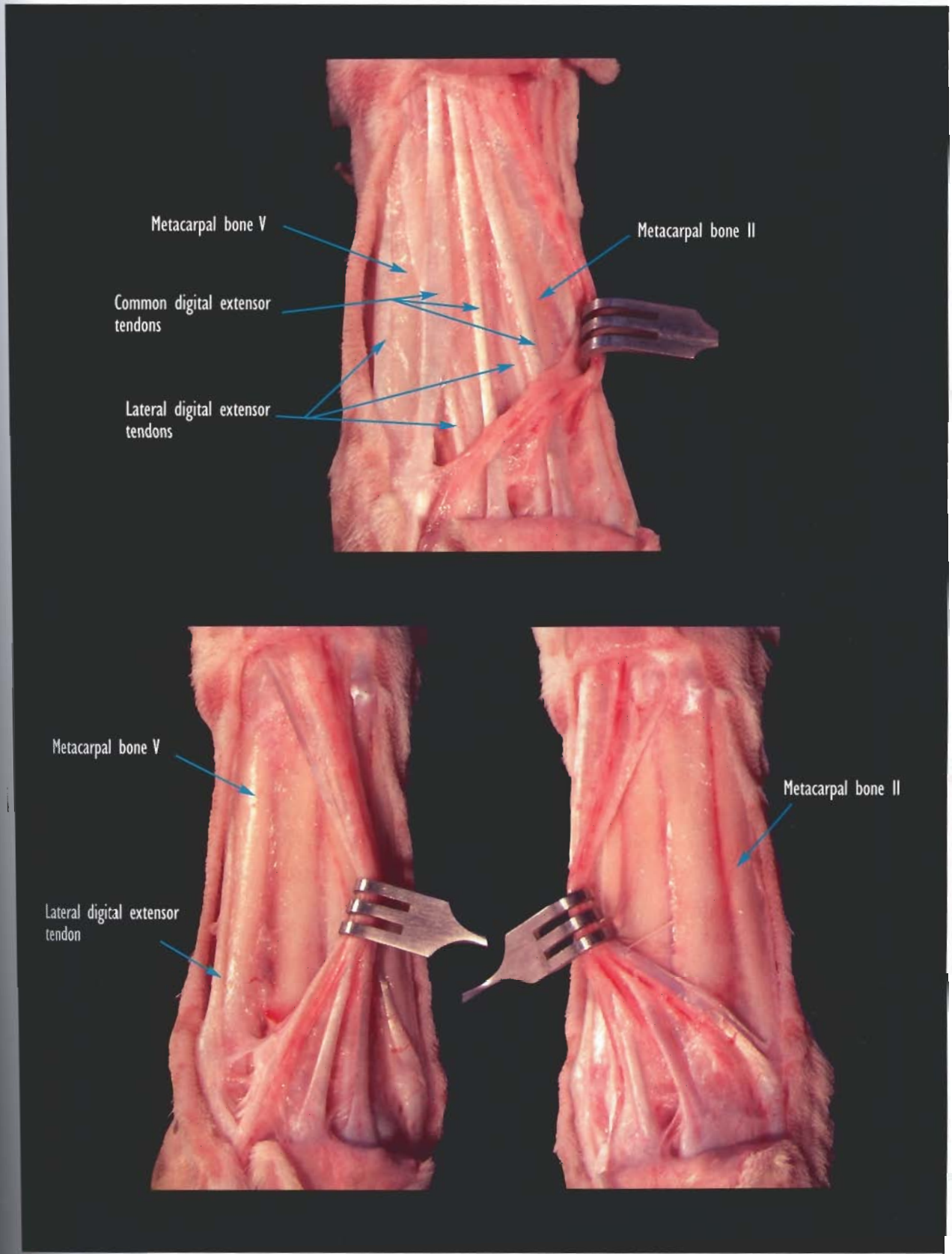
Approach to the metacarpal bones

Indications:
Surgical reduction of metacarpal fractures.



- *Upper image:* the metacarpal bones are approached using two longitudinal skin incisions over the metacarpal bones II and V. These incisions are interconnected at their midpoint (dotted lines). Dorsal view, right manus.
- *Lower image:* in the subcutis, the deep fascia has been incised to expose the vessels which overlie the tendons of the common and lateral digital extensor muscles.

CAUTION: preserve the vessels and tendons.



■ *Upper image:* the vessels are retracted medially to expose the tendons of the common and lateral digital flexor muscles. Dorsal view, right manus.

■ *Lower image:* to approach the desired metacarpal bones, the vessels and tendons are freed and retracted medially (left image) or laterally (right image).

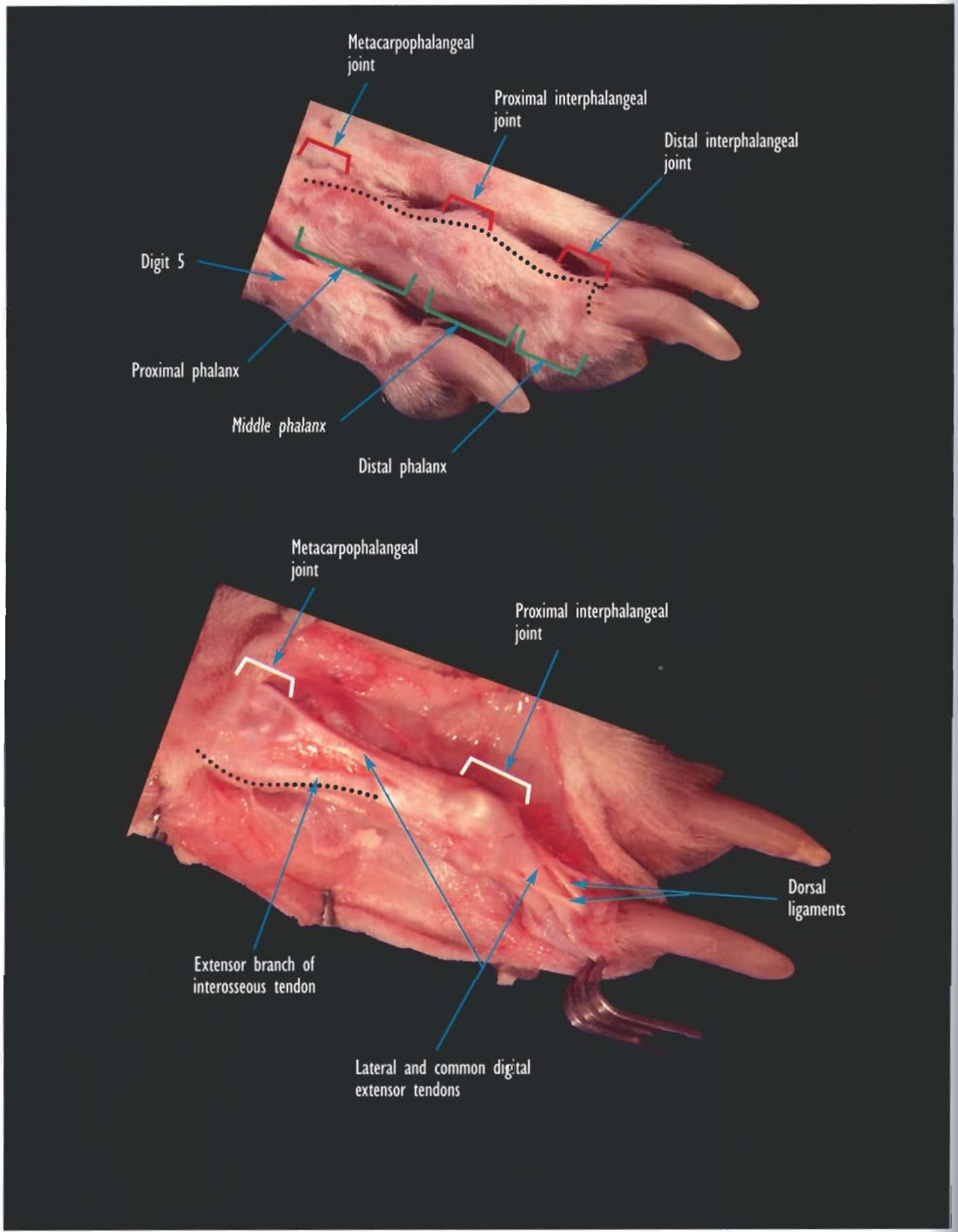
CAUTION: preserve the vessels and tendons.

Approach to the phalanges and the interphalangeal joints

Indications:

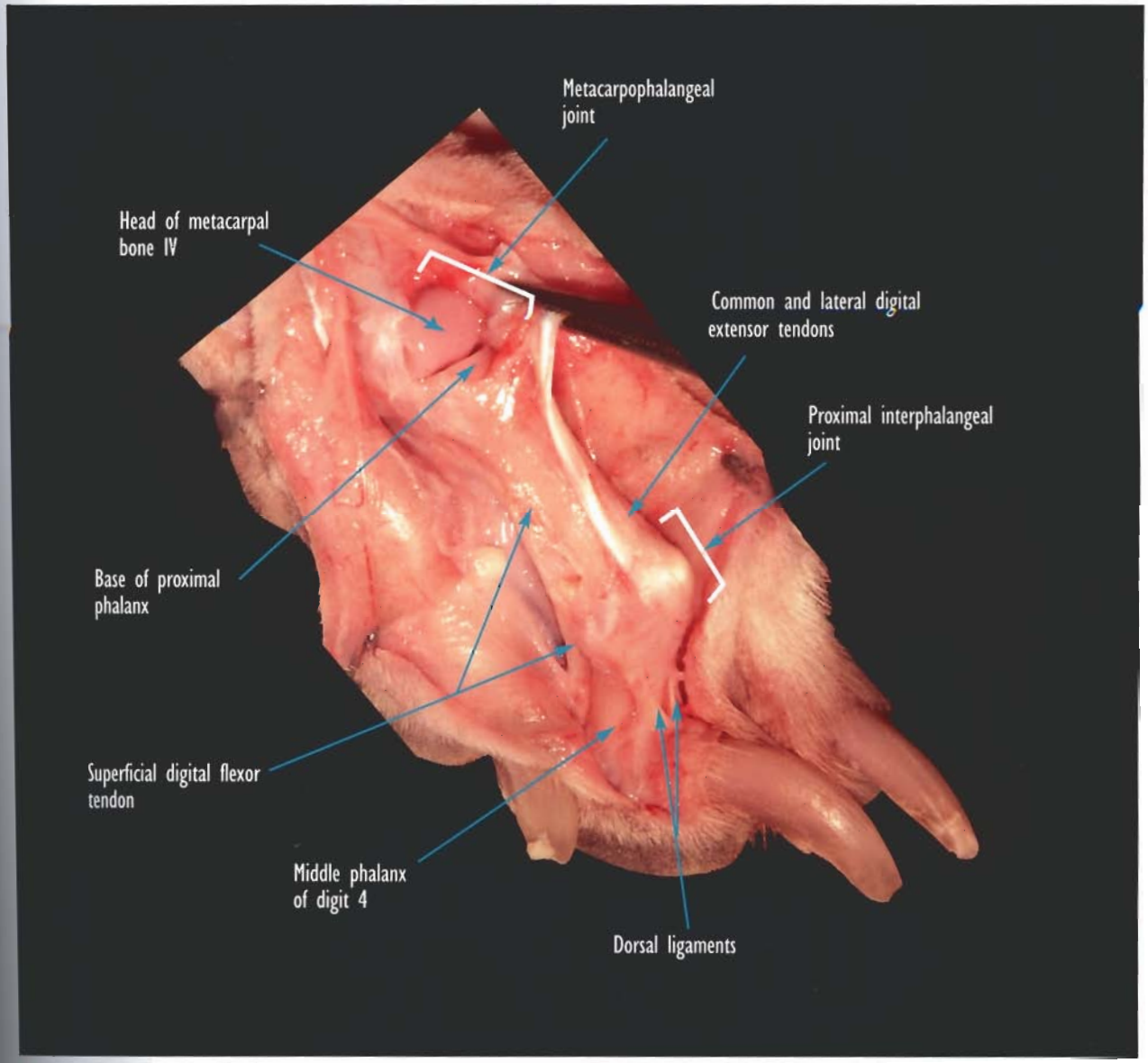
Surgical reduction of phalangeal fractures.

Surgical reduction of metacarpo/metatarsophalangeal and interphalangeal dislocations.



- *Upper image:* the skin incision passes distally from the corresponding metacarpal bone over the dorsal aspect of the digit to the distal phalanx (dotted line). Dorsolateral view, right digit IV.
- *Lower image:* in the subcutis, the deep fascia is sectioned to expose the digital extensor muscle tendons. To expose the metacarpophalangeal joint, the joint capsule and the extensor branch of the interosseous muscle are transsectioned (dotted line).

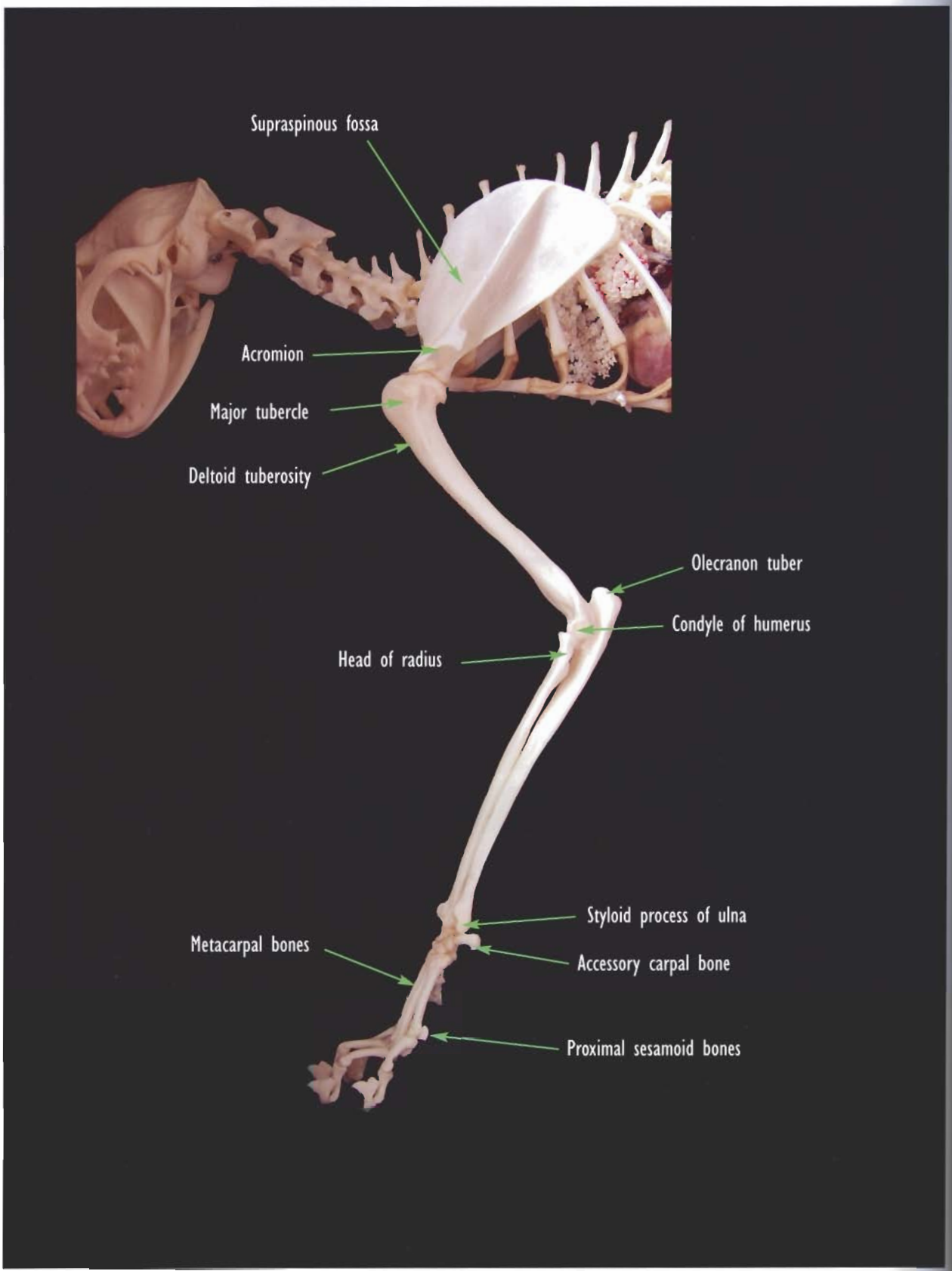
CAUTION: preserve the vessels and digital tendons.



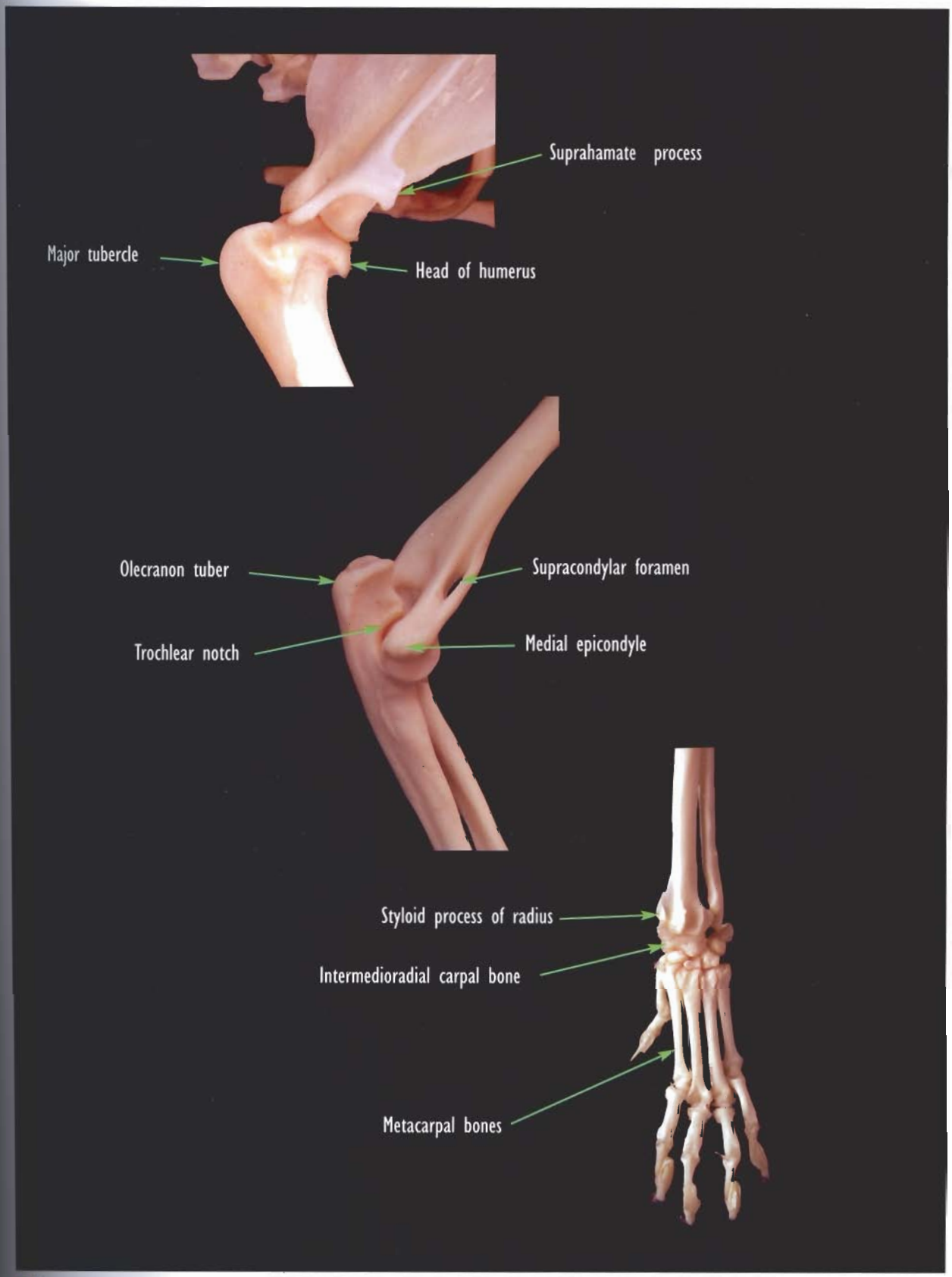
■ Once the joint capsule has been opened, the head of the corresponding metacarpal bone and the base of the proximal phalanx are exposed. Dorsal view, right digit IV.
CAUTION: protect the digital vessels and tendons.

2

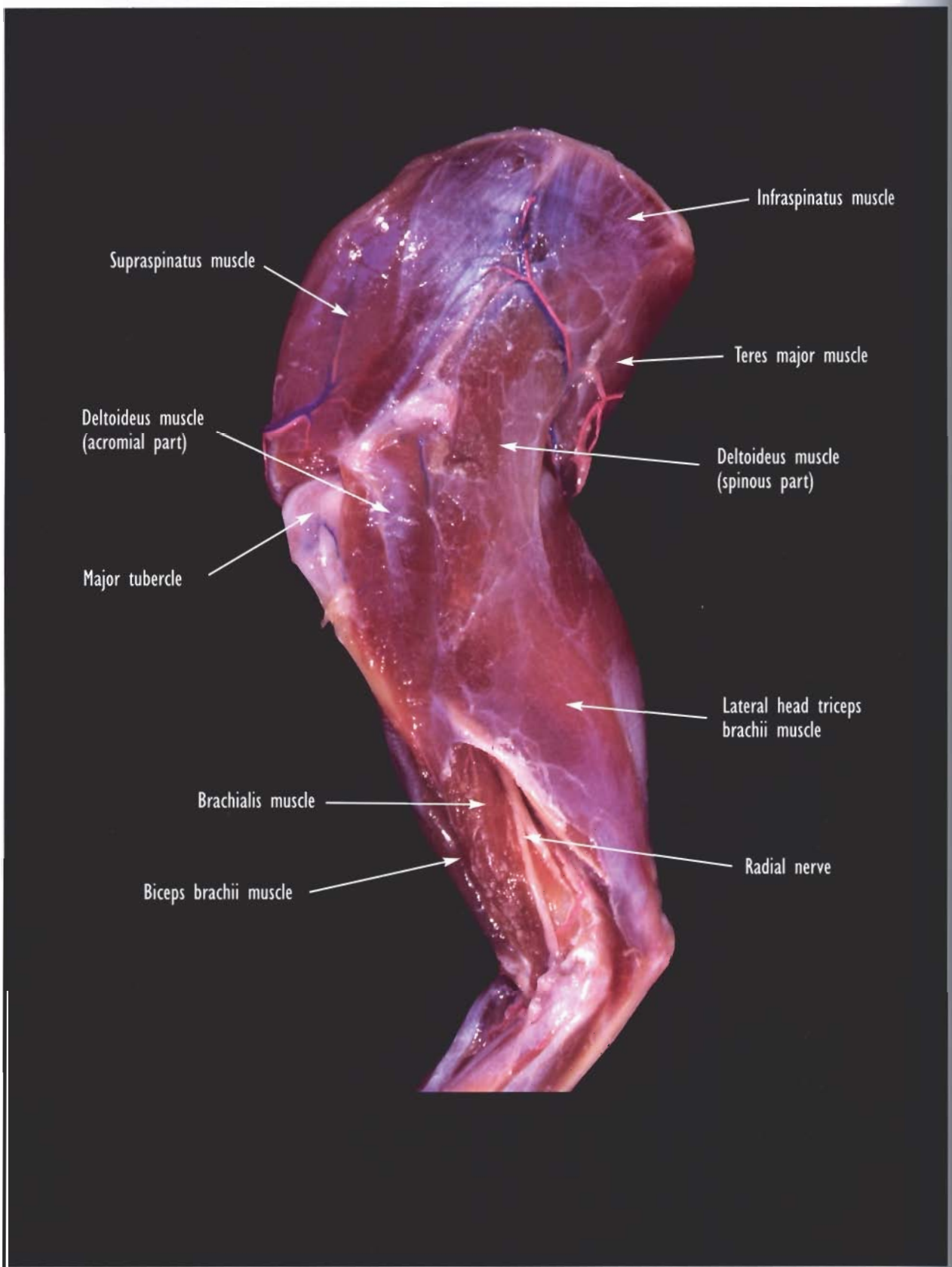
Cat
Thoracic limb



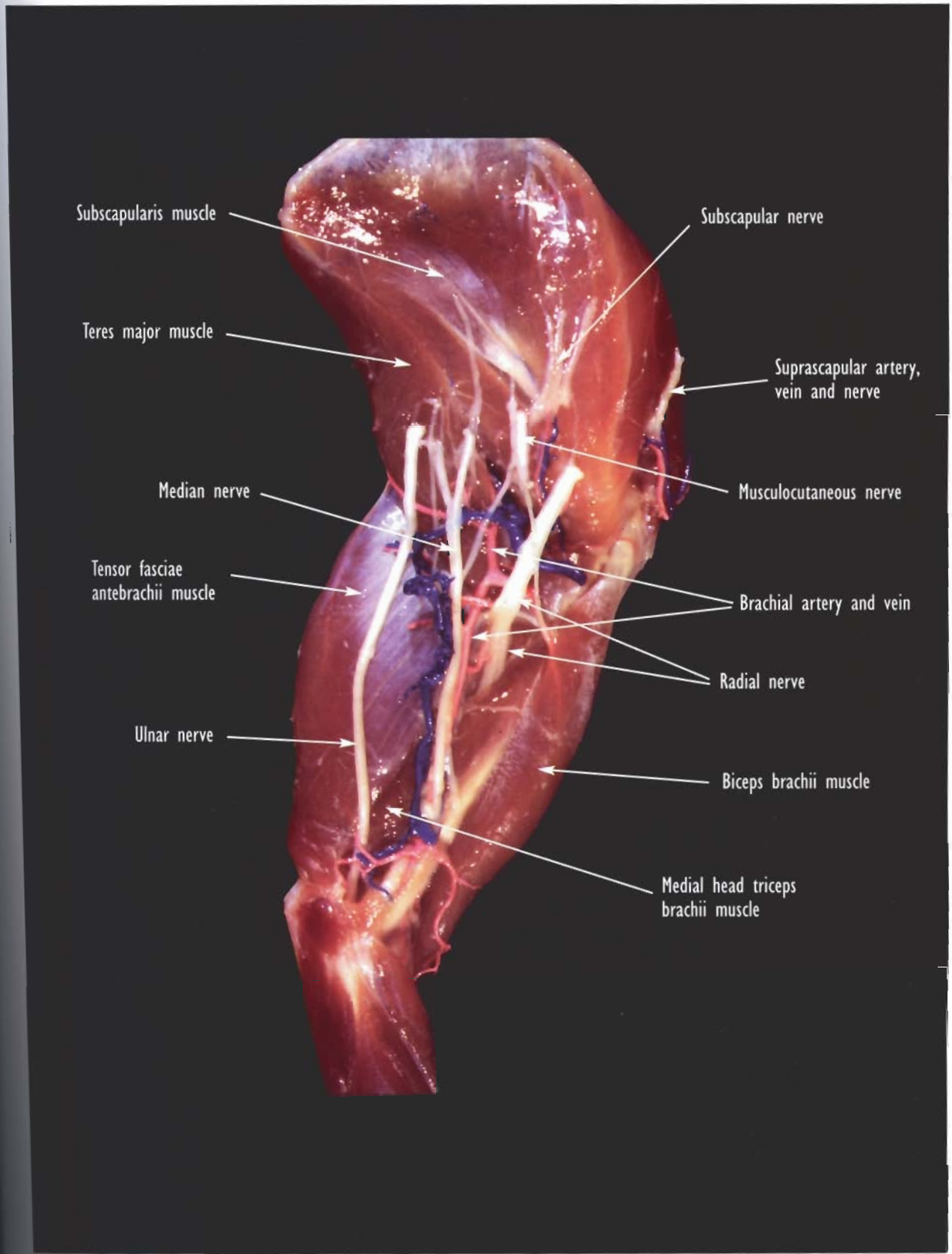
■ Osteology of the left thoracic limb, lateral aspect.



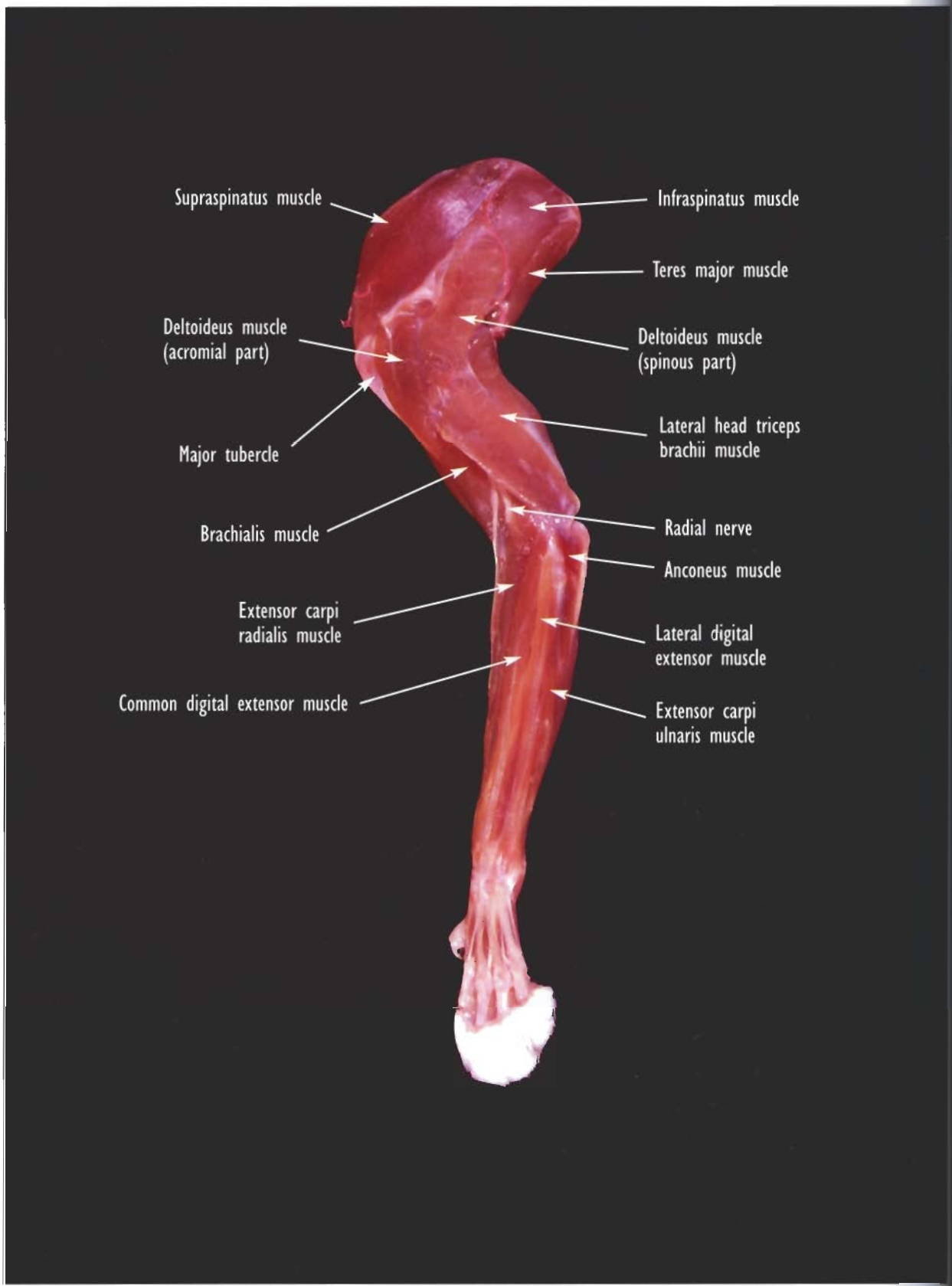
- *Upper image:* detailed osteology of the left shoulder joint, lateral view.
- *Middle image:* detailed osteology of the left elbow joint, medial view.
- *Lower image:* detailed osteology of the left manus, dorsal aspect.



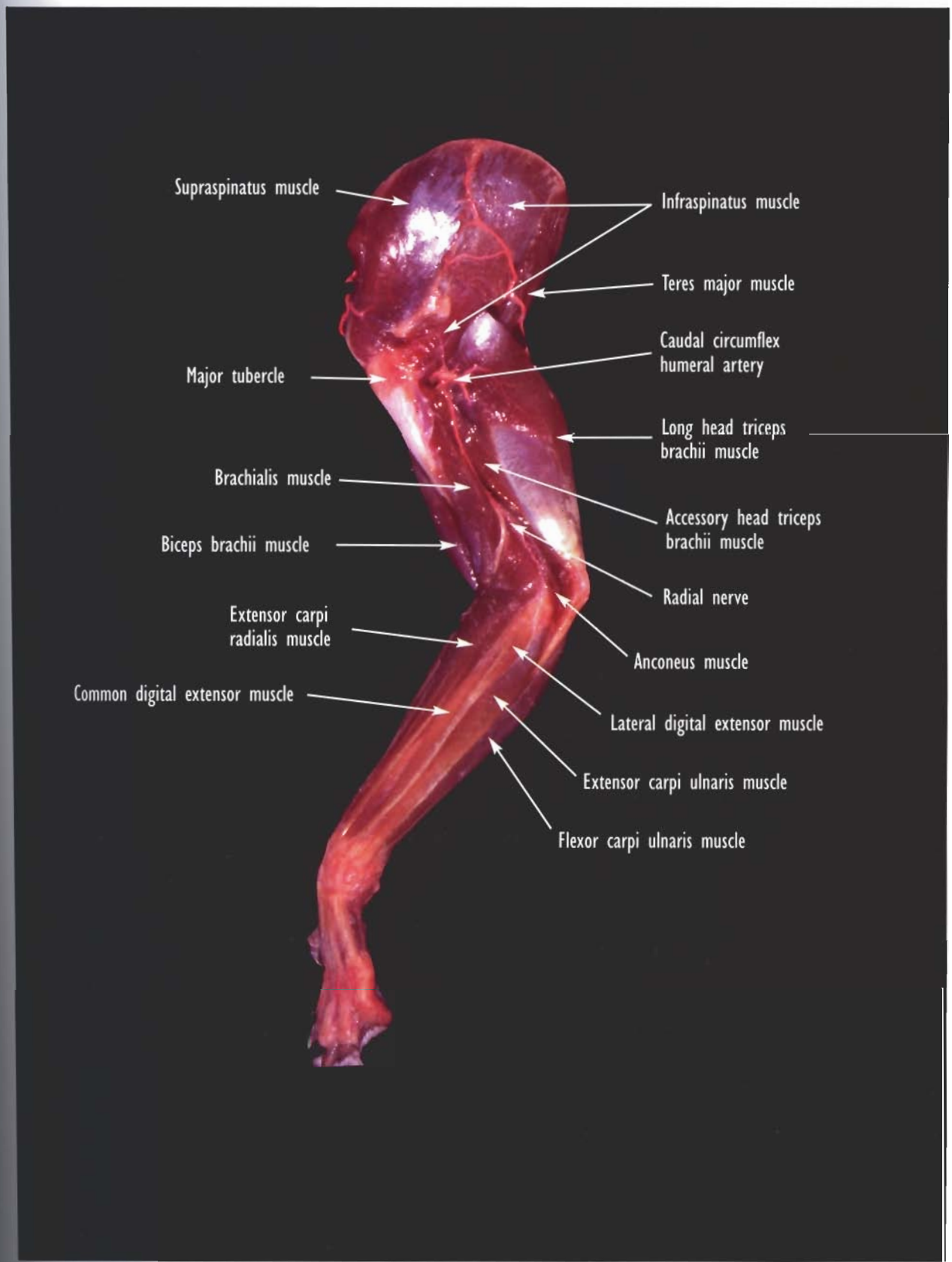
Lateral muscles of the left shoulder and arm.



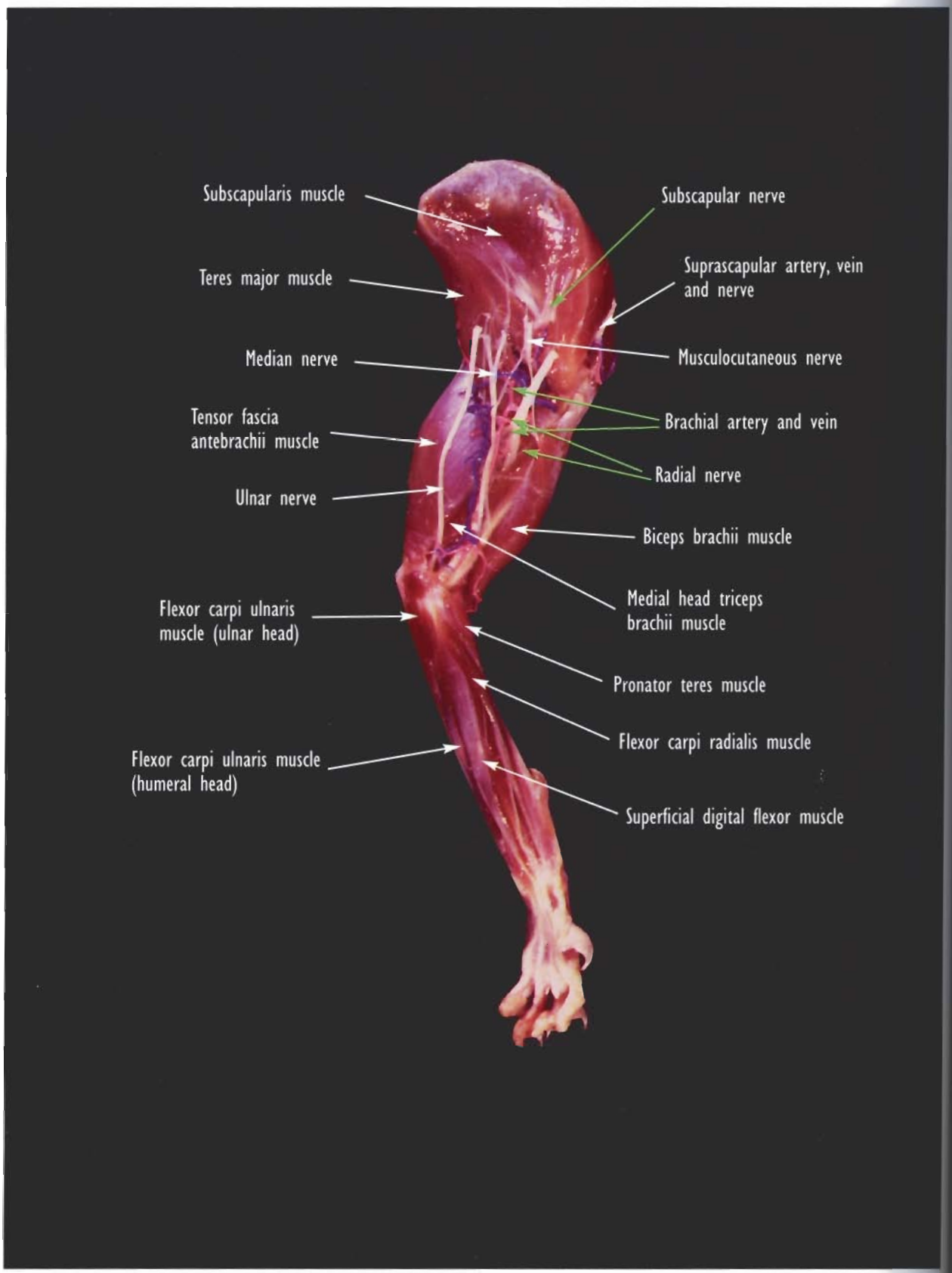
Medial muscles and vessels and nerves of the left shoulder and arm.



Lateral muscles of the left thoracic limb.

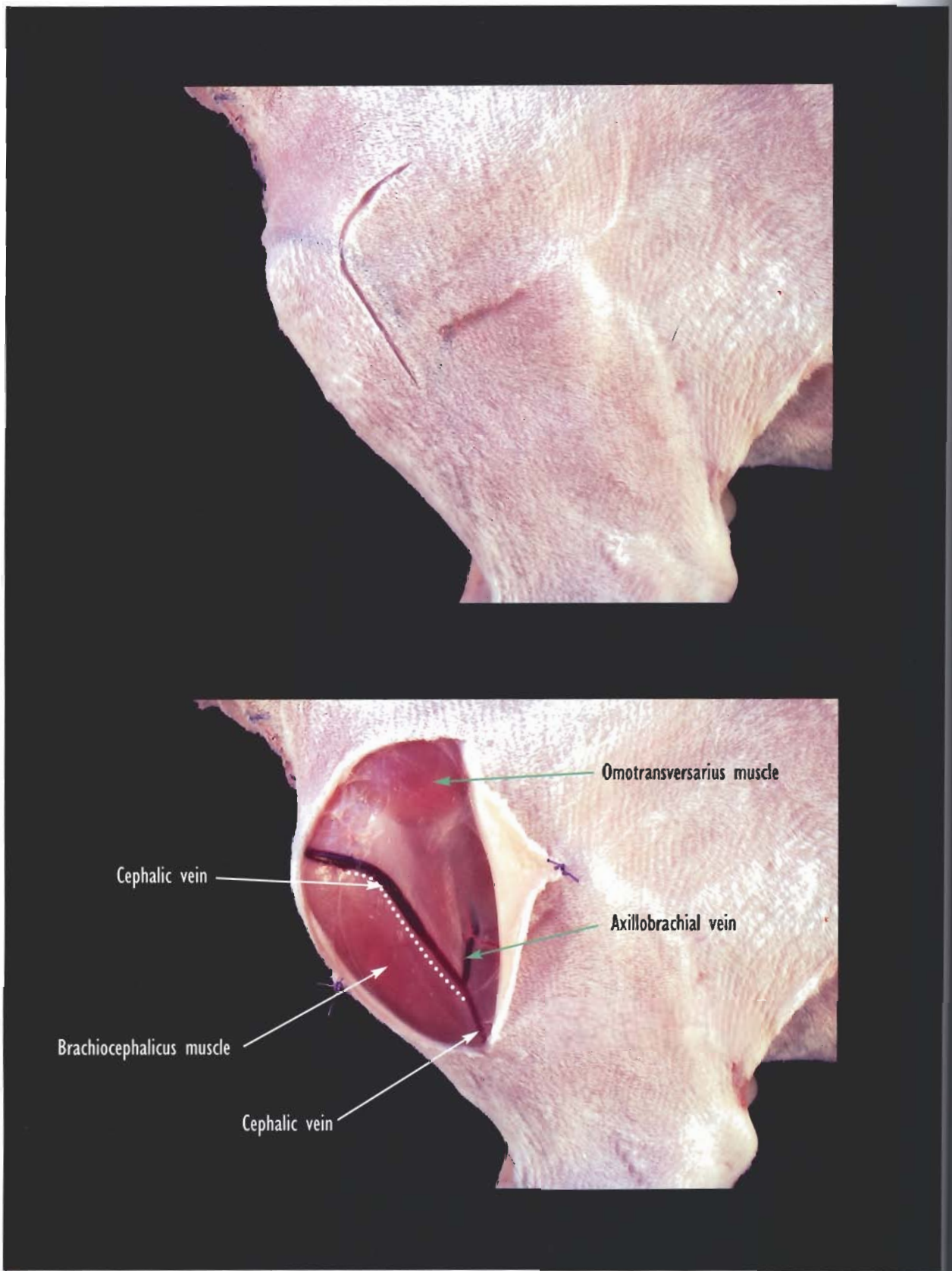


Lateral muscles of the left thoracic limb. The deltoideus and the lateral head of the triceps brachii muscles have been removed.



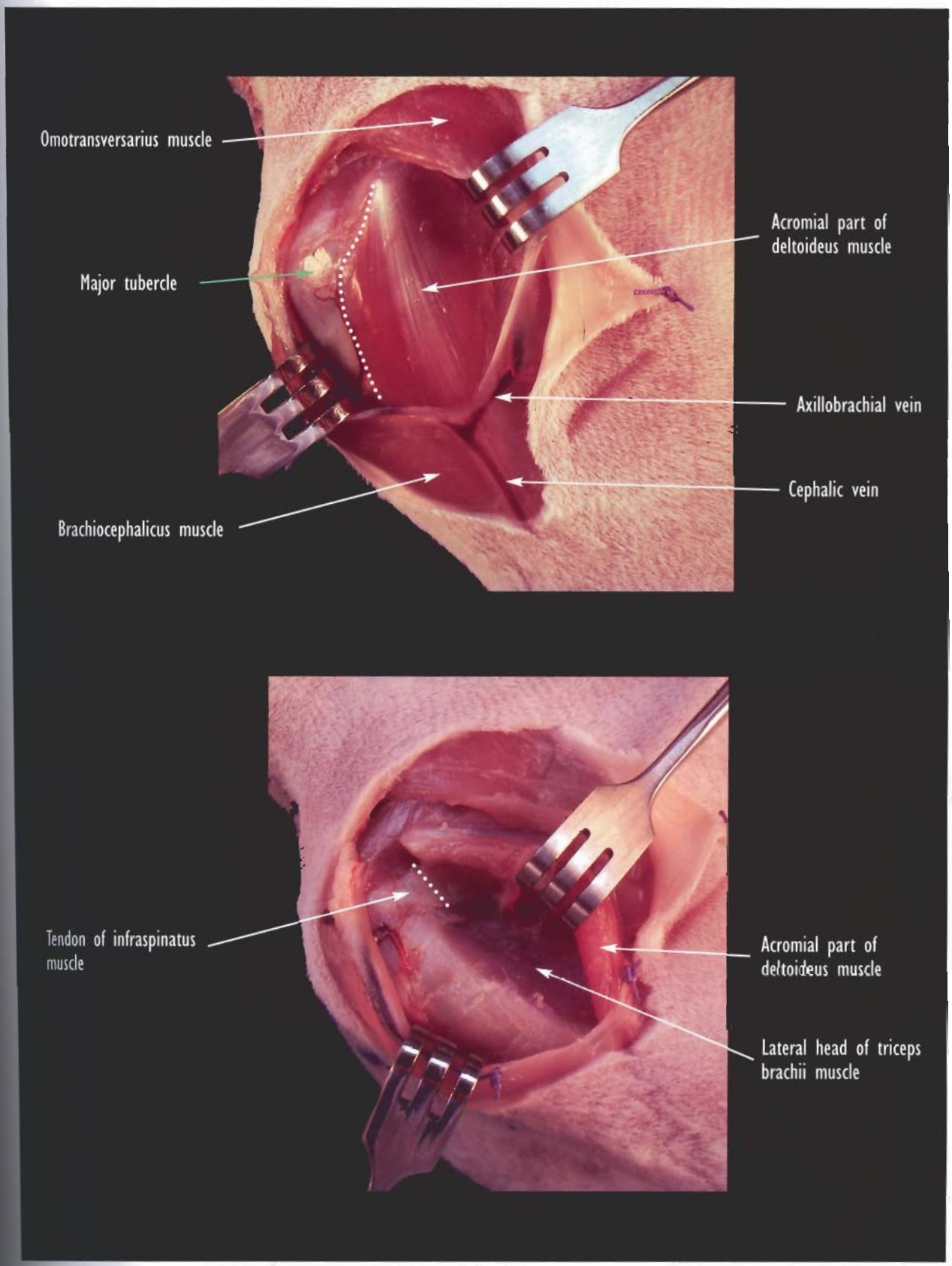
Medial muscles of the left thoracic limb.

Craniolateral approach to the shoulder joint by tenotomy of the infraspinatus muscle



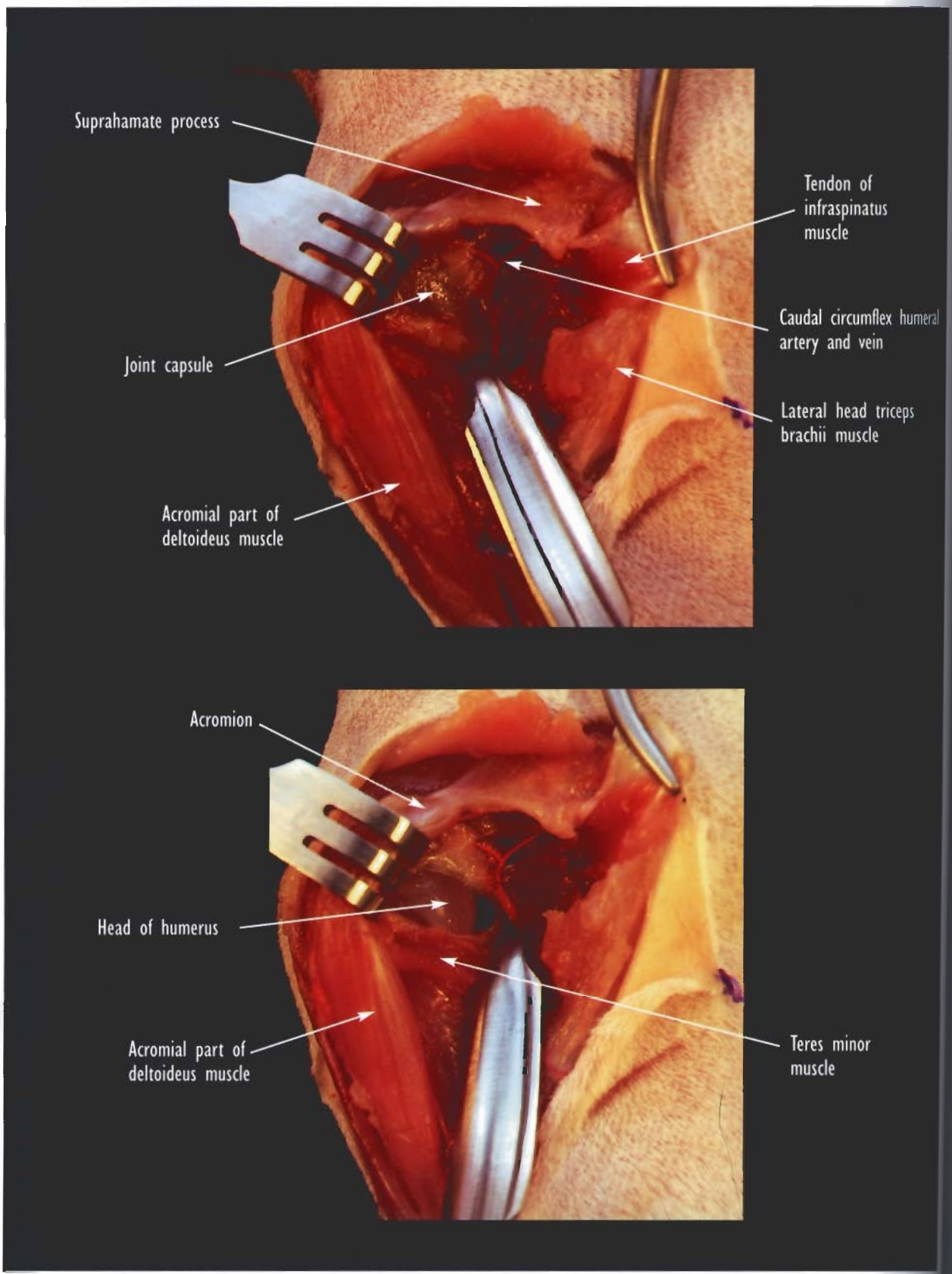
- *Upper image:* the skin incision extends over the major tubercle and distally to the lateral humeral epicondyle. Lateral view, left shoulder.
- *Lower image:* the dorsal border of the brachiocephalicus (dotted line) must be freed and retracted cranially to locate the acromial part of the deltoideus muscle.

CAUTION: preserve the cephalic and axillobrachial veins.



- *Upper image:* the cranial border of the acromial part of the deltoideus muscle (dotted line) must be freed for caudal retraction. Lateral view.
- *Lower image:* caudal retraction of the acromial part of the deltoideus muscle will expose the infraspinatus muscle tendon which will be transected (dotted line).

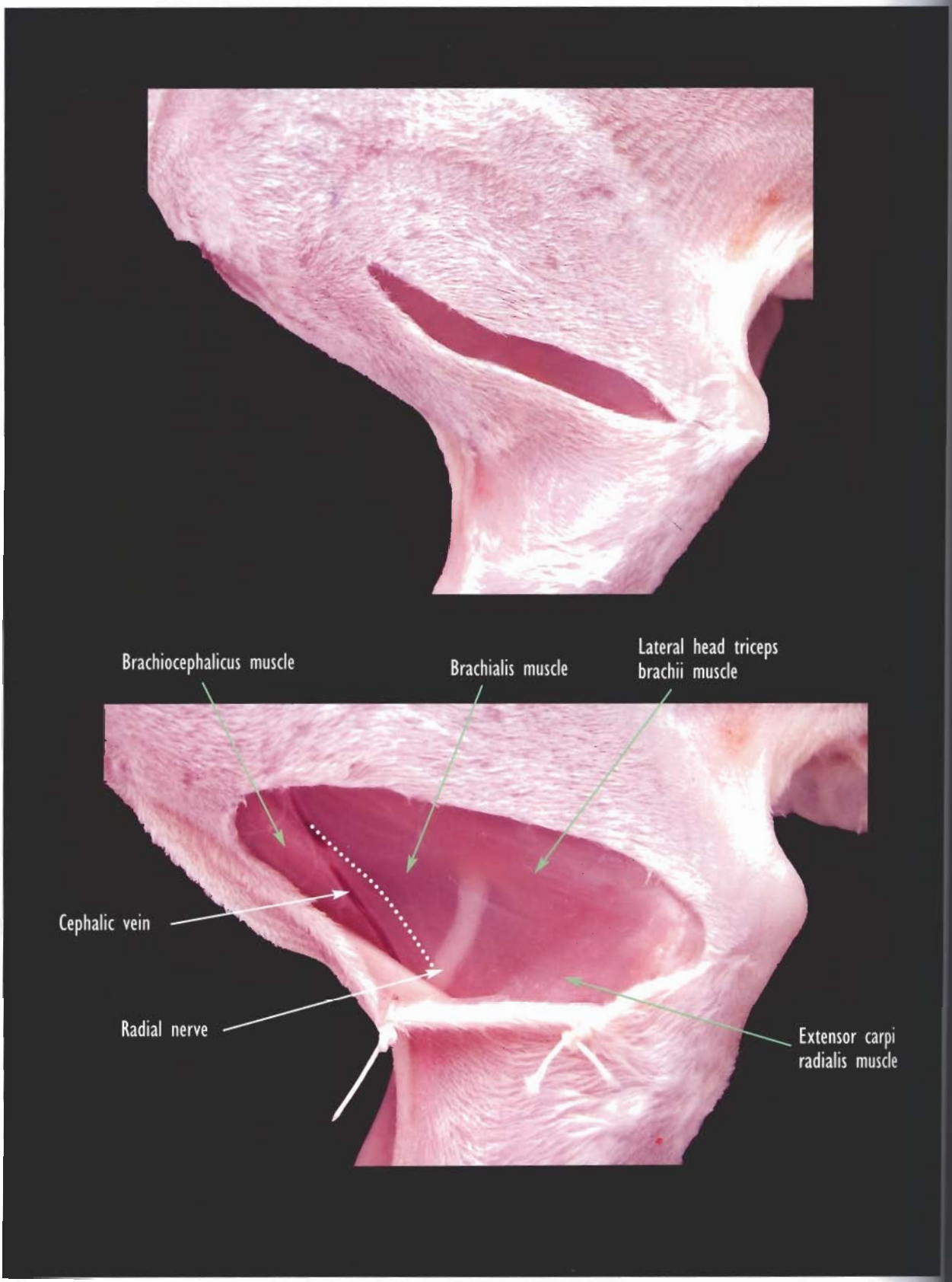
CAUTION: preserve the cephalic and axillobrachial veins.



- *Upper image:* to expose the joint capsule, the transected infraspinatus tendon is reflected caudodorsally and the acromial part of the deltoideus muscle is retracted cranially. Lateral view.
- *Lower image:* The joint capsule is cut to examine the articular surface and the teres minor muscle is retracted distally for greater exposure. In addition, internal rotation of the humerus allows better examination of the humeral head.

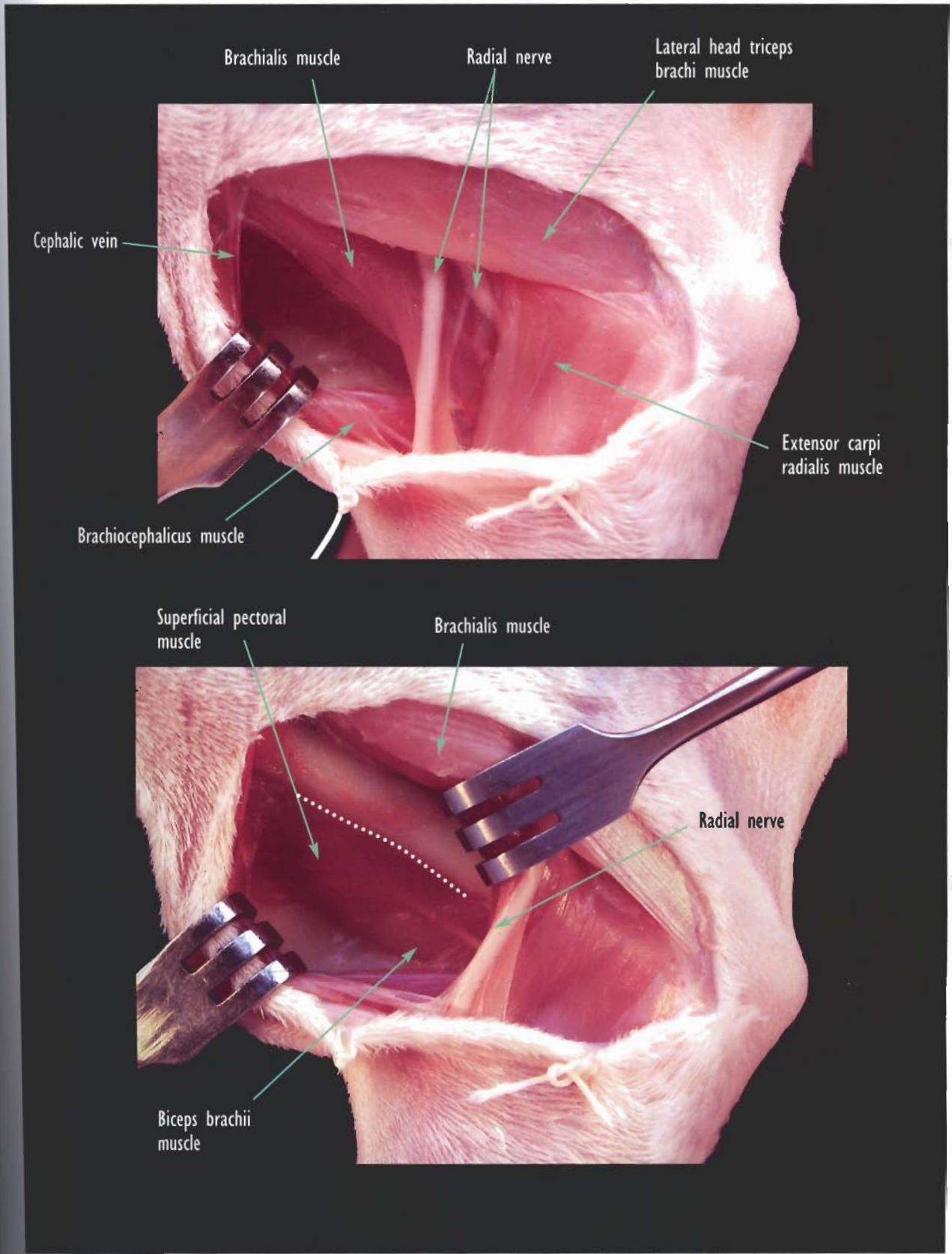
CAUTION: protect the cephalic and the axillobrachial veins.

Humerus: approach to the distal portion of the diaphysis by craniolateral incision



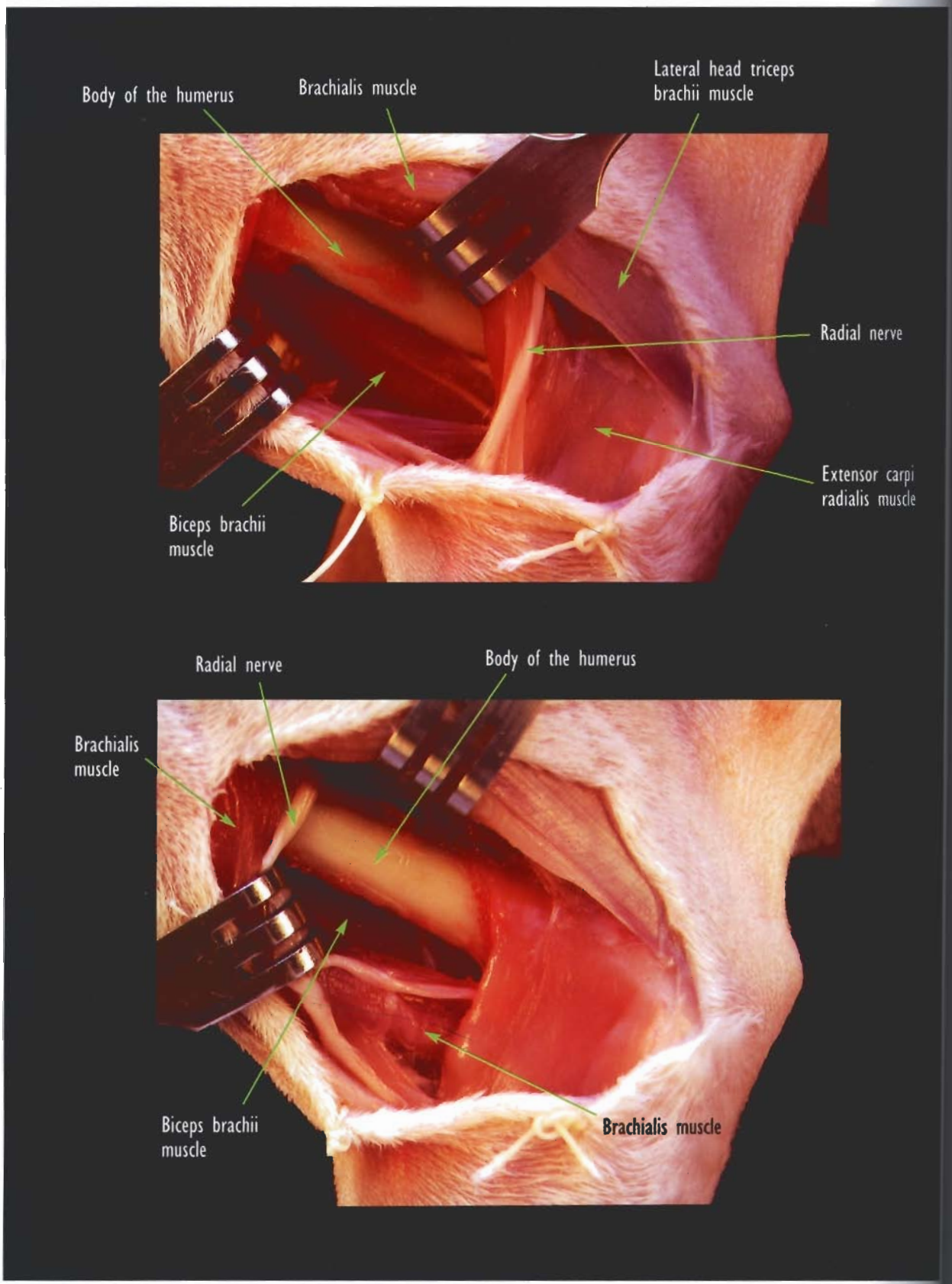
- *Upper image:* a curved cutaneous incision extends from the deltoid tuberosity to the lateral epicondyle. Lateral view, left arm.
- *Lower image:* free the fascia and identify the superficial muscles. The approach will continue between the brachiocephalicus and brachialis muscles (dotted line).

CAUTION: protect the cephalic vein and radial nerve.



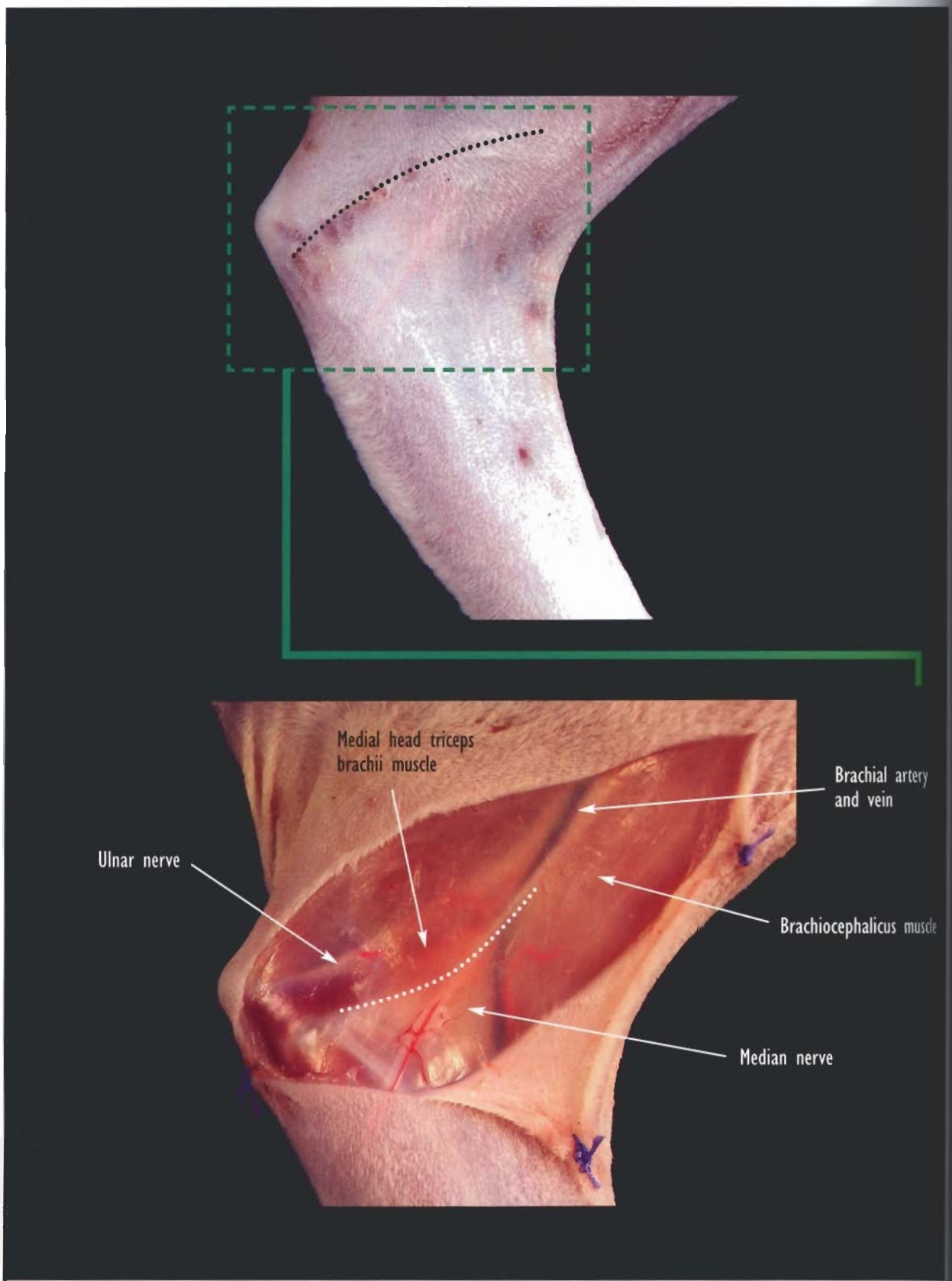
- *Upper image:* cranial retraction of the brachiocephalicus muscle provides greater exposure of the brachialis muscle. Lateral view.
- *Lower image:* the distal one third of the humerus is exposed by caudal retraction of the brachialis muscle and the radial nerve. Cutting the insertion of the superficial pectoral muscle (dotted line) provides greater exposure of the distal humerus.

CAUTION: protect the radial nerve.



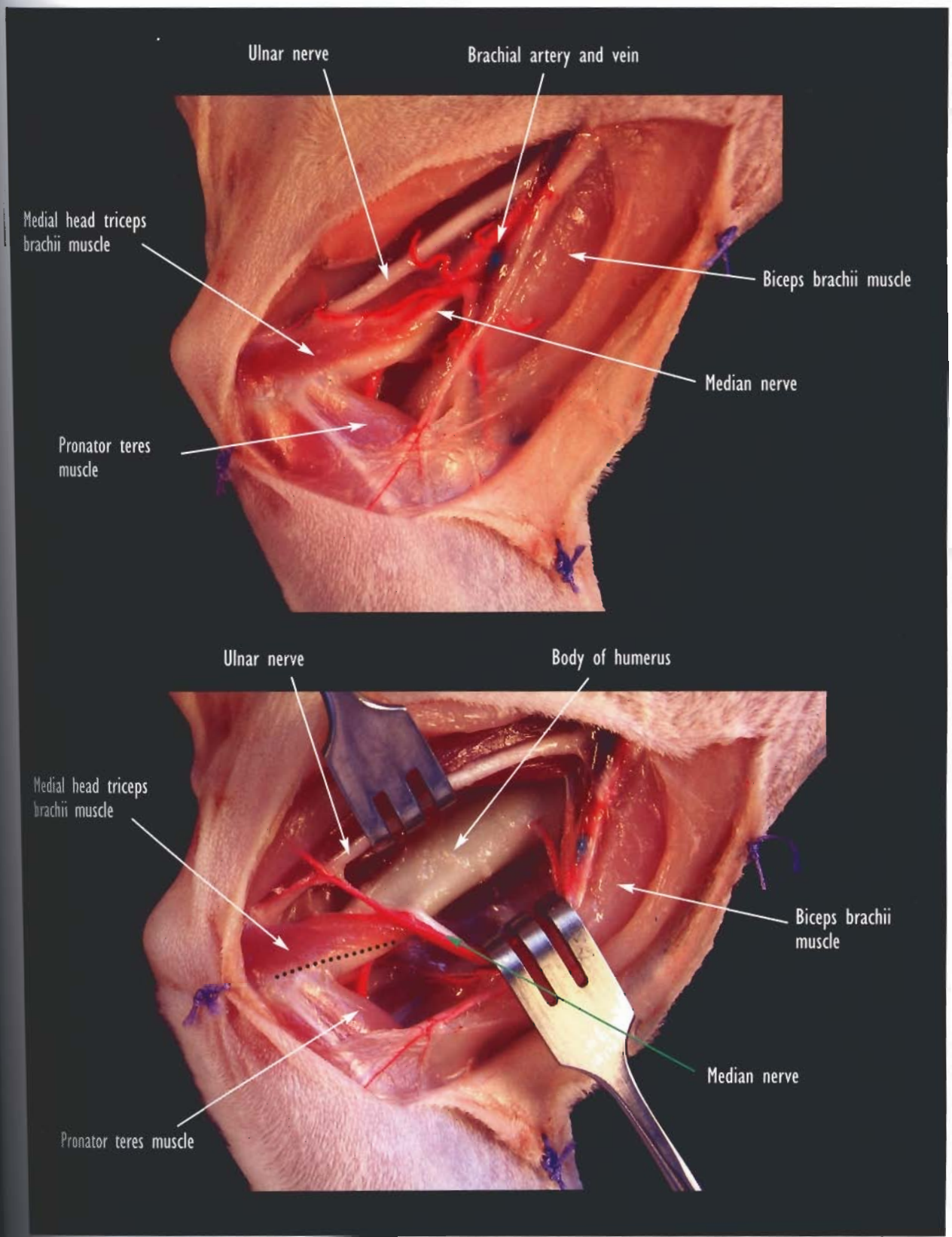
- *Upper image:* after cutting the insertion of the superficial pectoral muscle, exposure to the distal humerus is enhaced. Craniolateral view.
- *Lower image:* cranial retraction of the biceps brachii and brachialis muscles provides exposure of the distal one third of the humerus.

Approach to the distal humeral diaphysis and the humeral supracondylar region via a medial incision



- *Upper image:* the skin incision extends from the distal third of the humerus to the proximal third of the radius, passing over the medial humeral epicondyle. Medial view, left elbow.
- *Lower image:* the skin has been displaced to demonstrate the medial head of the triceps brachii muscle and the course of the ulnar nerve over the medial epicondyle. The deep brachial fascia will be cut cranial to the ulnar nerve (dotted line) and retracted cranially.

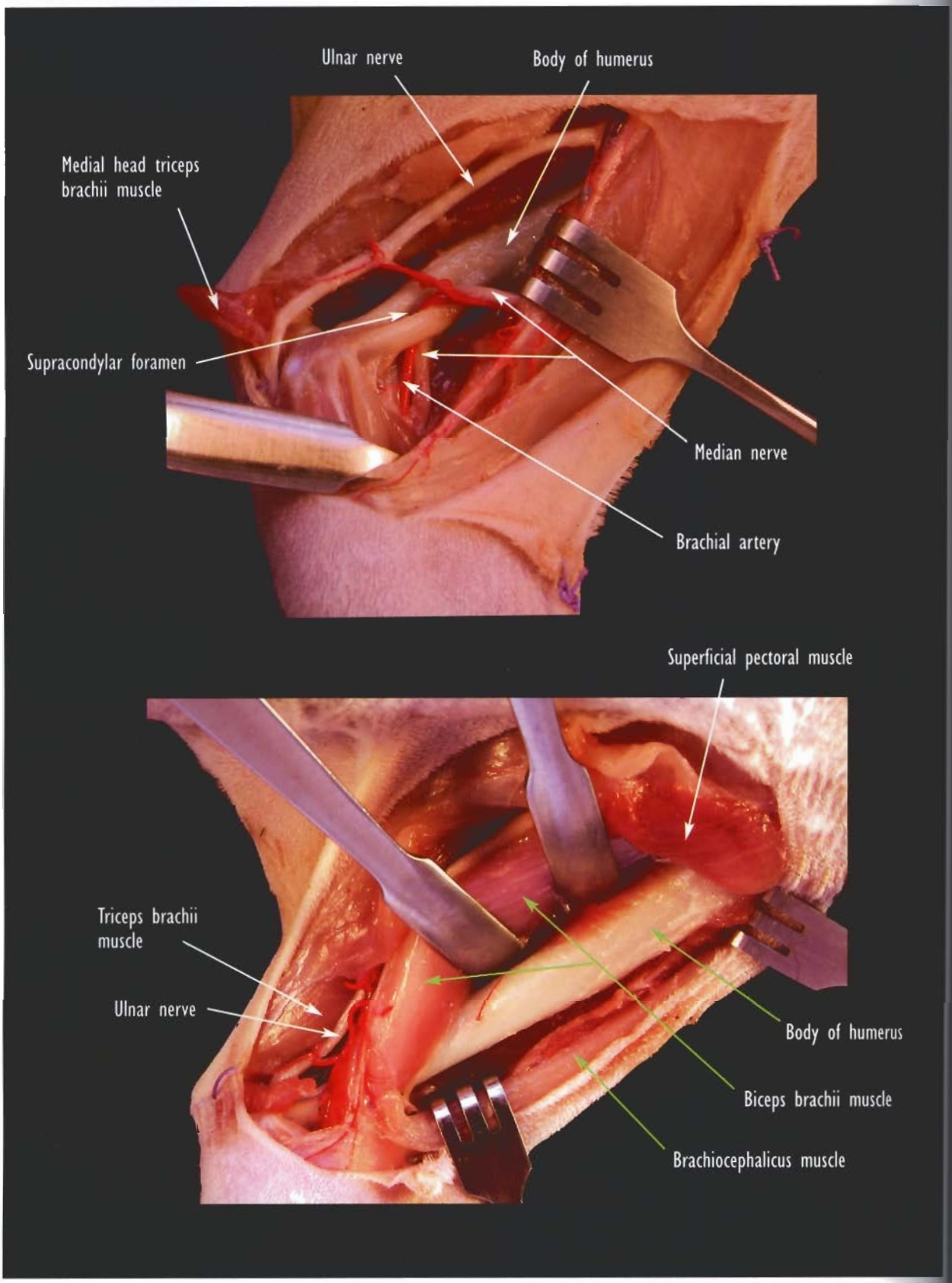
CAUTION: protect the ulnar nerve.



Upper image: opening the supracondylar brachial fascia, exposes the biceps brachii muscle and the brachial neurovascular bundle. Medial view.

Lower image: cranial retraction of the biceps brachii muscle, brachial vessels and the median nerve provides greater exposure of the humeral diaphysis. As well, the triceps brachii muscle and ulnar nerve may be retracted caudally. The origin of the medial head of the triceps brachii muscle (dotted line) may be transected and the muscle also retracted caudally for better exposure.

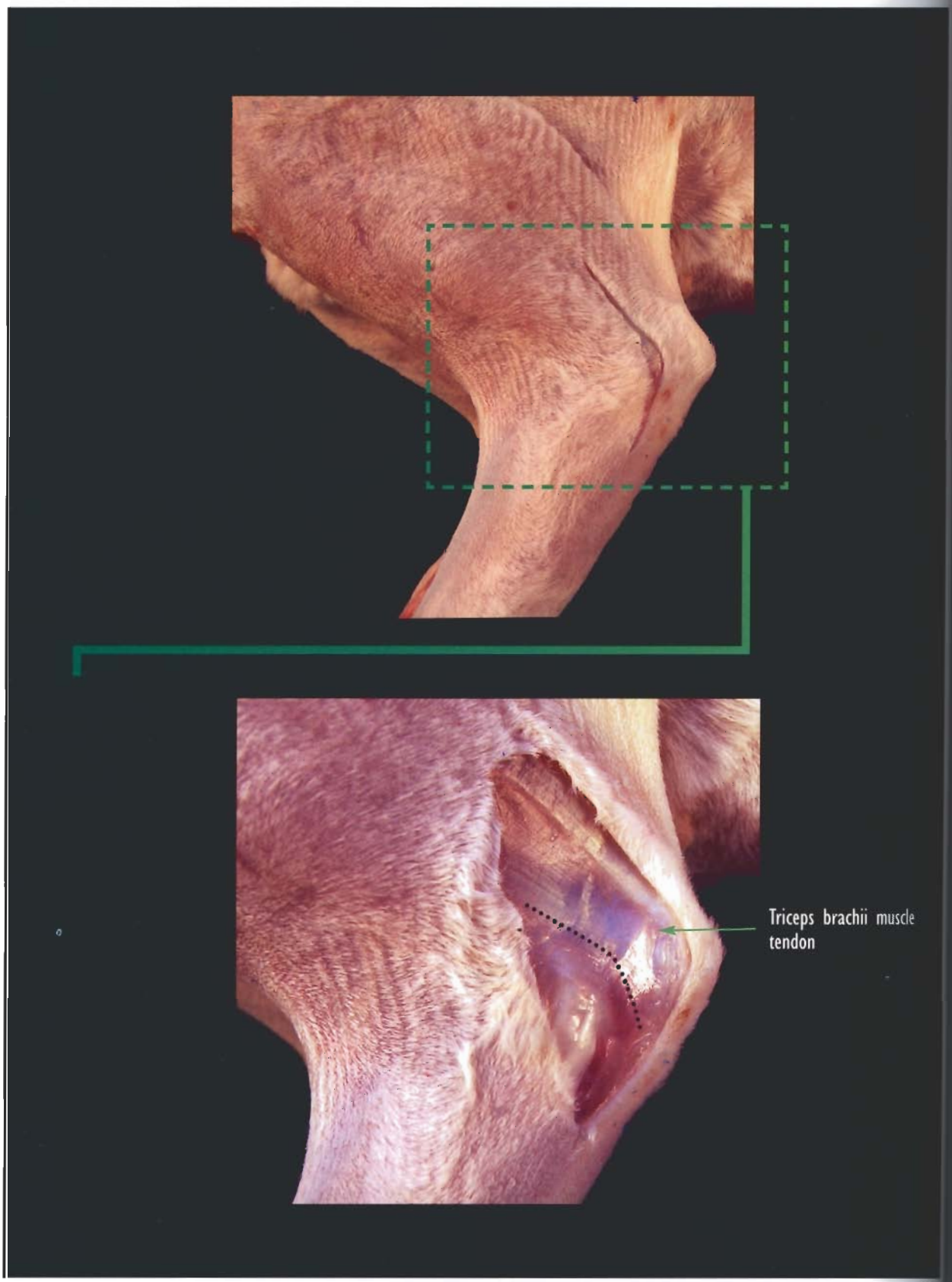
CAUTION: the brachial artery and median nerve pass through the supracondylar foramen.



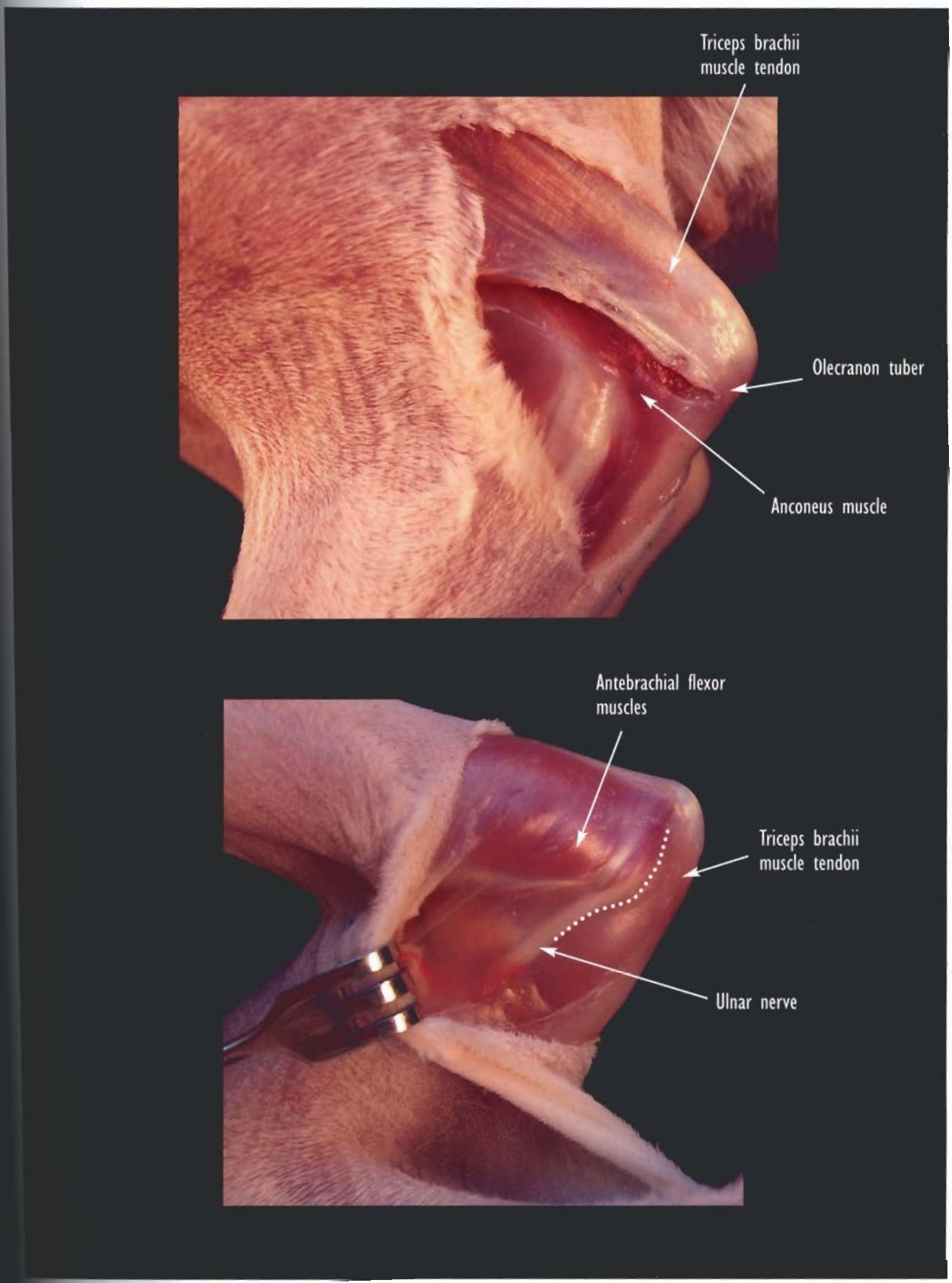
- *Upper image:* after the medial head of the triceps brachii muscle has been freed, the supracondylar region and its supracondylar foramen and associated structures can be viewed.
- *Lower image:* transecting the proximal attachment of the superficial pectoral muscle, yields greater exposure including the proximal third of the humerus. In addition, the biceps brachii muscle, brachial vessels and the median nerve may be retracted caudally to enhance this view.

CAUTION: protect the vessels and nerves.

Approach to the humero-ulnar portion of the elbow joint by olecranon osteotomy



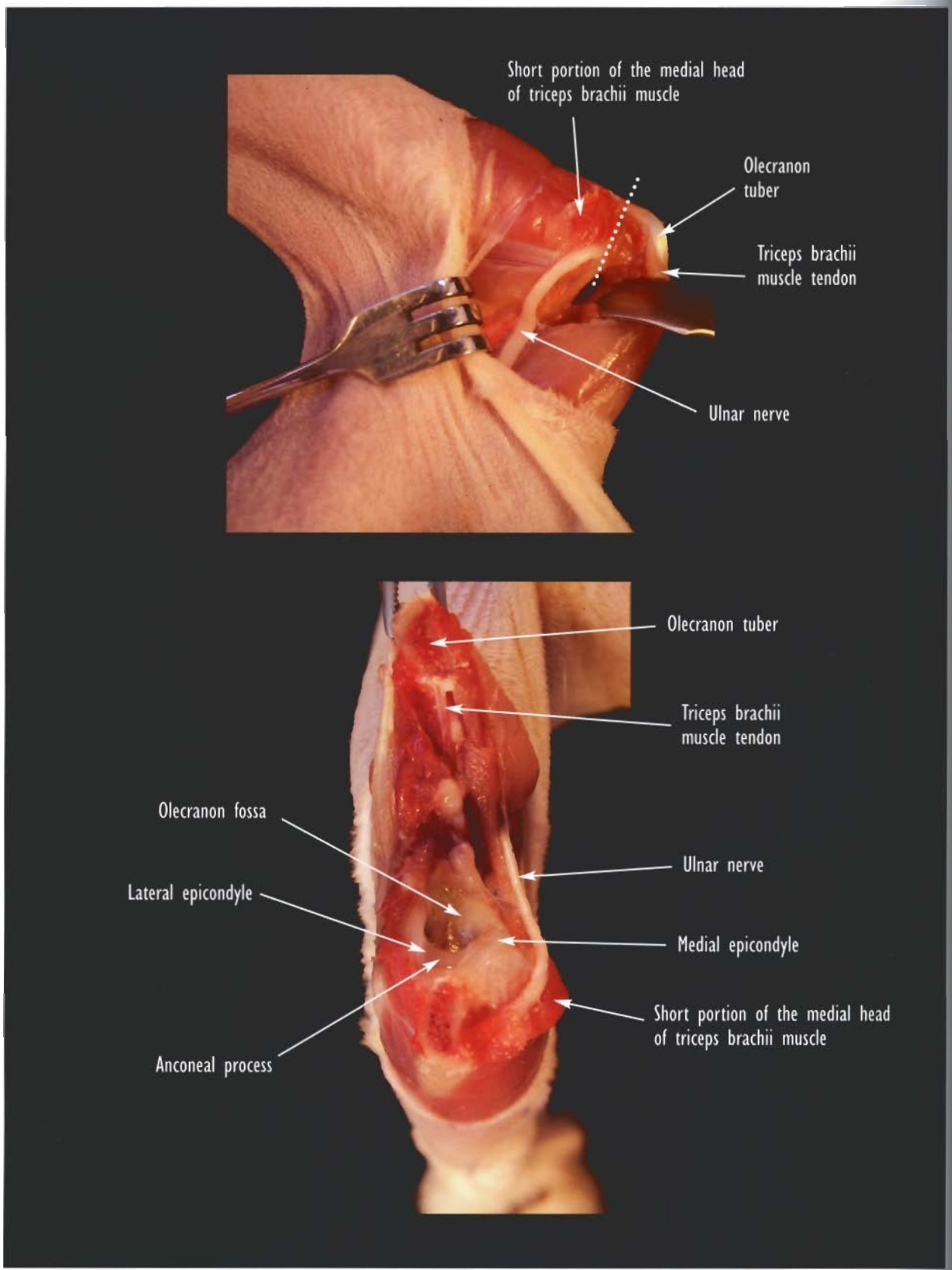
- *Upper image:* the arced skin incision extends from the humeral supracondylar region to the caudal aspect of the humeroulnar portion of the elbow joint. Lateral view, left elbow.
- *Lower image:* the fascia is dissected to identify and prepare the cranial margin of the triceps brachii muscle tendon for a lateral approach (dotted line).



Upper image: the triceps muscle tendon and anconeus muscle are delimited in preparation for reflection of the triceps tendon with the olecranon tuber. Lateral view.

Lower image: the limb is abducted to delimit the triceps brachii tendon from the medial aspect. Medial view.

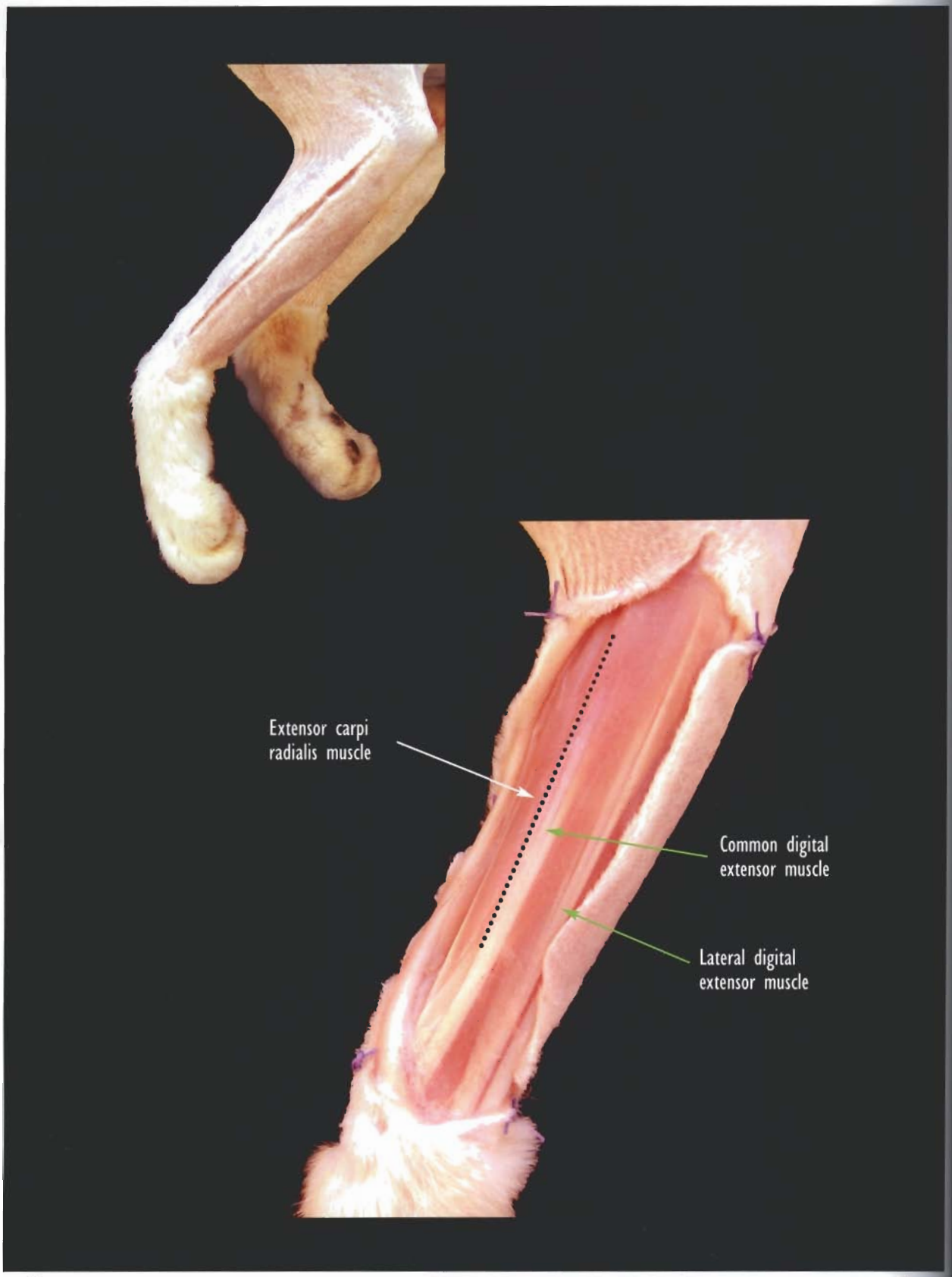
CAUTION: protect the ulnar nerve over the medial aspect of the elbow.



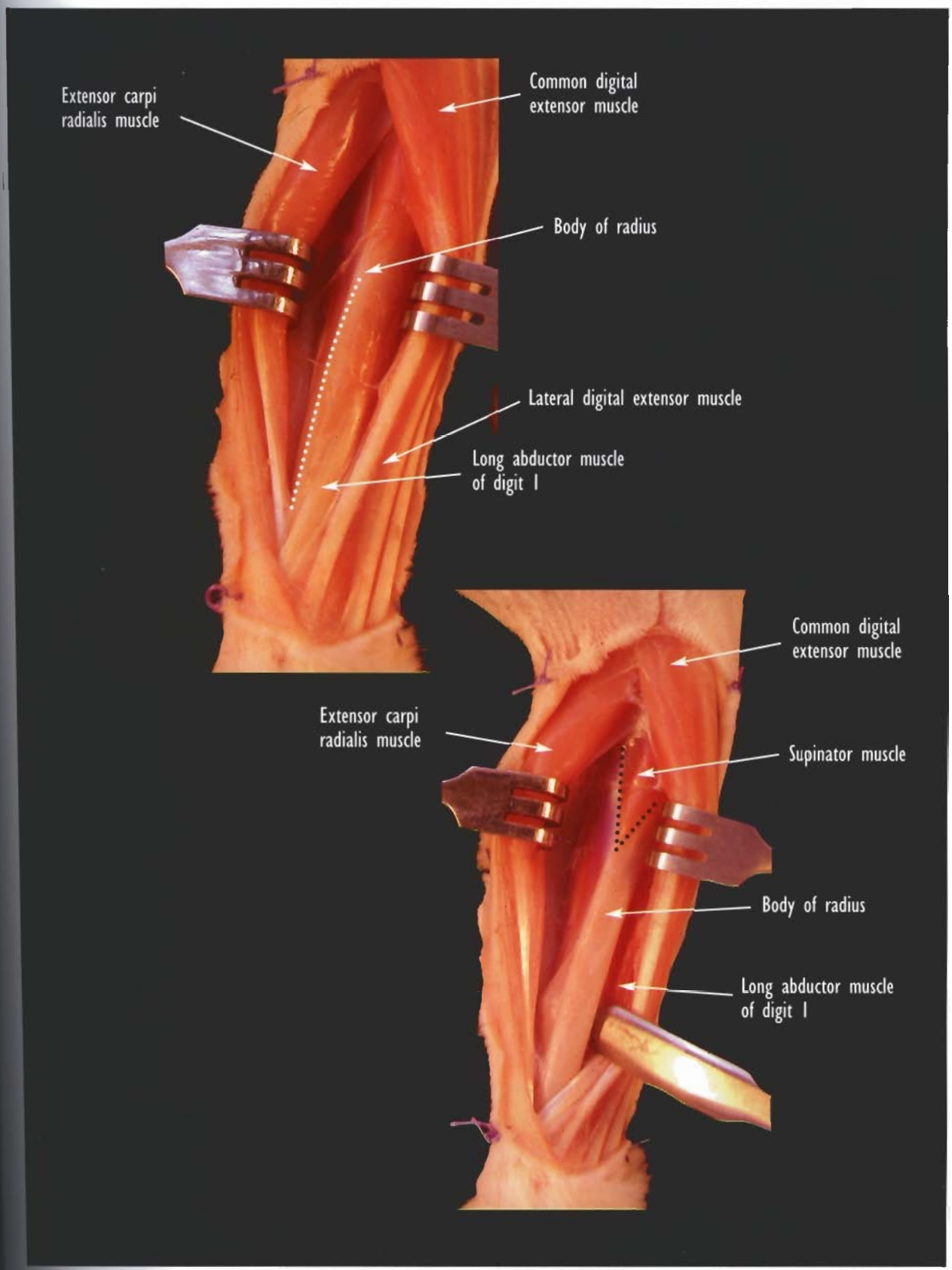
- *Upper image:* the short portion of the medial head of the triceps brachii muscle is separated to allow better isolation of the tendon and exposure of the olecranon tuber. The osteotomy will be made at a 45° angle with the long axis of the ulna. Medial view.
- *Lower image:* the intraarticular structures can be seen after the olecranon tuber is transected and reflected proximally. Caudodorsal view, left elbow.

CAUTION: keep the triceps brachii tendon attached to the olecranon tuber.

Approach to the diaphysis of the radius via a lateral incision

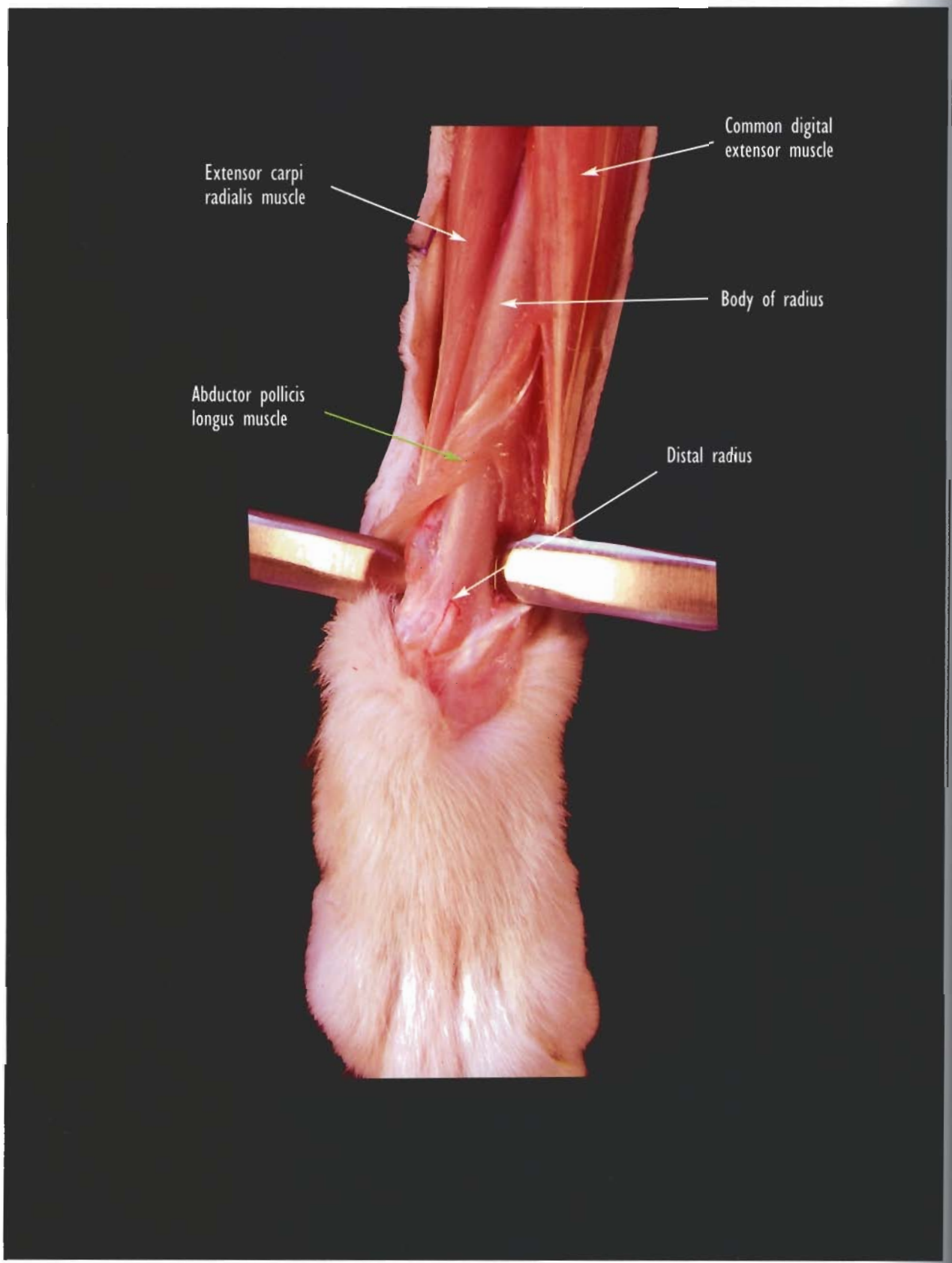


- *Upper image:* the skin incision over the lateral forearm extends from the lateral humeral epicondyle to the carpus. Lateral view, left forearm.
- *Lower image:* the antebrachial fascia is opened to expose the extensor carpi radialis and common digital extensor muscles in preparation to separate them (dotted line).



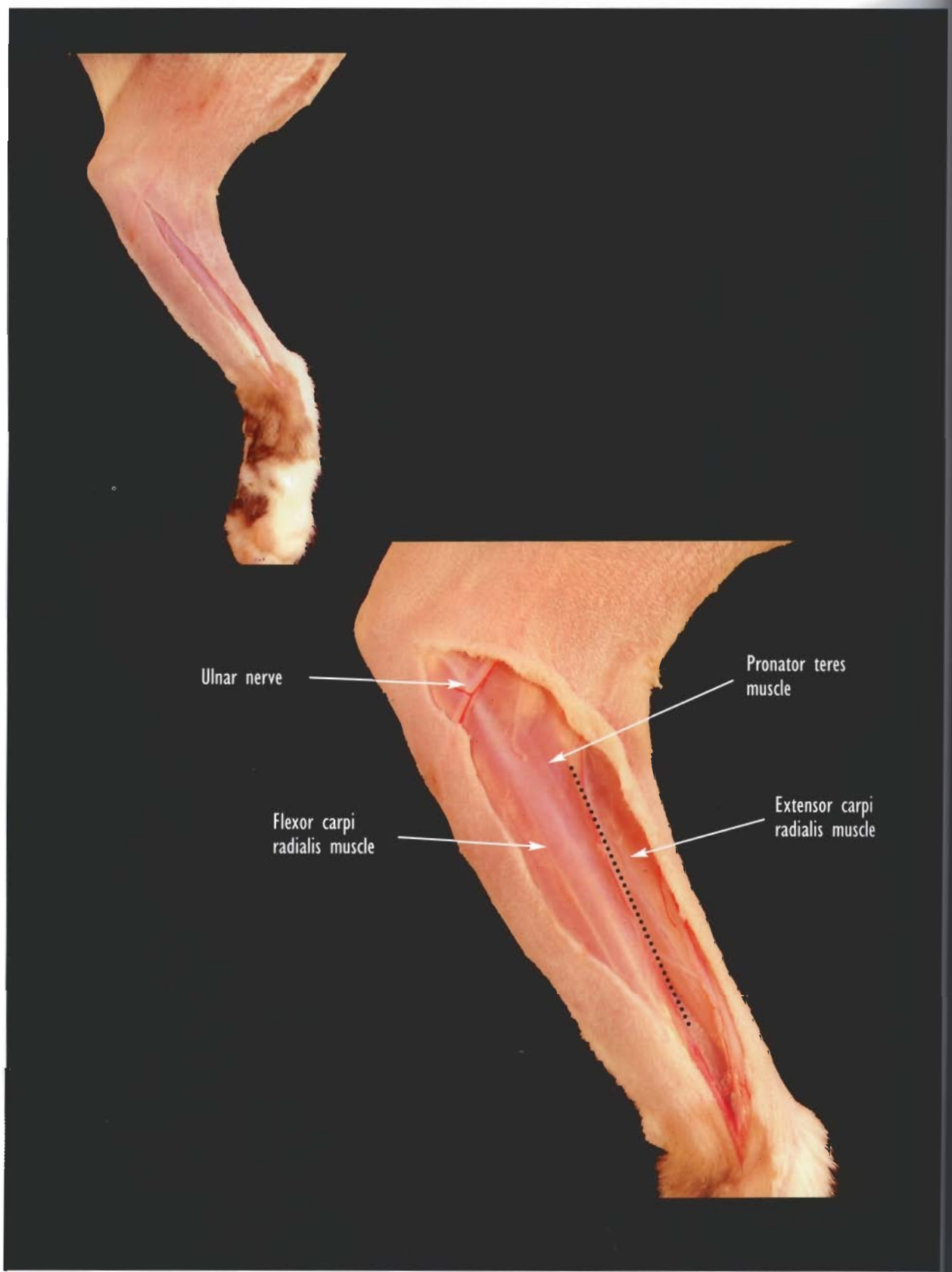
Upper image: the radial body and the long abductor muscle of digit I are exposed by retraction of the extensor carpi radialis muscle cranially and the common digital extensor muscle caudally. For greater exposure of the distal third of the radius, the attachment (dotsection) of the long abductor muscle of digit I to the radius may be incised and reflected. Lateral view.

Lower image: after section and caudal retraction of the long abductor muscle of digit I, the distal radius is exposed. Exposure can be extended proximally by separation of the supinator muscle (dotted lines) yielding complete access to the radius.



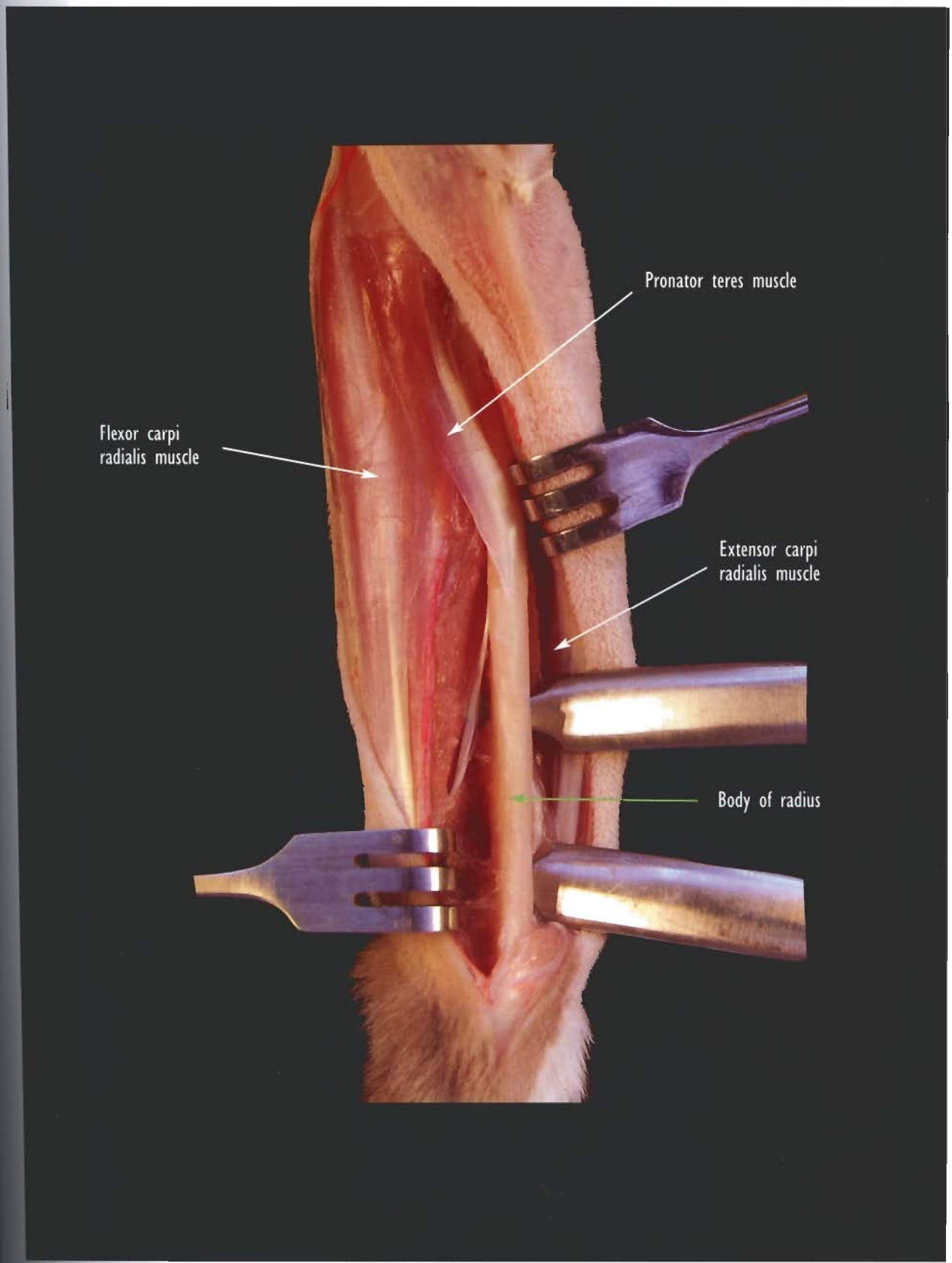
The distal radius may be approached by extending the skin incision distally to the carpus. Cranial view.

Approach to the diaphysis of the radius via a medial incision



- *Upper image:* the skin incision on the craniomedial forearm, extends distally from the elbow to the radial styloid process. Medial view, left forearm.
- *Lower image:* the antebrachial fascia is divided and the junction of the extensor carpi radialis and pronator teres muscles is located (dotted line) in preparation for separation.

CAUTION: preserve the cephalic and accessory cephalic veins.



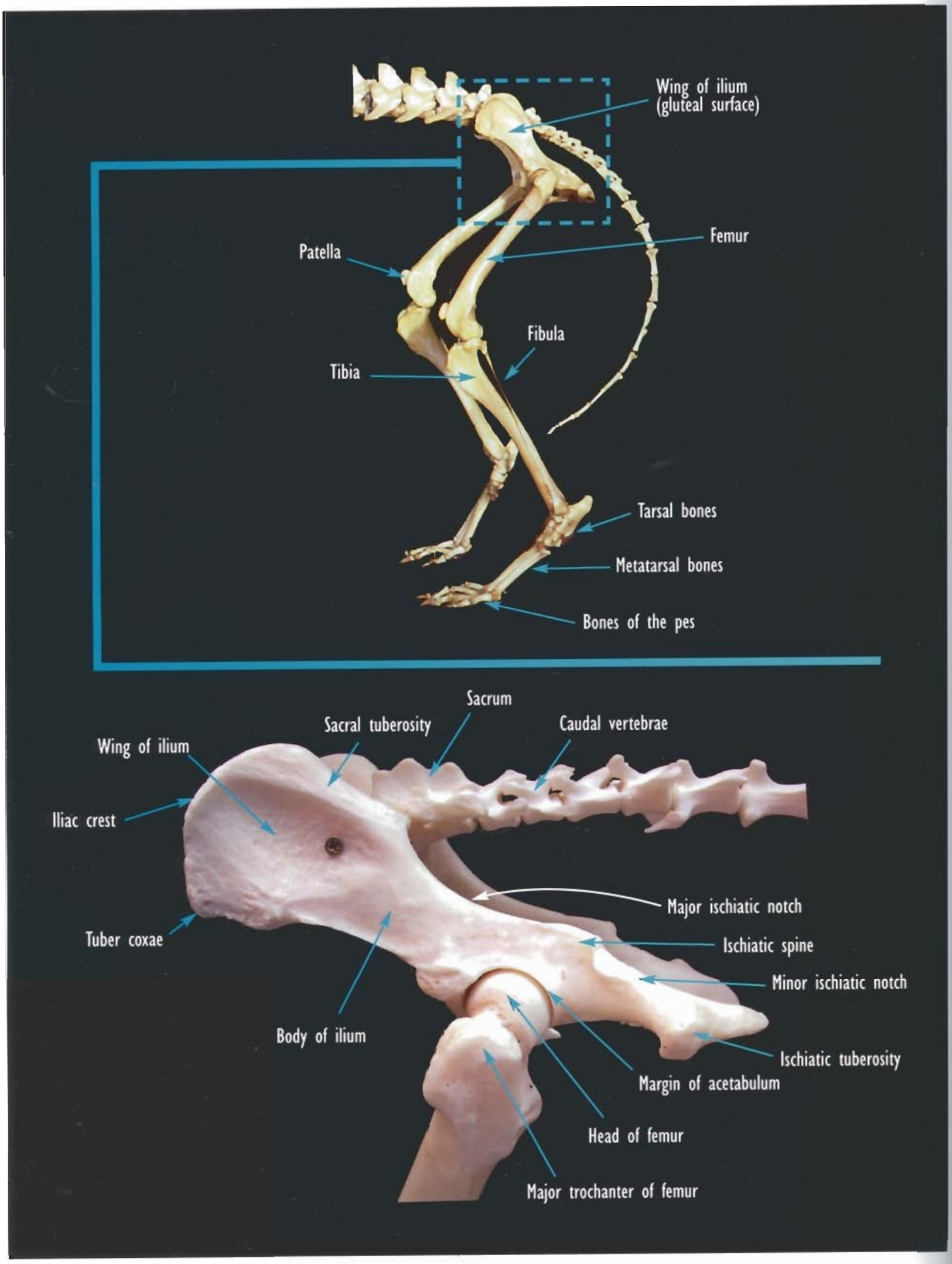
The distal radius and body are exposed by reflecting the extensor carpi radialis muscle cranially and the pronator teres and the flexor carpi radialis muscles caudally. Medial view.

3

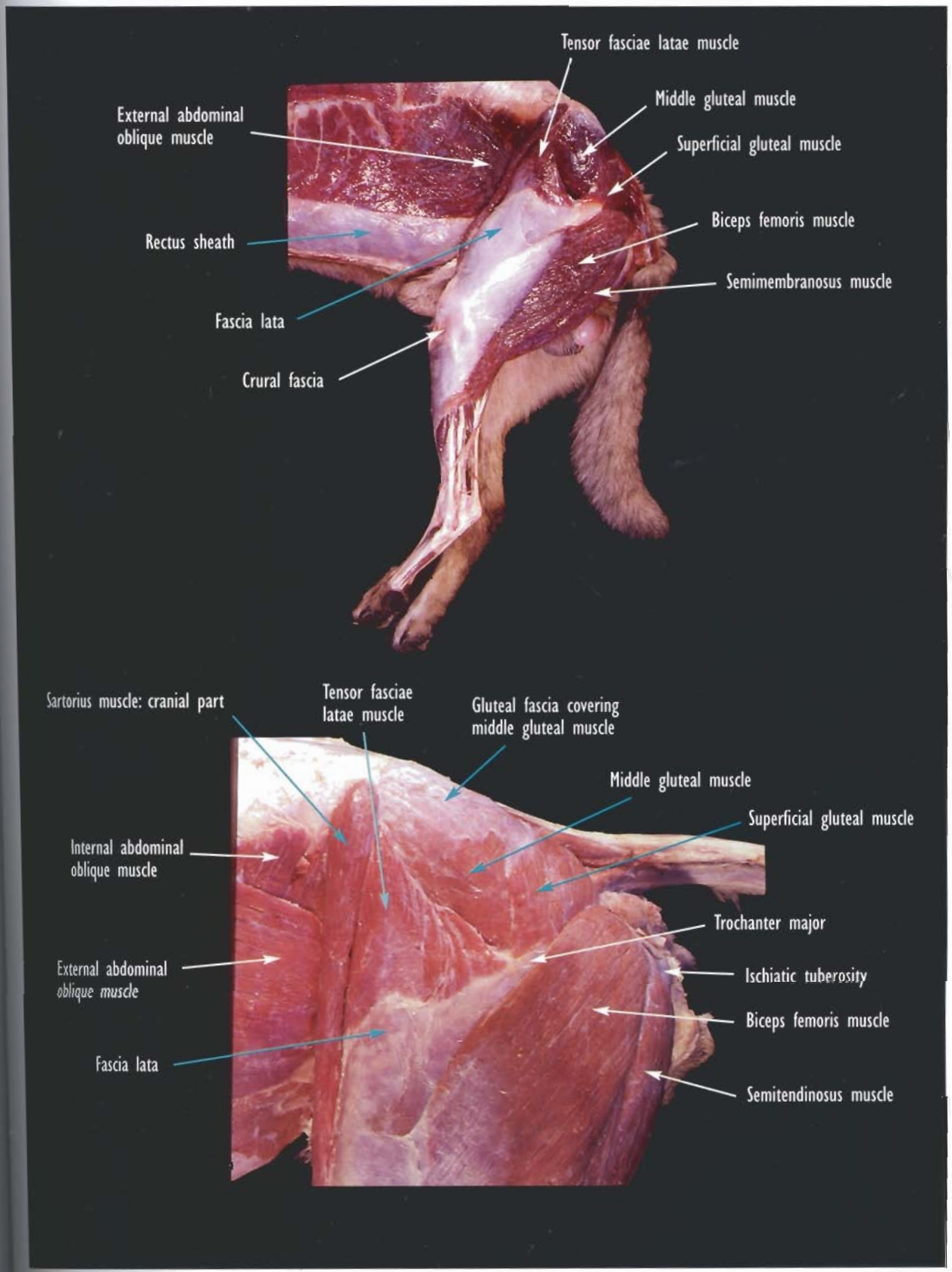
Dog
Pelvic limb

The pelvis and hip (coxal) joint

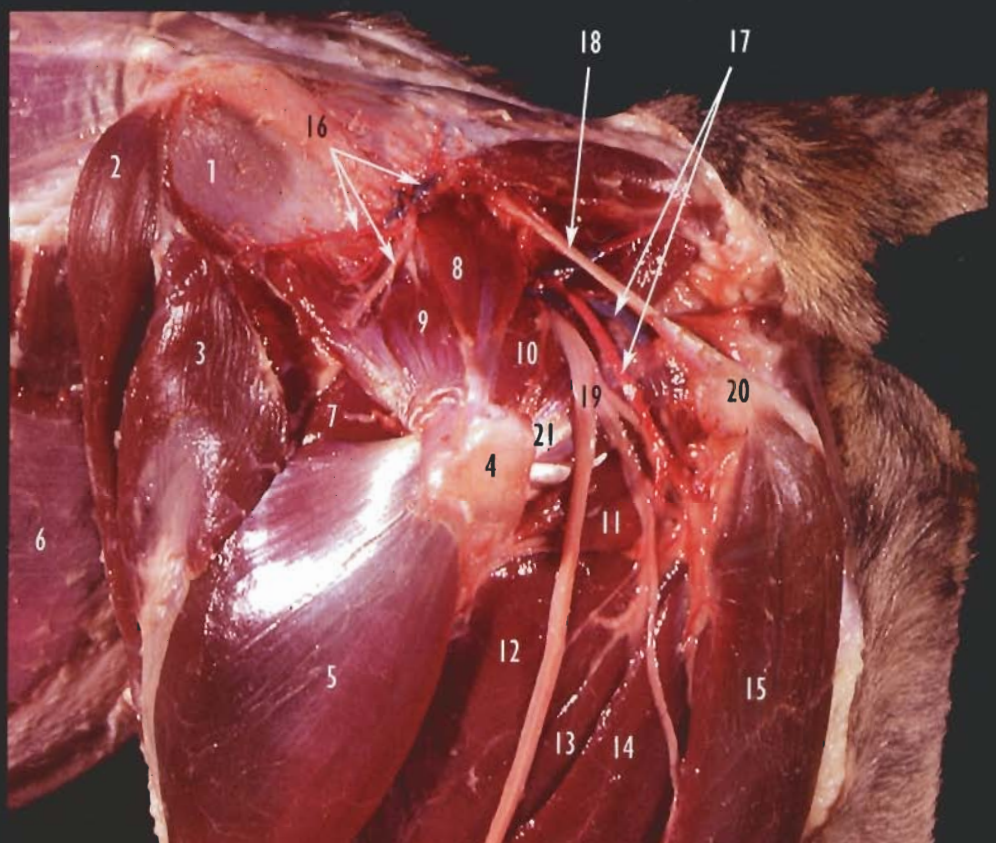
Anatomical considerations



■ *Upper image:* skeleton of pelvic limb. Left view.
■ *Lower image:* close up of skeleton of the pelvis and hip joint.
See videos 6 and 7, 3D reconstruction of hip joint.



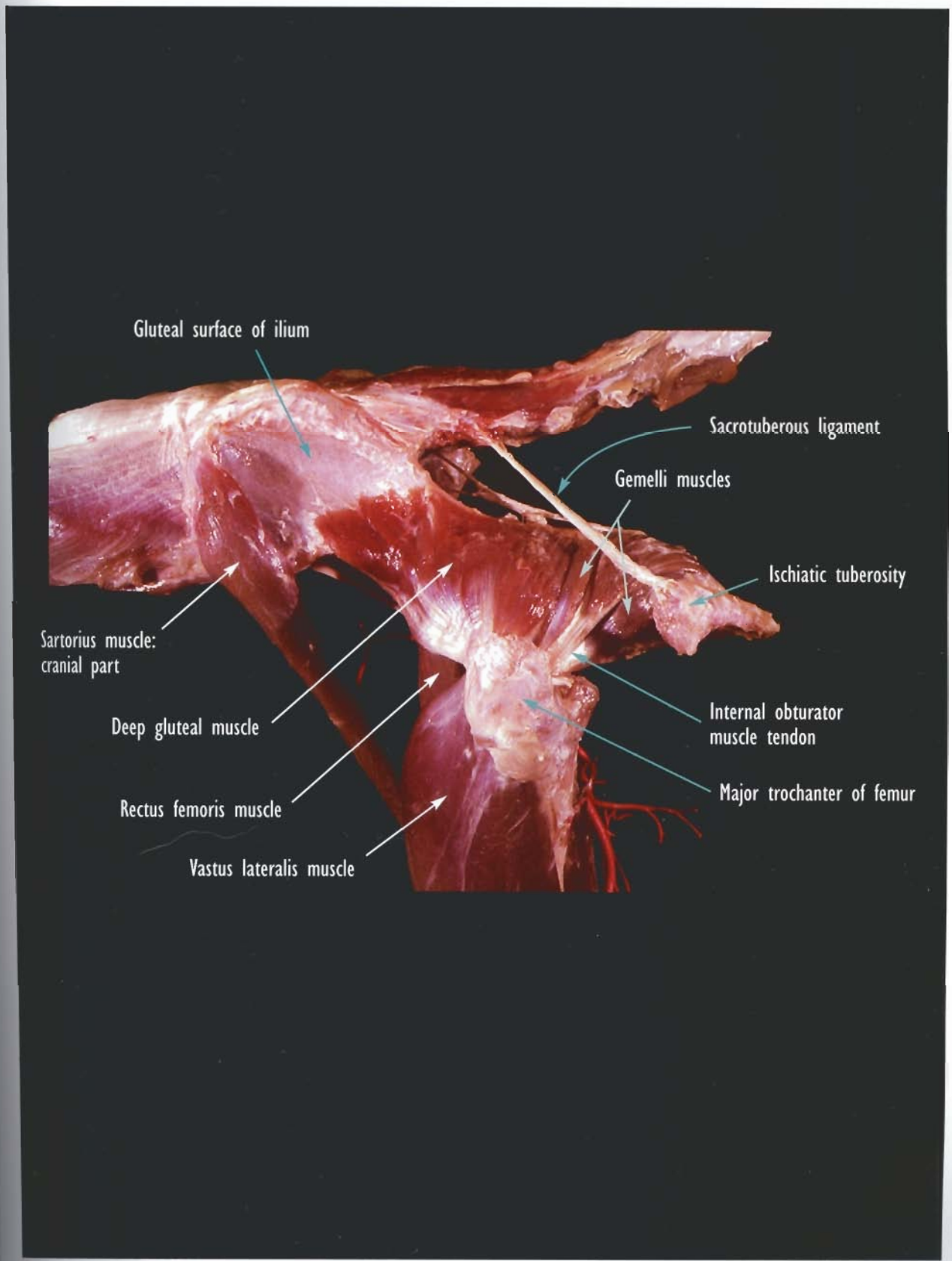
Upper image: superficial musculature of left pelvic limb. Lateral view.
Lower image: close up of musculature of the gluteal region.



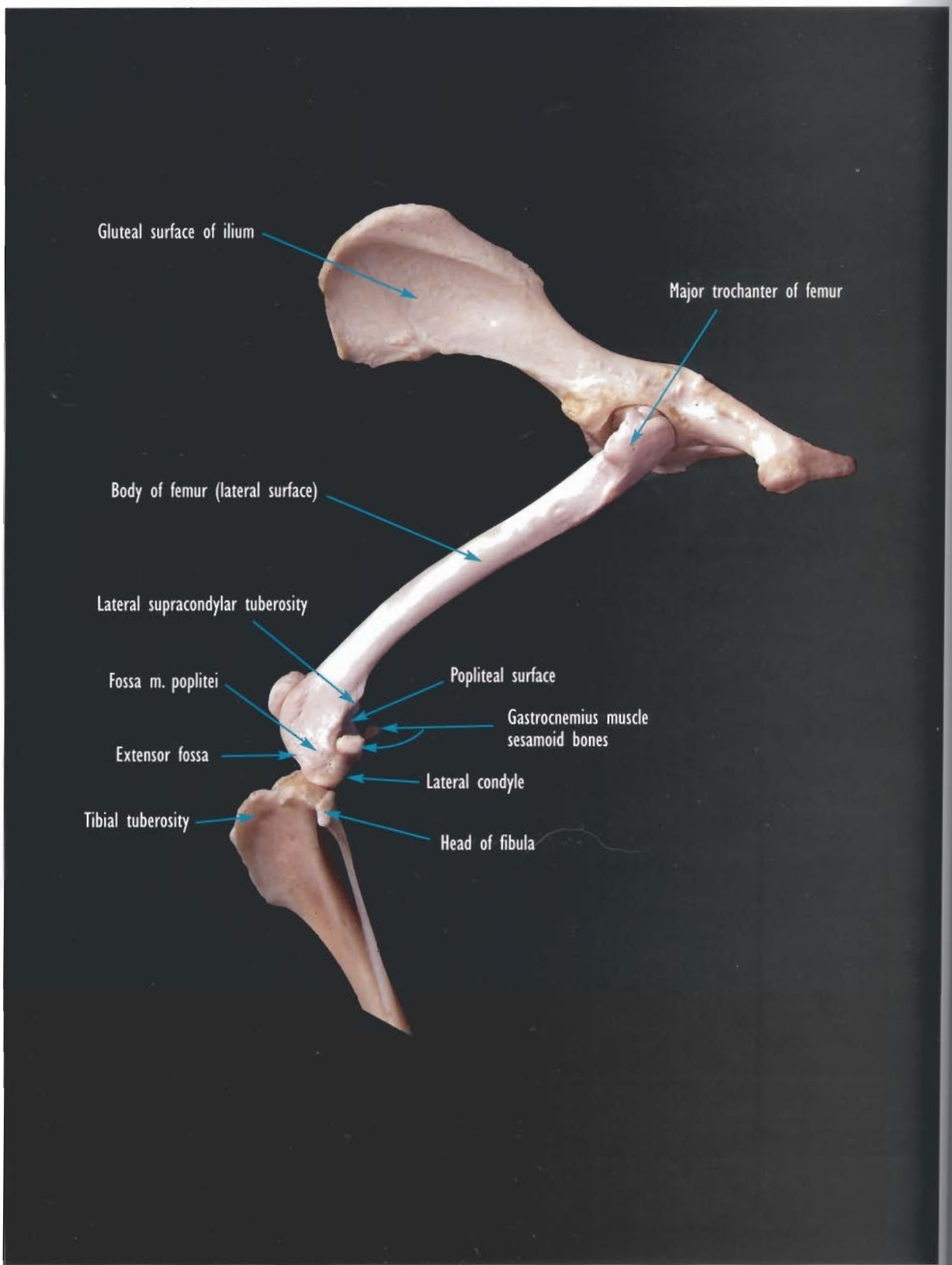
Legends

1- Ilium: gluteal surface
2- Sartorius muscle: cranial part
3- Tensor fasciae latae muscle
4- Major trochanter of femur
5- Quadriceps femoris muscle: vastus lateralis
6- External abdominal oblique muscle
7- Quadriceps femoris muscle: rectus femoris
8- Piriformis muscle
9- Deep gluteal muscle
10- Gemellus muscle
11- Quadratus femoris
12- Adductor muscle
13- Semimembranosus muscle (cranial)
14- Semimembranosus muscle (caudal)
15- Semitendinosus muscle
16- Cranial gluteal artery, vein and nerve
17- Caudal gluteal artery and vein
18- Sacrotuberous ligament
19- Sciatic nerve
20- Ischiatic tuberosity
21- Internal obturator muscle

■ Deep dissection of the gluteal region. The superficial and middle gluteal and biceps femoris muscles have been removed. Vessels are injected with colored latex. Note the relationship between the sacrotuberous ligament, caudal gluteal vessels and sciatic nerve. Lateral view, left limb.



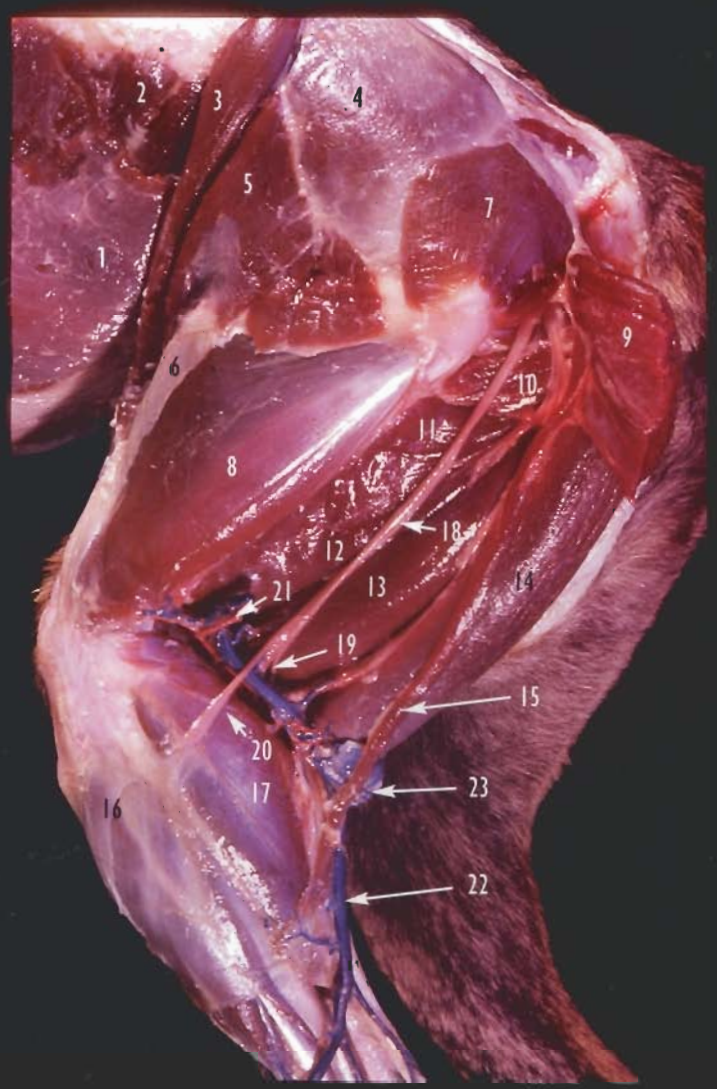
Deeper dissection showing the deep muscles of the hip joint. In additon to the superficial and middle gluteal and biceps femoris muscles, the adductor, semimembranosus and semitendinosus muscles have been removed. Removal of the sciatic nerve and caudal gluteal vessels provide a clear view of the gemelli and internal obturator muscles. Lateral view, left limb.



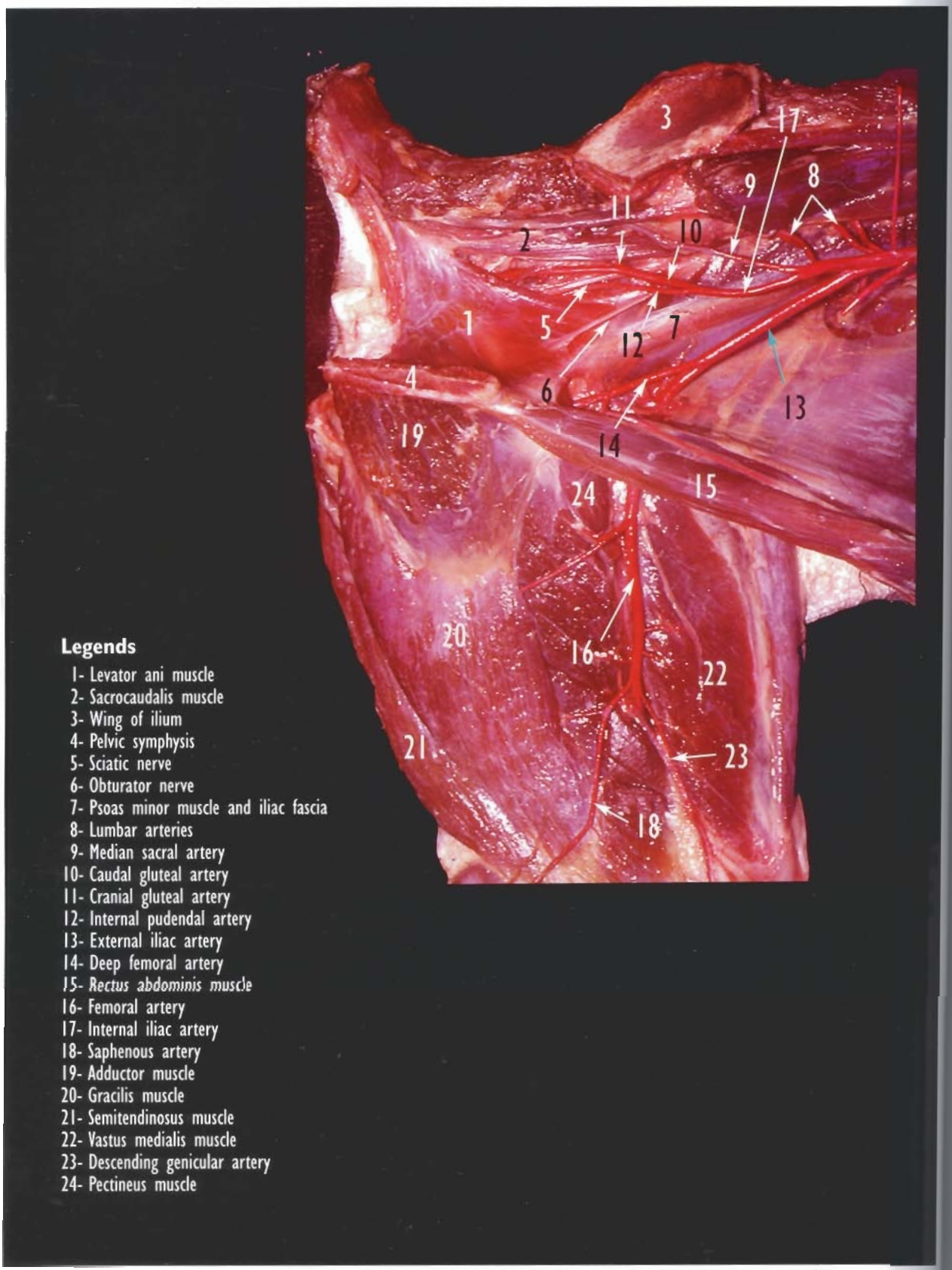
■ Close up of the bones of the thigh and stifle. Lateral view, left limb.

Legends

1- External abdominal oblique muscle
2- Internal abdominal oblique muscle
3- Sartorius muscle: cranial part
4- Gluteal fascia (covering middle gluteal muscle)
5- Tensor fasciae latae muscle
6- Fascia lata
7- Superficial gluteal muscle
8- Vastus lateralis muscle
9- Biceps femoris muscle (reflected)
10- Quadratus femoris muscle
11- Adductor muscle
12- Semimembranosus muscle (cranial)
13- Semimembranosus muscle (caudal)
14- Semitendinosus muscle
15- Caudal crural abductor muscle
16- Crural fascia
17- Gastrocnemius muscle
18- Sciatic nerve
19- Tibial nerve
20- Common peroneal nerve
21- Distal caudal femoral artery
22- Lateral saphenous vein
23- Superficial popliteal lymph node



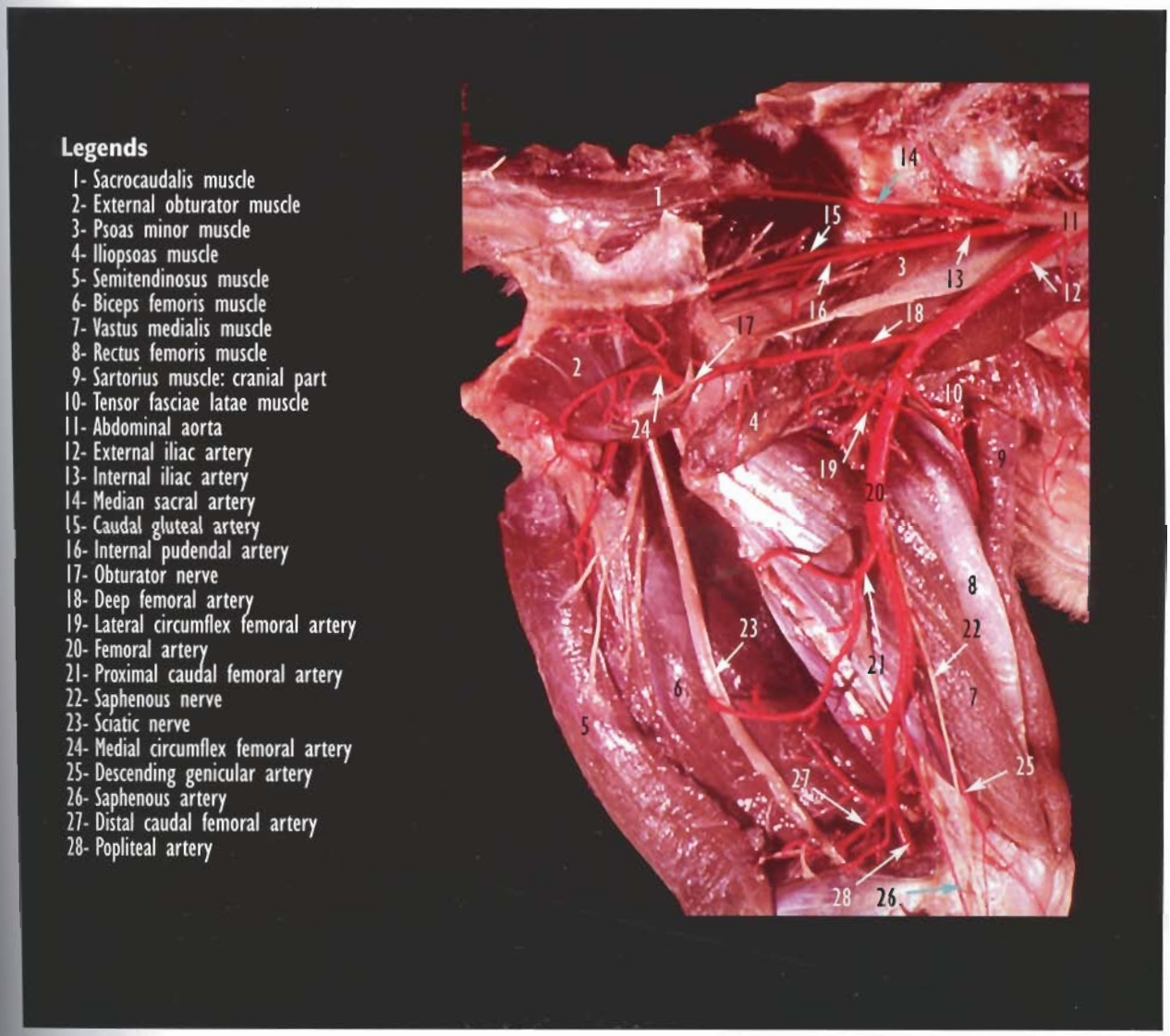
The course of the sciatic nerve through the caudal thigh is noted after removal of the biceps femoris muscle. The structures of the popliteal space are seen: tibial and common peroneal nerves and the superficial popliteal lymph node. Lateral view, left limb.



Legends

1- Levator ani muscle
2- Sacrocaudalis muscle
3- Wing of ilium
4- Pelvic symphysis
5- Sciatic nerve
6- Obturator nerve
7- Psoas minor muscle and iliac fascia
8- Lumbar arteries
9- Median sacral artery
10- Caudal gluteal artery
11- Cranial gluteal artery
12- Internal pudendal artery
13- External iliac artery
14- Deep femoral artery
15- *Rectus abdominis muscle*
16- Femoral artery
17- Internal iliac artery
18- Saphenous artery
19- Adductor muscle
20- Gracilis muscle
21- Semitendinosus muscle
22- Vastus medialis muscle
23- Descending genicular artery
24- Pectineus muscle

■ Medial muscles of left pelvic limb. The right os coxae has been removed except for the right wing of the ilium to facilitate the study of the medial superficial and deep musculature. The arteries are injected with red latex and branches of the internal and external iliac arteries are indicated. Medial view of left thigh and pelvic wall.



Distribution of the left medial circumflex femoral, deep femoral and femoral arteries. Most medial muscles have been removed (gracilis, adductor, pectineus, semimembranosus, caudal sartorius, rectus abdominis). Medial view of the left limb.

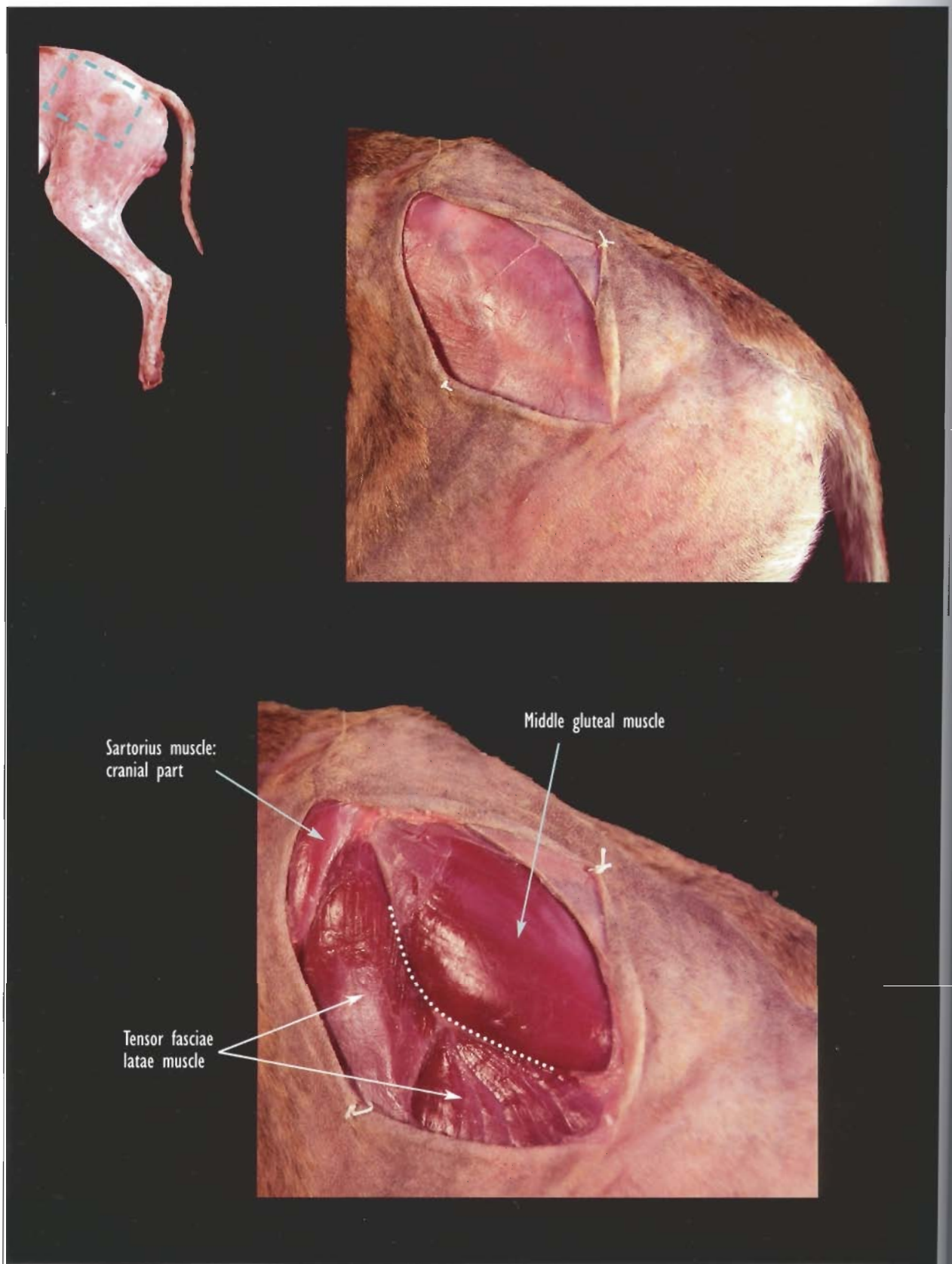
Approach to the wing of the ilium via a lateral incision

Indications:

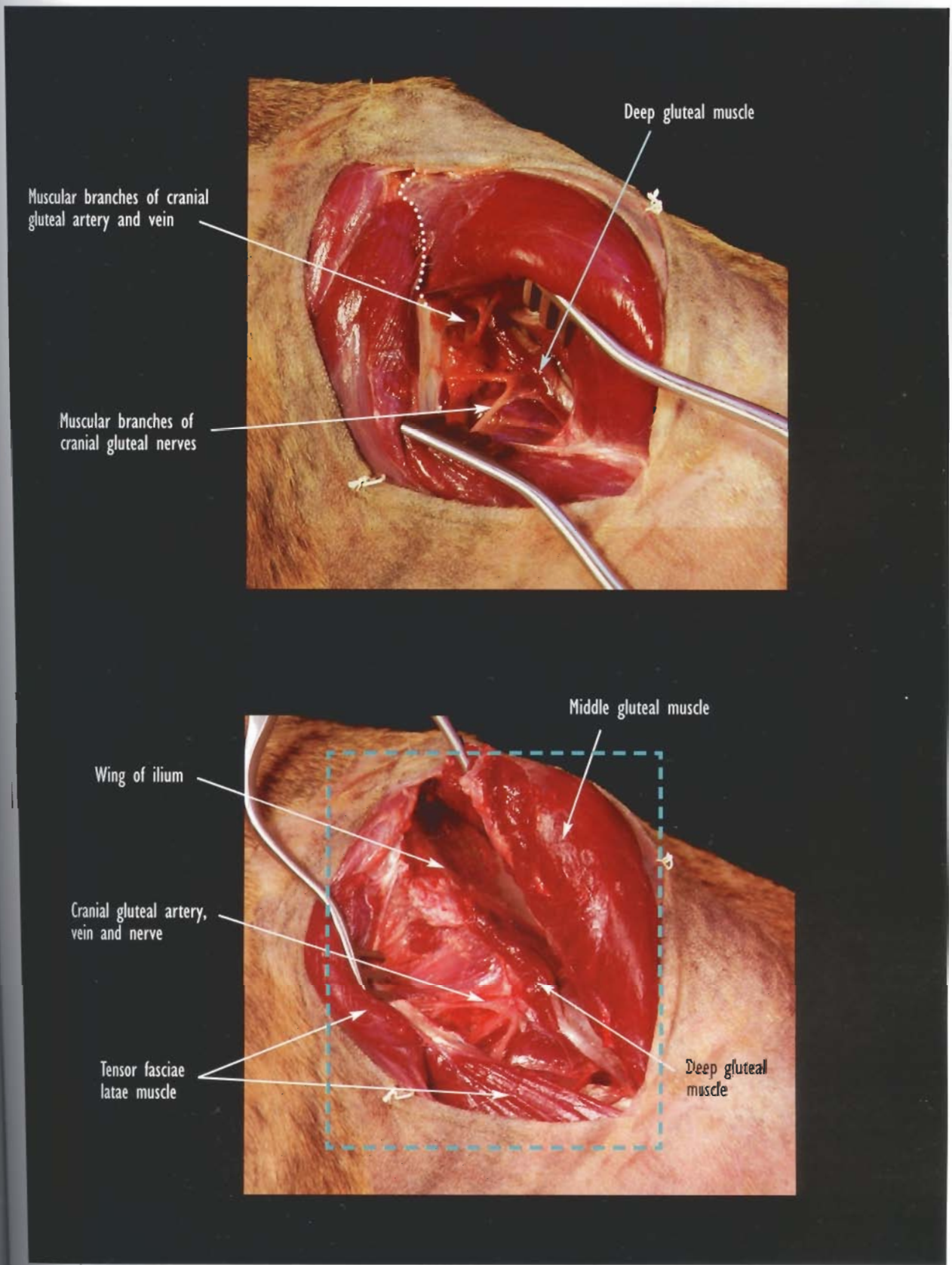
Open reduction and fixation of fractures of the wing of the ilium and sacrum, and sacroiliac luxations.

Obtaining of spongy bone tissue.

Corrective osteotomies (TPO).



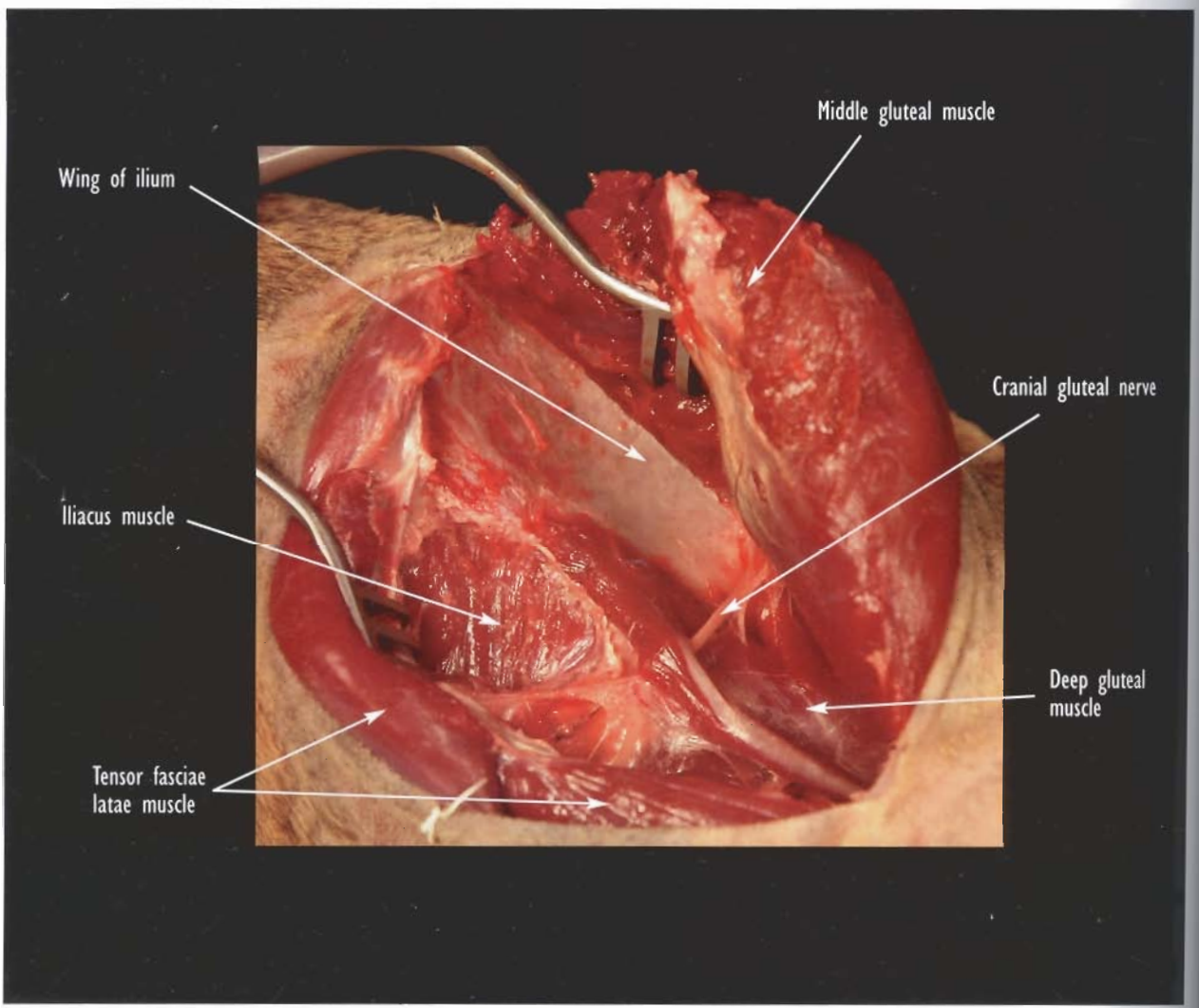
■ *Upper image:* the skin incision extends from the iliac crest to the major trochanter. Lateral view, left limb.
■ *Lower image:* the gluteal fascia is incised, and the middle gluteal muscle has to be separated from the tensor fasciae latae muscle (dotted line).



■ *Upper image:* to expose the deep gluteal muscle, the middle gluteal muscle is retracted dorsally and the tensor fasciae latae muscle ventrally. The origin of the middle gluteal muscle is elevated from the wing of the ilium. Lateral view, left limb.

CAUTION: the cranial gluteal neurovascular bundle passes between the deep gluteal muscle and the tensor fasciae latae muscle.

■ *Lower image:* the wing of the ilium is exposed after elevation and retraction of the middle gluteal muscle dorsally.

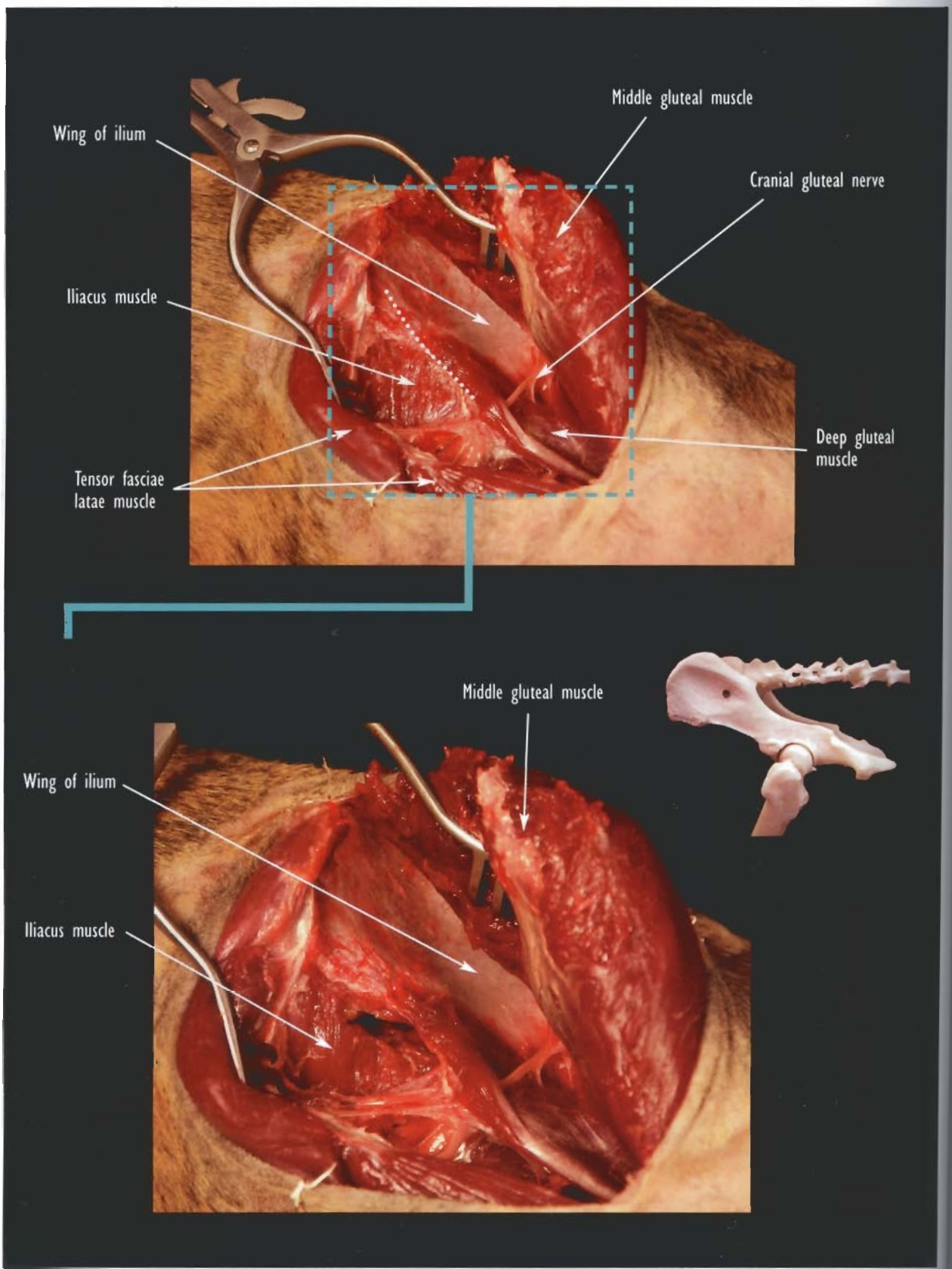


■ **Close up of** previous picture, after more elevation and retraction of the middle gluteal muscle, showing the wing of the ilium. For greater exposure caudally, the deep gluteal muscle may be elevated and retracted. The iliacus muscle and its attachment to the ventral border of the ilium are important landmarks for exploration of the sacroiliac joint. Lateral view, left limb.

CAUTION: protect the branch of the cranial gluteal nerve to the tensor fasciae latae muscle.

Approach to the ventral surface of the sacrum

Indications:
Open reduction and fixation of sacroiliac luxations.



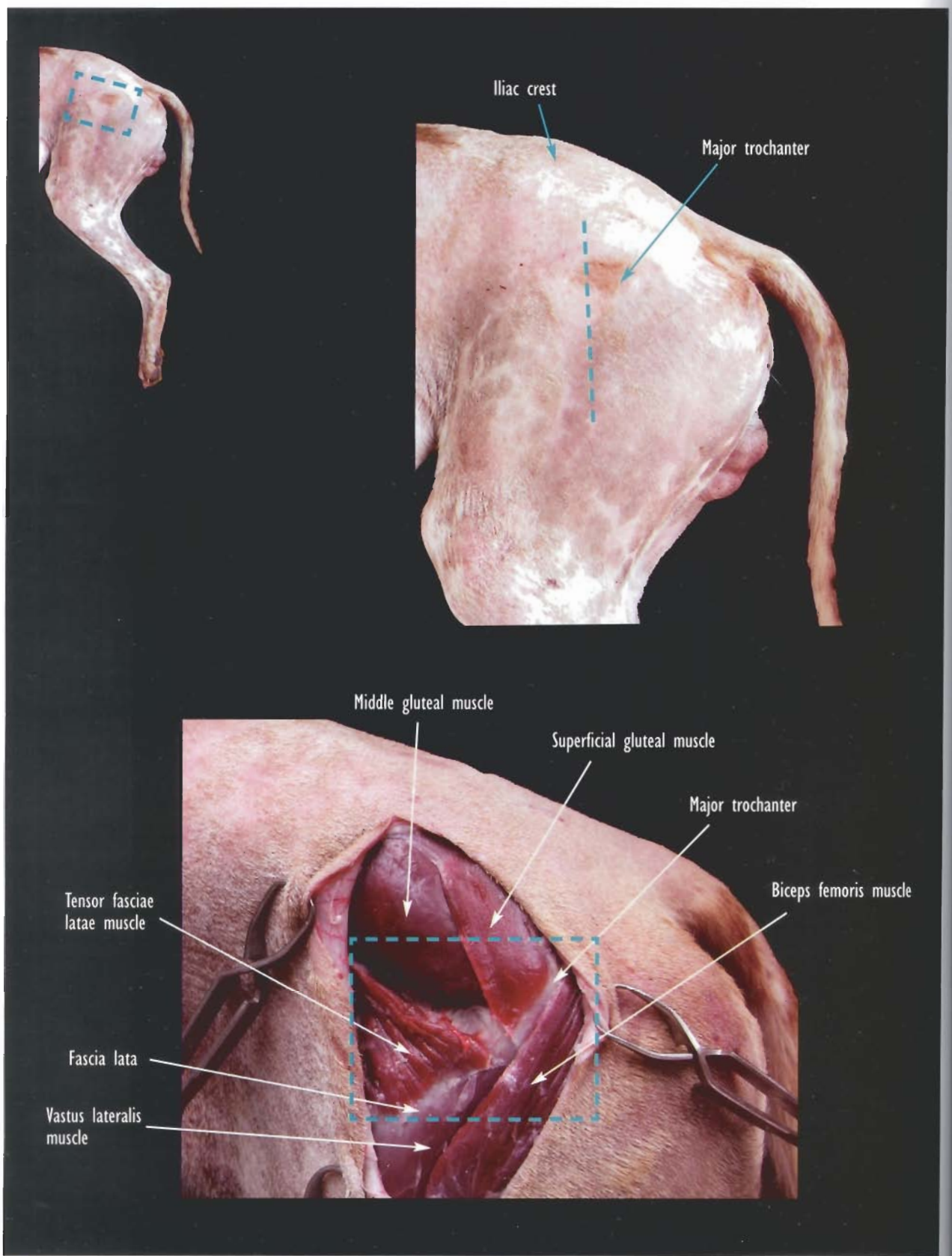
- *Upper image:* the approach to the sacrum is a continuation of the approach to the wing of the ilium. It continues between the ventral border of the ilium and the iliacus muscle (dotted line). Lateral view, left limb.
- *Lower image:* by freeing the iliacus muscle from the ilium, the wing of the sacrum and sacroiliac joint may be palpated and examined.

CAUTION: preserve the muscular branches of the cranial gluteal nerve.

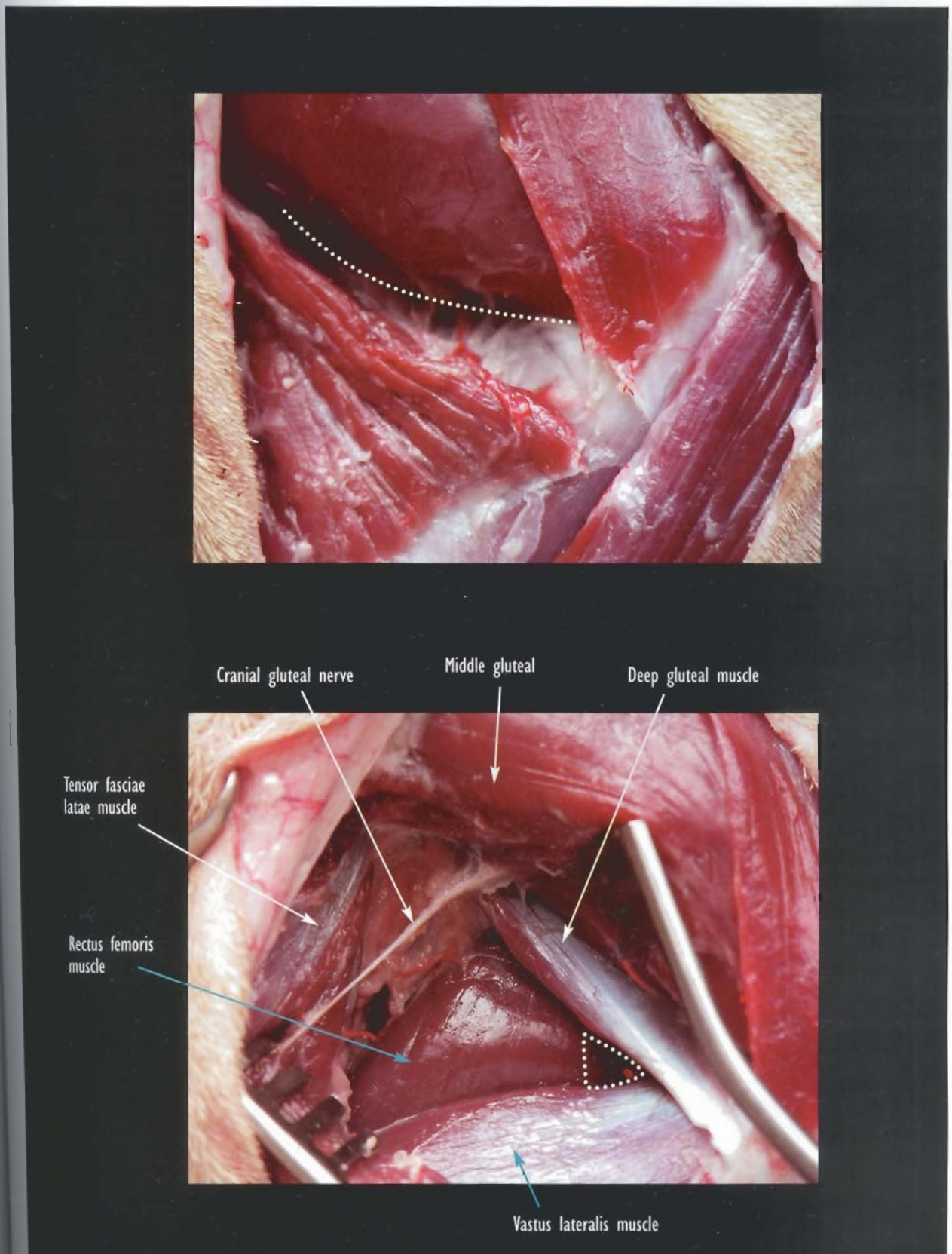
Approach to the craniodorsal region of the hip joint via a craniolateral incision

Indications:

Open reduction and fixation of coxofemoral luxations.
Open reduction and fixation of fractures affecting the neck of the femur, and epiphysiolysis of the femoral head.
Removal of head and neck of the femur.
Hip prosthesis implantation.



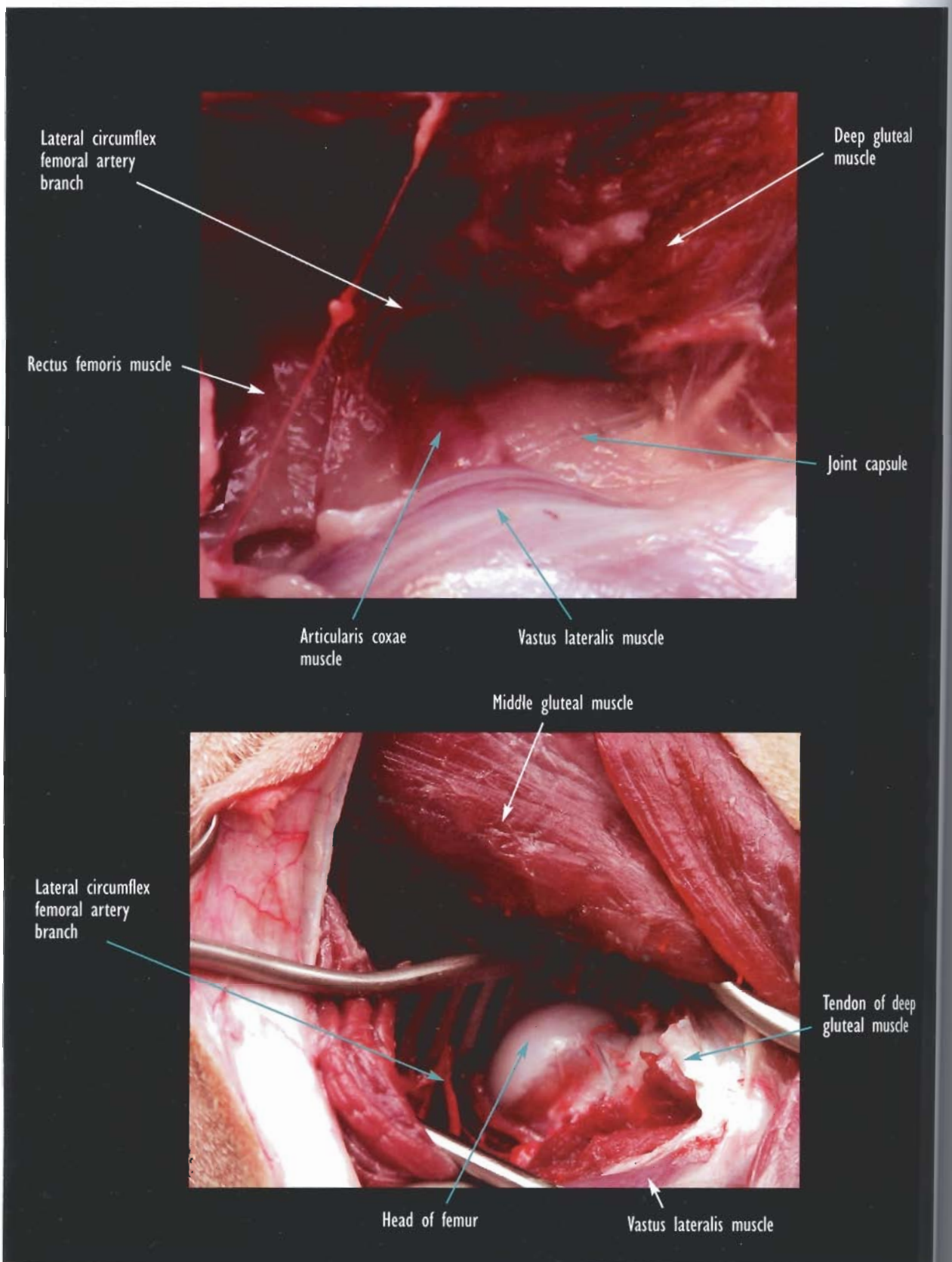
- *Upper image:* begin the skin incision (dashed line) over the major trochanter and extend it toward the iliac crest and to the middle one third of the femur. Lateral view, left limb.
- *Lower image:* after opening the gluteal fascia, the middle gluteal and tensor fasciae latae muscles are identified.



Upper image: close up of previous image. The approach to the cranial aspect of the hip joint is between the middle gluteal and tensor fasciae latae muscles (dotted line). Lateral view, left limb.

Lower image: by retracting the middle gluteal muscle dorsally and the tensor fasciae latae muscle ventrally, the approach to the hip joint is found (dotted line) between the deep gluteal, rectus femoris and the vastus lateralis muscles.

CAUTION: preserve cranial gluteal nerve innervation to the tensor fasciae latae muscle.



- *Upper image:* retractors are placed in the intermuscular space (deep gluteal, rectus femoris, vastus lateralis, described and shown in previous figure) to expose the dorsum of the joint capsule which is partially covered by the articularis coxae muscle. Dorsolateral view, left limb.
- *Lower image:* open the joint capsule to expose the femoral head. Partial tenotomy of the deep gluteal muscle tendon and external rotation of the femur provide better exposure.

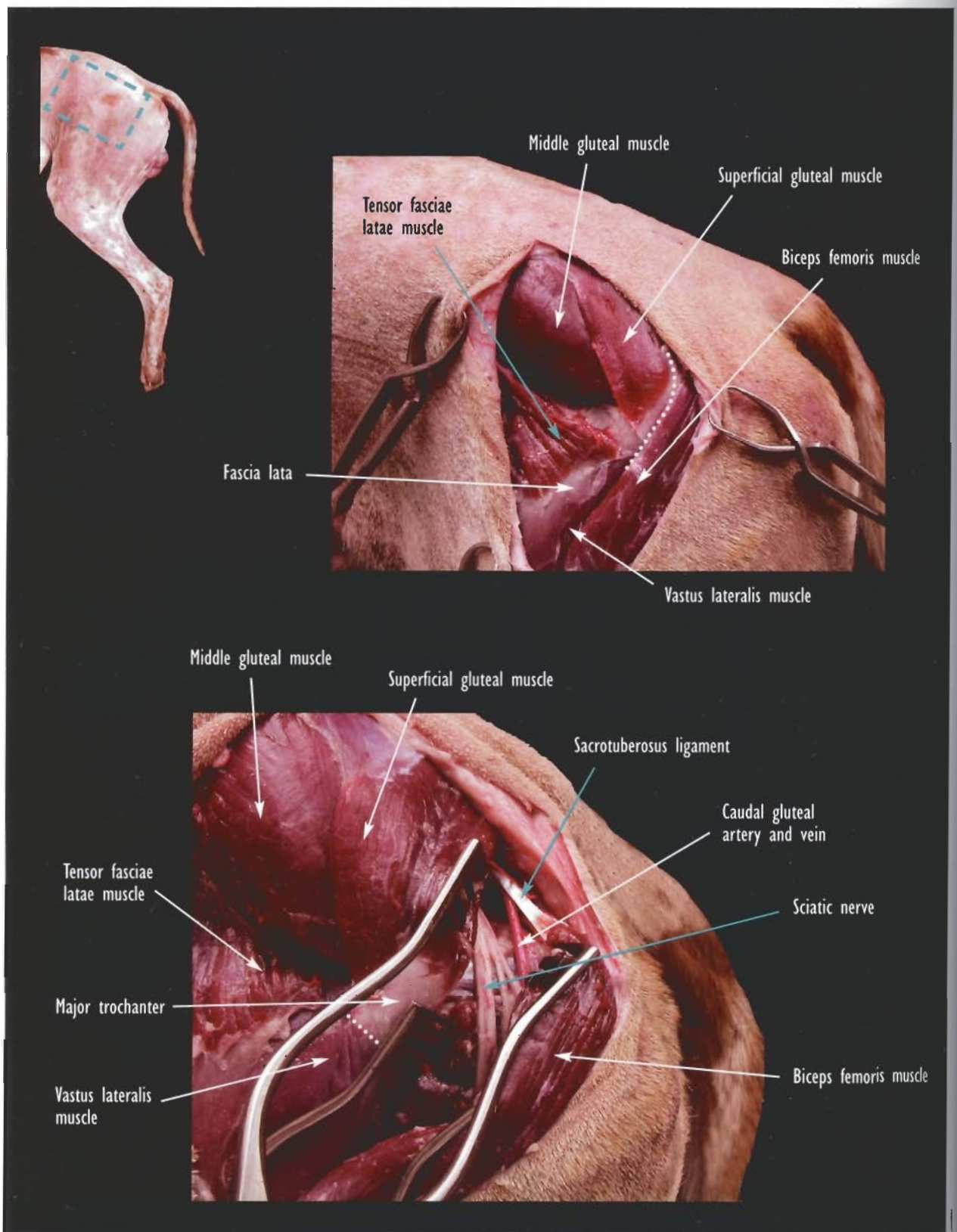
Approach to the craniodorsal and caudodorsal regions of the hip joint with osteotomy of the major trochanter

Indications:

Open reduction and fixation of chronic coxofemoral luxation.

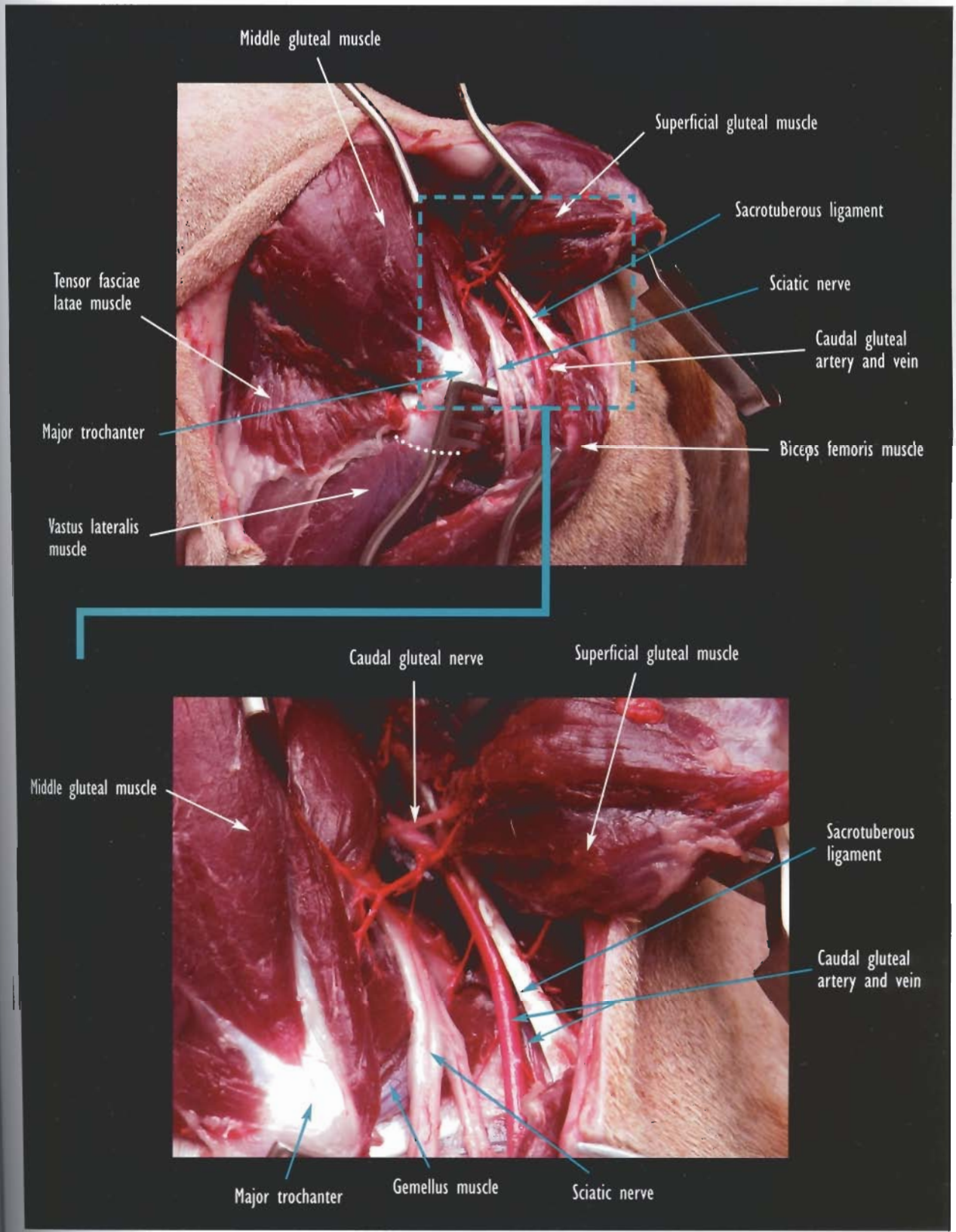
Open reduction and fixation of complex coxofemoral luxations and/or acetabular fractures.

Reposition and fixation of ischiatic fractures.



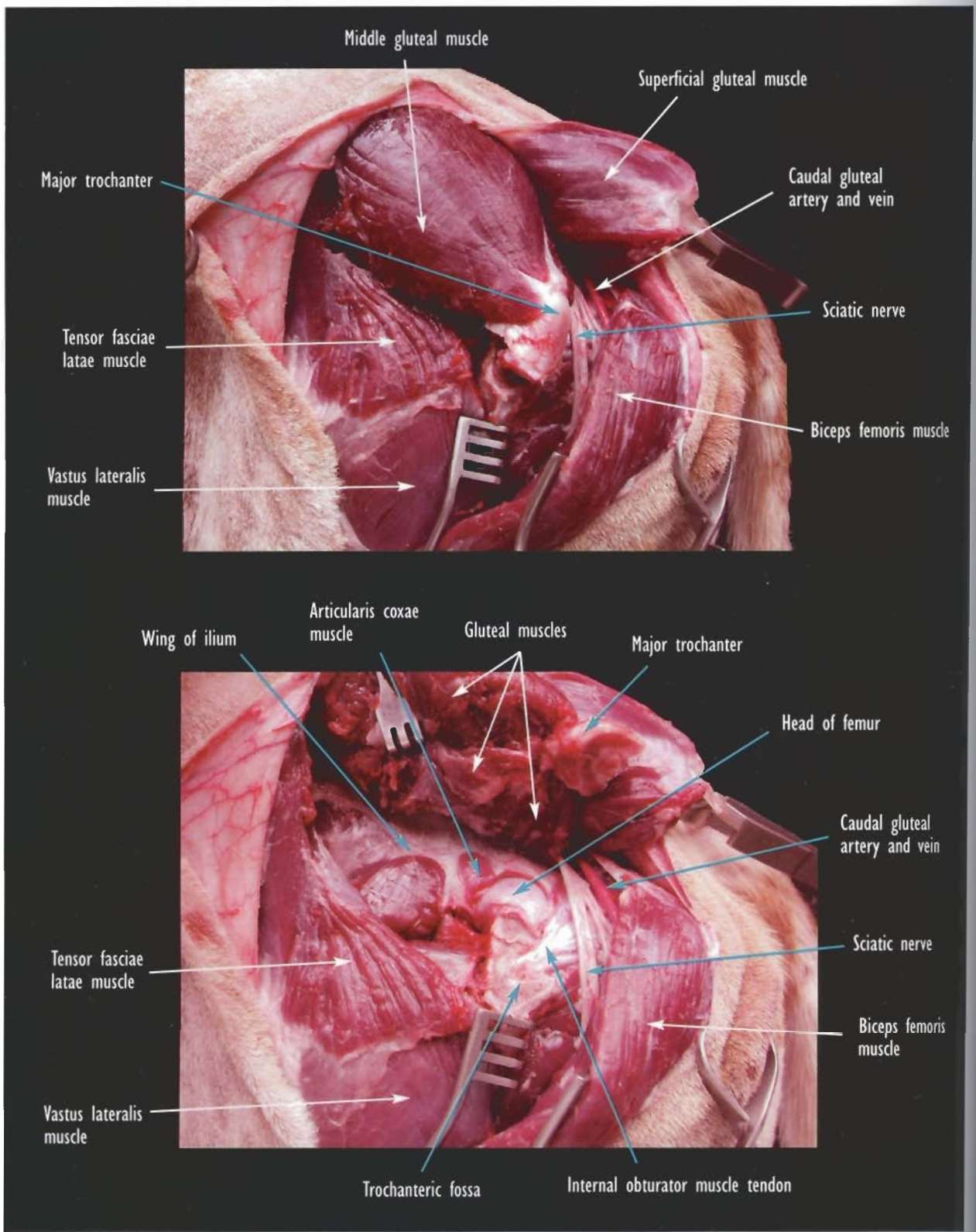
- *Upper image:* a vertical incision extends distally from the iliac crest over the major trochanter to the mid-femur. Open the gluteal fascia and demarcate the division between the superficial gluteal and biceps femoris muscles (dotted line). Lateral view, left limb.
- *Lower image:* retract the biceps femoris muscle caudally to visualize the tendon of the superficial gluteal muscle passing over the major trochanter to insert on the third trochanter. Divide the tendon (dotted line) to expose the major trochanter.

CAUTION: preserve the ischiatic nerve and caudal gluteal vessels.



Upper image: after superficial gluteal tenotomy, the muscle is reflected dorsally to expose the major trochanter. Major trochanteric osteotomy, at the base of the trochanter (dotted line), is performed at a 45° from the axis of the femur in a dorsomedial direction. Laterocaudal view, left.

Lower image: close up of upper image. Observe the course of the caudal gluteal nerve to the superficial gluteal muscle. Note the relationship of the sciatic nerve to the caudal gluteal vessels and the sacrotuberous ligament and the small group of muscles inserting into the trochanteric fossa.



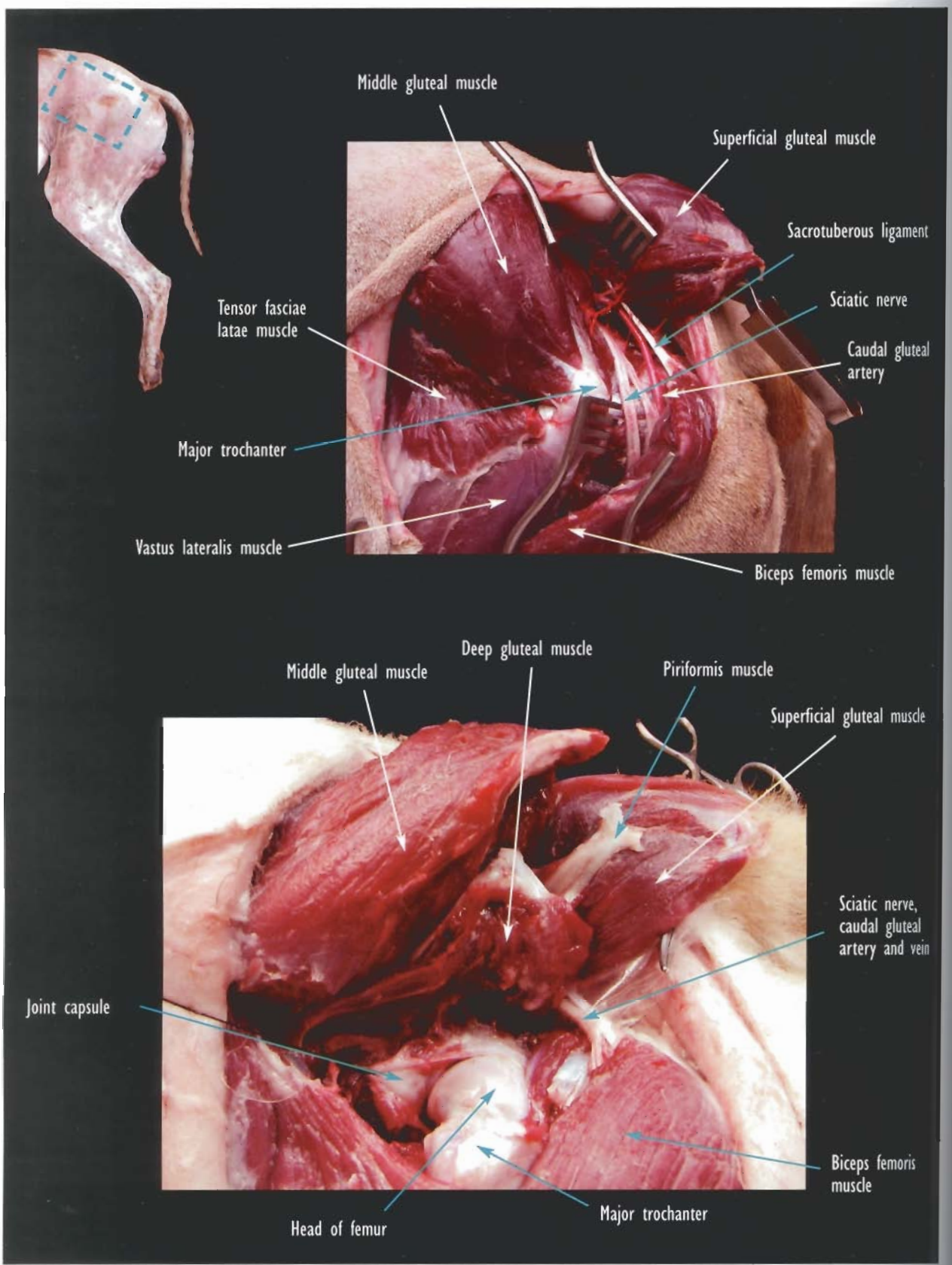
- *Upper image:* the osteotomy is performed (dotted line) and the muscles (middle and deep gluteal and piriformis) wich insert onto the major trochanter will be displaced with the trochanter dorsally. Laterocaudal view, left limb.
- *Lower image:* the major trochanter and the middle and deep gluteal and piriformis muscles are displaced dorsally. The joint capsule has been transected to expose the femoral head. Greater exposure of the articular surface is obtained by external rotation of the femur. The sciatic nerve and caudal gluteal vessels lie caudal to the line of osteotomy.

CAUTION: during the osteotomy, envision the course of the sciatic nerve and the insertion of the gemelli and internal obturator muscles into the trochanteric fossa.

Approach to the caudodorsal regions of the hip joint with gluteal muscle tenotomy

Indications:

Open reduction and fixation of coxofemoral luxations.
Open reduction and fixation of fractures affecting the neck of the femur, and epiphysiolysis of the femoral head.
Removal of head and neck of the femur.
Hip prosthesis implantation.

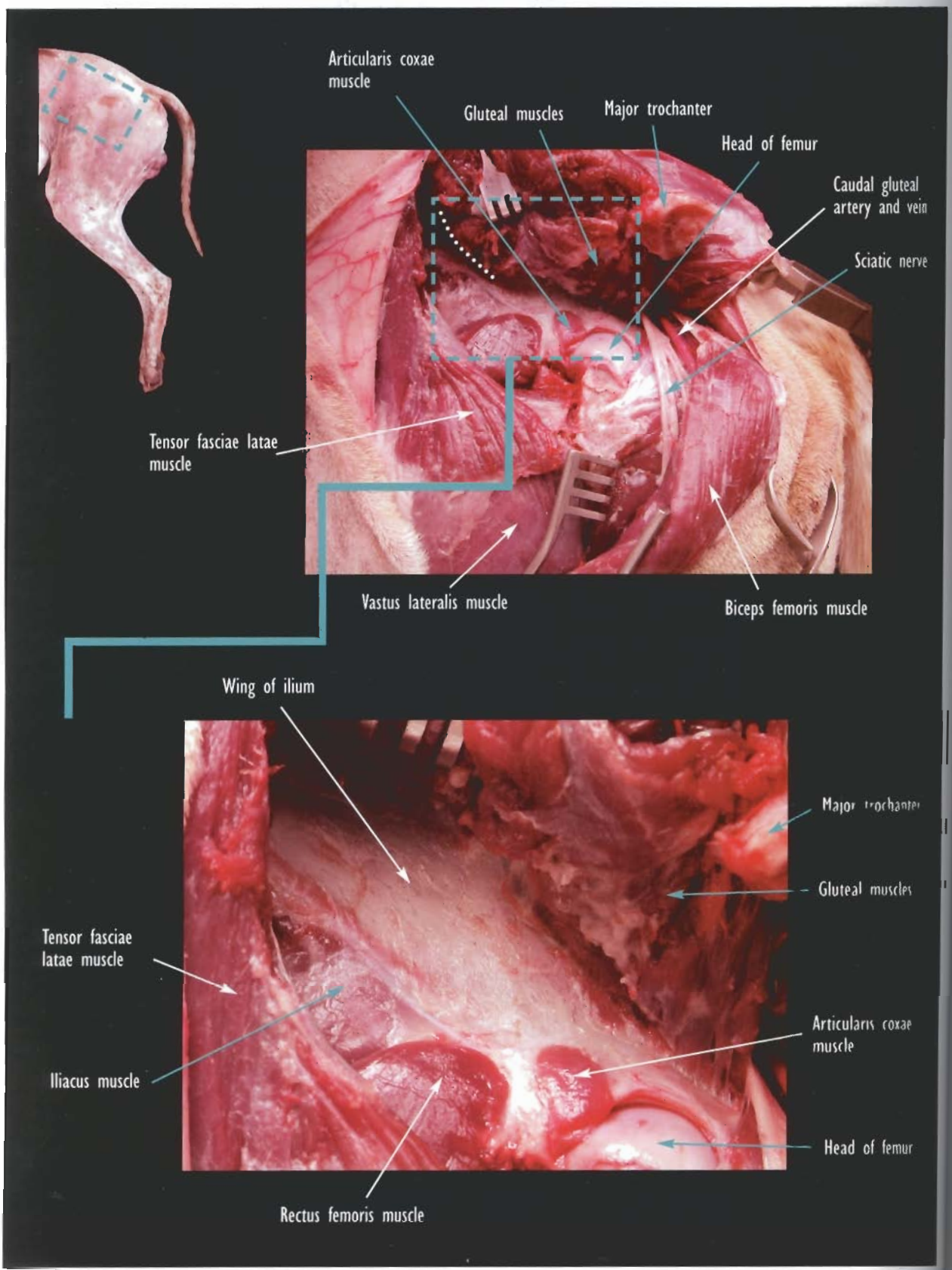


- *Upper image:* the approach starts similar to the previous approach. However, after superficial gluteal tenotomy, the remaining gluteal tendons will be transected. Lateral view, left limb.
- *Lower image:* the insertion of the middle and deep gluteal and piriformis muscles are transected near the major trochanter and reflected dorsally. The joint capsule is cut and the femur externally rotated to observe the femoral head.

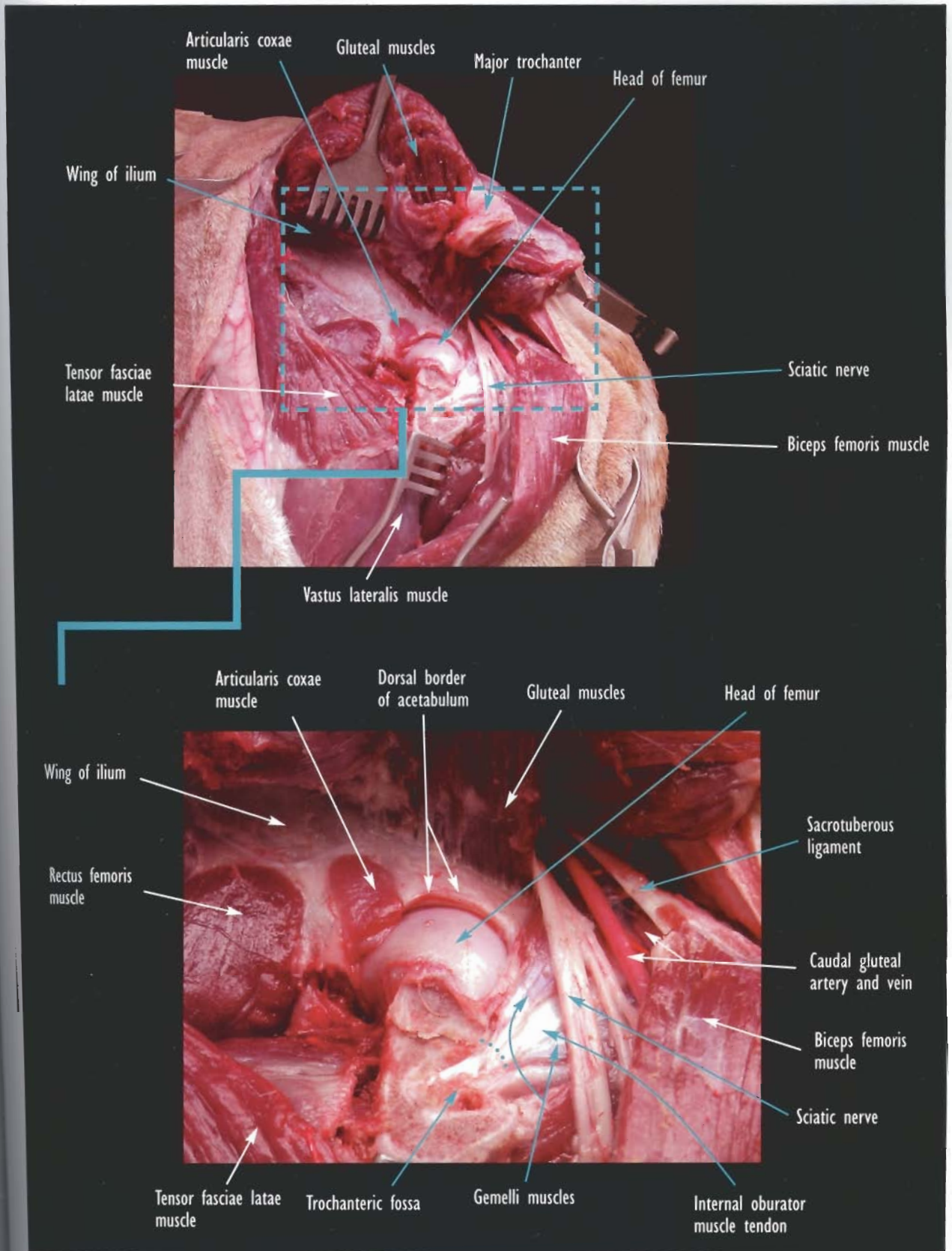
CAUTION: the sciatic nerve and caudal gluteal vessels are displaced caudally and need to be protected.

Approach to the os coxae

Indications:
Open reduction and fixation of multiple fractures of the os coxae.

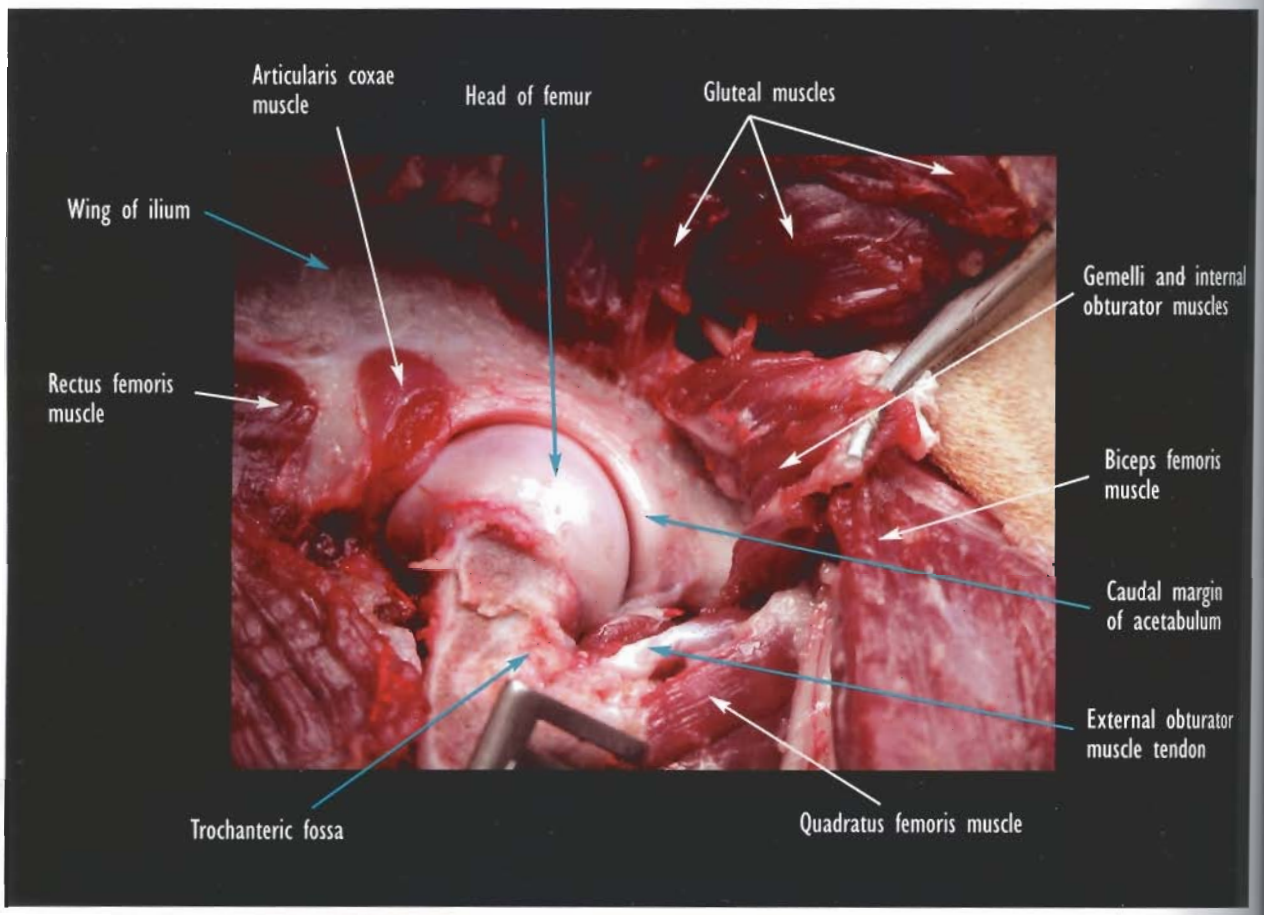


- *Upper image:* after transection of the major trochanter, the trochanter and gluteal muscles are reflected dorsally. The origin of the middle and deep gluteal muscles will be elevated to expose the ilial wing. Lateral view, left limb.
- *Lower image:* the origin of the gluteal muscles are retracted dorsally to expose the iliac wing.



Upper image: the major trochanter is displaced dorsally with the attached gluteal muscles, to view the central portion of the acetabulum. Lateral view, left limb.

Lower image: the articularis coxae muscle and joint capsule are transected along the dorsal border of the acetabulum. The caudal aspect of the hip joint will be exposed after transection of the insertions (dotted line) of the gemelli and internal obturator muscles.



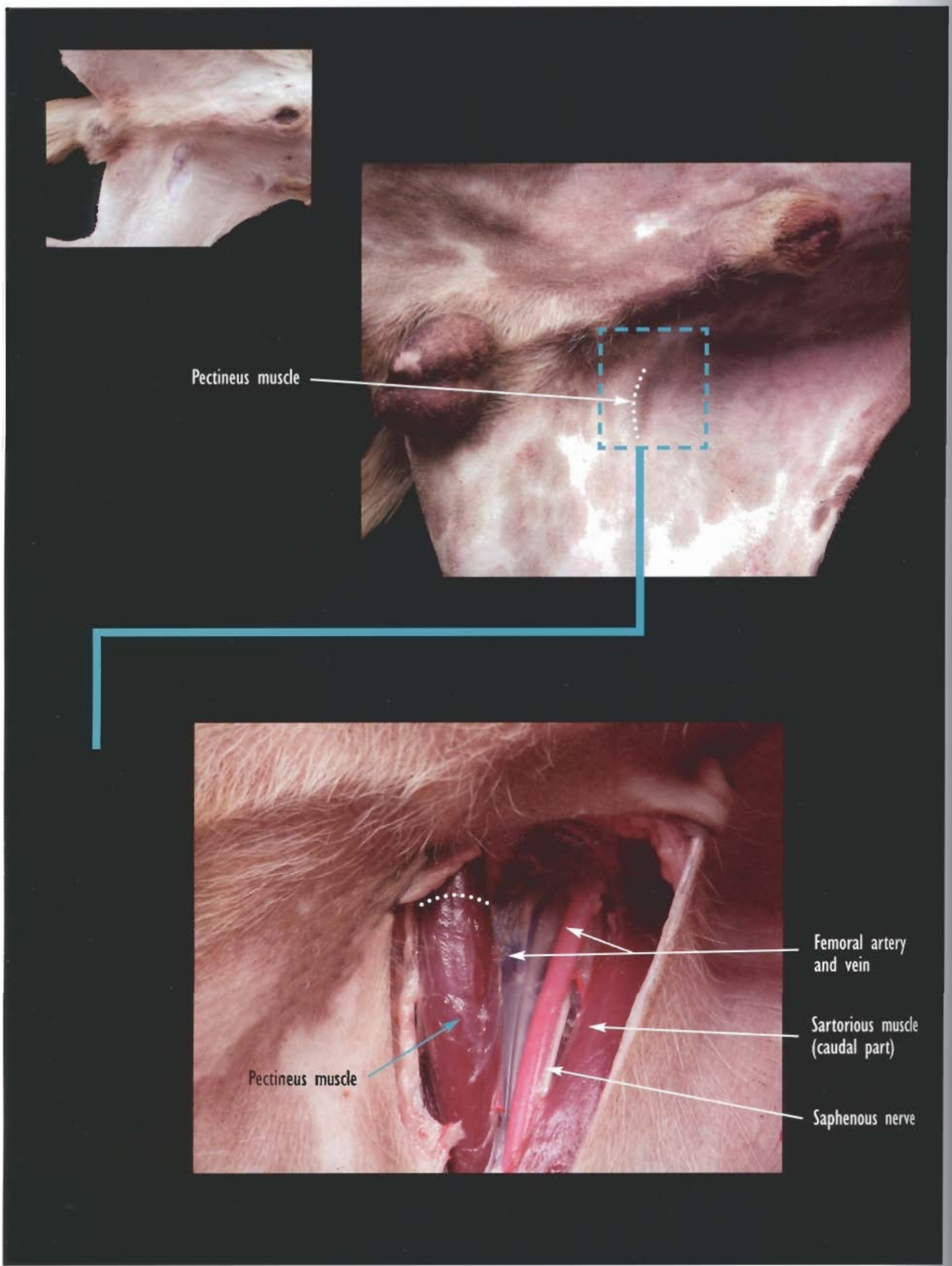
■ After tenotomy of the gemelli and internal obturator muscles and their dorsal reflection, the caudal margin of the acetabulum and part of the body of the ischium are seen. Dorsolateral view, left limb.

CAUTION: preserve the tendon of the external obturator muscle.

Approach to the ventral articulation of the femoral head

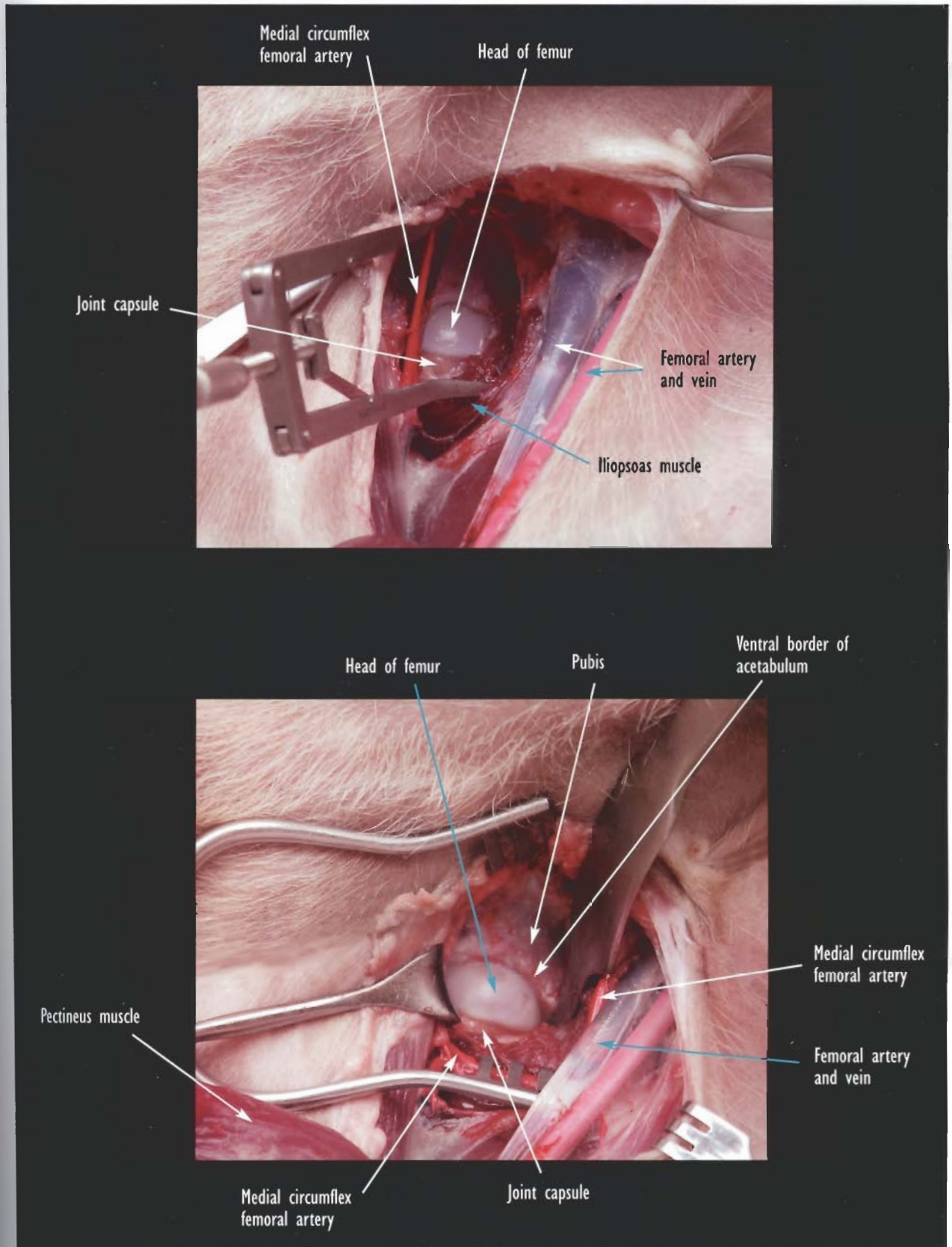
Indications:

Open reduction and fixation of ventral coxofemoral luxations.
Open reduction and fixation of acetabular fractures.
Removal of the femoral head and neck.
Pubic osteotomy for TPO.



- *Upper image:* the patient is placed in lateral recumbency with the contralateral limb in abduction. The line of incision passes over the pectineus muscle. Medial view, left limb.
- *Lower image:* after freeing the fascia, the femoral artery and vein, plus the pectineus and sartorious muscles are identified. To approach the ventral aspect of the hip, the origin of the pectineus from the pubis should be sectioned (dotted line).

CAUTION: preserve the femoral vessels.



- *Upper image:* the head of the femur is exposed after displacing the pectineus muscle ventrally and sectioning the joint capsule. The iliopsoas muscle is retracted ventrally and the medial circumflex femoral artery dorsally. Left medial view.
- *Lower image:* the medial circumflex femoral artery can be displaced ventrally in order to obtain exposure of the ventral border of the acetabulum and the body of the pubis. Forced abduction of the femur enhances exposure of the femoral head.

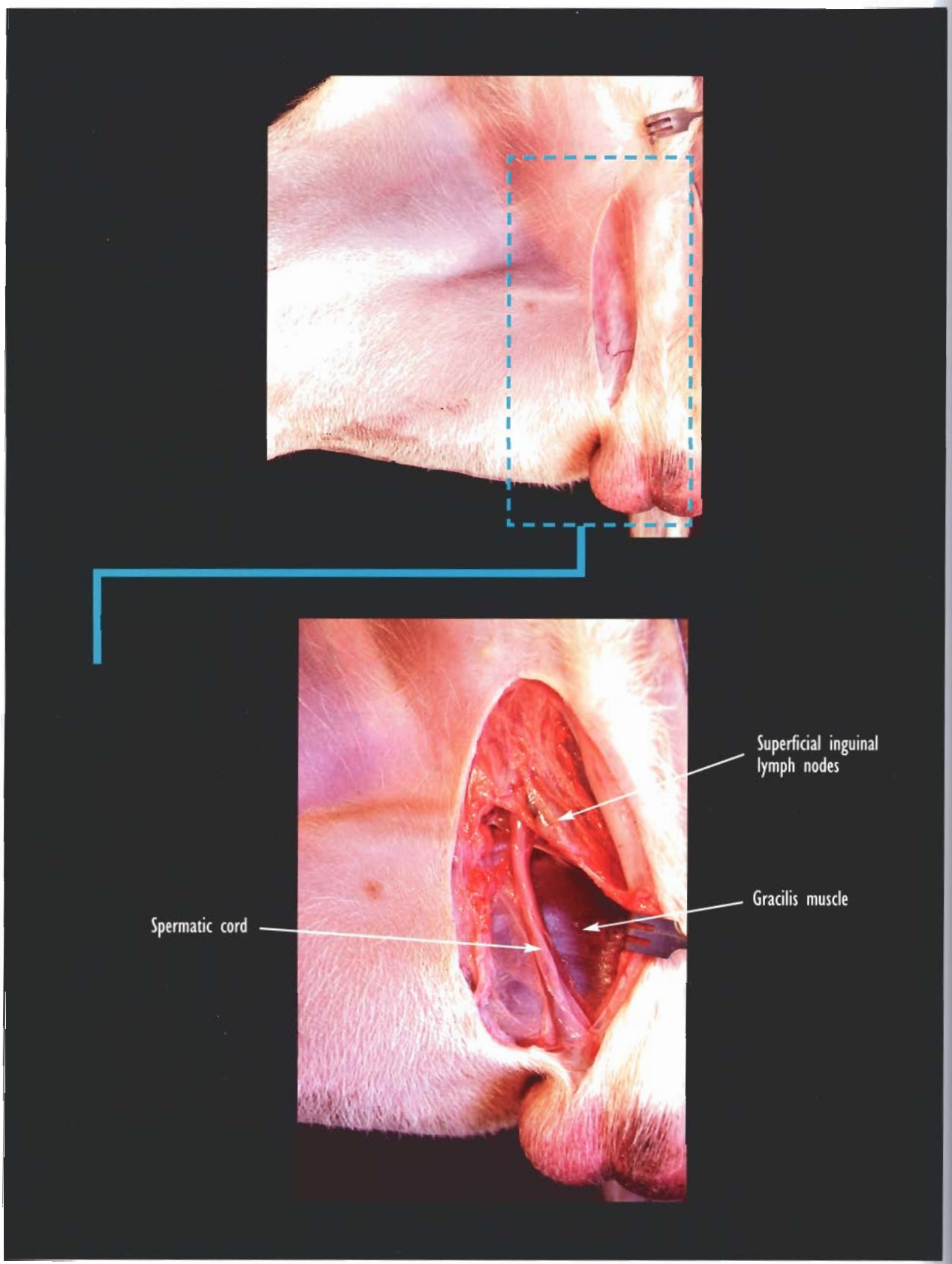
CAUTION: attention to the medial circumflex femoral artery.

Approach to the pubis and the pelvic symphysis

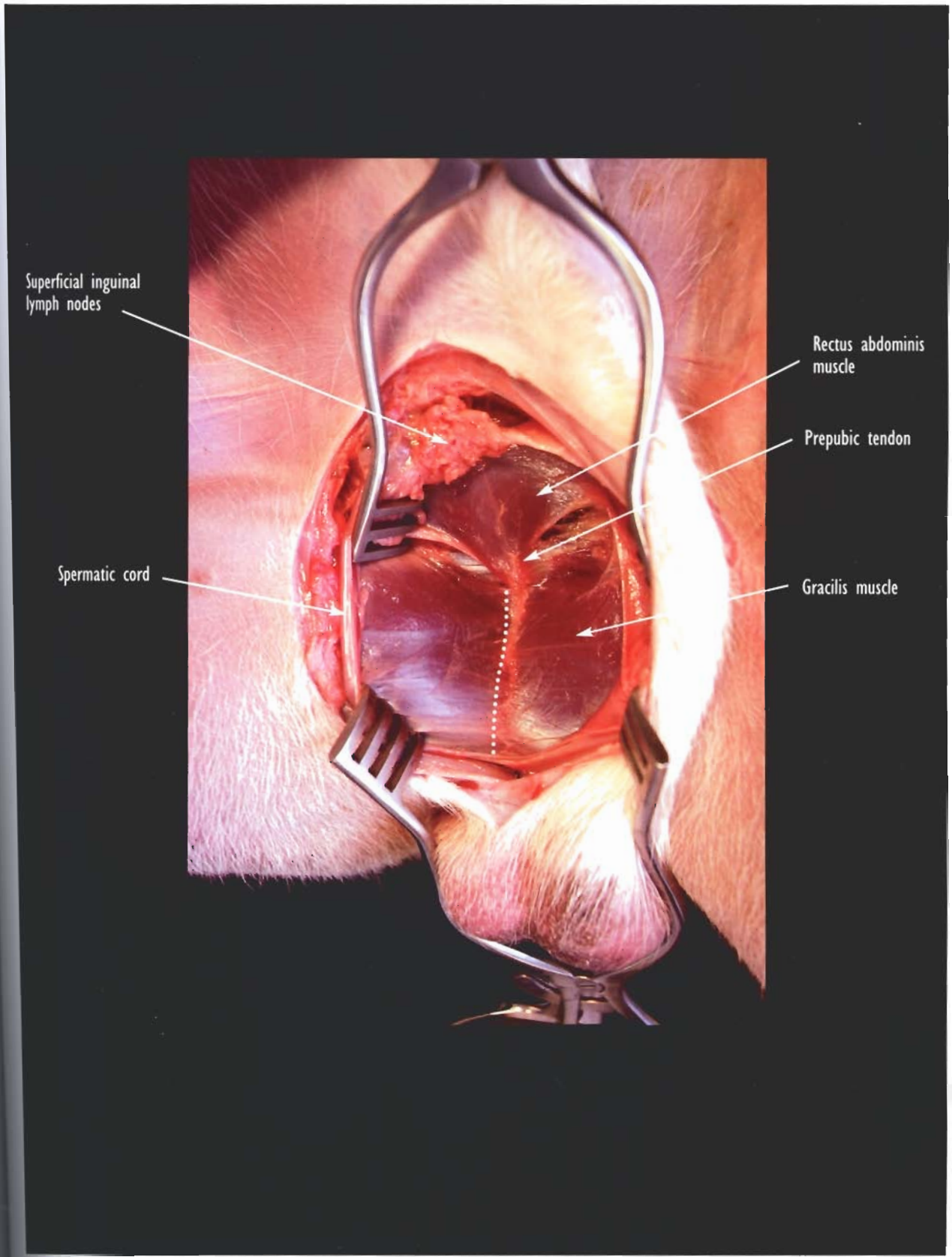
Indications:

Pubic symphysiodesis to prevent hip dysplasia.

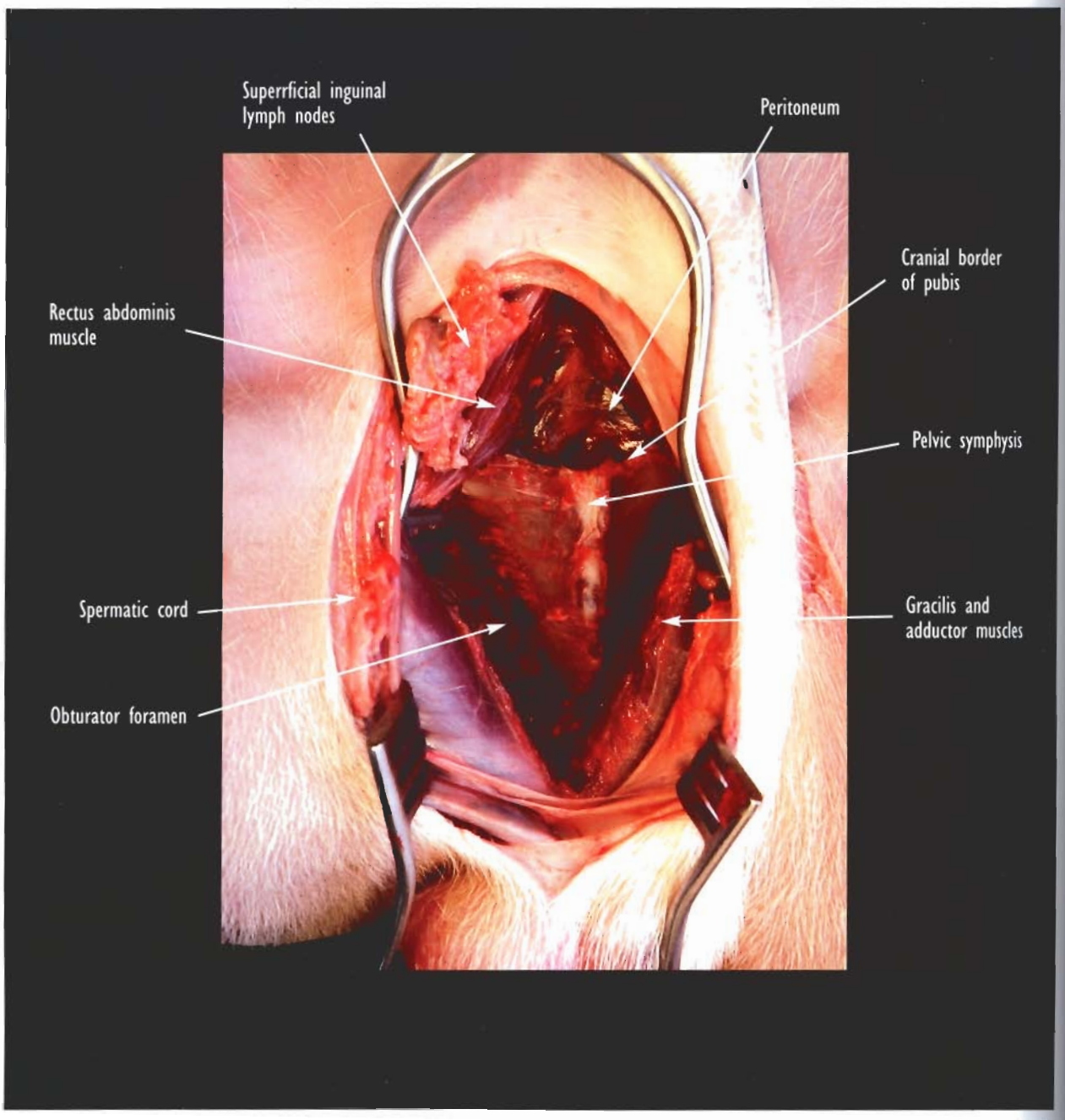
Symphysiotomy to approach the intrapelvic organs.



- *Upper image:* the dog is placed in dorsal recumbency with the legs abducted. A ventral midline incision is made through the skin. In the male, the penis is displaced laterally. Ventral view.
- *Lower image:* the superficial inguinal lymph nodes are identified in the subcutaneous fascia and fat, along with the course of the spermatic cord on the gracilis muscle.



After dissection of the fat and displacing the penis, identify the common tendon of the right and left gracilis muscles onto the symphysis (dotted line) which will be incised to extend the approach deeper. Cranially identify the rectus abdominis muscle inserting on the cranial border of the pubis. Ventral view.



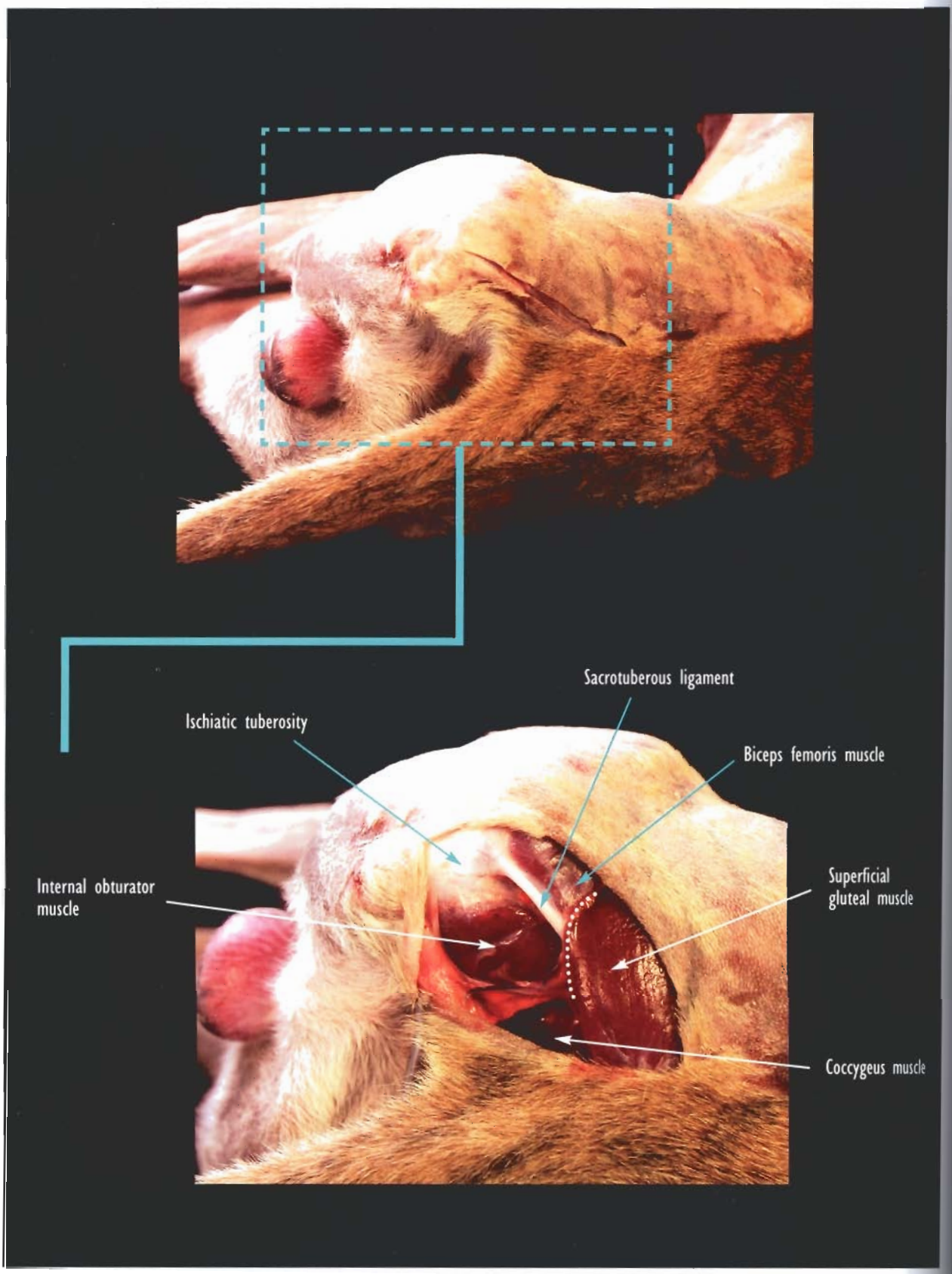
After bilateral incision of the symphyseal tendons of the gracilis and adductor muscles, retract the muscles to each side to expose the pelvic syphysis and the cranial and medial portions of the obturator foramen. To expose the parietal peritoneum, free the rectus abdominis muscle from the cranial border of the pubis. Ventral view.
CAUTION: preserve the parietal peritoneum.

Approach to the ischium

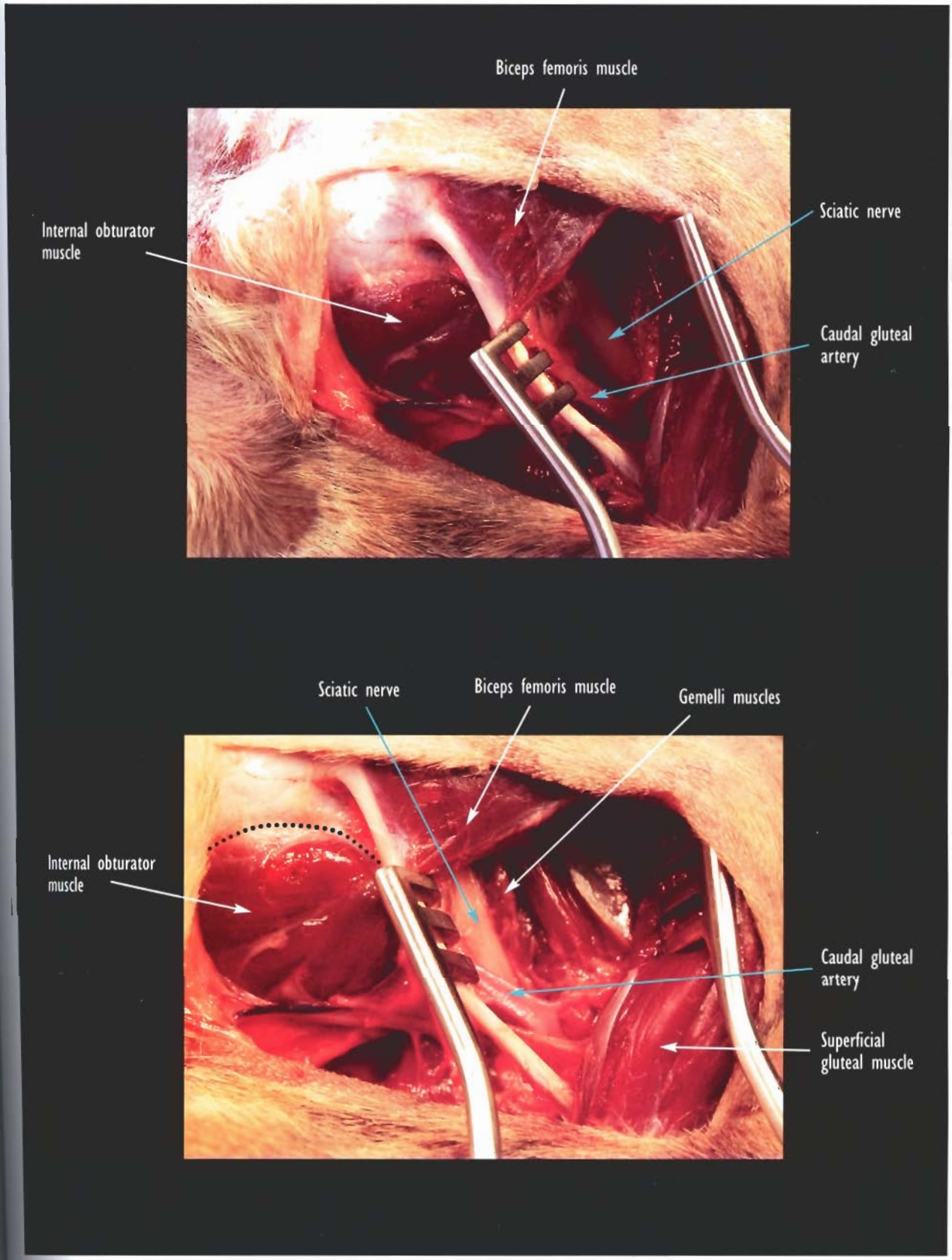
Indications:

Open reduction and fixation of ischiatic fractures.

Ischiatic osteotomy in the TPO.



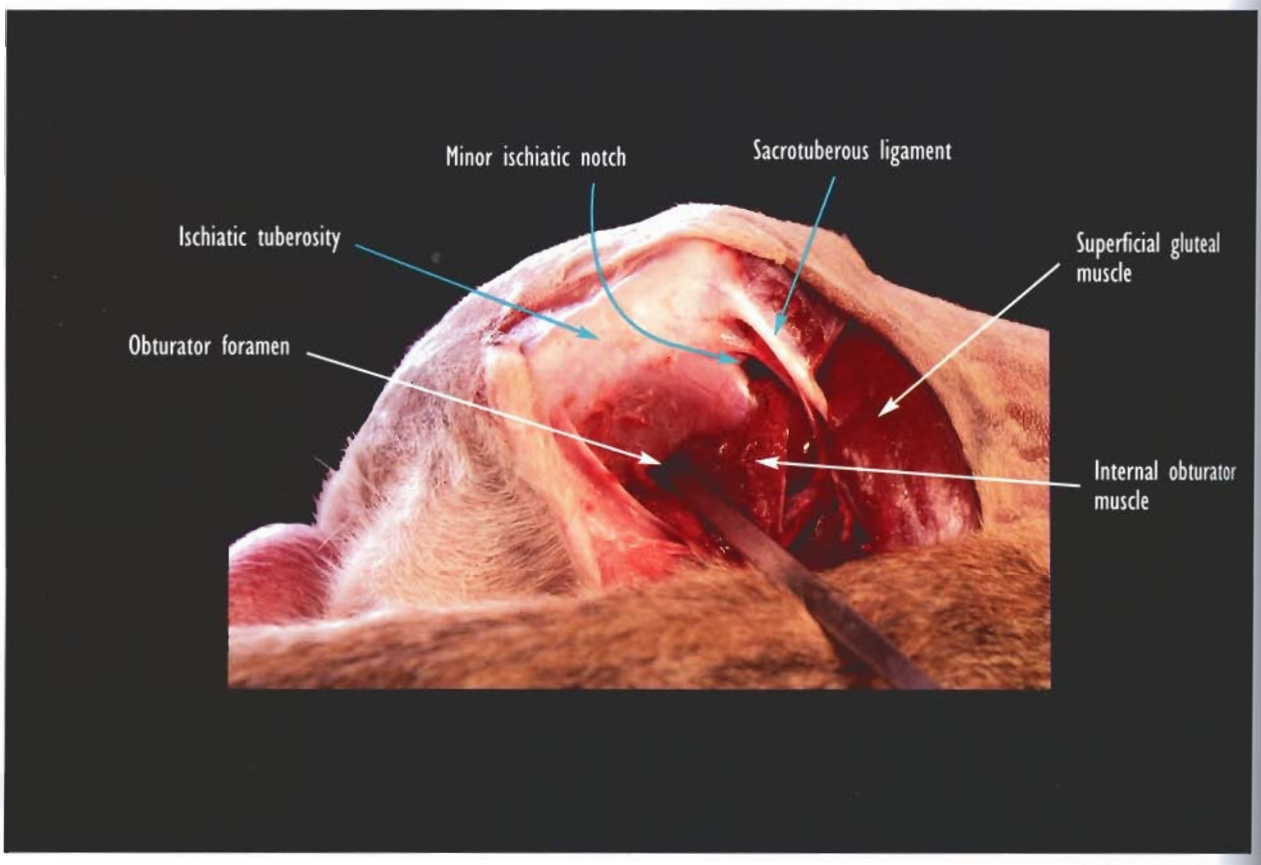
- *Upper image:* the dog is placed in lateral recumbency. The skin incision is made parallel to the sacrotuberous ligament from the sacrum to the ischiatic tuberosity. Dorsal view, left ischiatic region.
- *Lower image:* free the subcutaneous tissue overlying the sacrotuberous ligament. Identify the junction between the superficial gluteal and biceps femoris muscles (dotted line) which permits access to the body of the ischium.



Upper image: separation of the biceps femoris and superficial gluteal muscles exposes the course of the sciatic nerve and caudal gluteal vessels, parallel to the sacrotuberous ligament. Dorsal view.

Lower image: the sciatic nerve and caudal gluteal vessels are retracted caudally to view the gemelli and internal obturator muscles passing over the minor ischiatic notch. Identify the junction of the internal obturator muscle with the ischiatic tuberosity which will be separated.

CAUTION: preserve the sciatic nerve and caudal gluteal vessels.



After the internal obturator muscle is freed from the ischiatic tuberosity, it is retracted cranially to expose the table of the ischium, obturator foramen and minor ischiatic notch. Dorsal view.

luteal

obturator

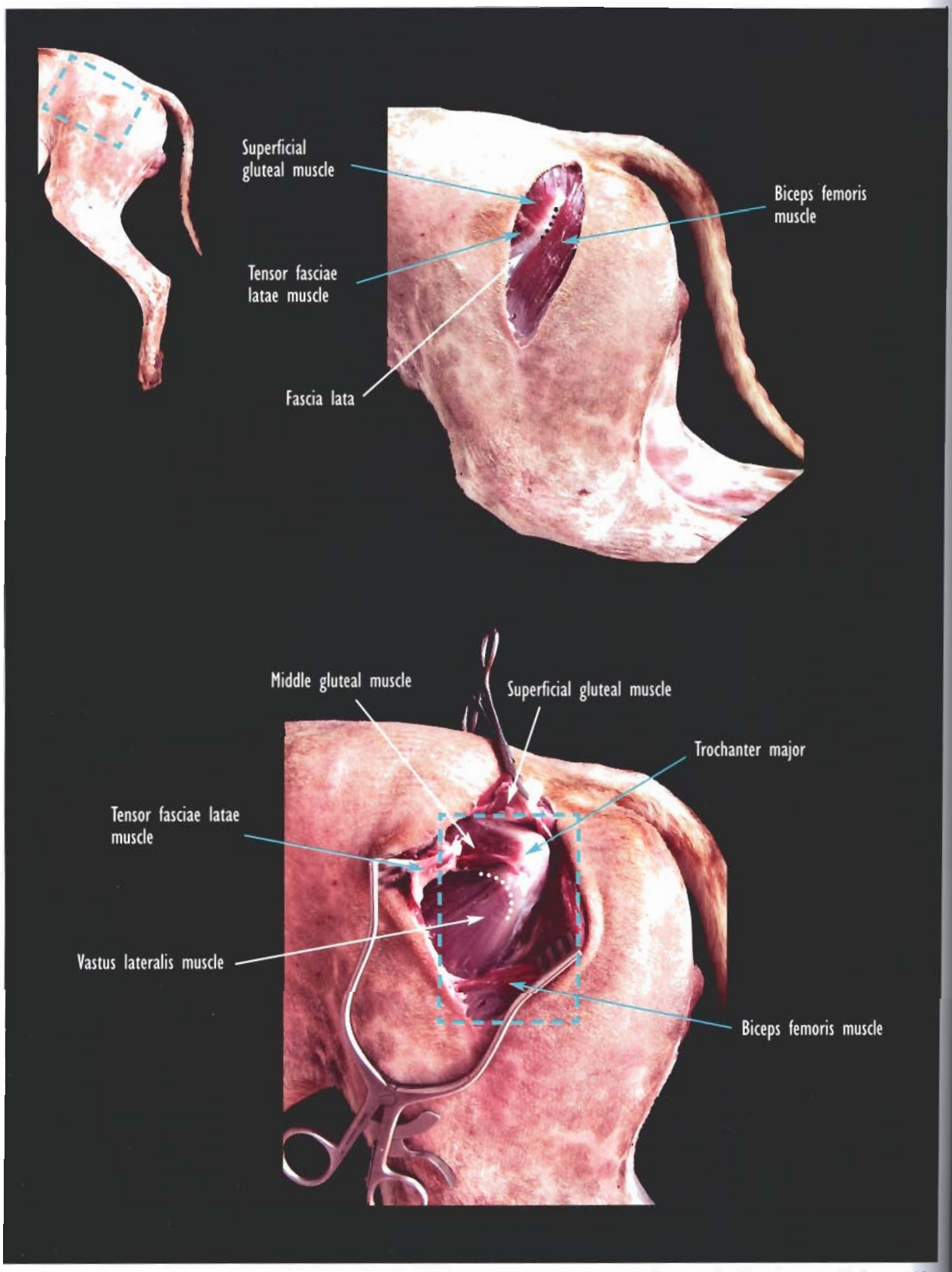
se the table

Approach to the major trochanter and the subtrochanteric region of the femur

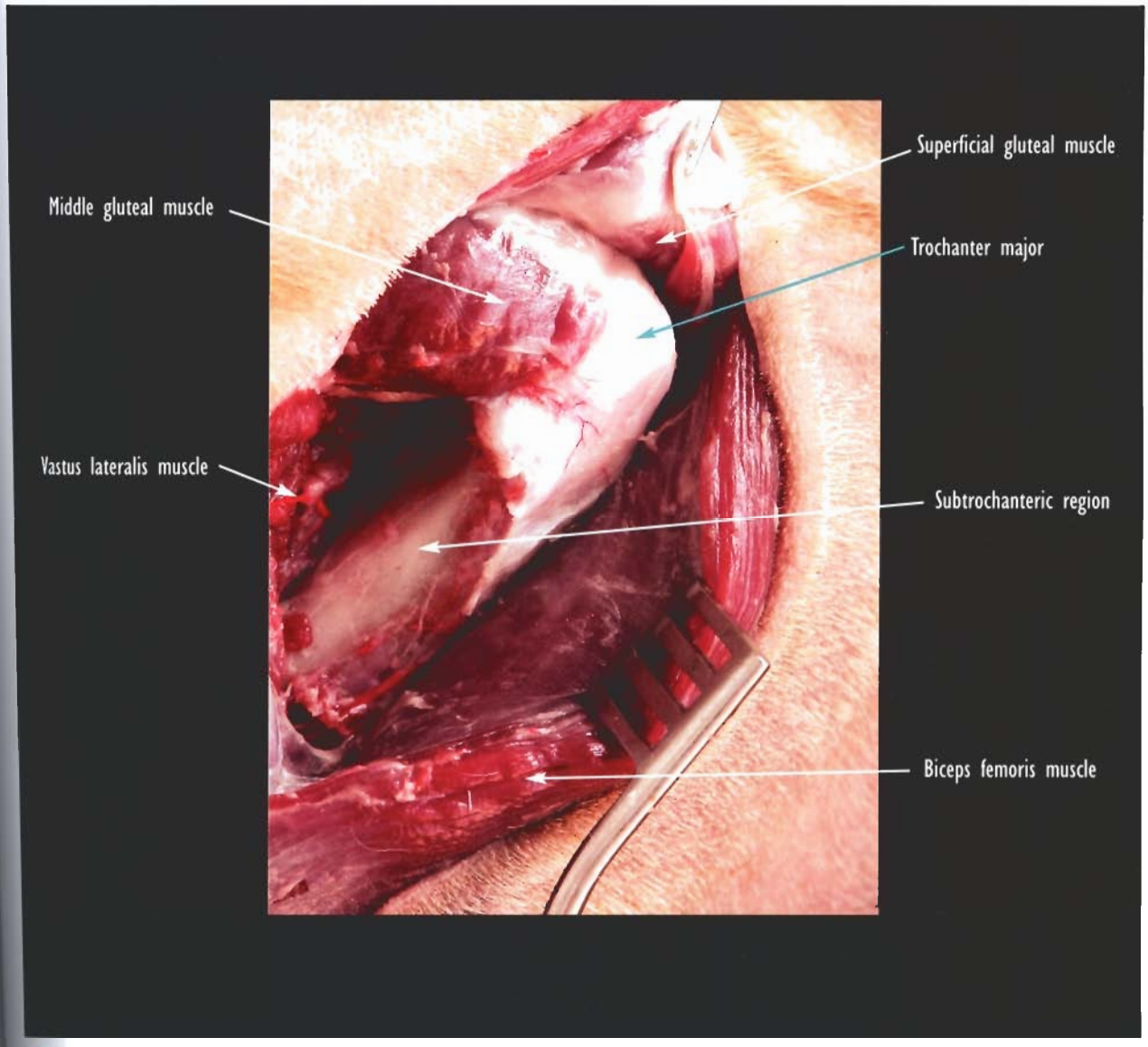
Indications:

Open reduction and fixation of subtrochanteric fractures.

Corrective osteotomy.



- *Upper image:* the skin incision starts proximally to the major trochanter and extends distally to mid-femur. After incision of the gluteal fascia, the tendon of the superficial gluteal muscle is identified and prepared for transection (dotted line). Lateral view, left limb.
- *Lower image:* after tenotomy, the superficial gluteal muscle is reflected dorsally; the tensor fasciae latae muscle is freed caudally and reflected cranially; and the biceps femoris muscle is retracted caudally to expose the major trochanter. The origin of the vastus lateralis muscle is ready for transection (dotted line).



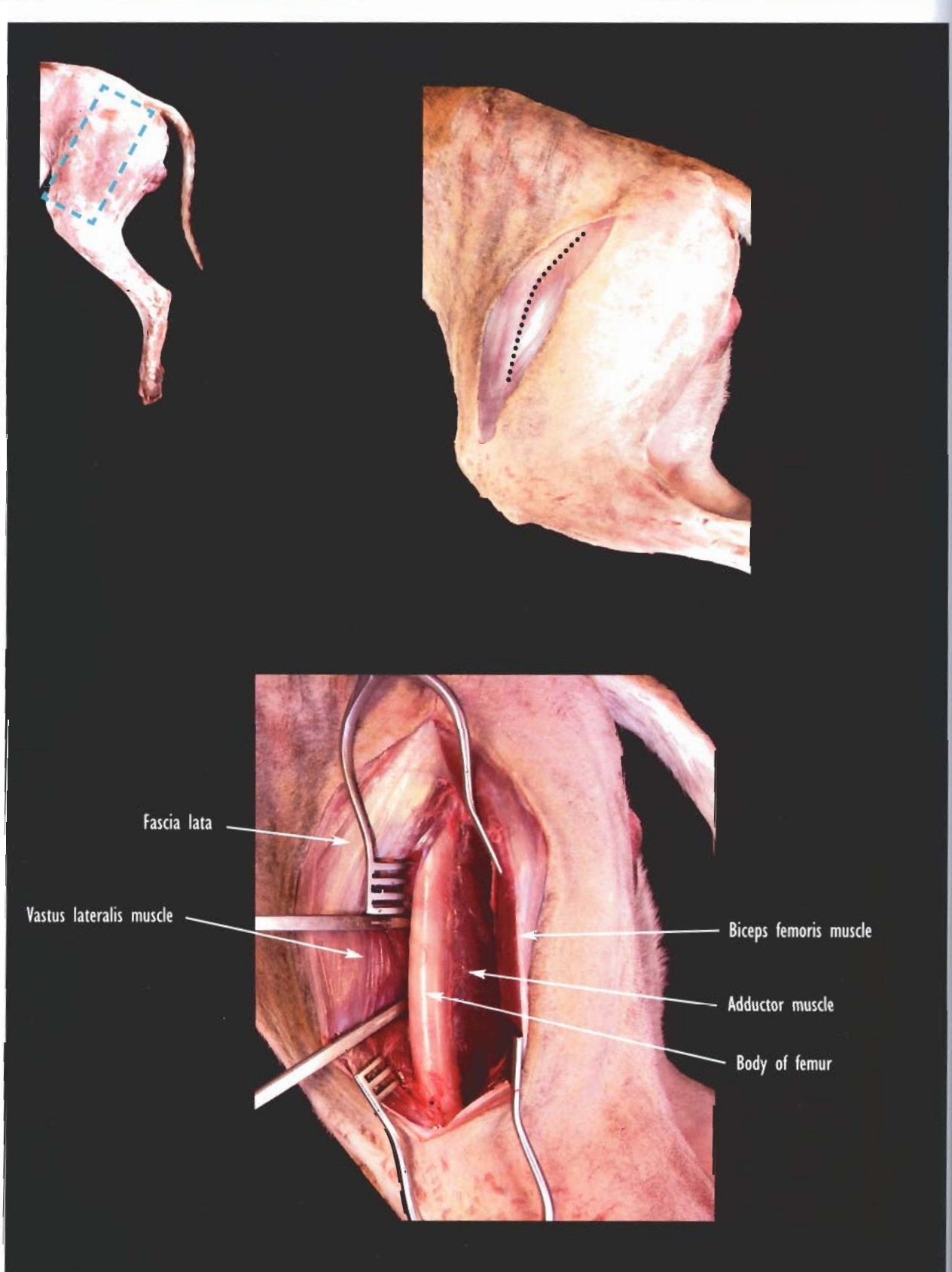
Close up of previous image after transection of the vastus lateralis muscle. The subtrochanteric region is exposed along with the major trochanter and the insertion of the middle gluteal muscle. Lateral view.

Approach to the diaphysis of the femur

Indications:

Open reduction and fixation of fractures of the femoral diaphysis.

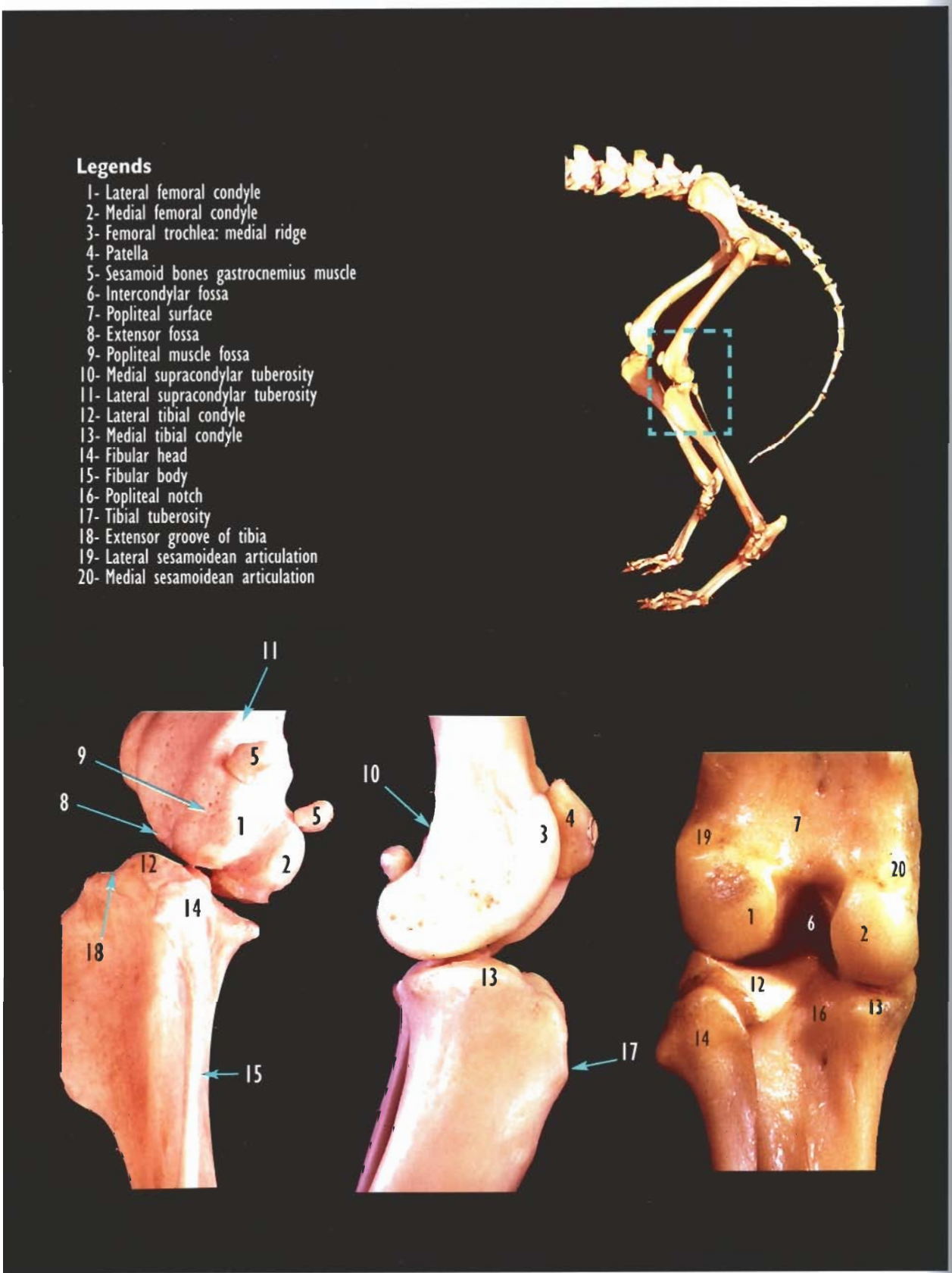
Corrective osteotomy.



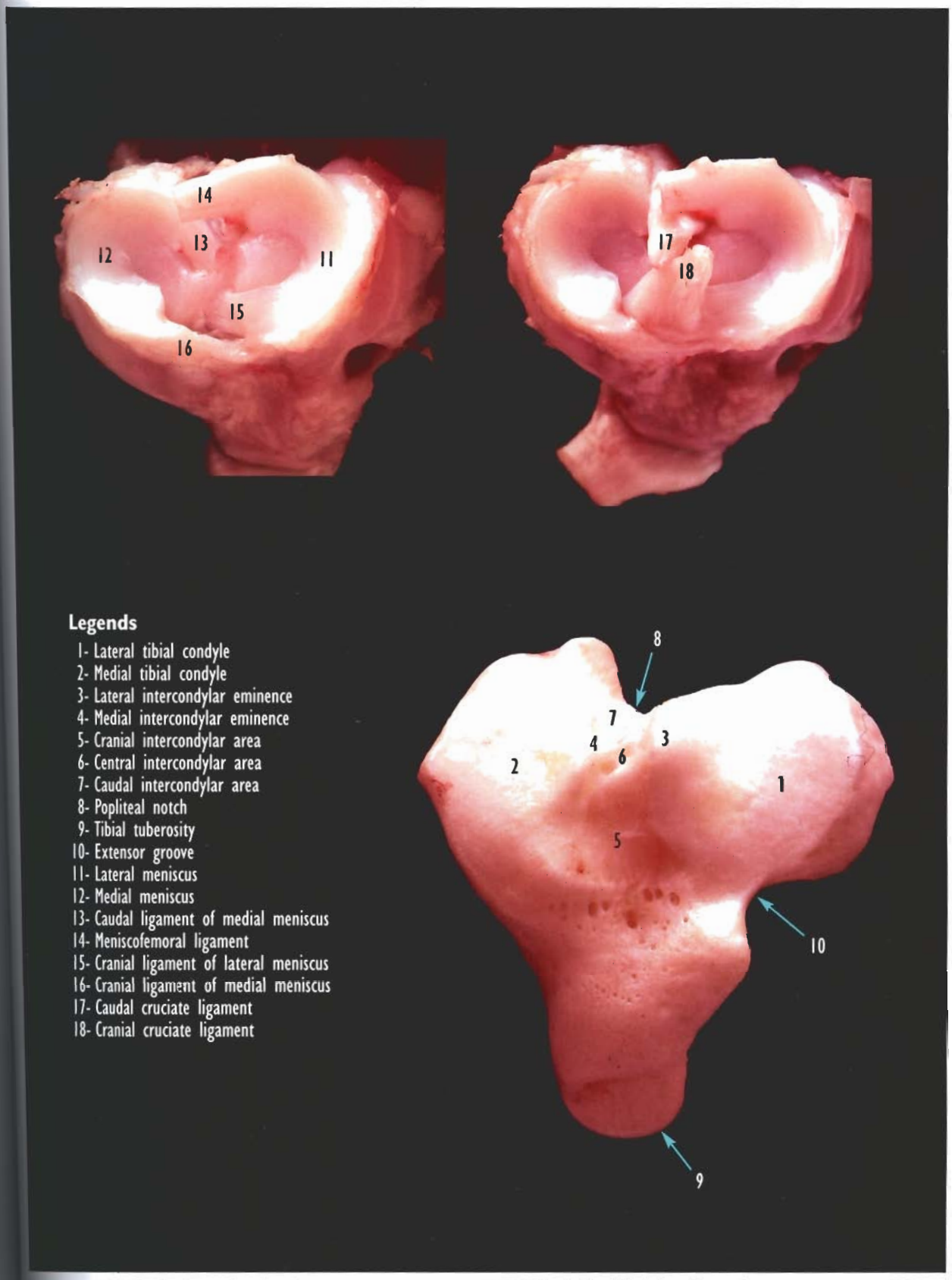
- *Upper image:* the skin incision extends from the major trochanter to the lateral condyle. The fascia lata at the junction of the vastus lateralis and biceps femoris muscle (dotted line) will be incised. Lateral view, left limb.
- *Lower image:* after opening the fascia lata, the vastus lateralis muscle is retracted cranially and the biceps femoris muscle retracted caudally to expose the femoral diaphysis.

Stifle, leg and foot

Anatomical considerations



Osteological detail of the stifle region. Lateral, medial and caudal views of the left stifle. See videos 8 and 9, 3D reconstruction of stifle joint.

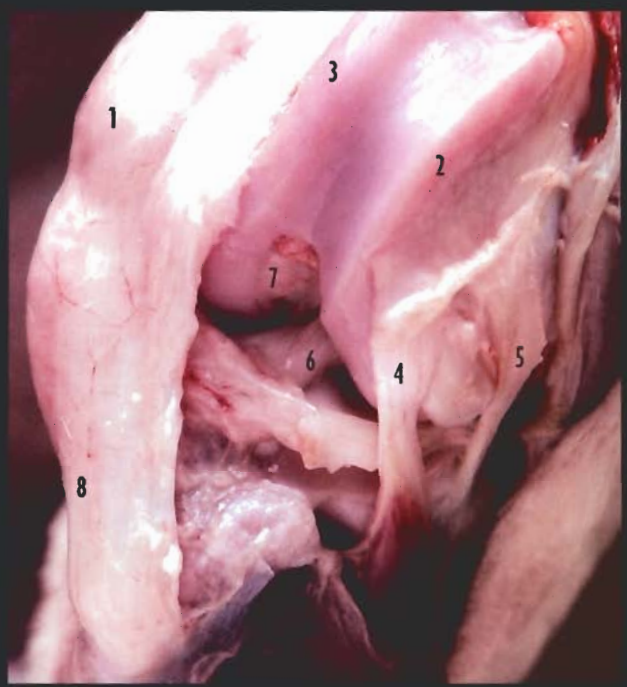


Legends

1- Lateral tibial condyle
2- Medial tibial condyle
3- Lateral intercondylar eminence
4- Medial intercondylar eminence
5- Cranial intercondylar area
6- Central intercondylar area
7- Caudal intercondylar area
8- Popliteal notch
9- Tibial tuberosity
10- Extensor groove
11- Lateral meniscus
12- Medial meniscus
13- Caudal ligament of medial meniscus
14- Meniscofemoral ligament
15- Cranial ligament of lateral meniscus
16- Cranial ligament of medial meniscus
17- Caudal cruciate ligament
18- Cranial cruciate ligament

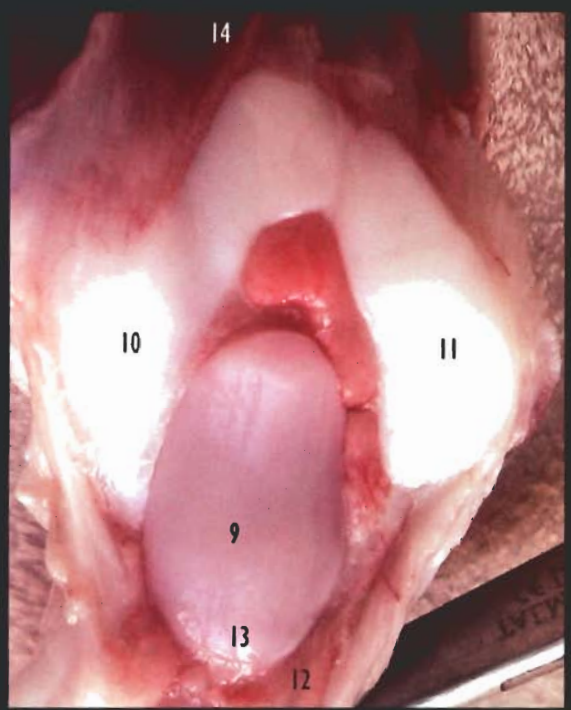
Upper images: **Menisci, meniscal and cruciate ligament details of the left stifle joint. Dorsal view.**

Lower image: Osteology of the left tibial plateau. Dorsal view.



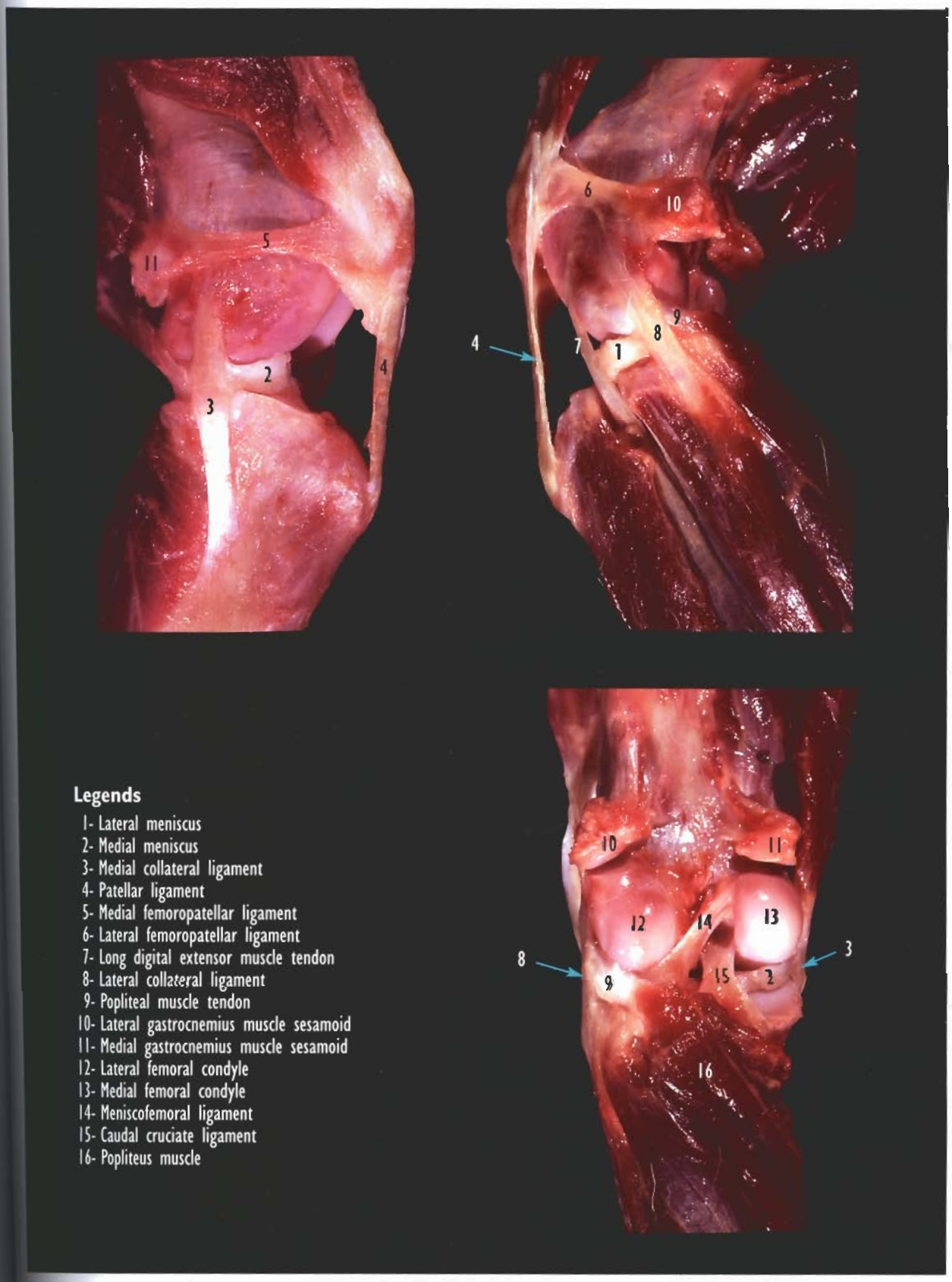
Legends

1- Patella
2- Lateral ridge of the trochlea
3- Medial ridge of the trochlea
4- Long digital extensor muscle tendon
5- Popliteal muscle tendon
6- Cranial cruciate ligament
7- Caudal cruciate ligament
8- Patellar ligament
9- Patellar articular cartilage
10- Lateral parapatellar fibrocartilage
11- Medial parapatellar fibrocartilage
12- Infrapatellar fat body
13- Patellar base
14- Quadriceps muscle tendon of insertion



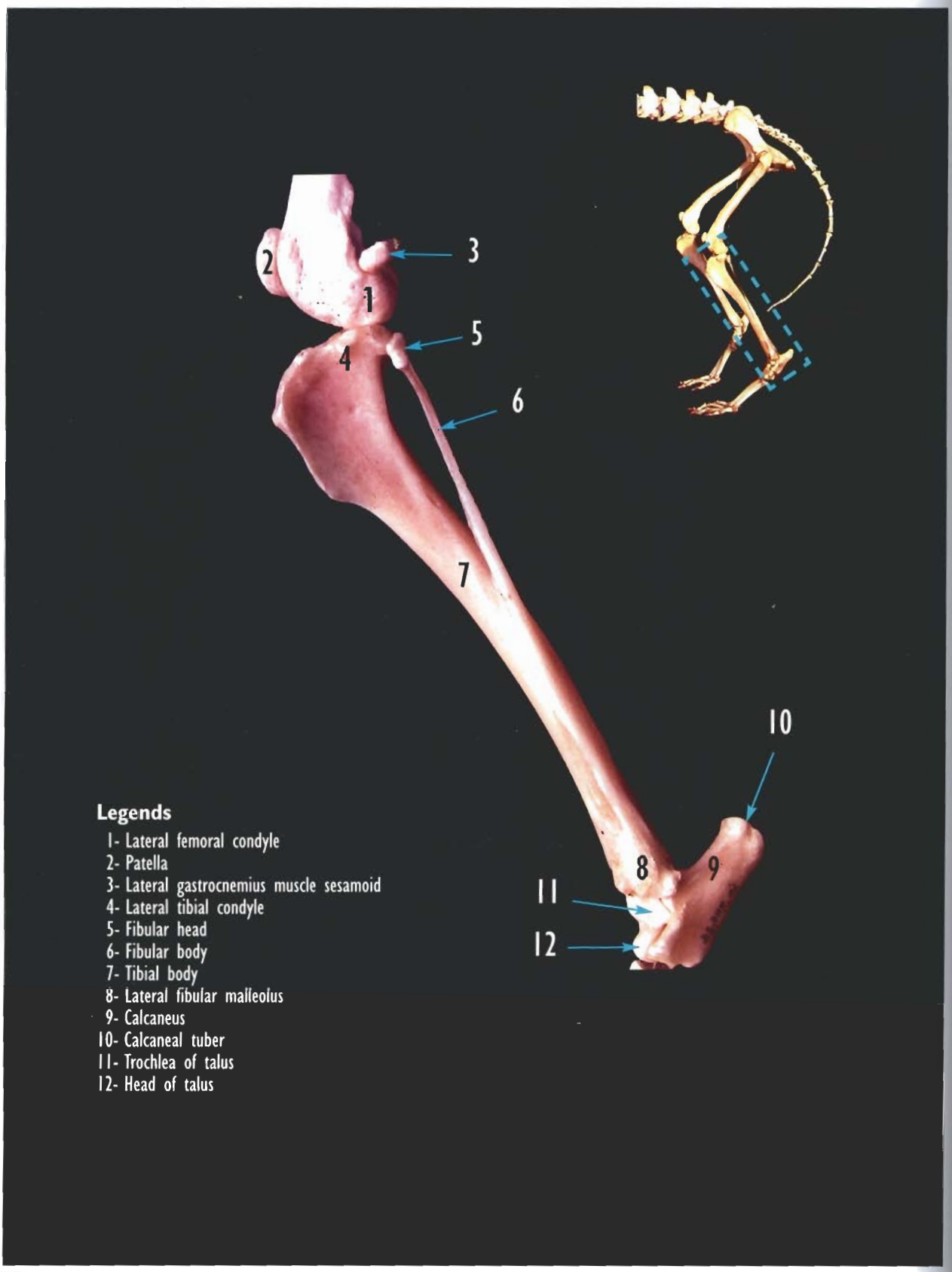
■ *Upper image:* details of the left stifle joint. The patella and patellar ligament have been luxated medially. Craniolateral view.

■ *Lower image:* patella is displaced craniodistally to view the patellar articular cartilage and parapatellar fibrocartilage. Caudal view.

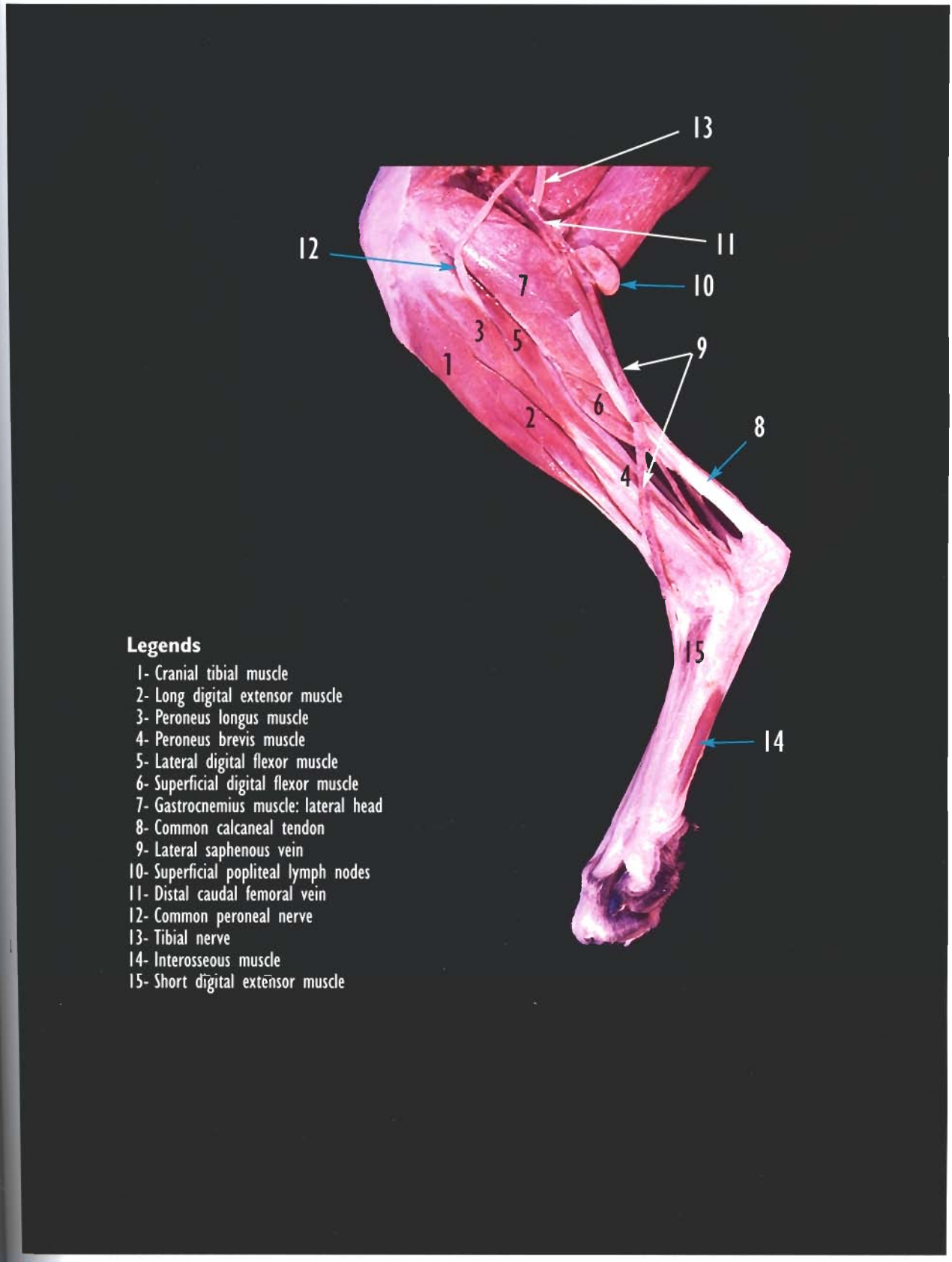


Upper image: menisci, ligaments and tendons details of the left stifle. Medial and lateral views.

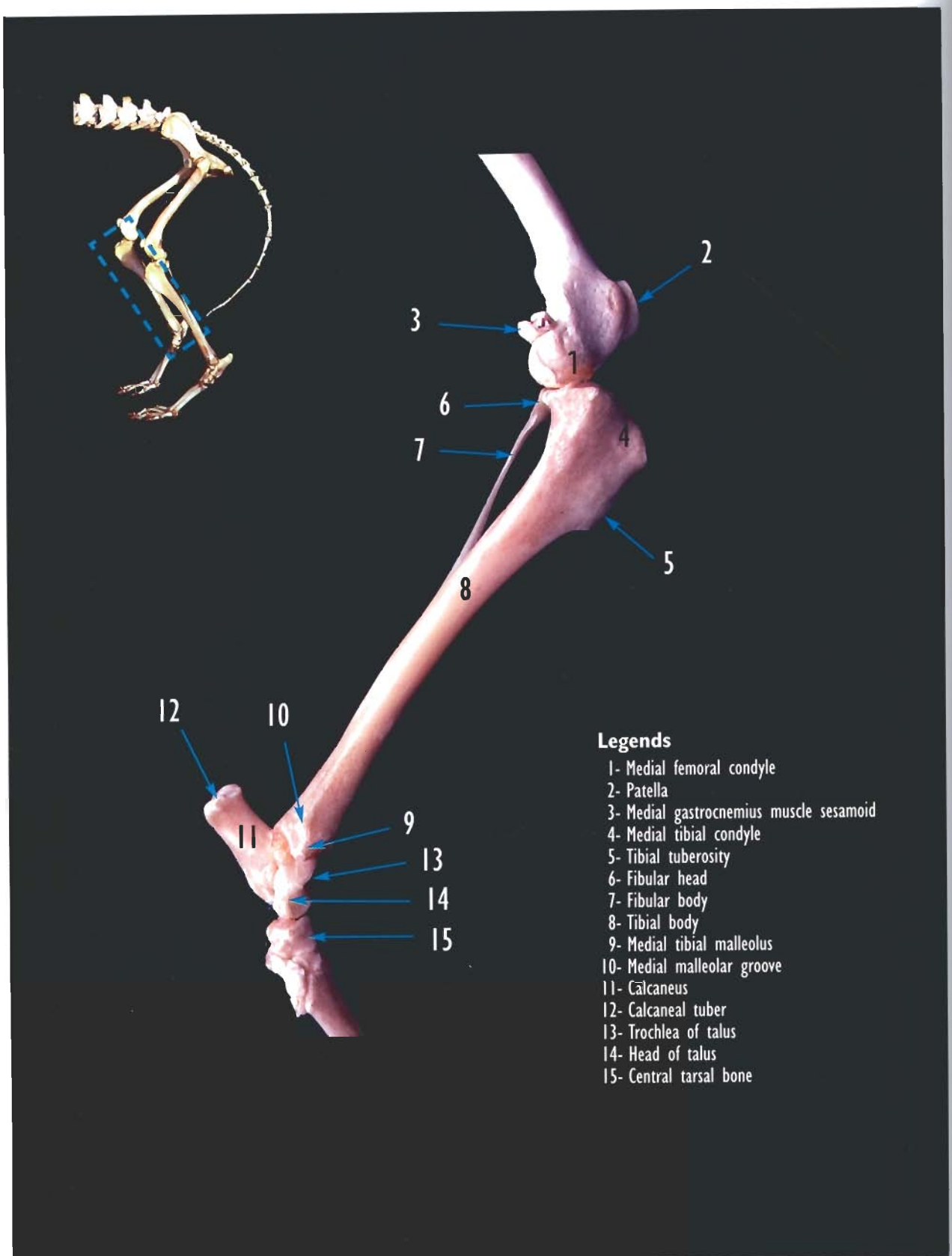
Lower image: menisci, ligaments and tendons details of the left stifle. Caudal view.



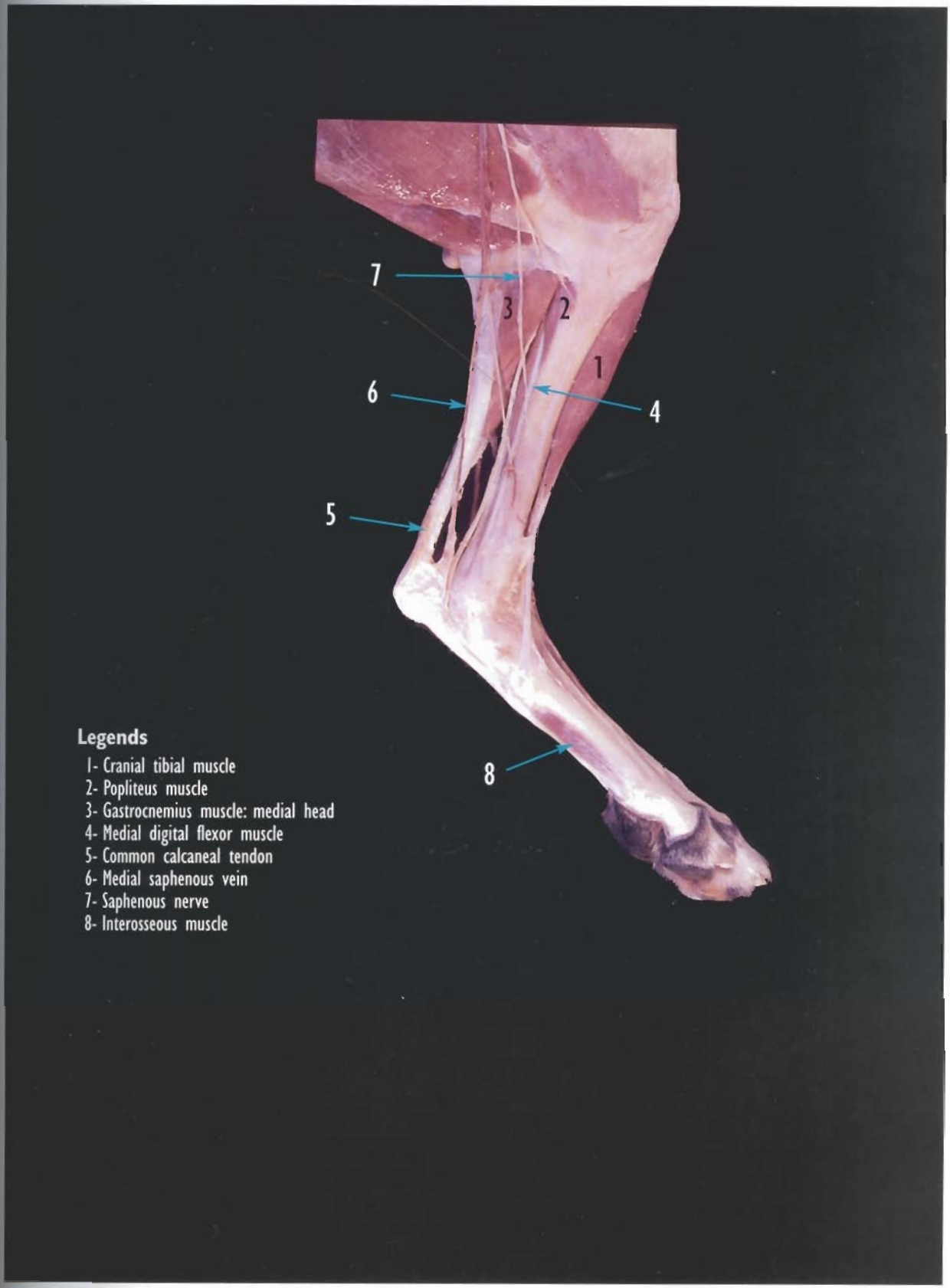
Detailed osteology of the left crus. Lateral view.



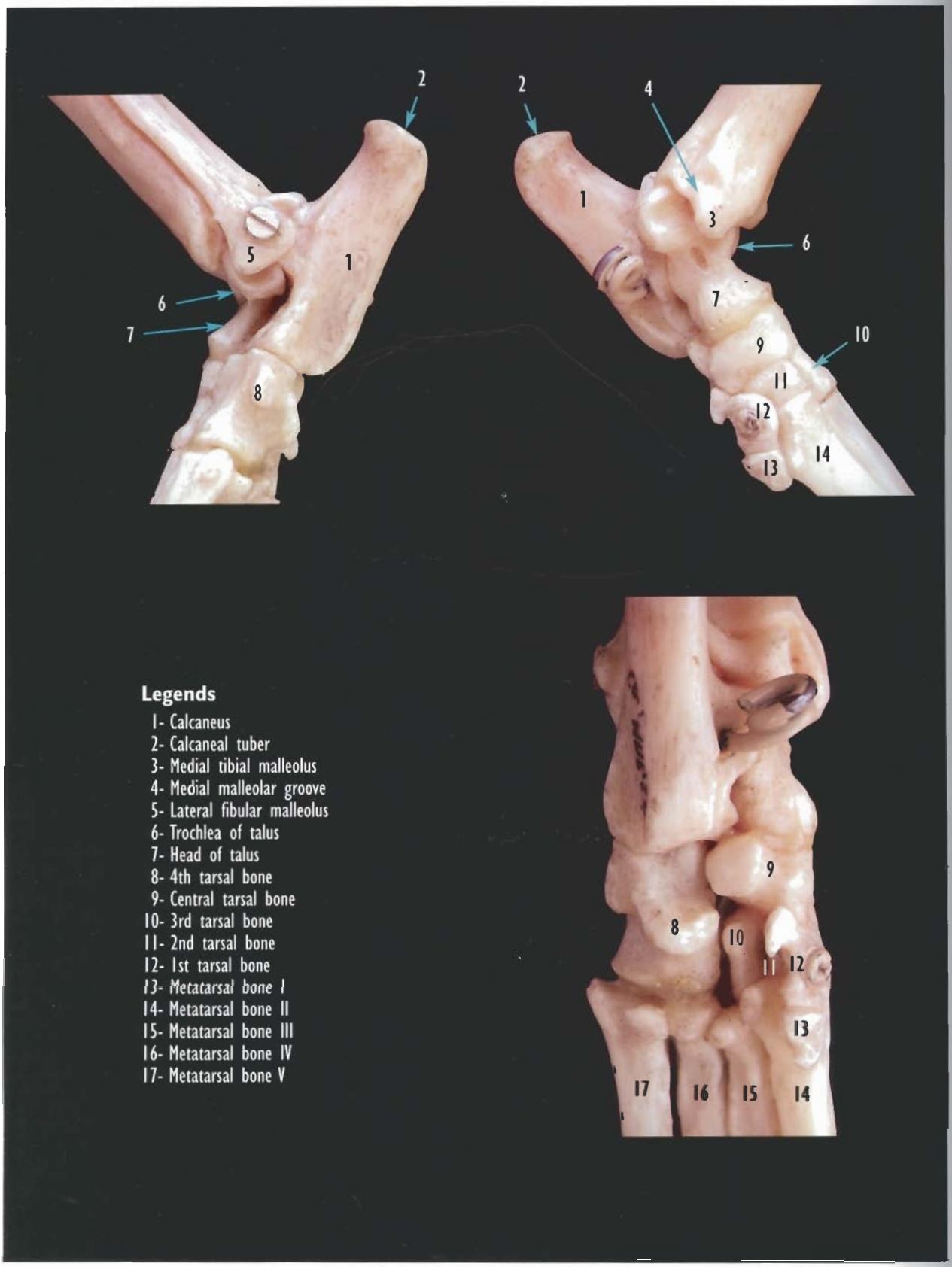
Details of the muscles on the lateral aspect of the left leg.



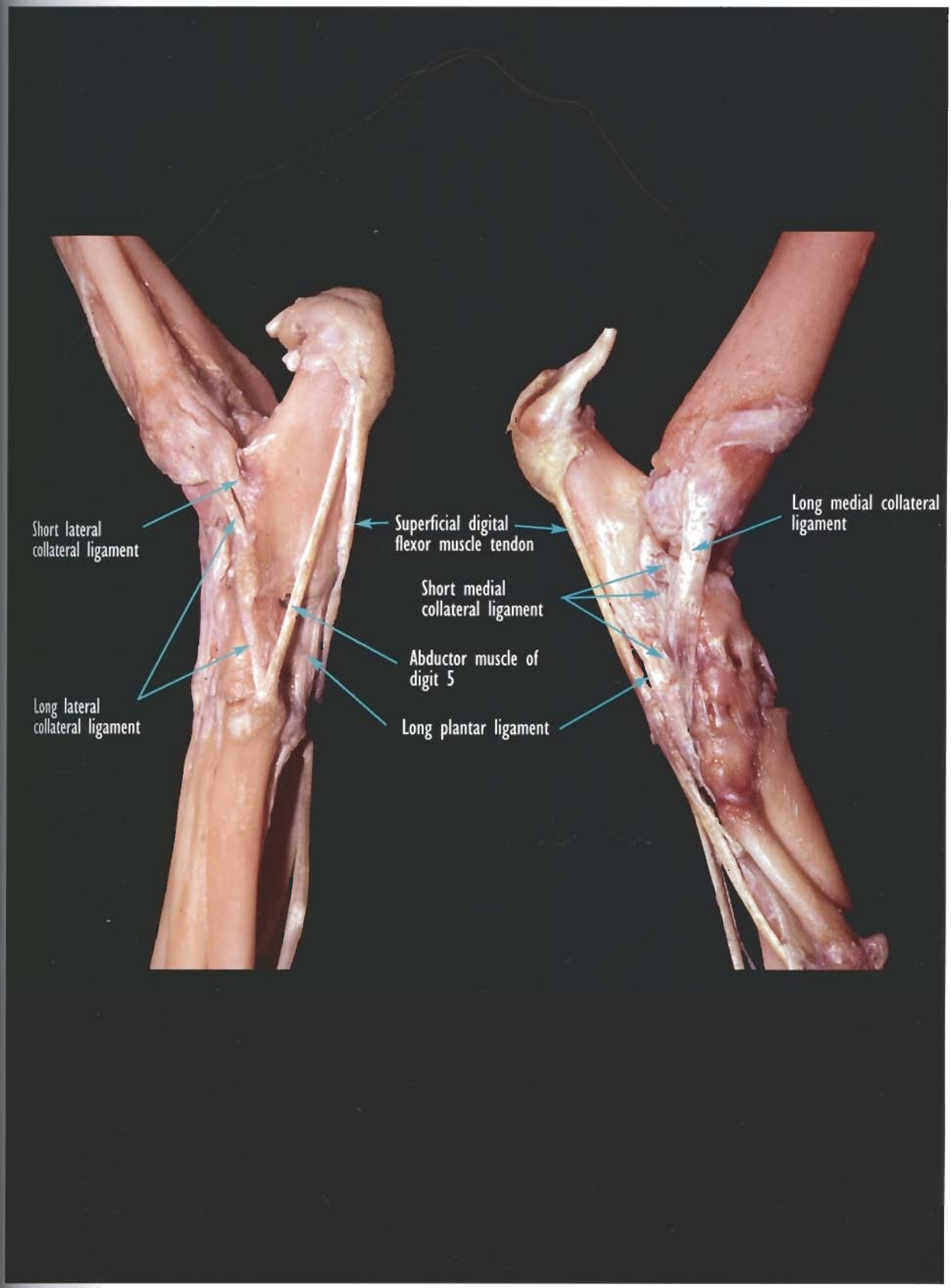
Detailed osteology of the left crus. Medial view.



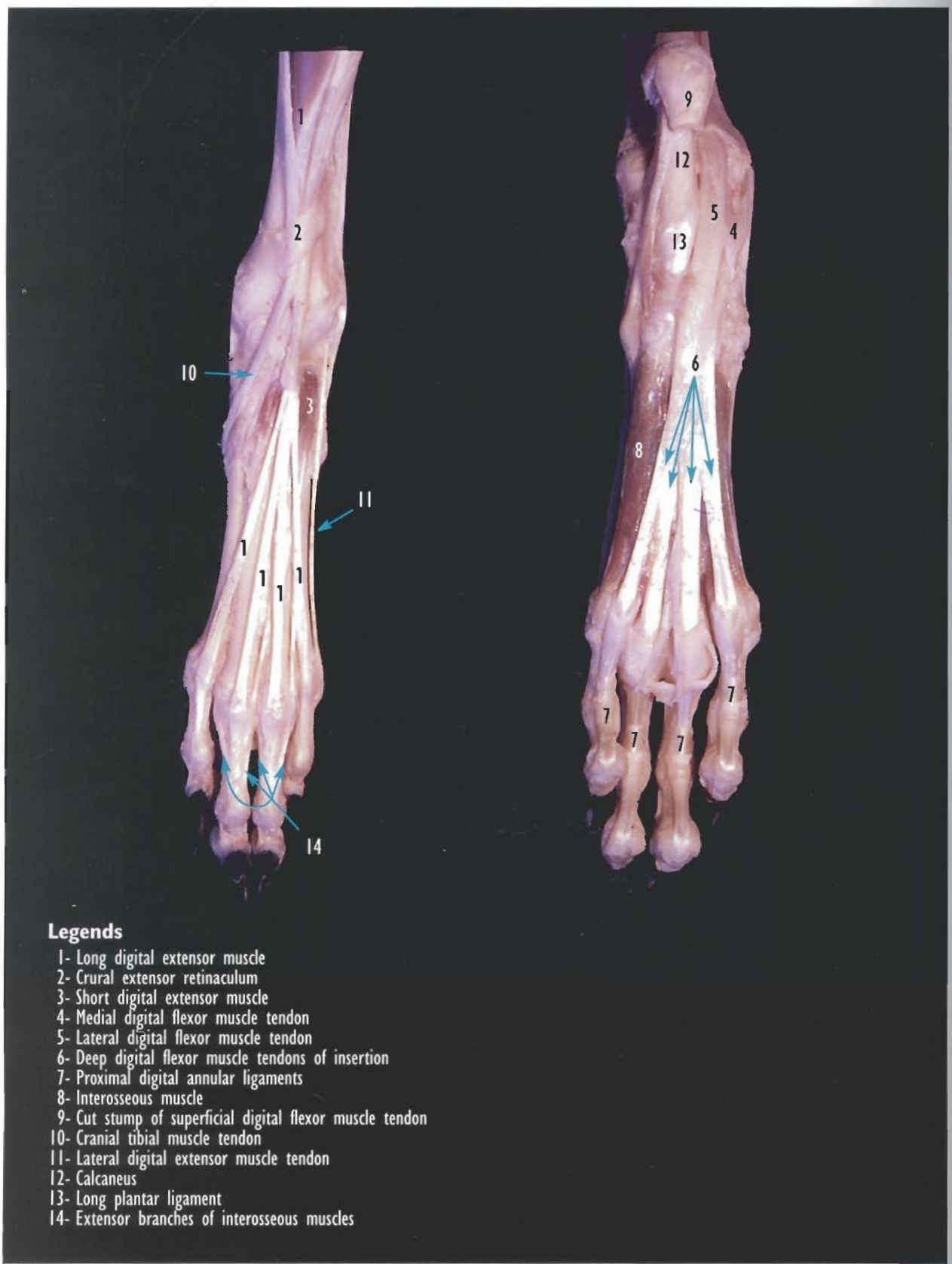
Details of the muscles on the medial aspect of the left leg.



- *Upper images:* osteological details of the left tarsus. Lateral and medial views. See videos 10 and 11, 3D reconstruction of the tarsal joint.
- *Lower image:* detailed osteology of the left tarsus. Plantar view.



Details of the main ligaments and tendons of the left tarsus. Lateral and medial views.



Legends

1- Long digital extensor muscle
2- Crural extensor retinaculum
3- Short digital extensor muscle
4- Medial digital flexor muscle tendon
5- Lateral digital flexor muscle tendon
6- Deep digital flexor muscle tendons of insertion
7- Proximal digital annular ligaments
8- Interosseous muscle
9- Cut stump of superficial digital flexor muscle tendon
10- Cranial tibial muscle tendon
11- Lateral digital extensor muscle tendon
12- Calcaneus
13- Long plantar ligament
14- Extensor branches of interosseous muscles

Ligament and tendon detail of the left pes. The superficial digital flexor muscle tendon has been transected at the calcaneal tuber and removed. Dorsal and planter views.

Approach to the distal femur and stifle joint via a lateral incision

Indications:

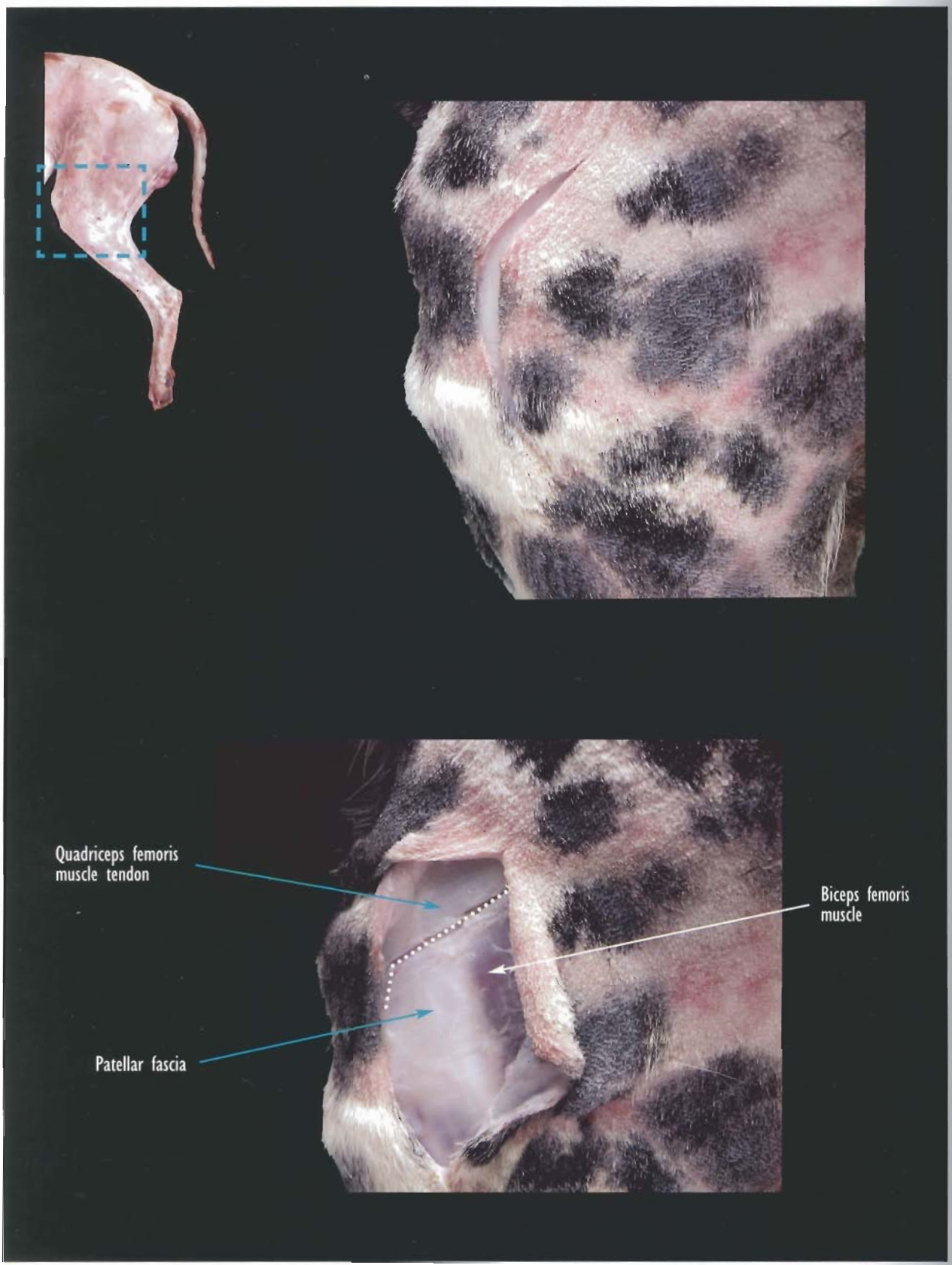
Diagnostic arthrotomy of the stifle.

Open reduction and fixation of supra-, inter- and condylar fractures.

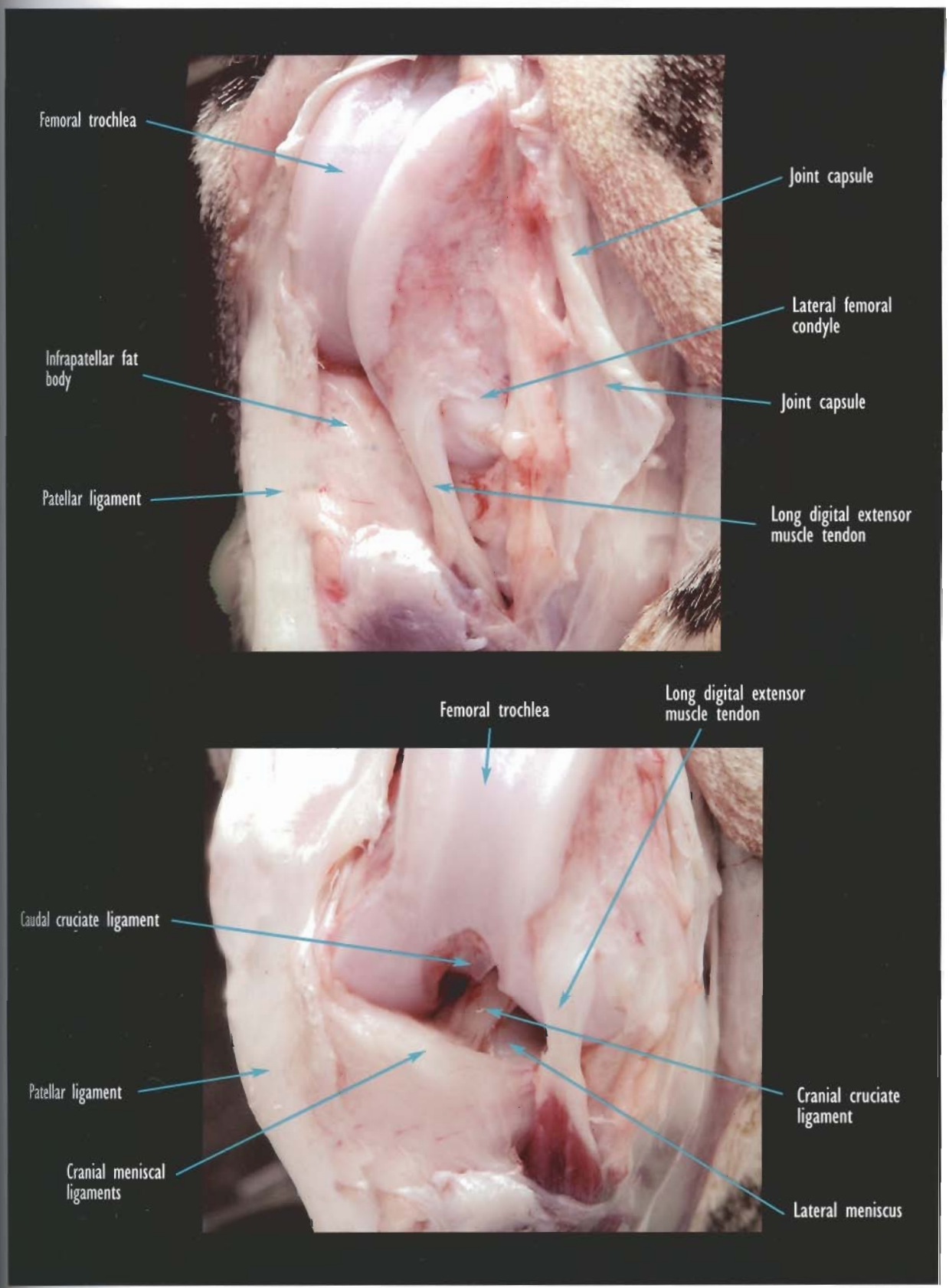
Medial or lateral patellar luxations.

Cranial cruciate ligament repair.

Exploration and partial removal of the lateral meniscus.



- *Upper image:* the arcing skin incision extends distally from the lateral femoral epicondyle to the proximal tibia. Lateral view, left stifle.
- *Lower image:* open the patellar fascia and locate the junction (dotted line) of the aponeurosis of the biceps femoris muscle and quadriceps femoris muscle tendons of insertion. The incision (dotted line) will be along the lateral margin of the quadriceps tendon through the joint capsule.

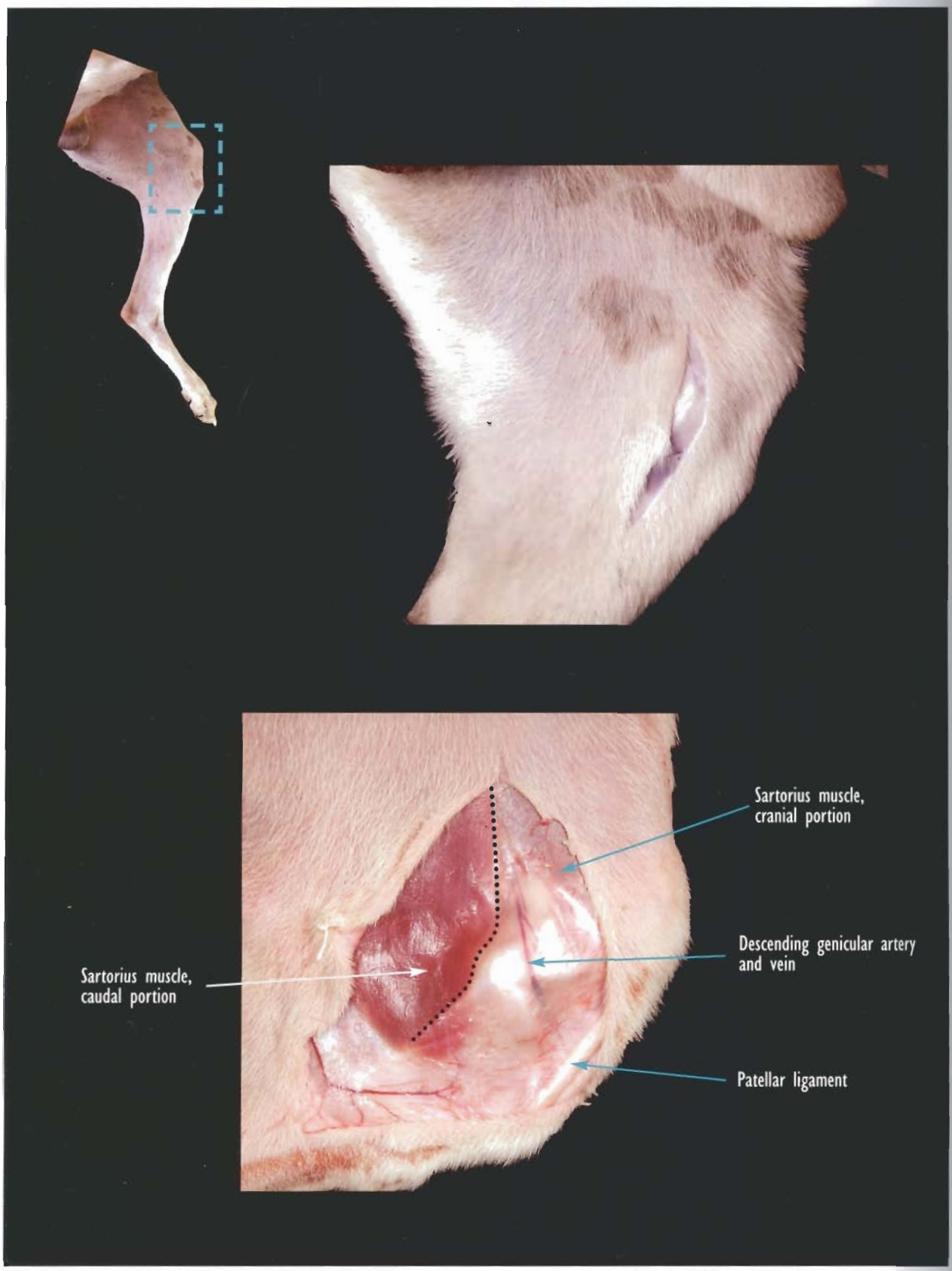


- *Upper image:* exploration of the opened stifle joint space is enhanced by medial luxation of the patella and the patellar tendon. Distally, the origin of the long digital extensor muscle tendon is seen with the infrapatellar fat body. This exposure provides access to the cruciate ligaments. Craniolateral view.
- *Lower image:* flexion of the joint and removal of the infrapatellar fat body allows examination of the cranial cruciate ligament and the cranial portion of the menisci. Craniolateral view.

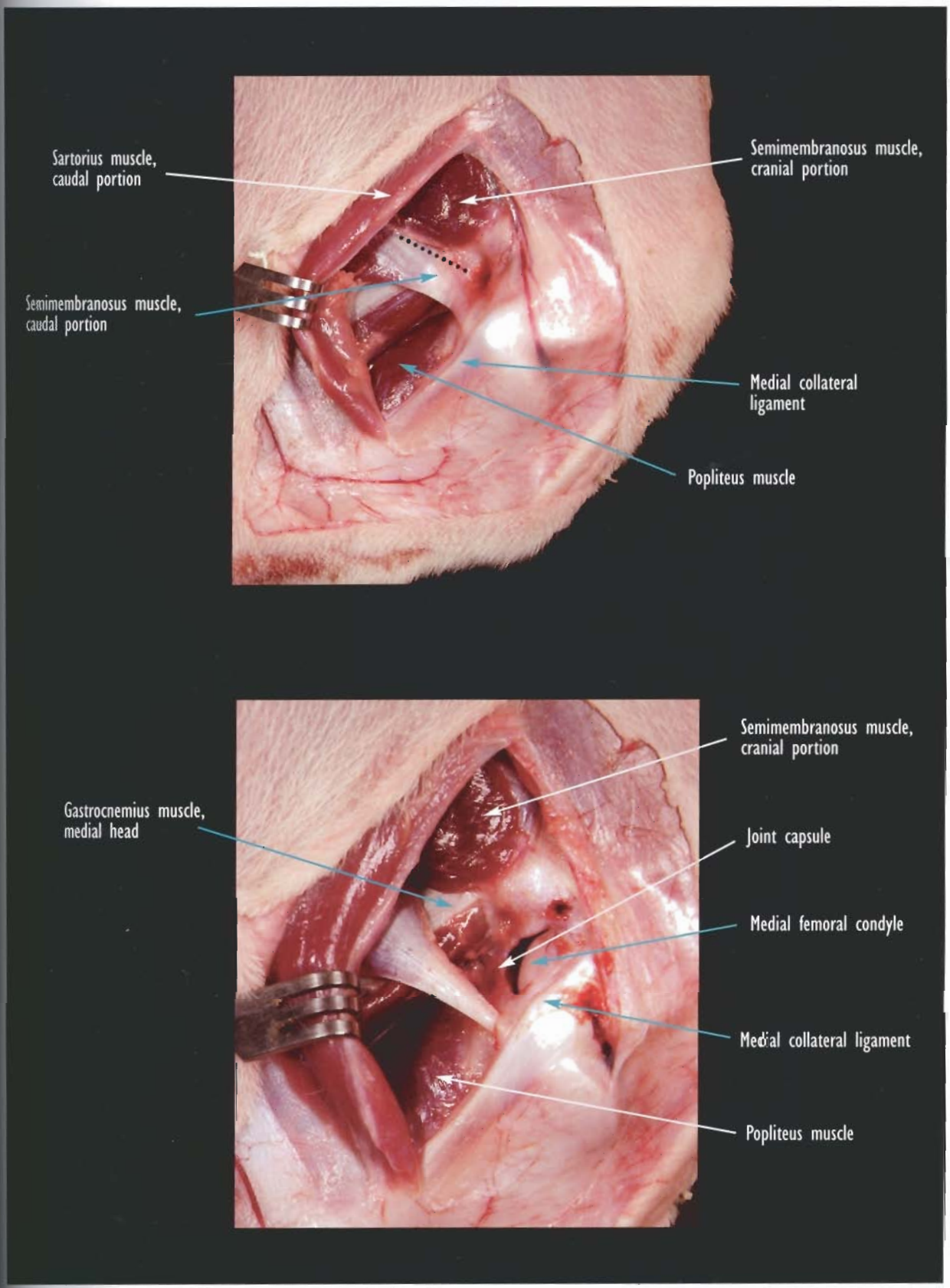
Approach to the medial collateral ligament and the caudomedial region of the stifle joint

Indications:

Diagnostic arthrotomy.
Medial collateral ligament repair.
TPLO, technique to repair the cranial cruciate ligament.
TTA, technique to repair the cranial cruciate ligament.
Exploration and partial removal of the medial meniscus.
Open reduction and fixation of fractures affecting the medial femoral condyle.
Freeing of the medial head of gastrocnemius.

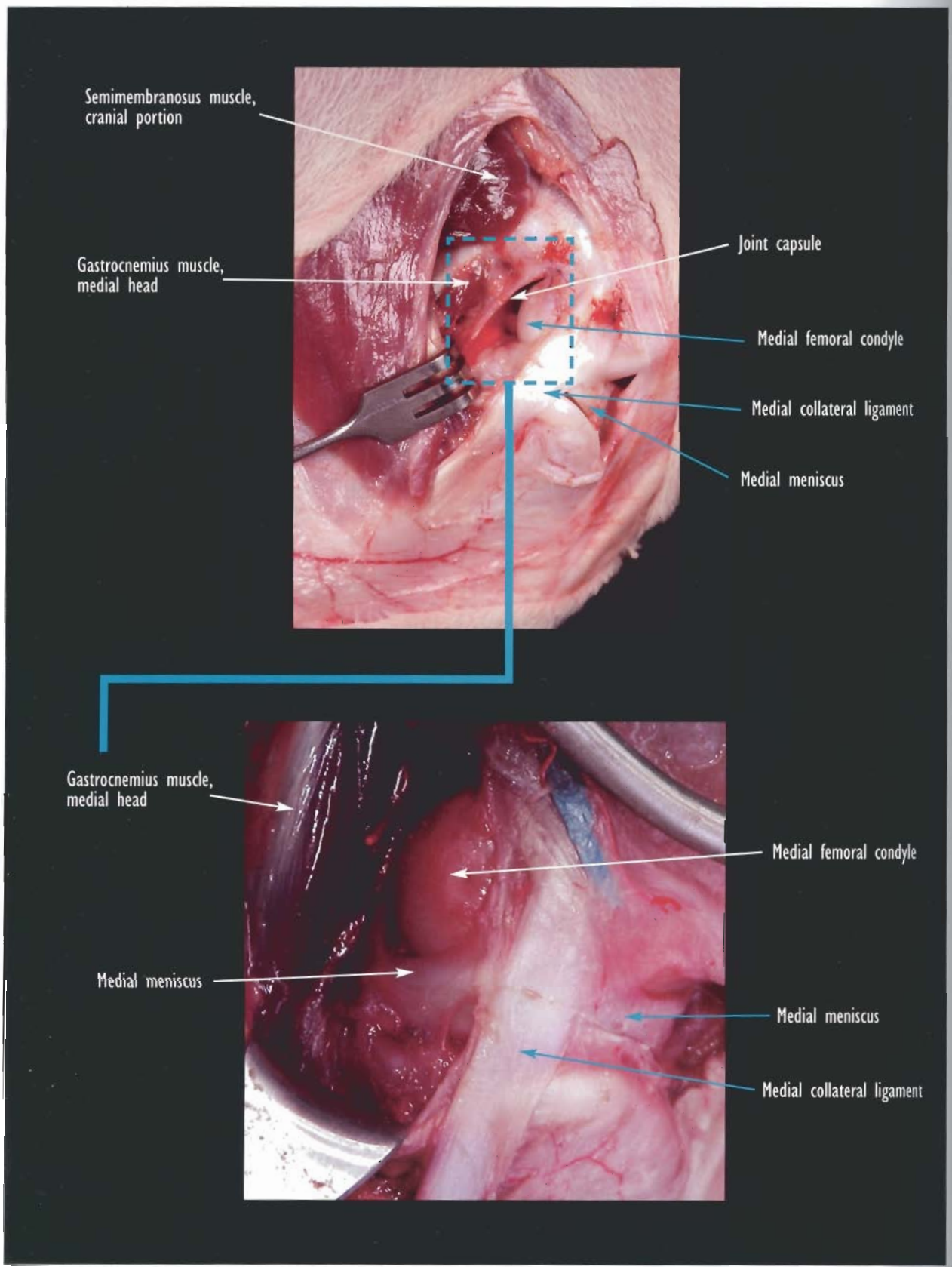


- *Upper image:* the dog is placed in lateral recumbency with the contralateral limb abducted. The incision arcs distally over the medial femoral epicondyle to the proximal medial tibia. Medial view, left stifle.
- *Lower image:* the medial patellar fascia is opened to expose the insertion (dotted line) of the caudal portion of the sartorius muscle in preparation for transection.



Upper image: after freeing the sartorius muscle (caudal portion), it is retracted caudally to identify the division (dotted line) between the two portions of the semimembranosus muscle. Medial view.

Lower image: after separation of the semimembranosus, the stifle joint capsule is exposed and may be cut.



■ *Upper image:* by retracting distally the caudal part of the semimembranosus muscle, the medial meniscus is exposed. Medial view.

■ *Lower image:* close up of the indicated region of the upper image. The medial meniscus can be seen cranially and caudally to the medial collateral ligament.

Approach to the lateral collateral ligament of the caudolateral stifle joint region

Indications:

Diagnostic arthrotomy.

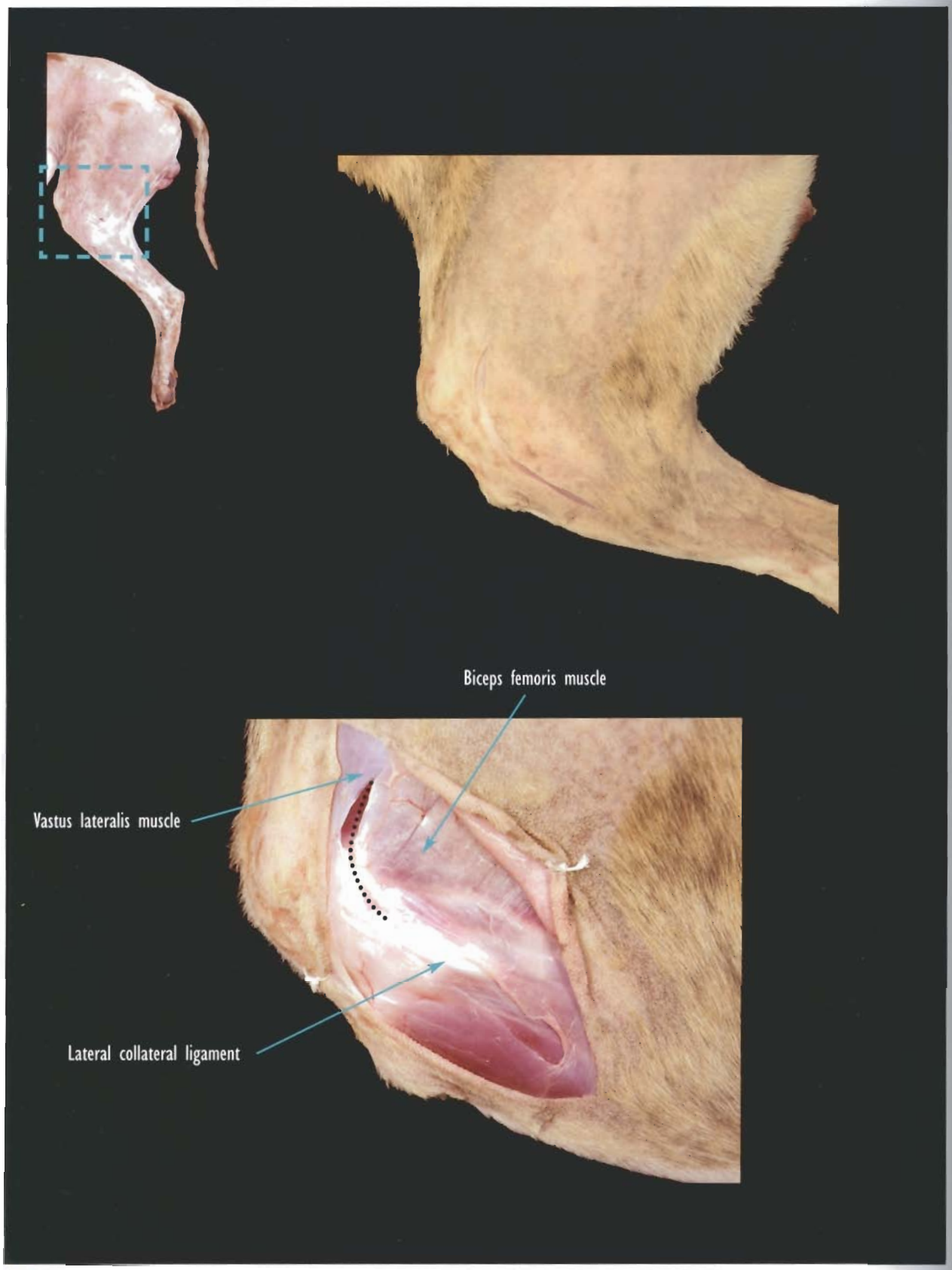
Lateral collateral ligament repair.

Dettachment of the lateral head of gastrocnemius muscle.

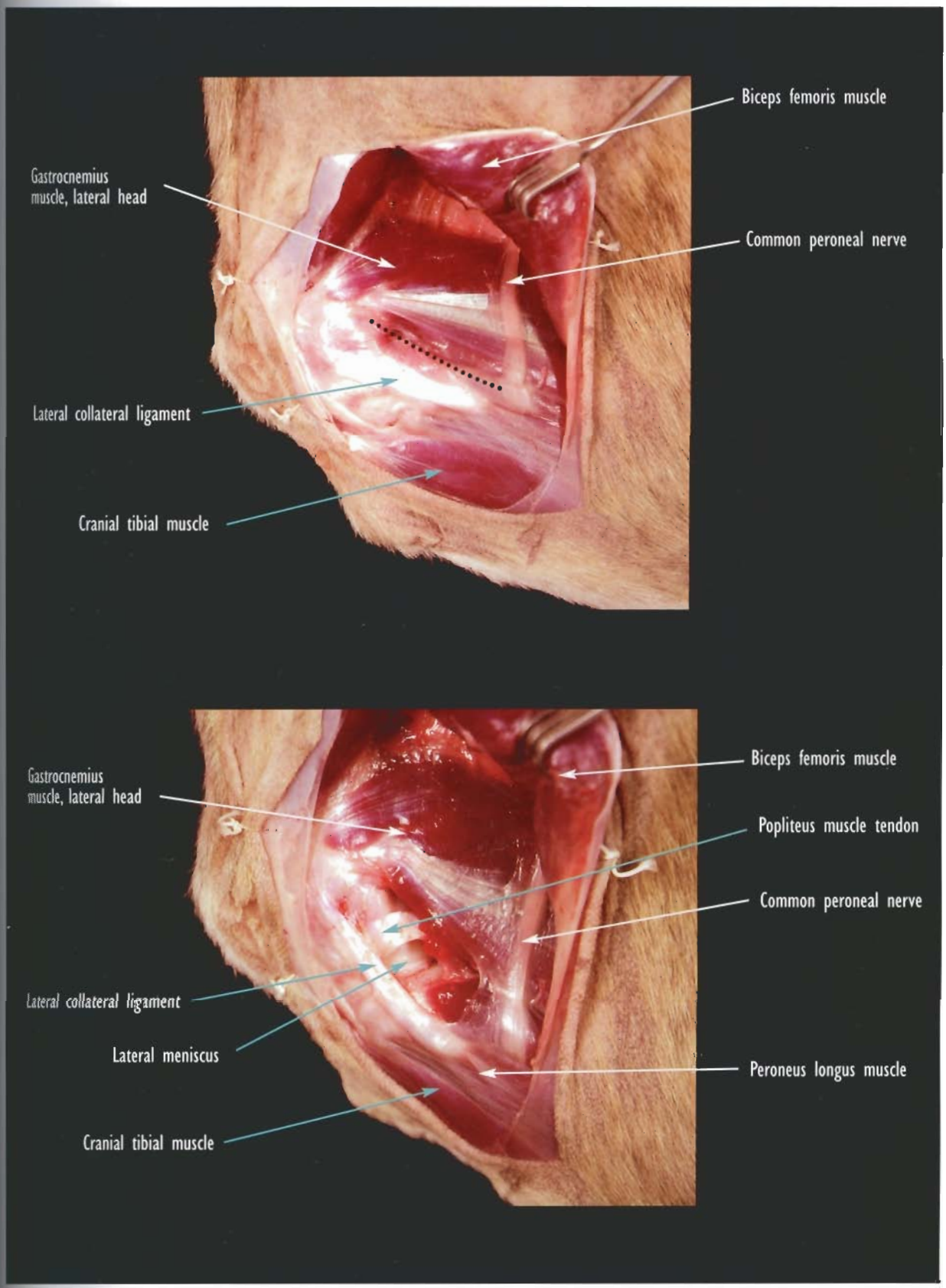
Transposition of the fibular head to repair the cranial cruciate ligament.

Exploration and partial removal of the lateral meniscus.

Open reduction and fixation of fractures of the lateral femoral condyle.



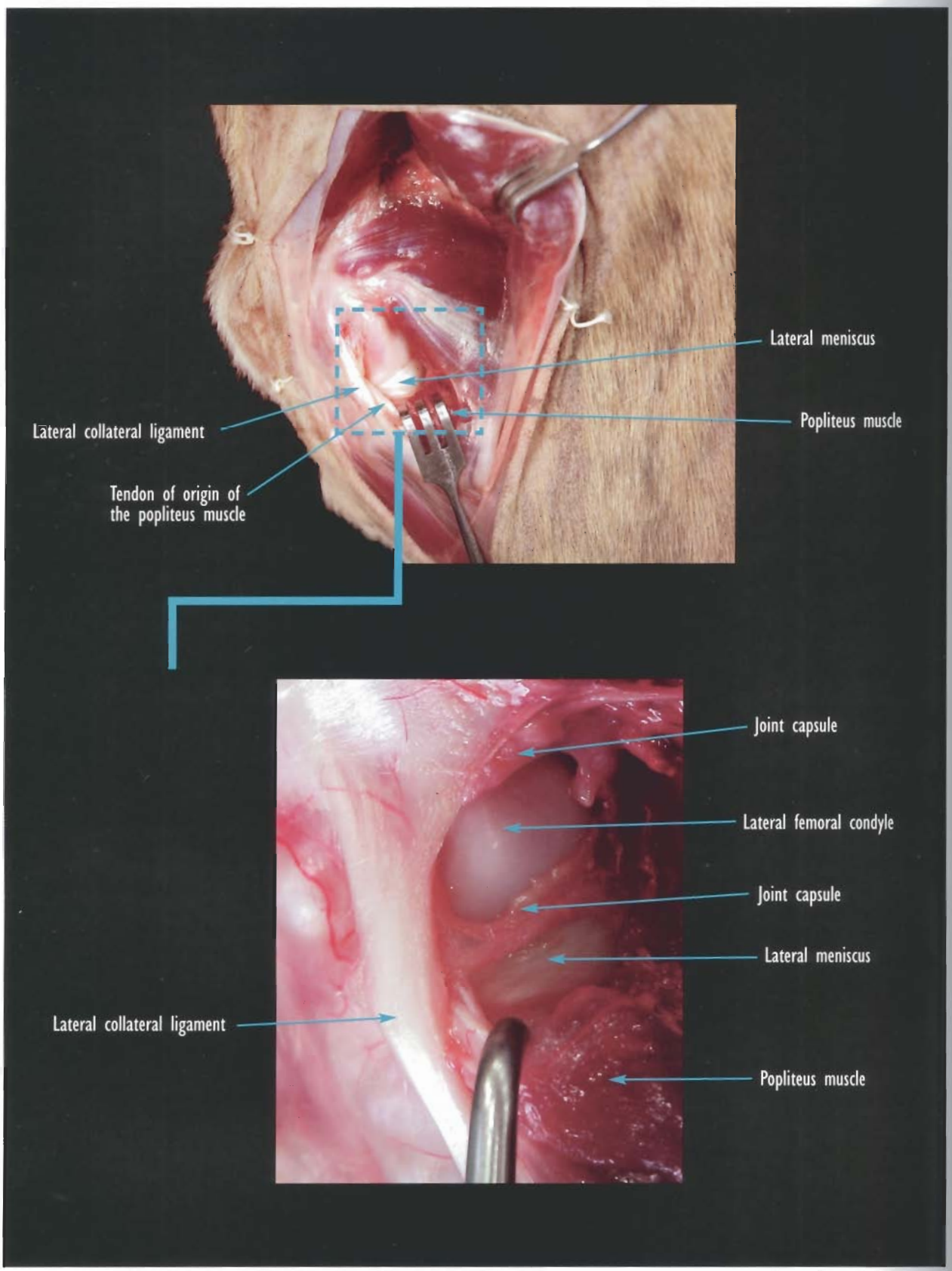
- *Upper image:* the skin incision arcs from proximal to distal over the lateral epicondyle. Lateral view, left stifle.
- *Lower image:* the fascia over the stifle region is divided and the aponeurosis between the vastus lateralis and biceps femoris muscles will be incised (dotted line). This incision will be continued distally to transect the biceps femoris tendon of insertion onto the tibia.



Upper image: after cutting the biceps femoris muscle tendon, the muscle is retracted caudally to access the space (dotted line) between the gastrocnemius muscle (lateral head) and the lateral collateral ligament. Lateral view.

Lower image: after opening this space, the joint capsule is incised to expose the lateral meniscus and the popliteus muscle tendon.

CAUTION: preserve the common peroneal nerve when displacing the biceps femoris muscle caudally.



- *Upper image:* the popliteus muscle tendon is displaced distally for complete exposure of the lateral meniscus. Lateral view.
- *Lower image:* enlargement of the indicated region (dashed lines) of the previous image.

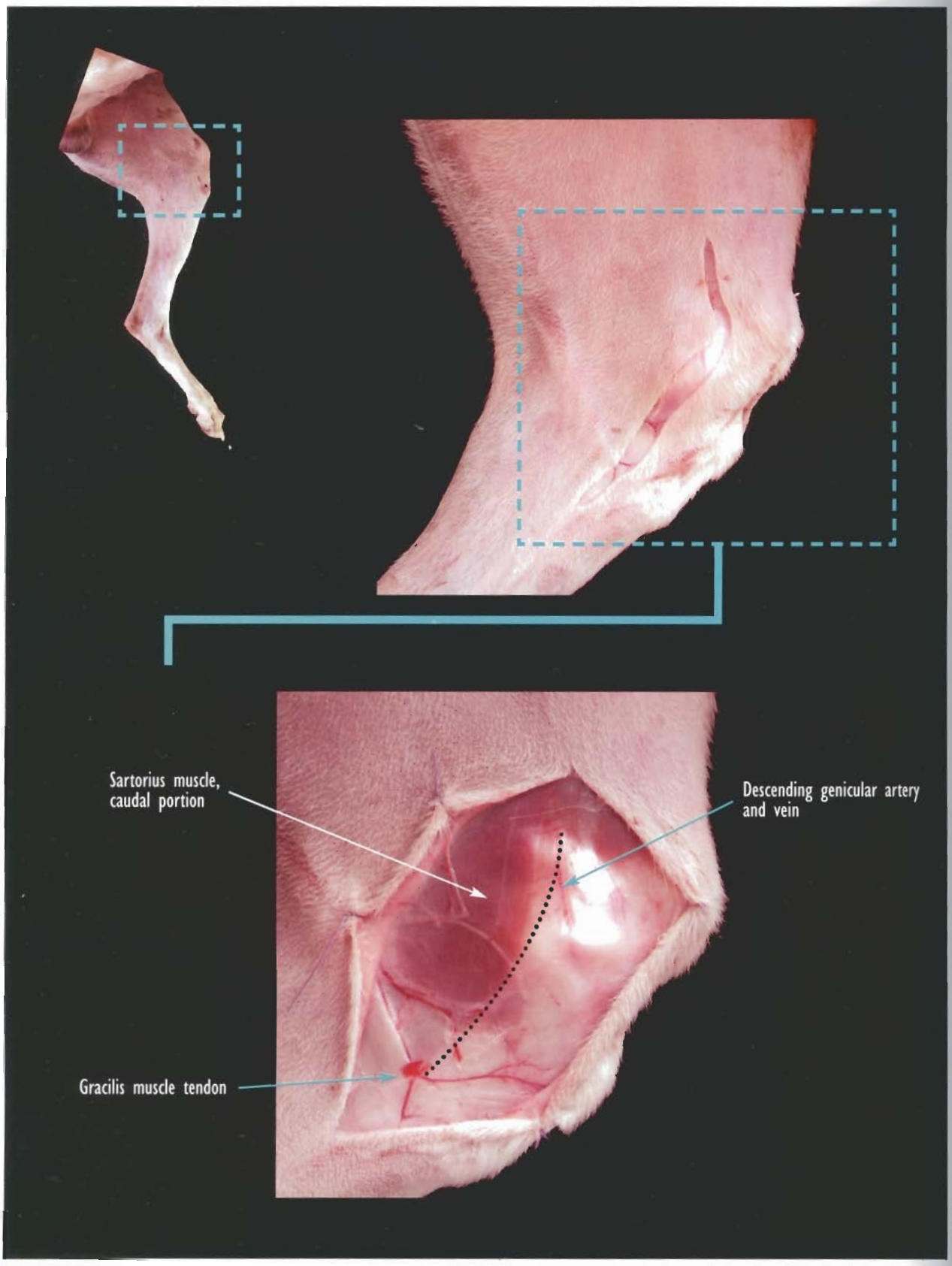
Approach to the proximal tibia via a medial incision

Indications:

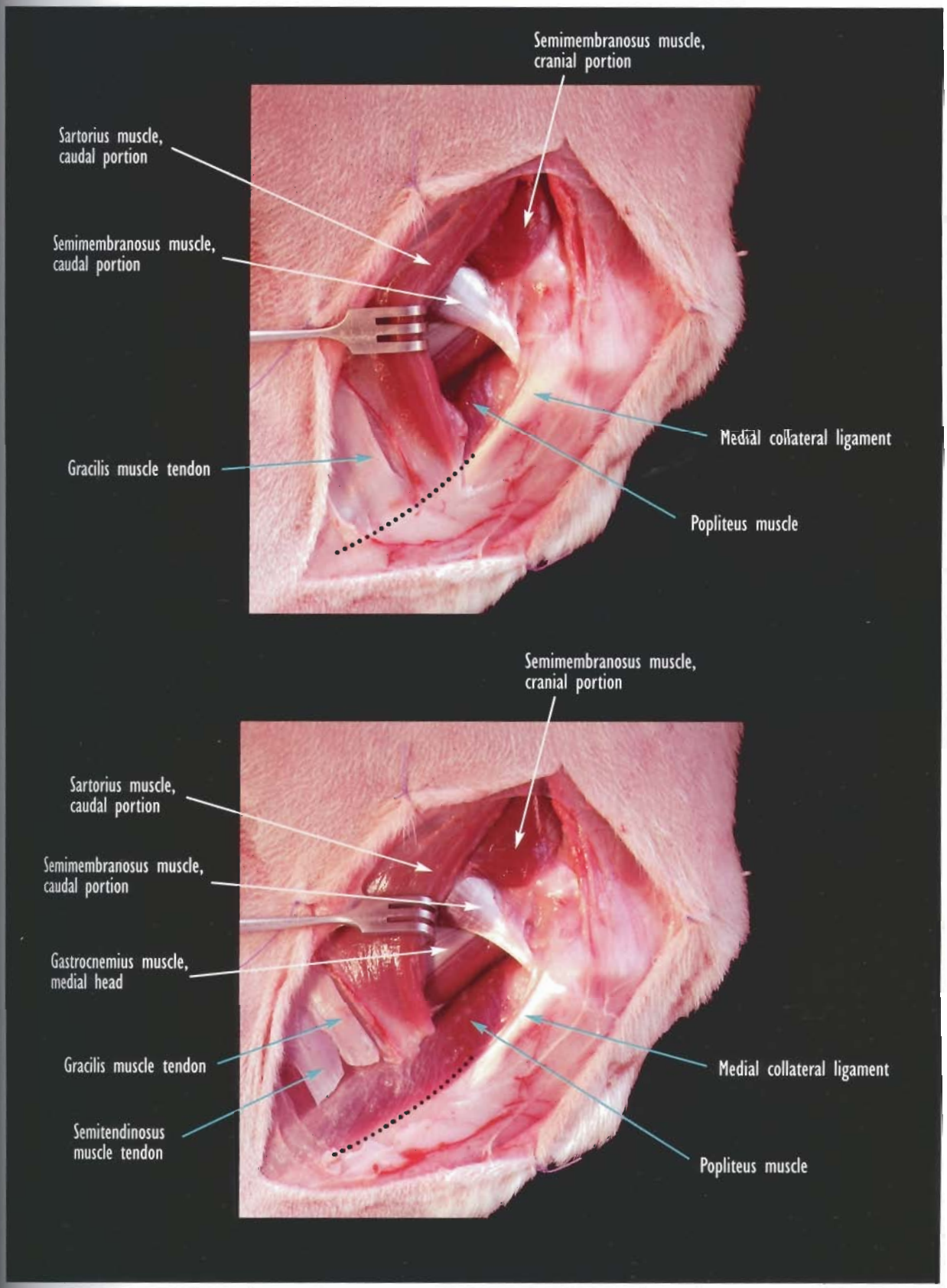
Open reduction and fixation of proximal tibial fractures.

Medial collateral ligament repair.

TPLO, technique to repair the cranial cruciate ligament.

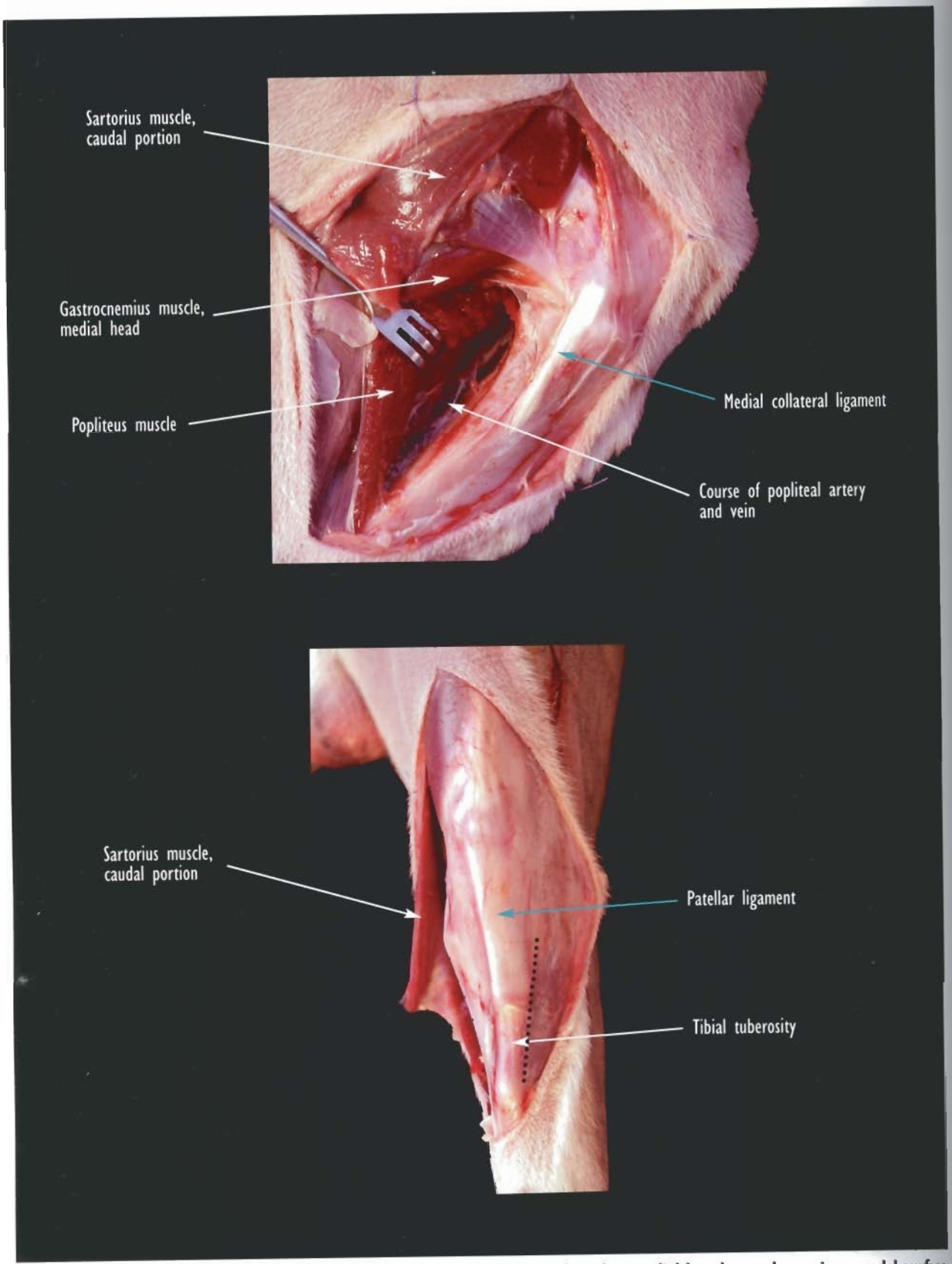


- *Upper image:* the dog is placed in lateral recumbency with the contralateral limb in abduction. The incision arcs distally over the medial femoral epicondyle to the proximal medial tibia. Medial view, left limb.
- *Lower image:* the medial patellar fascia is opened and the insertion (dotted line) of the caudal portion of the sartorius muscle will be transected.



Upper image: the sectioned sartorius muscle is retracted caudally to partially expose the popliteus muscle insertion. The tendons of the gracilis and semitendinosus muscles will be transected from their tibial attachment (dotted line). Medial view.

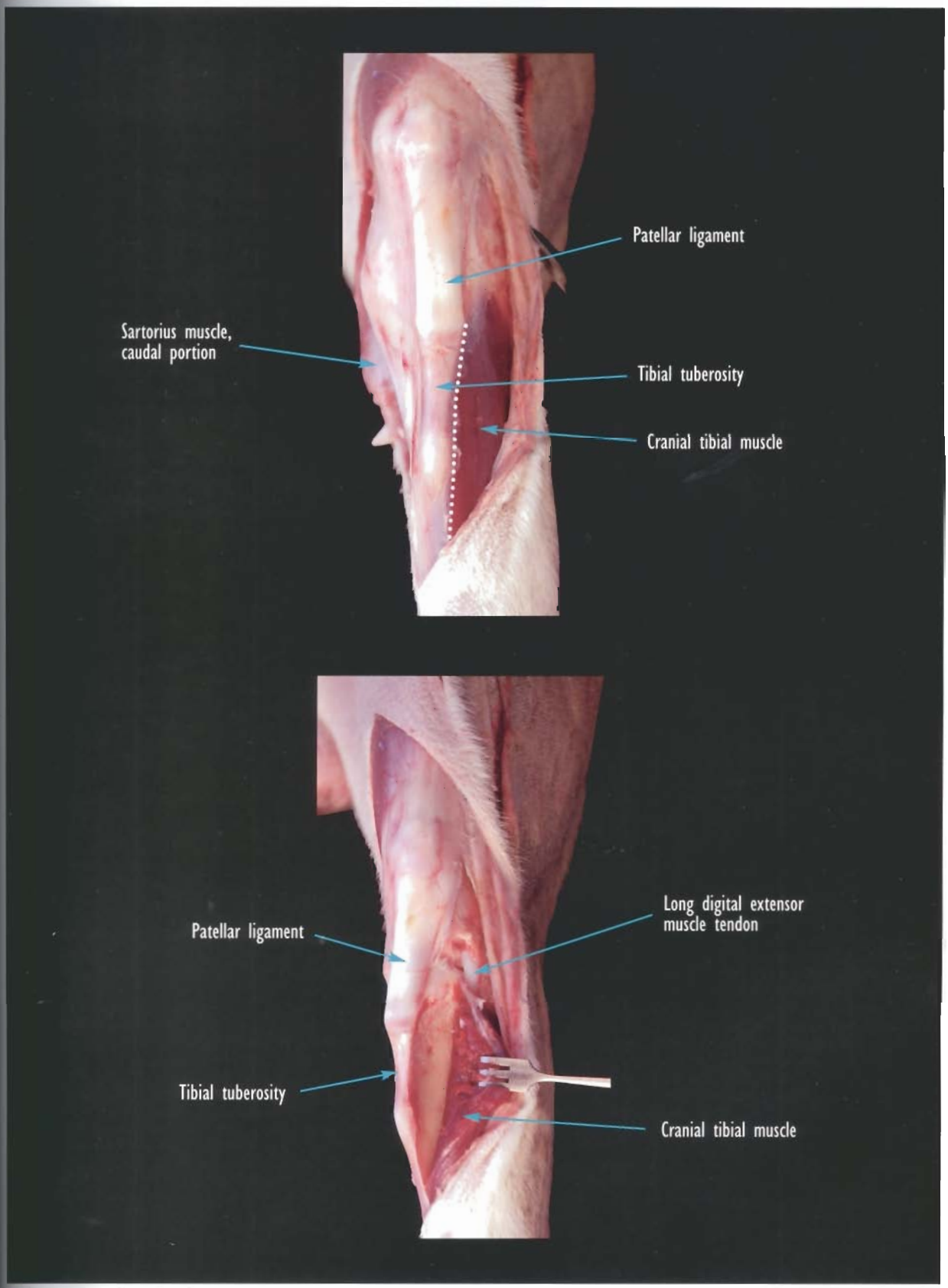
Lower image: after cutting the tendons of insertion of the sartorius, gracilis and semitendinosus muscles, the muscles will be retracted caudally. The attachment of the popliteus muscle to the tibia (dotted line) is ready for separation.



■ *Upper image:* after separation of the popliteus muscle from the tibia, the medial border and proximocaudal surface of the tibia are exposed. Medial view, left stifle.

CAUTION: preserve the popliteal artery and vein.

■ *Lower image:* from a cranial view, identify the lateral crural fascia and section it parallel to the tibial tuberosity (dotted line).



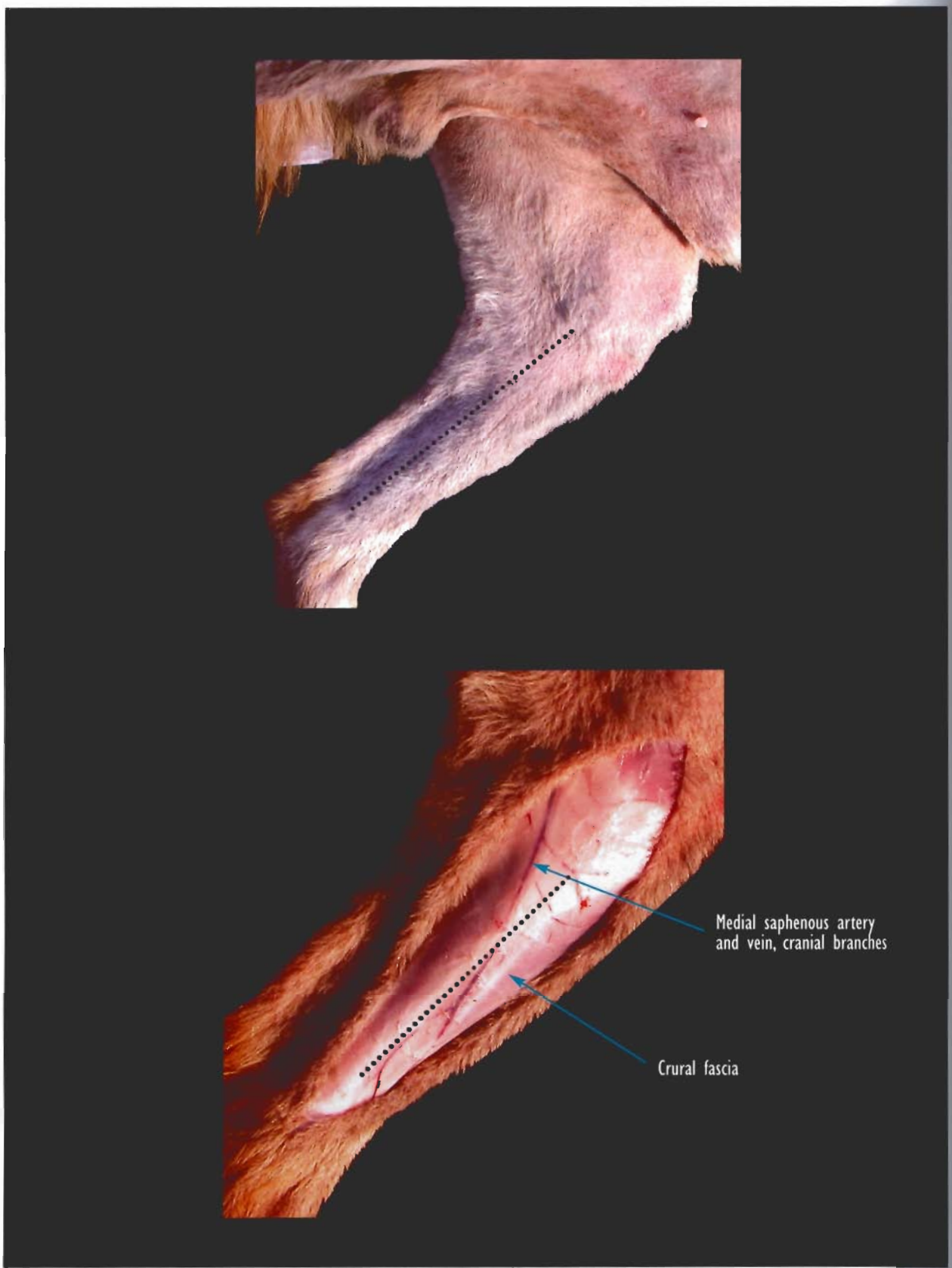
Upper image: after the fascia is cut and reflected laterally, identify and transect the attachment of the cranial tibial muscle to the tibial tuberosity (dotted line) and separate this attachment. Cranial view.

Lower image: retract the cranial tibial muscle laterally to expose the lateral surface of the tibia.

CAUTION: preserve the long digital extensor muscle tendon and its origin.

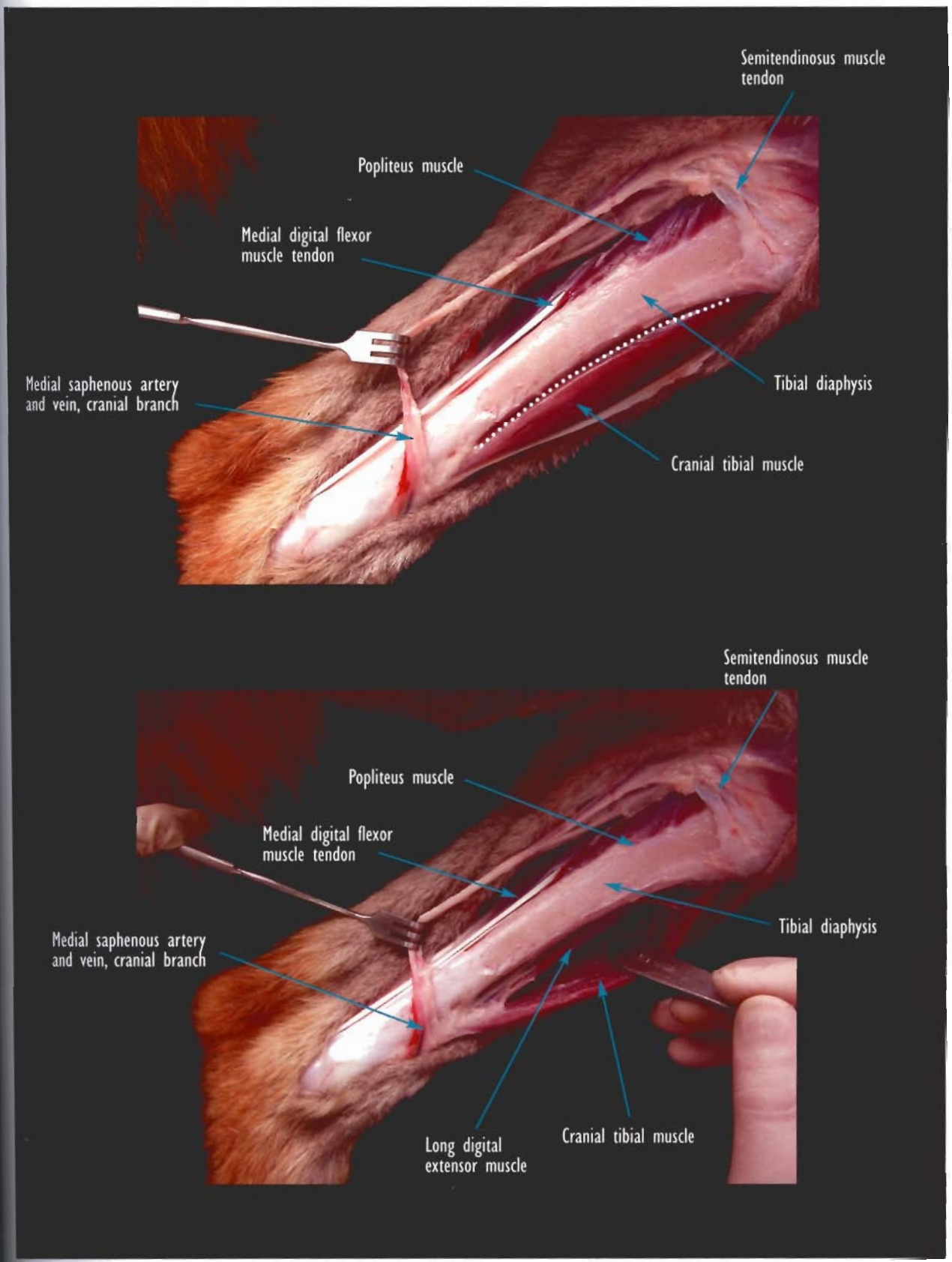
Approach to the tibial diaphysis

Indications:
Open reduction and fixation of tibial fractures.



- *Upper image:* the skin incision extends from the medial femoral epicondyle to the medial tibial malleolus. Medial view, left limb.
- *Lower image:* in the subcutaneous tissue, identify the crural fascia and open it from proximal to distal (dotted line).

CAUTION: preserve the medial saphenous vessels and the semitendinosus muscle tendon.



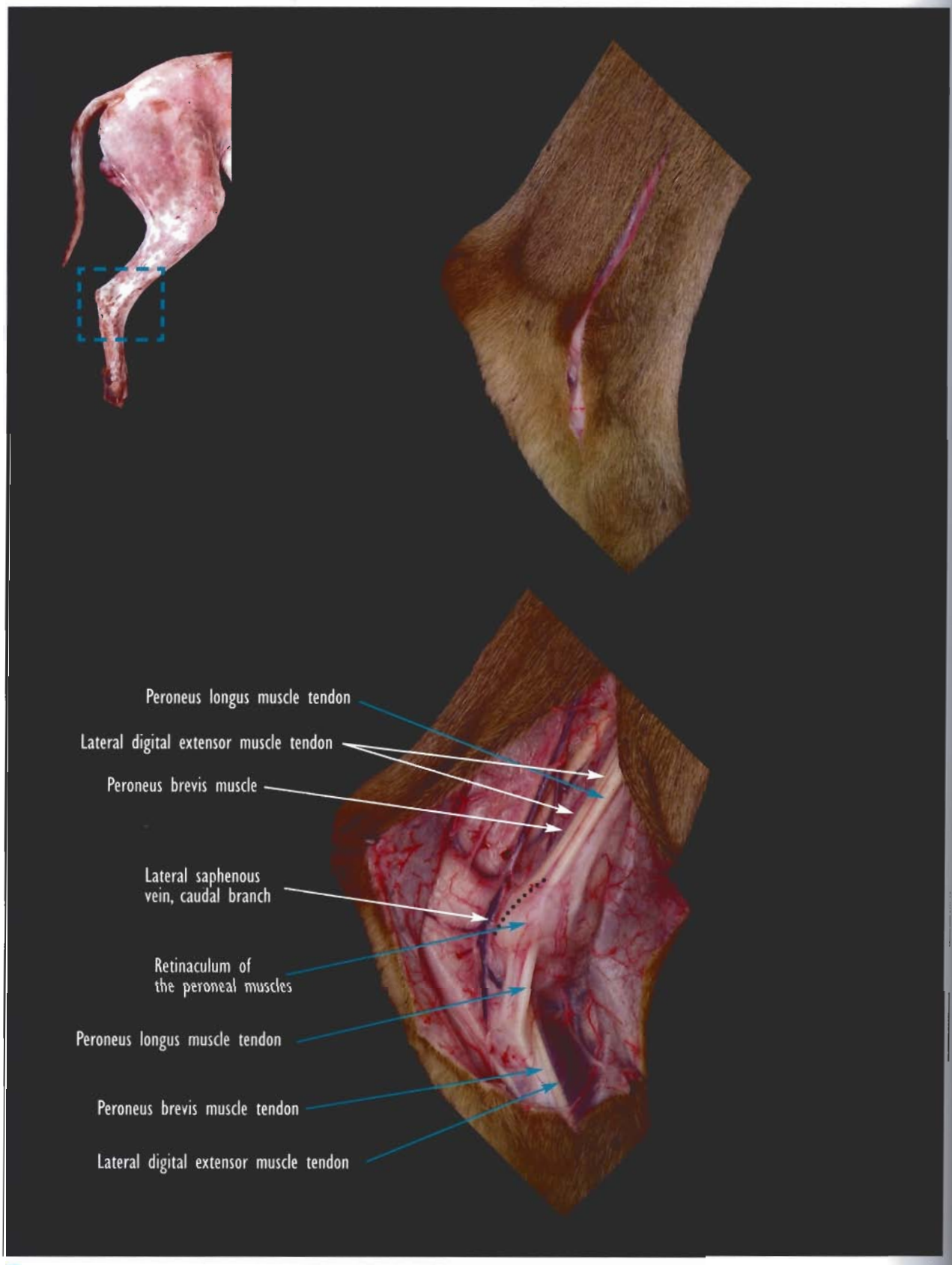
- *Upper image:* open the crural fascia to expose the medial surface of the tibia. Along the caudomedial border of the tibia, identify the popliteus muscle and medial digital flexor muscle tendon. On the cranial tibial border (dotted line), the cranial tibial muscle should be freed to facilitate the approach. Craniomedial view.
- *Lower image:* retract the cranial tibial muscle to view the cranial border of the tibia.

CAUTION: preserve the medial saphenous vessels.

Approach to the lateral malleolus and tarsocrural joint

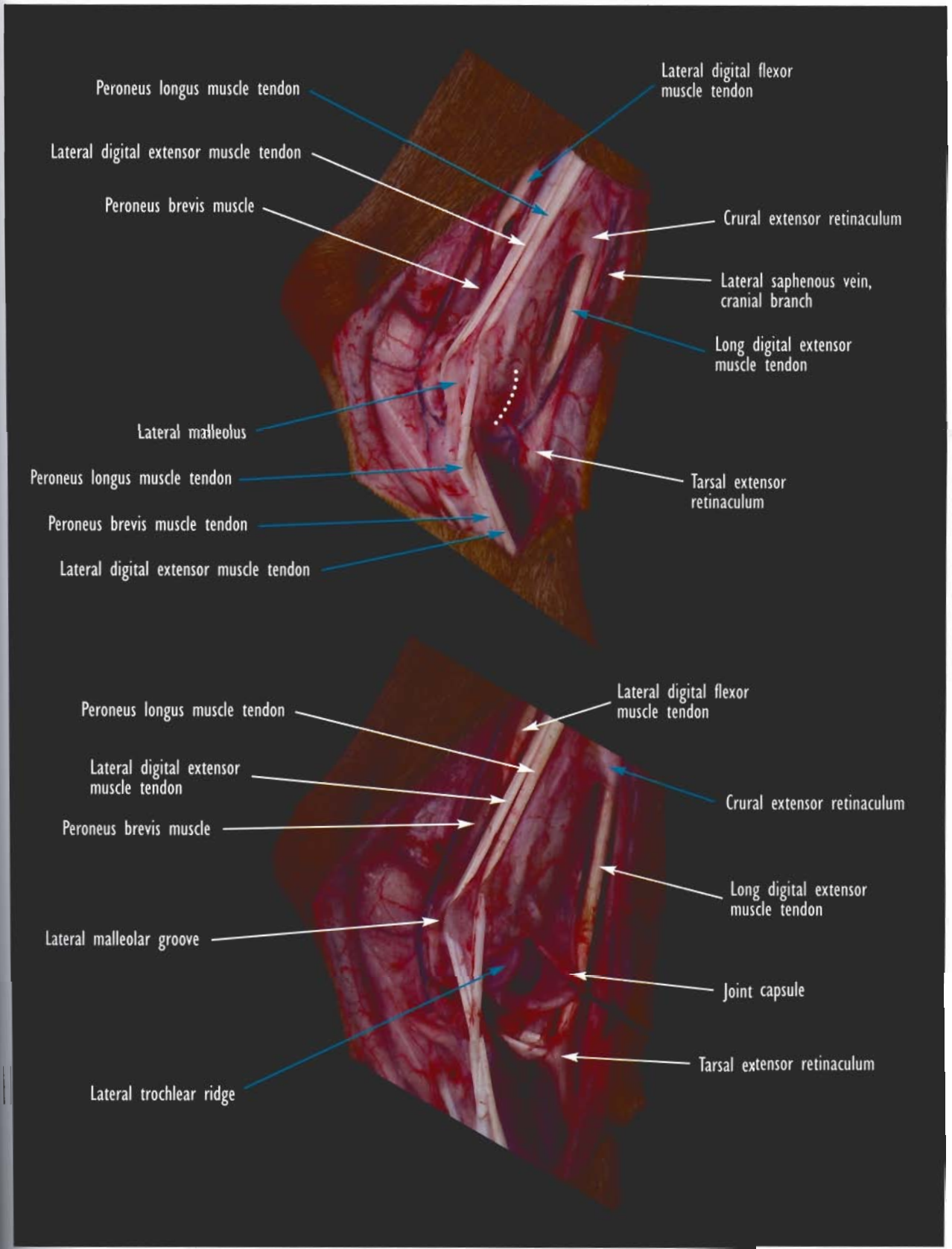
Indications:

Open reduction and fixation of fractures of the lateral malleolus.
Open reduction and fixation of tibial supramalleolar fractures.
Open reduction and fixation of lateral malleolar fractures of the tarsocrural joint.
Lateral collateral ligament tears.
Osteochondritis of the lateral ridge of the trochlea of the talus.



- *Upper image:* the arced incision extends from the distal crus, passes over the lateral malleolus and continues to the distal tarsus. Lateral view, rigth limb.
- *Lower image:* in the subcutaneous tissue, identify the tendons of the peroneus longus, lateral digital extensor and peroneus brevis muscles which traverse the lateral malleolar groove covered by the lateral extensor retinaculum. Divide the retinaculum (dotted line) to expose the lateral malleolus.

CAUTION: preserve the lateral saphenous vein branches.



Upper image: after the extensor retinaculum is cut, the lateral malleolus is exposed. To approach the tarsocrural joint, an arced incision (dotted line) of the joint capsule, which parallels the trochlear ridge, is made between the tendons of the peroneus longus and long digital extensor muscles. Lateral view.

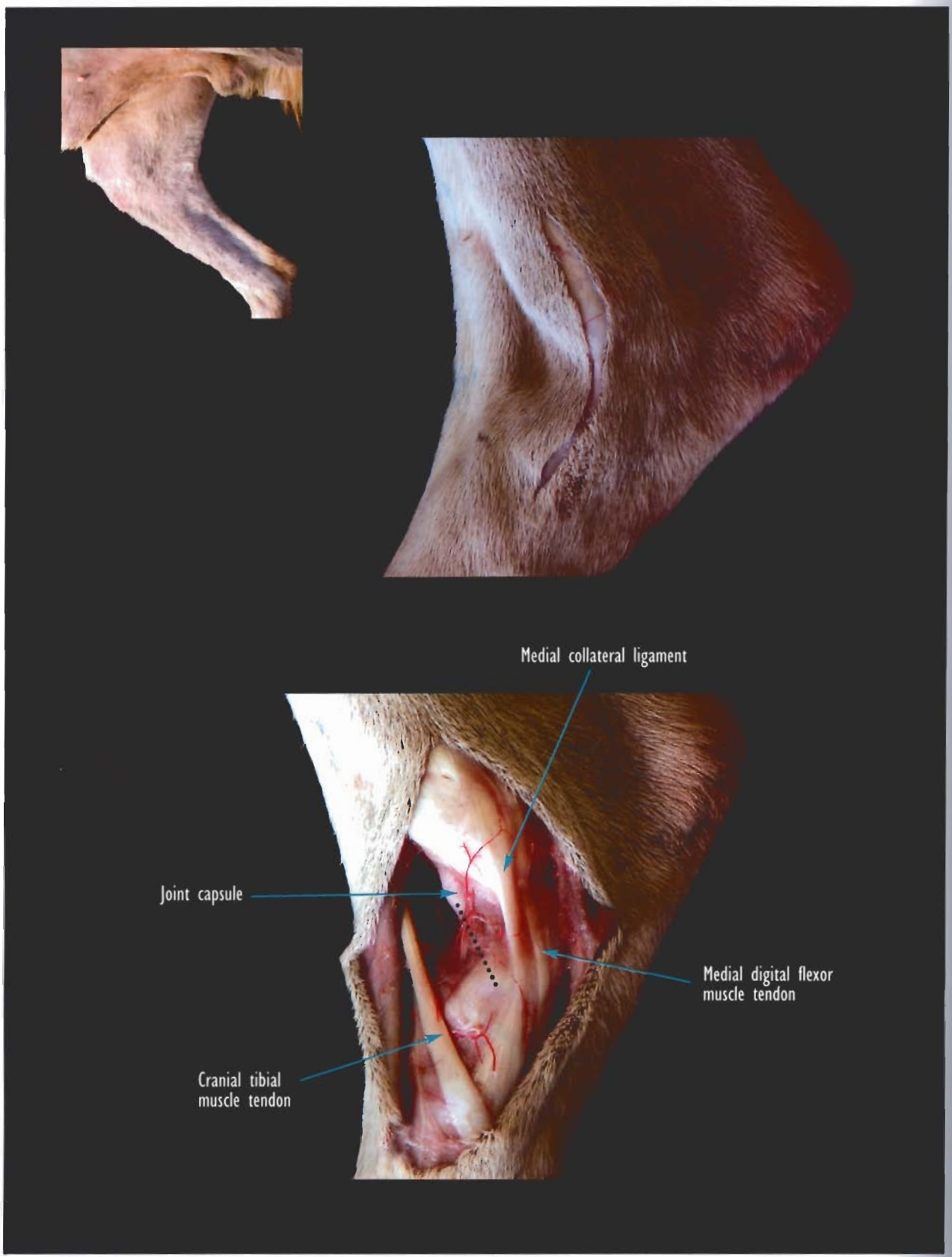
Lower image: after incision of the joint capsule, the trochlea of the talus is exposed.

CAUTION: preserve the lateral saphenous vein.

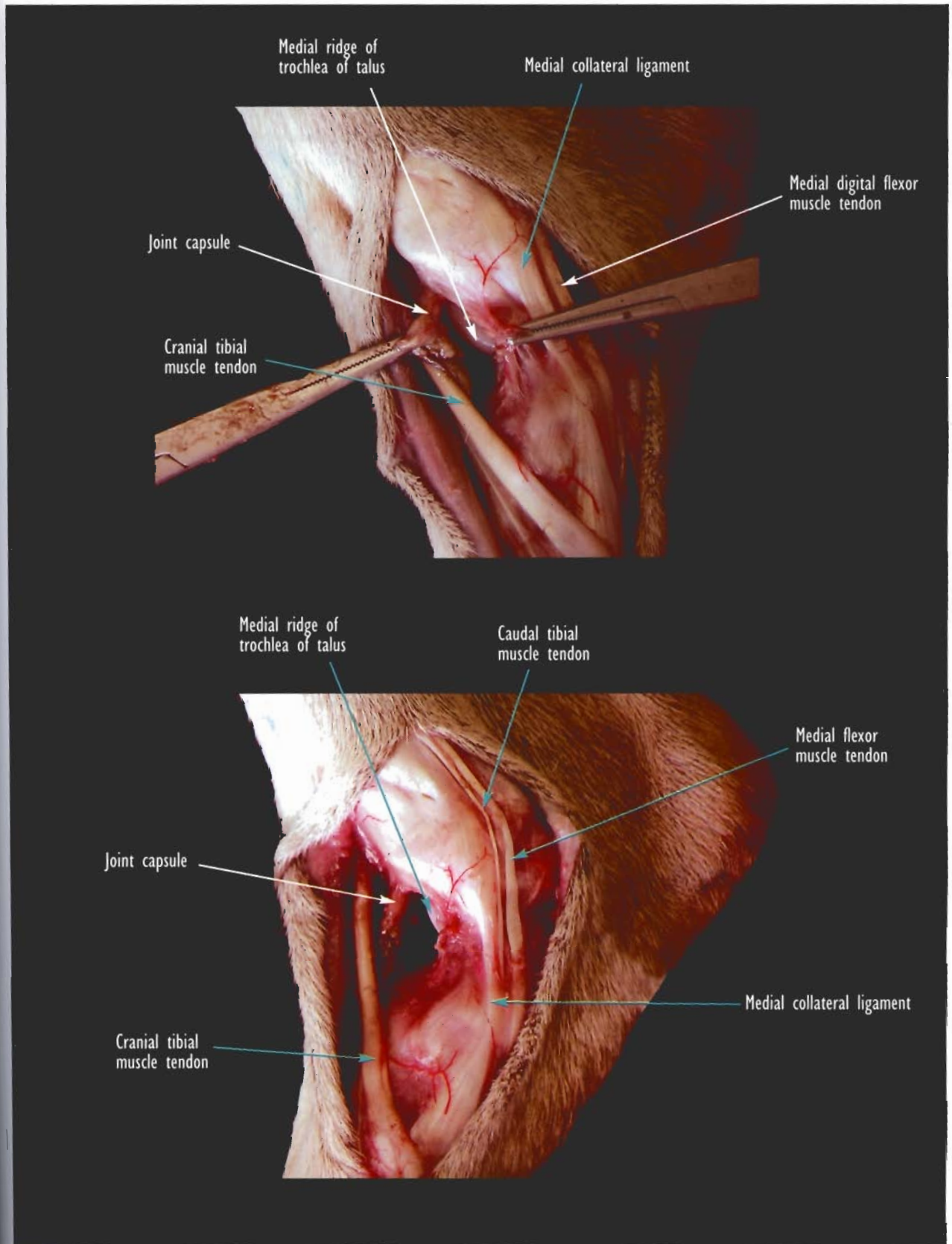
Approach to the medial malleolus and tarsocrural joint

Indications:

Open reduction and fixation of fractures affecting the medial malleolus.
Open reduction and fixation of tibial supramalleolar tibial fractures.
Open reduction of the tarsocrural joint for malleolar fractures.
Medial collateral ligament tears.
Osteochondritis of the medial ridge of the trochlea of the talus.



- *Upper image:* the arced incision extends from the distal crus, passes over the medial malleolus and continues distally to the base of metatarsal II. Medial view, right tarsus.
- *Lower image:* in the subcutaneous tissue, identify the medial collateral ligament and the tendon of the cranial tibial muscle. Between this ligament and tendon, incise the joint capsule (dotted line). The medial malleolus is covered by the medial collateral ligament.

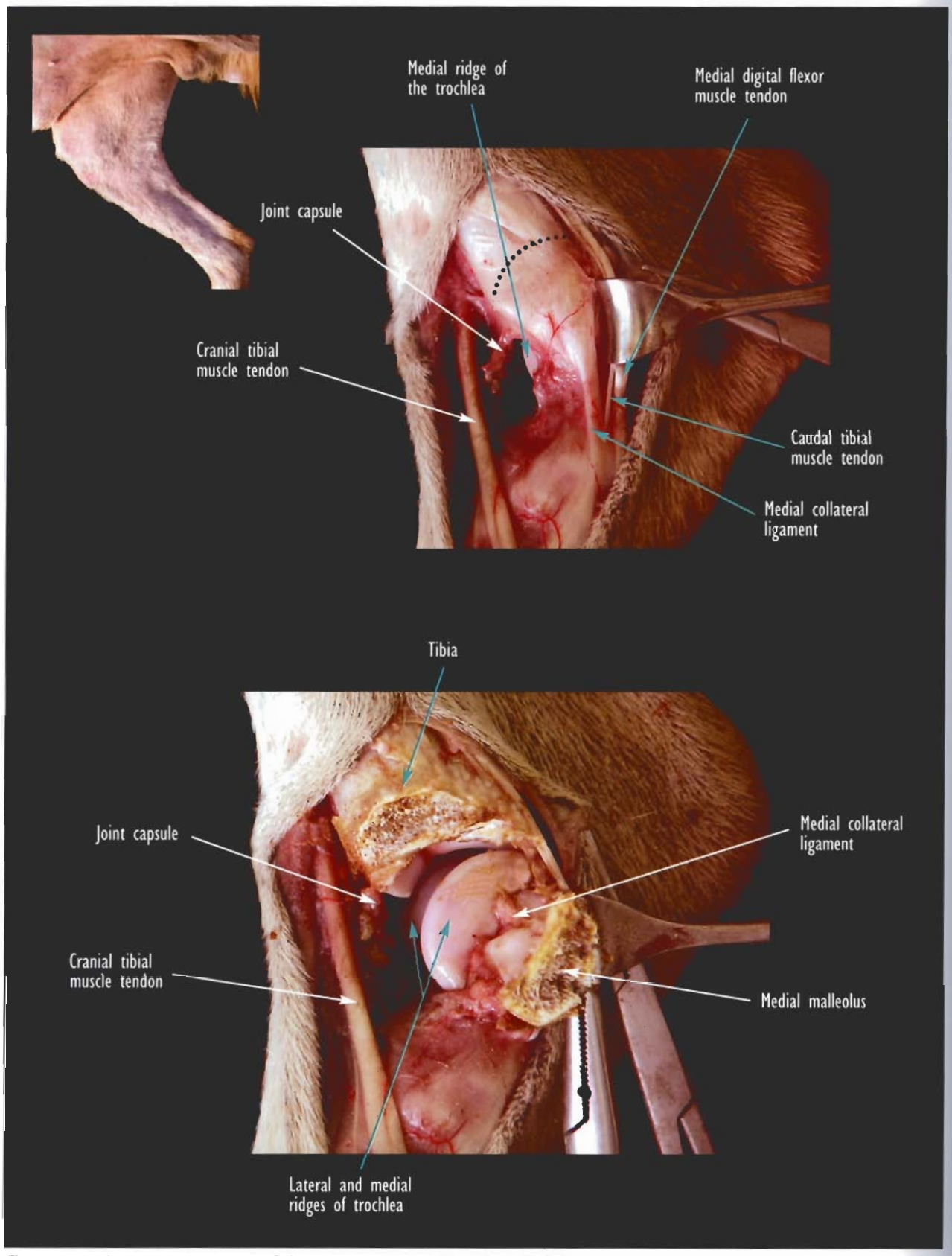


Upper image: after the joint capsule is opened, the medial trochlear ridge of the talus is exposed. Medial view.
Lower image: observe the relationship of the medial collateral ligament to the tendons of the caudal tibial and medial digital flexor muscles. Preserve these tendons during an osteotomy of the medial malleolus.

Approach to the tarsocrural joint via osteotomy of the medial malleolus

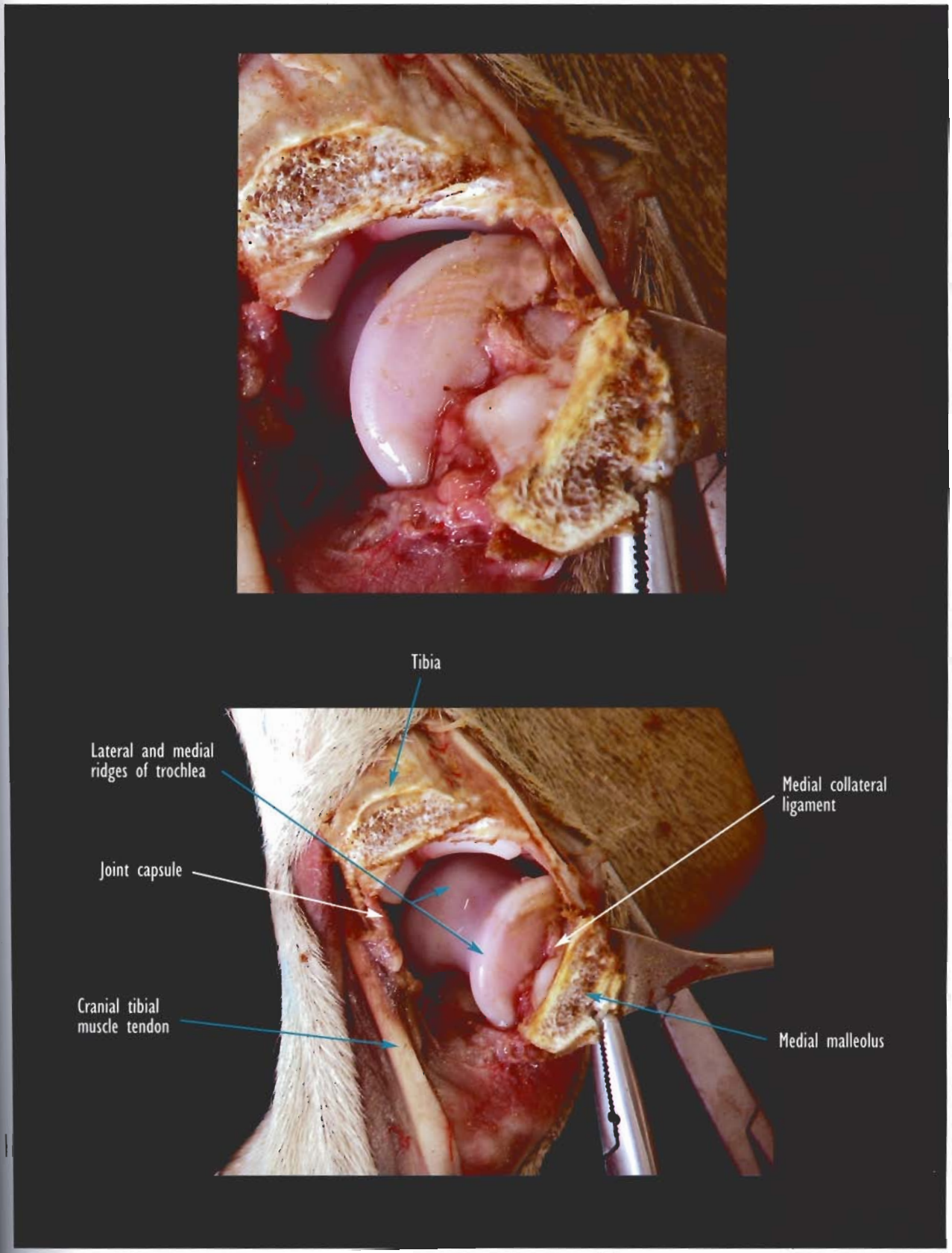
Indications:

Open reduction and fixation of complex fractures of the talus.
Osteochondritis of the lateral ridge of the trochlea of the talus.
Joint exploration.



This approach is a continuation of the previous approach (page 228).

- *Upper image:* during a medial approach to the tarsocrural joint, the medial collateral ligament should be isolated by retracting the tendons of the caudal tibial and medial digital flexor muscles caudally. Osteotomy (dotted line) of the medial malleolus should be done proximal to the attachment of the medial collateral ligament. Medial view, right tarsus.
- *Lower image:* the sectioned malleolus is displaced distally to expose the trochlea of the talus.



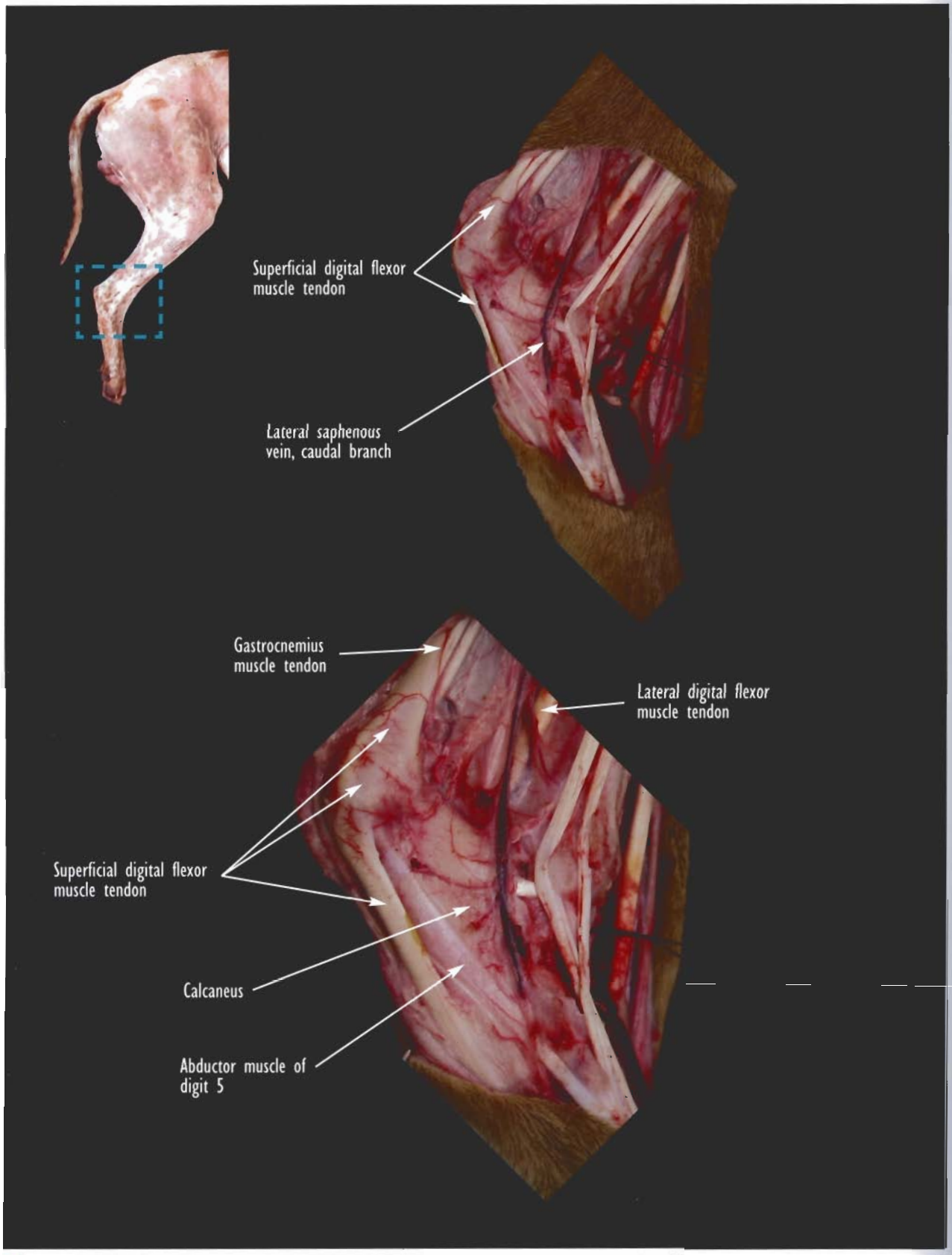
- *Upper image:* a close up of the previous image. The articular cartilage of the trochlea of the talus and the articular surface of the tibia are displayed. Medial view.
- *Lower image:* Both ridges of the trochlea of the talus can be evaluated by forced internal rotation of the tarsus.

Approach to the calcaneus

Indications:

Open reduction and fixation of calcaneal fractures.

Avulsion of the gastrocnemius muscle insertion.



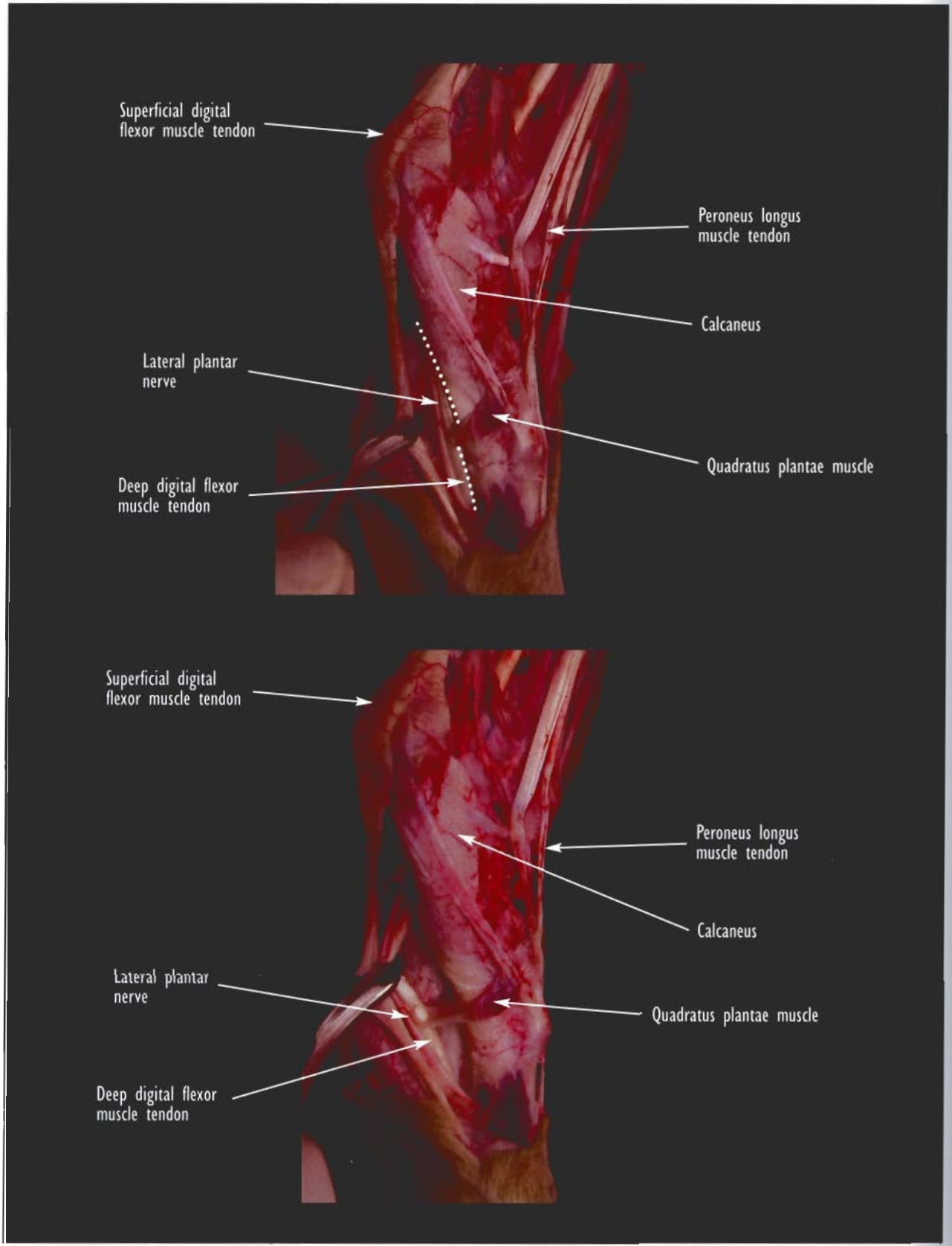
- *Upper image:* the incision extends from the distal crus, passes over the lateral malleolus and continues distoplantarly to the distal tarsus. The skin is displaced medially to expose the calcaneal tuber. Lateral view, right tarsus.
- *Lower image:* identify the superficial digital flexor muscle tendon as it passes over the plantar margin of the calcaneal tuber.

Approach to the calcaneus and the plantar surface of the tarsal bones

Indications:

Arthrodesis of the calcaneoquartal and/or tarsometatarsal joints associated with long plantar ligament tears.

Open reduction and fixation of calcaneal fractures.

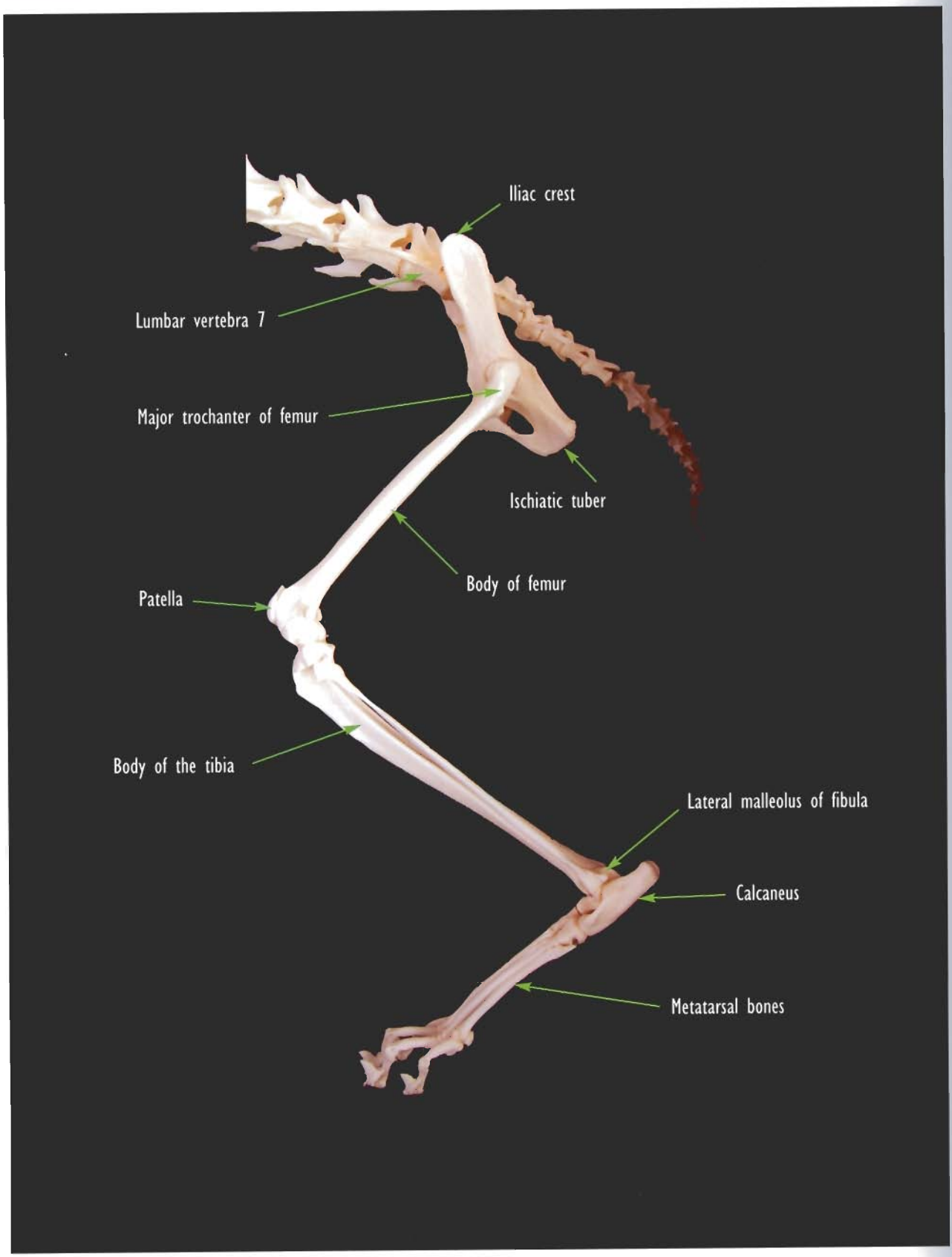


- *Upper image:* this is a continuation of the previous approach (page 236). The plantar fascia and flexor retinaculum are incised over the plantar aspect of the tarsus (dotted line). Lateral view, right tarsus.
- *Lower image:* after cutting the flexor retinaculum, the tendon of the deep digital flexor can be displaced to allow a plantar approach to the calcaneus and the distal row of tarsal bones.

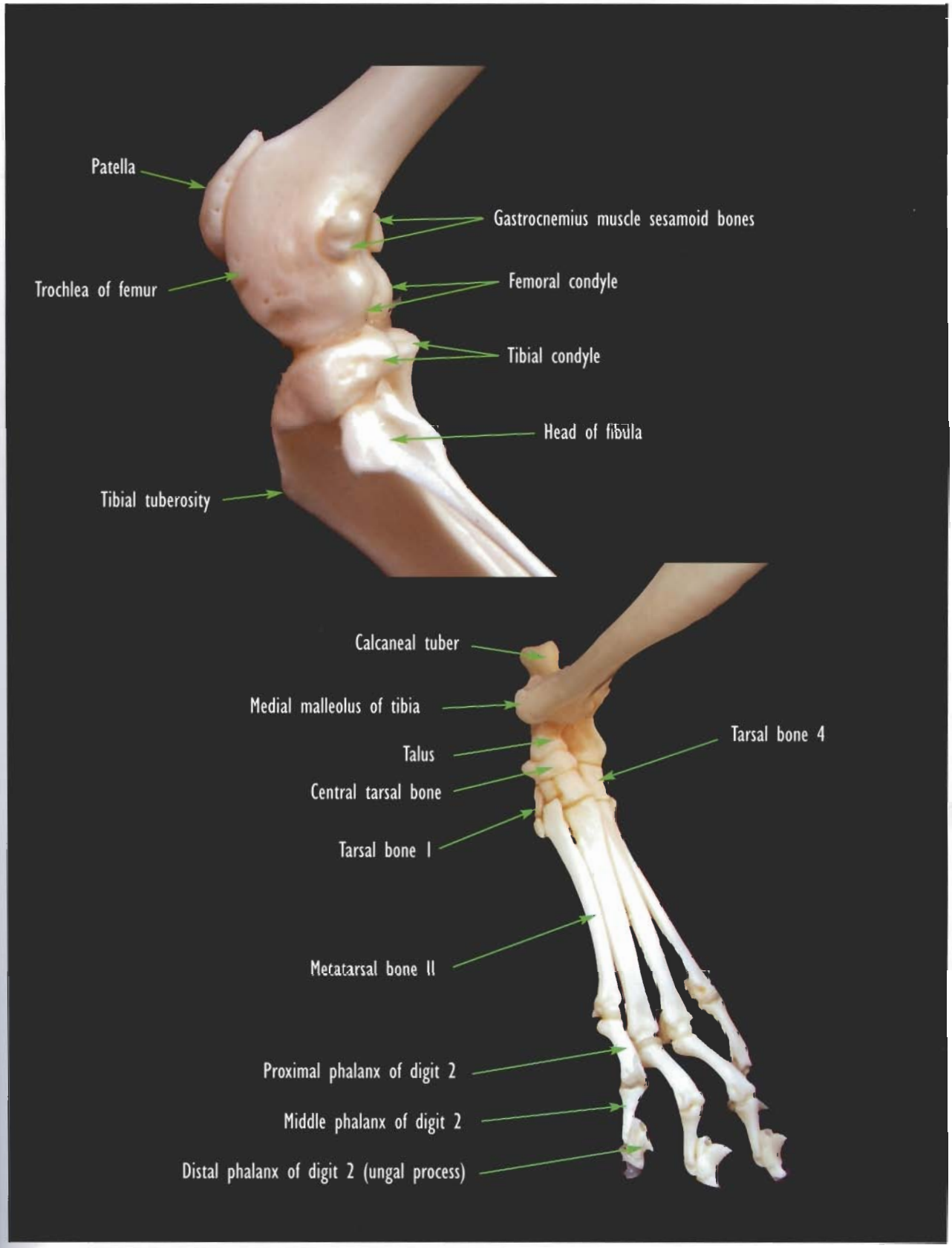
CAUTION: preserve the plantar nerves.

4

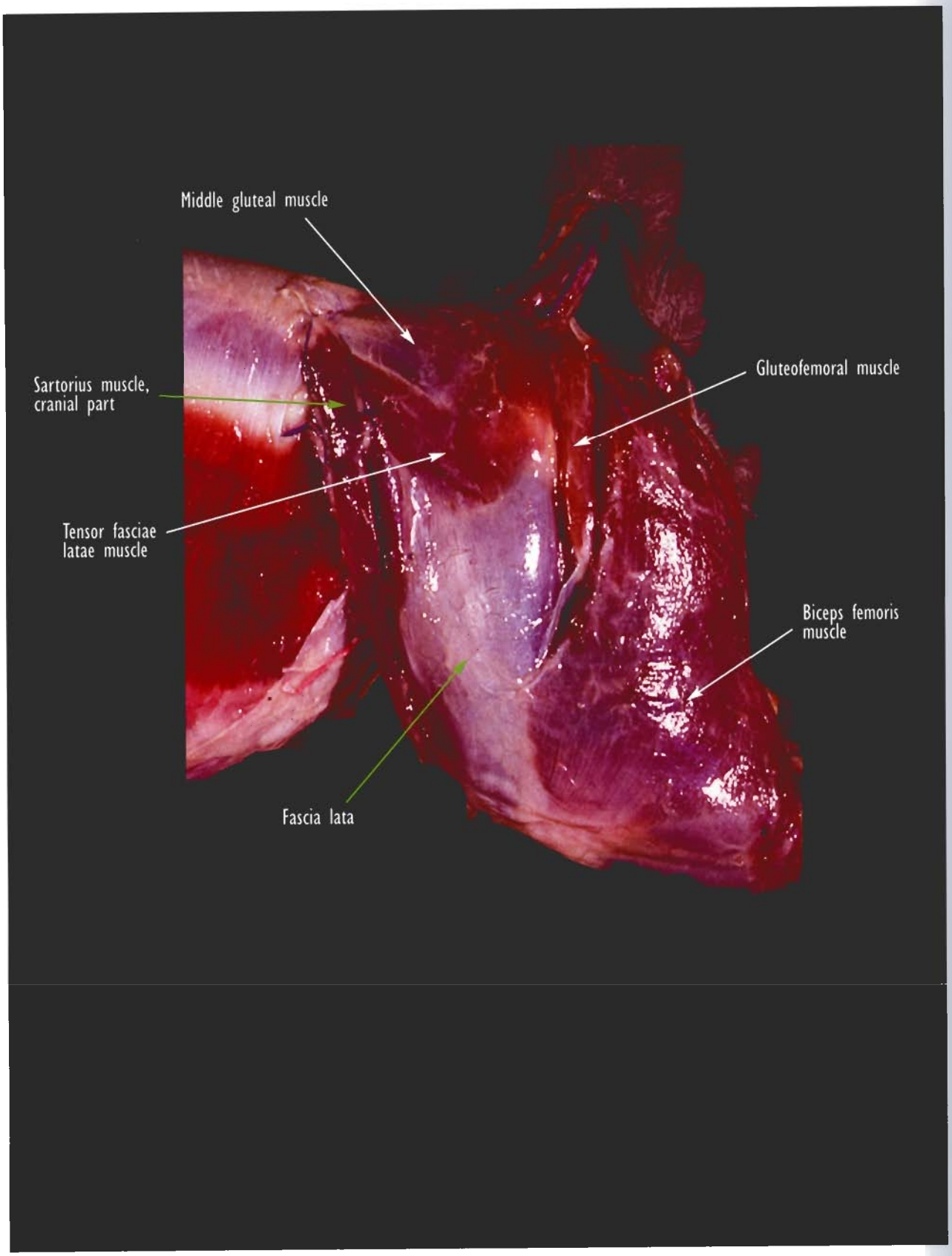
Cat
Pelvic limb



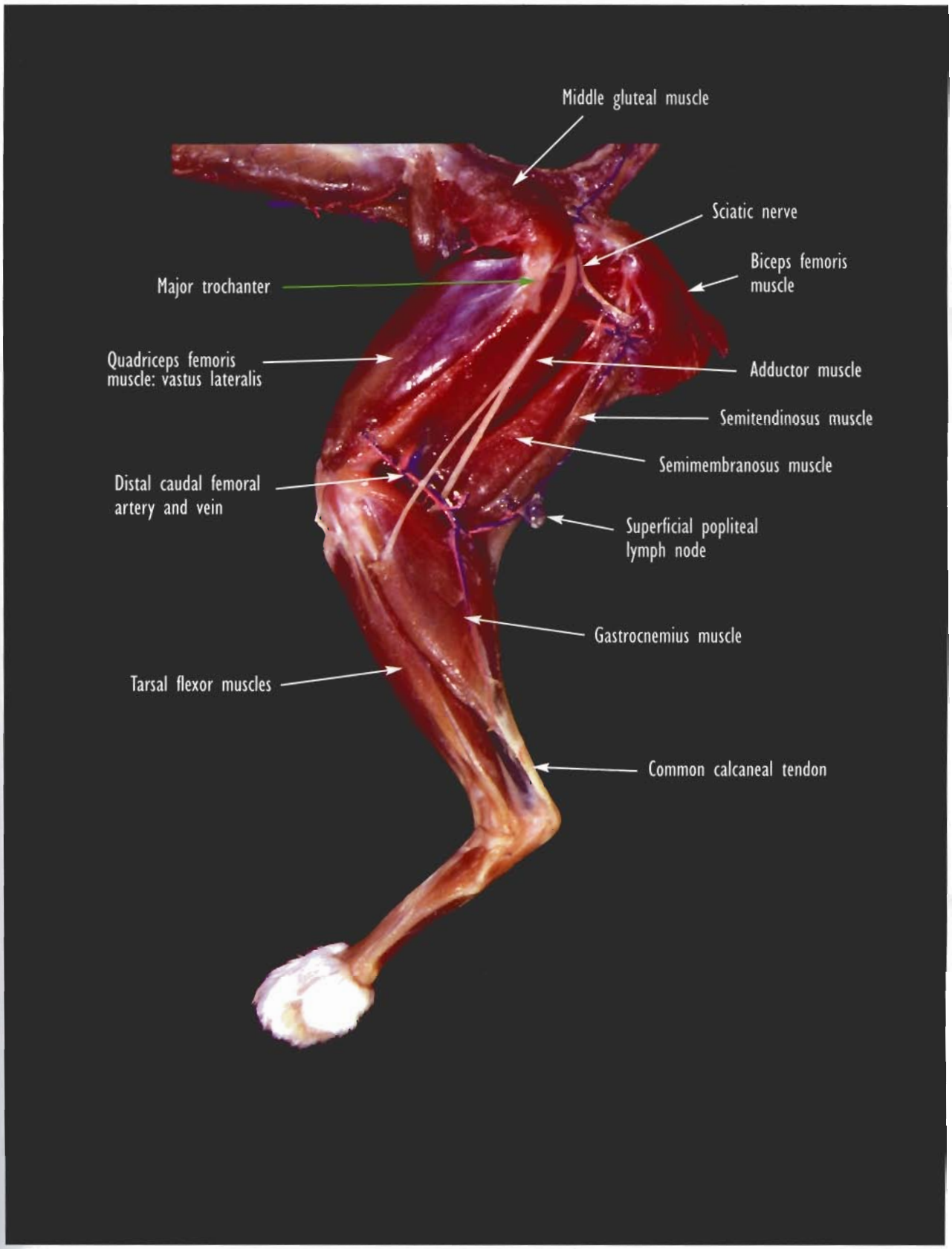
Lateral view of the left pelvic limb skeleton.



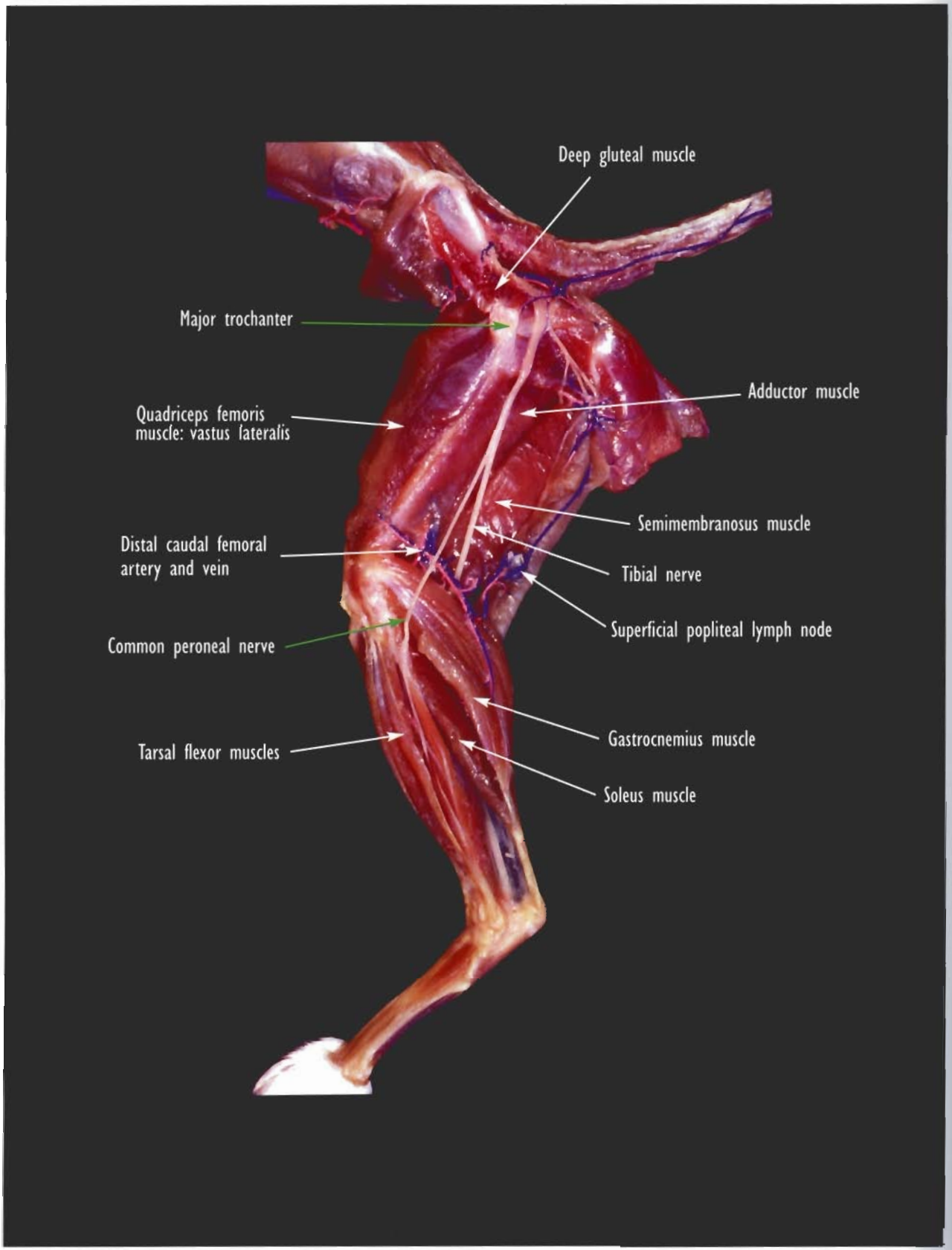
■ *Upper image:* detailed lateral view of the bones of the left stifle.
■ *Lower image:* detailed dorsal view of the bones of the left pes.



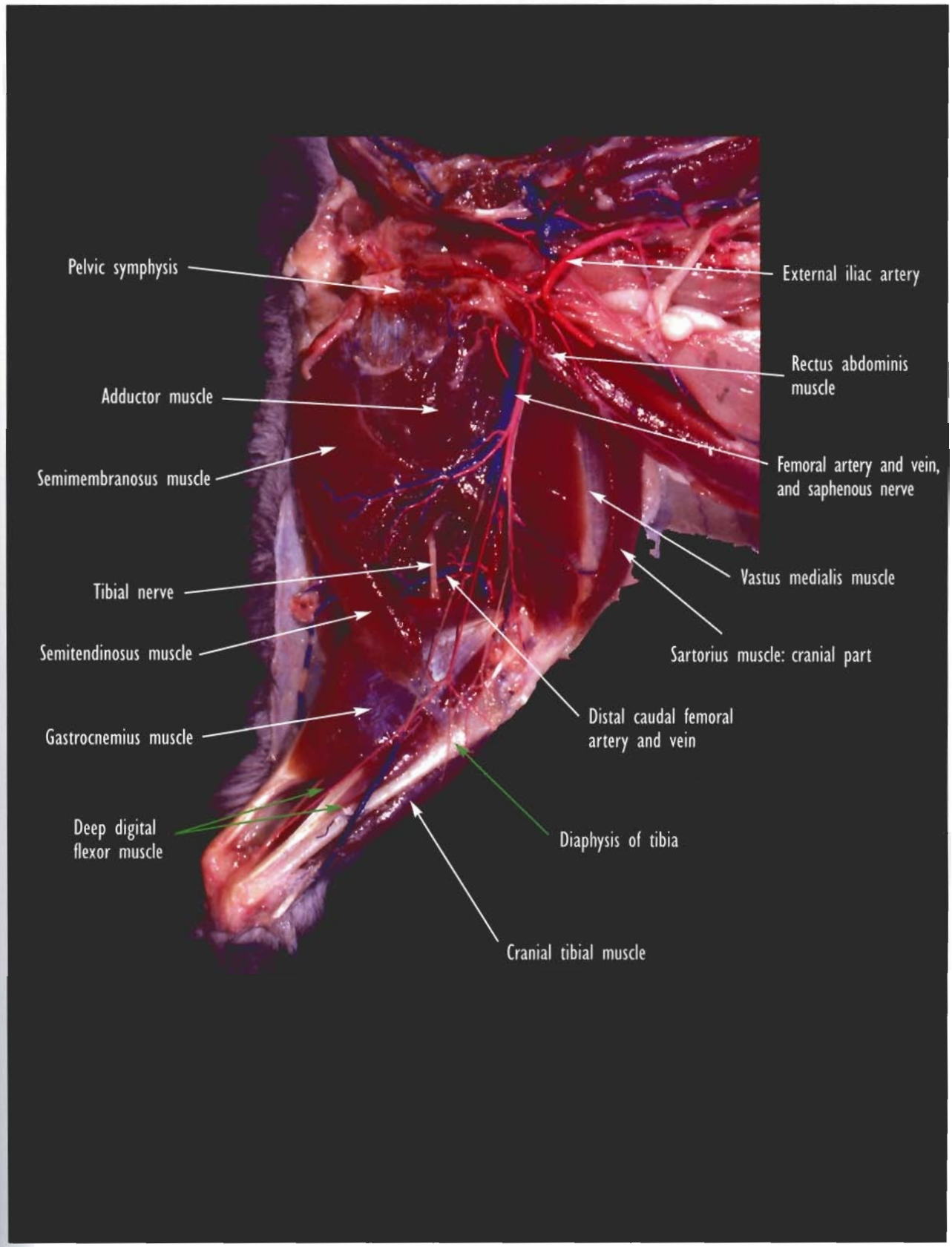
Superficial muscles of the left pelvic limb. Lateral view.



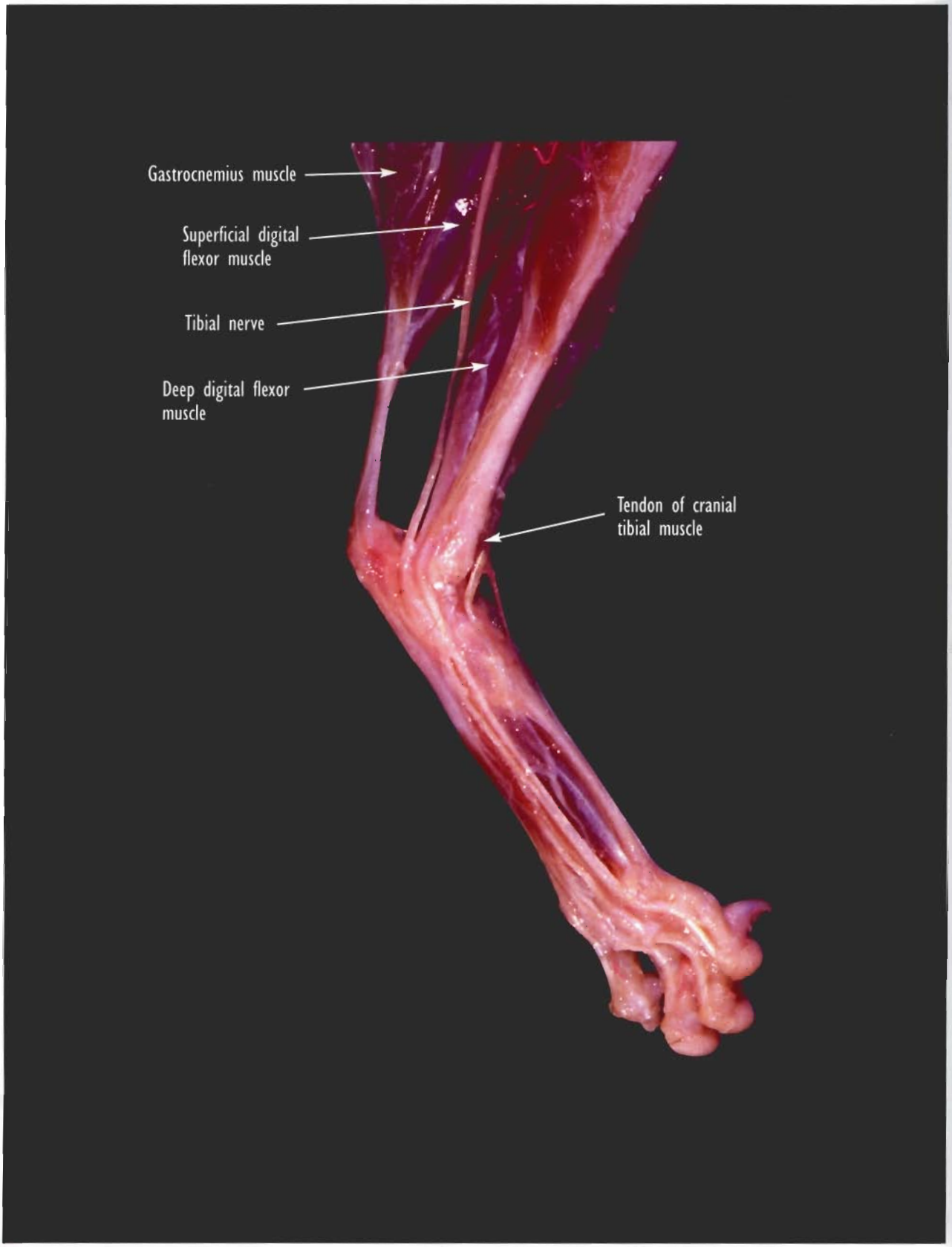
After removal of the biceps femoris and superficial gluteal muscles, the course of the sciatic nerve is exposed. The vessels were injected with colored latex. Lateral view, left limb.



After removal of the biceps femoris muscle and the superficial and middle gluteal muscles, the divisions of the ischiatic nerve are observed. Lateral view.

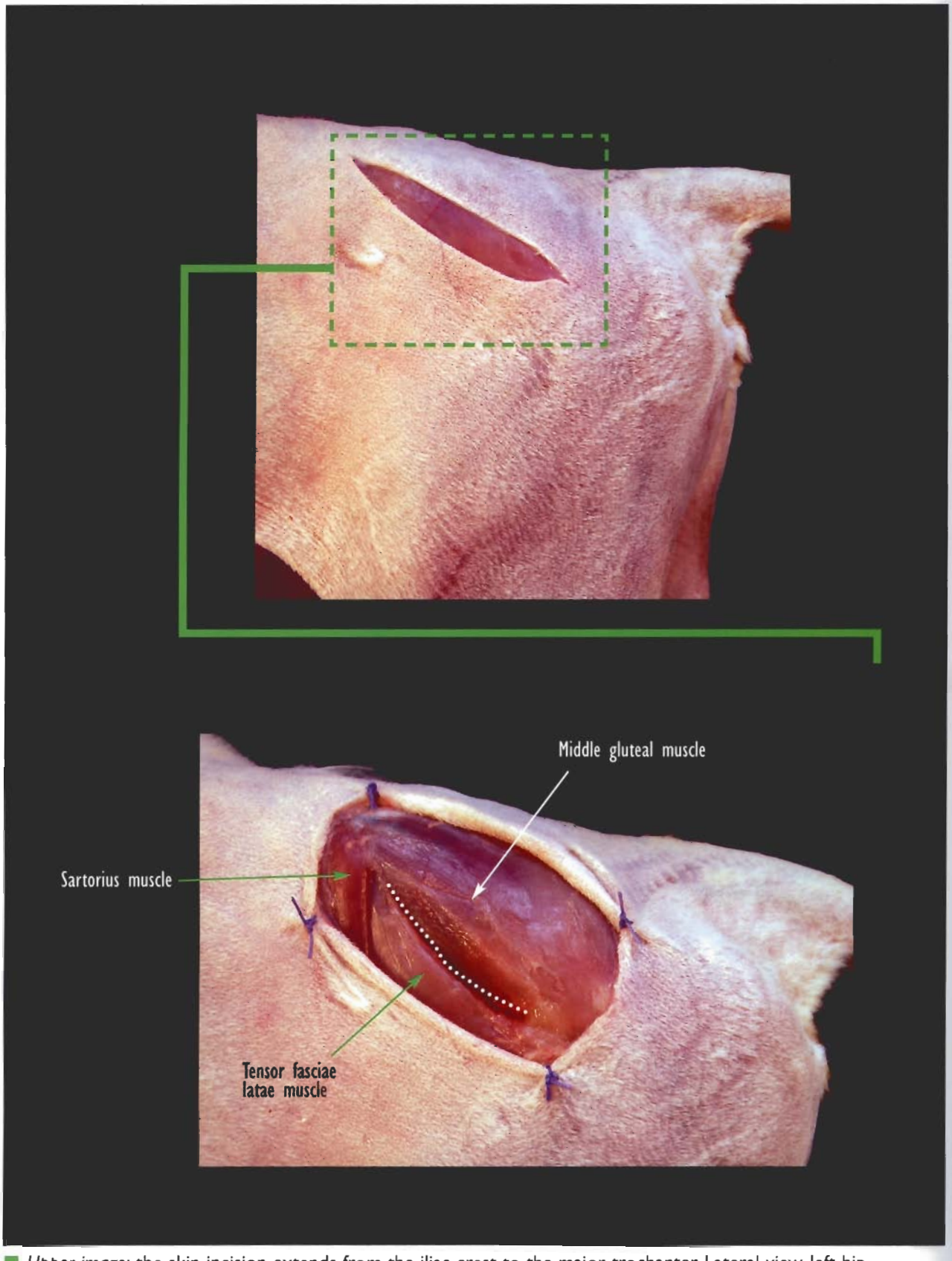


■ Muscles of the left medial pelvic limb are dissected. The right os coxae and pelvic limb have been removed for better exposure. The distal portion of the semimembranosus muscle and the gracilis muscle have been removed to show the branches of the femoral artery. The arteries have been injected with colored latex. Medial view, left limb.

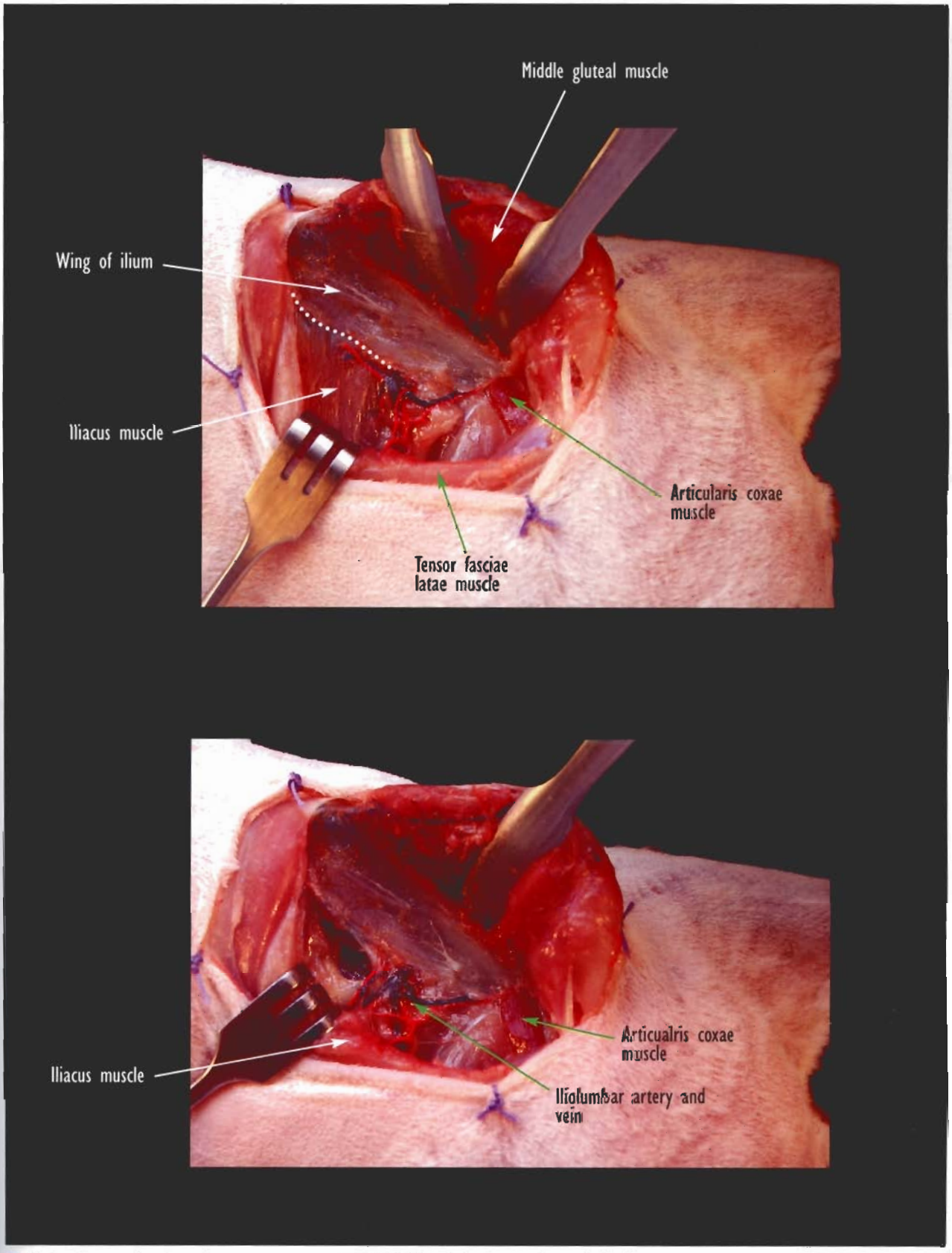


Detailed dissection of the medial muscles of the left crus and pes. Medial view.

Approach to the wing of the ilium by lateral incision



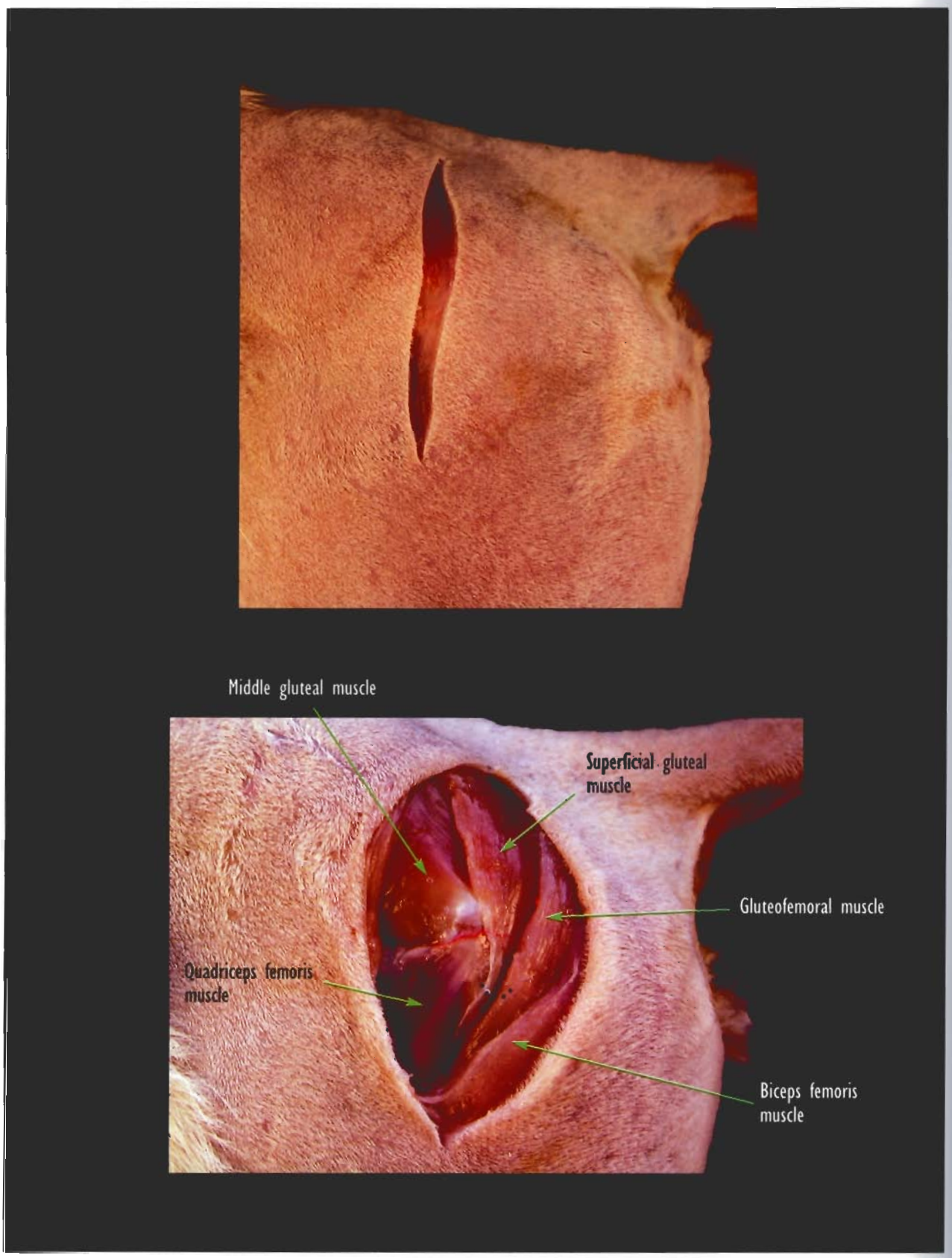
- *Upper image:* the skin incision extends from the iliac crest to the major trochanter. Lateral view, left hip.
- *Lower image:* the gluteal fascia is opened and the middle gluteal and tensor fasciae latae muscles will be separated (dotted line) and retracted.



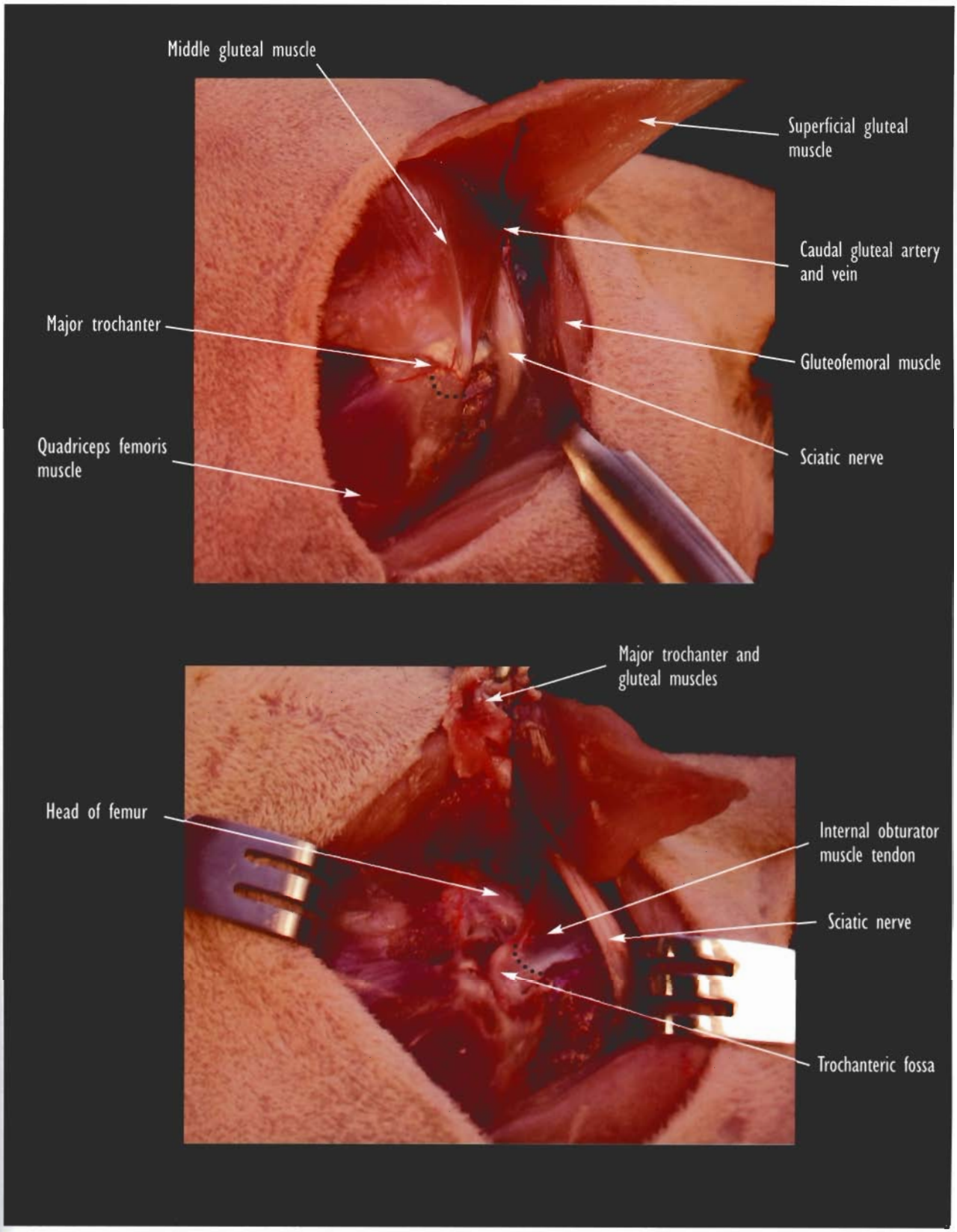
- *Upper image:* freeing the attachment of the middle gluteal muscle and displacing this muscle dorsally and the tensor fasciae latae muscle ventrally exposes the ilial wing. The sacrum may be approached between the wing and the iliacus muscle (dotted line). Lateral view.
- *Lower image:* after the iliacus muscle is displaced ventrally, both the sacral wing and the sacroiliac joint can be palpated.

CAUTION: preserve the iliolumbar vessels.

Craniodorsal and caudodorsal approaches to the hip joint by osteotomy of the major trochanter

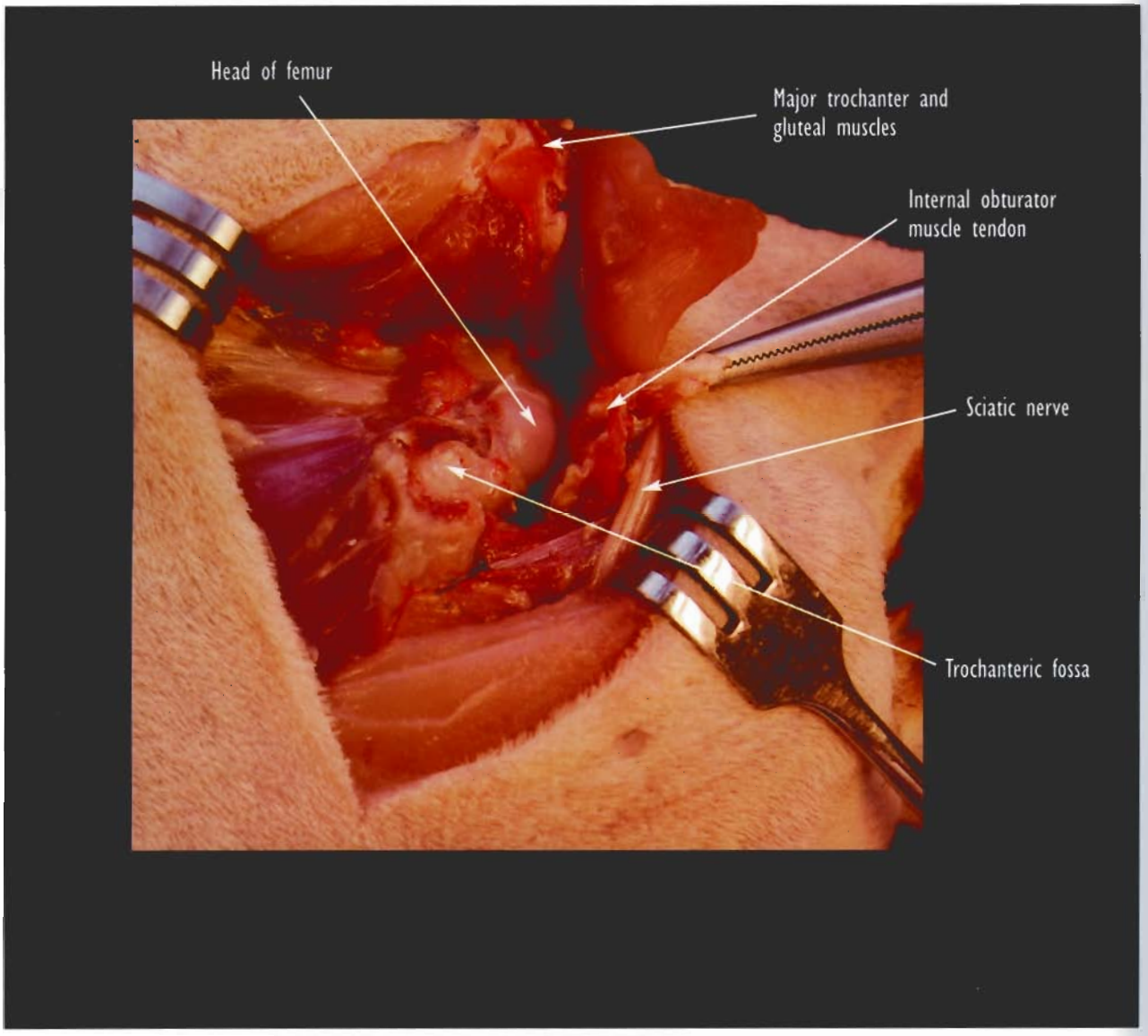


- *Upper image:* the skin incision commences over the major trochanter and extends proximally to the iliac crest and distally to the femoral body. Lateral view, left hip.
- *Lower image:* after opening the gluteal fascia, the superficial gluteal tendon is exposed. This tendon will be transected (dotted line) to approach the major trochanter.



- *Upper image:* after the superficial gluteal muscle tendon has been transected, the muscle is reflected dorsally. The osteotomy site of the major trochanter is located (dotted line) and the osteotomy is performed at a 45° angle from the axis of the femoral diaphysis. Lateral view.
- *Lower image:* after completing the osteotomy, the freed trochanter with the middle and deep gluteal and piriformis muscles are reflected dorsally. The joint capsule will be cut to view the femoral head. To view the caudal portion of the head, the insertions of the gemelli and internal obturator muscles need to be transected (dotted line).

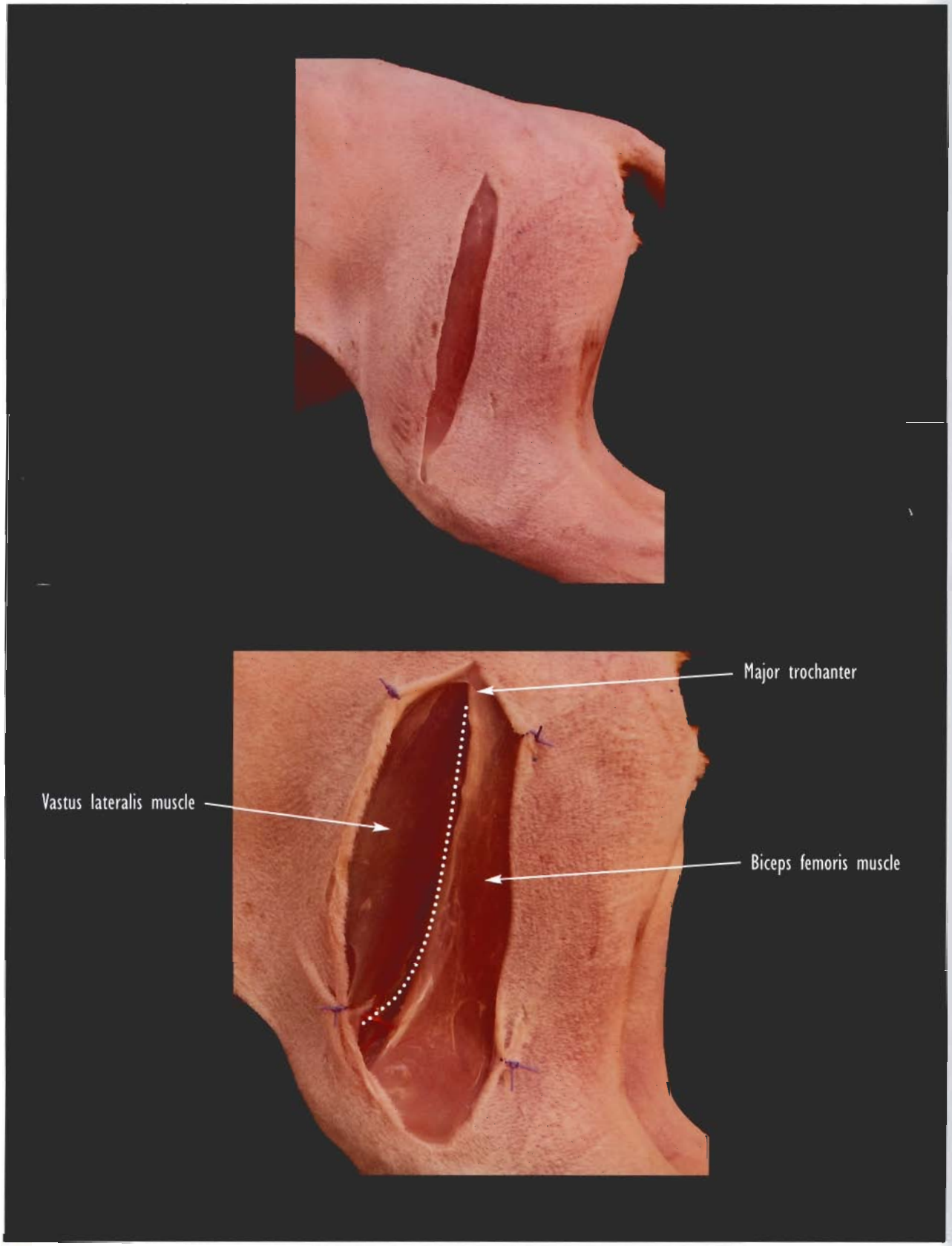
CAUTION: protect the sciatic nerve and caudal vessels passing caudal to the hip joint.



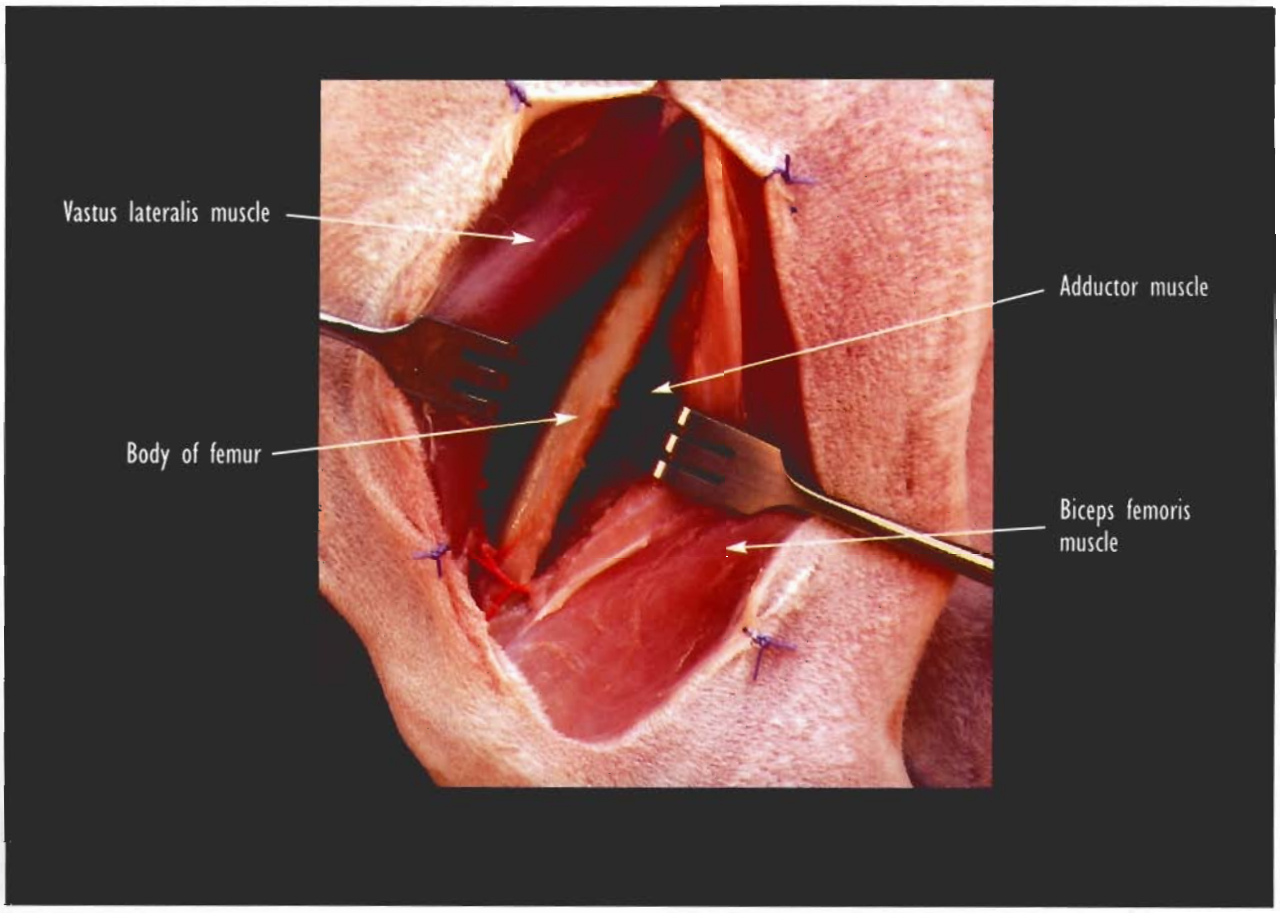
After tenotomy, the gemelli and internal obturator muscles are reflected to expose the caudal border of the acetabulum and the body of the ischium. Lateral view.

CAUTION: do not cut the external obturator muscle tendon.

Approach to the dyaphisis of the femur



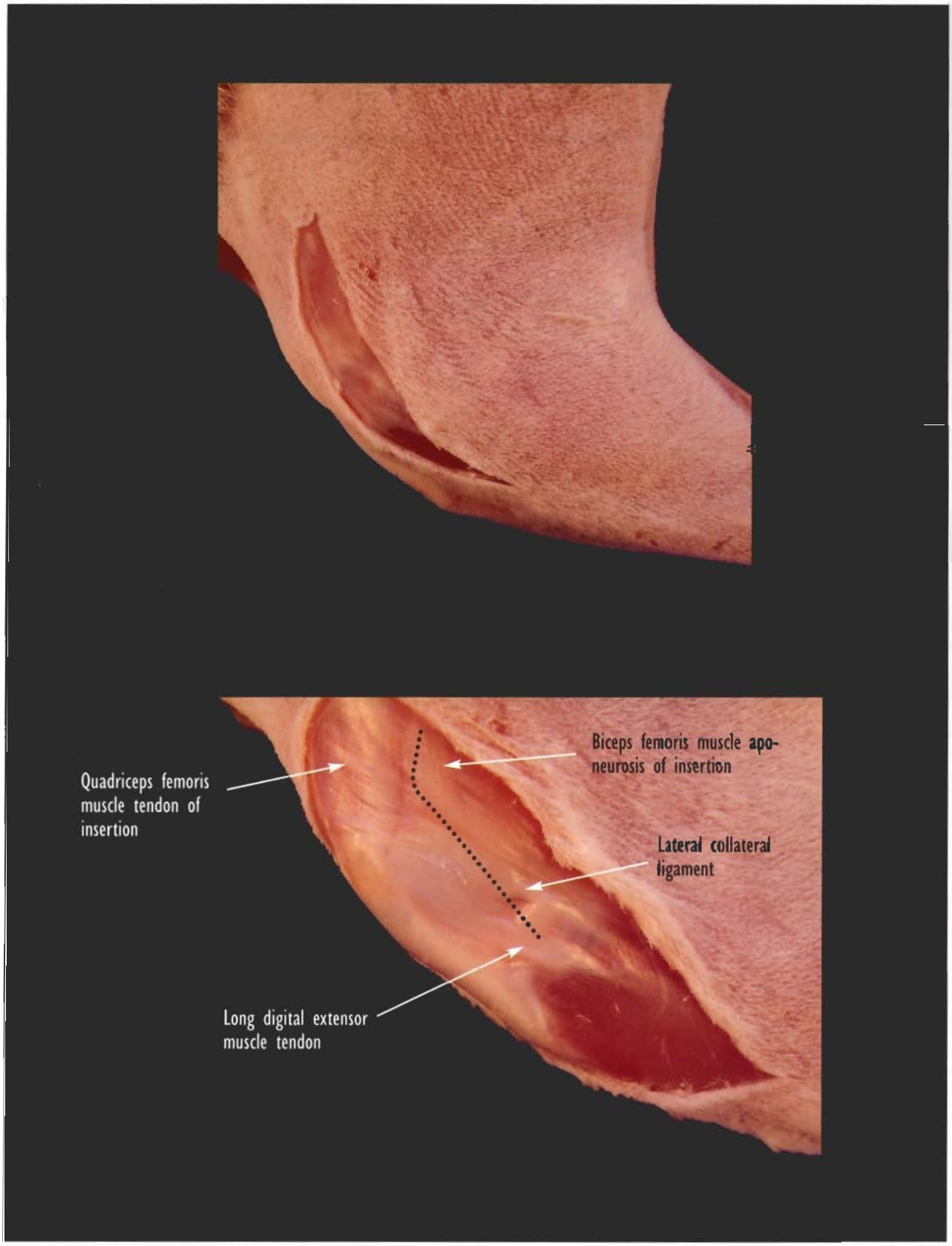
■ *Upper image:* the skin incision extends from the major trochanter to the femoral epicondyle. Lateral view, left thigh.
■ *Lower image:* the fascia lata is opened to locate the division between the vastus lateralis and biceps femoris muscles (dotted line).



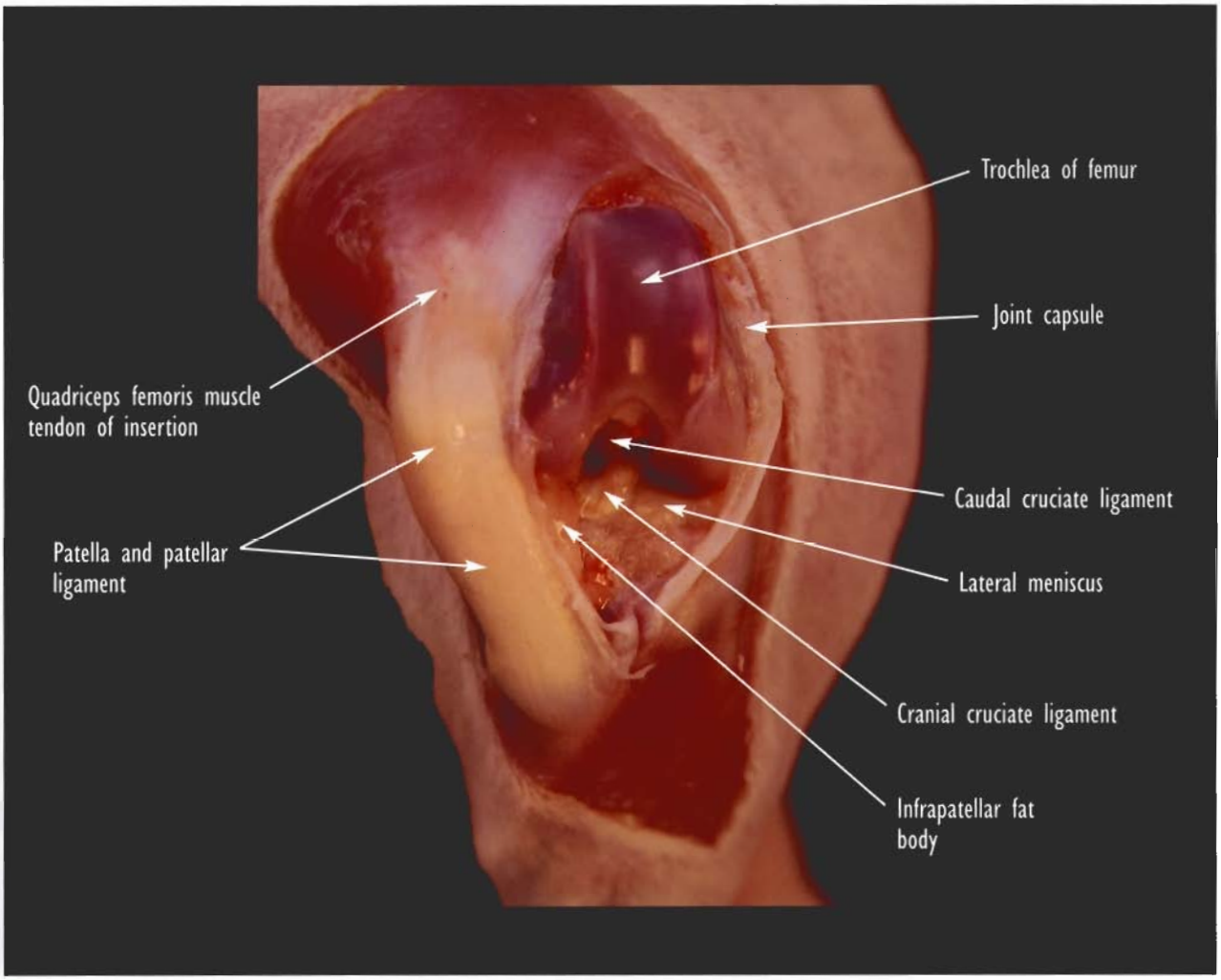
To view the cranial, lateral and caudal aspects of the femoral diaphysis, the vastus lateralis and biceps femoris muscles are retracted cranially and caudally, respectively. The adductor muscle inserts on the caudal surface of the diaphysis. For greater exposure, the incision and retraction can be extended proximally to the major trochanter and/or distally to the condyle. Lateral view.

CAUTION: in the distal part of the incision, branches from the distal caudal femoral vessels can be found and should be ligated.

Approach to the stifle joint by lateral incision



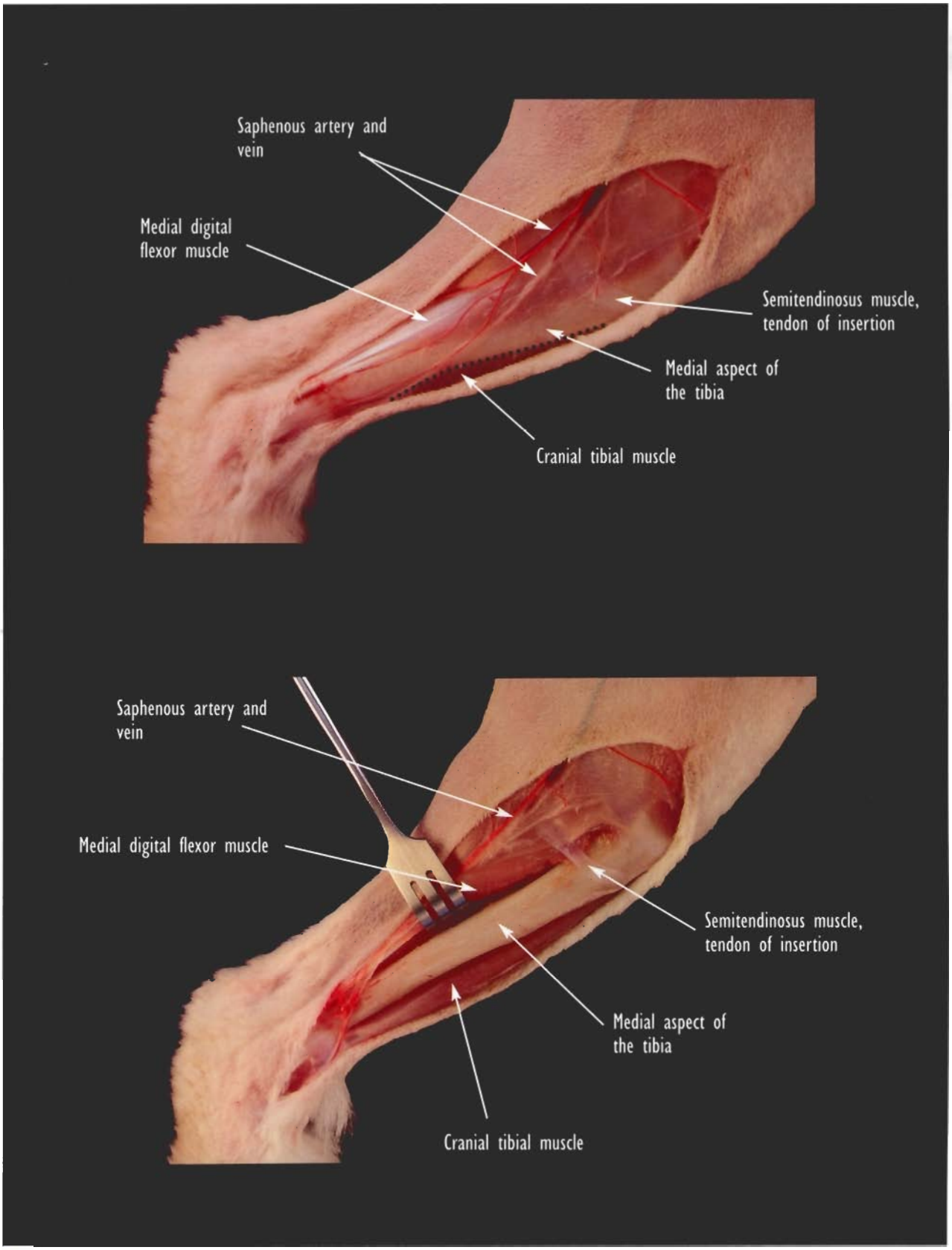
- *Upper image:* the skin incision extends from the distal one third of the femur, over the femoral lateral epicondyle, to the proximal one third of the crus. Lateral view, left stifle.
- *Lower image:* the lateral fascia is partially dissected to identify the junction of the biceps femoris muscle and the quadriceps femoris muscle tendon (dotted line). Dividing and retracting this aponeurosis will expose the joint capsule.



After incising the joint capsule, the quadriceps femoris muscle tendon is luxated medially to facilitate exposure of the stifle joint cavity. The cruciate ligaments and infrapatellar fat body are seen distally in the cavity. Cranial view, left stifle.

Approach to the diaphysis of the tibia

- *Upper image:* to gain better exposure to the medial crus, the contralateral pelvic limb should be abducted. Medial view, left crus.
- *Lower image:* skin incision extends from medial femoral epicondyle to the medial tibial malleolus.



- *Upper image:* the crural fascia is opened and the attachment of the cranial tibial muscle to the cranial border of the tibia is identified (dotted line). For greater exposure, the cranial tibial muscle can be freed from the cranial border of the tibia. Medial view.
- *Lower image:* after freeing the muscle, the cranial tibial muscle is retracted laterally and the medial digital flexor muscle retracted caudally to expose the medial tibia.

CAUTION: preserve the saphenous vessels and the semitendinosus muscle tendon.

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