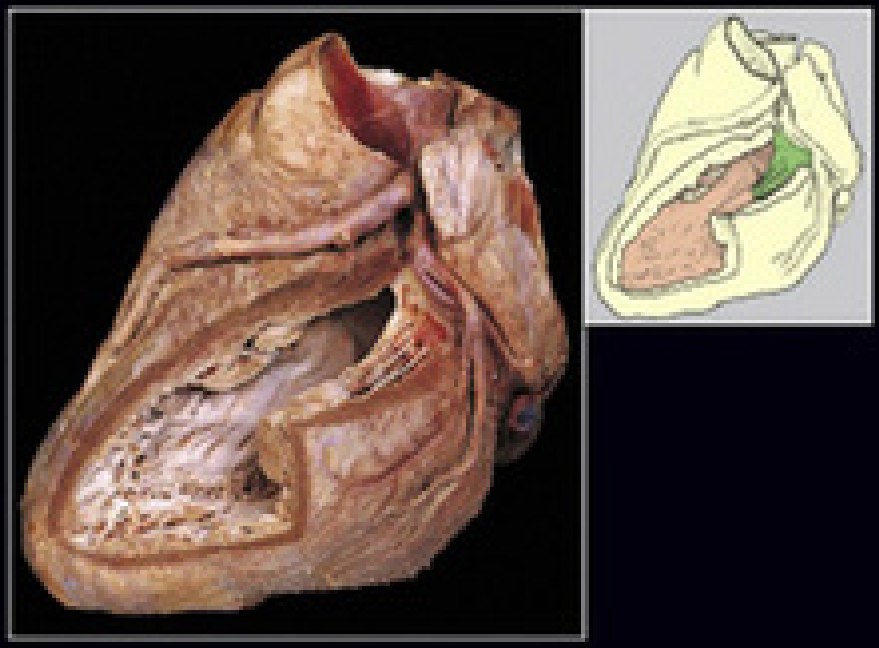
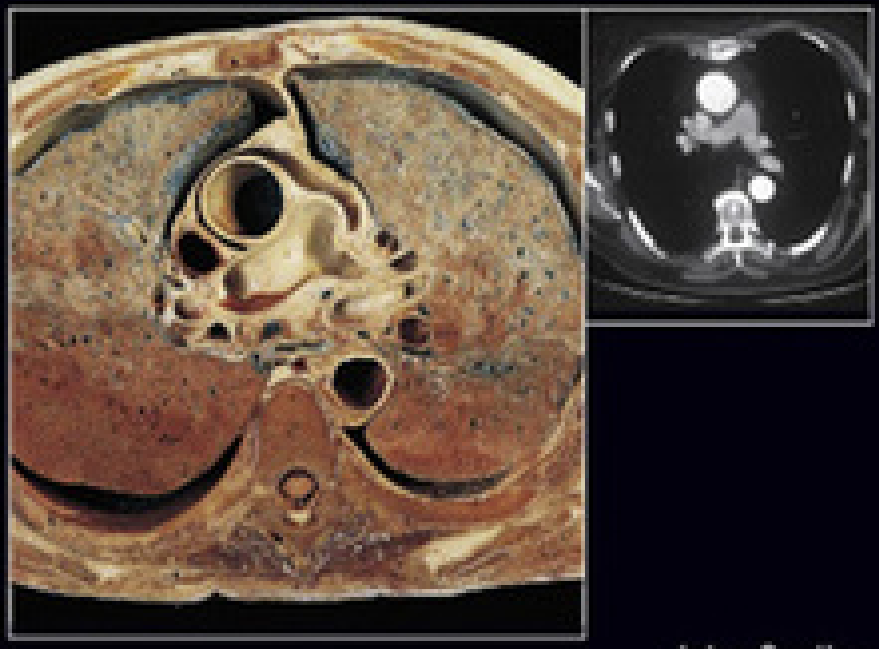
HUMAN ANATOMY

SIXTH EDITION

Color Atlas and Textbook





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Preface to the Sixth Edition

The prime purpose of the first edition of *Human Anatomy* was to present topographical anatomy as it is seen in the dissecting room. The unique combination of photographs with accompanying labelled diagrams and concise text is preserved in this edition. However, the book has evolved to accommodate modern trends in the teaching of anatomy to emphasise clinical applications and problem solving.

Changes have included the addition of introductory sections for each chapter to provide an overview of each region; the incorporation of selected radiographs and CT scans and MR images; and the use of cross sections of all regions of the body to provide a basis for interpreting body scans.

Self-assessment exercises have included clinical case histories and multiple choice questions, as well as radiographs and scans, together with anatomical sections.

In previous editions the terminology was updated to conform to *Terminologia Anatomica* and a list of alternative terms is included. On occasions fonts have changed to improve readability.

In this edition we have continued to improve the text and the diagrams by remedying omissions and removing errors and ambiguities. In addition, we have added new radiographs and scans. The numerous examples of clinical and applied anatomy in each chapter are now clearly identified. After discussions with the publisher, we elected to indicate clinical comments by highlighting in blue and to employ enclosing arrows in some electronic media.

Whilst the book was initially written for medical and dental students, the content will now also be useful to candidates preparing for higher qualifications in surgical specialties and radiology. It will also be relevant to students in other professions where anatomy is a significant component of the course.

It is with sadness that we report the death of John Davies whose skills as an embalmer enabled the authors to prepare the many dissections presented in this atlas.

J.A.G., P.F.H., J.R.H., I.W., P.L.T.W.
2016

Preface to the First Edition

Despite the many anatomical atlases and textbooks currently available, there appeared to be a need for a book which combined the advantages of each of these forms of presentation. This book was conceived with the intention of filling that need. With a unique combination of photographs of dissections, accompanying diagrams and concise text, this volume aims to provide the student with a better understanding of human anatomy.

The basis of this work is the cadaver as seen in the dissecting room; therefore, reference to surface and radiological anatomy is minimal. Likewise, comments on the clinical and functional significance of selected anatomical structures are brief. However, comparison is made where appropriate between the anatomy of the living and that of the cadaver.

Each dissection was specially prepared and photographed to display only a few important features. However, since photographs of dissections are inherently difficult to interpret, each is accompanied by a guide in the form of a drawing. Each drawing is coloured and labelled to highlight the salient features of the dissection and is accompanied by axes to indicate the orientation of the specimen. Adjacent photographs often depict different stages of the same dissection to help the student construct a three dimensional image.

The first chapter introduces anatomical terminology, provides general information about the basic tissues of the body, and includes overall views of selected systems. Because the six subsequent chapters describe anatomy primarily through dissection, a regional approach has been employed. Features of bones are described only when considering their related structures, especially muscles and joints; osteology is not considered in its own right. The internal structure of the ear and eye are beyond the scope of this book since the study of these topics requires microscopy; the anatomy of the brain and spinal cord are also excluded as they are usually taught in special courses.

The level of detail contained in this book is appropriate for current courses in topographical anatomy for medical and dental undergraduates. In addition, it will be of value to postgraduates and to students entering those professions allied to medicine in which anatomy is part of the curriculum.

The terminology employed is that which is most frequently used in clinical practice. Where appropriate, alternatives (such as those recommended in *Nomina Anatomica*) are appended in brackets.

Preparation of the dissections and the text has occupied the authors for nearly five years. Our objective was to create a high quality and visually attractive anatomical work and we hope that the time and effort spent in its preparation is reflected in the finished product.

J.A.G., P.F.H., J.R.H., I.W., P.L.T.W.
Manchester, 1985

Acknowledgements for All Editions

The authors are indebted to Drs Victoria Clague, Gulraiz Ahmad and Peter Mullaney, Professors Waqar Bhatti, R.S. Harris and A.R. Moody, and to the Departments of Radiology at Kaiser Permanente, San Rafael CA and Manchester University for the provision of radiographs, CT scans and MR images.

Our families deserve special mention, as without their untiring support and patience these editions would certainly not have come to publication.

We thank them all.

J.A.G., P.F.H., J.R.H., I.W., P.L.T.W.

MISSING

USE CHAPTER OUTLINES WITH DIRECT PAGE LINKS

Human Anatomy User Guide

Organization

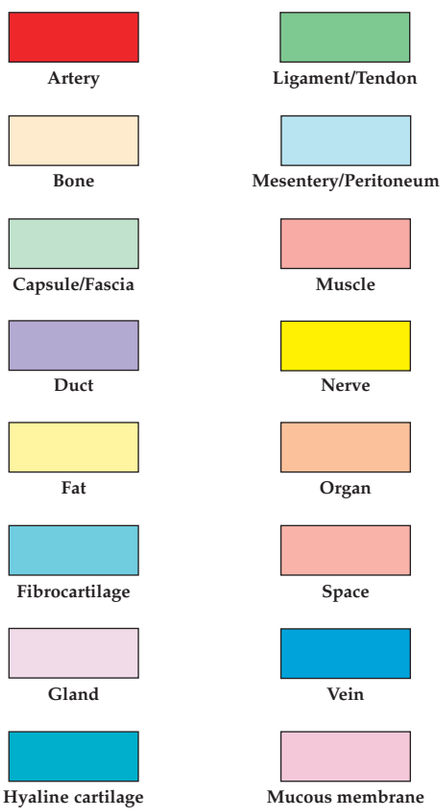
This book begins with a chapter on basic anatomical concepts. This is following seven chapters, each with its own introduction, on the different regions of the body. Information is usually presented in dissection order, progressing from the surface to deeper structures. The limbs are described from proximal to distal with the joints considered last.

Text and Photographs

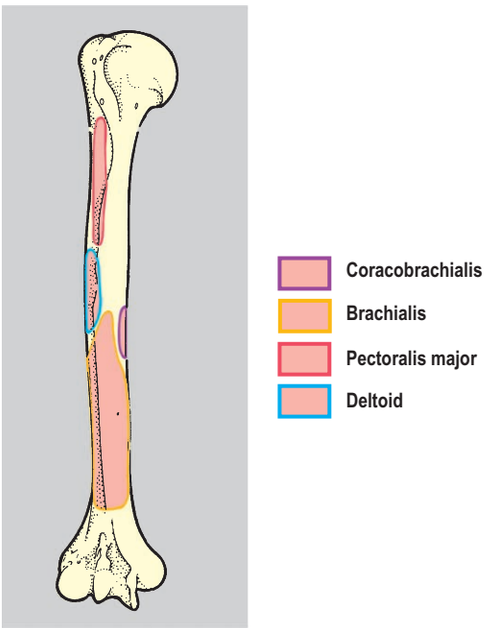
Where possible the text and photographs are arranged on self-contained two-page spreads, so that the reader can locate relevant illustrations without turning a page. Clinical content is highlighted in blue in the print edition or indicated by enclosing arrows in eBook versions (➲).

Accompanying Diagrams

Adjacent to each photograph is a line diagram in which colour is used to focus attention on particular structures in the dissection. The colours usually conform to the following code:

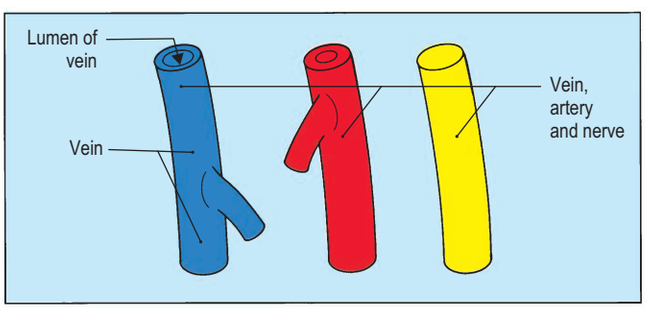


In diagrams showing muscle attachments on bone, the areas are shown using the muscle colour enclosed by different coloured lines. In other diagrams colour indicates the extent of a compartment or space.



Labels and Leader Lines

The structures of particular interest in each diagram are labelled. A single structure is named in a label either with a single leader line or by a leader line which branches to show different parts of the same structure. However, if two or more structures are named, the first has the main leader line terminating on it while the subsequent structures are indicated by side branches given off at progressively shorter distances from the label. A leader line ending in an arrow indicates a space or cavity.



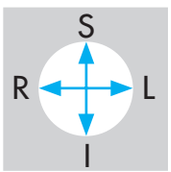
Orientation Guides

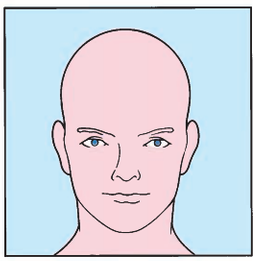
Next to the diagrams are orientation guides in which the following abbreviations are used:

L left	**P** posterior	**pr** proximal
R right	**A** anterior	**d** distal
S superior	**la** lateral	
I inferior	**m** medial	

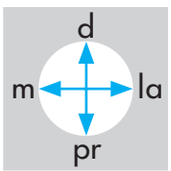
Orientation guides in oblique views employ large and small arrow heads and long and short arrow shafts. Here are four examples:

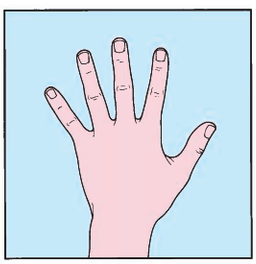
from in front;



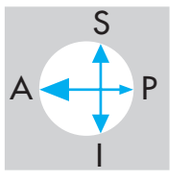


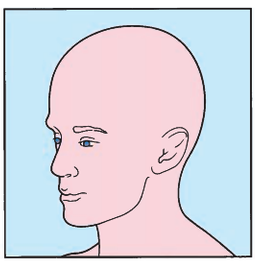
from behind;



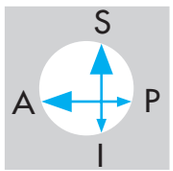


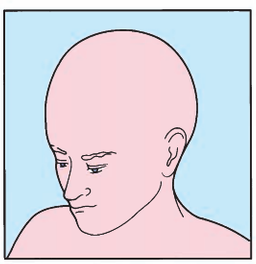
from the left side and slightly in front;





from the left side, slightly above and in front.





Terminology

The book conforms to *Terminologia Anatomica,* using the English terms. The list of alternative terms relates older non-official terms to their modern equivalent.

Self-assessment

The photographs in the main body of each chapter are unfettered by labels, leader lines or other superimposed markings; thus, readers can readily test their knowledge by either masking the whole of the accompanying diagram and studying the photograph alone, or covering only the labels.

Exams Skills, Clinical Case Skills & Observations Skills are provided after each chapter to allow readers to further self-test. Answers to Exam Skills and Clinical Case Skills are at the end of the book; those for Observation Skills are at the bottom of the same page as the picture.

Chapter 1

BASIC ANATOMICAL CONCEPTS

Terms of Position and Movement

To avoid ambiguity and confusion, anatomical terms of position and movement are defined according to an internationally accepted convention. This convention defines the anatomical position as one in which the human body stands erect with the feet together and the face, eyes and palms of the hands directed forwards (Fig. 1.1).

With the subject in the anatomical position, three sets of planes, mutually at right angles, can be defined.

Vertical (or longitudinal) planes are termed either coronal or sagittal. Coronal (or frontal) planes (Fig. 1.2) pass from one side to the other, while sagittal planes (Fig. 1.3) pass from front to back.

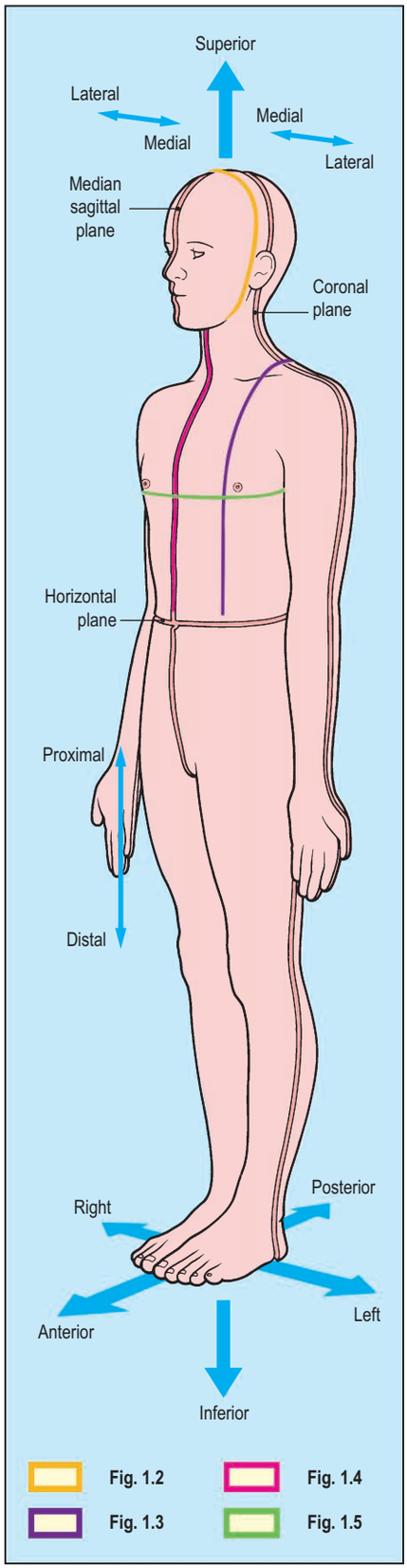


Fig. 1.1 Anatomical position and the terms used in anatomical description.

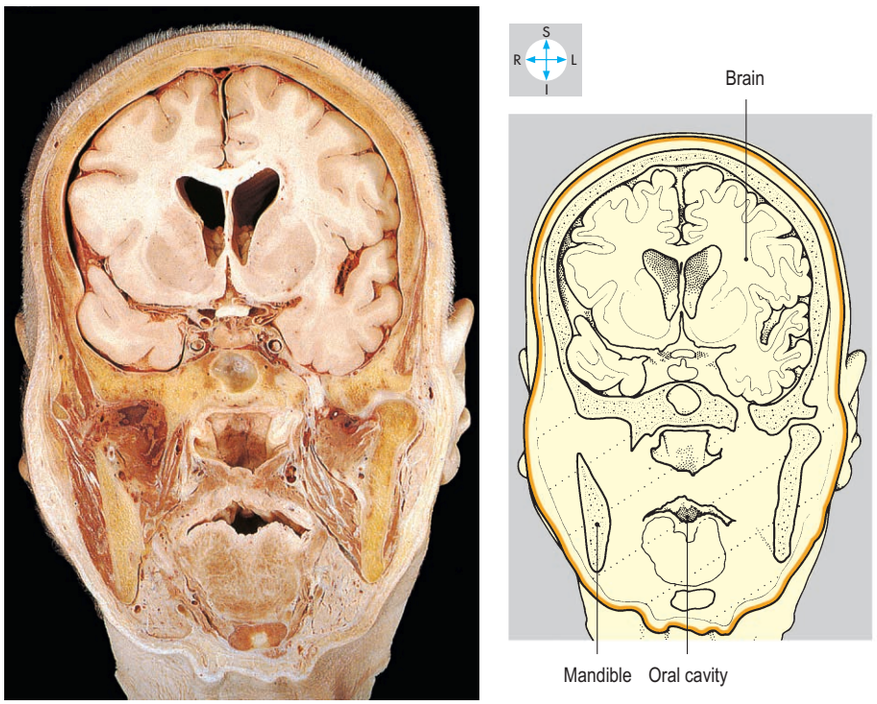


Fig. 1.2 Coronal section through the head.

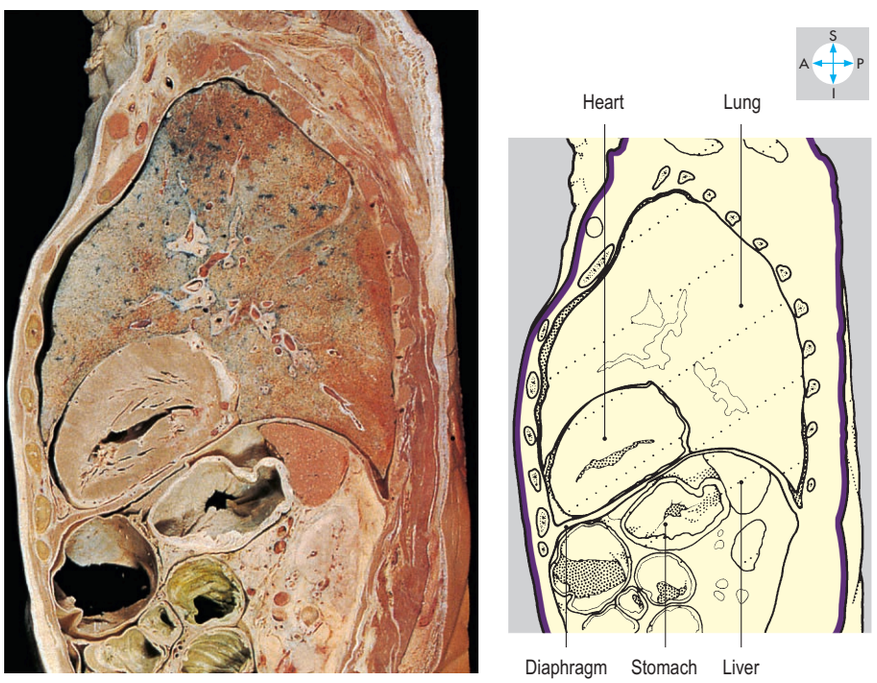


Fig. 1.3 Sagittal section through the trunk. This section lies to the left of the median sagittal plane.

One particular sagittal plane, the median sagittal (midsagittal) plane, lies in the midline and divides the body into right and left halves (Fig. 1.4).

Horizontal (or transverse) planes (Fig. 1.5) transect the body from side to side and front to back.

Sections cut at right angles to the long axis of an organ or parts of the body are also known as transverse. Similarly, longitudinal sections are cut parallel to the long axis.

The terms medial and lateral are used to indicate the position of structures relative to the median sagittal plane. For example, the ring finger lies lateral to the little finger but medial to the thumb. The front and back of the body are usually termed the anterior (or ventral) and posterior (or dorsal) surfaces, respectively (Fig. 1.1). Thus one structure is described as anterior to another because it is placed farther forwards.

Superior and inferior are terms used to indicate the relative head/foot positions of structures (Fig. 1.1). Those lying towards the head (or cranial) end of the body are described as superior to others, which are inferior (or caudal). Thus the heart lies superior to the diaphragm; the diaphragm is inferior to the heart. In the limbs, the terms proximal and distal have comparable meanings. For example, the elbow joint is proximal to the wrist but distal to the shoulder. These terms are also used to indicate the physiological direction of flow in tubes, such as the oesophagus is proximal to the stomach.

The terms superficial and deep indicate the location of structures in relation to the body surface. Thus the ribs lie superficial to the lungs but deep to the skin of the chest wall (Fig. 1.5).

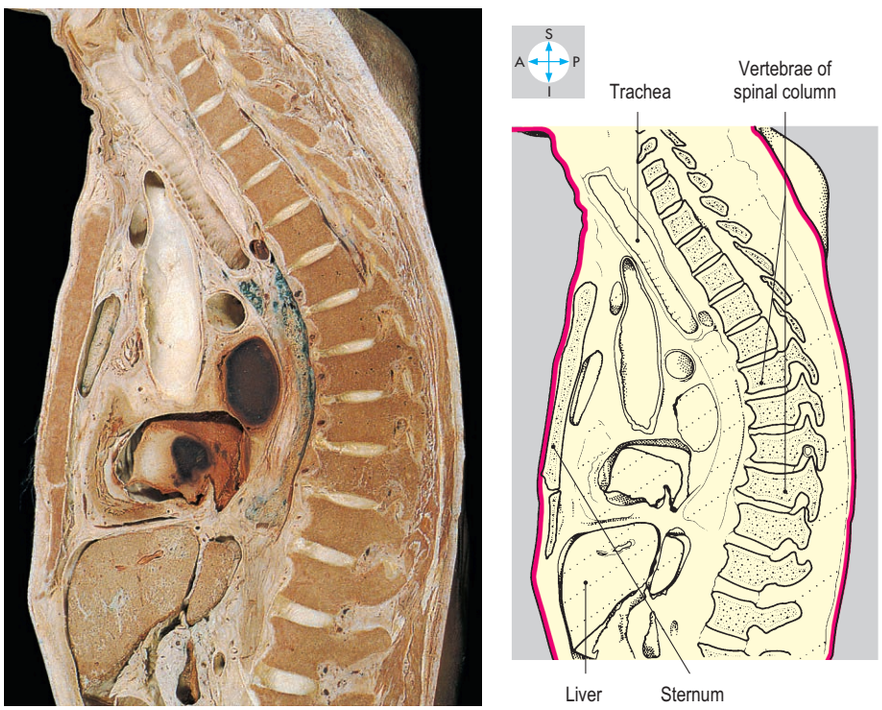


Fig. 1.4 Median sagittal section through the trunk.

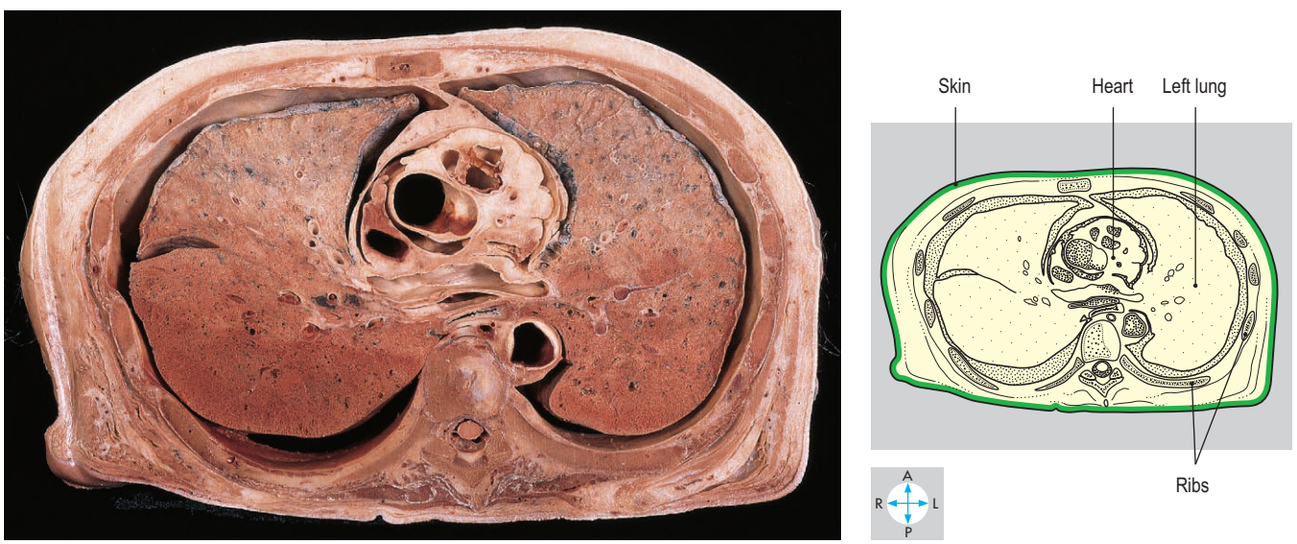


Fig. 1.5 Transverse section through the thorax at the level of the intervertebral disc between the sixth and seventh thoracic vertebrae. Inferior aspect. (Compare Fig. 2.71.)

Movements at joints are also described by specific terms. From the anatomical position, forward movement of one part in relation to the rest of the body is called flexion. Extension carries the same part posteriorly (Fig. 1.6). However, because in the fetus the developing upper and lower limbs rotate in different directions, the movements of flexion and extension in all joints from the knee downwards occur in opposite directions to the equivalent joints in the upper limb. In abduction, the structure moves away from the median sagittal plane in a lateral direction, whereas adduction moves it towards the midline (Fig. 1.7). For the fingers and toes, the terms abduction and adduction are used in reference to a longitudinal plane passing along the middle finger or the second toe, respectively. Movement around the longitudinal axis of part of the body is called rotation. In medial (or internal) rotation, the anterior surface of a limb rotates medially, while lateral (or external) rotation turns the anterior surface laterally (Fig. 1.8). Movements that combine flexion, extension, abduction, adduction and medial and lateral rotation (for instance, the 'windmilling' action seen at the shoulder joint) are known as circumduction.

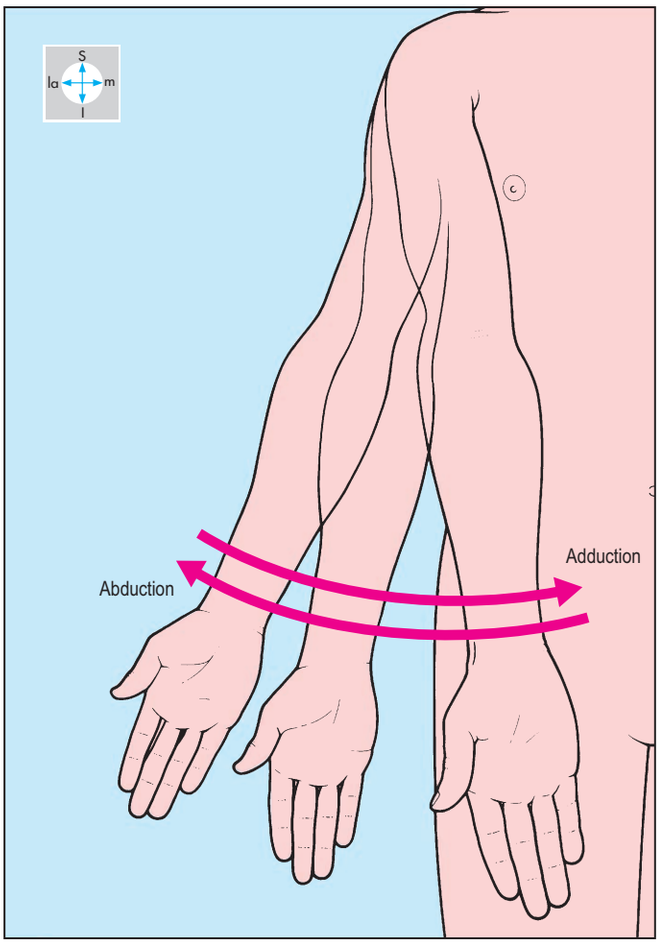


Fig. 1.7 Movements of abduction and adduction. In adduction, flexion of the shoulder joint allows the limb to be carried anterior to the trunk.

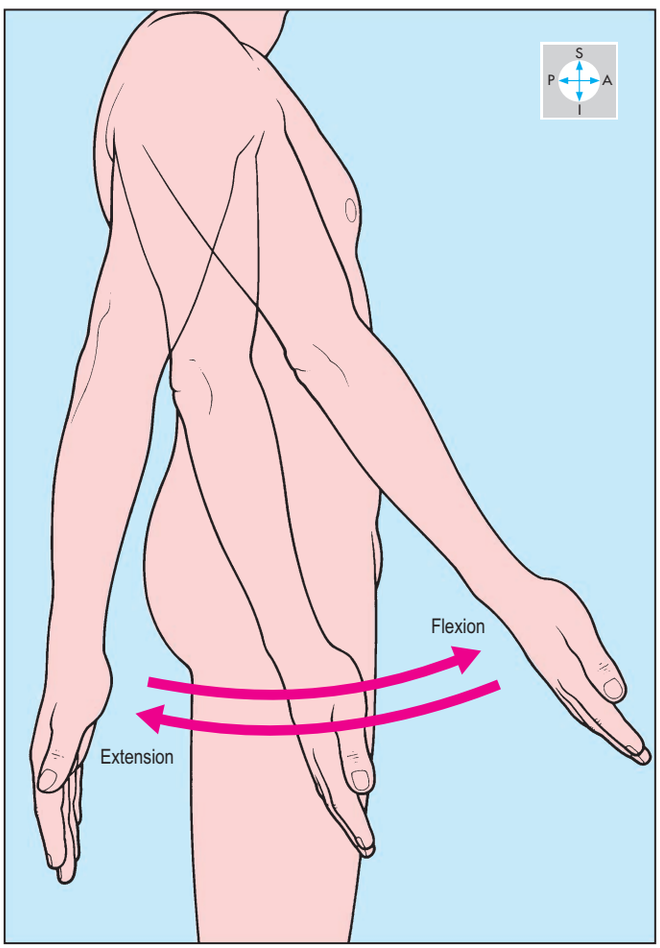


Fig. 1.6 Movements of flexion and extension of the shoulder joint.

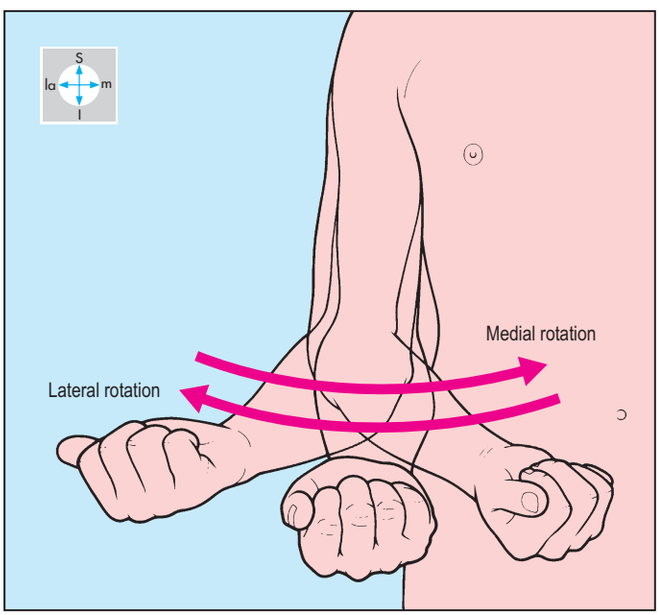


Fig. 1.8 Movement of the forearm indicates medial and lateral rotation at the shoulder joint. The elbow is flexed.

Basic Tissues and Structures

Skin

Skin (Fig. 1.9) is a protective covering for the surface of the body and comprises a superficial layer, called the epidermis, and a deeper layer, the dermis. The epidermis is an epithelium consisting of a surface layer of dead cells, which are continually shed and replaced by cells from its deeper germinal layer. The dermis is a layer of connective tissue containing blood vessels, lymphatics and nerves. In most areas of the body, the skin is thin and mobile over the underlying structures. Specializations of the skin include fingernails and toenails, hair follicles and sweat glands. On the palms of the hands and soles of the feet (and corresponding surfaces of the digits), hair follicles are absent and the epidermis is relatively thick. The skin in these regions is also firmly anchored to the underlying structures, reducing its mobility during gripping and standing. Lines of tension (Langer's lines) occur within skin and are of importance to surgeons. Scars following surgical incisions made along these lines tend to be narrower than those made across the lines of tension.

Skin is usually well vascularized and receives blood from numerous subcutaneous vessels. Knowledge of this vascular supply is important when operations that involve the use of skin flaps are undertaken. Skin has a rich nerve supply, responding to touch, pressure, heat, cold, vibration and pain. In certain areas, such as the fingertips, the skin is especially sensitive to touch and pressure. Skin is innervated by superficial (cutaneous) branches of spinal or cranial nerves. The area of skin supplied by each cranial or spinal nerve is known as a dermatome (Figs 1.37 & 1.38).

Subcutaneous tissue (superficial fascia)

Immediately deep to the skin is a layer of loose connective tissue, the subcutaneous tissue (Fig. 1.9), which contains networks of superficial veins and lymphatics and is traversed by cutaneous nerves and arteries. It also contains fat, which varies considerably in thickness from region to region and between individuals. For example, over the buttock the fat is particularly thick, while on the back of the hand it is relatively thin. Over the lower abdomen this tissue is subdivided into two layers, a superficial fatty layer and a deeper membranous layer.

Deep fascia

The deep fascia (Fig. 1.9) consists of a layer of dense connective tissue immediately beneath the subcutaneous tissue. Although thin over the thorax and abdomen, it forms a substantial layer in the limbs (e.g. fascia lata; p. 260) and neck (e.g. investing fascia; p. 324). Near the wrist and ankle joints, the deep fascia is thickened to form retinacula, which maintain the tendons in position as they cross the joints. Deep fascia also provides attachment for muscles and gives anchorage to intermuscular septa, which separate the muscles into compartments. Bleeding and swelling within muscle compartments due to crushing injuries or fractures may raise the pressure so much that it compresses blood vessels and reduces blood flow. The resulting ischaemia may be followed by scarring and deformity with contracture of muscles.

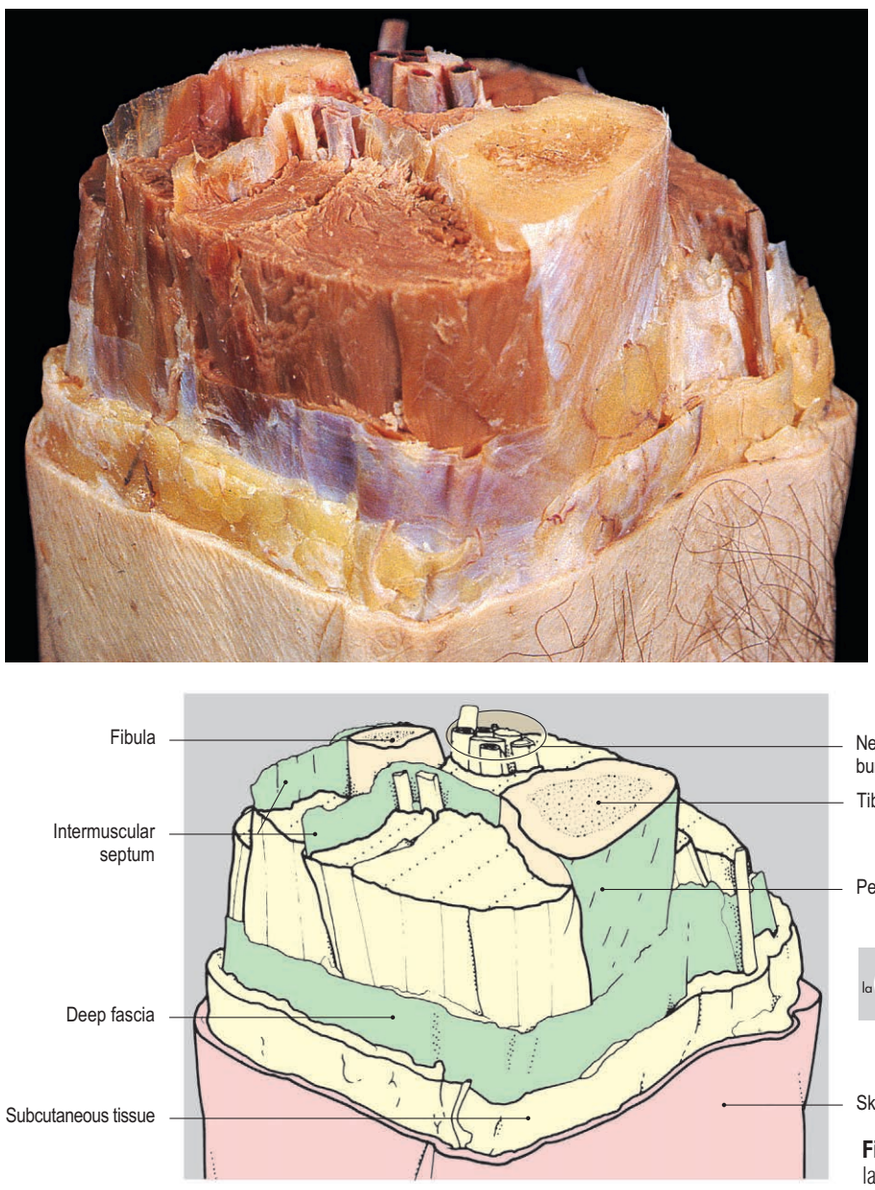


Fig. 1.9 Multilevel 'step' dissection through the right midcalf to show layers of skin, fascia and intermuscular septa.

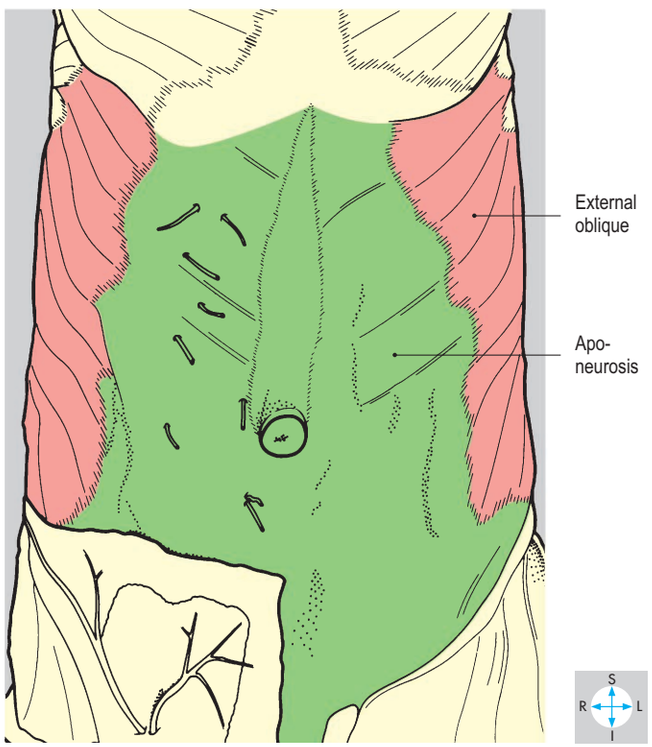


Fig. 1.10 External oblique is a flat muscle with an extensive aponeurosis.

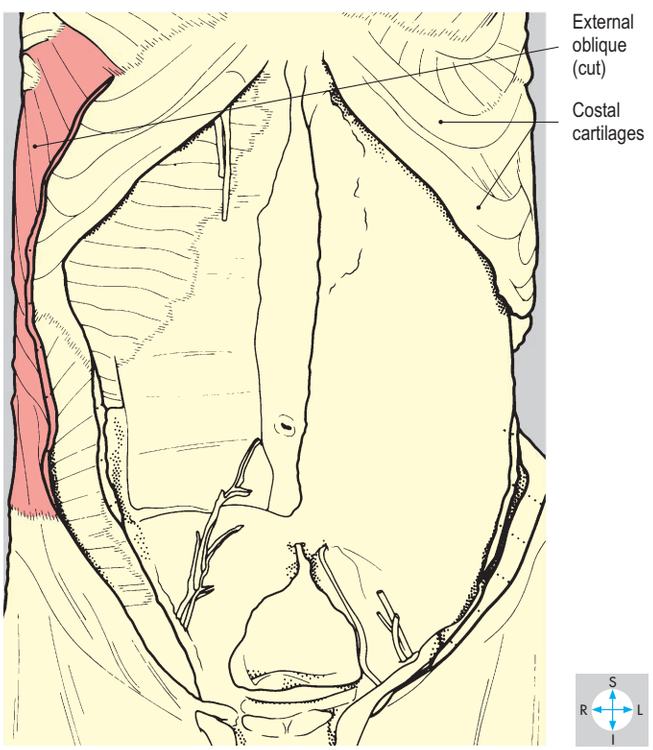


Fig. 1.11 External oblique cut to show its thickness.

Muscle

Muscle is a tissue in which active contraction shortens its component cells and/or generates tension along their length. There are three basic types: smooth muscle, cardiac striated muscle, voluntary striated muscle. Striated and smooth describe the microscopic appearance of the muscle.

Smooth muscle is present in the organs of the alimentary, genitourinary and respiratory systems and in the walls of blood vessels. Capable of slow, sustained contraction, smooth muscle is usually controlled by the autonomic nervous system (p. 22) and by endocrine secretions (hormones).

Cardiac striated muscle (myocardium) is confined to the wall of the heart and is able to contract spontaneously and rhythmically. Its cyclical activity is coordinated by the specialized conducting tissue of the heart and can be modified by the autonomic nervous system.

Skeletal muscle (voluntary striated muscle) is the basic component of those muscles that produce movements at joints. These actions are controlled by the somatic nervous system (p. 20) and may be voluntary or reflex. Each muscle cell (fibre) has its own motor nerve ending, which initiates contraction of the fibre. Muscles may be attached to the periosteum of bones either directly or by fibrous connective tissue in the form of deep fascia, intermuscular septa or tendons. Direct fleshy attachment can be extensive but tendons are usually attached to small areas of bone. Muscles with similar actions tend to be grouped together, and in limbs these groups occur in compartments (e.g. extensor compartment of the forearm).

Usually, each end of a muscle has an attachment to bone. The attachment that remains relatively fixed when the muscle performs its prime action is known as the origin, whereas the insertion is the more mobile attachment. However, in some movements, the origin moves more than the insertion; therefore, these terms are of only limited significance.

The muscle fibres within voluntary muscle are arranged in differing patterns, which reflect the function of the muscle. Sometimes they are found as thin flat sheets (as in external oblique; Figs 1.10 & 1.11). Strap muscles (such as sartorius; Fig. 1.12) have long fibres that reach without interruption from one end of the muscle to the other.

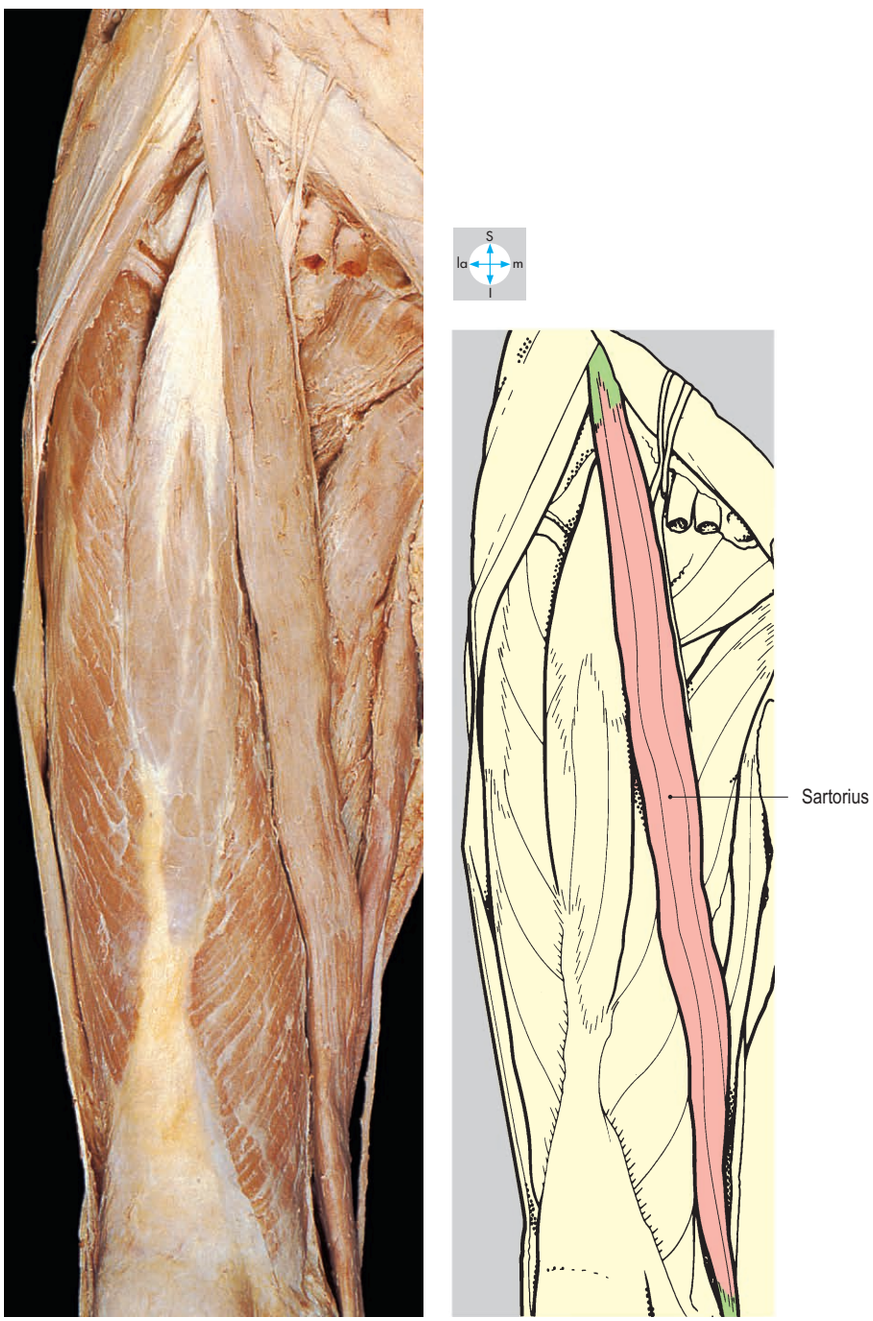


Fig. 1.12 Sartorius is a strap muscle.

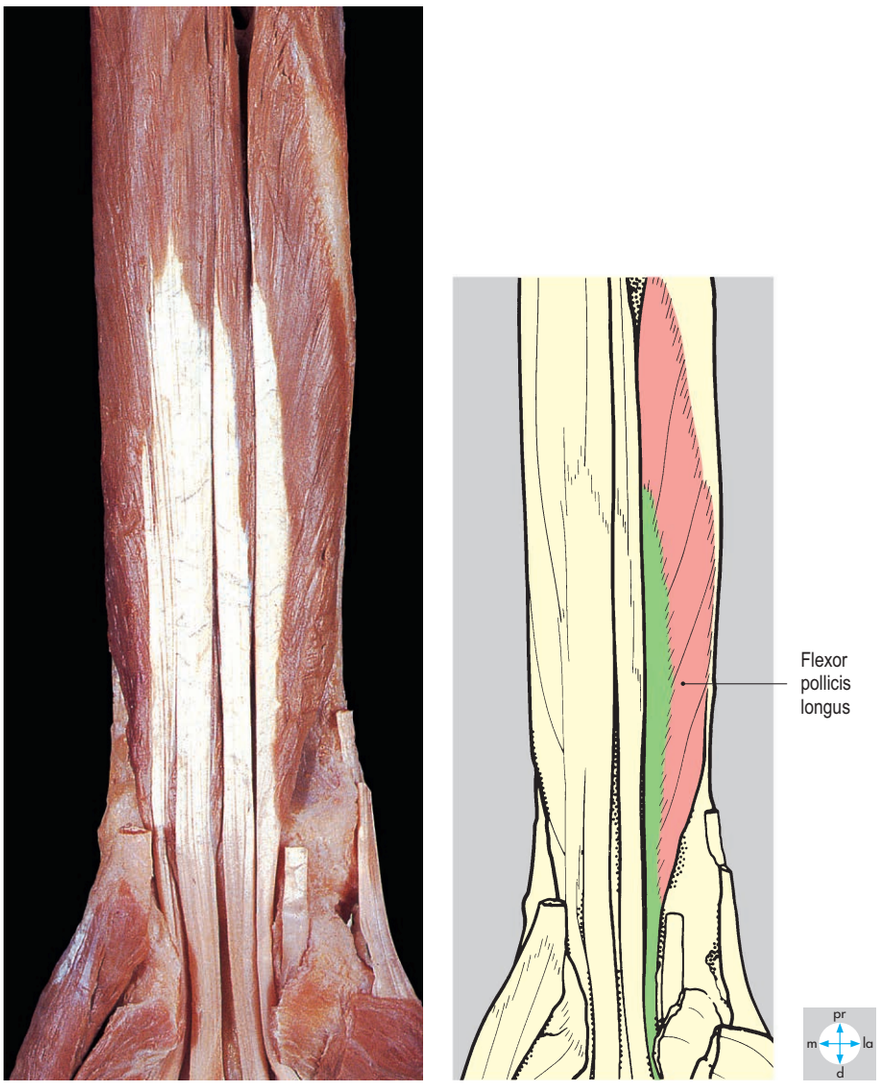


Fig. 1.13 Flexor pollicis longus is a unipennate muscle.

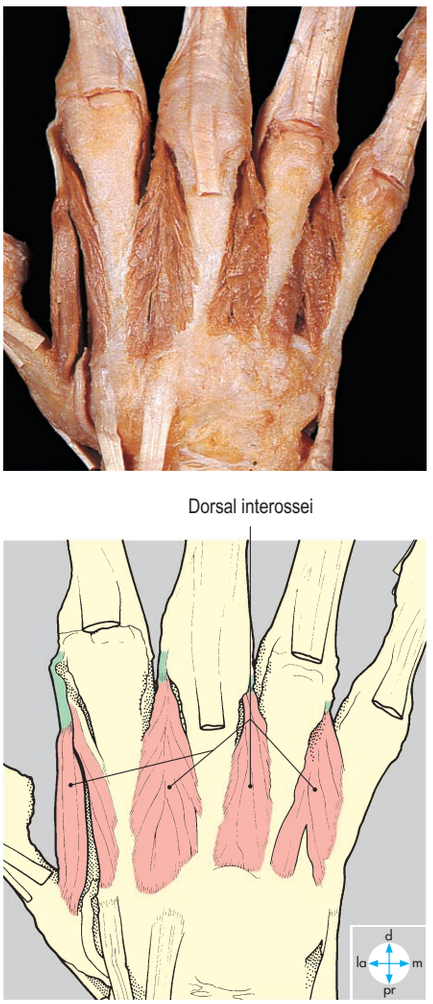


Fig. 1.14 Dorsal interossei are bipennate muscles.

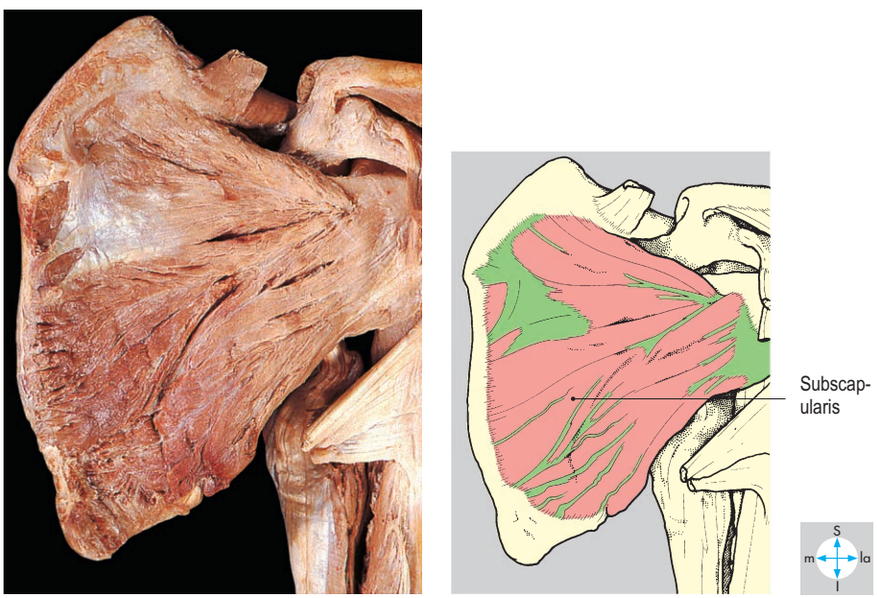


Fig. 1.15 Subscapularis is a multipennate muscle.

Pennate muscles are characterized by fibres that run obliquely. Unipennate muscles (e.g. flexor pollicis longus; Fig. 1.13) have fibres running from their origin to attach along only one side of the tendon of insertion. In bipennate muscles (such as dorsal interossei; Fig. 1.14) the fibres are anchored to both sides of the tendon of insertion.

Multipennate muscles (e.g. subscapularis; Fig. 1.15) have several tendons of origin and insertion with muscle fibres passing obliquely between them. Some muscles, for instance digastric, have two fleshy parts (bellies) connected by an intermediate tendon (p. 348).

Most tendons are thick and round or flattened in cross-section, although some form thin sheets called aponeuroses (Fig. 1.10). When tendons cross projections or traverse confined spaces, they are often enveloped in a double layer of synovial membrane to minimize friction. Where they cross joints, tendons are often held in place by bands of thick fibrous tissue, which prevent 'bowstringing' when the joints are moved. Examples include the retinacula at the wrist and ankle joints, and tendon sheaths in the fingers and toes (Figs 1.16 & 1.17).

The nerve supply to a skeletal muscle contains both motor and sensory fibres, which usually enter the fleshy part of the muscle. Groups of muscles with similar actions tend to be supplied by nerve fibres derived from the same spinal cord segments.

As very metabolically active tissue, muscle has a rich arterial blood supply, usually carried by several separate vessels. The contraction and relaxation of muscles in the limbs compresses the veins in each compartment. As the veins contain unidirectional valves, this muscle pump action assists the return of venous blood from the limbs to the trunk.

Cartilage

Cartilage is a variety of hard connective tissue, which gains its nutrition by diffusion from blood vessels in the surrounding tissues. It is classified by its histological structure into hyaline cartilage, fibrocartilage and elastic cartilage.

Hyaline cartilage occurs in costal cartilages (Fig. 1.11), the cartilages of the larynx and trachea, and in developing bones. In synovial joints (Fig. 1.23) it forms the glassy, smooth articular surfaces, which reduce friction during movement. Articular cartilage is partly nourished by diffusion from the synovial fluid in the joint cavity.

The inclusion of tough inelastic collagen fibres in the matrix constitutes fibrocartilage, which is stronger and more flexible than the hyaline type. Fibrocartilage is found in intervertebral discs (Fig. 1.22), the pubic symphysis, the manubriosternal joint, and as articular discs in some synovial joints (e.g. knee and temporomandibular).

Elastic cartilage, which occurs in the external ear and epiglottis, is the most flexible form of cartilage. It contains predominantly elastic fibres and has a yellowish appearance.

Cartilage may become calcified in old age, becoming harder and more rigid. Brittle costal cartilages may be subject to fracture during chest compressions of cardiopulmonary resuscitation, particularly in older people.

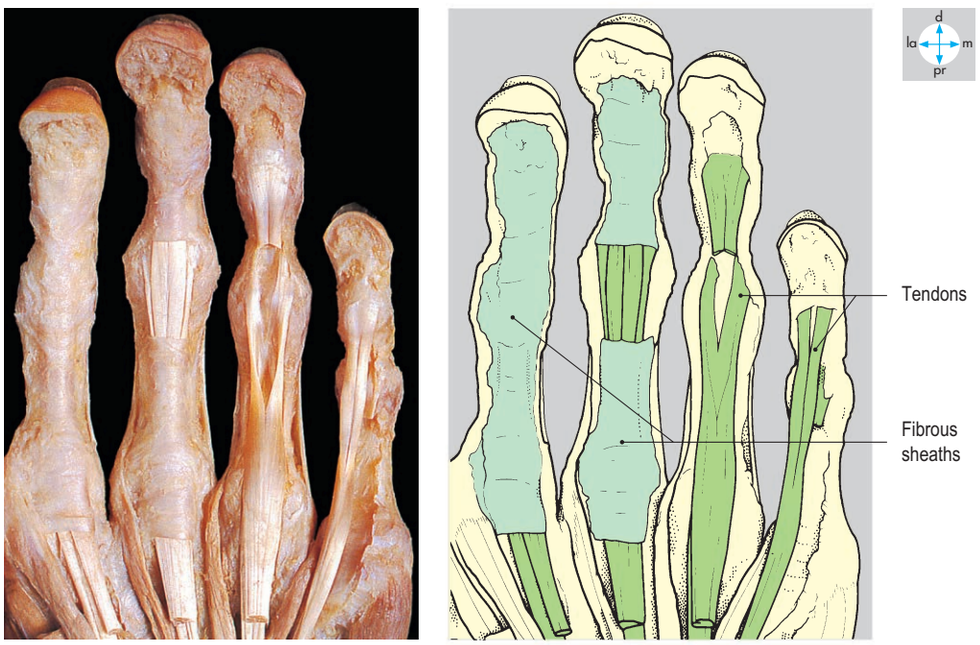


Fig. 1.16 Anterior view of the left hand, dissected to reveal its fibrous sheaths and tendons.

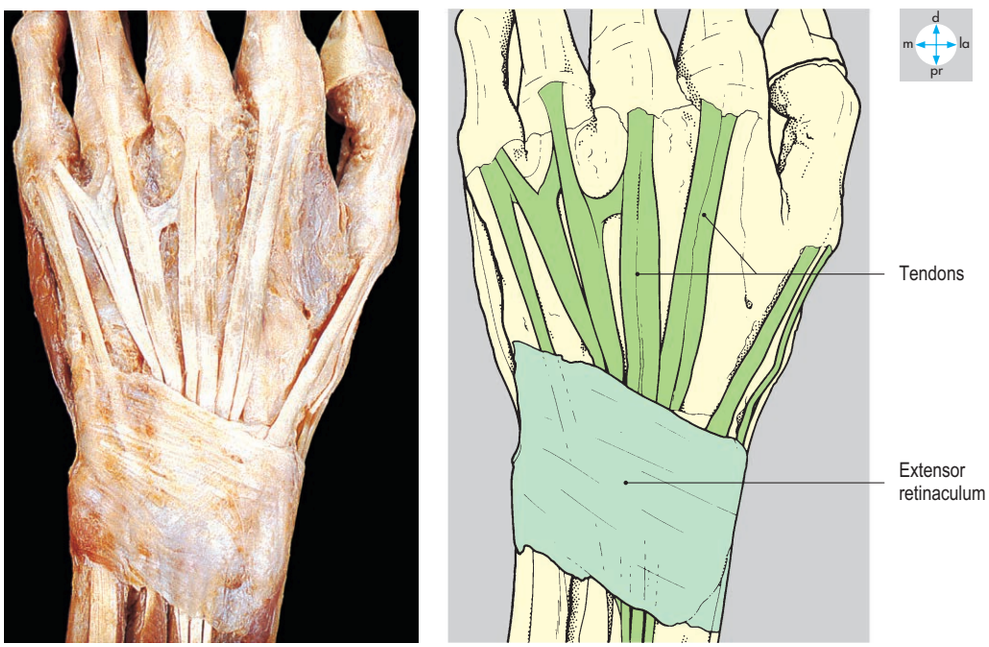


Fig. 1.17 Posterior view of the left hand, dissected to show the extensor retinaculum at the wrist.

Fig. 1.18 Longitudinal section of an adult tibia.

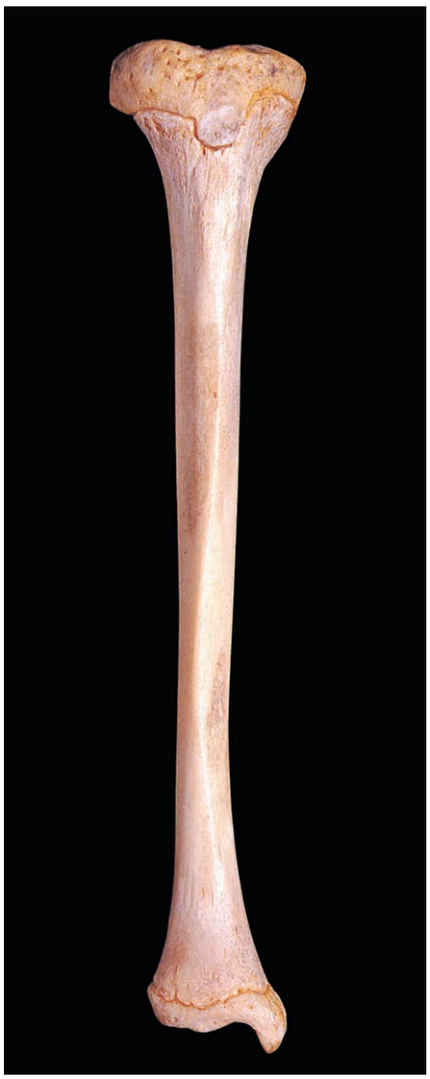


Fig. 1.19 Anterior view of a child's tibia.

Bone

Bone forms the basis of the skeleton and is characterized by a hard, calcified matrix, which gives rigidity. In most bones two zones are visible. Near the surface the outer cortical layer of bone appears solid and is called compact bone, whereas centrally the bone is known as spongy (cancellous) bone. Many bones contain a cavity (medulla) occupied by the bone marrow, a potential site of blood cell production (Fig. 1.18).

The numerous bones comprising the human skeleton vary considerably in shape and size, and are classified into long bones (e.g. femur); short bones (bones of the carpus); flat bones (parietal bone of skull); irregular bones (maxilla of skull); and sesamoid bones (patella). Sesamoid bones develop in tendons, generally where the tendon passes over a joint or bony projection. Some bones are described as pneumatized because of their air-filled cavities (for instance, ethmoid).

Bone is enveloped by a thin layer of fibrous tissue called periosteum (Fig. 1.9), which provides anchorage for muscles, tendons and ligaments. Periosteum is a source of cells for bone growth and repair and is richly innervated and exquisitely sensitive to pain. The pain of fractures or tumours in bone is often due to disturbance of the periosteum.

Bone has a profuse blood supply provided partly via the periosteal vessels and partly by nutrient arteries, which enter bones via nutrient foramina and also supply the marrow. Fractured bones often bleed profusely from damaged medullary and periosteal vessels.

Several names are given to the different parts of a long bone in relation to its development (Fig. 1.19). The shaft (or diaphysis) ossifies first and is separated by growth plates from the secondary centres of ossification (or epiphyses), which usually lie at the extremities of the bone. The part of a diaphysis next to a growth plate is called a metaphysis and has a particularly rich blood supply. When increase in bone length ceases, the growth plates disappear and the epiphyses fuse with the diaphysis. Fractures involving epiphyses and metaphyses often disrupt bone growth.

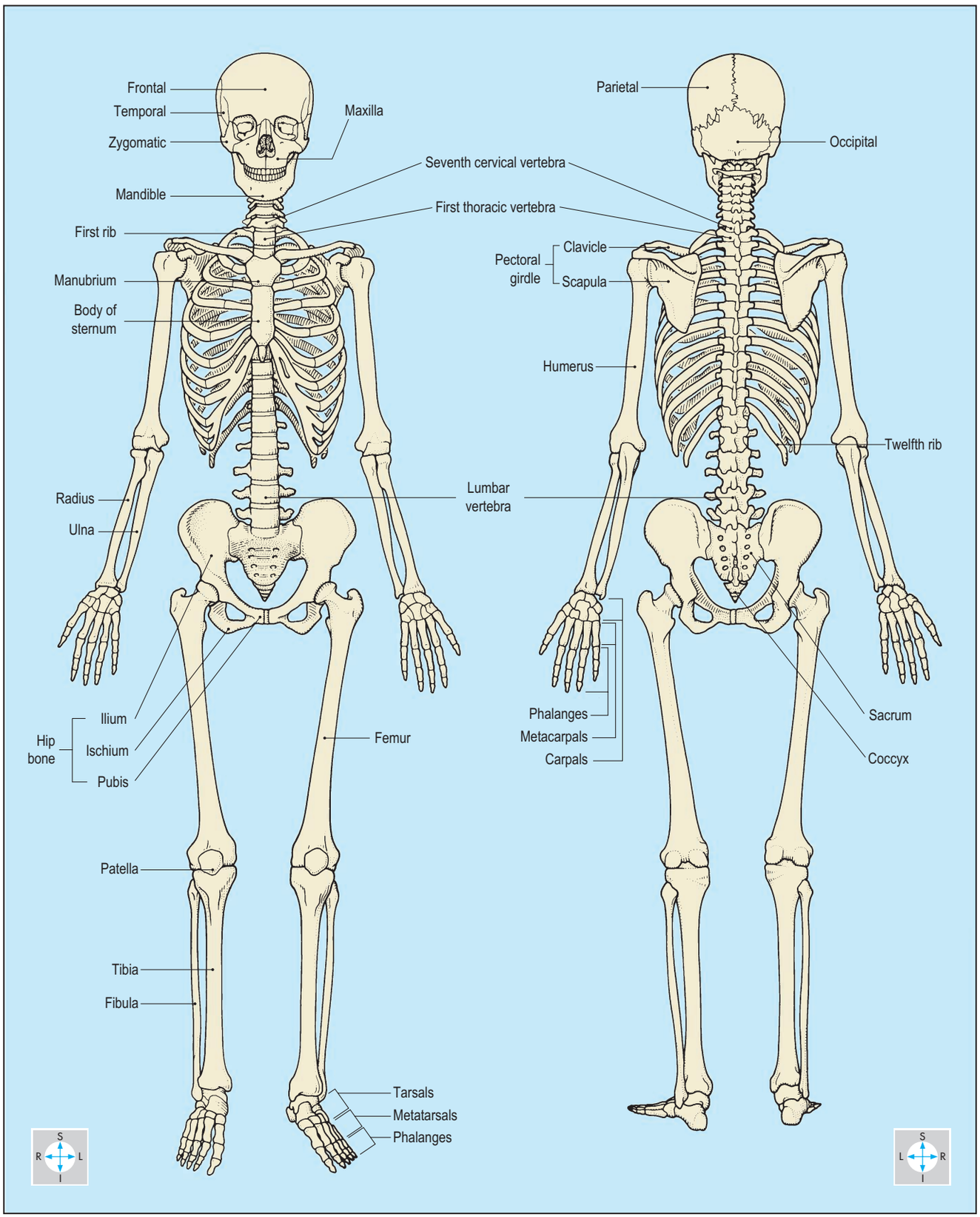


Fig. 1.20 Anterior and posterior views of the skeleton.

Skeleton

The skeleton (Fig. 1.20) is composed of bones and cartilages held together by joints, and gives rigidity and support to the body. It has axial and appendicular components. The axial component includes the skull, vertebral column, ribs, costal cartilages and sternum. The appendicular skeleton comprises the bones of the upper and lower limbs and their associated girdles. In this book, individual bones are described in the appropriate regions.

Joints

Joints are classified according to their structure into fibrous, cartilaginous and synovial types. In fibrous joints (Fig. 1.21), which are relatively immobile, the two bones are joined by fibrous tissue (e.g. sutures seen between the bones of the skull).

Cartilage is interposed between bone ends in cartilaginous joints. Primary cartilaginous joints contain hyaline cartilage, are usually capable of only limited movement, and are described between the ribs and sternum. In secondary cartilaginous joints (Fig. 1.22), fibrocartilage unites the bone ends. These joints, which generally allow more movement than those of the primary type, all lie in the midline. Examples include the intervertebral discs, the manubriosternal joint and the pubic symphysis.

Synovial joints

The most common type of joint is the synovial joint, which is complex and usually highly mobile. They are classified according

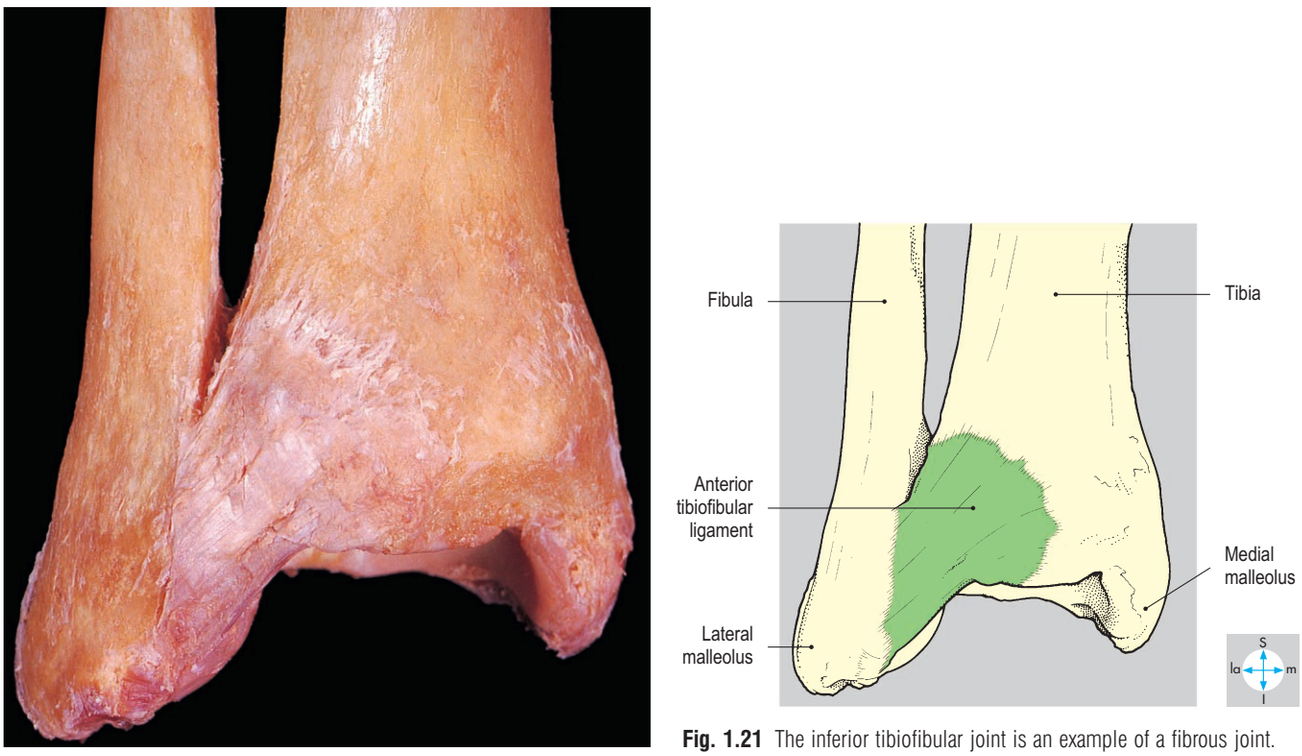


Fig. 1.21 The inferior tibiofibular joint is an example of a fibrous joint.

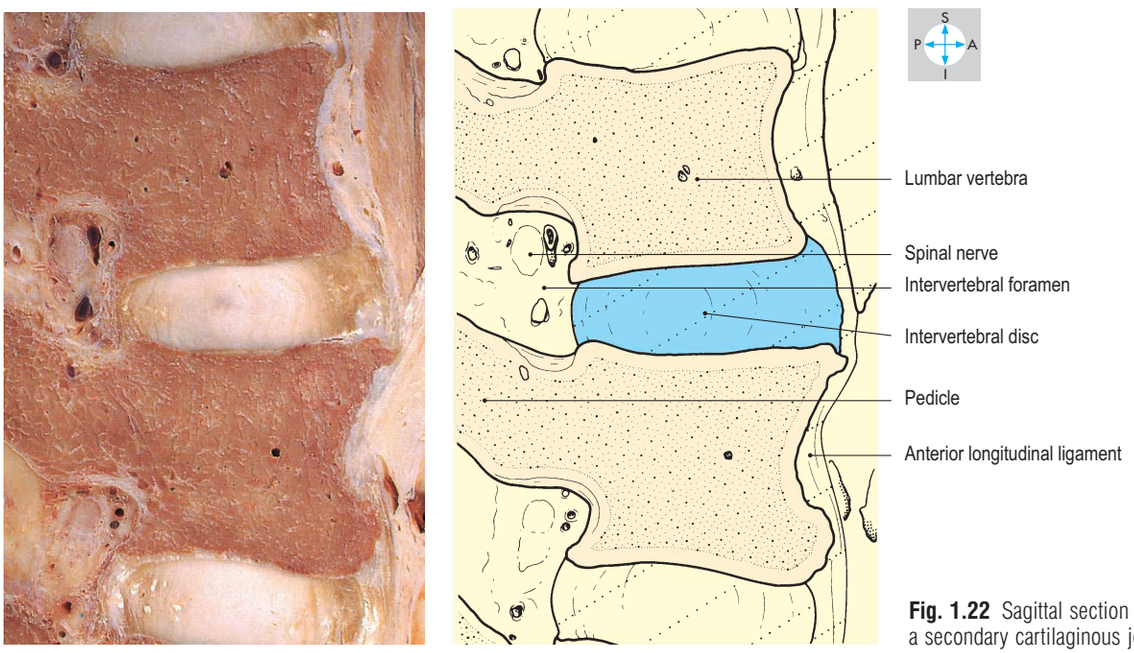


Fig. 1.22 Sagittal section to show an intervertebral disc, a secondary cartilaginous joint.

to the shape of the joint surfaces (such as plane, saddle, ball-and-socket) or by the type of movement they permit (such as sliding, pivot, hinge). In a typical synovial joint (Fig. 1.23) the articulating surfaces are coated with hyaline cartilage and the bones are joined by a fibrous capsule, a tubular sleeve, which is attached around the periphery of the areas of articular cartilage. In every synovial joint, all of the interior (except for intra-articular cartilage) is lined with synovial membrane. This thin vascular membrane secretes synovial fluid into the joint space, providing nutrition for the cartilage and lubrication for the joint.

The capsule is usually thickened to form strengthening bands known as capsular ligaments (e.g. the pubofemoral ligament). In addition, fibrous bands, discrete from the capsule, may form extracapsular ligaments (such as the costoclavicular ligament). In some joints, there are intracapsular ligaments (for instance, the ligament of the head of the femur), which are covered by synovial membrane. Tendons sometimes fuse with the capsule (as in the rotator cuff) or they may run within the joint, covered by synovial membrane, before reaching their bony attachment (e.g. biceps brachii at the shoulder joint; Fig. 1.24).

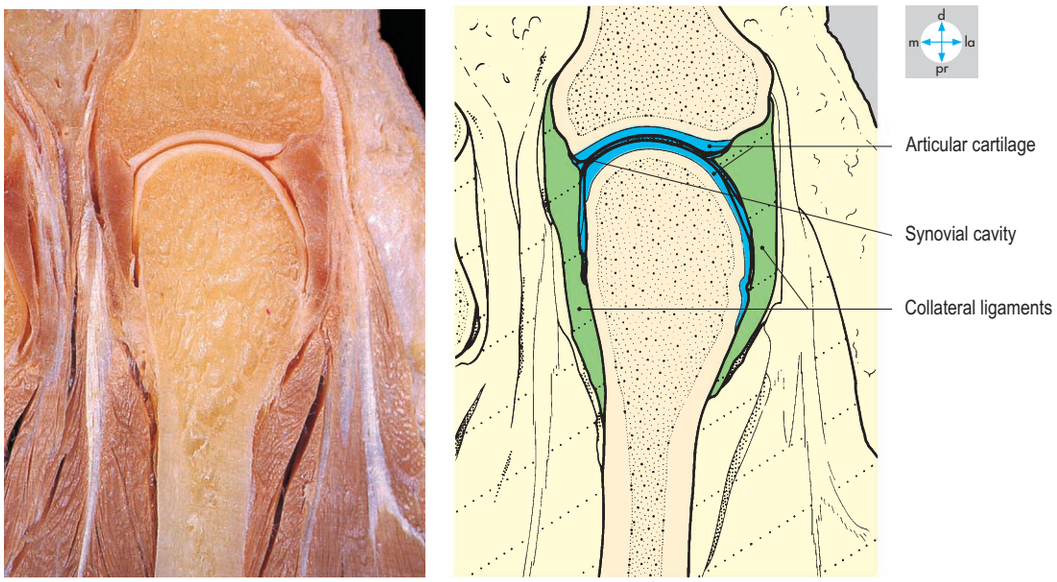


Fig. 1.23 Coronal section through a metacarpophalangeal joint, a synovial joint. The collateral ligaments are thickenings of the joint capsule.

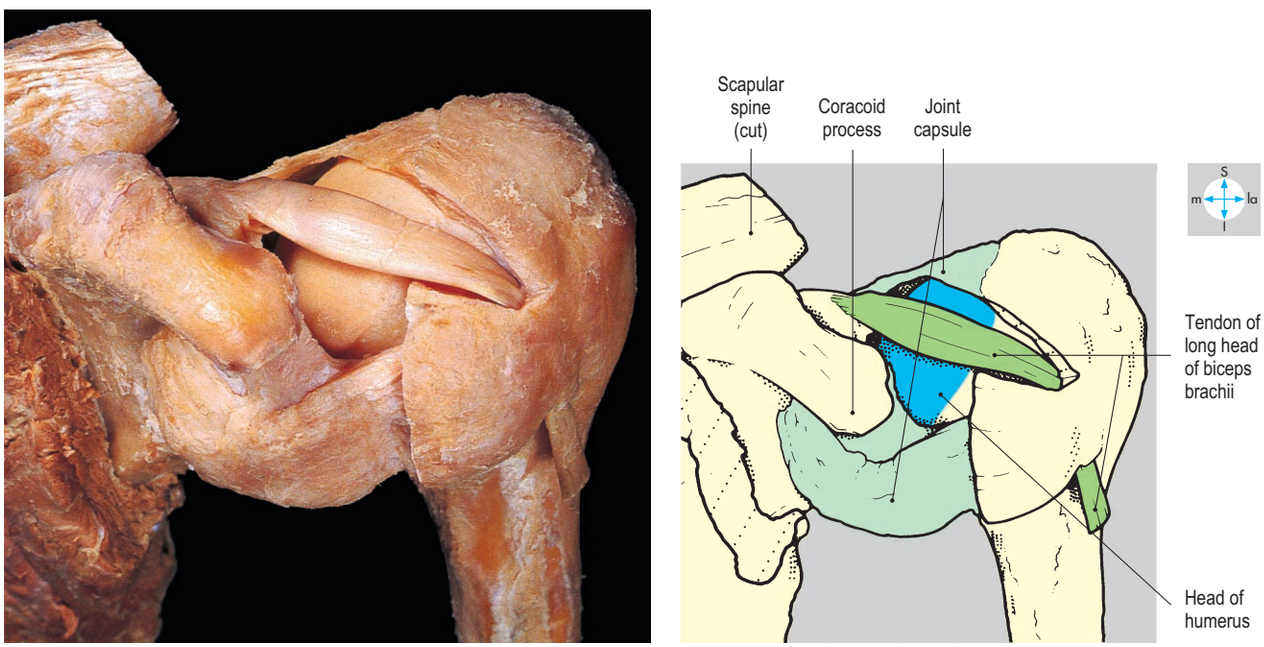


Fig. 1.24 Removal of part of the shoulder joint capsule reveals the intracapsular but extrasynovial tendon of the long head of biceps brachii.

Fluid-containing sacs of synovial membrane called bursae (Fig. 1.25) separate some tendons and muscles from other structures. Bursae, which lie close to joints, may communicate with the cavity of the joint through a small opening in the capsule (as does the subscapularis bursa).

In some joints (e.g. knee) a disc of cartilage is interposed between the articular cartilage covering the bone ends (Fig. 1.26). This provides a matched shape for each bone end, thus allowing freer movement without compromising stability. In addition, different types of movement are permitted in each half of the joint.

Stability varies considerably from one synovial joint to another, as several factors limit excessive movement and contribute to the stability of the joint. These include the shape of the articulating surfaces, the strength of the capsule and associated ligaments, the tone of the surrounding muscles and, where present, intra-articular discs and ligaments. At the hip joint, the ligaments and the shape of the bones provide the main stability, whereas the tone of the surrounding muscles is more important in stabilizing the shoulder joint. Lack of stability associated with muscle weakness or trauma may result in dislocation, so that the cartilage-covered surfaces may no longer make contact. Dislocation may damage adjacent blood vessels and nerves.

Joints, particularly their capsules, receive a rich sensory innervation derived from the nerves supplying the muscles that act on the joint. For instance, the axillary nerve supplies the shoulder joint and deltoid.

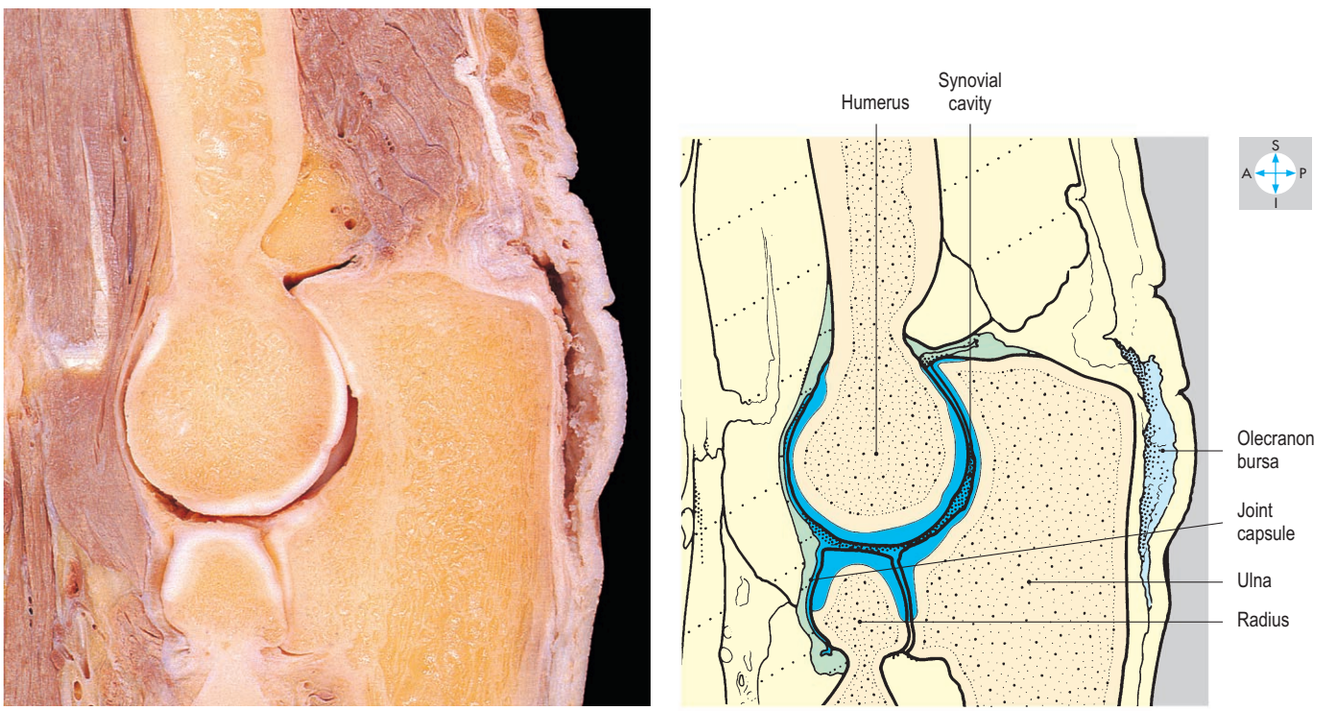


Fig. 1.25 Sagittal section through the elbow joint. The olecranon bursa does not communicate with the joint cavity.

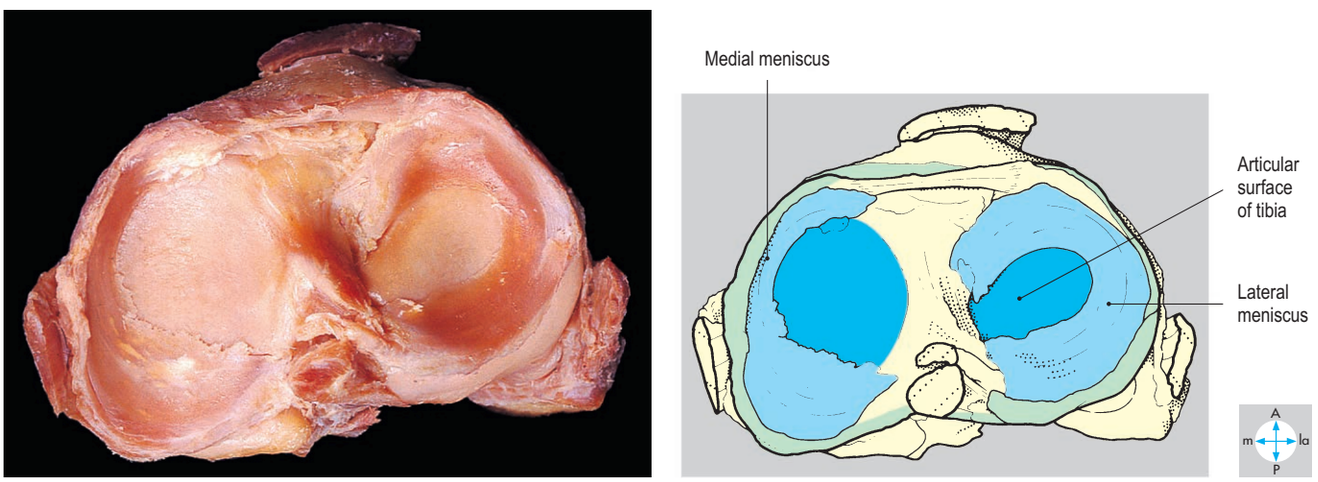


Fig. 1.26 Disarticulated knee joint to show the menisci.

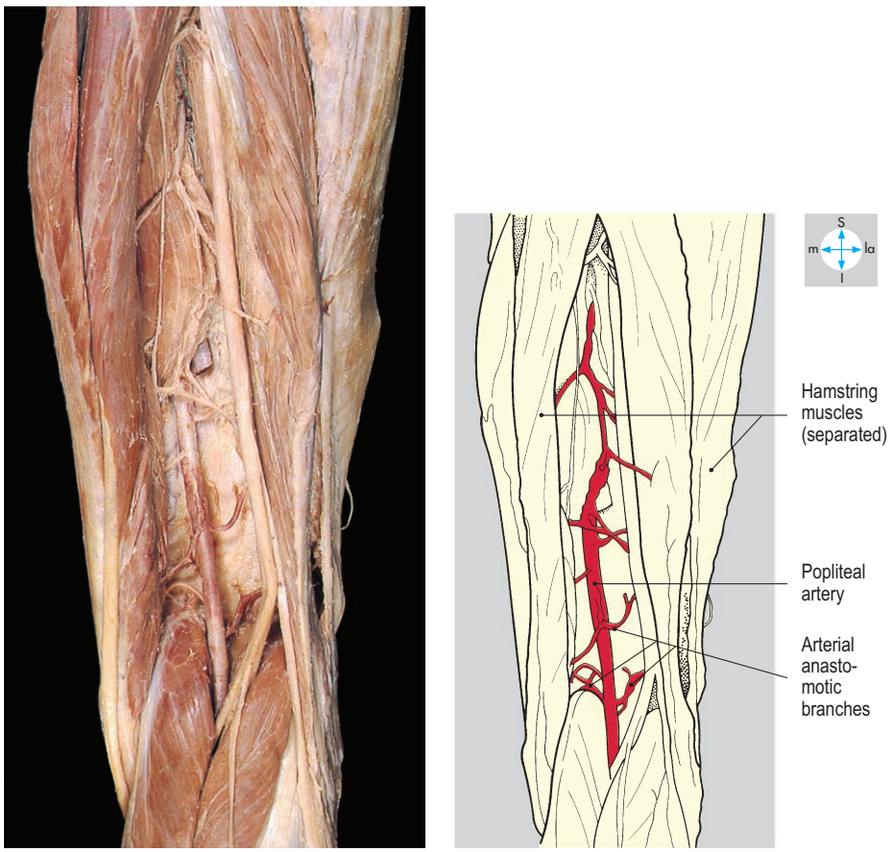


Fig. 1.27 Branches of the popliteal artery anastomose around the knee joint.

Blood vessels around joints frequently take part in rich anastomoses, which allow alternative pathways for blood flow when the joint has moved to a different position and ensure an adequate supply to the synovial membrane (such as in the knee joint; Fig. 1.27).

Serous membranes and cavities

Pericardium, pleura and peritoneum comprise the serous membranes lining the cavities that separate the heart, lungs and abdominal viscera, respectively, from their surrounding structures. Where the membrane lines the outer wall of the cavity it is called parietal and has somatic sensory innervation, and where it covers the appropriate organ it is called visceral with no somatic innervation. The spread of disease to involve parietal membranes usually provokes pain felt at a site which the patient can identify precisely. The parietal and visceral parts are in continuity around the root of the viscus and are separated from each other by a cavity, which normally contains only a thin film of serous fluid. The membranes are in close contact but are lubricated by the intervening fluid, which permits movement between the viscus and its surroundings (Fig. 1.28).

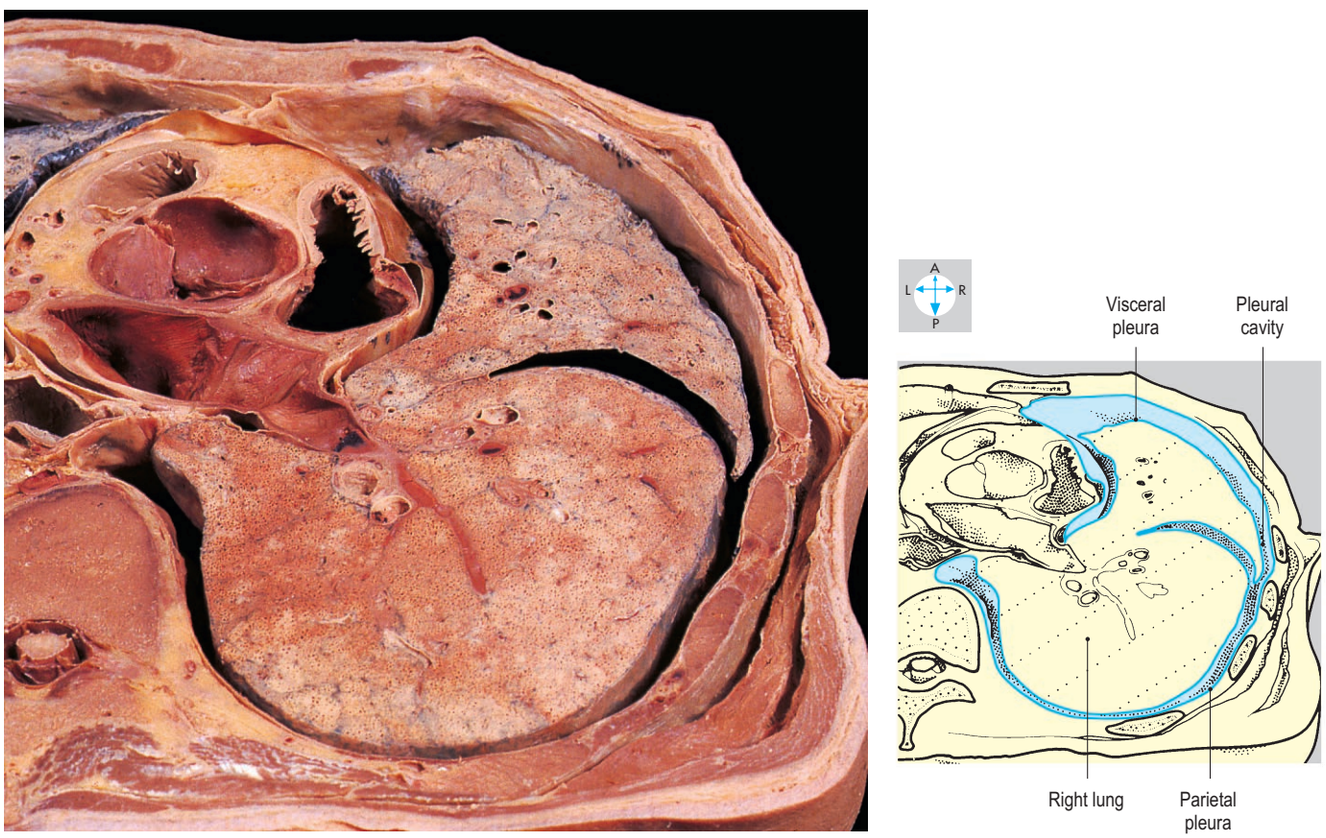


Fig. 1.28 Transverse section through the thorax at the level of T5 showing the right pleural cavity. Superior aspect.