GENERAL ORTHOPAEDICS

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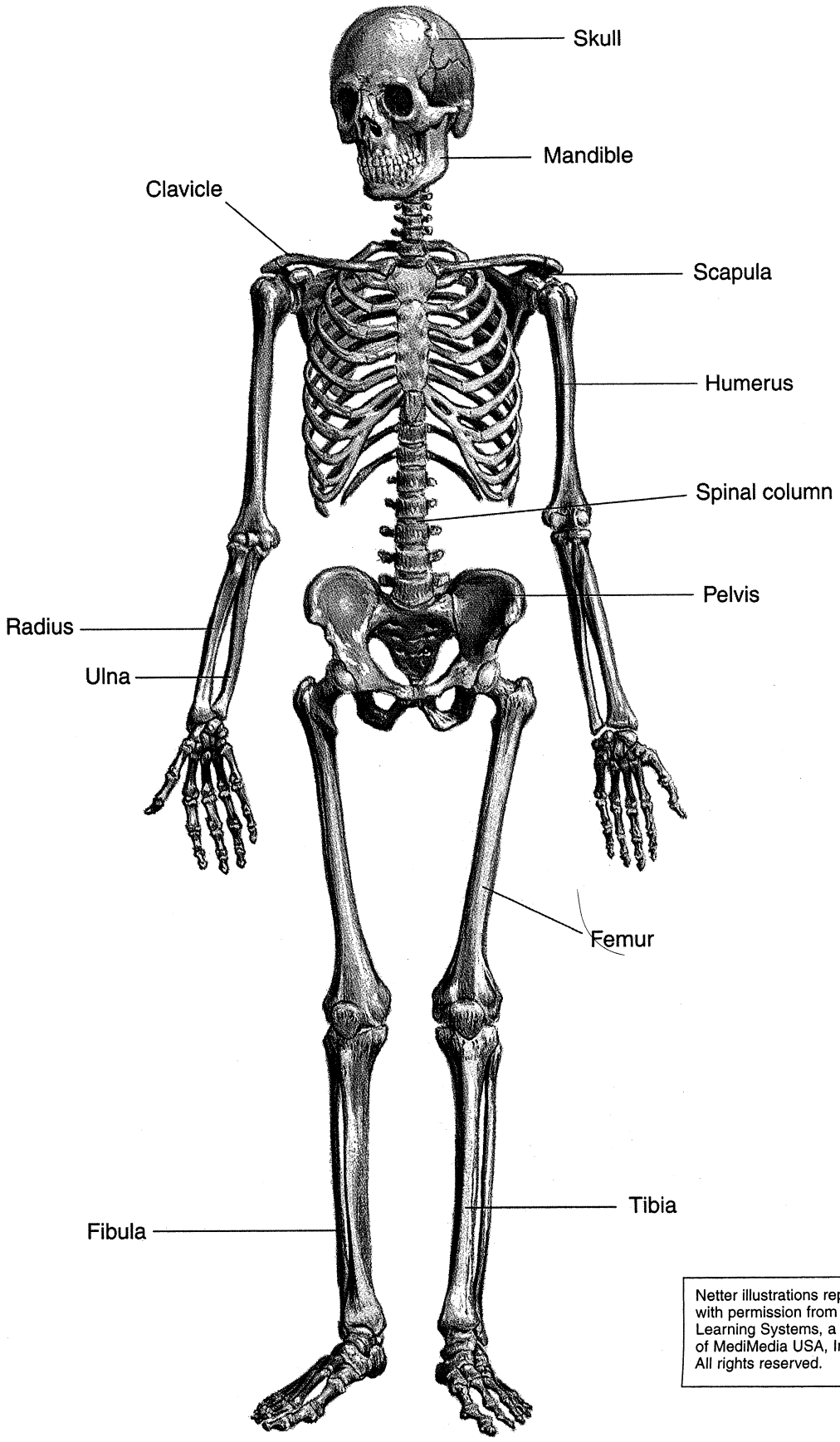

General Orthopaedics—Overview

Bone, cartilage, muscle, tendon, ligament, and their supporting nerve and vascular supplies are the specialized structures that make up the musculoskeletal system. In combination, these structures provide remarkable strength, movement, durability, and efficiency. Disease or injury to any of these tissues may adversely affect function and the ability to perform daily activities. This section of *Essentials of Musculoskeletal Care* describes conditions that affect multiple joints, bones, or regions; conditions that have systemic effects; and therapeutic modalities commonly used in the nonsurgical treatment of musculoskeletal conditions. The purpose of this overview is to highlight special conditions and to provide practical advice on diagnosis and treatment. For relevant anatomy, refer to the anatomic drawings that appear at the beginning of each of the sections of this book devoted to particular anatomic areas. A glossary of commonly used orthopaedic terms is provided on pp 996-1013.

Arthritis

The etiologies of arthritis range from degenerative processes associated with aging (osteoarthritis) to an acute infectious process (septic arthritis). Likewise, disability from arthritis ranges from inconsequential stiffness to severe pain and crippling dysfunction.

The most common type of arthritis, osteoarthritis (also called degenerative joint disease), is a noninflammatory disorder characterized by deterioration of articular cartilage and formation of new bone (sclerosis at the joint surfaces) and osteophytes (outgrowths of new bone at the joint margins). By middle age, virtually everyone experiences some type of degenerative change in the fingers or weight-bearing joints, even though most individuals at this time are asymptomatic. Primary osteoarthritis develops without apparent cause, whereas secondary osteoarthritis can develop as a result of trauma (fracture or repetitive trauma), neuromuscular disorders that cause weakness or loss of proprioception, hemophilia, skeletal dysplasias, hemochromatosis, and other disorders that either injure or overload the articular cartilage. Stiffness and pain with activity are characteristic of osteoarthritis.

Types of inflammatory arthritides include rheumatoid arthritis, the seronegative spondyloarthropathies, crystalline

deposition diseases, and septic arthritis. Of these conditions, septic arthritis is the most urgent, as it demands immediate diagnosis and an efficacious treatment plan including appropriate antibiotics and in most cases, surgical drainage and lavage. The crystalline arthropathies present with an abrupt onset of intense pain and swelling. The seronegative spondyloarthropathies are a group of disorders characterized by the following: oligoarticular peripheral joint arthritis, enthesitis, inflammatory changes in axial skeletal joints (sacroiliitis and spondylitis), extra-articular sites of inflammation, association with HLA-B27 antigen, and negative rheumatoid factor. Rheumatoid arthritis is an autoimmune disorder of unknown etiology that is characterized by a destructive synovitis, morning stiffness, and symmetric involvement that primarily affects the joints of the hands, wrists, feet, and ankles.

Bursitis and Tenosynovitis

Sterile inflammation of bursae and tendon sheaths occurs frequently in adults, particularly following an injury or repetitive motion. Characteristic symptoms include localized pain that is exacerbated by specific movements. Patients who have stiffness associated with tendinitis and bursitis may feel better once the tendon or joint is moved because the movement mechanically squeezes out the edema and allows free motion of the parts. With extended activity, however, inflammation develops and the patient notices increasing pain and the return of stiffness.

Osteoporosis

Although bone strength and risk of fracture can be affected by diseases such as hyperparathyroidism, osteomalacia, renal osteodystrophy, and other endocrine disorders, primary osteoporosis is the most common and costly bone disease. With the population of people over 65 years increasing, fractures and deformity related to osteoporosis have become epidemic. Preventing excessive bone loss with aging and its disabling consequences and minimizing the risk of fractures should be concerns for all physicians.

Trauma

Trauma is a principal cause of musculoskeletal disorders and is more likely to affect young adults. Appropriate treatment can minimize time lost from work and, more critically, permanent

impairment and predisposition to arthritis. Traumatic compartment syndrome is catastrophic if unrecognized and untreated. Appropriate splinting is necessary for all fractures, partly to reduce the likelihood of compartment syndromes, and partly to decrease soft-tissue injury and pain while the patient awaits definitive treatment. The principles used in the initial evaluation and splinting of fractures also can be helpful in the evaluation and initial management of ligament and tendon injuries.

Other Pain Disorders

Three conditions, considered the so-called "fuzzy areas" of arthralgias and periarticular pain, are discussed in this section on General Orthopaedics: fibromyalgia, complex regional pain syndrome, and cumulative trauma disorders also known as overuse syndromes. These processes are as difficult to treat as they are to understand, especially when issues of causation and compensation mix with issues of comfort. Nonorganic symptoms and signs are also discussed. Like the above conditions, these are often misinterpreted as a sign of nondisease, or even malingering; however, nonorganic findings are more likely to be a predictor of the patient's satisfaction with treatment outcomes than an indicator of psychosomatic behavior.

Patient Age

Trauma and conditions associated with overuse most commonly affect young adults. As adults reach their 40s, degenerative conditions that affect tendons, intervertebral disks, and joints are the source of most presenting symptoms. Common presenting problems in the elderly include fractures, metastatic tumors, and arthritis.

Abuse

Abuse involving children, spouses, or the elderly is a complex social and medical problem. Failing to diagnose abuse (false negative) may lead to catastrophic consequences; therefore, it is essential that the appropriate social service agencies be notified if a patient's injuries are potentially from abuse. In the section on Pediatric Orthopaedics, child abuse is discussed in a separate chapter. Spouse or elder abuse may be more difficult to identify. A patient whose history is given wholly by a caregiver may feel unable to talk in the caregiver's presence. In these circumstances, interview the patient and caregiver separately. A caregiver frustrated by an elderly patient's memory problems,

behavior problems, alcoholism, or difficult personality may be abusing the patient regularly. Further, a financially stressed caregiver may be usurping the elderly patient's finances for his or her own benefit.

The complexity of these problems and the seriousness of the consequences demand familiarity with community resources and knowledge of the competence, compassion, and professionalism of those who will investigate the potential abuse.

General Orthopaedics—Principles of Evaluation and Examination

Patients presenting with musculoskeletal problems usually report pain, deformity, or weakness. In evaluating pain, question the patient about the following:

History

Questions about the character of the pain

- Is the pain aching (joint or muscle problem), or is it sharp and associated with numbness or tingling (nerve compression)?
- Is the pain becoming worse, better, or is it relatively stable?
- Is the pain worse on movement in the morning (an inflammatory condition), or is it worse with activity (an injury or degenerative condition)?
- Does the pain wake the patient at night or prevent sleep (neoplasm, infection, or severe arthritis)?
- Does the pain radiate? If so, what course does it take?

Questions about any type of deformity

- When did the patient first notice the deformity? Was it associated with any injury or disease?
- Is the deformity getting worse?
- Does the deformity affect function, including the ability to work, pursue hobbies, and/or perform activities of daily living?

Questions about any type of weakness

- What is the extent of the muscle weakness? Does the patient have difficulty placing objects on shelves or climbing steps (proximal muscle weakness and a primary myopathy)?
- Does the patient have any associated sensory abnormalities (a neurologic problem), or does the patient report only weakness (a muscle disorder)?
- Has the patient had any loss of bowel or bladder function, loss of fine motor control (handwriting), or balance function (upper motor neuron involvement)?

Additional questions about the medical history, family history, and a review of systems may reveal clues that suggest the correct diagnosis. For example, weight loss may be a hint that the patient's low back pain is secondary to metastatic disease.

Physical Examination

The principles of examining musculoskeletal problems are similar to evaluating any medical disorder. The specific techniques are detailed in subsequent sections, but the general principles used for inspection, palpation, range of motion, muscle testing, motor and sensory evaluation, and special tests are outlined below. When examining the extremities, comparison with the opposite, asymptomatic extremity is often helpful in defining the specific abnormalities in the symptomatic extremity.

Inspection/Palpation

The examination starts with inspection. Ask the patient to place one finger on the one spot that hurts the most (**Figure 1**). This simple request will localize the problem and narrow the differential diagnosis. Look for swelling, ecchymosis, and muscular atrophy. Note the patient's body habitus and standing posture. Compare the affected extremity with the opposite extremity. This comparison is important to define subtle abnormalities and to rate the severity of the problem.

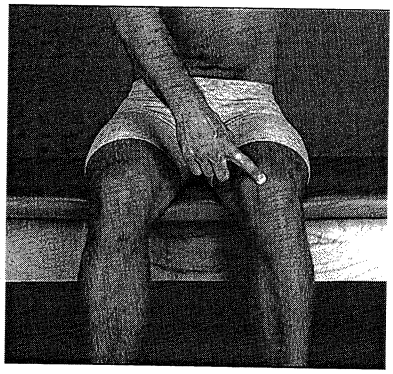

Figure 1
Patients can best localize a problem by identifying the one spot that hurts the most.

Watch the patient walk. Analyze the stance and swing phases of gait. Look for an antalgic gait, which is characterized by limited stance phase on the affected extremity. Weakness of the swing-phase muscles, eg, weakness of the ankle dorsiflexors (peroneal nerve dysfunction), is manifested by a drop foot gait.

The affected area should be palpated for tenderness, abnormal masses, or temperature changes (increased heat from inflammation secondary to injury, infection, or other inflammatory process).

Range of Motion

Measuring joint motion is important for several reasons. In acute illnesses, the degree of joint mobility is a clue to the diagnosis. For example, hip motion is restricted in children with septic arthritis of the hip or transient synovitis of the hip, but this loss of motion is much greater in patients with septic arthritis. In chronic conditions such as osteoarthritis, the degree of joint motion provides an index to the severity and progression of the disorder, as well as providing important information concerning the results of treatment.

Basic principles

Joint motion is an objective measurement that can be simply done. Therefore, the parameters for rating musculoskeletal disability, whether for governmental or other agencies, are based largely on the degree that joint motion is impaired.

Joint motion can be estimated visually; however, a goniometer enhances accuracy and is preferred at the elbow, wrist, finger, knee, ankle, and great toe. In measuring hip and shoulder motion, the overlying soft tissue does not allow the same degree of precision with a goniometer.

Zero Starting Position

Knowing the accepted Zero Starting Position for each joint is necessary to provide consistent communication between observers. The Zero Starting Position for each joint is described in the examination chapter of each section and on the inside covers of this book. For most joints, the Zero Starting Position is the extended anatomic position of the extremity.

To measure joint motion, start by placing the joint in the Zero Starting Position. Place the central axis of the goniometer at the center of the joint. Align one arm of the goniometer with the proximal segment and the other end of the goniometer with the bony axis of the distal segment (**Figure 2**). The upper end of the goniometer is held in place while the joint is moved through its arc of motion. The lower arm of the goniometer is then realigned with the axis of the extremity, and the degree of joint motion is read off the goniometer.

Definitions of limited motion

The terminology for describing limited motion is illustrated in **Figure 3**. The knee joint depicted in this photograph can be neither fully extended nor fully flexed. The restricted motion is recorded as follows: (1) the knee flexes from 30° to 90° (30° → 90°), or (2) the knee has a 30° flexion contracture with further flexion to 90° (30° FC → 90° or 30° FC W/FF 90°).

Range of motion is slightly greater in children, particularly those younger than age 10 years. Decreased motion occurs as adults age, but the loss of motion is relatively small in most

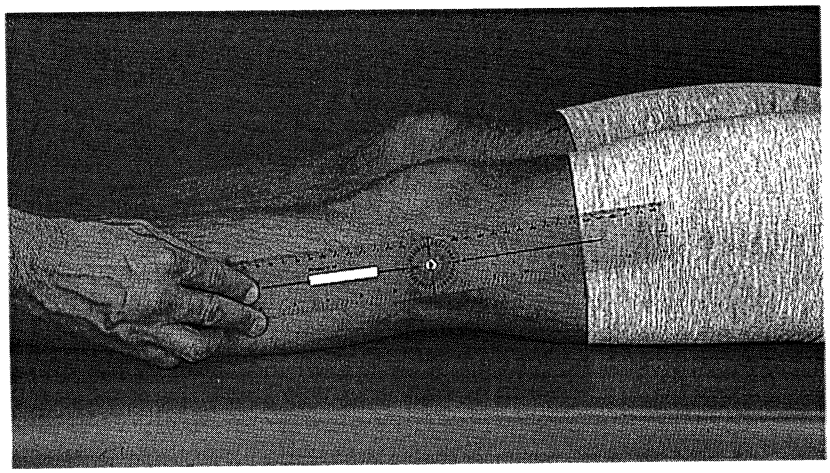

Figure 2
The correct position of the goniometer in the Zero Starting Position.

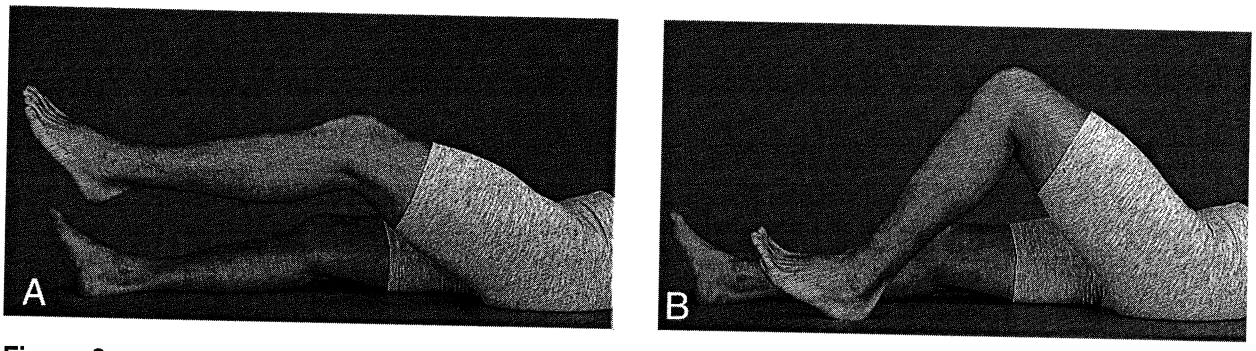

Figure 3

A, The knee flexes from 30° to 90°. **B,** The knee has a 30° flexion contracture with further flexion to 90°.

joints. Except for motion at the distal finger joints, it is safe to say that any substantial loss of mobility should be viewed as abnormal and not attributable to aging.

Finally, motion of an injured or diseased joint is often painful. In such a situation, it is better to observe active motion first. The examiner will then know how much support to provide the limb as the passive arc of motion is analyzed.

Muscle Testing

The examination techniques used in muscle testing start with placing the muscle in a shortened position and then proceed with the examiner resisting the movement. For example, when testing the biceps muscle, the patient should position the elbow in flexion and supination, and then the examiner should test resistance of the biceps by attempting to push the elbow into extension.

Table 1 Grading of Manual Muscle Testing

Numeric Grade	Descriptive Grade	Description
5	Normal	Complete range of motion against gravity with full or normal resistance
4	Good	Complete range of motion against gravity with some resistance
3	Fair	Complete range of motion against gravity
2	Poor	Complete range of motion with gravity eliminated
1	Trace	Muscle contraction but no or very limited joint motion
0	Zero	No evidence of muscle function

Manual muscle testing provides a semi-quantitative measurement of muscle strength (**Table 1**). The key differentiation is grade 3. For example, a patient's passive knee range of motion is normally 0 to 135°. However, if the patient can actively extend or lift the knee to only 20° of flexion, then, by definition, the quadriceps strength is less than grade 3.

Motor and sensory evaluation

Nerve root function should be tested if the patient's presenting symptoms suggest a neck or back problem. Peripheral nerve function should be tested if the disorder is localized to the extremities. In either case, the examination should be thorough and efficient. This is most readily accomplished by evaluating one muscle and one area of sensation for either a nerve root or peripheral nerve. The guidelines for assessing nerve root function are presented under Physical Examination in the Spine section, p 722.

Evaluation of peripheral nerves is outlined in **Table 2**. Basically, each peripheral nerve that crosses an acute injury or chronic disorder of the extremity should be evaluated. This examination can be done quickly and completely by evaluating one distal muscle group and one distal area of sensation.

Special Tests

One basic principle to keep in mind when examining patients with joint and/or muscle pain is that stretch exacerbates pain or

Table 2 Evaluation of Peripheral Nerves

Nerve	Muscle and Function	Sensory Area
Upper extremity		
Axillary	Deltoid–shoulder abduction	Lateral aspect arm
Musculocutaneous	Biceps–elbow flexion	Lateral proximal forearm
Median	Flexor pollicis longus–thumb flexion	Tip of thumb, volar aspect
Ulnar	First dorsal interosseous–abduction	Tip of little finger, volar aspect
Radial	Extensor pollicis longus–thumb extension	Dorsum thumb web space
Lower extremity		
Obturator	Adductors–hip adduction	Medial aspect, midthigh
Femoral	Quadriceps–knee extension	Proximal to medial malleolus
Peroneal		
Deep branch	Extensor hallucis longus–great toe extension	Dorsum first web space
Superficial branch	Peroneus brevis–foot eversion	Dorsum lateral foot
Tibial	Flexor hallucis longus–great toe flexion	Plantar aspect foot

contracture of an injured or deformed structure. Furthermore, if a muscle/tendon crosses two joints, then both joints must be positioned to stretch the injured part. For example, if the hamstrings are injured, their involvement is elucidated by placing these structures on stretch (eg, flexing the hip to 90° and then extending the knee). Pain and/or limited knee extension typically occurs with this maneuver when a patient has an injury or contracture of the hamstring muscles.

Tests specific to individual anatomic injuries are described in the appropriate section.

Of note, as the physician becomes familiar with the musculoskeletal examination, combining different elements of inspection, palpation, range of motion, etc will make the evaluation more efficient.