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# 骨 科 学

## ORTHOPAEDICS

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# ORTHOPAEDICS

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# PREFACE

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*Orthopaedics* was envisioned and developed to provide concise, systematic coverage of the essential principles of orthopaedics, including the relevant scientific information on which those principles are based. While scientific literature remains the foundation of knowledge of the musculoskeletal system, its prodigious nature in an ever-expanding number of specialty journals precludes assimilation of all of the information. The editors sought to develop a single source of authoritative information reflecting knowledge synthesized from the literature and clinical experience, with integration of pertinent basic research investigations and clinical outcomes.

*Orthopaedics* was not intended to compete with multivolume reference works nor with monographs on circumscribed topics. Rather, it represents core orthopaedic knowledge that will provide the reader with information and concepts pertinent to the essential principles that guide modern orthopaedic practice.

One of the main goals of this textbook is to integrate current discussion of the clinical aspects of musculoskeletal disorders with rapidly evolving scientific information that is altering knowledge of diseases and their treatments. Another, closely related goal is to provide information that will facilitate preparation for the American Board of Orthopaedic Surgery Certification Examination, for the Recertification Examination, for the American Academy of Orthopaedic Surgeons In-Training Examination, and for other certifying examinations throughout the world.

Diseases of the musculoskeletal system are increasing with an aging world population and are highly prevalent throughout the world. As a result, a wide range of individuals have a keen interest in the principles of musculoskeletal medicine and surgery who we hope will find *Orthopaedics* useful. We believe this book will have value to orthopaedic surgeons at all stages of their professional lives. Beginning residents can read through this book for an overview of their new specialty; trainees or clinicians preparing for certification or recertification examinations can read portions of this book as a broad review; and practicing clinicians can use this book as a convenient shelf reference. We also believe that other physicians, including rheumatologists, physiatrists, and a wide range of primary care physicians, will find this book advantageous both for treating patients and deciding which patients require referral for musculoskeletal care. In addition, the many other health profes-

sionals who care for patients with musculoskeletal disorders should find this book to be an accessible, authoritative, and reliable guide to the foremost, up-to-date medical and surgical thinking.

In order to avoid the lengthy tracts of dense text so often encountered in modern multivolume orthopaedic reference works, *Orthopaedics* has a unique user-friendly format with a high degree of consistency in style and presentation designed to impart knowledge without unnecessary minutiae. Each chapter opens with a Summary Box featuring several concise statements that highlight the key principles detailed in the chapter. These summaries not only provide a preview of the chapter but also serve as a rapid-recall trigger for readers who have studied the chapter. Each chapter is then developed in a consistent manner. Rather than an exhaustive list of references, each chapter contains highly selected and relevant references.

Chapters devoted to various diseases of the musculoskeletal system begin with a concise definition of the disease followed by a discussion of its history, epidemiology, pathophysiology, clinical findings, differential diagnosis, and management. *Orthopaedics* was not envisioned to be a treatise on surgical technique; pearls of surgical wisdom are provided in operative pictures, artwork, and text. Applications of new devices and techniques are emphasized with diagrams and operative photographs. Each of the chapters that focuses on diagnostic and therapeutic interventions discusses the various options for achieving a desired goal and clearly identifies the pros and cons, priorities, and controversies of each option. Chapters concerned with basic science of the musculoskeletal system contain a brief historical review of the development of the scientific issues and clearly identify the clinical or practical relevance of each biological or engineering issue that is discussed. This approach will appeal to the reader who desires an in-depth understanding of the disease and also allows for easy retrieval of specific information on the subject.

In *Orthopaedics* there is a strong emphasis on illustrations, with the belief that visual images facilitate rapid learning with long-term retention. Medical and surgical treatments have been summarized with tables and graphs to present easily digested comparisons. Artists working with the contributors in a consistent style and format created hundreds of new drawings. In addition to these drawings, each of the chapters includes clinical photographs and high-quality reproductions of

pathological specimens, radiographs, and other clinical imaging techniques.

The editors wish to thank all whose efforts have been responsible for the development of this readable and informative textbook. The contributing authors were carefully selected to provide information that is accurate, up-to-date, and easy to understand. We are grateful to them for their effort, their knowledge, and their skill. We are particularly grateful to the section editors who shared our enthusiasm and played a critical role in the development of their sec-

tions, choice of authors, and editing. Geoff Greenwood should be commended for his efforts with the initial impetus for the development of *Orthopaedics*, and Richard Lampert has been a stalwart through the various difficulties we have encountered.

Robert H. Fitzgerald, Jr, M.D.

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# **GENERAL ORTHOPAEDICS**

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**COURTLAND G. LEWIS**



## Summary

- The musculoskeletal system provides locomotor function.
- Disorders of the musculoskeletal system are associated with pain and loss of function.
- A good history qualitatively and quantitatively characterizes the pain and quantifies the disability based on the functional requirements peculiar to each individual patient.
- A structured routine of clinical history and examination usually elicits the clinical symptoms and signs that will confirm the diagnosis.

Orthopaedic surgeons deal with injuries, diseases, and disorders of the musculoskeletal system. Patients are unaware of the autonomic control of many of the systems of the body; for example, they are unaware of an increased production of insulin after a glucose-rich meal, or of the liver's response to a cholesterol challenge. The function of the musculoskeletal system, however, is most often recruited by a conscious act of volition. A failure to provide the desired function is therefore usually readily apparent.

## A PHILOSOPHY OF ORTHOPAEDIC DIAGNOSIS

I do not believe that the orthopaedic clinical examination should be based on the symptoms and signs traditionally associated with pathogenetic groupings of disease entities—inflammatory, infective, vascular, neoplastic, degenerative. These should rather be unbundled and applied to problem solving in specific clinical areas—the painful knee, the painful shoulder, and so on. A careful history will often provide sufficient information for a provisional diagnosis, which can usually be affirmed by methodical clinical examination. Special investigations are then only required to confirm the diagnosis.

In orthopaedic surgery, it is often easy to make the diagnosis: it is the choice of management that provides the greatest challenge. In deciding on the optimal treatment, it is essential to attempt to assess the pain and to quantify the associated disability. Disability will to some extent be determined by deformity, rate of progression, and so on. However, it will mainly depend on the degree to which the patient's social, domestic, recreational, and professional activities are restricted. Although expectations will clearly differ enormously from patient to patient, one needs to define to what degree quality of life is compromised. This will be very patient-specific. Only when armed with this information can the surgeon make a rational decision about management (Fig. 1).

## HISTORY

The history should consist of the following points.

**Presenting Complaint.** What was the patient's main complaint that persuaded him or her to visit the doctor? How long has it been present? Is it deteriorating, and if so, how rapidly?

**Personal History and Background.** It is important to establish the patient's age, social circumstances (e.g., family, type of abode), work environment, recreational pursuits, and general psychological condition. This allows the orthopaedic surgeon to establish a patient profile. Souter<sup>1</sup> has emphasized the importance of "picking a winner" when choosing the first operation in a program of reconstructive surgery in a patient with rheumatoid arthritis. A successful procedure establishes patient trust, and the more complex surgery can then be contemplated "together" with more confidence. It is only when the patient's expectations and attitude have been identified that it becomes possible to "pick a winner" in patient terms (Table 1).

**Family History.** A pertinent family history should be sought only when the presenting complaint has been defined. The interrogation should include any history of a similar complaint in any member of the family.

Some orthopaedic conditions are autosomal dominant (e.g., Ehlers-Danlos and Marfan's syndromes) whereas others are autosomal recessive (e.g., diastrophic dysplasia). However, the majority of orthopaedic conditions that have any genetic association are characterized by a familial predisposition, such as osteoarthritis, rheumatoid arthritis, and gout.

**Past Medical History.** Musculoskeletal symptoms in the adult are often a late expression of treated or untreated orthopaedic disorders. It is therefore important to try to establish whether the patient had any musculoskeletal disorder as a child. As much detail as possible should be gleaned about any previous orthopaedic surgery. In some cases, this may merely assist with the diagnosis (e.g., degeneration secondary to a dysplastic hip), whereas in other cases it may have management implications (e.g., ankylosis and scarring from drainage of previous septic arthritis).

Trauma of bones, joints, and soft tissues often predisposes to degenerative conditions of the musculoskeletal system. A detailed history of all severe trauma should therefore be obtained. It must be recognized that all children suffer intermittent episodes of minor trauma, but these will invariably be implicated in the etiology of many nontraumatic childhood conditions (e.g., Perthes' disease, slipped capital femoral epiphysis).

In arthritis, any history of the involvement of other joints should be sought. This may suggest a polyarticular inflammatory arthropathy. Do these patients fit the American Rheumatism Association criteria for rheumatoid arthritis? Similarly, arthritic patients should be specifically questioned



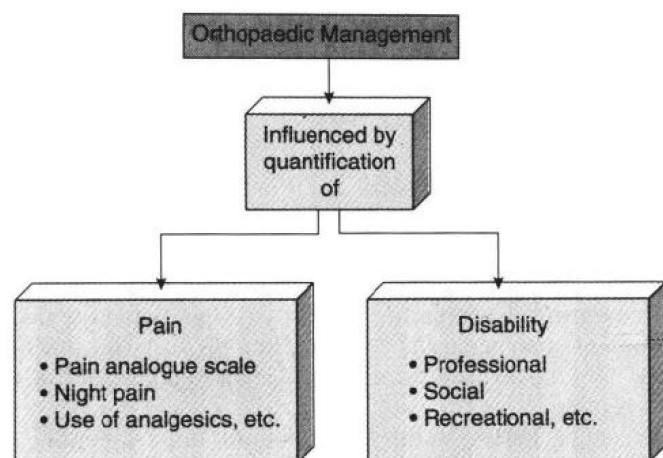


Fig. 1. Orthopaedic management.

regarding the stigmata of reactive arthritis—psoriasis, regional ileitis, urethritis, and so on.

Examination and special investigations may suggest diagnoses that invite more specific details of the medical history. Thus a suspected diagnosis of osteosarcoma in the middle-aged patient demands further questioning regarding a history of previous radiotherapy. An overview of other systems should always be included in the past medical history. This may contribute to the diagnosis and should expose any conditions from which the patient suffers that might adversely affect proposed surgery and anesthesia. Risk factors should be identified, such as diabetes mellitus or steroid therapy (Fig. 2).

The prevalence rate of familial predisposition in inflammatory arthropathies, and the association of mechanical derangement and osteoarthritis, makes the past medical history particularly relevant in making an orthopaedic diagnosis.

## PREDISPOSING FACTORS

In cases in which predisposing factors are associated with specific diagnoses, the surgeon should expose the relevant history. Thus a patient with suspected osteonecrosis of the

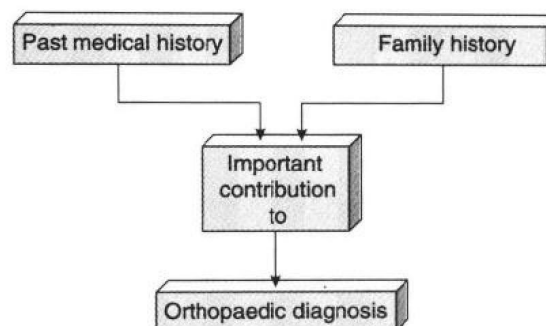


Fig. 2. Orthopaedic diagnosis.

hip should be carefully questioned regarding exposure to a dysbaric environment, abuse of alcohol, steroid therapy, and so on. Likewise, a patient with a suspected infective lesion of the spine should be asked about previous exposure to tuberculosis and brucellosis.

Overuse injuries occur in athletes and dancers, or indeed in anyone after excessive activity without adequate training. The three main causes of overuse trauma are friction, stress, and ischemia.

Excessive friction of a tendon or bursa during joint movement may provoke an inflammatory reaction (e.g., iliotibial band syndrome). Repeated stress may result in an incomplete fracture of bone (e.g., March fracture of the second or third metatarsal). Ischemia usually occurs in muscles that are tightly contained within fascial compartments. Overuse causes relative ischemia, swelling, and, occasionally, a recurring low-grade compartment syndrome.

Table 2 lists some of the better known clinical overuse syndromes.

## SYMPTOMS

### PAIN

Pain is probably the most common presenting symptom in orthopaedic conditions (Table 3). It is traditional to discuss the pain's location, duration, progression, nature (e.g., stabbing, burning), intensity, and presence of radiation. It is important to elicit this history; however, this should not be undertaken by rote. The specific characterization of the pain is often diagnostic. Thus a sharp shooting pain in the back (often with radiation) is usually radicular, whereas a chronic ache aggravated by activity is caused by degenerative changes, and a constant boring pain is usually infective or neoplastic.

TABLE 1. ELEMENTS OF THE ORTHOPAEDIC PATIENT'S HISTORY

#### Main complaint

Pain  
Disability

#### Other complaints

Musculoskeletal  
Nonorthopaedic

#### Personal history and social background

Determine sociodomic and work environment

#### Past medical history

Musculoskeletal  
Other

#### Family history

Musculoskeletal  
Other

TABLE 2. OVERUSE SYNDROMES

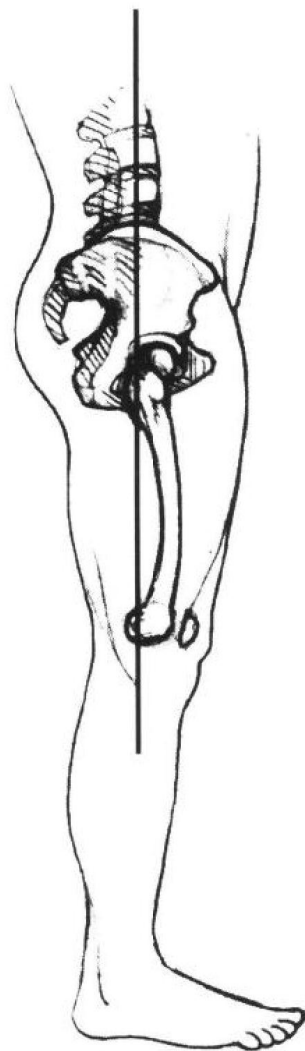
Tennis elbow (lateral epicondylitis)  
Golfer's elbow (medial epicondylitis)  
Trochanteric bursitis  
Patellar tendinitis (jumper's knee)  
Iliotibial band syndrome  
Achilles tendinitis  
Calcaneal bursitis  
Shin splints  
Stress fractures (tibia and metatarsals)

**TABLE 3. PRESENTING SYMPTOMS IN ORTHOPAEDIC CONDITIONS**

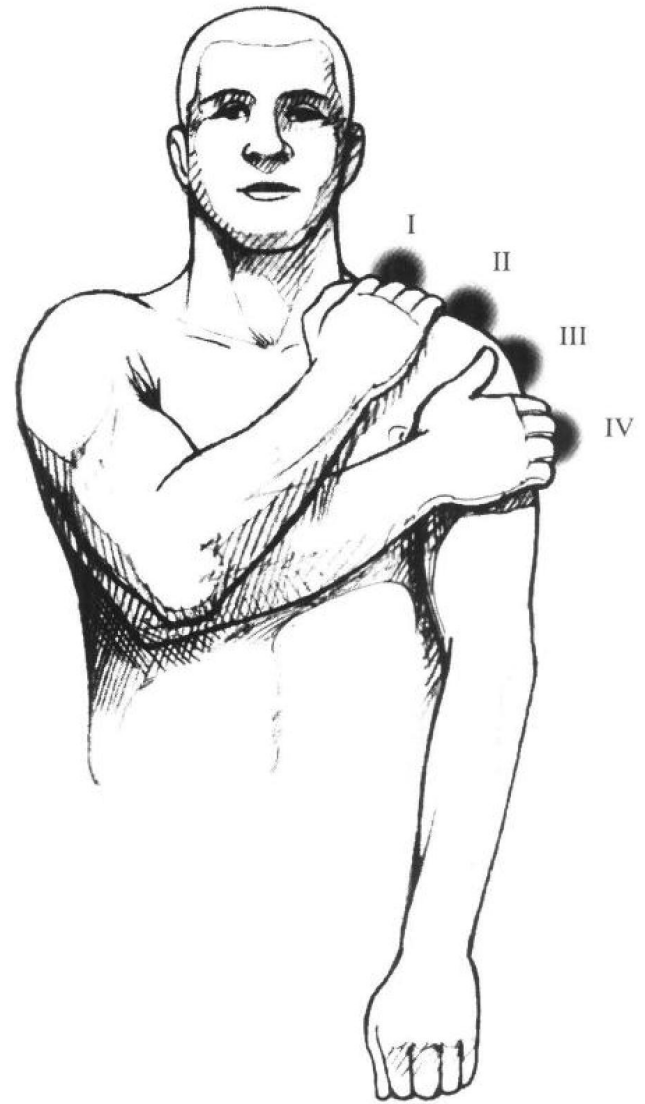
Pain
Stiffness
Swelling
Deformity
Altered sensation
Limp
Loss of function

Groin pain is typically hip pain. As a rule of thumb, pain anterior to a midline coronal plane usually arises from the hip whereas pain posterior to this line is most often attributable to the spine (Fig. 3).

It is often useful to ask a patient to point to the site of pain. Thus pain in the neck/shoulder interval is usually caused by cervical spondylosis, whereas the patient will point with one finger to the source of acromioclavicular joint pain. The shoulder is clasped for glenohumeral pain.



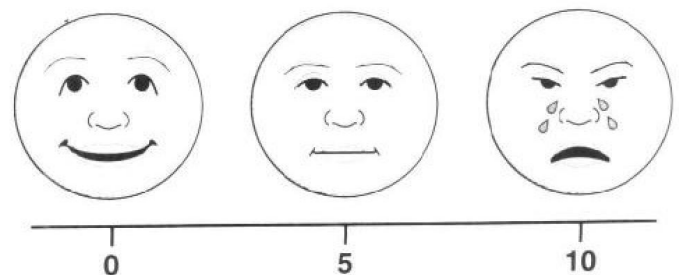
**Fig. 3. Pain.** Pain anterior to the midcoronal plane generally arises from the hip, whereas pain posterior to this line is usually attributable to the spine.



**Fig. 4. Pain.** The patient's localization of pain is often diagnostic around the shoulder: I. cervical spondylosis; II. arthritis of the acromioclavicular joint; III. glenohumeral arthritis; IV. rotator cuff syndrome.

and a hand over the badge area indicates a rotator cuff problem (Fig. 4).

If the pain has been present for a long time, the condition is likely to be chronic and degenerative. The severity and rate of deterioration will certainly influence decisions regarding management. It is often useful to use a pain analogue scale in an attempt to quantify pain (Fig. 5).



**Fig. 5. A visual pain analogue scale.**

TABLE 4. GRADING OF PAIN

Grade	Criteria
1	No pain
2	Mild, can be ignored
3	Moderate, requires analgesics
4	Severe, intrusive despite an analgesic
5	Very severe; inhibits virtually all activities

Although pain is subjective, its intrusiveness and the need for an analgesic have been recruited in an attempt to classify its severity (Table 4).

Patients should also be carefully questioned regarding their analgesic regimen. This can be used to monitor pain in much the same way as the patient-controlled analgesia method is used in the postoperative period. Some patients are stoic and will deny significant pain despite taking a substantial regular dose of analgesia. Alternatively, an impressionable person who has witnessed a loved one die with excruciating pain may grossly exaggerate his or her own pain as a result of anxiety bordering on neurosis.

When considering the identified site of the pain, it should be remembered that it could be referred. Pain referred into the upper and lower limbs is commonly referred from the cervical or lumbar region. Osteonecrosis of the hip may present exclusively with pain in the knee. Referred pain may originate from very different areas. For example, avascular necrosis and an obturator hernia can both present with pain in the knee. This is not the result of shared sensory pathways but reflects the inability of the cerebral cortex to distinguish between sensory messages from embryologically related sites (Fig. 6).

I am aware of at least three patients with osteonecrosis of the femoral head who underwent arthroscopies of the knee because the possibility of referred pain was not considered in their symptomatic presentation.

### STIFFNESS

Stiffness may represent a subjective impression or may denote an absolute reduction in movement. Stiffness is commonly encountered with soft tissue scarring, periaricular fibrosis, or intra-articular adhesions. This is nonspecific; however, establishing when the stiffness is at its worst may provide a valuable clue to the diagnosis. Thus osteoarthritic joints are painful on rising after an interval of rest following a period of vigorous physical activity. Prolonged morning stiffness characterizes the inflammatory arthropathies. For example, a young man in his 20s who complains of recurring severe stiffness (and pain) in his back on rising in the morning should be regarded as having ankylosing spondylitis until it is proved otherwise. Stiffness will of course also contribute to loss of function.

### SWELLING

The patient may be aware of a swelling. Is this hard or soft and does it fluctuate? Is it progressive? If the knee has swollen following trauma, it is important to distinguish

between early swelling (within an hour) and late swelling (within 12 to 24 hours). The former is probably hemarthrosis consequent on disruption of intracapsular soft tissue, whereas the latter is likely to be an effusion (possibly a meniscal tear).

### INSTABILITY

Instability may be the presenting symptom of the patient. It is then necessary to obtain a detailed account of the mechanism of injury and to establish the movements or positions that give rise to the feeling of instability. Structurally, the instability may be the result of ligamentous disruption, or it may be spurious to avoid pain because soft tissue is trapped in the joint. The latter case will then often be associated with locking. This may be the presenting feature of a bucket handle tear of the meniscus. Muscle weakness may also lead to a feeling of instability.

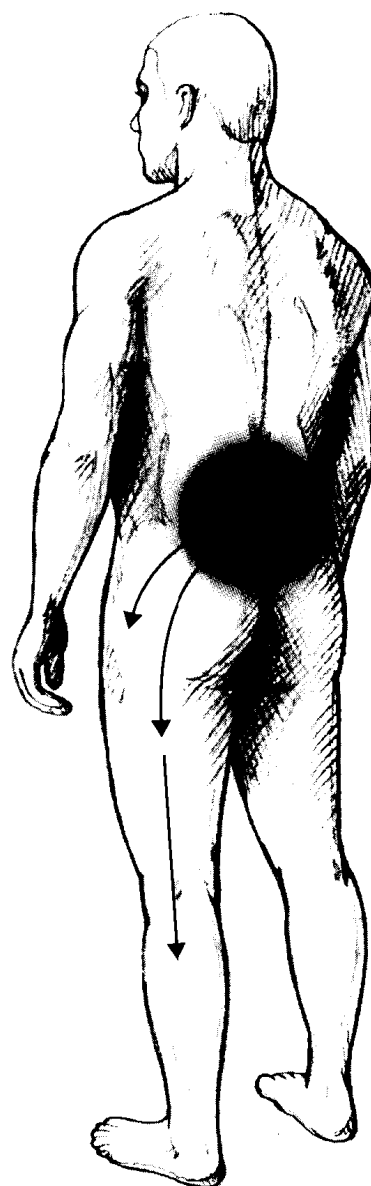


Fig. 6. Referred pain. A disorder in the lower back can produce nonradicular pain that radiates down the leg.