

CONTENTS

Preface xiii
David J. Hunter

Epidemiology of Osteoarthritis 515
Yuqing Zhang and Joanne M. Jordan

Evolving definitions of osteoarthritis and improvements in risk factor measurement that use advanced imaging, systemic and local biomarkers, and improved methods for measuring symptoms and their impact can help elucidate mechanisms and identify potential areas for intervention or prevention.

Etiopathogenesis of Osteoarthritis 531
Kenneth D. Brandt, Paul Dieppe, and Eric L. Radin

In this article, the authors posit that, because osteoarthritis (OA) involves all of the tissues of the synovial joint, the emphasis on the loss of cartilage, in particular, is misguided. In contrast, the authors view OA as a process that is attempting to contain a mechanical problem in the joint. They argue that OA is best defined as failed repair of damage that has been caused by excessive mechanical stress on joint tissues. Because the body's innate mechanisms for repairing the damaged tissues cannot be effective in the face of the overwhelming mechanical abnormality, they cannot solve the problem of OA.

The Role of Bone in Osteoarthritis Pathogenesis 561
Steven R. Goldring

This article focuses on the specific skeletal features of osteoarthritis and the putative mechanisms involved in their pathogenesis. In addition, the relationship of these changes to the alterations in articular cartilage and the other tissues comprising the diarthrodial joint are reviewed.

The Role of the Meniscus in Osteoarthritis Genesis

573

Martin Englund

The menisci play a critical protective role for the knee joint through shock absorption and load distribution. Currently, the consensus in surgical treatment of meniscal tears is to preserve as much functional meniscal tissue as possible. The health professional is challenged to choose the best treatment, both in the short- and in the long-term. A degenerative lesion in the middle-aged or older patient could suggest early-stage knee osteoarthritis and should be treated accordingly. Surgical resection of nonobstructive degenerate lesions may remove only the evidence of the disorder while the osteoarthritis degradation proceeds. Well-designed randomized, controlled clinical trials are needed.

The Contribution of Genes to Osteoarthritis

581

Ana M. Valdes and Timothy D. Spector

Osteoarthritis (OA) is the most prevalent form of arthritis in the elderly. A large body of evidence, including familial aggregation and classic twin studies, indicates that primary OA has a strong hereditary component that is likely polygenic in nature. Furthermore, traits related to OA, such as longitudinal changes in cartilage volume and progression of radiographic features, are also under genetic control. In recent years, several linkage analysis and candidate gene studies have been performed and have unveiled some of the specific genes involved in disease risk, such as *FRZB* and *GDF5*. The authors discuss the impact that future genome-wide association scans can have on our understanding of the pathogenesis of OA and on identifying individuals at high risk for developing severe OA.

The Measurement of Joint Mechanics and their Role in Osteoarthritis Genesis and Progression

605

David R. Wilson, Emily J. McWalter, and James D. Johnston

Justifying and improving mechanically based approaches to the treatment and prevention of osteoarthritis (OA) requires a critical understanding of the methods used to study joint mechanics and the current evidence for the role of mechanics in OA. The objectives of this article are (1) to summarize methods for assessing joint mechanics and their relative merits and limitations, (2) to describe the current evidence for the role of mechanics in OA initiation and progression, and (3) to describe some current treatment approaches that focus on modifying joint mechanics.

The Symptoms of Osteoarthritis and the Genesis of Pain

623

David J. Hunter, Jason J. McDougall, and Francis J. Keefe

Symptomatic osteoarthritis (OA) causes substantial physical and psychosocial disability. This article delineates the characteristic

symptoms and signs associated with OA and how they can be used to make the clinical diagnosis. The predominant symptom in most patients is pain. The remainder of the article focuses on what is known about the causes of pain in OA and factors that contribute to its severity. Much has been learned during recent years, but much of this puzzle remains unexplored or inadequately understood.

Imaging in Osteoarthritis

645

Ali Guermazi, Deborah Burstein, Philip Conaghan,
Felix Eckstein, Marie-Pierre Hellio Le Graverand-Gastineau,
Helen Keen, and Frank W. Roemer

Conventional radiography is still the first and most important imaging examination in a clinical setting when evaluating a patient with a known or suspected diagnosis of osteoarthritis (OA). In research and clinical trials, it still is a valuable tool for stratifying patients who have OA into different categories for inclusion criteria and eligibility. MRI has become crucial in understanding the natural history of the disease and in guiding future therapies because of its ability to image the knee as a whole organ and to assess cartilage morphology and composition directly and in a three-dimensional manner. The other modalities discussed in this article are valuable additional techniques indicated on a case-by-case basis.

The Management of Osteoarthritis: An Overview and Call to Appropriate Conservative Treatment

689

David J. Hunter and Grace H. Lo

Despite its growing prevalence, osteoarthritis (OA) remains a poorly understood disease, and recent doubts about the safety of several commonly prescribed OA medications have served to highlight deficiencies in the traditional medical approach to management. This article presents a general outline for the management of the patient who has OA in the form of a narrative review considering diagnosis, investigation, and treatment. It provides the clinician with an overview of the available treatments in line with the guidelines of the Osteoarthritis Research Society International and the European League Against Rheumatism.

Obesity and Osteoarthritis: Disease Genesis and Nonpharmacologic Weight Management

713

Stephen P. Messier

The mechanisms by which obesity affects osteoarthritis (OA) are of great concern to osteoarthritis researchers and clinicians who manage this disease. Inflammation and joint loads are pathways commonly believed to cause or to exacerbate the disease process. This article reviews the physiologic and mechanical consequences of obesity in older adults who have knee OA, the effects of

long-term exercise and weight-loss interventions, the most effective nonpharmacologic treatments for obesity, and the usefulness and feasibility of translating these results to clinical practice.

Role of Muscle in the Genesis and Management of Knee Osteoarthritis

731

Kim L. Bennell, Michael A. Hunt, Tim V. Wrigley, Boon-Whatt Lim, and Rana S. Hinman

The muscles of the lower limb play an important role in the genesis and management of knee osteoarthritis (OA). This article outlines the influence of muscle activity on knee joint loading, the deficits in muscle function observed in people who have knee OA, and available evidence pertaining to the role of muscle in the development and progression of knee OA. It also discusses whether muscle deficits can be modified in knee OA and whether improvements in muscle function lead to improved symptoms and joint structure. It concludes with a discussion of exercise prescription for muscle rehabilitation in knee OA.

Noninvasive Devices Targeting the Mechanics of Osteoarthritis

755

K. Douglas Gross and Howard J. Hillstrom

The goal of many noninvasive devices for knee osteoarthritis (OA) is to alter joint biomechanics and thereby limit regional exposure to damaging and provocative mechanical stresses. Optimal prescription of most noninvasive devices first requires the specification of which mechanical stresses should be reduced, and in which knee region. This article introduces several types of devices currently used in the treatment of knee OA. Each section begins with a short presentation of the device's biomechanical effects and considers evidence of clinical efficacy. Where possible, the authors conclude each section by offering their subjective insights and clinical impressions.

The Role of Analgesics and Intra-articular Injections in Disease Management

777

William F. Harvey and David J. Hunter

The focus of pharmacologic treatment of osteoarthritis (OA) includes targets from the cell and cytokine level to the larger joint components such as cartilage, bone, innervations, and vascular supply. The most important goals of therapy in patients who have OA are pain management, improvement in function and disability, and ultimately disease modification. This article discusses the current pharmacologic regimens available to address these goals. Specific attention is paid to current trends and controversies related to pharmacologic management, including the use of oral, topical, and injectable agents.

How Close are We to Having Structure-Modifying Drugs Available?

789

David J. Hunter and

Marie-Pierre Hellio Le Graverand-Gastineau

This article describes what structure modification is, explains the distinctions among preventing, retarding, stopping, and reversing disease, and suggests approaches that might be clinically meaningful. It discusses whether any evidence suggests it is possible to modify disease and whether the current focus on cartilage is appropriate. It considers the methodologic approaches and the obstacles to demonstrating efficacy of these agents in clinical trials. The authors hope that at the end of this narrative review the reader will appreciate the complexities of this rapidly evolving field and of the development of disease-modifying drugs for osteoarthritis drugs.

Nonarthroplasty Hip Surgery for Early Osteoarthritis

803

Young-Jo Kim

Subtle anatomic abnormalities of the hip, such as acetabular retroversion, acetabular overcoverage, and decreased head-neck offset of the femoral head-neck junction, are important anatomic variants that may lead to pain and osteoarthritis in the young adult population. Advances in surgical techniques, such as the periacetabular osteotomy, safe surgical dislocation of the hip, and hip arthroscopy, are providing us with more effective and safer tools to correct these anatomic problems. The limiting factor in treatment outcome in many mechanically compromised hips is the amount of cartilage damage that has occurred before treatment. This article is a guide to these subtle anatomic abnormalities and the options for treatment.

Surgery for Osteoarthritis of the Knee

815

John C. Richmond

The role of surgical treatment in osteoarthritis of the knee continues to evolve. The indications for arthroscopy have narrowed. Orthopedic surgeons continue to explore options less invasive than total knee replacement for isolated unicompartmental arthritis of the knee joint. In addition to arthroscopy, this article discusses the merits and drawbacks of and indications for osteotomy, interpositional arthroscopy, patellofemoral replacements, and emerging technologies for total knee replacements.

Index

827