



Clinical and Basic Research in Orthopaedic Surgery: The New Milestones

Although the medical specialty of orthopaedic surgery is already large, it remains a rapidly expanding field. Key areas of orthopaedics, including fracture management, sports medicine, adult reconstructive surgery, hand surgery, spine surgery, pediatric orthopaedics, and microsurgery, have maintained a steady progress over the last years. In addition, however, orthopaedic surgeons have also embraced tissue engineering, robotic surgery, noninvasive surgery, gene therapy, and a number of other groundbreaking areas.

In the course of these rapid developments, orthopaedic associations and academics have focused on defining gaps in knowledge concerning skeletal biology and exploring new directions for basic and clinical research in orthopaedics. This search for new areas of development is based on the premise that collaboration between basic scientists performing bench-level laboratory research and physicians conducting clinical patient-oriented research is the hallmark of modern orthopaedic research. The basic science studies explain how healthy tissues function, how and why they change in diseases and aging, and what makes certain people prone to developing a disease or sustaining an injury, whereas clinical research systematically evaluates which treatments work best in caring for specific patient groups.

The purpose of this particular special edition is to present just a few of the advances that have been made in both basic and clinical orthopaedic research and to identify new areas of concern and hence identify areas in need of new basic and clinical research.

The papers presented in this symposium highlight areas of recent advancement, significant research, and ongoing debate and cover all areas of orthopaedic research. Four articles in this edition represent ongoing areas in the basic sciences, five articles highlight areas of recent clinical advancement, and the last three articles focus on ongoing debates and identify areas that need clarification.

Basic Studies

Kanakaris and Giannoudis present a thorough analysis of the osteoinductive and osteoconductive role of bone morphogenetic proteins (BMPs). The authors go through the existing evidence and suggest that BMPs appear to be both efficacious and safe for a large number of indications. Elderly patients frequently experience problems associated with the musculoskeletal system that affect their quality of life. As a result, recent focus has been placed on the changes that take place in the extracellular matrix composition and cell structure of the major connective tissues with age. Johnson and colleagues examine the evidence showing the role of programmed cell death (apoptosis) of chondrocytes in the remodeling of musculoskeletal tissues and, in particular, as playing a central role in cartilage degeneration observed in osteoarthritis. Hadjicostas and colleagues use modern immunohistochemistry and other methods to address the fine micro- and macromorphology of two ligament substitutes for surgical reconstruction of the anterior cruciate ligament. The consequences of ligament injury on neuromuscular function and its relevance to rehabilitation, in addition to the phantom limb phenomenon after amputation, have long been recognized by orthopaedists. Johnson et al. address the current understanding of the complex neural pathways responsible for proprioception and focus on the often forgotten center of perception, the brain.

Clinical Studies

Vince and colleagues suggest that revision total knee arthroplasty should be regarded as a discipline separate from primary surgery. The authors present evidence supporting a general technical pathway of three steps that are key for revision surgery. Although the incidence of periprosthetic knee infection is generally low, the economic impact is very high. In this regard, Babis and colleagues evaluate the two-phase exchange arthroplasty with the use of antibiotic-impregnated articulating

spacer as a means of managing chronic periprosthetic knee infection.

The restoration of normal joint function represents a major problem in the artificial knee. Mavrodontidis and colleagues present a retrospective study to assess the effects of a modified design on the clinical results in total knee arthroplasty. Pulido et al. discuss the prevalence and risk factors related to transfusion during and after periacetabular osteotomy. The authors present evidence supporting the use of intraoperative blood salvage. Dailiana and colleagues discuss the management of the common congenital deformity, congenital clubfoot. The authors present a retrospective analysis of patients treated with an innovated 12-in-1 procedure (lengthening of the tendons and division of the ligaments and capsules during the same procedure). Long-term follow-up showed encouraging results.

Debates and New Areas of Study

Late postoperative infection following instrumental spinal surgery is a clinical entity that has emerged during the past years. Soultanis and colleagues assess the

contribution of instrumentation material and mechanical loosening in these infections, and underscore the need of long-term follow-up and further detailed study to determine the incidence and pathology of late postoperative wound infections in instrumented spinal surgery.

Novak et al. discuss the recent emphasis placed in orthopaedic academics on validated patient-derived outcome measures. Recent trends are present in relation to the emerging field of cost-effectiveness analysis in orthopaedics.

Papagelopoulos and colleagues address the current concepts for management of soft-tissue sarcomas of the extremities. The authors stress the need for a multidisciplinary team approach with input from oncologists, pathologists, radiation oncologists, and orthopaedic and plastic surgeons. Innovations in treatment paradigms are dependent on understanding tumor biology.

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