

## [ Editorial ]

# Emerging Technologies

It is difficult to believe how much musculoskeletal medicine has improved over the past 30 years. In the sports medicine world, the arthroscope has been one of the instruments that has revolutionized orthopaedic care of the synovial joints, especially the knee, shoulder, and recently, the hip. These developments are far beyond what orthopaedic entrepreneurs of the 1970s and 1980s could imagine. Many orthopaedic residents today have not performed arthrotomies on many of these joints, which were the standard of care to treat even the simplest of joint disorders not long ago. I am thankful that I witnessed the transition from open joint surgery to endoscopic approaches as the arthroscope made its way from the hands of a few gifted orthopaedic surgeons to academic medical centers. Interestingly, many respected orthopaedic educators of the past did not welcome this transition to arthroscopy, which slowed its acceptance in academia.

Along with an improved ability to treat joint disorders without the trauma of open joint surgery came the need for improved diagnostic capabilities of critical soft tissue components of synovial joints. These critical components included articular cartilage, the menisci and anterior cruciate ligament (ACL) in the knee, and the glenoid labrum and rotator cuff in the shoulder. This need was quickly filled with the development of magnetic resonance imaging (MRI) in the 1980s and its rapid incorporation into clinical medicine in the 1990s. Ultrasound was soon to follow, adding to the armamentarium of the musculoskeletal clinician. These diagnostic and treatment advances have greatly enhanced musculoskeletal care as the role of the orthopaedic surgeon advanced as a specialist in the medical community. Consequently, many medical students have been drawn to orthopaedics by these and other patient care enhancements, making orthopaedic surgery one of the more competitive resident education programs. Truthfully, I don't think that I'd be a competitive applicant these days.

Fast forward to 2016 where continued diagnostic imaging advancements have improved not only clinical care but have also become important tools in the research of disease, trauma care, and preventive medicine. Examples of these features are highlighted in this issue of *Sports Health*. The review by Li et al<sup>3</sup> on "Advanced Imaging in Osteoarthritis" highlights the noninvasive, multiplanar capability, and excellent soft tissue contrast of today's MRI techniques. The quantitative and compositional evaluation of articular cartilage ultrastructure

along with the diffusion and chemical exchange transfer technologies has made the monitoring of disease progression and articular cartilage restoration efforts possible.<sup>1</sup>

A less expensive and more portable device is the ultrasound unit, which is highly user dependent. It has progressed from the imaging of simple superficial soft tissue structures to the complex evaluation of nerves (neurosonology) and muscle with the advantage of dynamic real-time capabilities.<sup>4</sup> The stiffness of soft tissues can now be determined with techniques like elastography, which can help determine pathologic processes. Last, for a look to the future of ultrasound, the review by Finnoff et al<sup>2</sup> demonstrates even more potential for ultrasound in the rapid evaluation of trauma victims, athletic cardiac issues in preparticipation physicals, glycogen stores in the muscles of aerobic athletes, and ophthalmic examinations of the intraocular structures. MRI and ultrasound have advanced beyond musculoskeletal conditions and now may play a role in the clinical practice of many additional medical specialties. We'll have to wait for comparison and validation studies to determine the most appropriate use of these imaging advances in clinical practice.

Surprising as it may seem, I think there is a downside to these advancements in imaging technology. The emphasis on and development of basic patient evaluation skills may have consequently slipped in medical education as imaging technologies advanced. I do not think that medical students and residents receive the same focus on patient history and physical examination skills as many of us did in the past. Unfortunately, many clinicians are quick to go first to imaging as the standard of care in many settings, including acute joint injury. Part of this is pressure from the public to be technically up to date. In my own practice, it is not unusual to see an injured athlete with radiographs and MRI in hand who has not had an adequate physical examination. While MRI can very accurately delineate areas of soft tissue injury in the knee such as a torn ACL, it cannot determine the degrees of pathological laxity. Just as in the shoulder, injured structures can be identified but the pattern and degree of laxity cannot be determined with imaging. These features can only be determined by physical examination.

To put these issues into current perspective as economic issues play an expanding role in the delivery of musculoskeletal care in the United States, clinicians must strive to determine the best use of resources, including our imaging capacity. While it

would be unfortunate to exclude these exciting developing technologies that enhance our diagnostic capabilities, we should not let our history taking and physical examination skills fall by the wayside. These basic skills are still part of what validates our expertise in musculoskeletal medicine and really cannot be replaced by technical advances.

—Edward M. Wojtys, MD  
*Editor-in-Chief*

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