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The History of Clinical Musculoskeletal Radiology **349**

Carolyn M. Sofka and Helene Pavlov

The discipline of musculoskeletal radiology has evolved into a major imaging subspecialty in the years since the first use of x-rays to diagnose fractures. Musculoskeletal radiology expertise has experienced enormous developments in diagnostic sensitivity and specificity and in image-guided treatment options, in addition to technologic advances far beyond x-rays. Advances in cross-sectional imaging such as CT and MR imaging and educational and research endeavors have contributed further to the growth of musculoskeletal radiology as a distinct subspecialty.

Conventional Radiography in Musculoskeletal Imaging **357**

Jordan B. Renner

Conventional radiography in musculoskeletal imaging has a venerable past. This article outlines the development of radiographic techniques. It then discusses the continuing advantages of conventional radiography in many specific circumstances and acknowledges the circumstances in which CT, MRI, ultrasound, and nuclear imaging are more useful modalities.

History of Arthrography **373**

Jeffrey J. Peterson and Laura W. Bancroft

Arthrography has evolved during the last century from crude techniques with post-procedural radiographic imaging to modern CT and MR arthrographic techniques. Arthrography saw its widest use in the 1960s and 1970s, but indications for its use in many joints decreased significantly after the introduction of cross-sectional imaging modalities such as CT and MR imaging. Arthrography continues to provide valuable anatomic information about the joints and provides accurate depiction of internal derangement.

Musculoskeletal CT: Recent Advances and Current Clinical Applications **387**

Kenjirou Ohashi and Georges Y. El-Khoury

This article discusses the indications for CT in the management of acute fractures and postoperative complications related to orthopedic procedures. The current clinical use of CT in spine injuries, pelvic/acetabular fractures, and major fractures in the extremities is discussed. Multidetector CT techniques to minimize metal artifacts and common hardware complications are reviewed.

**Past, Present, and Future of Therapeutic Lumbar Spine
Interventional Procedures**

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Eric A. Bogner

This article discusses in detail lumbar epidural injections, in all their manifestations, and pain management procedures related to the lumbar zygapophyseal joints are discussed in detail as relates to their formulation, current use, and potential future endeavors.

Lumbar Discography

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Gregory R. Saboeiro

Lumbar discography has generally proven to be a safe diagnostic tool for the evaluation and potential treatment planning of presumed discogenic pain, but it has not been wholeheartedly embraced by the radiologic and surgical community because of doubts as to its safety, accuracy, and relevance to patient outcome. There have been some conflicting reports on the relative merits and limitations of the procedure in the diagnosis and treatment planning of low back pain and radiculopathy; further studies are needed to determine with certainty whether discography is in fact able to localize the precise discs of clinical significance and accurately predict those patients who will respond well to surgery and those who will not.

The Evolution of Musculoskeletal Tumor Imaging

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Sinchun Hwang and David M. Panicek

Since the discovery of the X-ray, there have been substantial advances in musculoskeletal tumor imaging as radiography, nuclear medicine, angiography, ultrasound, CT, and MR imaging and the requisite computer technology have been developed. These imaging modalities provide invaluable information about musculoskeletal tumors to surgeons and medical oncologists at all time points along the continuum of patient care, from tumor detection and diagnosis to posttreatment surveillance. Despite the many technological advances, however, limitations of current imaging modalities persist. Advanced MR imaging techniques and molecular imaging hold substantial promise for further improvements in musculoskeletal tumor imaging. This article reviews the evolution of musculoskeletal tumor imaging by modality, and suggests possible directions for future developments.

Fire and Ice: Thermal Ablation of Musculoskeletal Tumors

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Leon D. Rybak

Thermal ablation of tumors is a rapidly growing field that has found various applications in the musculoskeletal system. Radiofrequency ablation (RFA) has become the reference standard for treatment of most osteoid osteomas. More recently, RFA has been applied to several other forms of primary tumors and in the treatment and palliation of osseous metastases. Cryoablation using new closed systems has also become available for the percutaneous treatment of both primary and metastatic lesions, and the initial results have been promising.

Magnetic Resonance Arthrography

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Usha Chundru, Geoffrey M. Riley, and Lynne S. Steinbach

Magnetic resonance arthrography is widely used throughout the world for joint imaging. It extends the capabilities of conventional MR imaging because contrast

solution distends the joint capsule, outlines intraarticular structures, and extends into soft tissue tears and defects. MR arthrography exploits the natural advantages gained from a joint effusion and can be performed on any joint.

Noncontrast MR Techniques and Imaging of Cartilage

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Mathew F. Koff and Hollis G. Potter

Recent advances in noncontrast MR imaging produce images with higher quality for standardized diagnostic interpretation and in many cases may obviate the need for intra-articular contrast agents. These techniques may now be applied to all joints, and are particularly efficacious in the assessment of articular cartilage. Additional specialized noncontrast sequences enable the direct quantitative assessment of articular cartilage and other joint structures, thereby providing indirect assessment of tissue health and biochemistry. T2 mapping displays local water content and collagen fibril orientation, and the method of T1 rho mapping displays the local proteoglycan content of the tissue. Ultrashort echo imaging improves the contrast of joint structures with high tissue isotropy or low water content, such as ligament, tendon, and meniscus.

The Evolution of Nuclear Medicine and the Musculoskeletal System

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Christopher J. Palestro, Charito Love, and Robert Schneider

This article reviews the evolution of nuclear medicine in the evaluation of the musculoskeletal system over the past hundred years, from autoradiography and Geiger counters and rectilinear scanners to sophisticated imaging devices that provide both functional and morphological information. Initially synonymous with bone scanning, radionuclide evaluation of musculoskeletal disorders now includes gallium, labeled leukocytes, FDG, and fluorine-18, indications and applications of which are reviewed.

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