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- Therapeutic and Diagnostic Joint Injections** 439
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- Joint injections remain a valuable modality in the detection and treatment of intra-articular pathology. Over the past several decades, various diagnostic and therapeutic indications for joint injections have been developed. Imaging guidance for joint injection generally increases accuracy in joint aspirations and diagnostic blocks. Confirming intra-articular placement with steroid injections improves efficacy and reduces local complications. Administering intra-articular contrast can improve the diagnostic performance of CT and MR imaging in many circumstances. This article focuses on the rationale for injections at different sites and describes different fluoroscopic approaches for common joints.
- Image-Guided Musculoskeletal Biopsy** 455
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- Image guidance allows safe passage of needles, often into small and otherwise inaccessible lesions, and into the portions of the lesion most likely to yield useful samples, while avoiding damage to important structures. This article hopes to provide a useful guide to image-guided musculoskeletal biopsy for radiologists in practice and in training.
- Positron Emission Tomography—CT Imaging in Guiding Musculoskeletal Biopsy** 475
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- Positron emission tomography (PET)—computed tomography (CT) is a useful device in identifying musculoskeletal lesions that require biopsy. It can be used to localize the primary lesion, identify a site to biopsy, and evaluate metastatic lesions that require follow-up biopsies. Not all malignant tumors have hypermetabolic activity, and there are many benign lesions and physiologic processes that do have increased F-18 fluorodeoxyglucose uptake. Knowledge of these issues is important when reviewing PET-CT and directing subsequent musculoskeletal biopsies.
- Spinal Injection Procedures: A Review of Concepts, Controversies, and Complications** 487
 Manraj K.S. Heran, Andrew D. Smith, and Gerald M. Legiehn
- The field of spinal injection procedures is growing at a tremendous rate. Many disciplines are involved, including radiology, anesthesiology, orthopedics, psychiatry and rehabilitation medicine, as well as other specialties. However, there remains tremendous variability in the assessment of patients receiving these therapies, methods for evaluation of outcome, and in the understanding of where these

procedures belong in the triaging of those who require surgery. In this article, we attempt to highlight the biologic concepts on which these therapies are based, controversies that have arisen with their increasing use, and a description of complications that have been reported.

Musculoskeletal Ultrasound Intervention: Principles and Advances

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Luck J. Louis

Ultrasound scan is an invaluable tool in the diagnosis and treatment of disorders of the musculoskeletal system. Core concepts that are common to most ultrasound-guided procedures are reviewed, including an in-depth discussion regarding the use of injectable corticosteroids. Various aspects of intra-articular, intratendinous, bursal, and ganglion cyst intervention are discussed and promising advances in the treatment of chronic tendon disorders are presented.

Embolization of Musculoskeletal Tumors

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Richard J.T. Owen

Transarterial embolization should be considered in the treatment algorithm of primary or secondary bone tumors. Specific benefit is present where there is a high risk of bleeding at surgery, where there is spinal involvement and neural encroachment, where active bleeding is present, or in awkward surgical locations where prolonged surgery is anticipated.

Venous Malformations: Classification, Development, Diagnosis, and Interventional Radiologic Management

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Gerald M. Legiehn and Manraj K.S. Heran

Venous malformations are categorized as low-flow vascular malformations within the domain of vascular anomalies and are the most common vascular malformation encountered clinically. Venous malformations are by definition present at birth, undergo pari passu growth, and present clinically because of symptoms related to mass effect or stasis. Although diagnosis can usually be made by clinical history and examination, differentiation from other vascular and nonvascular entities often requires an imaging work-up that includes ultrasound, CT, MR imaging, and diagnostic phlebography. All decisions regarding imaging work-up and decision to treat must be coordinated through referral and discussions with a multidisciplinary team and be based on clearly defined clinical indications. Percutaneous image-guided sclerotherapy has become the mainstay of treatment for venous malformations and involves the introduction of any one of a number of endothelial-cidal sclerosants into the vascular spaces of the lesion, with each sclerosant possessing its own unique spectrum of advantages and disadvantages.

Musculoskeletal Interventional Radiology: Radiofrequency Ablation

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Emily Ward, Peter L. Munk, Faisal Rashid, and William C. Torreggiani

Radiofrequency Ablation is the use of low-voltage high-frequency electrical energy to heat and destroy abnormal tissues within the human body. It has gained increasing acceptance as both a primary and secondary form of treatment in the musculoskeletal system because of its excellent safety profile, ease of use, and technical success. In the musculoskeletal system, radiofrequency ablation may be used to treat a wide range of lesions that include primary lesions such as osteoid osteomas

and a variety of metastases both within the osseous skeleton as well as those lying within the muscles and soft tissues. In this chapter, a background to the principles, physics, and indications of radiofrequency is presented as well as an in-depth description of radiofrequency ablation techniques that may be utilized in the musculoskeletal system.

Percutaneous Vertebral Augmentation: Vertebroplasty, Kyphoplasty and Skyphoplasty 611

Wilfred C.G. Peh, Peter L. Munk, Faisal Rashid, and Louis A. Gilula

Percutaneous vertebroplasty is a safe, inexpensive, and effective interventional vertebral augmentation technique that provides pain relief and stabilization in carefully selected patients with severe back pain due to vertebral compression. Complications from percutaneous vertebroplasty can be devastating, but are rare and avoidable with application of a meticulous technique. Percutaneous vertebroplasty has a role in the management pathway of patients presenting with painful vertebral compression fractures. Kyphoplasty uses a balloon tamp with the aim of restoring vertebral body height, improving kyphotic deformity, and creating a cavity into which bone cement is injected. Kyphoplasty is as effective and safe as vertebroplasty in treatment of painful vertebral compression fractures. Skyphoplasty, a modification of kyphoplasty, is a promising new technique.

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