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A Practical Guide to

Joint & Soft Tissue Injections

Third Edition



James W. McNabb



Wolters Kluwer

A Practical Guide to Joint & Soft Tissue Injections

Third Edition

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Wolters Kluwer

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9 8 7 6 5 4 3 2 1

Printed in China

Library of Congress Cataloging-in-Publication Data

McNabb, James W., author.

[Practical guide to joint & soft tissue injection & aspiration]

A practical guide to joint & soft tissue injections : an illustrated text for primary care providers / James W. McNabb. — Third edition.

p. ; cm.

Preceded by A practical guide to joint & soft tissue injection & aspiration / James W. McNabb.
2nd ed. 2010.

Includes bibliographical references and index.

ISBN 978-1-4511-8657-4 (alk. paper)

I. Title.

[DNLM: 1. Injections, Intra-Articular—methods. 2. Anesthesia, Local—methods. 3. Biopsy, Needle. 4. Injections—methods. 5. Joint Diseases—drug therapy. WB 354]

RC932

616.72—dc23

2014029297

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This textbook is dedicated to my patients.

Foreword

Medical delivery in the United States is rapidly changing. Multiple forces, including the implementation of the Affordable Care Act and the promotion of Patient Centered Medical Care, are calling on clinician's, in particular those who deliver primary care, to optimize treatment at the initial point of medical entry. Musculoskeletal disorders and complaints, in particular, are increasingly common with an aging population; many of whom remain active in recreational and competitive activities. In addition, new initiatives for improving patient-centered care regularly call on providers to confront pain as the "fifth vital sign," creating a need for office-specific and effective strategies to both diagnose and treat pain. Traditional systemic therapies addressing musculoskeletal disorders and pain, such as NSAIDs and narcotics, while effective in the short term, have inherent risks that are often compounded by individual patient comorbidities. Clinicians have the challenging task of balancing complications of these systemic therapies, such as gastric, renal, and cardiovascular morbidity, as well as potential addiction, with potential benefit. The need for targeted strategies, and alternative and integrative interventions, in the armamentarium and skill set for medical providers has never been greater.

The challenges identified in the preceding paragraph are a clear call for providers that have expertise in procedural training. Training programs, however, have in recent years faced their own challenges as there have been increasing demands for professional training, as well as limitations on time devoted to training with work hour restrictions. These limitations have created a "gap" in training with many providers seeking additional medical education programs outside of core professional training, including the utilization of professional CME courses, online training, and individual use of textbooks and DVDs. Dr. James McNabb has assisted in addressing this "gap" with his first two editions of *A Practical Guide to Joint & Soft Tissue Injection and Aspiration*. These texts have become landmark resources for both clinicians and training programs in their unparalleled ability to provide the student with what he or she needs to know to deliver care at the point of entry and improve the experience for both the patient and the provider. The second edition was a tremendous improvement over the first with the introduction of online high definition videos of the injection techniques as well as significant expansion of both injections and coding chapters.

The third edition builds on success of the first and second editions and provides the complete resource for the provider who administers injections. The third edition continues to build and expand on injection techniques and appropriate and current coding and covers new territory emerging in pain management. New chapters have been written on dry needling techniques, as well as local anesthesia. In his years of teaching for the AAFP, Dr. McNabb has been alerted to the deficits in training in the utilization of local anesthesia. The third edition has a detailed section that addresses the use of local anesthesia. Dr. McNabb's singular focus remains intact throughout the text as he is dedicated to assisting providers in delivering immediate relief of pain and dysfunction to patients in need.

In Medicine, many specialties identify core texts that are easily recognized and referred to by the original author's last name. Examples include **Harrison's** textbook of internal medicine, **Habif's** textbook of dermatology, and **Sabiston's** textbook on surgery. In addition, few in the medical profession are unfamiliar with such classic's

as **Cope's** approach to abdominal pain and **Sanford's** guide to antibiotic selection for infectious disease. In musculoskeletal medicine, there are many great textbooks that both primary care providers and orthopedic subspecialists reach to for readily available and current information, among those is Dr. McNabb's textbook. I have no doubt that this resource will emerge, if it has not already done so, as "the" resource on injection therapy for the MSK provider, and quite simply be referred to as **McNabb's**. I congratulate Dr. McNabb on yet again a wonderful contribution to our discipline, as I know this textbook will be an invaluable resource for providers and serve to improve care for thousands of patients.

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"America's Medical School"

Preface

“It was a dark and stormy night.” I have always wanted to write a great melodramatic novel. However, I possess neither the time, talent, nor writing skill for that endeavor. Instead, I have borrowed this classic line from the Peanuts character, Snoopy, who was always going to write his great book. He in turn took this opening quote from the 1830 novel, *Paul Clifford* written by Edward Bulwer-Lytton.¹ When I was approached by the editors to write the third edition of this medical injection text, my only condition was that I begin with this phrase. I did not get their approval, but they also did not say no. I interpreted their response as an indication that I could take this project in a different direction from traditional musculoskeletal injection texts. I believe that the product of this work represents the spectrum of common, straightforward, effective, medical procedures that are performed with simple, inexpensive equipment in a variety of medical settings. Although written from the perspective of a practicing family physician in a busy private office, these procedures cross specialty lines. They may also be employed in settings as diverse as outpatient offices, urgent care centers, nursing homes, emergency rooms, and inpatient facilities. This text is also used in residency training programs and medical schools.

I am indeed fortunate to enjoy a professional career with a full-time practice of direct patient care at Full Circle Family Medicine. I truly am a simple country doctor, but also teach and write when I have time. While teaching musculoskeletal and dermatology courses, it has become evident that primary care providers’ learning needs include procedures that extend beyond traditional musculoskeletal injections. For this reason, I have expanded the focus of this project to include more skin-related injections and to also include basic skin anesthesia techniques including facial nerve blocks. This text is meant to serve as an evidence-based, yet, practical guide for those providers who wish to learn the techniques and finer details of the most common needle-based procedures.

This edition is also an academically sound work. I have devoted a great deal of time and effort reviewing the peer-reviewed literature and citing references, where available. In recent years, there has been a significant expansion of basic science knowledge, discovery of additional medication toxicities, adoption of musculoskeletal ultrasound, and documentation of different techniques to access joint and soft tissue structures. I strongly advise that every provider using this text please read, study, and understand all of the information contained in the Foundation Concepts section BEFORE attempting to perform ANY of the procedures.

This third edition was infinitely more difficult to write and much more time consuming than even I anticipated. The challenge was to build on the success of the previous editions by expanding the content, while keeping the text truly relevant and accessible to practicing providers. This entire edition has been rewritten to incorporate recent information and add even more value. The first section titled Foundational Concepts updates and adds new information regarding medication toxicities, local anesthetics, injectable agents, musculoskeletal ultrasound, and others. A brand new section on Skin Anesthesia includes the administration of local anesthetics for direct local injection, field blocks, digital blocks, and facial nerve blocks. Skin and Skin Structures provides updated treatment of chalazions, keloids, and warts and presents corticosteroid intralesional treatment of both thin and thick benign, inflammatory dermatoses. The Head and Neck section updates existing chapters. The Upper Extremities section contains

important updates of all injections, eliminates a carpal tunnel injection, includes a new preferred approach to treat CTS based on further understanding of the anatomy of the median nerve, and also adds a new section on digital mucous cysts. An important update has occurred in the Trunk section. The previous chapter on muscular trigger points has been replaced with a new, evidence-based chapter on myofascial trigger points documenting the preferred technique of “dry-needling.” The Lower Extremities section has also been extensively rewritten with significant updates to the hip joint and knee joint chapters. A new chapter that provides a scientific overview of the different approaches and success rates for knee joint injections has also been added. The ancillary use of musculoskeletal ultrasound to guide these injections is emphasized.

Other features that add value include updated CPT, ICD-9 and ICD-10 codes. Examples of informed consent, aftercare instructions, and procedure documentation are found in the appendices. I am grateful to Wolters Kluwer Health for their commitment to improving the quality of this work by creating beautiful drawings that are consistent across all chapters.

High definition videos that demonstrate each procedure are included as part of this text. These are all case-based films that have been recorded in my office on real patients. Each gave their permission to use the images to advance medical education. A unique feature is that each of the videos is taken from the operator’s viewpoint. This solidifies learning after the user reviews the background information, local anatomy, landmarks, and techniques for each procedure.

I would like to acknowledge the following people and organizations who taught, encouraged, and helped me write this text. This project is a culmination of 30 years of private practice and teaching. First, I must again thank my wife, Liz, for her support during my medical education, training, years of practice, teaching, and finally during the research and writing of this text. Without you I could never have done this. The leadership and faculty of family medicine residency training programs at the University of Wyoming – Casper, Scottsdale HealthCare, and Cabarrus Family Medicine were instrumental in allowing me to expand my knowledge base, develop sports medicine and procedural curricula, and build expertise in evidence-based medicine. My office staff has been great—putting up with my demands and politely getting out of my way when I rush down the hall with “another great idea” or carrying video camera equipment. Without the confidence of my patients, I would not have been able to achieve mastery of these techniques—for that I remain privileged to serve as your family physician. I must acknowledge the opportunity to teach the Joint Injections workshops for the American Academy and North Carolina Academy of Family Physicians and the Dermatologic Procedures workshops for National Procedures Institute over the last 15 years. Many thanks are directed to workshop participants for their involvement and honest feedback. Deserved recognition is extended to teaching faculty who have provided encouragement, support, and stimulated my thinking. These physicians include Drs. Richard Lord, Kevin Burroughs, Amrish Patel, Jack Pfenninger, Grant Fowler, Russ White, Gerald Admussen, Francis O’Connor, Joe Ruane, and A.J. Cianflocco. Special recognition is again extended to family physician, Dr. Roy “Chip” Watkins, who has served as my presentation partner for many of these workshops. Finally, a big thank you to those at Wolters Kluwer Health/Lippincott Williams & Wilkins. In particular, Kristina Oberle, Senior Product Development Editor, and Rebecca Gaertner, Executive Editor. They have treated me with the utmost professionalism, support and patience during the extremely long process of writing this third edition. To all involved, and so many more unintentionally left unnamed—Thank you!

Instead of a “dark and stormy night,” let’s make this a bright and sunny day!

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Video clips of the following procedures can be found in the companion eBook edition.

SKIN ANESTHESIA

Direct Local Injection
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Digital Nerve Block
Supraorbital and Supratrochlear Nerve Blocks
Infraorbital Nerve Block
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Ankle Joint—Anteromedial Approach
Fibularis Brevis Tendonitis
Plantar Fasciitis
First Metatarsophalangeal Joint
Morton Interdigital Neuroma

Introduction

The performance of joint and soft tissue injections and aspirations is a valuable skill that can be mastered by primary care physicians and qualified medical providers. These procedures can help relieve pain and improve function for the patient, while at the same time, empowering the clinician, improving continuity of care, and decreasing health care costs. It is essential that these techniques be used thoughtfully and precisely—only after making the correct dermatologic or musculoskeletal diagnosis. This can be quite challenging at times but is no more difficult than diagnosing and treating any of the other many medical conditions that the primary care physician encounters on a daily basis. Learning how to confidently make an accurate diagnosis of these conditions is beyond the scope of this text.

Our primary consideration is the welfare of the patient. We must always endeavor to provide the best medical care at the least risk of harm. This can be achieved by developing a cognitive knowledge base along with an accompanying set of complementary procedural skills. In addition, our focus must remain on providing a positive patient experience. This involves the provision of a safe and supportive environment while ensuring a pain-free procedural experience. Patient satisfaction from a positive experience along with a good clinical outcome is the primary goal.

An important concept is that aspiration and injection therapy is not an end in itself. It is only one treatment option. The withdrawal of fluid or the precise deposition of a therapeutic agent is a temporary measure that is generally used as adjunctive therapy to other modalities. In many conditions, corticosteroid injection therapy used alone has been demonstrated to give short- to intermediate-term pain/functional relief, but no difference in long-term results. In these cases, initial injection treatment in combination with another treatment modality and activity modification gives patients optimal long-lasting results. Additional therapeutic options may include relative rest, compression, splinting/casting, ice, heat, ultrasound, stretching, physical therapy, and administration of other medications for pain control or even surgery. The performance of aspirations or injections alone, without correcting the underlying factors, is likely to result in recurrence if used without complementary treatment.

In this text, the following primary learning objectives are identified:

- Describe the indications and contraindications for each procedure.
- Review the current evidence-based medical literature.
- Select appropriate equipment/products for each injection or aspiration.
- Illustrate pertinent anatomic landmarks for each procedure.
- Demonstrate safe and effective technique.

Foundation Concepts

“The life so short, the craft so long to learn.”

—Hippocrates

THOUGHTFUL CONSIDERATION

The evaluation and treatment of musculoskeletal conditions is a very important aspect of primary medical care. With improved understanding of anatomy, biomechanics, pathophysiology, and modern treatment options, the primary care provider is now in a position to make positive contributions to musculoskeletal patient care. Gone are the days when patients were treated with an oral nonsteroidal anti-inflammatory medication (NSAID) and ignored with the hope that the condition would heal itself. This text may be used to further understanding of techniques useful in the treatment of some of the most common musculoskeletal disorders as well as select skin conditions and anesthetic nerve blocks. As with any medical procedure, performing injections and aspirations places a great responsibility on the operator. These procedures should be done with a clear differential diagnosis and treatment plan in mind. They should never be performed indiscriminately. *Primum non nocere* or “first, do no harm” is one of the fundamental principles of medical care. Therefore, the physician is obligated to consider the indications, contraindications, weight of evidence in the medical literature, expected benefits, possible side effects, anticipated outcomes, diagnostic certainty, his or her personal experience with the procedure, clinical experience, the patient’s response to previous interventions, and respect for the patient’s values before making a decision on whether or not to perform any injection. This is a very complex process that requires thoughtful contemplation and a conversation with each patient. Furthermore, it is imperative that the clinician use common sense and know his or her limits before performing any medical procedure. In some cases, following a conversation with the patient, it may be preferable to use an alternative approach or request specialty consultation, rather than performing any invasive procedure.

ALTERNATIVES TO MEDICATION MANAGEMENT

Musculoskeletal disorders are commonly encountered in practice by primary care providers. Traditionally, many of these have been treated using oral medications. However, the prescriber must be aware of their adverse reactions and potential toxicities.

Acetaminophen toxicity occurs on a frequent basis. From 1990 to 1998, there were 56,000 emergency room visits, 26,000 hospitalizations, and 458 deaths on average per year related to acetaminophen-associated overdoses.¹ In 2007, the Centers for Disease Control estimated 1,600 cases of acute liver failure each year, of which acetaminophen-related was the most common.² On January 13, 2011, the U.S. Food and Drug Administration (FDA) released a safety announcement requesting manufacturers to

limit acetaminophen in prescription drug products to 325 mg/tablet/capsule. A boxed warning emphasizing the potential for severe liver injury and a warning highlighting the potential for allergic reactions (e.g., swelling of the face, mouth, and throat, difficulty breathing, itching, or rash) were added to the label of all acetaminophen prescription drug products.

Other reported side effects include anaphylaxis, acute renal tubular necrosis, anemia, thrombocytopenia, nausea, rash, and headache. On August 1, 2013, the FDA published a news release informing the public of the potential of rare but severe skin reactions reported in individuals following acetaminophen ingestion. These reactions include Stevens-Johnson syndrome, toxic epidermal necrolysis, and acute generalized exanthematous pustulosis. All of these skin conditions are potentially fatal and can occur with even first exposure.³

NSAIDs and coxibs are commonly employed classes of medications for use in the treatment of inflammatory conditions. However, many of the musculoskeletal conditions treated by primary care clinicians do not actually involve inflammation in their pathogenesis. Nevertheless, this class of medication is commonly employed. Unfortunately, NSAIDs and coxibs have side effects that extend beyond their well-recognized gastrointestinal (GI) side effects, hepatotoxicity, nephrotoxicity, edema, increase in blood pressure, and exacerbation of congestive heart failure. A meta-analysis of 754 trials in 353,809 patients with greater than 233,798 patient-years of follow-up was reported in 2013. Coxibs and diclofenac are found to increase major vascular events by a third—primarily due to an increase in coronary events. Ibuprofen significantly increases major coronary events. Naproxen, however, does not increase the incidence of major vascular events. All NSAIDs double the risk of heart failure and increase the risk of upper GI complications.⁴ A nationwide cohort study determined that even short-term treatment with most NSAIDs is associated with an increase in the risk of death and recurrent myocardial infarction in patients with prior MI. Therefore, neither short- nor long-term treatment with NSAIDs is advised in this population. Any NSAID use should be limited from a cardiovascular safety point of view.⁵ Most recently, two large European population-based studies show that traditional NSAIDs and COX-2 inhibitors increase the incidence of atrial fibrillation.^{6,7} This is especially noted with recent use within 30 days of onset of atrial fibrillation. Since NSAIDs inhibit cyclooxygenase enzymes expressed in the kidneys, it is thought that this mechanism causes fluid retention, increases blood pressure, and leads to enlargement in both end-diastolic and end-systolic dimensions of the heart. Alternatively, because NSAIDs are used as anti-inflammatory drugs, the underlying inflammatory conditions and pain they treat may be associated with their cardiac effects.

Consequently, other treatment alternatives should be considered to avoid these potential toxicities. These include pharmacologic options including pain-modulating medications and injection management employing corticosteroids or intra-articular viscosupplement products/devices. Injections of botulinum toxin, platelet-rich plasma, and high concentrations of glucose (as utilized in prolotherapy) are used “off-label” by some practitioners. Finally, physical therapy techniques are available to use with great effect but are frequently underutilized.

UNDERSTAND ANATOMY

It is critical that the clinician has a complete understanding of the three-dimensional anatomy and the structure’s function in each area that is selected for injection or aspiration. A thorough knowledge of the target area brings a deeper understanding of the pathologic process causing the patient’s symptoms. It also enables the provider to

develop a list of alternative diagnostic possibilities. With this knowledge, the physician is able to take the next step. He or she can understand structural relationships beneath the surface of the skin. The physician is then able to think in three dimensions. While advancing the needle, it is important to “visualize” the location of the needle as it passes through the anatomic structures. Performing these thought processes enables the clinician to clinically determine the location of the needle tip in “real time.” This results in improved clinical outcomes through the accurate placement of a therapeutic product or the insertion of a large-bore needle for fluid aspiration. Complications from needle trauma are also minimized by avoidance of critical structures.

IDENTIFY LANDMARKS

For each injection or aspiration procedure, the physician must identify the pertinent local anatomic landmarks. These are areas that represent underlying bony prominences or easily identifiable soft tissues. The landmarks are specific to each injection site. After identification, the structures should be marked on overlying skin with ink by using either a ballpoint pen or a surgical marker. Next, the entry site for the needle is indicated with ink. Then an indentation in the skin is created by applying firm pressure over the ink mark using the retracted tip of a ballpoint pen. An indentation must be done since aseptic preparation of the area will remove the ink mark. This process gives the clinician a visual frame of reference and standardizes the procedure from one patient to the next. No matter how much experience a physician has with a procedure, the process of identifying and marking the landmarks and entry site should not be skipped. After committing the landmarks to a surface drawing, the patient is instructed not to move that area of the body. Repositioning will change the relationships between the skin markings and the underlying anatomy.

WHEN TO REFER TO A SUBSPECIALIST

There will be situations where referral to subspecialist colleagues is desirable and necessary. This would be the case whenever the provider feels uncomfortable performing a procedure. Other indications include instances where there is uncertainty regarding the correct diagnosis; the expected response to treatment has not occurred; joints are not easily accessible (spine, hip, or sacroiliac joints); arthrocentesis attempts have been unsuccessful; and possible septic arthritis, suspected inflammatory polyarthritis, recurrent monoarthritis unresponsive to treatment, or undiagnosed chronic monoarthritis. In these instances, the patient may be referred to a sports medicine specialist, rheumatologist, orthopedic surgeon, interventional radiologist, or pain specialist. If an acute septic joint is suspected, the patient requires emergent inpatient hospitalization for joint drainage, debridement, irrigation, intravenous antibiotics, and possibly an infectious disease consultation in the case of an atypical infection.

INDICATIONS FOR INJECTIONS AND ASPIRATIONS

There are many indications for performing injections and aspirations. From a diagnostic standpoint, the introduction of local anesthetic solution into a joint or soft tissue structure to temporarily decrease pain may allow the clinician to perform a more comprehensive examination. Pain limits the musculoskeletal exam through voluntary or involuntary guarding of the affected area. Muscle spasm commonly develops in response, further limiting the range of motion of the area examined.