MILITARY ADVANCED REGIONAL ANESTHESIA AND ANALGESIA HANDBOOK

Published by the

Office of The Surgeon General
Department of the Army, United States of America

US Army Medical Center and School
Fort Sam Houston, Texas

John P. Murtha Neuroscience and Pain Institute
Johnstown, Pennsylvania

Telemedicine and Advanced Technology Research Center
US Army Medical Research and Materiel Command, Fort Detrick, Maryland

MILITARY ADVANCED REGIONAL ANESTHESIA AND ANALGESIA

HANDBOOK

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Borden Institute
Walter Reed Army Medical Center, Washington, DC

2008

Borden Institute

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Published by the Office of The Surgeon General at TMM Publications
Borden Institute, Walter Reed Army Medical Center, Washington, DC 20307-5001

Library of Congress Cataloging-in-Publication Data

Buckenmaier, Chester.
Military advanced regional anesthesia and analgesia handbook / Chester Buckenmaier III, Lisa Bleckner ; Michael K. Sracic, illustrator.
p. ; cm.
Developed as a supplement to Emergency war surgery. 3rd U.S. revision. 2004.
Includes bibliographical references.
ISBN 978-0-9818228-2-2
1. Conduction anesthesia--Handbooks, manuals, etc. 2. Analgesia--Handbooks, manuals, etc. 3. Medicine, Military--Handbooks, manuals, etc. I. Bleckner, Lisa. II. Borden Institute (U.S.) III. Emergency war surgery. IV. Title.
[DNLM: 1. Anesthesia, Conduction--methods--Handbooks. 2. Analgesia--methods--Handbooks. 3. Military Medicine--methods--Handbooks. 4. Pain--drug therapy--Handbooks. WO 231 B922b 2008]

RD84.B79 2008
617.9'64--dc22

2008031170

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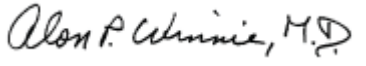
PREFACE

Almost 50 years ago a seminal observation in the renaissance and subsequent explosive development of regional anesthesia was made by a resident prosector preparing a cadaver for a nerve block course taught by the resident's chairman. Although the dissection was primarily focused on the nerves, the resident noted a consistent relationship between the nerves, muscles, and fascia: the brachial plexus, for example, was surrounded by a fascial sheath, provided in large part by the surrounding muscles, throughout its development and distribution to the upper extremity. As the dissection continued, he noted a similar fascial envelope surrounding the other major plexuses, cervical, lumbar, and sacral. As a result, the resident theorized that it might be possible to block an entire plexus by injecting local anesthetic through a needle inserted into its sheath, just as in producing epidural anesthesia. He tried it clinically and it worked. After his first few successful single injection blocks, he commented to his fellow residents how useful such single injection techniques would be on the battlefield, especially since the use of a catheter would allow analgesia to last as long as necessary.

Over the subsequent half century many (perhaps too many!) approaches to these "fascial envelopes" have been described, and many of them have become popular throughout the world. Furthermore, technological advances have kept pace with the increasing use of regional anesthesia, making all the techniques simpler to learn, safer to administer, and much more successful. Although regional anesthesia was being utilized frequently in hospital clinical practice, it took the Military Advanced Regional Anesthesia and Analgesia (MARAA) group's vision to recognize the unique value of these techniques during wartime: for centuries morphine has been the traditional painkiller on the battlefield, despite producing a high incidence of nausea and vomiting, bringing the possibility of abuse and dependence, and never completely abolishing the pain. Continuous plexus or peripheral blocks can relieve pain completely and can maintain relief as long as necessary. Colonel Chester C Buckenmaier III, the founder of MARAA, personally provided the first successful application of a continuous peripheral nerve block on the battlefield: he placed a continuous catheter in the leg of a soldier who had sustained a severe shrapnel injury to his left calf from a rocket propelled grenade. This one catheter with a continuous infusion of local anesthetic provided complete pain relief during this soldier's entire evacuation, the initial surgery at the combat support hospital in Iraq, transport to Germany, a second surgical procedure there, transport home to Walter Reed Army Medical Center, and four additional surgical procedures there, the last being amputation. The catheter was finally removed after the last procedure, 16 days after its insertion!

As impressive as this approach is to the management of the acute pain of battlefield injuries and subsequent surgical procedures, its advantages may go even further: evidence is accumulating that neural blockade of acute pain may prevent the subsequent development of chronic pain (complex regional pain syndrome I and II, phantom limb pain, etc); researchers are even predicting that the absence of excruciating pain following devastating injuries could prevent the development of posttraumatic stress syndrome. Only time and the data being obtained by MARAA will tell.

Military anesthesiologists should be proficient in regional anesthesia techniques, which will undoubtedly play an increasingly important role in providing pain relief and recovery during wartime. MARAA hopes to make this possible by providing this excellent, brief but complete synopsis of regional anesthesia as a resource for anesthesiologists serving in the armed forces. Not intended for the beginner or trainee, this book is carefully structured to provide a quick review of the anatomy and technique of each nerve block, formatted for easy reference on the battlefield or in the operating room. Because of the variable circumstances under which a block may be carried out on the battlefield, each technique is described using paresthesia, nerve stimulation, and ultrasound. I am certain that this book will not only go a long way toward integrating continuous plexus and peripheral nerve blocks into military medicine, but also, ultimately (because soldiers aren't soldiers forever), both the manual and MARAA will have a positive impact on civilian medicine, and in particular the way we manage painful trauma in large-scale civilian disasters.



Alon P. Winnie, MD

PROLOGUE

The Military Advanced Regional Anesthesia and Analgesia (MARAA) Handbook was developed as a supplement *to Emergency War Surgery – Third United States Revision.* In *Emergency War Surgery*, regional anesthesia is described as "a 'field friendly' anesthetic requiring minimal logistical support while providing quality anesthesia and analgesia on the battlefield." Until now, details on how to provide advanced regional anesthesia and acute pain medicine services on the modern battlefield were unavailable. The contributors to this MARAA handbook have collaborated to provide a useful resource for managing the pain of battlefield trauma.

Rapid advancement in medical science has been the hallmark of US military medicine throughout the nation's history. The recent wars in Iraq and Afghanistan are no exception. Life-saving advances in body armor, rapid medical evacuation from point of injury, availability of blood products, improved far-forward surgical and critical care capability, and rapid air evacuation of casualties to level IV medical facilities have contributed to a less than 10% died-of-wounds rate in the current conflicts. The military medical triumph represented by this statistic is undeniable, although the achievement has resulted in other problems, particularly in the management of acute pain. Since the US Civil War morphine has been the accepted standard for battlefield pain control, because options for pain management in previous conflicts were limited, comprehension of pain mechanisms nascent, and casualties, when they survived, tended to remain near the battlefield while they recovered. Modern combat casualty care now emphasizes rapid evacuation to progressively higher levels of medical care with critical care support provided at all times (including transport). Casualties who earlier were kept in a war zone for days to weeks until they were stable for transport now are transported by plane from Iraq to Germany within 8 to 72 hours of injury. The environment of evacuation aircraft—crowded, deafening, jolting, poorly lit, with limited monitoring capabilities—only magnifies the difficulties of using opioid-only pain control therapy. Healthcare providers placed in this situation are less likely to use adequate doses of morphine because of valid patient safety concerns. The large numbers of healthcare providers in the evacuation chain and long evacuation distances further complicate opioid use in these patients.

Fortunately, among the medical advances arising from the current conflicts are improved understanding and management of pain in war casualties. Through the MARAA organization (see Chapter 1), like minded anesthesia providers from the Air Force, Army, and Navy have greatly improved the management of pain in combat wounded through the application of modern pain treatment medications and technologies, including advanced regional anesthesia. In the US military, uncontrolled acute pain is now recognized as a disease process of the nervous system, not just a symptom of trauma. This text celebrates this advancement, preserving what has been learned to serve as a new, higher standard for pain management in this and forthcoming conflicts.

The purpose of this handbook is to assist with the education of anesthesiology residents in the art and science of advanced regional anesthesia and acute pain medicine. As John J Bonica stated in *The Management of Pain*, "The proper management of pain remains, after all, the most important obligation, the main objective, and the crowning achievement of every physician." This handbook is dedicated to the US military professionals who have been wounded in the service of this country. It is our hope that the knowledge within this text will be used to ease the burden of their wounds.