

Burkhardt's View of the Shoulder A Cowboy's Guide to Advanced Shoulder Arthroscopy

Stephen S.
Burkhardt

Ian K.Y.
Lo

Paul C.
Brady

DVD includes
4 hours of surgical
procedures.



Lippincott Williams & Wilkins

a Wolters Kluwer business

Burkhart's View of the Shoulder

**A COWBOY'S GUIDE TO ADVANCED
SHOULDER ARTHROSCOPY**



Acquisitions Editor: Robert Hurley
Managing Editor: Jenny Kim
Production Manager: Dave Murphy
Senior Manufacturing Manager: Benjamin Rivera
Marketing Manager: Sharon Zinner
Design Coordinator: Holly McLaughlin
Compositor: TechBooks
Printer: Quebecor World Bogotá S.A.

© 2006 by LIPPINCOTT WILLIAMS & WILKINS
530 Walnut Street
Philadelphia, PA 19106 USA
LWW.com

All rights reserved. This book is protected by copyright. No part of this book may be reproduced in any form or by any means, including photocopying, or utilized by any information storage and retrieval system without written permission from the copyright owner, except for brief quotations embodied in critical articles and reviews. Materials appearing in this book prepared by individuals as part of their official duties as U.S. government employees are not covered by the above-mentioned copyright.

Printed in Colombia

Library of Congress Cataloging-in-Publication Data

Burkhart, Stephen S., 1949–

Burkhart's view of the shoulder : a cowboy's guide to advanced shoulder arthroscopy / Stephen S. Burkhart, Ian K. Y. Lo, Paul C. Brady ; illustrated by Nancy D. Place.

p. ; cm.

Includes bibliographical references and index.

ISBN 0-7817-8000-4 (alk. paper)

1. Shoulder joint—Endoscopic surgery. 2. Arthroscopy. I. Lo, Ian K. Y.

II. Brady, Paul C. III. Title. IV. Title: View of the shoulder.

[DNLM: 1. Shoulder—surgery. 2. Arthroscopy—methods.

WE 810 B959b 2006]

RD557.5.B87 2006

617.5'720597—dc22

2005036674

Care has been taken to confirm the accuracy of the information presented and to describe generally accepted practices. However, the authors, editors, and publisher are not responsible for errors or omissions or for any consequences from application of the information in this book and make no warranty, expressed or implied, with respect to the currency, completeness, or accuracy of the contents of the publication. Application of this information in a particular situation remains the professional responsibility of the practitioner.

The authors, editors, and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accordance with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed drug.

Some drugs and medical devices presented in this publication have Food and Drug Administration (FDA) clearance for limited use in restricted research settings. It is the responsibility of the health care provider to ascertain the FDA status of each drug or device planned for use in their clinical practice.

To purchase additional copies of this book, call our customer service department at (800) 638-3030 or fax orders to (301) 223-2320. International customers should call (301) 223-2300.

Visit Lippincott Williams & Wilkins on the Internet: at LWW.com. Lippincott Williams & Wilkins customer service representatives are available from 8:30 am to 6 pm, EST.

10 9 8 7 6 5 4 3 2

Burkhart's View of the Shoulder

A COWBOY'S GUIDE TO ADVANCED SHOULDER ARTHROSCOPY

■ STEPHEN S. BURKHART, MD

The San Antonio Orthopaedic Group
San Antonio, Texas

■ IAN K. Y. LO, MD, FRCSC

Department of Surgery
University of Calgary
Calgary, Alberta

■ PAUL C. BRADY, MD

Orthopaedic Surgeon
Tennessee Orthopaedic Clinics
Knoxville, Tennessee

Illustrated by Nancy D. Place, MS, AMI



Lippincott Williams & Wilkins

a Wolters Kluwer business

Philadelphia • Baltimore • New York • London
Buenos Aires • Hong Kong • Sydney • Tokyo

To Nora. Thanks for sharing the trail with me. Vaya con Dios.

S.S.B.

To my mentors of science, Graham King, Sandy Kirkley, and Cy Frank; to my mentors of shoulder surgery, Bob Litchfield, Bob Hollinshead, and Evan Flatow; to Dr. Burkhart, who taught me so much about shoulders and even more about life; and to my wonderful wife Elaine and our precious daughters, Katelyn, Madison, and Isabella, the loves of my life.

I.K.Y.L

For all her love and support I thank my wife Jennifer—you're the greatest. To my wonderful children (Meredith, Davis, Garrett, and baby on the way) who had to give up much "Daddy Time" for this endeavor—I say, "You rock, dudes." Thanks mostly to the master healer ... my Lord Jesus ... for giving me the privilege of helping the hurting and letting me learn from the best—Drs. David Martin, Gary Poehling, and of course Stephen S. Burkhart.

P.C.B.

Acknowledgments

The authors wish to thank Nancy Place for her magnificent artwork, her photoediting, and her total dedication to a project that consumed far too many of her weekends; Gina Ruelas for her tireless efforts in compiling, transcribing, and proofreading the manuscript; Bob Merrill for his technical video support; Jenny Kim for her work as managing editor; Mark Flanders for his work as video editor; and

finally, Bob Hurley and Eileen Wolfberg at Lippincott Williams & Wilkins for believing in the cowboy code and for recognizing that sometimes the book that will make the most difference is the book that is the most different.

Stephen S. Burkhart, MD

Ian K. Lo, MD

Paul C. Brady, MD

Preface

I swore I would never write a book on shoulder arthroscopy. For those of you who heard me say this, I imagine that this book must come as a bit of a surprise.

The problem in writing a technical book is that the author must overcome two major obstacles. First of all, he or she must accept the fact that, for a rather extended time period, the book will dominate the author's life. Until the book is finished, the author will not sleep well; the author will seem distant and distracted during dinner conversation; and likely become a bit short-tempered from time to time. Secondly, in the case of a rapidly developing technical discipline such as shoulder arthroscopy, the book must be written over a fairly short time period so that it will not be out of date by the time it is printed. The challenge to the author is to produce a book that is timely yet timeless—an obviously impossible task that creates even further insomnia.

So why bother to write this book? First of all, I knew that I would have tremendous help with this daunting project from my outstanding former fellows, Dr. Ian Lo and Dr. Paul Brady, as well as from my immensely talented medical illustrator, Ms. Nancy Place. Furthermore, I never would have begun the book without Ian Lo's repetitive encouragement to write it, plus his promise to be a coauthor. As it turned out, Paul Brady's abundant skills at video editing were a perfect complement to round out our team. But I'm sure that the greatest incentive of all was the opportunity, finally, to consolidate my rather extensive collection of previously published concepts, ideas, and research in a single place. The way this research came about has a story of its own.

When I was first beginning to consider the possibility of arthroscopic rotator cuff repair, I firmly believed that if it were to be done, its technique would need to have a sound biomechanical basis to become accepted as a reasonable alternative to open repair. My previous training in mechanical engineering was quite useful in providing me the necessary background to devise a series of experiments designed to determine optimized rotator cuff repair constructs. These experiments were set up to identify the weak link in a standard repair, then to test new constructs and methods that would shift the weak link to a different component of the construct. I would then test new constructs to optimize the weak link, so that the weak link shifted to another component of the repair. This sequence of experimentation would continue until finally the weak link was shifted to the weakest biologic substrate (i.e., tendon). Obviously, the biologic tissue had an intrinsic mechanical strength over which I

had no control, so once we had isolated it as the weak link, we had optimized our repair construct.

After I had identified the optimized constructs, I set out to devise instrumentation to assemble these constructs arthroscopically, a task that is much like building a ship in a bottle. I began with very simple devices which we gradually expanded and refined, so that now we have a wide array of instrumentation and implants that assure a secure arthroscopic repair every time.

Obviously, I could never have done this work alone. Dr. Kiriacos (Kerry) Athanasiou was an invaluable and inspired collaborator on the basic research. As for the instrumentation, I was privileged to work with Don Grafton and his engineering team in developing most of the instruments and implants used in the surgical procedures described in this book. Reinhold Schmieding, president of Arthrex, gave me great support and assistance in the development of these procedure-specific devices.

Fortunately, I was not facing the open shoulder establishment alone. Two of the greatest visionaries in shoulder arthroscopy, Dr. Steve Snyder and Dr. Jim Esch, also became my best friends during the early years of shoulder arthroscopy. Over the years, we have come to be called "The Three Amigos," and the name has stuck. The value of having loyal friends united in a common cause cannot be overstated. Revolutions are never won by an individual.

One aspect of my work that deserves special mention as a true group effort is that of the disabled throwing shoulder. Dr. Craig Morgan, Dr. Ben Kibler, and I pooled our ideas and taught each other a great deal in the process. To a washed-up baseball player such as myself, this project was a lot of fun.

Another combined effort was my collaboration with Dr. Joe DeBeer of Cape Town, South Africa, on the consequences of bone loss in patients with anterior shoulder instability. It is a tribute to the state of our current communications systems that two researchers from opposite sides of the globe could combine and analyze their data to reach conclusions with important implications for patients and surgeons around the world.

Now, I'm sure you are wondering why we chose to call this book a "cowboy's guide" to shoulder arthroscopy. I'll confess that this was entirely my idea. I've often been called a cowboy, and I take that as a compliment. Where I grew up, in central Texas, there were two ways to do things: the easy way and the cowboy way. I was fortunate to grow up with role models who always tried to do the right thing, and who passed on

pithy pearls of cowboy wisdom in their everyday speech. For example, it doesn't take a genius to figure out what the cowboy means when he says, "Never drink downstream from the herd." But it takes a genius to put it so succinctly.

The cowboy spirit has pervaded the personalities of those most responsible for the development of shoulder arthroscopy. It seems only fitting that each chapter should begin with a nugget of cowboy wisdom, paraphrased to the best of my memory from my childhood mentors.

So, here it is. We have tried to write a book that is different from all the rest—a book with a consolidated section on the principles that underlie successful operative shoulder arthroscopy, followed by an extensive section devoted to details, tricks, and technical tips on the latest arthroscopic techniques. Specifically, we tried to emphasize the surgical pearls (tricks and tips) that are most useful to surgeons, yet are rarely found in books.

This book serves to further a mission to which I have felt called from the very beginning. That mission has been to do all that I can to facilitate the development and teaching of shoulder arthroscopy so that it becomes the "new gold standard" for shoulder surgery around the world. In my opinion, that has already happened; however, because of the marked resistance of certain open shoulder surgeons to operative arthroscopy, I think that "piling on" is justified. I hope this text, with its liberal use of digital video, will accelerate the dissemination of the art, the science, and the technique of shoulder arthroscopy.

Finally, I have felt some urgency to finish this book. Over the past year, after treatment for recurrent prostate cancer, I have been acutely aware of my own mortality and of the precious frailty of life. I believe that God wants all of us to pass on any of our ideas that have merit and that have the potential to help our fellow man. I would like this book to serve as a tribute to the preservation of worthwhile ideas.

Philosophically, the ascendancy of shoulder arthroscopy is the only acceptable outcome. It is a significant medical advancement, and it is gratifying to be a part of that advancement. Two years ago, I tried to crystallize my thoughts on arthroscopy and arthroscopic surgeons for my Presidential Address to the Arthroscopy Association of North America. My sentiments have not changed. We're still a bunch of cowboys.

PRESIDENTIAL ADDRESS

Stephen S. Burkhart, MD

Presented at the 22nd Annual Meeting of the Arthroscopy Association of North America; Phoenix, Arizona; April 26, 2003.

The Arthroscopic Surgeon: Cowboy and Scientist

Ladies and gentlemen, members and guests: My heroes have always been cowboys. Growing up in a small Texas

town, it's hard to imagine that they could have been anything else. To me, Roy Rogers was not an actor on the small screen. He was real; and he was exactly the type of man I wanted to be.

Now more than ever, people feel the need to know their history, to know where they came from. But they also need to know their mythology, to know who they are trying to be. Our history tells us who we are, and our myths tell us who we hope to be.

The West, with a capital W, became the mythical landscape of America's home-grown hero, the cowboy. This hero, of course, was not the real cowboy, but the mythical cowboy, the one that talked slow, rode fast, shot straight, and called every woman "Ma'am." This cowboy was generally dependable, but he could be brash and impetuous, and he was easily offended. And once he set out to do something, he was tenacious. Relentless. He simply would not give up.

When I attended my first meeting of the Arthroscopy Association of North America (AANA) in the early 1980s, I had a sensation that I had never experienced during all my years of medical training, a sensation that I had stumbled into the camp of a major group of cowboys. And that's a compliment.

This group of cowboys, assembled at the infancy of arthroscopic surgery, presented papers on arthroscopic ligament reconstruction of the knee in broad daylight, and discussed them in an open forum as if these procedures were okay to perform. And it didn't stop with the knee. These renegades had the audacity to discuss arthroscopic procedures of the shoulder and to predict that such procedures would someday become the standard of care for the shoulder. And they were so sure of themselves that they didn't care what any of the open surgery experts of the day thought.

I was so impressed by my first encounter with the Arthroscopy Association of North America that I immediately applied for membership. Unfortunately, the membership committee was less impressed by me than I was by the Association, and they deferred my application, advising me to reapply in a year. I was crushed. But like the rodeo bronc-riders I admired, I got back on that bucking horse and tried again, and the second time I was successful. Ironically, I am the first president of the Arthroscopy Association of North America who was not accepted to membership on his first application.

What does that mean? That I'm stubborn, tenacious, and bull-headed? That I'm an over-achiever? That I can't take a hint? Maybe it means a little bit of all those things. But maybe it means I'm a cowboy. After that first rejection, I could have ridden into the sunset and found another professional organization to which I could devote my time and energy. That would have been the easy way, but it wouldn't have been the cowboy way.

As a Texan, I have observed the cowboy way all my life. The hallmarks of the cowboy are tenacity and self-reliance.

These qualities are also the hallmarks of the surgeon. But as arthroscopic surgeons, we must recognize that the cowboy way did not survive, and we must discover how to avoid that same fate.

The great flaw of the cowboy was his lack of adaptability. Once the open range was fenced, he was reduced to a caretaker of cattle—cattle that were taken to market by railroads rather than by cattle drives. As time went on and the focus of transportation changed from the horse to the automobile, the cowboy became irrelevant. But his values never became irrelevant. Now, more than ever, we should be able to appreciate that “doing the right thing” will never be out of date.

As arthroscopic surgeons, we have had to be very adaptable, and that is where we have surpassed the cowboy. To accomplish this, we have had to take on the characteristics of an entirely different and ultimately adaptable type of human—the scientist.

Arthroscopy has become increasingly dependent upon technology, and we, as arthroscopists, have had to embrace technology. But that embrace has had to be selective, and we have been forced to scientifically choose the best technology for our purposes—technology not only for treating our patients but also for teaching the next generation of surgeons. In short, the arthroscopic surgeon has had to become a blend of cowboy and scientist, an “adaptable cowboy.”

The history of surgery is a fascinating story of adaptation. Before the development of inhalation anesthesia, a surgeon’s speed was the measure of his skill (1). Robert Liston, professor of surgery at University College of London in the 1830s and 1840s, was widely regarded as the world’s best surgeon due to his speed in the operating room, where his practice consisted primarily of amputations. He routinely performed major amputations in less than 3 minutes. As a result, he attracted visiting surgeons from throughout Europe and the United States (2–4).

In his quest for speed, Liston sometimes amputated more than he intended. In one case, he performed an accidental orchiectomy along with amputation of the patient’s leg. At times, he would injure observers who stood too close to the operating table. One of his leg amputations resulted in the demise of three people: a visiting surgeon died from a slash wound, the patient died of sepsis several days later, and Liston’s assistant died from an overwhelming infection after he lost several of his fingers in the operation. But the speed that made Liston famous lost its significance when ether anesthesia became commonplace during his own career. Even so, he refused to use ether, publicly proclaiming that it offered no advantage to a surgeon who was fast. His failure to embrace this new technology assured his rapid retreat into obscurity. Liston did not adapt.

As a shoulder surgeon and a Texan, I’m proud to relate that the first surgical procedure in North America was a combined shoulder and chest surgery performed in Texas in 1535 by Cabeza de Vaca (5). The Spanish explorer had

been shipwrecked off Galveston Island in 1528. He subsequently developed a reputation among the Indians as a healer, treating the sick and injured with herbs and poultices. He had been wandering across Texas for 7 years when the Jumano Indians brought to him a young brave who had been hit in his right shoulder by an arrow, and the arrowhead had lodged in the chest, superficial to the ribs.

“The point was aslant and troublesome to take out,” Cabeza de Vaca later wrote. “I continued to cut, and putting in the point of the knife, at last with great difficulty I drew the head forth. With the bone of a deer, and by virtue of my calling, I made two stitches that threw the blood over me, and with hair from a skin I stanchd the flow.” The wound healed and the Indian recovered. After he finally made it back to Spain, Cabeza de Vaca wrote, “In consequence of this operation, they had many of their dances and festivities. This cure gave us control throughout the country.” Cabeza de Vaca was adaptable—and very lucky.

Surgery on the Texas frontier progressed largely due to the efforts of Dr. Ferdinand Herff and Dr. George Cupples (5), the first surgeons in Texas. These men had very busy practices in San Antonio by the 1850s. They understood the importance of clean water in surgery, and actually boiled the water that was to be used for the operation, unlike many of their contemporaries. Furthermore, they used ether anesthesia, but they were acutely aware of its high flammability. For that reason, they performed most of their surgery outdoors under bright sunlight to avoid the fire danger posed by an indoor lantern. Naturally, they tried to operate on days when there was not much wind. These surgeons had results that were far better than those of their peers. In 1886, Dr. Cupples reported to the Texas State Medical Association’s Committee on Surgery that his mortality rate for major surgery was only 16%; for minor surgery it was only 8%. Only 1 out of 12 people who had minor surgery died. Dr. Herff and Dr. Cupples were adaptable. And they were masters of spin.

As surgeons, it is imperative that we embrace new technology, but we must do so with a discerning eye. The technology must be scientifically proven. Too often, patients demand “the next best thing,” and that creates an environment more conducive to marketing than to science.

At the beginning of the Great Depression, Dr. John Brinkley of Del Rio, Texas, was determined to give the people what they wanted. In 1931, when other Americans were standing in bread lines, Dr. Brinkley bought air time from a super-powered radio station across the Rio Grande in Ciudad Acuña, Mexico. For \$750, he offered to restore a man’s sexual energy by implanting goat testicles beneath the skin of his abdomen. There were many goats in the Del Rio area, and many gullible men listening to the radio. Before he died in 1942, Dr. Brinkley claimed that he had implanted 16,000 sets of goat testicles (5). Dr. John Brinkley had been guilty of what we must always strive to

avoid: embracing a procedure or a technology for purely personal gain, regardless of its impact on patients. I should point out that Dr. Brinkley, although he lived and worked in South Texas, was not a cowboy. A cowboy does not compromise his ideals; he always does the right thing, regardless of personal consequences.

Dr. Red Duke, this year's Presidential Guest Speaker, has been a friend for a long time. We've gone on a yearly deer hunt on the Mexican border, along with other friends, for the past 20 years. This hunt is truly like an old-time Texas deer hunt, complete with tall tales and lively dinner conversation at the camp house. About 10 years ago, the conversation turned to occupational hazards of being a surgeon. Naturally, protection against HIV exposure was mentioned, and one doctor at the table expressed his concern about the fact that HIV infection was uniformly fatal, unlike any of the other occupational risks to which we were exposed. Red Duke, who has been a trauma surgeon his entire career, spoke up about the impossibility of avoiding contact with blood in his profession. Then, with his trademark cowboy drawl, he said, "The way I look at it, if you're livin', you're dyin'." The table became quiet. We all knew what he meant. He wasn't minimizing the danger of HIV infection. He was just putting things into perspective. A doctor, like a cowboy, does what is right, even if it has deadly consequences. And a doctor faces up to reality; he knows that death waits around the corner for all of us, sooner or later. Dr. Red Duke is a cowboy.

Let's leave the cowboy for now and move on to the scientist. The word science comes from the Latin word *scientia*, which means knowledge (6). Science differs from other types of knowledge in that scientific progress depends on new ideas expanding or replacing old ones. In contrast, great works of art produced today do not replace the masterpieces of the past. But with science, new discoveries expand the knowledge base on which technology, or applied science, can develop.

The science of medicine is unique in that it sometimes gets confused with the art of medicine. The art of medicine is a subtle blend of opinion and technique, and it is more easily manipulated by strong personalities into dogma than is the science of medicine. Manipulators of the art of medicine have done more to stifle the science of medicine than any government regulations. Their dogma, exempt from the rules of the scientific method, has done immeasurable harm by autocratically denying to the human race the benefits of the natural rate of scientific advancement. Often, this dogma is concealed within the legalistic language of standards of care or accepted medical practice. But it is there, and it is destructive to medical progress, and it has been destructive to the advancement of arthroscopic surgery. This is not the fault of the art of medicine, but the result of the devious manipulation of the art of medicine for personal gain.

At this point, you may be wondering if I am suggesting that all standards of medical practice be suspended; that

the tablets of the medical rulemakers be broken. And the answer, of course, is no. All aspects of a civilized society must have rules. I am simply suggesting that medical advancement would be much more rapid and more meaningful if science were allowed to take precedence over dogma. Which is precisely why I treasure my relationship with the Arthroscopy Association of North America.

At its inception, this organization was criticized for being based on a specific technology—arthroscopy—which would some day become obsolete. Nothing could have been further from the truth. This organization was based on the hypothesis that minimally invasive surgery was better for patients than equivalent procedures done by open techniques. That hypothesis was submitted to scientific examination, and was freely discussed and debated at our meetings and in our journal. The organization, the science, and the technology have developed in accordance with the scientific validity of that hypothesis and its corollary hypotheses. To me, the Arthroscopy Association of North America has been the ultimate success story of the application of the scientific method to medicine. And the key to this success has been the principle of allowing science to dominate over dogma.

The history of scientific advancement is fascinating. The pioneering scientist must be, in large measure, a cowboy. Until a scientist's theories are confirmed by others, he must stand alone, much like the cowboy, with only his convictions to shield him from the criticism of his peers. Most of us would never consider Albert Einstein a cowboy, but an excerpt from the esteemed journal *Science*, in 1929, underscores the isolation that a scientific pioneer must be willing to face. "Albert Einstein announced January 20, 1929, that he has found a key to the formulation of a unified gravitational field theory—a group of equations applicable not only to gravitation but also to electromagnetism and subatomic phenomena. His six pages of equations, however, are unprovable, incomprehensible, ignore quantum mechanics, and are incorrect" (7). Einstein stood by his hypotheses and was vindicated when his equations were proved correct by the experiments and observations of his peers. But this did not happen overnight. And until it did, Einstein had to stand alone and exposed, with only his belief in himself and his ideas to comfort him.

Where do ideas come from? How can we explain the creative process? Albert Szent-Gyorgi, the 1937 Nobel Prize winner in medicine, said, "Discovery consists of seeing what everyone else has seen and thinking what no one else has thought" (8). This simple statement explains the spark that separates the creators of knowledge from the collectors of knowledge.

I have been privileged to know a handful of brilliant scientists and researchers in my life, people who have thought what no one else has thought. But I have not always recognized the implications that their work would have on my life and on my career. As a freshman engineering student at Rice University in 1969, I had no clue that

Dr. Robert Curl, the mild-mannered professor who taught my inorganic chemistry class, would win the Nobel Prize in chemistry 22 years later. I had no concept that his discovery of “bucky balls” (carbon-60 fullerenes which are one nanometer, or one billionth of a meter, in diameter, the first of the nanomaterials) would open up a whole new realm of nanotechnology that would have direct application to my future career in arthroscopic surgery.

Nanotechnology deals with “molecular machines,” and it is very different from the top-down approach known as miniaturization. Nanotechnology devices are built from the bottom up, one molecule at a time (9). They may be powered by physical energy or by biochemical energy. Rotating molecular shafts with small knobs and dents to encode logic operations can function as molecular computers to regulate the release of arthroscopically implanted substances such as growth factor. Growth factor and other therapeutic compounds can be attached to nanomaterials such as the “bucky balls” that Dr. Curl discovered, so that they can be arthroscopically delivered to aid in biologic repair and regeneration of biologic tissues such as bone and articular cartilage.

In 1969, as I listened to Dr. Curl’s chemistry lectures, I didn’t dwell on the fact that history runs in both directions and that some things simply haven’t happened yet. If I could have read the future, I would have seen 30 years forward, to a time when my good friend Dr. Kiriacos (Kerry) Athanasiou, this year’s AANA Scientific Presidential Guest Speaker, would be conducting groundbreaking research on articular cartilage and polymer scaffolds in that very same building on the Rice University campus where Dr. Curl taught my freshman chemistry class. And I would have recognized the importance of that research, which could easily make Dr. Athanasiou a Nobel Prize candidate. Research that could change the way we do orthopaedic surgery. So you see, history runs in both directions, and time weaves it into a complete story.

As my year as President of AANA draws to a close, I am proud of what this organization has been able to accomplish, and I am honored to have been elected to preside over it for the past year. Our mission is education, and we have been able to reach more surgeons with our educational programs than ever before. We had record-breaking attendance this past year at the Fall Course and Specialty Day, and we routinely filled the hands-on cadaver courses at the Orthopaedic Learning Center (OLC) in Chicago. In August, we staged the first live remote interactive surgery transmission from San Antonio to an OLC course, using high-speed phone lines to transmit high-quality digital video images. This technology has created a highly effective teaching tool for us to use in training surgeons both here and abroad. These educational initiatives would not have been possible without the AANA members who have served as instructors, faculty, and committee members, as well as our industry partners.

On a personal level, I have many people to thank for a very successful year: the AANA staff in Chicago (Ed Goss, Holly Albert, Pam Beaumont, Donna Nikkel, and the rest of the staff); our Executive Vice President, Dr. Whit Ewing; the AANA Board of Directors; the AANA committee chairmen and committee members; the *Arthroscopy Journal* staff and editors, led by Editor-in-Chief Dr. Gary Poehling; the Journal Board of Trustees; the Education Committee and its chairman, Dr. Rick Ryu; my Program Chairman Dr. Don Johnson; the audiovisual team that has provided state-of-the-art digital presentations for all our meetings; my secretary Judy Collins; my nurse Mary Hatter; and my partners in The San Antonio Orthopaedic Group, two of whom (Dr. Brad Tolin and Dr. David Gonzalez) are here today.

As for my professional development, I am indebted to my two greatest role models: the late Dr. Mark Coventry of the Mayo Clinic, who demonstrated to me the true meaning of intellectual integrity; and Dr. John Hinchey, my late senior partner, who taught me the sanctity of our profession. I am grateful to Steve Snyder and Jim Esch for being both teachers and my best friends. And I want to thank Dr. Gary Poehling for publishing my early biomechanical concepts when they were considered too “edgy” for traditional orthopaedic journals. As for these biomechanical concepts, I am indebted to Kerry Athanasiou and Don Grafton for their input and contributions to the end result.

Family, of course, is always of paramount importance. My parents, Claude and Gene Burkhart, provided me with a classic small-town upbringing surrounded by real-life characters that were every bit as honest and straight-shooting as Roy Rogers. Yet they encouraged me to reach beyond our sheltered environment, to sample the greater world outside of Taylor, Texas, and to believe that I might actually have some impact on that world. I regret that my mother Gene cannot be here today because she would be beaming at me from the audience, but I am happy that my dad Claude Burkhart was able to make the trip.

I am very proud that my son Zack and daughter Sarah are here today. Zack will graduate next month from Notre Dame, summa cum laude, and has been accepted to medical school. He is engaged to Jenny May and they will be married in December. Sarah is a freshman at Rice University, my alma mater, where she is excelling in the mechanical engineering curriculum. It has been a blessing to watch Zack and Sarah develop into such wonderful people. They started out as my biggest responsibility and have become my greatest accomplishment. They have enriched my life, and I am so proud of them.

That brings me to the most important influence in my life, my wife Nora. I’ll share a very personal story with you, because it illustrates the great strength and direction that Nora has given me, particularly in the past year and a half.

In 2001, I was scheduled to go to Japan as a guest speaker at the annual meeting of the Japan Shoulder

Society. Nora and I were to leave on September 12, 2001. Needless to say, the events of September 11 caused our trip to be canceled. I found myself at home in San Antonio with a few days off work, so I decided to do something I'd never done before—go to the doctor for a check-up. After a battery of blood tests and routine referrals to specialists for long-overdue tests such as a cardiac evaluation and a stress test, I was feeling confident and quite smug about my apparent good health. The tests were confirming what I had always assumed, that I was healthy and that bad things only happened to other people. After all, I was a doctor, and doctors see themselves as invincible.

I was in California at an arthroscopy meeting when I received the call about my final test, a prostate biopsy. My urologist, not known for his tact, said, "You've got cancer. It's a big one and it may not be curable. I'm sending you to the Mayo Clinic for surgery."

I felt as if I had just been shot. I felt small, helpless, insignificant, and out of control. I spent the first of many sleepless nights.

Two months later, lying in my hospital bed after the surgery, I sustained another direct hit when my surgeon came to my room and explained that he had not been able to get clear margins completely around the tumor. I stared past him in disbelief. At first, I wanted to blame someone. Then, I illogically wanted to run out of the hospital, but with my spinal anesthetic still in effect, I couldn't move my legs. I was terrified. I felt empty and alone. Abandoned. That same day, when Nora was gone from my room, my friend Dr. Shawn O'Driscoll, an orthopaedic surgeon at the Mayo Clinic, dropped by, and I shared the news with him. The first thing he asked was, "Are you equipped spiritually to deal with this?" The question caught me totally off guard. I couldn't answer. I just began to cry.

Then Shawn reached out and held my hand and said, "Let's pray about it." And we did. And for the first time, I felt at peace.

When Nora returned to the room that evening, I told her the story, and I asked her to pray with me. Nora is a person of great faith, and has always prayed for me. She had been praying for me all along but due to my stubbornness and denial she had not been praying with me. But this was the point at which I put everything into God's hands, and we prayed together.

From that moment on, Nora was the rock that I relied on, that pulled me through. She taught me the meaning of faith, and the meaning of life. Without her, I couldn't have made it. But with her as my spiritual guide, I realized that the best thing that ever happened to me was to get cancer, because by facing death through faith I learned to appreciate life.

Nora, I thank you for sharing my life and restoring my faith. And I thank you for being the most entertaining person I have ever known. We have great fun together, and

life with you has been the greatest party I could ever have imagined.

The other positive viewpoint to emerge from my cancer experience was the notion that ideas are a continuum over time, a cement that connects one generation to the next. If our ideas are worthwhile, they can live on through our students long after we're gone. In the early days of arthroscopy, those of us involved in arthroscopic education were often ridiculed by the "experts" of the day. They openly stated that arthroscopy would not catch on, that its results would never be as good as open surgery, and that we were wasting our time. I tried to respectfully disagree with them, but their lack of approval bothered me. Even so, I was gratified by the response of the arthroscopic students that I taught.

Years later, I read the preface to Dr. E. A. Codman's classic book *The Shoulder* (10), and one passage from this great teacher stood out as particularly meaningful to me: *Through much of my life I have suffered somewhat from a sense of isolation, because I have always been thinking, or saying, one thing or another, with which other doctors did not agree. . . . My regrets are for wasting so much time on the opinions of a previous generation and not realizing that it was the approval of my pupils, rather than of my masters, that was desirable.*

Codman was a cowboy (even Bostonians can be cowboys), and Codman was a scientist of the first order. And his ideas set us on a trail of discovery that we hope will never end. As arthroscopic surgeons, we need to recognize our heritage as cowboys and scientists, so that we will always be adaptable cowboys. That will assure the survival of our discipline.

Arthroscopic surgery has come a long way in the past 20 years, but there's still so much to do. Although the history of arthroscopy has been very exciting, the future promises to be nothing short of breathtaking. So, ladies and gentlemen, cowgirls and cowboys, let's take a deep saddle and hold a loose rein, because we've got a long way to go.

Happy Trails

REFERENCES

1. Fenster JM. *Ether Day*. New York: Harper Collins, 2001.
2. Gordon R. *Great Medical Disasters*. New York: Stein and Day, 1983.
3. Thorwald J. *The Century of the Surgeon*. New York: Pantheon Books, 1957.
4. Buckwalter JA. Advancing the science and art of orthopaedics: Lessons from history. *J Bone Joint Surg Am* 2000;82:1782–1803.
5. Cox M. Frontier medicine: Texas doctors overcome disease and despair. *Texas Med* 2003;99:19–26.
6. Mish FC, ed. *The New Merriam-Webster Dictionary*. Springfield, MA: Merriam-Webster, 1989.
7. Trager J. *The People's Chronology*. New York: Henry Holt, 1994.
8. Holliman K. Orthopedic surgeons should become involved in research. *Orthop Today* 2002;22:17–18.
9. Reitman EA. *Molecular Engineering of Nanosystems*. New York: Springer-Verlag, 2001.
10. Codman EA. *The Shoulder*. Boston: Thomas Todd, 1934.

Foreword

This book by Stephen S. Burkhart, Ian K. Lo, and Paul C. Brady is a must read for any surgeon who wishes to be in the forefront of arthroscopic shoulder surgery. Dr. Burkhart brings his unique skills as a mechanical engineer, research scientist, arthroscopic surgeon, and Texas rancher to arthroscopic shoulder surgery. His creative discoveries on the suspension bridge, margin convergence, awning effect, stable force-couples, and loop-knot security have created a paradigm shift in rotator cuff surgery. Arthroscopic repair is now the preferred method of any shoulder surgeon who has taken the time to learn these techniques.

Drs. Burkhart, Lo, and Brady share their technical pearls that make our surgery easier and benefit our patients. The basic techniques of good visualization with appropriate portals using fluid control principles serve the beginning

arthroscopic shoulder surgeon and are good reminders for the advanced surgeon. Finally, the chapters on bone loss in our patients with instability are their reminder to take another look at our patients with instability, especially our failures.

All of us are fortunate that Drs. Burkhart, Lo, and Brady have taken their time and effort to put down their ideas in words, drawings, and photographs that will make our surgery easier and benefit our patients. *Burkhart's View of the Shoulder: A Cowboy's Guide to Advanced Shoulder Arthroscopy* belongs next to your bed as you review your shoulder surgery for tomorrow.

James C. Esch, MD
Tri-City Orthopaedics
Oceanside, California

Foreword

It is a pleasure for me to write this foreword for *Burkhart's View of the Shoulder: A Cowboy's Guide to Advanced Shoulder Arthroscopy*, Dr. Stephen S. Burkhart's new book on the treatment of complex rotator cuff tendon pathology using the latest shoulder arthroscopic techniques. I have known Steve as a loyal friend and have respected and learned from him for almost 20 years. This book is yet another example of his dogged devotion to advancing the field of shoulder arthroscopy education for all of us in the field.

Dr. Burkhart is well known as a "thought" leader, an innovator, an exceptional surgeon, a zealous organizer, and a tireless teacher who generously devotes a great deal of time and effort to his favorite area of interest, that of shoulder arthroscopy. His enthusiasm is contagious. I have known him to mesmerize an entire room during a lecture on orthopaedic biomechanics, a generally soporific topic. Steve can skillfully imbue his audience with theories and facts that clarify complex topics such as fluid dynamics or fixation strength of suture anchors in bone. To solidify his lessons, he often uses clever, memorable vignettes that help his audience understand and retain the important points.

Steve draws on many of his talents to disseminate his messages. He sprinkles his lectures with colorful Texas humor, often portraying himself as a simple-thinking, straight-talking cowboy whose goal is to do an honest day's work and keep the bad guys in check. But believe me, Dr.

Burkhart is no simple thinker. His supercomputer genius never rests. His "free" time is consumed with creative writing of scientific works and novels as well as musical lyrics. He has a rare knack for solving difficult surgical problems by either altering and improving an existing technique or inventing new instruments and methods to facilitate the complicated task. It is this creative gift that sets Steve aside from most of us. Although he is gifted, he is humble, self-deprecating, and approachable, traits that make him all the more effective as a paradigm developer and educator.

Steve has been accompanied and supported throughout his professional life by his wife Nora and his children Zack and Sarah. Both children are following in Steve's footsteps. Zack is enrolled in medical school and Sarah is studying biomedical engineering. Nora is not only Steve's wife, but a true complementary partner and lifelong friend. She has traveled the world helping him to stay on course and add important balance to their lives. Recently, the Burkhart family has discovered a special site to spend some much deserved slow-down time. I suspect and hope that Steve will continue to solve problems with shoulder arthroscopy while at work as well as when relaxing with his family and friends at his beautiful "Cloud Nine" Ranch.

Stephen J. Snyder, MD
SCOI Shoulder Clinic
Van Nuys, California

Messages from the Fellows

To be selected from innumerable applicants to be a fellow under Dr. Burkhart is truly a life-changing experience. It is distinct from any other fellowship. It is a true one-on-one apprenticeship to learn from a pioneering master of shoulder arthroscopy. Although the knowledge gained in the theory, rationale, and technical aspects of shoulder disorders and shoulder arthroscopy are unsurpassed, it is the delivery of such information that is completely unique. Dr. Burkhart personifies what it means to be a Texas gentleman. We are eternally grateful to him, his wife Nora, and their wonderful family for providing us fortunate few with an experience like no other. The fellowship year is justifiably one of the greatest years of our lives, and we are honored and humbled to be considered fellows of Dr. Stephen S. Burkhart.

I am proud to have been Dr. Burkhart's first fellow and will forever thank him for taking a chance on me. In my opinion, he defines the term "renaissance man" and if he didn't invent "thinking outside the box," then he certainly fine-tuned it. I am eternally grateful for the experience.

Charles Pearce, MD
Fellow 1997–1998

I honestly didn't see much of the Hollywood-type "cowboy" in Dr. Stephen Burkhart, but I did see that he was, and continues to be, the intellectual "cowboy" of shoulder arthroscopy. Dr. Burkhart is known for taking on a herd of intellectual doubt and controversy regarding various topics in shoulder arthroscopy. With dedication, persistence, and intellect he routinely educates the orthopedic community about various shoulder arthroscopy issues and techniques. This approach leads surgeons to his "ranch of reason," where we can see shoulder-related problems and treatments through his eyes. And with quiet deference, as you would expect of a gentleman and a cowboy, he then lets us come to our own conclusions regarding what he has seen.

Dr. Burkhart often said "I'm no stranger to controversy." It is these simple few words that belie the intellect, passion, and strength of a man who continues to single-

handedly reshape the field of shoulder arthroscopy. It is a distinct honor to have worked with such a distinguished cowboy. And I look forward to where he will lead us next.

Steven Danaceau, MD
Fellow 1998–1999

It is an honor to be a part of Steve's view of the shoulder. I owe so much of my success and happiness to him. He is a leader and visionary in many ways and on many levels. People do not care how much you know, until they know how much you care. Thanks for everything, Steve.

Armin M. Tehrany, MD
Fellow 1999–2000

Not a day passes that I don't draw on clinical and surgical lessons learned from my time spent with Dr. Burkhart. He is a complete mentor: an unparalleled teacher, an innovative scientist, a gentleman, and, of course, a cowboy. I will always remain thankful for his guidance and expert instruction, as will my patients.

Peter Parten, MD
Fellow 2000–2001

To say that Dr. Burkhart has been at the frontier of shoulder arthroscopy over the last two decades is an understatement. He has literally defined and continues to redefine the field of arthroscopic shoulder surgery. When I first saw Dr. Burkhart in the operating room, I was in complete awe. Despite my residency training at a respected sport medicine center, I had never seen anyone evaluate or treat a shoulder arthroscopically in a similar fashion. It was a truly awe-inspiring and humbling experience. He remains light-years ahead of the rest of us. It has been an honor and privilege to be a fellow under Dr. Burkhart and hopefully in some small way contribute to his ongoing legacy. I wish to thank Dr. Burkhart, Nora, and their family for providing our family one of the best years of our lives (and a little Texan also).

Ian Lo, MD, FRCSC
Fellow 2001–2002

How many subsaps have you repaired?" This was one of the first questions Dr. Burkhart asked me during my first case with him as a fellow. As it turned out, this was just the beginning of my arthroscopic shoulder experience, as I was continually introduced to newer and more advanced concepts. I feel fortunate to have been taught and trained by an innovative and progressive thinker that certainly has changed how future orthopaedic surgeons will deal with shoulder pathology. Not only has he been a great teacher, mentor, and example, he has been a genuine friend. As I mentioned to Dr. Burkhart on my last day of fellowship, my advanced shoulder experience in San Antonio was one of the greatest experiences of my life.

David P. Richards, MD, FRCSC

Fellow 2003–2004

Far from my wonderful country of France I took the challenge to visit one of the most famous shoulder arthroscopists of North America. I had the wonderful experience of spending 6 months with a unique surgeon-cowboy. He is not only a wonderful teacher but also a great man and human being who welcomed me as a son in his own family. I want to thank Dr. Burkhart for the wonderful time spent with him in the "West." I am now trying to spread all of the knowledge I learned with him in Grenoble and France.

Johannes Barth, MD

Research Fellow 2003–2004

I came to San Antonio to learn shoulder arthroscopy. Soon I figured out that I wasn't facing just a skilled surgeon but a man with the attitude to live every day and every case as a challenge. To optimize tomorrow what he was doing in that moment. His knowledge, skills, and overall approach to arthroscopy and life were an inspiration to me, and I went home knowing more about the

difference between good surgeons and great men. I am honored to have worked with him. Thanks.

Paolo Arrigoni, MD

Research Fellow 2004

In residency I asked Dr Gary Poehling (my chairman) what he would do if he were just finishing his residency. Without hesitation he said, "I'd go work with Steve Burkhart—he's taking our field to the next level." After just a few days with Dr. Burkhart I realized the truth in that statement. Thank you, Dr. Burkhart, for sharing your knowledge and your gift with me.

Paul Brady, MD

Fellow 2004–2005

In 2005 I had an amazing opportunity to visit Dr. Burkhart for 6 months. I traveled from Rio de Janeiro, Brazil, to San Antonio, Texas. I was afraid because I didn't know what was waiting for me, but I knew Dr. Burkhart was a great teacher and doctor.

He has two wonderful attributes: he never loses his posture, and he shares his knowledge with his fellows.

I am very thankful for how you have opened my eyes to arthroscopic shoulder surgery.

Alexandre Alves Campos, MD

Research Fellow 2005

Thank you for taking on what you may now have realized to be one of your life's greatest challenges: teaching me how to approach and treat ailments of the shoulder. I appreciate your patience and generosity in sharing your wisdom. I am inspired by your love for your work and your dedication to helping your patients.

David P. Huberty, MD

Fellow 2005–2006

Contents

Preface ix

Forewords xv, xvii

James C. Esch and Stephen J. Snyder

Messages from the Fellows xix

PART I. THE BASIS OF COWBOYIN'

There Ain't a Horse That Can't Be Rode, There Ain't a Man That Can't Be Thrown

- 1 Visualization 3
- 2 Angle of Approach 7
- 3 Creating a Stable Construct 33
- 4 Understanding and Recognizing Pathology 53
- 5 The Tough Stuff: Massive Contracted Adhesed Rotator Cuff Tears, Subscapularis Tears, and Biceps Pathology 110
- 6 Exposing the Hidden Arthroscopic Landmarks 147
- 7 Insurmountable Problems—Bone Deficiency 156
- 8 Gaining Speed and Tricks of the Trade 169
- 9 Order of Steps 191
- 10 Rotator Cuff Tear Patterns: Repairing a Tear the Way It Ought to Be 193
- 11 Postoperative Rehabilitation 203

PART II. PLAYIN' WITH FIRE

A Cowboy's Guide to Cookin' (Workin' Smooth), Smokin' (Workin' Fast), and Brandin' (Leavin' Your Mark)

- 12 Operating Room Set-up 215
- 13 Instability 217
 - A. Arthroscopic Bankart Repair 217
 - B. Arthroscopic Latarjet Procedure 220
 - C. Arthroscopic Treatment of Multidirectional Instability 220

D. Nonengaging Hill-Sachs Lesion 222

E. Open Latarjet Reconstruction 223

F. Posterior Bankart and SLAP Repair 226

G. Repair of a Bony Bankart Lesion 227

H. Repair of Reverse Humeral Avulsion of Glenohumeral Ligament (RHAGL) Lesion 230

I. Repair of Triple Labral Lesion 232

J. Arthroscopic Repair of Humeral Avulsion of Glenohumeral Ligament (HAGL) Lesion 234

14 SLAP Repair 236

15 Subacromial Procedures (Non-cuff) 239

A. Arthroscopic Acromioplasty 239

B. Arthroscopic Distal Clavicle Excision 241

C. Coplaning of Distal Clavicle 242

D. Os Acromiale Excision 243

16 Stiffness 245

A. Capsular Release for Adhesive Capsulitis 245

B. Capsular Release for Postoperative Stiffness after Rotator Cuff Repair 246

C. Manipulation Under Anesthesia 247

17 Rotator Cuff 249

A. Completion of a PASTA Lesion to a Full-Thickness Cuff Tear 249

B. Coracoplasty with Nonretracted Subscapularis Tendon 250

C. Double-Pulley Technique of Double-Row Repair 251

D. Double-Row Rotator Cuff Repair 252

E. L-Shaped Tear Assessment 254

F. Margin Convergence to Bone in a Reverse-L Tear 255

G. Massive Adhesed Rotator Cuff Tear: Repair by Modified Double Interval Slide 257

H. PASTA Repair: One Anchor Repair 261

I. Repair of a Partial (Upper) Subscapularis Tendon Tear 263

J. Repair of Bursal Sided Rotator Cuff Tear 265

K. Repair of Complete Subscapularis Tendon Tear 266