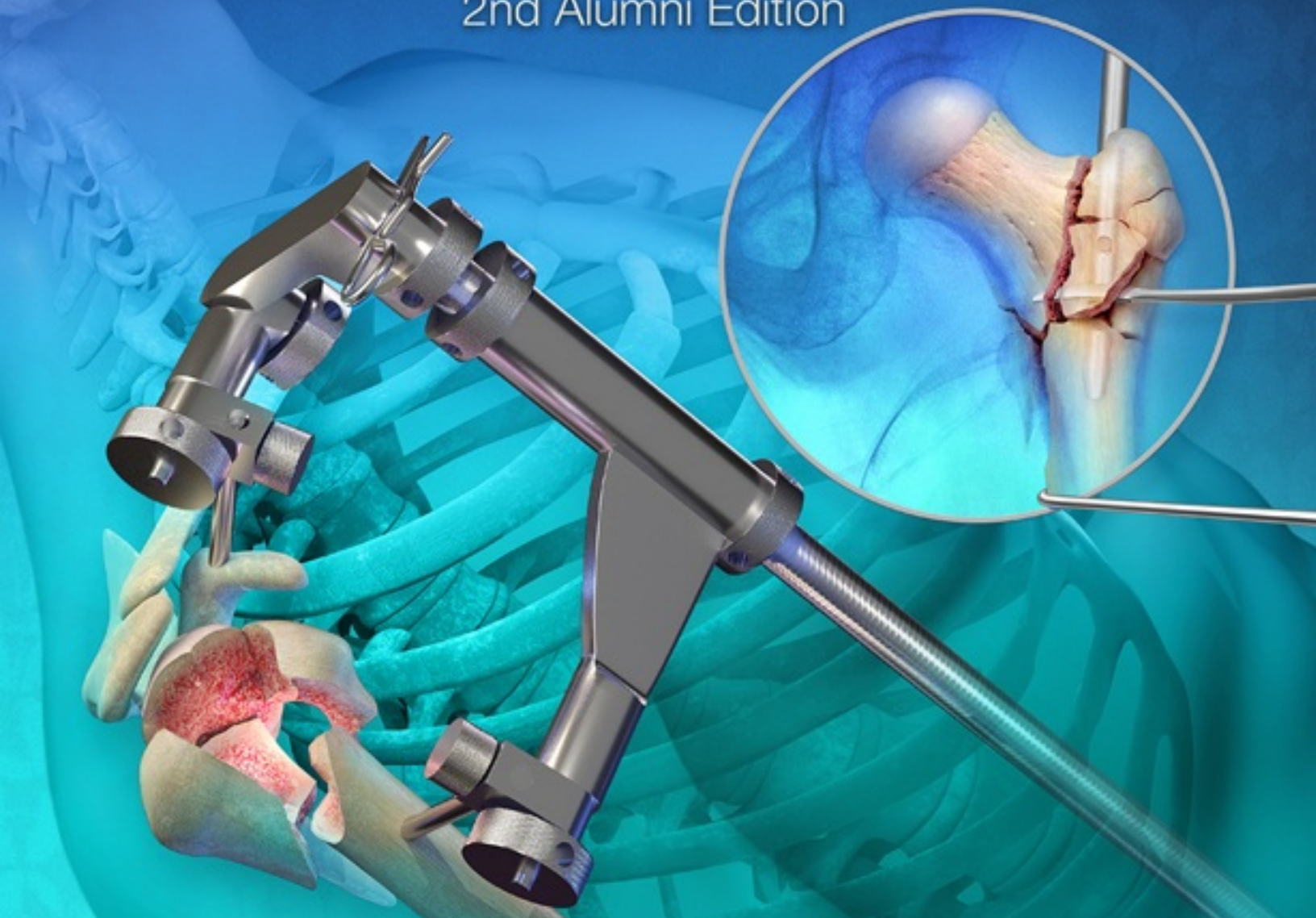
HARBORVIEW

Illustrated Tips and Tricks in

FRACTURE SURGERY

2nd Alumni Edition



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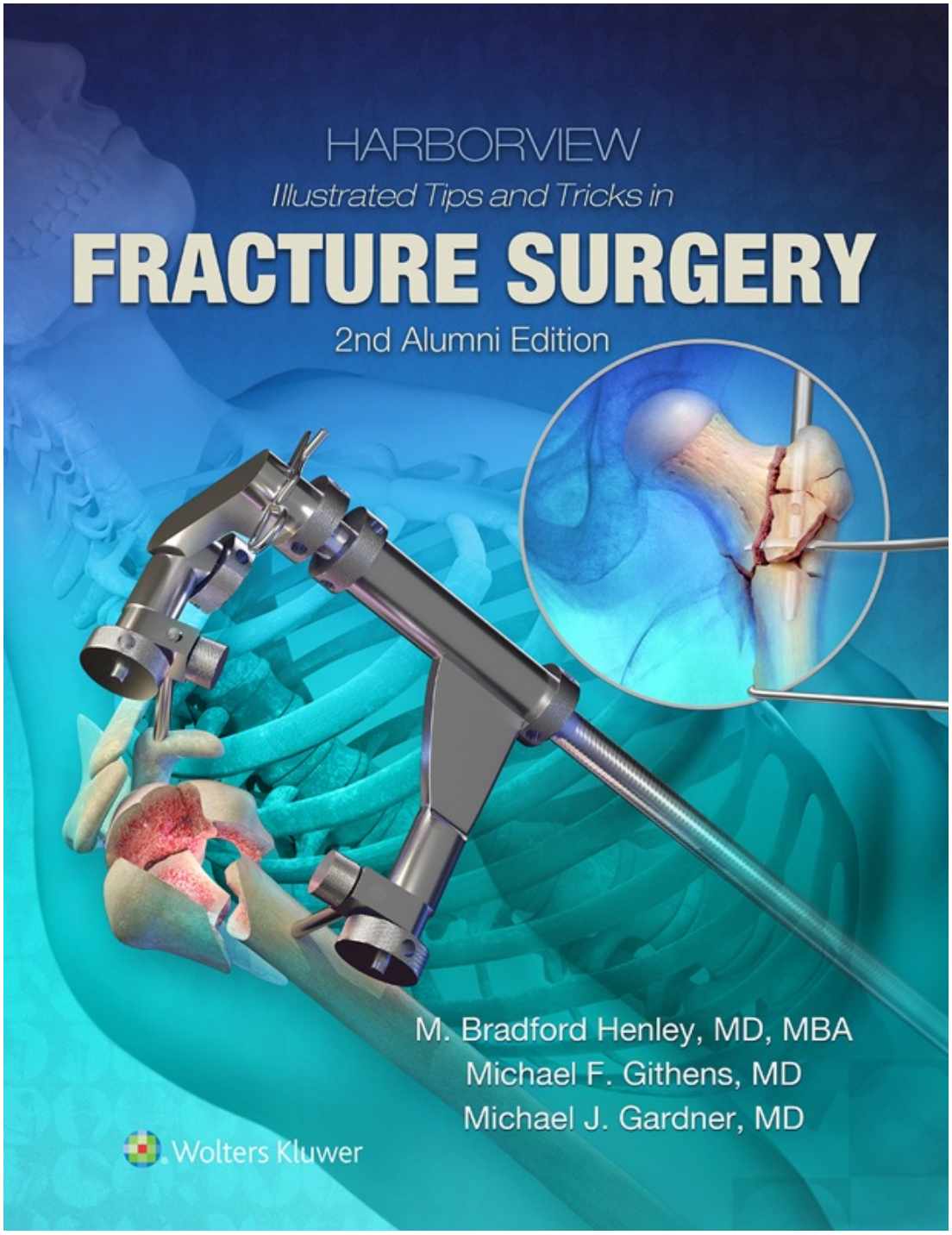
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Harborview Illustrated Tips and Tricks in Fracture Surgery

SECOND EDITION

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Foreword to the First Edition

When I was a resident during the mid-1970s, fracture management revolved around the use of plaster casts and traction. Young men with femur fractures remained hospitalized for weeks, lying in beds inclined on wooded boxes to counteract the pull of heavy weights. They were then placed in plaster spica casts for several months. Open fractures were treated with pins in plaster and the Orr method. Osteomyelitis and amputations were common. Some fractures were opened and fixed with straight nails or plates, but the indications were inconsistent and unclear. Custom-molded plastic bracing and functional treatment were introduced by Sarmiento, and his fracture courses in Miami were very popular. The faculty at the one I attended as a senior resident included a little-known surgeon from Seattle named Sigvard “Ted” Hansen. He reported on the initial results from Harborview Hospital with the closed nailing technique they had learned when Gerhard Kuntscher visited. To support his case for the superiority of the technique, he argued that animals with endoskeletons were more advanced than those with exoskeletons. Ted later noted that this presentation I witnessed was the launching for closed nailing and the beginning of the transition to a new era of treatment for long bone fractures.

I traveled to Davos for the annual AO course as a chief resident. There was a small zealous group of mostly European surgeons who were developing a system of internal fixation that was not yet embraced by American orthopaedic surgeons. The precisely designed Swiss implants and equipment and highly organized approach to operative fracture care were very appealing. When this system was introduced in the United States, the emphasis on early rigid fixation and rapid mobilization caused a major shift in fracture care. During this period, external fixation had a revival in the United States and was used extensively for open fractures, which were prevalent as the United States reached the peak of road traffic deaths and injuries.

Working at the Maryland Shock Trauma Center, housed then in an old wing of the hospital, I was a participant in and a witness to the birth of a new field called orthopaedic trauma. The focus became optimal care of seriously injured

patients and treatment of complex musculoskeletal injuries. We incorporated the new techniques and moved away from the old methods. A pivotal moment occurred at the 1983 AAOS meeting in Las Vegas when Bob Winquist presented the highly positive Harborview experience with the closed nailing of 504 femoral fractures. Because of its significance, the presentation was scheduled in the slot before the first vice presidential address and was heard by an audience of thousands in a massive rotunda ballroom. Gus Sarmiento the leading apostle of functional bracing, who was the discussant, acknowledged that the technique offered unprecedented advantages and would change the standard of care.

Over the subsequent 27 years, the field of orthopaedic trauma has evolved constantly, and modern fracture management has spread throughout the world. The orthopaedic faculty at Harborview has been among the leading groups in the subspecialty. Serving as the trauma referral center for surrounding states, they have consistently been receiving large volume of patients, which allowed them to develop a large group of orthopaedic trauma faculty. They have amassed a large collective experience and completed many important clinical studies. Their emphasis on excellence and constant pursuit of improved methods of care has enabled them to establish and refine a series of protocols for operative management. Surgeons from all over the world visit the center to observe their approach to trauma care. Their orthopaedic trauma fellowship is considered the premier experience in the country.

Brad Henley, MD, MBA, a veteran member of the Harborview Orthopaedic Trauma group, has used his clinical expertise and business leadership skills to organize an outstanding surgical technique atlas. Members of the Harborview Orthopaedic Trauma faculty and current and former orthopaedic trauma fellows created the various chapters. A consistent approach was used combining very high-quality intraoperative photos and beautiful halftone line drawings. Details of surgical technique are conveyed in brief notes, which form legends for each illustration.

This treatise will provide valuable supplementation on surgical management and technique to the information contained in major fracture texts. There is a growing need for this type of detailed “how to do it” guidance. Successive global burden of disease and injury analyses document a growing prevalence of road traffic injuries, particularly in the developing world. The problem stems from vulnerable road travelers sharing the roads with heavy vehicles and public transportation that are overcrowded and dangerous. Increasing numbers of deaths and injuries result and disabling musculoskeletal

disabilities are causing major social and economic impact. Rapid motorization in populous, economically powerful countries such as India and China is causing a surge in injuries to occupants of cars. Airbags, seat belts, and improved car design have decreased the fatality rate in developed countries, but severe lower extremity injuries are not prevented by current measures. Medical systems in many countries are evolving to levels where surgeons will be able to employ modern methods of internal and external fixation to avoid disabilities. This Harborview book will be an extremely useful resource that will assist them with the quest for optimal patient care.

Bruce Douglas Browner, MD, MS, FACS

Preface to the Alumni (Second) Edition

The genesis for this second alumni edition of *Harborview Illustrated Tips and Tricks in Fracture Surgery* came from discussions with several of our ACE graduates, many of whom are trauma surgeons at other trauma hospitals in the United States, Canada, and internationally. These surgeons found the first edition to be useful and well received by their colleagues, residents, and their orthopaedic trauma fellows. Many volunteered that they learned other "tips and tricks" during their fellowship from their Harborview faculty mentors and that these hadn't been included in the first edition. Alternatively, our graduates also either had improved on what they had learned or had their own tip(s) that they wanted to share with a wider audience in hopes of improving patient care. They encouraged me to reach out to all of graduates from Harborview's Ortho Trauma program asking for volunteers who might want to contribute one or more tips and tricks to this second "Alumni Edition." We received contributions from past trauma fellows spanning nearly 40 years of our program. The most "senior" graduate to submit a tip is Randy Marcus (Class of 1980), and we also received many tips from the most recent graduating class (2015, see Table 1 below). While most submitted just one tip, a few submitted in excess of five manuscripts.

Though these tip chapters are authored by our alumni, this doesn't mean that they are claiming ownership of any specific technique or procedure nor does authorship imply that the technique is necessarily their "invention." Some of these tips have been published previously by the same or different authors. We want to emphasize that the idea behind the first edition and now this second "Alumni Edition" of *Harborview Illustrated Tips and Tricks in Fracture Surgery* has been to further the care of trauma patients by disseminating novel or helpful ideas that hopefully will increase quality of orthopaedic trauma care. It is not to give attribution to the author for the tip but instead to credit the author for the work involved in writing and illustrating the tip for the benefit of other surgeons. Though it may have been ideal if the author could give attribution to the tip's

creator, should it not be his/her own, this was not an expectation.

Mike Gardner and I have enlisted the editorial assistance of Mike Githens (class of 2016) in reviewing and revising many of the chapters from the first edition. Mike joined the Harborview Trauma faculty after completing his fellowship, and his “fresh eyes” and ideas have contributed to the breadth and depth of this second Alumni Edition. We thank him for his painstaking attention to detail and have added him as the third editor to this publication.

Mike Gardner and I also went through each of the new tip and trick submissions at least three times and took editorial license, so as to embellish, clarify, and make the text consistent with the style of the first edition. While enlarging the text significantly, we have maintained the organization of the first edition. The names of all authors contributing to a specific chapter are listed in alphabetic order at the beginning of each chapter. Some of the new alumni tips have been integrated into the text of each chapter while others are called out and featured separately. When featured as a separate tip or trick within a chapter, the name(s) of the contributor(s) submitting the specific tip is/are also associated with that feature. We should note too that we were unable to use every tip submitted though we thank the authors none the less.

As in the first edition, I would like to dedicate this book again to all of my colleagues (orthopaedic surgeons and nonorthopaedists) who provide emergency medical services to humankind. Should family or friends need emergency trauma care, I am glad to know that I can depend on the many trauma surgeons and physicians who have trained at Harborview Medical Center and at the other excellent trauma centers in the United States. I also want to acknowledge again, all of my past and present teachers and mentors but especially three of my role models, Professor Dr. med. Bernd Claudi, Dr. Kenneth D. Johnson, and Dr. Richard E. “Dickey” Jones (all former UTHSCD/Parkland physicians). Throughout their careers as orthopaedic surgeons, Bernd, Ken, and Dickey were committed to lifelong learning, teaching, and sharing their knowledge, ideas, and insights with fellows, residents, and medical students. All were incredibly generous individuals and gave their time and services freely to their patients and to their hospital’s staff. They were always respectful to all members of the health care team, and both willing served the less fortunate by putting their patients’ needs first and by always “doing the right thing” irrespective of reimbursement and the time of day.

I hope that the trauma faculty at Harborview, which has continued to change and expand since the first edition (Table 1), has instilled the same sense

of purpose, and this service ethic in our ACEs. Since the first edition was written in 2009–2010, 36 more ACEs have been added to list found in the Preface to the first edition. Those who have completed the trauma fellowship and those currently enrolled are listed below (Table 2):

Table 1 Harborview-based UW Orthopaedic Faculty from 1988–2017

Last Name, First Name	Hire Date	Current or Departure Date
Hansen, Sigvard T.	7/1/1968	7/1/2011, now emeritus
Winquist, Robert A.	7/1/1974	5/25/1980
Veith, Robert G.	7/1/1980	3/31/1984
Mayo, Keith A.	6/25/1984 and 12/26/2012	11/12/1990 and 10/25/2015
Sack, John T.	7/1/1984	7/1/2014
Anderson, Paul A.	7/1/1985	Current
Benirschke, Stephen K.	1/1/1986	Current
Sangeorzan, Bruce J.	4/1/1987	Current
Henley, M. Bradford	2/1/1988	Current
Swiontkowski, Marc	5/1/1988	9/1/1997
Routt, M. L. Chip	7/1/1989	12/3/2012
Trumble, Thomas E.	7/1/1989	1/7/2010
Smith, Douglas G.	7/1/1990	12/31/2016, now emeritus
Chapman, Jens R.	8/1/1991	11/1/2014
Hanel, Douglas P.	6/1/1992	Current
Mirza, Sohail	9/1/1995	8/31/2008
Nork, Sean E.	8/1/1998	Current
Allan, Christopher H.	9/1/1998	current (now UWMC based)
Mills, William J.	9/10/1998	7/2/2004
Bellabarba, Carlo	10/1/1999	Current
Barei, David P.	8/1/2000	Current
Taitsman, Lisa A.	8/1/2002	Current
Bransford, Richard J.	10/6/2003	Current
Beingessner, Daphne M.	8/1/2004	Current
Dunbar, Robert P.	9/15/2005	Current
Krieg, James C.	7/1/2007	5/31/2013
Huang, Jerry I.	9/1/2008	Current (now UWMC based)
Firoozabadi, Reza	9/17/2012	Current
Kennedy, Stephen	3/5/2013	Current
Sagi, H. Claude	9/1/2015	Current
Hébert-Davies, Jonah	12/1/2016	Current
Githens, Michael	8/1/2016	Current

Table 2 Chronology of HMC Orthopaedic Trauma ACEs from 2010–2018 (see Table 2 in the

Preface to the first edition for those ACEs from 1978–2010)

Name	Begin Date	End Date	Length (mo)
Barber, Richard	8/1/2010	7/31/2011	12
Miller, Anna	8/1/2010	7/31/2011	12
Munz, John	8/1/2010	7/31/2011	12
Olson, Soren	8/1/2010	7/31/2011	12
Sharp, Lorra	8/1/2010	7/31/2011	12
Steeves, Mark	8/1/2010	7/31/2011	12
Adam, mark	8/1/2011	7/31/2012	12
Eastman, Jonathan	8/1/2011	7/31/2012	12
Frioozabadi, Reza	8/1/2011	7/31/2012	12
Large, Thomas	8/1/2011	7/31/2012	12
Schneidkraut, Jason	8/1/2011	7/31/2012	12
Bernstein, Mitchell	8/1/2012	7/31/2013	12
Maracek, Geoffrey	8/1/2012	7/31/2013	12
Scolaro, John	8/1/2012	7/31/2013	12
Shatsky, Joshua	8/1/2012	7/31/2013	12
Westrick, Edward	8/1/2012	7/31/2013	12
Fishler, Thomas	8/1/2013	7/31/2014	12
Hébert-Davies, Jonah	8/1/2013	7/31/2014	12
Learned, James	8/1/2013	7/31/2014	12
Little, Milton	8/1/2013	7/31/2014	12
Spittler, Clay	8/1/2013	7/31/2014	12
Lee, John	8/1/2014	7/31/2015	12
Schenker, Mara	8/1/2014	7/31/2015	12
Shearer, David	8/1/2014	7/31/2015	12
Toogood, Paul	8/1/2014	7/31/2015	12
Yuan, Brandon	8/1/2014	7/31/2015	12
Alton, Timothy	8/1/2015	7/31/2016	12
Garner, Matthew	8/1/2015	7/31/2016	12
Githens, Michael	8/1/2015	7/31/2016	12
Haller, Justin	8/1/2015	7/31/2016	12
Sullivan, Matthew	8/1/2015	7/31/2016	12
Cohen, Joseph	8/1/2016	7/31/2017	12
Hirschfeld, Adam	8/1/2016	7/31/2017	12
Murr, Kevin	8/1/2016	7/31/2017	12
Refaat, Motasem	8/1/2016	7/31/2017	12
Romeo, Nicholas	8/1/2016	7/31/2017	12
Donohue, David	8/1/2017	7/31/2018	12
Hecht, Garin	8/1/2017	7/31/2018	12
Lucas, Justin	8/1/2017	7/31/2018	12
Putnam, Sara	8/1/2017	7/31/2018	12

Disclaimer

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I also want to thank my wife, Ann Rutledge; my parents, Ernest and Elaine; my daughters, Taryn and Cailin; and my colleagues and friends for their support and help during this project.

Thank you very much
Brad Henley

Preface to the First Edition

I developed the idea for this book nearly 15 years ago. Like most orthopaedic surgeons, I learned surgical operations by reading about a specific or preferred technique. This was followed by observing the procedure as performed by a mentor. At some point in my training, I began performing these operations as the operating "surgeon," usually with the assistance of a senior physician. After I was awarded my first academic position at University of Texas Southwestern Health Science Center at Dallas (UTHSCD) and Parkland Hospital, I performed them independently. Also similar to most orthopaedic surgeons, after "reading one, doing one, and teaching one," I would frequently modify certain aspects of the operation to make it "better" and to improve my surgical efficiency. Throughout my career, I have continued to "refine" procedures, using what I believe are more effective and efficient methods of accomplishing the task of obtaining an anatomical reduction (an "ORIF" instead of an "OIF"[1])

After leaving UTHSCD, I joined the University of Washington (UW) faculty at Harborview Medical Center (HMC). When I arrived in February 1988, the full-time faculty at HMC numbered only five: Sigvard "Ted" Hansen, Keith Mayo, Paul A. Anderson, Stephen K. Benirschke, and Bruce J. Sangeorzan. Steve and Bruce had recently completed fellowships in Trauma and Foot & Ankle, respectively. Later in 1988, Marc Swiontkowski joined our team expanding our number to seven. Ted, Bruce, and Paul had a nontrauma orthopaedic specialty as their primary clinical interest, though all took trauma call and cared for patients with musculoskeletal injuries. Over the next decades, the Harborview's Orthopaedic faculty contracted and expanded. Currently, we have eight full-time faculty trauma surgeons and Ted Hansen with more than 179 years of postfellowship trauma experience. Supplementing these core trauma surgeons are the other faculty based at HMC who share in covering trauma call, hand call, or spine call; I believe that the orthopaedic group at Harborview is the largest trauma group with the greatest accumulated experience treating musculoskeletal injuries in the nation (~280 physician years). Table 1 summarizes the orthopaedic faculty appointments and departures since my arrival at HMC.

The faculty at Harborview have a long history dedicated to graduate and postgraduate medical education. Beginning in the 1970s, they offered an opportunity for physicians desiring a greater trauma experience to spend time at the institution dedicated to the care of patients with musculoskeletal injuries. Both academic and community orthopaedists availed themselves of this experience and would spend either 3 or 6 months working with the residents and faculty. It was not until the mid-1980s that a few surgeons would stay for a year at a time. With the formation of the Orthopaedic Trauma Hospital Association (OTHA, the organization preceding the Orthopaedic Trauma Association [OTA; www.ota.org]), two 1-year long orthopaedic trauma fellowship positions were offered. By the late 1980s, after Marc Swiontkowski's and my arrival at HMC, three Advanced Clinical Experience (ACE) positions were offered per year. Over the next two decades, the number of positions expanded gradually from the initial three, to four, then five, and finally to the six trauma ACE positions we offer today. (Table 2 summarizes the chronology of HMC Orthopaedic Trauma ACEs.)

Being an orthopaedic trauma attending at Harborview Medical Center in Seattle allowed me to establish a practice devoted full time to musculoskeletal trauma. Performing operations, repetitively, provided many opportunities to devise my own set of tips and tricks. However, working at Harborview has also allowed me to work with some of the world's foremost thought leaders and best technical orthopaedic trauma surgeons. This environment has been conducive to collaboration and refinement of patient care. Our weekly fracture conference is renowned as it allows discourse and debate of the treatments for acute ortho trauma by six-twelve orthopaedic trauma surgeons. Additionally, my colleagues and I can often "visit" with each other in between cases to observe each other's techniques and technical tips.

Table 1 Harborview-Based UW Orthopaedic Faculty from 1988 to 2009

Last name, First name	Hire Date	Current or Depart Date
Hansen, Sigvard T.	7/1/1968	current
Winquist, Robert A.	7/1/1974	5/25/1980
Veith, Robert G.	7/1/1980	3/31/1984
Mayo, Keith A.	6/25/1984	11/12/1990
Sack, John T.	7/1/1984	current
Anderson, Paul A.	7/1/1985	4/30/1994
Benirschke, Stephen K.	1/1/1986	current
Sangeorzan, Bruce J.	4/1/1987	current

Henley, M. Bradford	2/1/1988	current
Swiontkowski, Marc	5/1/1988	9/1/1997
Routt, M. L. Chip	7/1/1989	current
Trumble, Thomas E.	7/1/1989	current
Smith, Douglas G.	7/1/1990	current
Chapman, Jens R.	8/1/1991	current
Hanel, Douglas P.	6/1/1992	current
Mirza, Sohail	9/1/1995	8/31/2008
Nork, Sean E.	8/1/1998	current
Allan, Christopher H.	9/1/1998	current
Mills, William J.	9/10/1998	7/2/2004
Bellabarba, Carlo	10/1/1999	current
Barei, David P.	8/1/2000	current
Taitsman, Lisa A.	8/1/2002	current
Bransford, Richard J.	10/6/2003	current
Beingessner, Daphne M.	8/1/2004	current
Dunbar, Robert P.	9/15/2005	current
Krieg, James C.	7/1/2007	current
Huang, Jerry I.	9/1/2008	current

This has allowed us to disseminate our own ideas and those of our colleagues by incorporating each other's tricks, tips, and treatment philosophies into the care of our own patients and our educational philosophy.

Over the past 15 years, I have often thought of codifying these tips and tricks in journal articles or book form. Some tips and tricks have been published by HMC ACEs in orthopaedic journals but many ideas of the HMC trauma faculty are unpublished. It has been a habit of the ACEs to keep a diary or record of their cases noting surgical tips, tricks, and techniques. In September of the 2007–2008 ACE year, I pitched my idea to our six trauma fellows (Mike Brennan, Andy Evans, Jason Evans, Mike Gardner, Zach Roberts, and Ray Wright). I was greeted with enthusiastic support. Each of the ACEs digitally recorded their observations and lessons learned after each case or at the end of the day. They illustrated their notes with digital images saved from the image intensifier and planar radiographs during their 1-year experience. Their hand drawings were converted to medical illustrations by Scott Bodell, a superb medical illustrator whom I met while at UTHSCD (1985–1988). These image files were appended to their recorded observations and serve to illustrate many of the tips and tricks. This book is therefore the result of a single year's observations of select cases made by six orthopaedic trauma ACEs (8/2007–

7/2008), each of whom was assigned authorship of one or more chapters.

Over the course of the year, Mike Gardner demonstrated an affinity for this book concept. He used his leadership skills to help me organize the project and served as the liaison with his peers. Based on his academic interest and his early and sustained contributions to the manuscript, I suggested that he serve as coeditor with me. Each ACE was assigned authorship of one or more chapters.

Mike and I understand that HMC is an orthopaedic center for the germination and coalescence of ideas and techniques. This is facilitated by a continuing stream of scholars, visitors, and physicians who seek education and advanced training. Together with the faculty, these individuals help catalyze the refinement of ideas and techniques, which lead to new techniques and improved patient care. We know that musculoskeletal trauma care will continue to evolve in the future. It is our hope that HMC and our ACE disciples will continue to maintain leadership roles through research and collaboration.

The editors and authors make no claim to many of the techniques, “tips,” and “tricks” described in this publication. Instead, we view it as a compilation of those techniques that were used by the HMC faculty and observed and chronicled in a 1-year period by our six orthopaedic trauma ACEs. Some of these techniques were learned from interactions with our national and international colleagues while others may be accurately ascribed to a specific HMC faculty member. Some of these ideas may have been published previously by other authors and this is referenced only if we were aware of the prior publication.

Table 2 Chronology of HMC Orthopaedic Trauma ACEs

Name	Begin Date	End Date	Length (mo)
Stuyck, Jos	10/13/1978	9/17/1979	11
Weber, Michael	10/1/1979	12/31/1979	3
Jackson, Robert	1/1/1980	6/30/1980	6
Marcus, Randall	4/1/1980	6/30/1980	3
Johnson, Kenneth D.	12/1/1980	6/15/1981	6
Shammas, Sameer	7/1/1980	12/31/1980	6
Jacobson, Wells	1/1/1981	3/31/1981	3
Kellam, James	4/1/1981	6/30/1981	3
Burney III, Dwight	7/1/1981	9/30/1981	3
Burman, William	10/1/1981	12/31/1981	3
Ratcliffe, Steven	1/1/1982	3/31/1982	3
Gerhart, Tobin	4/1/1982	6/30/1982	3

Webb, Lawrence	7/1/1983	12/31/1983	6
Moody,Wayne	1/3/1984	2/29/1984	2
LaMont, Justin	7/1/1984	6/30/1985	12
Wilber, John	7/1/1984	6/30/1985	12
Cotler, Howard	1/1/1985	6/30/1985	6
Lhowe, David	7/1/1985	12/31/1985	6
Moye, Daniel	7/1/1985	6/1/1986	11
Carr, James	8/1/1985	7/31/1986	12
Cornell, Charles	1/1/1986	6/30/1986	6
Jonassen, E. Andrew	7/1/1986	6/30/1987	12
Keeve, Jonathan	7/1/1986	12/31/1986	6
Donovan, Thomas	1/1/1987	4/30/1987	4
Benca, Paul	7/1/1987	6/30/1988	12
Carr, Charles	7/1/1987	12/31/1987	6
Kaehr, David	7/1/1987	6/30/1988	12
Verdin, Peter	7/1/1987	6/30/1988	12
Mirels, Hilton	7/1/1988	1/31/1989	7
Routt, Chip	7/1/1988	6/30/1989	12
Gruen, Gary	1/1/1989	6/30/1989	6
Agnew, Samuel	7/1/1989	7/31/1990	13
Santoro, Vincent	7/1/1989	7/15/1990	12
Peter, Robin	7/16/1990	7/15/1991	12
West, Gregory	7/16/1990	7/15/1991	12
Chapman, Jens	8/1/1990	1/31/1991	6
Kottmeier, Stephen	1/1/1991	7/31/1991	7
Cramer, Kathryn	8/1/1991	7/31/1992	12
Meier, Mark	8/1/1991	7/31/1992	12
Patterson, Brendan	8/1/1991	7/31/1992	12
Grujic, Les	8/1/1992	7/31/1993	12
Ott, Judson	8/1/1992	7/31/1993	12
Selznick, Hugh	8/1/1992	7/31/1993	12
Brokaw, David	8/1/1993	7/31/1994	12
Handley, Robert	8/1/1993	7/31/1994	12
Teague, David	8/1/1993	7/31/1994	12
McNamara, Kevin	4/1/1994	7/31/1994	4
Hubbard, David	8/1/1994	7/31/1995	12
Schwappach, John	8/1/1994	7/31/1995	12
Twaddle, Bruce	8/1/1994	7/31/1995	12
Weber, Tim	8/1/1994	7/31/1995	12
Clark III, Carey	8/1/1995	7/31/1996	12
Desai, Bharat	8/1/1995	7/31/1996	12
Krieg, James	8/1/1995	7/31/1996	12

Thomson, Gregory	8/1/1995	7/31/1996	12
Harding, Susan	8/1/1996	7/31/1997	12
Harvey, Edward	8/1/1996	7/31/1997	12
Mormino, Matt	8/1/1996	7/31/1997	12
O'Byrne, John	8/1/1996	7/31/1997	12
Cole, Peter	8/1/1997	7/31/1998	12
Jones, Cliff	8/1/1997	7/31/1998	12
Nork, Sean	8/1/1997	7/31/1998	12
Russell, George	8/1/1997	7/31/1998	12
Kuo, Roderick	8/1/1998	7/31/1999	12
Sanzone, Anthony	8/1/1998	7/31/1999	12
Segina, Daniel	8/1/1998	7/31/1999	12
Tejwani, Nirmal	8/1/1998	7/31/1999	12
Barei, David	8/1/1999	7/31/2000	12
Hymes, Robert	8/1/1999	7/31/2000	12
Schildhauer, Thomas	8/1/1999	7/31/2000	12
Schwartz, Alexandra	8/1/1999	7/31/2000	12
Ertl, William	8/1/2000	7/31/2001	12
Fowble, Coleman	8/1/2000	7/31/2001	12
Ringler, James	8/1/2000	7/31/2001	12
Vallier, Heather	8/1/2000	7/31/2001	12
Camuso, Matthew	7/1/2001	8/31/2002	14
McNair, Patrick	7/1/2001	8/31/2002	14
Taitsman, Lisa	8/1/2001	7/31/2002	12
Wagshul, Adam	8/1/2001	7/31/2002	12
Wiater, Patrick	8/1/2001	7/31/2002	12
Coles, Chad	8/1/2002	7/31/2003	12
Dunbar, Robert	8/1/2002	7/31/2003	12
Hammerberg, Eric Mark	8/1/2002	7/31/2003	12
Polonet, David	8/1/2002	7/31/2003	12
Smith, Carla	8/1/2002	7/31/2003	12
Beingessner, Daphne	8/1/2003	7/31/2004	12
Farrell, Eric	8/1/2003	7/31/2004	12
Howlett, Andrew	8/1/2003	7/31/2004	12
Molnar, Rob	8/1/2003	7/31/2004	12
Stafford, Paul	8/1/2003	7/31/2004	12
Confl itti, Joseph	8/1/2004	7/31/2005	12
Della Rocca, Gregory	8/1/2004	7/31/2005	12
Gomez, Arturo	8/1/2004	7/31/2005	12
Osgood, Gregory	8/1/2004	7/31/2005	12
Weiss, David	8/1/2004	7/31/2005	12
Bryant, Ginger	8/1/2005	7/31/2006	12

Graves, Matthew	8/1/2005	7/31/2006	12
Greene, Craig	8/1/2005	7/31/2006	12
Howard, James	8/1/2005	7/31/2006	12
O'Mara, Timothy	8/1/2005	7/31/2006	12
Yoo, Brad	8/1/2005	7/31/2006	12
Kubiak, Erik	8/1/2006	7/31/2007	12
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Mirza, Amer	8/1/2006	7/31/2007	12
Puttler, Eric	8/1/2006	7/31/2007	12
Summers, Hobie	8/1/2006	7/31/2007	12
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Brennan, Michael	8/1/2007	7/31/2008	12
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Oldenburg, Frederick	8/1/2008	7/31/2009	12
Orec, Robert	8/1/2008	7/31/2009	12
Bishop, Julius	8/1/2009	7/31/2010	12
Cross, W. Woodie	8/1/2009	7/31/2010	12
Dikos, Greogry	8/1/2009	7/31/2010	12
Glasgow, Don	8/1/2009	7/31/2010	12
Maples, Allan	8/1/2009	7/31/2010	12
McAndrew, Christopher	8/1/2009	7/31/2010	12

I would like to dedicate this book to all of my colleagues (orthopaedists and nonorthopaedists) who provide emergency medical services to humankind. Should family or friends need emergency trauma care, I am glad to know that I can depend on the many trauma surgeons and physicians who have trained at Harborview and at the other excellent trauma centers in the United States. I want to acknowledge, especially, all of my past and present teachers and mentors (especially Professor Dr. med. Bernd Claudi and Dr. Kenneth D. Johnson), current and former (UTHSCD and UW/HMC) faculty colleagues, OTA colleagues and members, and HMC ACEs [see Tables 1 and 2]. It is these individuals and their disciples who have dedicated their careers to providing the

emergency trauma services and are continuing graduate and postgraduate education needed by our nation. Most importantly, I want to thank my domestic partner Ann Rutledge; my parents, Ernest and Elaine; my daughters, Taryn and Cailin; and my colleagues and friends for their support and help during this project.

Thank you very much
Brad Henley

When I first visited Harborview during my residency, I attended the weekly fracture conference. After witnessing the postoperative fracture conference and X-ray presentations, I knew immediately I wanted to learn and emulate the quality, techniques, and style of fracture fixation that seemed to be consistent among all faculty. During my fellowship at Harborview, this conference was among the many highlights. The postoperative review of many fluoroscopic images in succession, often 15 or 20, made it possible to follow along the progression of the procedure, step by step. The subtleties of clamp placements for specific fracture fragments, reduction sequences for common fracture patterns, and the rationale for particular implant choices and positions were often discussed. This was an extremely effective way to teach and learn the technical aspects of fracture surgery. My co-fellows and I began to jot down names of interesting patients during the conference, and would later review and save the images. A critical mass of particularly demonstrative cases was obtained, and formed the basis of the present text. I have subsequently revisited these chapters countless times prior to operations, and hope it can similarly provide other young fracture surgeons with useful techniques. Participating in this “extra-curricular” activity during my fellowship and early career would not have been possible without the endless support and understanding from my wife, Katie, and daughter, Kelsey.

I hope that you will enjoy this compilation of tips, tricks and surgical cases that my colleagues and I have compiled.

Thank you
Mike Gardner

[1]I ascribe this vernacular to the insights and surgical perfectionism of my partner and friend “Stevie B” (Stephen. K. Benirschke MD): ORIF — open reduction with internal fixation; OIF — open….with

internal fixation.

Tribute

On December 10, 2017, the orthopaedic trauma community was shocked and heartbroken to learn of the untimely passing of Dean G. Lorich, MD. As those who worked with Dean can attest, he was the epitome of a master surgeon. His attention to detail, relentless pursuit of perfection, and technical expertise were a few of the reasons nearly all of his trainees put him on an untouchable pedestal. He had a knack for innovative thinking that was unparalleled, and his refusal to concede that the standard was the best way to do something led him to push the envelope; his patients had better outcomes because of it. But perhaps more impressive and memorable than his personal dexterity and stamina was the energy and passion he had toward making his trainees better surgeons. He embodied “tough love,” and the way he transformed and matured us as young surgeons was visible and unprecedented.

Now almost 10 years into practice, as my circle of colleagues and experience has expanded, it gets difficult to remember where I learned certain techniques or surgical approach nuances. But one never forgets where the basic principles and foundation of orthopaedic surgery were established. Dean gave that to me, and I am forever grateful. He was a mentor and friend to myself and countless residents, fellows, and others and will be deeply missed for a long time. Although he never would have wanted this much praise and gratitude, I’d like to dedicate this book to Dean, with a heartfelt “thank you,” and may he rest in peace.

Mike Gardner

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Section 1
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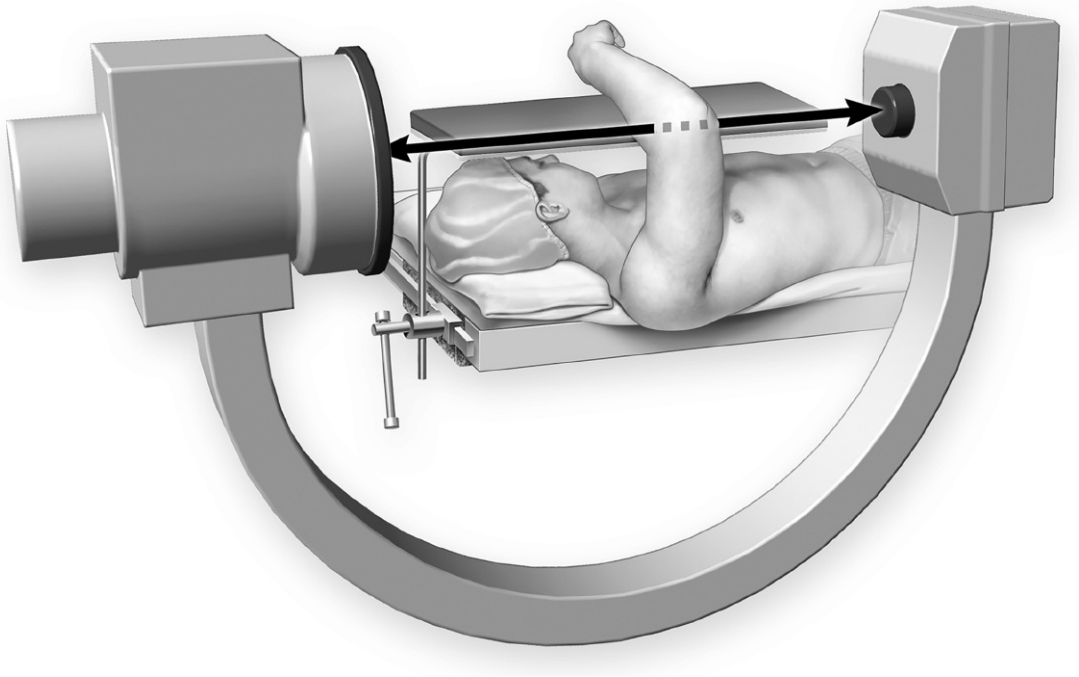

Chapter 1
Patient Positioning

MICHAEL L. BRENNAN
ERIC D. FARRELL
CONOR KLEWENO
LISA A. TAITSMAN

- The goal of positioning a patient for surgery is to allow the surgeon unrestricted access to the extremity (surgical site) for the surgical procedure and for imaging.
- Prolonged soft tissue pressure and shear forces from improper positioning may compromise quality of care and patient safety, resulting in tissue injuries such as circulatory embarrassment, perioperative pressure ulcers, and neurological injury, even in routine surgical procedures.

Upper Extremity

ORIF Clavicle, Proximal Humerus, Humeral Shaft

- Supine on reversed radiolucent cantilever table.
  - Standard beach chair positioning is an alternative.
- Patient brought as proximal and lateral on the table as possible, with head at the top corner of the table, ipsilateral to operative extremity (Figs. 1-1 and 1-2).
  - Neck should be slightly extended and head turned slightly away from operative extremity and secured with tape over a forehead towel.
- Small folded towel may be placed beneath the ipsilateral scapula if needed.
- C-arm from the top of the table, parallel to the long axis of the bed, permits axillary lateral image of the humerus in addition to standard imaging of the shoulder girdle.
- Radiolucent (e.g., Plexiglas) arm board is placed under the mattress pad with

sufficient board protruding to support the arm.

- Add height to radiolucent Plexiglas arm support with blankets (secure with tape) to match the table pad height.

Figure 1-1 Supine positioning for upper extremity procedure, C-arm from the head of the bed.

Figure 1-2 C-arm position for axillary lateral imaging.

- Upper extremity is draped free.
- Wide prep and drape to contralateral side of midline (Figs. 1-3 and 1-4).
  - Include the sternal notch in field.

Figure 1-3 Supine positioning for upper extremity procedure after prepping and draping.

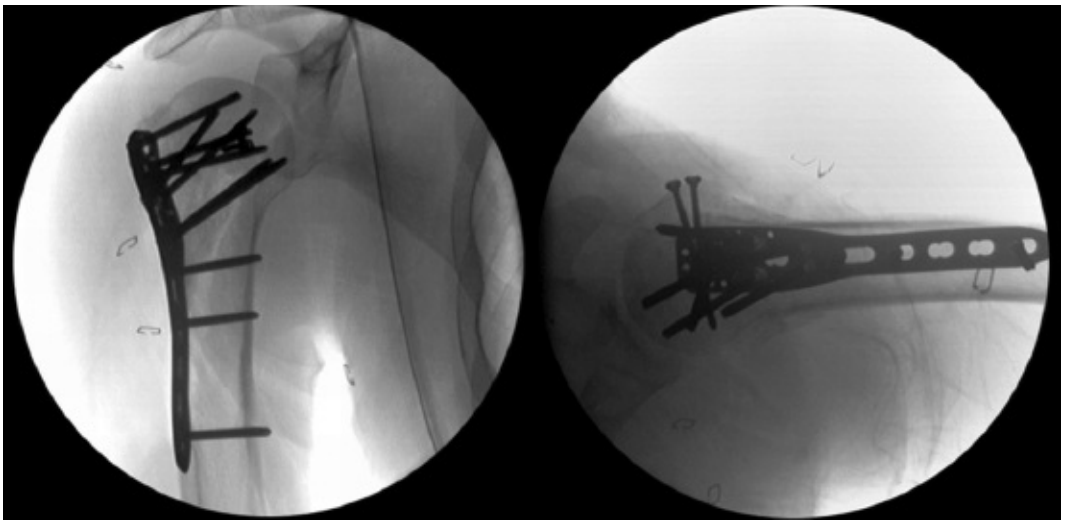

Figure 1-4 AP and axillary fluoroscopic imaging in supine position.

IM Nail Humerus (Supine)

- Radiolucent reversed cantilever or fully radiolucent table such that the patient's head/upper extremities are placed at the cantilevered end.
- Small bump (folded towel) beneath the scapula.
- C-arm from the opposite side of the table (use fluoroscope that goes 45 degrees beyond vertical ["over the top"] and 90 degrees in the other direction).
- Uninjured arm adducted alongside the body, so that it does not impede the C-arm moving parallel to the long axis of the table/arm.
- Plexiglas arm board with stacked blankets to match the table pad height.
  - Plexiglas board is placed on the table, under the mattress pad and the patient with its long axis parallel to the table.
  - It needs only to protrude from the side of the OR table by 4 to 6 inches to support the adducted operative extremity (Figs. 1-5–1-9).

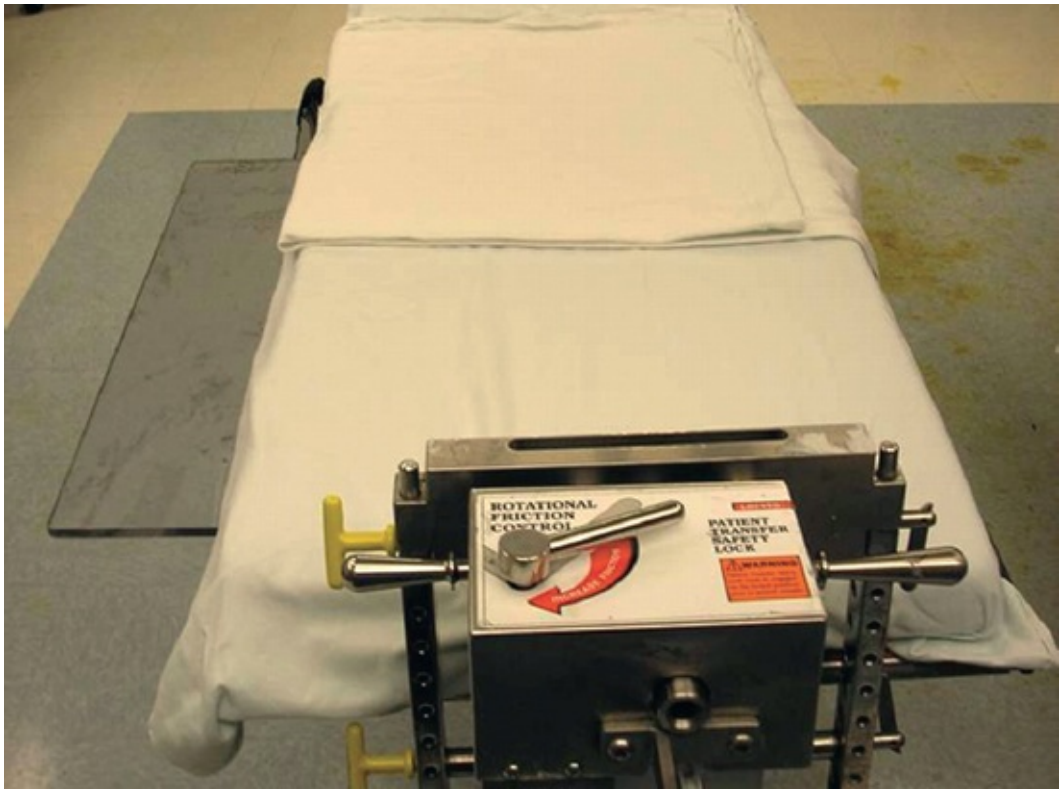

Figure 1-5 Radiolucent flat top table with Plexiglas arm support.

Figure 1-6 Radiolucent flat top table with Plexiglas arm support.