



FORTY-FIFTH ANNUAL MEETING

**March 1-6, 2015
Telluride, Colorado**

Dear WTA Members and Guests:

On behalf of the Officers and Board of Directors of the Western Trauma Association, I would like to welcome you to the 45th Annual Meeting in Telluride, Colorado. The program committee, headed by Peter Rhee, has created an outstanding scientific program which is available online at www.westerntrauma.org as well as in the program book. In addition to original research, highlights include three Pro/Con Debates, Panel of Experts, two Algorithm sessions as well as two Family Abstracts that reflect the WTA spirit. The presidential address is Tuesday afternoon. Dr. Charles S. Cox will present the 7th Annual Founder's Basic Science lecture on Thursday morning and Dr. Julie Freischlag will present the 2015 Paint the Ceiling Lecture on Thursday afternoon.

The Social Program once again includes events destined to be classic WTA moments. These include Star Gazing on Sunday and Monday evenings at Hotel Madeline, Complimentary Mountain Tour on Monday morning, Residents Reception on Monday evening, NASTAR race, Mountain Barbeque, WTA Book Club and Family Sledding Night on Wednesday, Banquet and Kids party on Thursday evening.

The WTA is about science, collegiality, family and friends and Telluride provides the ideal winter venue for all of us to reconnect and rejuvenate. There is no doubt that this has been a wild and crazy winter across the United States. I am delighted to be your host for what I anticipate to be another wonderful week of science and fellowship with the WTA.

Sincerely,

Christine S. Cocanour
2014-2015 President

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ACCREDITATION STATEMENT

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the American College of Surgeons and the Western Trauma Association. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™

The American College of Surgeons designates this live activity for a maximum of 18.75 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the *AMA PRA Category 1 Credits™* listed above, a maximum of 13.25 credits meet the requirements for Self-Assessment.



AMERICAN COLLEGE OF SURGEONS

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100+years

SPEAKER DISCLOSURE INFORMATION

In compliance with ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. All reported conflicts are managed by a designated official to ensure a bias-free presentation. Please see the insert to this program for the complete disclosure list.

WTA MISSION STATEMENT

The Western Trauma Association is committed to the improvement of trauma care through research, education, sharing of clinical experiences, and the development of physicians of all specialties who are involved in the care of trauma patients. The goals of the Association are not only the intellectual growth attained through increased knowledge, but also the emotional growth attained through camaraderie and interaction with family and friends in an environment conducive to winter sports.

LEARNING OBJECTIVES

This activity is designed for physicians of all specialties who are involved in the care of trauma patients. Meeting attendees will hear a wide range of scientific information covering the topics discussed here plus many others. Using that information, attendees can make appropriate adjustments to their own, and their institutions' current practices to align new scientific data. Upon completion of this course, attendees will be able to better understand:

1. have the ability to make appropriate adjustments to their own, and their institutions', practices to align new scientific data
2. discuss pertinent topics in trauma that are currently being researched
3. Recognize the pathophysiology after trauma
4. Know when to apply damage control surgery techniques as well as when to use radiographic studies to diagnose and manage the patients
5. Identify the pros and cons of ordering too many tests
6. systematically manage penetrating chest trauma and how to better manage duodenal injuries

2014-2015 OFFICERS & COMMITTEE CHAIRS

Officers

President	Christine S. Cocanour, MD
President-Elect	Thomas Scalea, MD
Vice President	Carl J. Hauser, MD
Secretary	David V. Shatz, MD
Treasurer	Dennis W. Vane, MD
Historian	Harold F. Sherman, MD
Immediate Past President	David H. Livingston, MD

Board of Directors

Term Ends

Alicia J. Mangram, MD	2015
Richard S. Miller, MD	2015
R. Lawrence Reed, MD	2015
Hasan B. Alam, MD	2016
Mark T. Metzдорff, MD	2016
Martin A. Schreiber, MD	2016
Krista L. Kaups, MD	2017
David H, Livingston, MD	2017
R. Stephen Smith, MD	2017

Program Committee

Peter Rhee, MD, *Chair*

Publications Committee

Roxie M. Albrecht, MD, *Chair*

Nominating Committee

David H. Livingston, MD, *Chair*

Multi-Center Trials Committee

Rosemary A. Kozar, MD, *Chair*

Algorithms Committee

Karen J. Brasel, MD, *Chair*

2014-2015 COMMITTEES

Program Committee

Peter Rhee, MD, *Chair*
Hasan Alam, MD
Roxie A. Albrecht, MD
Christine S. Cocanour, MD
Kenji Inaba, MD
Matthew Martin, MD
Richard Miller, MD
Kimberly Peck, MD
Anne Rizzo, MD
Susan Rowell, MD
Jack Sava, MD
Gary Vercruysse, MD

Publications Committee

Roxie A. Albrecht, MD, *Chair*
C. Clay Cothren- Burlew, MD
Megan Brenner, MD
Carlos Brown, MD
Mitch Cohen, MD
Panna Codner, MD
Matthew L. Davis, MD
Rochelle Dicker, MD
Larry Diebel, MD
John Kepros, MD
Robert Letton, MD
David M Notrica, MD
Barbara Mainville, MD
Alicia Mangram, MD
Ash Mansour, MD
Matt Martin, MD
Claude (Henry) Sagi, MD
Stephanie Savage, MD
Mike Truitt, MD
Nicholas Wetjen, MD

Nominating Committee

David H. Livingston, MD, *Chair*
Mark T. Metzдорff, MD
Andrew Michaels, MD
Steve Ross, MD

Multi-Center Trials Committee

Rosemary A. Kozar, MD, *Chair*

Algorithms Committee

Karen J. Brasel, MD, *Chair*
Roxie A. Albrecht, MD
Martin Croce, MD
Riyad Karmy-Jones, MD
Ernest E. Moore, MD
Nick Namias, MD
Martin Schreiber, MD
David V. Shatz, MD

WTA PRESIDENTS

Robert G. Volz, MD	1971	Vail
Robert G. Volz, MD	1972	Vail
Peter V. Teal, MD	1973	Vail
William R. Hamsa, MD	1974	Aspen
Arthur M. McGuire, MD	1975	Sun Valley
Lynn Ketchum, MD	1976	Snowmass
Fred C. Chang, MD	1977	Park City
Glen D. Nelson, MD	1978	Steamboat
Gerald D. Nelson, MD	1979	Snowmass
Kevin G. Ryan, MD	1980	Snowbird
David S. Bradford, MD	1981	Jackson Hole
Erick R. Ratzer, MD	1982	Vail
William R. Olsen, MD	1983	Jackson Hole
Earl G. Young, MD	1984	Steamboat Springs
Robert B. Rutherford, MD	1985	Snowbird
Rudolph A. Klassen, MD	1986	Sun Valley
Robert J. Neviasser, MD	1987	Jackson Hole
Robert C. Edmondson, MD	1988	Steamboat Springs
Ernest E. Moore, MD	1989	Snowbird
Stephen W. Carveth, MD	1990	Crested Butte
George E. Pierce, MD	1991	Jackson Hole
Peter Mucha, Jr., MD	1992	Steamboat
David V. Feliciano, MD	1993	Snowbird
R. Chris Wray, MD	1994	Crested Butte
David A. Kappel, MD	1995	Big Sky
Thomas H. Cogbill, MD	1996	Grand Targhee
G. Jerry Jurkovich, MD	1997	Snowbird
James B. Benjamin, MD	1998	Lake Louise
Herbert J. Thomas III, MD	1999	Crested Butte
Barry C. Esrig, MD	2000	Squaw Valley
Steven R. Shackford, MD	2001	Big Sky
James A. Edney, MD	2002	Whistler-Blackcomb
J. Scott Millikan, MD	2003	Snowbird
Harvey J. Sugerman, MD	2004	Steamboat Springs
Scott R. Petersen, MD	2005	Jackson Hole

WTA PRESIDENTS

Harold F. Sherman, MD	2006	Big Sky
Frederick A. Moore, MD	2007	Steamboat Springs
James W. Davis, MD	2008	Squaw Valley
Grace S. Rozycki, MD	2009	Crested Butte
Robert C. Mackersie, MD	2010	Telluride
M. Gage Ochsner, MD	2011	Big Sky
R. Lawrence Reed, MD	2012	Vail
Mark T. Metzdorff, MD	2013	Snowmass
David H. Livingston	2014	Steamboat Springs
Christine S. Cocanour	2015	Telluride

NEW MEMBERS

Western Trauma Association Welcomed the Following New Members at the 2014 Annual Meeting

Lisa Ferrigno, MD
Santa Barbara, CA
General Surgery
Active Member

Matthew Loos, MD
Morgantown, WV
Hand Surgery
Active Member

Anastasia Kunac, MD
Newark, NJ
Hospice & Palliative Medicine
Active Member

Olga Kaslow, MD, PhD
Milwaukee, WI
Anesthesiology
Active Member

Robert Letton, Jr., MD
Oklahoma City, OK
Pediatric Surgery
Active Member

Michael Norman, MD
Webster, TX
General Surgery
Active Member

Robert O'Connor, MD
Fort Myers, FL
Critical Care
Active Member

Ali Tabatabai, MD
Baltimore, MD
Internal Medicine
Active Member

Martin Zielinski, MD
Rochester, MN
Critical Care
Active Member

WESTERN TRAUMA FOUNDATION DONORS

Current lifetime accumulation status, based on 2014 year end

Couloir Society (\$5,000 and Above)

Roxie Albrecht
Christine Cocanour
James Davis
Barry Esrig
David Feliciano
David Livingston
Mark Metzdorff
J. Scott Millikan
Robert Neviasser
Scott Petersen
R. Lawrence Reed
Grace Rozycki
Thomas Scalea
Steven Shackford
Dennis Vane
Anonymous Founder

Double Black Diamond Club (\$2,500 - \$4,999)

Denis Bensard
Marilu Bintz
Kimberly Davis
Soumitra Eachempati
David Kappel
Krista Kaups
Robert Mackersie
Matthew Martin
Andrew Michaels
Steven Ross
R. Stephen Smith
Harvey Sugerman
Herbert Thomas, III

Black Diamond Circle (\$1,000 - \$2,499)

John Adams
James Benjamin
Walter Biffi
Miriam Bullard
David Ciesla
Thomas Cogbill
Raul Coimbra
Matthew Davis
Doreen DiPasquale
George Dulabon
Enrique Ginzburg
K. Dean Gubler
Carl Hauser
Gregory Jurkovich
Brent King
M. Margaret Knudson
Rosemary Kozar
Guy Lanzi
Manuel Lorenzo
James McCarthy
Robert McIntyre, Jr.
Richard Miller
Ernest Moore
Frederick Moore
Steve Moulton
M. Gage Ochsner
Patrick Offner
Anne Rizzo akaFantini
Keith Stephenson
Steven Wald
Michaela West

WESTERN TRAUMA FOUNDATION DONORS

Blue Trail Associate (\$500 - \$999)

Scott Armen
Carlos Brown
Gregory Campbell
Howard Champion
Roy Cobean
Alain Corcos
Clay Cothren-Burlew
James Cushman
Bruce Ferris
Richard Gamelli
Larry Gentilello
John Hall
David Hoyt
Riyad Karmy-Jones
William Long
M. Ashraf Mansour
Frank Nastanski
J. Bradley Pickhardt
Basil Pruitt
Peter Rhee
Aaron Scifres
Mark Shapiro
George Testerman
ERIC A. Toschlog
Jennifer Watters
R. Christie Wray, Jr.

Green Trail Associate (\$250 - \$499)

Bonny Baron
Karen Brasel
Alfonso Fonseca
Rajan Gupta
Michael Hauty
James Hebert
Barbara Latenser
Richard Leone
Charles Mains
Edmund Rutherford
Daniel Vargo

Friends of the WTA (\$1 - \$249)

Donald Carter
Mitch Cohen
Charles Cook
Rochelle Dicker
John Fildes
Charles Fox
Warren Gall
Rajesh Gandhi
Jay Johannigman
Heather MacNew
Ajai Malhotra
Robert Maxwell
Charlene Nagy
Nicholas Namias
Keith O'Malley
George Pierce
Susan Rowell
Jack Sava
Carol Schermer
S. Robb Todd
Gary Verduyse
Amy Wyrzykowski
Ben Zarzaur

IN MEMORIAM

Earl G. Young, MD

February 27, 1989

Gerald S. Gussack, MD

August 25, 1997

Peter Mucha, Jr., MD

August 9, 2006

W. Bishop McGill, MD

October 14, 2007

Ronald P. Fischer, MD

January 25, 2013

M. Gage Ochsner, MD

April 26, 2013

George Cierny, MD

June 24, 2013

R. Christie Wray, MD

November 18, 2013

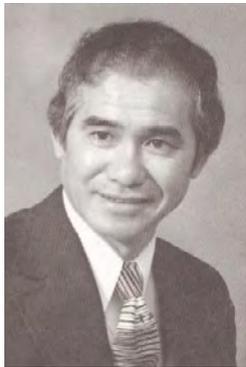
Robert B. Rutherford, MD

November 22, 2013

Doreen DiPasquale, MD

January 7, 2014

EARL YOUNG AWARD



**Earl G. Young, MD
(1928-1989)**

RESIDENT PAPER COMPETITION

Dr. Earl G. Young of Minneapolis was a founding member of the Western Trauma Association and its 14th President. He died of a myocardial infarction, Monday, February 27, 1989, while skiing at Snowbird during the 19th Annual Meeting of the Association.

Dr. Young received his medical degree from the University of Rochester, N.Y. and Ph.D. in surgery from the University of Minnesota. He completed advanced training in cancer research at Harvard, a fellowship in cardiovascular surgery at Baylor University in Houston and studied microvascular surgery at the University of California-San Diego.

He was a clinical professor of surgery at the University of Minnesota Medical School, and a practicing general and vascular surgeon at the Park-Nicollet Clinic in Minneapolis from 1960. He was nationally known and was actively involved in research and education throughout his career. In 1988, one year before his untimely death, he received the Owen H. Wangensteen Award for Academic Excellence from the University of Minnesota Health Science Center. It was awarded by an unprecedented unanimous vote of all 72 surgical residents.

The Residents Paper competition was begun in 1991 as a tribute to Dr. Young's memory and his "spirit of inquiry, love of learning ... and commitment in service to mankind."* The award is given to the best resident paper presented at the Annual Meeting.

**Dr. John Najarian characterizing Earl at a memorial service in his honor at the University of Minnesota.*

EARL G. YOUNG AWARD RECIPIENTS

Resident	Institution	Year
Joseph Schmoker, MD	University of Vermont	1991
Joseph Schmoker, MD	University of Vermont	1992
Charles Mock, MD	University of Washington	1993
Gino Travisani, MD	University of Vermont	1994
Phillip C. Ridings, MD	Medical College of Virginia	1995
David Han, MD	Emory University	1996
Preston R. Miller, MD	Wake Forest University	1997
Geoffrey Manley, MD, PhD	University of California, San Francisco	1998
James M. Doty, MD	Medical College of Virginia	1999
D.J. Ciesla, MD	Denver Health Medical Center	2000
Ricardo J. Gonzales, MD	Denver Health Medical Center	2001
Scott C. Brakenridge, MD	Cook County Hospital	2002
Adena J. Osband, MD	UMDNJ-New Jersey Medical School	2003
Cindy Lee, MD	UMDNJ-New Jersey Medical School	2004
Ernest A. Gonzalez, MD	University of Texas at Houston	2005
Jennifer M. Watters, MD	Oregon Health & Science University	2005
Jennifer J. Wan, MD	University of California, San Francisco	2006
Jennifer J. Wan, MD	University of California, San Francisco	2007
Keir J. Warner, MD	University of Washington	2008
T. W. Constantini, MD	University of California, San Diego	2009
C. Anne Morrison, MD	Baylor College of Medicine	2010
Marlin Causey, MD	Madigan Army Medical Center	2011
Phillip Letourneau, MD	University of Texas at Houston	2011
Gerard De Castro, MD	University of Maryland	2011
Matthew E. Kutcher, MD	University of California, San Francisco	2012
Kimberly Song, MD, MA	UMDNJ - New Jersey Medical School	2013
Lucy Kornblith, MD	UCSF/SFGH, San Francisco	2014

PRESIDENTIAL ADDRESS



End of Life Care in Trauma

Tuesday, March 3
5:00 pm - 6:00 pm

Christine S. Cocanour, MD
University of California, Davis
Sacramento, CA

"PAINT THE CEILING" LECTURESHIP

In 1997, Dr. Gregory "Jerry" Jurkovich delivered his Presidential Address entitled "Paint the Ceiling: Reflections on Illness". This was a personal account of his battle with non-Hodgkin's lymphoma. His deep insights were shared from a patient's perspective, even that of a stained ceiling that he observed while lying on his back. He proposed that future WTA Scientific Programs have some time "dedicated to our patients and to the Art of Medicine".

Presenter	Year	Location
G. Jerry Jurkovich, MD	1997	Snowbird
John W. McGill, MD	1998	Lake Louise
William T. Close, MD	1999	Crested Butte
Jimmy Cornell	2000	Squaw Valley
Geoff Tabin, MD	2001	Big Sky
James H. "Red" Duke, MD	2002	Whistler
David V. Shatz, MD	2003	Snowbird
Susan and Tim Baker	2004	Steamboat Springs
Alex Habel, MD	2005	Jackson Hole
Andrew Schneider	2006	Big Sky
Ernest E. Moore, MD	2007	Steamboat Springs
Pamela Kallsen	2008	Squaw Valley
Sylvia Campbell, MD	2009	Crested Butte
William Schechter, MD	2010	Telluride
Jeff McKenney, MD	2011	Big Sky
Larry M. Gentilello, MD	2012	Vail
Neil L. Barg, MD	2013	Snowmass
Ziad Sifri, MD	2014	Steamboat Springs
Julie Freischlag, MD	2015	Telluride

PAINT THE CEILING LECTURE



The Surgeon's Life: Trading Burnout for Engagement

Thursday, March 5
4:00pm - 4:40pm

Julie Ann Freischlag, MD
University of California, Davis
Sacramento, CA

Julie A. Freischlag is the Vice Chancellor for Human Health Sciences and Dean of the School of Medicine at UC Davis. She oversees UC Davis Health System's academic, research and clinical programs, including the School of Medicine, the Betty Irene Moore School of Nursing, the 1,000-member physician practice group, and UC Davis Medical Center.

Freischlag is one of the most prominent leaders among the nation's academic health centers. For more than 15 years, she has led education and training programs at top medical schools in her role as professor and chair of surgery and vascular surgery departments. Freischlag also has more than 30 years of experience leading patient-care services as either chief of surgery or vascular surgery at nationally ranked hospitals. Before joining UC Davis Health System, she served as professor, chair of the surgery department and surgeon-in-chief at Johns Hopkins Medical Institutions. She led initiatives to expand research, add specialty clinical services, improve patient-centered care and patient safety, redesign the surgical training program and enhance academic career paths for faculty.

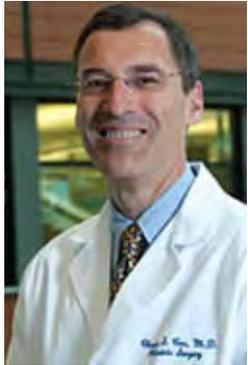
Freischlag received a bachelor's degree in biology from the University of Illinois and a medical degree from Rush University Medical College in Chicago. She completed her surgical residency and vascular fellowship at the David Geffen School of Medicine at UCLA.

FOUNDERS' BASIC SCIENCE LECTURESHIP

Throughout the years, the Western Trauma Association has matured as an academic society while maintaining the cherished elements of friendship, collegiality and family. In honor of this unique spirit, a founding member has generously provided the idea and most of the financial support for an annual *Founders' Basic Science Lectureship*. The purpose of this Lecture is to further enhance the educational value of our Scientific Meeting relative to the area of basic science research. This Lecture reflects the vision and dedication of our founding members and will hold a prominent place in all future programs.

Presenter	Year	Location
Raul Coimbra, MD	2009	Crested Butte
Lawrence Diebel, MD	2010	Telluride
Carl J. Hauser, MD	2011	Big Sky
Fred Moore, MD	2012	Vail
Steve Shackford, MD	2013	Snowmass
Hasan B. Alam, MD	2014	Steamboat Springs
Charles S. Cox, Jr. MD	2015	Telluride

FOUNDERS' BASIC SCIENCE LECTURE



Advanced Cellular Therapy for TBI

Thursday, March 5
8:20 am - 9:00 am

Charles S. Cox, Jr.

The University of Texas Health
Science Center at Houston
Houston, TX

Dr. Charles S. Cox, Jr., is the Children's Fund, Inc. Distinguished Professor of Pediatric Surgery and directs the Pediatric Surgical Translational Laboratories and Pediatric Program in Regenerative Medicine at the University of Texas Medical School at Houston. He directs the Pediatric Trauma Program at the University of Texas-Houston/Children's Memorial Hermann Hospital in the Texas Medical Center.

A Texas native, Dr. Cox received his undergraduate degree from the University of Texas at Austin in the Plan II Liberal Arts Honors Program. Upon graduating from the University of Texas Medical Branch, he completed his Surgery residency at the University of Texas Medical School at Houston. Further post-graduate fellowships were completed in Pediatric Surgery at the University of Michigan, an NIH T32 sponsored clinical and research fellowship in cardiopulmonary support/circulatory support devices/bio-hybrid organs at the Shriners' Burns Institute, and Surgical Critical Care/Trauma at the University of Texas Medical School at Houston. He is certified by the American Board of Surgery in Surgery, with added qualifications in Pediatric Surgery and Surgical Critical Care.

Dr. Cox has served on scientific study sections/review groups for the National Institutes of Health, American Heart Association, Veterans Affairs MERIT Awards, Department of Defense, Congressionally Directed Medical Research Programs, as well as National Research Programs in Canada, Singapore, Spain, and the Czech Republic. He is the author of over 120 scientific publications, 20 book chapters, and is the editor of a text entitled, *Progenitor Cell Therapy for Neurological Injury*.

SPECIAL SESSIONS

MONDAY, MARCH 2

5:30 pm - 6:00 pm

PRO/CON DEBATE: Tourniquet in Civilian Trauma

Kenji Inaba, MD

LAC+USC Medical Center, Los Angeles, CA

Carlos Brown, MD

University of Texas at Austin, Austin, TX

TUESDAY, MARCH 3

8:20 am - 9:00 am

PRO/CON DEBATE: TEC PCC

Matthew Martin, MD

Madigan Army Medical Center, Tacoma, WA

Bryan Cotton, MD, MPH

University of Texas Health Science Center,
Houston, TX

WEDNESDAY, MARCH 4

7:40 am - 7:50 am

ALGORITHM: Esophageal Trauma

Walt Biffel, MD

Denver Health Medical Center, Denver, CO

7:50 am - 8:00 am

ALGORITHM: Update Splenic Trauma

Susan Rowell, MD

Oregon Health & Science University, Portland, OR

SPECIAL SESSIONS

THURSDAY, MARCH 5

4:50 pm - 5:20 pm **PRO/CON Debate: ETOH and Prevention of Alcohol Withdrawal in The Trauma Patients.**

Gary Vercruyse, MD

University of Arizona Medical Center, Tucson, AZ

R. Lawrence Reed, MD

Indiana University, Indianapolis, IN

5:20 pm - 6:00 pm **PANEL OF EXPERTS**

Moderator: Steve Shackford, MD

Scripps Mercy Trauma and Vascular, San Diego, CA

Peter Rhee, MD

University of Arizona Medical Center, Tucson, AZ

Martin Schrieber, MD

Oregon Health & Science University, Portland, OR

Riyad Karmy-Jones, MD

Legacy Emanuel Medical Center, Portland, OR

FRIDAY, MARCH 6

4:00 pm - 4:10 pm **ALGORITHM: INITIAL IMAGING**

Mitch Cohen, MD

San Francisco General Hospital, San Francisco, CA

4:10 pm - 4:20 pm **ALGORITHM: PELVIC TRAUMA**

Nick Namias, MD

University of Miami School of Medicine, Miami, FL

AGENDA

SUNDAY, MARCH 1, 2015

5:00pm - 7:30pm	Registration	The Great Room, The Peaks Resort
5:00pm - 7:00pm	Welcome Reception	The Great Room, The Peaks Resort
5:00pm - 7:00pm	Kids Welcome Reception	Big Billie Ballroom, The Peaks Resort
6:00pm - 7:00pm	WTA Foundation Meeting	Golden Slipper, The Peaks Resort
7:00pm - 8:00pm	WTA Past Presidents Meeting	Liberty Bell, The Peaks Resort
7:00pm - 9:00pm	Star Gazing	Ski Valet, Hotel Madeline

MONDAY, MARCH 2, 2015

6:30am - 8:00am	Attendee Breakfast & Exhibits	Ballroom, Conference Center
7:00am - 9:00am	Scientific Session	Ballroom, Conference Center
7:30am - 9:00am	Friends & Family Breakfast	Legends, Peaks Resort, Rev Restaurant, Madeline
4:00pm - 6:00pm	Scientific Session	Ballroom, Conference Center
6:00pm - 8:00pm	WTA Board of Directors Meeting	Klammer Room, Conference Center
6:30pm - 7:30pm	Residents Reception	Hospitality Suite 620, Hotel Madeline
7:00pm - 9:00pm	Star Gazing	Ski Valet, Hotel Madeline

AGENDA

TUESDAY, MARCH 3, 2015

6:30am - 8:00am	Attendee Breakfast & Exhibits	Ballroom, Conference Center
7:00am - 9:00am	Scientific Session	Ballroom, Conference Center
7:30am - 9:00am	Friends & Family Breakfast	Legends, Peaks Resort, Rev Restaurant, Madeline
4:00pm - 5:00pm	Scientific Session	Ballroom, Conference Center
5:00pm - 6:00pm	Presidential Address	Ballroom, Conference Center
6:00pm - 7:00pm	Multi-Center Trials	Ballroom, Conference Center

WEDNESDAY, MARCH 4, 2015

6:30am - 8:00am	Attendee Breakfast & Exhibits	Ballroom, Conference Center
7:00am - 9:00am	Scientific Session	Ballroom, Conference Center
7:30am - 9:00am	Friends & Family Breakfast	Legends, Peaks Resort Rev Restaurant, Madeline
10:00am - 12:00pm	NASTAR Race	TBD, Mountain
12:00pm - 1:30pm	WTA Mountain Picnic	Appaloosa Terrace, The Peaks Resort
4:00pm - 5:00pm	Scientific Session	Ballroom, Conference Center
4:00pm - 6:00pm	WTA Book Club	Hospitality Suite, Hotel Madeline
5:00pm - 6:00pm	WTA Business Meeting	Ballroom, Conference Center
6:30pm - 9:30pm	WTA Family Sledding Night	TBD, Mountain

AGENDA

THURSDAY, MARCH 5, 2015

6:30am - 8:00am	Attendee Breakfast & Exhibits	Ballroom, Conference Center
7:00am - 9:00am	Scientific Session & Founder's Basic Science Lecture	Ballroom, Conference Center
7:30am - 9:00am	Friends & Family Breakfast	Legends, Peaks Resort Rev Restaurant, Madeline
4:00pm - 6:00pm	Scientific Session & Paint the Ceiling Lecture	Ballroom, Conference Center
7:00pm - 10:00pm	Reception & Awards Banquet	Ballroom, Conference Center
7:00pm - 10:00pm	Kids Party	Klammer, Conference Center

FRIDAY, MARCH 6, 2015

6:30am - 8:00am	Attendee Breakfast & Exhibits	Ballroom, Conference Center
7:00am - 9:00am	Scientific Session	Ballroom, Conference Center
7:30am - 9:00am	Friends & Family Breakfast	Legends, Peaks Resort Rev Restaurant, Madeline
4:00pm - 6:00pm	Scientific Session	Ballroom, Conference Center

Scientific Program

MONDAY, MARCH 2 - MORNING SESSION

7:00 am – 9:00 am

Scientific Session I: Papers 1-5, Case Reports 6-7

Moderator: Christine S. Cocanour, MD, University of California Davis Medical Center, Sacramento, CA

7:00 am - 7:20 am	*1. ADDITION OF VALPROIC ACID TO SALINE RESUSCITATION ATTENUATES TRAUMATIC BRAIN INJURY (TBI) AND IMPROVES THE RATE OF NEUROLOGICAL RECOVERY IN A LARGE ANIMAL MODEL OF COMBINED TBI AND HEMORRHAGIC SHOCK Ihab Halaweish, MD University of Michigan, Ann Arbor, MI	Page 37
7:20 am - 7:40 am	*2. THE “DEATH DIAMOND”: RAPID TEG IDENTIFIES LETHAL HYPERFIBRINOLYSIS Michael P Chapman, MD, MD Denver Health and Hospital Authority, Denver, CO	Page 39
7:40 am - 8:00 am	*3. PLASMA FIRST RESUSCITATION ATTENUATES HYPERFIBRINOLYSIS INDUCED BY HEMORRHAGIC SHOCK Hunter B Moore, MD University of Colorado, Denver, CO	Page 41
8:00 am - 8:20 am	*4. SUGAR OR SALT?: THE RELATIVE ROLES OF THE GLUCOCORTICOID AND MINERALOCORTICOID AXES IN TRAUMATIC SHOCK Daniel Nelson, DO Madigan Army Medical Center, Fort Lewis, WA	Page 43
8:20 am - 8:40 am	*5. THE TISSUE FACTOR PATHWAY MEDIATES BOTH ACTIVATION OF COAGULATION AND COAGULOPATHY AFTER INJURY Benjamin Howard, MD MPH San Francisco General Hospital; University of California, San Francisco, CA	Page 45
8:40 am - 8:50 am	6. FETAL INJURIES AND PLACENTAL ABRUPTION DETECTED ON CT SCAN NOT OBSERVED ON ULTRASOUND Kathleen Romanowski, MD University of California, Davis, Sacramento, CA	Page 47
8:50 am - 9:00 am	7. A WARY EYE, A KEEN MIND, AND A SHARP KNIFE: SUCCESSFUL MANAGEMENT OF MASSIVE INTRAOPERATIVE PULMONARY EMBOLISM AT A COMMUNITY HOSPITAL Jawad Ali, MD University of Texas Southwestern, Austin, TX	Page 49

*Denotes Earl Young Award Competition Paper

MONDAY, MARCH 2 - AFTERNOON SESSION

4:00 pm – 6:00 pm

Scientific Session II: Papers 8-11, Case Report 12, Pro/Con

Moderator: Hasan B. Alam, MD, University of Michigan, Ann Arbor, MI

4:00 pm - 4:20 pm	*8. APPROPRIATE DOSING OF HEPARIN IS NOT INFERIOR TO ENOXAPARIN IN PREVENTING VENOUS THROMBOEMBOLISM IN TRAUMA PATIENTS: RESULTS OF A PROSPECTIVE RANDOMIZED CLINICAL TRIAL Erik Olson, MD Scripps Mercy, San Diego, CA	Page 51
4:20 pm - 4:40 pm	*9. SUBCAPSULAR HEMATOMA IN BLUNT SPLENIC INJURY: A SIGNIFICANT PREDICTOR OF FAILURE OF NON-OPERATIVE MANAGEMENT Joseph Lopez, Jr., MD Wake Forest School of Medicine, Winston-Salem, NC	Page 53
4:40 pm - 5:00 pm	*10. THE OLD MAN AND THE C-SPINE FRACTURE: IMPACT OF HALO VEST STABILIZATION IN PATIENTS WITH BLUNT CERVICAL SPINE FRACTURES John Sharpe, MD, MS University of Tennessee Health Science Center, Memphis, TN	Page 55
5:00 pm - 5:20 pm	*11. EARLY TRANEXAMIC ACID ADMINISTRATION: A PROTECTIVE EFFECT ON GUT BARRIER FUNCTION FOLLOWING ISCHEMIA/REPERFUSION INJURY Mark Diebel, MD Wayne State University, Detroit, MI	Page 57
5:20 pm - 5:30 pm	12. MESH FIXATION TO THE ILIAC CREST WITH SUTURE ANCHORS IS EFFECTIVE FOR TRAUMATIC AND POST-SURGICAL FLANK HERNIAS Kaushik Mukherjee, MD MSCI Vanderbilt University Medical Center, Nashville, TN	Page 59
5:30 pm - 6:00 pm	PRO/CON DEBATE: Tourniquet in Civilian Trauma Kenji Inaba, MD LAC+USC Medical Center, Los Angeles, CA Carlos Brown, MD University of Texas at Austin, Austin, TX	Page 61

*Denotes Earl Young Award Competition Paper

TUESDAY, MARCH 3 - MORNING SESSION

7:00 am – 9:00 am

Scientific Session III: Papers 13-16, Pro/Con

Moderator: Matthew Martin, Madigan Army Medical Center, Tacoma, WA

7:00 am - 7:20 am	*13. A NEW KID ON THE BLOCK: OUTCOMES WITH KCENTRA ONE YEAR AFTER APPROVAL Allison E Berndtson, MD University of California - San Diego, San Diego, CA	Page 63
7:20 am - 7:40 am	*14. A PILOT STUDY OF CHEST TUBE VERSUS PIGTAIL CATHETER DRAINAGE OF ACUTE HEMOTHORAX IN SWINE Rachel Russo, MD University of California, Davis, Sacramento, CA	Page 65
7:40 am - 8:00 am	*15. UTILITY OF REPEAT MONITORING OF HEMOGLOBIN AND HEMATOCRIT FOLLOWING BLUNT SOLID ORGAN INJURY IN CHILDREN Shannon Acker, MD Children's Hospital Colorado, Aurora, CO	Page 67
8:00 am - 8:20 am	*16. LEGALIZATION OF MARIJUANA IN COLORADO AND WASHINGTON DID NOT CHANGE HIGHWAY DEATHS Kevin Luftman, MD University Medical Center Brackenridge, Austin, TX	Page 69
8:20 am - 9:00 am	PRO/CON DEBATE: TEC PCC Matthew Martin, MD Madigan Army Medical Center, Tacoma, WA Bryan Cotton, MD, MPH University of Texas Health Science Center, Houston, TX	Page 71

*Denotes Earl Young Award Competition Paper

TUESDAY, MARCH 3 - AFTERNOON SESSION

4:00 pm – 6:00 pm

Scientific Session IV: Papers 17-19, Presidential Address

Moderator: Peter Rhee, University of Arizona, Tucson, AZ

4:00 pm - 4:20 pm	*17. PRE-HOSPITAL INTERVENTIONS IN SEVERELY INJURED PEDIATRIC PATIENTS: RETHINKING THE ABC'S. Kyle Sokol, MD Madigan Army Medical Center, Tacoma, WA	Page 73
4:20 pm - 4:40 pm	*18. THE "HIGH-RISK" DVT SCREENING PROTOCOL FOR TRAUMA PATIENTS - IS IT PRACTICAL? Zachary Dietch, MD University of Virginia, Charlottesville, VA	Page 75
4:40 pm - 5:00 pm	*19. NO BREAK POINT FOR MORTALITY IN PEDIATRIC RIB FRACTURES Graeme Rosenberg, MD Yale School of Medicine, New Haven, CT	Page 77
5:00 pm - 6:00 pm	PRESIDENTIAL ADDRESS: End of Life Care in Trauma Christine S. Cocanour, MD University of California Davis Medical Center, Sacramento, CA	

*Denotes Earl Young Award Competition Paper

WEDNESDAY, MARCH 4 - MORNING SESSION

7:00 am – 9:00 am

Scientific Session V: Papers 20-23, Algorithms, Case Report 24, Family 25

Moderator: Gary Vercruyse, University of Arizona Medical Center, Tucson, AZ

7:00 am - 7:20 am	*20. DEAD OR ALIVE? NEW CONFIRMATORY TEST USING QUANTITATIVE ANALYSIS OF COMPUTER TOMOGRAPHIC ANGIOGRAPHY Lorena P. Suarez-Kelly, MD, MD Memorial Health-University Medical Center, Savannah, GA	Page 79
7:20 am - 7:40 am	*21. COMPARISON OF FIBRINOLYSIS BEFORE AND AFTER TRANEXAMIC ACID IN TRAUMA PATIENTS: A 2-YEAR SINGLE-CENTER EXPERIENCE Maile Park, MD Mayo Clinic, Rochester, Rochester, MN	Page 81
7:40 am - 7:50 am	ALGORITHM: Esophageal Trauma Walt Biffl, MD Denver Health Medical Center, Denver, CO	Page 83
7:50 am - 8:00 am	ALGORITHM: Pelvic Trauma Nick Namias, MD University of Miami School of Medicine, Miami, FL	Page 85
8:00 am - 8:20 am	*22. PRESENCE OF A DEDICATED TRAUMA CENTER PHYSIATRIST IMPROVES FUNCTIONAL OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY Christine Greiss, D.O. Rutgers - NJMS, Newark, NJ	Page 87
8:20 am - 8:40 am	*23. RECURSIVE PARTITIONING IDENTIFIES GREATER THAN 4 UNITS OF PRBC'S PER HOUR AS AN IMPROVED MASSIVE TRANSFUSION DEFINITION Alexis Moren, MD, MPH Oregon Health and Science University, Portland, OR	Page 89
8:40 am - 8:50 am	24. ALPINE AIRWAY EMERGENCY: CRICOTHYROTOMY AT 17,000 FEET Brian Scheele, DO Mount Sinai Medical Center, Miami, FL	Page 91
8:50 am - 9:00 am	25. THE FAMILY APPROACH TO THE TREATMENT OF SEPTIC SHOCK Grace Rozycki, MD, MBA, MD, MBA Indiana University, Indianapolis, IN	Page 93

*Denotes Earl Young Award Competition Paper

WEDNESDAY, MARCH 4 - AFTERNOON SESSION

4:00 pm – 6:00 pm

Scientific Session VI: Papers 26-28, Business Meeting

Moderator: Dr. Richard Miller, Vanderbilt Medical Center, Nashville, TN

4:00 pm - 4:20 pm	26. BICYCLE COMMUTING: IS THERE SAFETY IN NUMBERS? Jamison Nielsen, DO, MBA Oregon Health & Science University, Portland, OR	Page 95
4:20 pm - 4:40 pm	27. THE USE OF EXTRACORPOREAL MEMBRANE OXYGENATION IN BLUNT THORACIC TRAUMA: A STUDY OF THE EXTRACORPOREAL LIFE SUPPORT ORGANIZATION DATABASE Jordan Jacobs, MD St. Joseph's Hospital and Medical Center, Phoenix, AZ	Page 97
4:40 pm - 5:00 pm	28. A PARADIGM FOR ACHIEVING SUCCESSFUL PEDIATRIC TRAUMA VERIFICATION IN THE ABSENCE OF PEDIATRIC SURGICAL SPECIALISTS WHILE ENSURING QUALITY OF CARE Richard Falcone, MD, MPH Cincinnati Children's Hospital Medical Center, Cincinnati, OH	Page 99
5:00pm - 6:00pm	WTA BUSINESS MEETING Members Only	

THURSDAY, MARCH 5 - MORNING SESSION

7:00 am – 9:00 am

Scientific Session VII: Papers 29-32, Founders Basic Science Lecture

Moderator: Kenji Inaba, LAC+USC Medical Center, Los Angeles, CA

7:00 am - 7:20 am	29. ASPIRATION IN TRAUMA: FREQUENT OCCURRENCE, RARE MORBIDITY. A PROSPECTIVE ANALYSIS Elizabeth Benjamin, MD PhD University of Southern California, Los Angeles, CA	Page 101
7:20 am - 7:40 am	30. GERIATRIC TRAUMA “G-60” FALLS WITH HIP FRACTURES: PAIN MANAGEMENT USING FEMORAL NERVE FASCIA ILIACA BLOCKS Alicia Mangram, MD, FACS John C. Lincoln Hospital - North Mountain, Phoenix, AZ	Page 103
7:40 am - 8:00 am	31. CADAVERIC COMPARISON OF THE OPTIMAL SITE FOR NEEDLE DECOMPRESSION OF TENSION PNEUMOTHORAX BY PREHOSPITAL CARE PROVIDERS Kenji Inaba, MD Los Angeles County + University of Southern California Medical Center, Los Angeles, CA	Page 105
8:00 am - 8:20 am	32. WHEN CHILDREN BECOME ADULTS AND ADULTS BECOME MOST HYPERCOAGULABLE AFTER TRAUMA: AN ASSESSMENT OF ADMISSION HYPERCOAGULABILITY BY TEG AND VENOUS THROMBO-EMBOLIC RISK Ioannis Liras, BS University of Texas Health Science Center, Houston, TX	Page 107
8:20 am - 9:00 am	FOUNDERS BASIC SCIENCE LECTURE: Advanced Cellular Therapy for TBI Charles S. Cox, Jr., MD University of Texas Health Science Center, Houston, TX	

THURSDAY, MARCH 5 - AFTERNOON SESSION

4:00 pm – 6:00 pm

Scientific Session VIII: Paint the Ceiling Lecture, Case Report 33, Pro/Con, Panel of Experts

Moderator: Susan Rowell, MD, Oregon Health & Science University, Portland, OR

4:00 pm - 4:40 pm	PAINT THE CEILING LECTURE: The Surgeon's Life: Trading Burnout for Engagement Julie Ann Freischlag, MD University of California, Davis, Sacramento, CA	
4:40 pm - 4:50 pm	33. IT'S NOT A PARTY WITHOUT THE FIREWORKS: A TRUE ABDOMINAL “BLOWOUT”! Shad Pharaon, MD PeaceHealth Southwest Medical Center, Vancouver, WA	Page 109
4:50 pm - 5:20 pm	PRO/CON Debate: ETOH and Prevention of Alcohol Withdrawal in The Trauma Patients. Gary Vercausse, MD University of Arizona Medical Center, Tucson, AZ R. Lawrence Reed, MD Indiana University, Indianapolis, IN	Page 111
5:20 pm - 6:00 pm	PANEL OF EXPERTS Moderator: Steve Shackford, MD Scripps Mercy Trauma and Vascular, San Diego, CA Panel: Peter Rhee, MD University of Arizona Medical Center, Tucson, AZ Martin Schrieber, MD Oregon Health & Science University, Portland, OR Riyad Karmy-Jones, MD Legacy Emanuel Medical Center, Portland, OR	Page 113

FRIDAY, MARCH 6 - MORNING SESSION

7:00 am – 9:00 am

Scientific Session IX: Papers 34-38, Case 39, Family 40

Moderator: Jack Sava, MD, MedStar Washington Hospital Center, Washington, DC

7:00 am - 7:20 am	34. MILD TRAUMATIC BRAIN INJURY INCREASES RISK FOR THE DEVELOPMENT OF POSTTRAUMATIC STRESS DISORDER Ann Marie Warren, PhD Baylor University Medical Center, Dallas, TX	Page 115
7:20 am - 7:40 am	35. USE OF CONTINUOUS POSITIVE AIRWAY PRESSURE FOR APNEA TESTING DURING BRAIN DEATH EVALUATION IMPROVES LUNG TRANSPLANTATION RATES Jennifer L. Hubbard, MD, MD UCSF Fresno, Fresno, CA	Page 117
7:40 am - 8:00 am	36. HIPS DON'T LIE: WAIST TO HIP RATIO IN TRAUMA PATIENTS Bardiya Zangbar, MD The University of Arizona, Tucson, AZ	Page 119
8:00 am - 8:20 am	37. SELECTIVE INHIBITION OF HISTONE DEACETYLASE 6 PROMOTES SURVIVAL IN A RODENT MODEL OF HEMORRHAGIC SHOCK Hasan Alam, MD University of Michigan, Ann Arbor, MI	Page 121
8:20 am - 8:40 am	38. RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA RESTORES CAROTID BLOOD FLOW FASTER THAN BLOOD RESUSCITATION DURING MASSIVE HEMORRHAGE IN SWINE Andriy Batchinsky, MD United States Army Institute of Surgical Research, JBSA Ft Sam Houston, TX	Page 123
8:40 am - 8:50 am	39. WHEN LIGHTNING STRIKES TWICE: FORT HOOD AND THE VALUE OF EXPERIENCE Matthew Davis, MD FACS Texas A&M HSC/Scott & White Memorial Hospital, Temple, TX	Page 125
8:50 am - 9:00 am	40. MOVIES AND GORILLAS Enrique Ginzburg, MD University of Miami, Miami Beach, FL	Page 127

FRIDAY, MARCH 6 - AFTERNOON SESSION

4:00 pm – 6:00 pm

Scientific Session X: Algorithms, Papers 41-44, Case 45, Family 46

Moderator: Anne Rizzo, MD, United Regional Hospital, Wichita Falls, TX

4:00 pm - 4:10 pm	ALGORITHM: Initial Imaging Mitch Cohen, MD San Francisco General Hospital, San Francisco, CA	Page 129
4:10 pm - 4:20 pm	ALGORITHM: Update Splenic Trauma Susan Rowell, MD Oregon Health & Science University, Portland, OR	Page 131
4:20 pm - 4:40 pm	41. THE ELIMINATION OF ANASTOMOSIS IN OPEN TRAUMA VASCULAR RECONSTRUCTION: A NOVEL TECHNIQUE USING AN ANIMAL MODEL Andrew Tang, MD University of Arizona Medical Center, Tucson, AZ	Page 133
4:40 pm - 5:00 pm	42. THE ROLE OF CT SCAN IN ONGOING TRIAGE OF OPERATIVE HEPATIC TRAUMA: A WESTERN TRAUMA ASSOCIATION MULTICENTER RETROSPECTIVE STUDY Matthew Kutcher, MD University of Pittsburgh Medical Center, Pittsburgh, PA	Page 135
5:00 pm - 5:20 pm	43. ROLE OF CTA IN THE MANAGEMENT OF ZONE 2 PENETRATING NECK TRAUMA IN PATIENTS PRESENTING WITH CLINICAL HARD SIGNS Megan Lipcsey, BS Tulane University School of Medicine, New Orleans, LA	Page 137
5:20 pm - 5:40 pm	44. THE FOUND DOWN PATIENT: A WESTERN TRAUMA ASSOCIATION MULTI-CENTER STUDY Mitchell Cohen, MD San Francisco General Hospital; University of California, San Francisco, San Francisco, CA	Page 139
5:40 pm - 5:50 pm	45. FREE INTRAPERITONEAL AIR AND ACUTE MYOCARDIAL INFARCTION IN THE SETTING OF BLUNT TRAUMA: A TREATMENT DILEMMA Alessandra Landmann, MD University of Oklahoma Health Sciences Center, Oklahoma City, OK	Page 141
5:50 pm - 6:00 pm	46. FAMILY IS NOT AN IMPORTANT THING: ITS EVERYTHING! Bellal Joseph, MD The University of Arizona, Tucson, AZ	Page 143

Abstracts

Paper# 1**March 2, 7:00 am - 7:20 am****ADDITION OF VALPROIC ACID TO SALINE RESUSCITATION ATTENUATES TRAUMATIC BRAIN INJURY (TBI) AND IMPROVES THE RATE OF NEUROLOGICAL RECOVERY IN A LARGE ANIMAL MODEL OF COMBINED TBI AND HEMORRHAGIC SHOCK ***

I Halaweish, T Bambakidis, Z Chang, H Wei, C Tafatia, T Bonthron, J Pinnmaneni, C Swope, A Srinivasan, B Liu, Y Li, T Bonham, and HB Alam
University of Michigan, Ann Arbor, MI

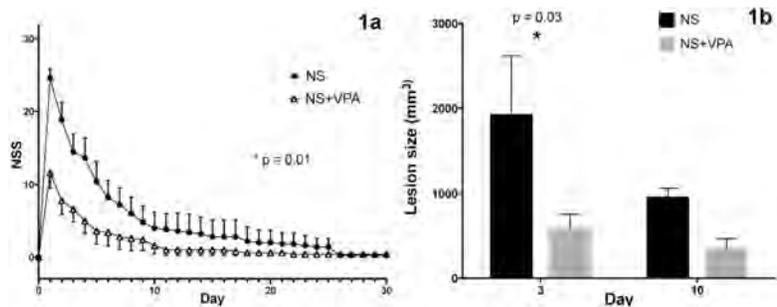
Presenter: Ihab Halaweish, MD**Senior Sponsor: Hasan B. Alam, MD**

INTRODUCTION: Combined traumatic Brain Injury (TBI) and hemorrhagic shock (HS) is highly lethal. In previous models of HS, we have shown that addition of high-dose (300 mg/kg) valproic acid (H-VPA), a histone deacetylase inhibitor, can improve survival, protect neurons from hypoxia-induced apoptosis, and attenuate inflammation. In a non-survival swine model of TBI+HS, addition of H-VPA to hetastarch resuscitation reduced the size of brain lesion and associated swelling 6 hours after injury, but whether this would have translated into better neurological outcomes remains unknown. It is also unclear whether lower doses of VPA (L-VPA) would be neuroprotective. We hypothesized that addition of L-VPA to saline resuscitation would result in improved long-term neurological recovery and decreased brain lesion size.

METHODS: TBI was created in anesthetized swine (40-43 kg) using a computer-controlled cortical impact device. Volume-controlled hemorrhage (40% volume) was induced concurrently. After 2 h of shock, animals were randomized (n=5/group) to normal saline solution (NS, 3x shed blood) or normal saline plus L-VPA 150 mg/kg (NS+VPA). VPA infusion was started after one hour of shock. Six hours post-resuscitation, packed red blood cells were transfused and animals were recovered from anesthesia. Peripheral blood mononuclear cells (PMBC) were harvested serially for 24 hours following VPA infusion and analyzed for acetylated histone-H3 at lysine-9. A 32-point objective neurologic severity score (NSS) was assessed daily for 30 days (0=normal, 32=severe injury). Brain magnetic resonance imaging (MRI) was performed on days 3 and 10. Cognitive function was assessed by training animals to retrieve food from color-coded boxes.

RESULTS: The lower dose of VPA was adequate to cause significant acetylation within 2 hours, and sustain it for 24 hours. NS+VPA group demonstrated decreased neurological impairment and a faster rate of recovery (Fig 1a), as well as smaller brain lesion size compared to NS group (Fig 1b). Although the final cognitive function scores were similar between the groups, the VPA treated animals reached the goal significantly faster than the NS controls.

CONCLUSIONS: In this long-term survival model of TBI+HS, addition of L-VPA to saline resuscitation resulted in attenuated neurological impairment, faster rate of neurological recovery, smaller brain lesion size, and quicker normalization of cognitive functions.



NOTES

Paper# 2
March 2, 7:20 am - 7:40 am

THE “DEATH DIAMOND”: RAPID TEG IDENTIFIES LETHAL HYPERFIBRINOLYSIS *

MP Chapman, EE Moore, E Gonzalez, HB Moore, AP Morton, J Chandler, A Ghasabyan, A Banerjee, CC Silliman, A Sauaia
 Denver Health and Hospital Authority, Denver, CO

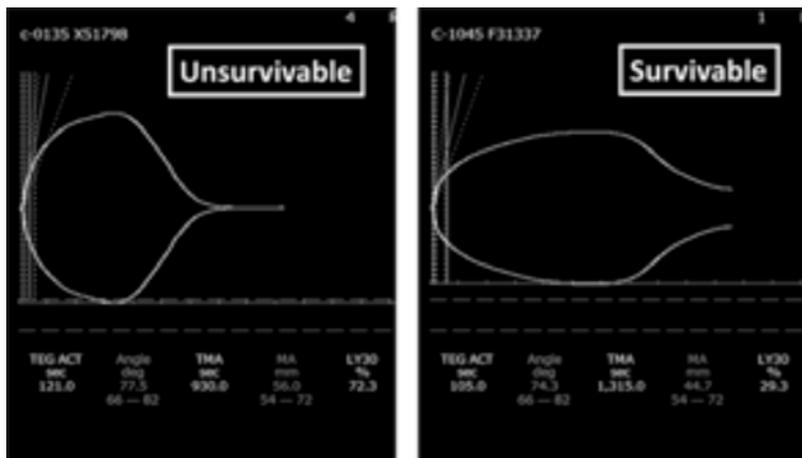
Presenter: Michael P Chapman, MD
Senior Sponsor: Ernest E. Moore, MD

INTRODUCTION: Post-injury hyperfibrinolysis (HF), defined as LY30 \geq 3% on rapid thrombelastography (rTEG), is associated with high mortality and large utilization of blood products. We have observed that certain subcategories of hyperfibrinolytic TEG tracing are reversible by intervention and associated with patients who respond to hemostatic resuscitation; whereas, other patterns of hyperfibrinolysis appear to be associated with these patients’ inevitable demise. We sought to define this unsurvivable subtype of hyperfibrinolysis as a recognizable TEG tracing pattern.

METHODS: We queried our trauma registry for all patients admitted to our level 1 trauma center from 2009-2014 who met the following criteria: either died or spent at least one day in the ICU, received at least one unit of PRBCs, and had an admission rTEG. Within this group of 572 patients (median NISS 37), we identified 42 pairs of non-survivors and survivors who matched on age, sex, injury mechanism and NISS. We visually inspected all admission rTEG tracings to ascertain if any pattern of rTEG was found exclusively within the non-surviving group and applied these findings to the entire cohort of 572 patients to assess the predictive value for mortality.

RESULTS: Within the matched group (median NISS 49), 17% of patients developed HF. Within the HF subgroup, a unique rTEG pattern was present in 54% of HF patients who died and in none of the survivors. This pattern was characterized by a “diamond-shaped” tracing with a very rapid time to maximum amplitude (TMA) of \leq 17 min and complete lysis (i.e. return of tracing to baseline) at or before the LY30 point. Applying these criteria to the 572 unmatched patients, this pattern had a 95% positive predictive value for mortality, with 19 deaths and 1 survivor. The only patient to survive with this rTEG pattern had a transecting iliac artery injury, which was rapidly controlled. Patients with the lethal “diamond” pattern had a median PRBC requirement of 13 units, compared to 4 for all survivors.

CONCLUSIONS: Patients displaying the “death diamond” pattern on their admission rTEG are at higher risk for mortality than any other known pattern of coagulopathy seen on the TEG. Given the enormous volume of blood products and other resources that these patients consume, the “death diamond” TEG pattern may represent an objective criterion to discontinue efforts at hemostatic resuscitation, if a readily manageable cardiovascular injury is not the sole source of bleeding.



NOTES

Paper# 3
March 2, 7:40 am - 8:00 am

PLASMA FIRST RESUSCITATION ATTENUATES HYPERFIBRINOLYSIS INDUCED BY HEMORRHAGIC SHOCK *

HB Moore, EE Moore, AP Morten, M Fragoso, E Gonzlaez, A D'Alessandro, KC Hansen, A Sauaia, MP Chapman, F Gamboni, A Banerjee, CC Silliman
 University of Colorado, Denver, CO

Presenter: Hunter B Moore, MD
Senior Sponsor: Ernest E. Moore, MD

INTRODUCTION: Plasma pre hospital resuscitation in the ambulance has been proven to be feasible in our ongoing clinical trial. We have observed in several hyperfibrinolytic patients that plasma resuscitation attenuated fibrinolysis upon arrival to the hospital. We developed a severe hemorrhagic shock animal model to produce hyperfibrinolysis and replicate the pre hospital setting where resuscitation fluids are limited. We hypothesized that severe shock increases systemic levels of tissue plasminogen activator (tPA) resulting in hyperfibrinolysis, which can be corrected by resuscitation with plasma (PL) but exacerbated by normal saline (NS).

METHODS: Sprague Dawley rats were hemorrhaged to achieve a mean arterial pressure (MAP) of 25 mmHg within 5min. Animals were kept in shock for 30min and resuscitated with NS or PL with an initial 10% estimated total blood volume bolus, followed by an additional 5min NS resuscitation to achieve a MAP>30 mmHg. Animals' blood pressure response and survival were assessed. Blood samples were obtained at baseline, shock, and at the end of the experiment for thrombelastography (TEG) paired with tPA levels. Fibrinolysis was quantified by the amount of clot degraded 30 minutes after achieving maximum amplitude (LY30). Median (interquartile range, IQR) values were compared with the Wilcoxon test and correlations assessed using the Spearman test.

RESULTS: The groups did not differ regarding median percent of total blood volume shed [NS 52.5%(51.2-55.3) vs. PL 55.7(54.3-59.2), p=0.065]. The NS group required more resuscitation fluid than the PL group [36.1% of shed blood (32.7-44.0) vs. 20% (17.8-22.3), p=0.002]. During the observation period, the PL group maintained a MAP>25mmhg for a longer time than the NS group (NS: 6 min, P: 16 min, p<0.001). Animal's baseline TEG LY30 values increased from 0.95%(0.53-2.68) to 7.30%(4.25-10.95) after shock, which correlated to increased levels of tPA [10.9ng/ml (9.2-12.1) to 21.8 ng/ml (16.2-24.1), Spearman's Rho 0.53, p=0.009]. There was no difference in LY30 or tPA values at baseline (p=0.394, p=0.485) or shock (p=0.589, p=0.240) between the treatment arms. However, post resuscitation NS group LY30 was increased to 22.5 (11.8-30.6) while the post resuscitation PL group LY30 decreased to 2.60 (2.35-2.90, p=0.009).

CONCLUSIONS: Hyperfibrinolysis is driven by hypoperfusion and associated with increased systemic levels of tPA. Plasma is a superior resuscitation fluid to normal saline in a pre-hospital model of severe hemorrhagic shock as it attenuates hyperfibrinolysis and improves perfusion. These results encourage the evolving concept of plasma first resuscitation for trauma patients with pre-hospital hypotension.

Paper# 4**March 2, 8:00 am - 8:20 am****SUGAR OR SALT?: THE RELATIVE ROLES OF THE GLUCOCORTICOID AND MINERALOCORTICOID AXES IN TRAUMATIC SHOCK ***

DW Nelson, GE Black, MD Debarros, QM Hatch, CR Porta, DP McVay, MJ Eckert, and MJ Martin

Madigan Army Medical Center, Fort Lewis, WA

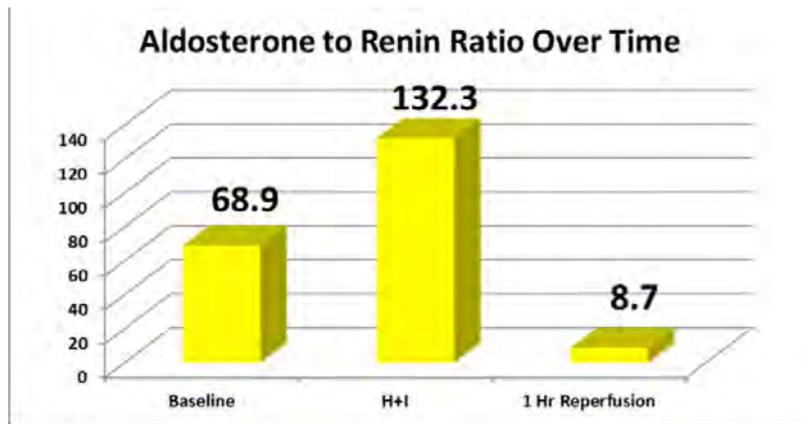
Presenter: Daniel Nelson, DO**Senior Sponsor: Matthew J. Martin, MD**

INTRODUCTION: Deficiency in glucocorticoids has been proposed as a key contributor to shock states and a target for therapy, but the presence and role of acute mineralocorticoid deficiency (MD) may be of equal or greater significance. We hypothesized that MD is present in post-hemorrhagic shock and results from ischemia/reperfusion (IR) injury.

METHODS: 57 swine underwent 35% volume-controlled hemorrhage followed by aortic cross clamping for 50 minutes to induce truncal I/R injury. Protocol-guided resuscitation and monitoring was performed for up to 24 hours. Laboratory analysis was performed including cortisol, aldosterone, and plasma renin activity (PRA). The aldosterone to renin ratio (ARR) was also calculated at each time point.

RESULTS: Mean baseline cortisol levels for the entire cohort were 5.8 ug/dl. Following hemorrhage there was a significant increase in mean cortisol levels to 9.2 ug/dl ($p < 0.001$). After 1 hour of reperfusion there was no change in mean cortisol levels at 9.8 ug/dl ($p = 0.12$). Mean baseline aldosterone levels of this cohort were 13.3 pg/ml. Aldosterone levels prior to cross clamp removal increased significantly to 115.1 pg/ml ($p < 0.001$) and then rapidly declined to 49.2 pg/ml ($p < 0.01$) after one hour of reperfusion. Conversely, baseline plasma renin activity was 0.75 ng/ml/hr and increased significantly prior to cross clamp removal (1.8) and at 1 hour (8.9, both $p < 0.001$). The ARR at baseline was 68.9 and increased to 132.3 ($p = 0.07$) prior to cross clamp removal, but significantly declined following 1 hour of reperfusion to 8.7 ($p < 0.001$). Overall, this represented a 93% reduction in mean ARR following reperfusion for the entire cohort (Figure). The degree of aldosterone deficiency correlated with degree of systemic shock as measured by arterial base deficit ($r = 0.47$, $p = 0.04$), while cortisol showed no correlation.

CONCLUSIONS: Hemorrhagic shock with I/R injury resulted in only modest impact on the glucocorticoid axis but major dysfunction of the mineralocorticoid axis with resultant hyperreninemic hypoaldosteronism. The degree of aldosterone deficiency may provide prognostic information or offer a potential target for pharmacologic supplementation.



NOTES

Paper# 5
March 2, 8:20 am - 8:40 am

THE TISSUE FACTOR PATHWAY MEDIATES BOTH ACTIVATION OF COAGULATION AND COAGULOPATHY AFTER INJURY *

BM Howard, BY Miyazawa, W Dong, RF Vilardi, W Cedron, W Ruf, MJ Cohen
 San Francisco General Hospital; University of California, San Francisco, CA

Presenter: Benjamin Howard, MD MPH
Senior Sponsor: Mitchell Jay Cohen, MD

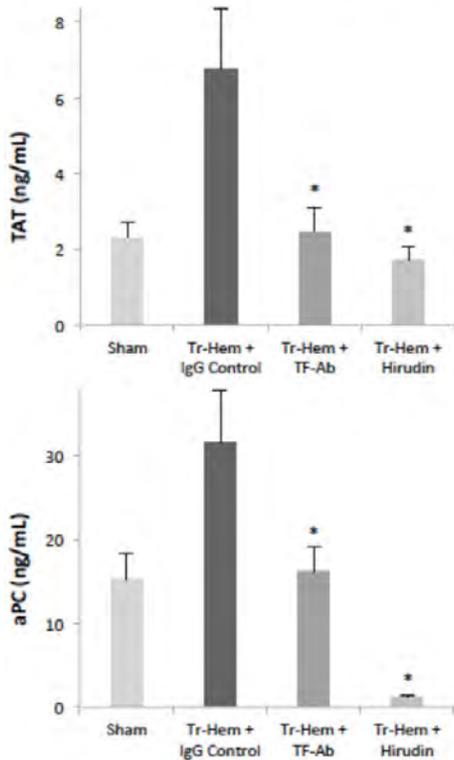
INTRODUCTION: The initiation of coagulation in trauma is traditionally thought to originate from exposed tissue factor (TF), which stimulates activation of the extrinsic pathway and formation of thrombin. Recent data have led to the alternative hypothesis that the intrinsic pathway may mediate coagulation after injury, through activation of DAMPs such as extracellular histones. Which pathway predominates in trauma patients remains to be determined. In acute traumatic coagulopathy (ATC), aberrant coagulation is mediated via the activated protein C (aPC) pathway. The upstream regulators of this process, and the relationship between clot initiation via TF and ATC, remain uncharacterized. To examine the mechanistic role of the pleiotropic TF pathway in mediating ATC, we employed specific antibody blockades in an established murine model of traumatic hemorrhagic shock. We hypothesized that both coagulation activation after injury and aPC-mediated coagulopathy are primarily driven by TF via thrombin, and that both would be attenuated by blocking the TF pathway.

METHODS: Mice underwent an established model of trauma and hemorrhage, and were subjected to either sham (vascular cannulation), trauma (cannulation plus laparotomy), or trauma-hemorrhage (cannulation, laparotomy, shock to MAP 35mmHg); they were monitored for 60 min prior to sacrifice. Mice in each group were pre-treated with either targeted anti-TF antibody (TFAb 21E10, 0.5mg) to block the TF pathway, or hirudin (lepirudin, 0.5mg) for specific blockade of thrombin; control mice were treated with volume-matched control IgG. Post treatment plasma was assayed for thrombin-antithrombin (TAT) and aPC by ELISA; organs were sectioned for histology.

RESULTS: Compared to controls, trauma-hemorrhage mice treated with anti-TF Ab had significantly reduced levels of TAT (2.91 vs. 6.93 ng/mL, p=0.028), and corresponding decreases in aPC (16.3 vs. 31.6 ng/mL, p=0.034), with reductions to levels seen in non-traumatized sham mice (Figure). Direct inhibition of thrombin yielded similar results, with attenuation of TAT and aPC to levels at or below those seen in sham mice.

CONCLUSIONS: In this study, blockade of the TF pathway led to attenuation of both thrombin production and aPC activation observed in traumatic shock. Specific thrombin inhibition achieved similar results, indicating that aPC-related coagulopathy is mediated via thrombin activated by the TF pathway. The near-complete blockade of TAT and aPC observed in this model argues for a dominant role of the TF-thrombin pathway in both coagulation activation after injury and traumatic coagulopathy.

Figure. TAT & aPC levels in sham and trauma-hemorrhage.



NOTES

Paper# 6
March 2, 8:40 am - 8:50 am

FETAL INJURIES AND PLACENTAL ABRUPTION DETECTED ON CT SCAN NOT OBSERVED ON ULTRASOUND

KS Romanowski, I Struve, B McCracken, J Anderson, DV Shatz
 University of California, Davis, Sacramento, CA

Presenter: Kathleen Romanowski, MD
Senior Sponsor: David V. Shatz, MD

INTRODUCTION: Trauma is the leading non-obstetric cause of maternal death during pregnancy. In the United States, between 5% to 8% of women experience trauma during pregnancy. Ultrasound has been the default imaging modality for the detection of fetal injuries and placental abnormalities in these patients.

METHODS: Our patient was a 23-year-old woman, 33 weeks 4 days pregnant, who was a restrained driver in a motor vehicle crash going approximately 65 mph when she hit an abandoned vehicle head on and spun into the median. Her initial vital signs were unremarkable. Physical exam revealed a soft, tender, gravid abdomen with a seat belt abrasion to the right chest and lower abdomen, abdominal tenderness, a right wrist deformity, bilateral ankle deformities and a left hip laceration. Obstetricians examined the patient on arrival to the trauma center. She had no fluid leak or vaginal bleeding and a fetal heart rate of 160 with minimal variability. Initial bedside ultrasound revealed no fetal injuries and no evidence of placental abruption. A CT scan of the abdomen and pelvis was obtained to evaluate for maternal abdominal injury. The scan revealed maternal L1 and L2 transverse process fractures, a comminuted fracture of the left iliac wing, and a gravid uterus with hypoattenuation of the placenta concerning for abruption (striped arrow). A fetal right femur fracture (white arrow) was also diagnosed.

RESULTS: Given the findings of the CT scan, and non-reassuring fetal heart rate during reduction of the patient’s wrist fracture, the decision was made to proceed with emergent cesarean section. Intraoperative findings confirmed the partial placental abruption, with an otherwise uneventful delivery. After several orthopedic procedures, the mother was discharged home on post-operative day 10. Her baby boy was ultimately found to have a right femur fracture, left clavicle fracture, liver laceration and renal contusion. His femur fracture was treated nonoperatively. He was discharged on day of life 23. Follow-up in the Orthopedic clinic revealed good healing of his fractures.

CONCLUSIONS: Ultrasound should be considered the first line of imaging in the pregnant trauma patient, but CT scan can have an important role in planning the treatment of the mother and the baby.



NOTES

Paper# 7

March 2, 8:50 am - 9:00 am

A WARY EYE, A KEEN MIND, AND A SHARP KNIFE: SUCCESSFUL MANAGEMENT OF MASSIVE INTRAOPERATIVE PULMONARY EMBOLISM AT A COMMUNITY HOSPITAL

JT Ali, JP Sabra, CV Brown

University of Texas Southwestern - Austin, Austin, TX

Presenter: Jawad Ali, MD

Senior Sponsor: Carlos Brown, MD

INTRODUCTION: Massive pulmonary embolism (MPE) is a feared entity that causes mortality in up to 64% of patients despite aggressive treatment. Prompt diagnosis and immediate treatment are crucial for success. We present the case of a trauma patient diagnosed with an intraoperative MPE at a community hospital who underwent emergent embolectomy. This rare case re-enforces recognition of patient risk factors, physiologic presentation, and prompt diagnostic and therapeutic maneuvers that can lead to saving a life.

METHODS: A healthy 45 year-old male was involved in a motorcycle collision resulting in a severe right-sided pelvic fracture with involvement of the acetabulum, ilium, and pubic rami. Having no other injuries, he was placed on traction with a Steinman pin and after operative planning he was taken for fixation on hospital day 4; he had not been started on anticoagulation. After routine induction and shortly after skin incision he became profoundly hypotensive and tachycardic. His oxygen saturation decreased until he proceeded to cardiac arrest and cardiopulmonary resuscitation (CPR) was initiated. With a high suspicion of PE, transthoracic echocardiogram was immediately performed revealing an underfilled, hypercontractile left ventricle (LV), a massively dilated right ventricle (RV), and a right atrium with tricuspid insufficiency (TI).

RESULTS: An available cardiothoracic surgeon promptly performed Trendelenburg's procedure. Via sternotomy, the pericardium was opened which confirmed the ultrasound findings. Open cardiac massage was performed without return of spontaneous circulation and the patient was placed on cardiopulmonary bypass. Large amounts of clot were removed from both main pulmonary arteries (Figure 1). Off bypass transesophageal echocardiography now showed a much smaller RV with resolution of TI. His tachycardia was reduced from over 200 to 130 BPM with synchronized cardioversion. A wire guided IVC filter was placed through the atrial appendage. He was extubated in the ICU hours later and had no neurologic sequelae. His hip was repaired 7 days later and he left the hospital 10 days after that in good condition and on therapeutic Coumadin.

CONCLUSIONS: In this case of MPE in a community hospital, knowing the risk factors for thrombus inherent in traumatic pelvic fractures and how to diagnose it rapidly were not enough. Mortality was averted by the certainty that an invasive surgical procedure needed to be performed immediately and the expertise to execute it.



NOTES

Paper# 8

March 2, 4:00 pm - 4:20 pm

APPROPRIATE DOSING OF HEPARIN IS NOT INFERIOR TO ENOXAPARIN IN PREVENTING VENOUS THROMBOEMBOLISM IN TRAUMA PATIENTS: RESULTS OF A PROSPECTIVE RANDOMIZED CLINICAL TRIAL *

EJ Olson, J Bandle, JM VanGent, AL Zander, CE Dunne, RY Calvo, SR Shackford, CB Sise, MJ Sise
Scripps Mercy, San Diego, CA

Presenter: Erik Olson, MD

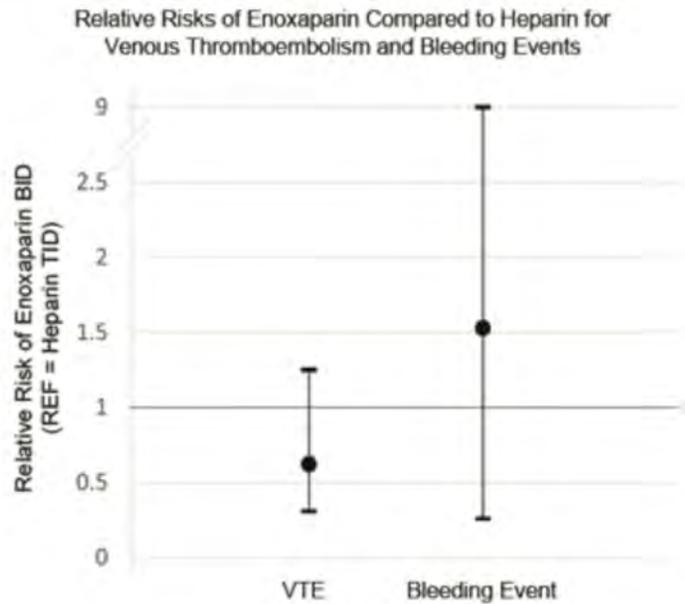
Senior Sponsor: Steven R Shackford, MD

INTRODUCTION: Venous thromboembolism (VTE) prophylaxis with enoxaparin (ENX) every 12 hours (Q12) was proven more effective than unfractionated heparin (UFH) Q12. The initial clinical trials recommended UFH be given every 8 hours (Q8). UFH is much less costly than ENX. We hypothesized that UFH 5000 U Q8 would result in a similar VTE incidence in trauma patients compared to those receiving 30mg ENX Q12 at a fraction of the cost.

METHODS: Adult patients admitted to the trauma service who met criteria for VTE prophylaxis were randomized to receive UFH 5000 U Q8 or ENX 30 mg Q12. Routine surveillance duplex sonography was performed on all ICU patients twice a week and weekly on the Trauma Med-Surg Unit. The primary outcomes were deep vein thrombosis diagnosed by duplex ultrasound and pulmonary embolism diagnosed by CT angiography of the chest.

RESULTS: Of the 495 patients randomized, 106 UFH patients and 103 ENX patients underwent VTE surveillance or diagnostic testing. The risk of developing VTE among UFH patients was not significantly different than that among ENX patients (17% vs 11%, $p=0.126$). Among screened patients, 5 (2.4%) had bleeding events (2 UFH, 3 ENX) and heparin-induced thrombocytopenia developed in 1 UFH patient (0.5%). The pharmaceutical cost was nearly 20-fold higher in the ENX group (UFH: \$2,134; ENX: \$41,193).

CONCLUSIONS: The administration of UFH Q8 is not inferior to ENX Q12 for the prevention of VTE following trauma. The cost of UFH is substantially lower. UFH provides trauma centers a comparable result at reduced cost. The use of UFH instead of ENX for preventing VTE offers greater value in a time of increasing scrutiny of health care expenditures.



NOTES

Paper# 9
March 2, 4:20 pm - 4:40 pm

SUBCAPSULAR HEMATOMA IN BLUNT SPLENIC INJURY: A SIGNIFICANT PREDICTOR OF FAILURE OF NON-OPERATIVE MANAGEMENT *

JM Lopez Jr., JL Gross, PW McGonagill, JA Requarth, KL Parker, JJ Hoth, MC Chang, PR Miller

Wake Forest School of Medicine, Winston-Salem, NC

Presenter: Joseph Lopez, Jr., MD
Senior Sponsor: Preston Roy Miller, MD

INTRODUCTION: In patients with blunt splenic injury (BSI), appropriate patient selection and the recent increase in the use of angiography and embolization for higher grade injuries has contributed to low non-operative management (NOM) failure rates, even in grade III-V injuries. Despite these advances, some appropriately selected patients will still fail NOM. Anecdotally, we noted that a significant proportion of NOM failures also had subcapsular hematomas (SCH) identified on imaging. Thus we sought to determine if there is a correlation between SCH and higher risk of NOM failure after BSI.

METHODS: Our institutional trauma registry was queried for all patients with BSI over a 2-year period. Charts were then reviewed to determine grade of splenic injury, presence of SCH, and outcome of NOM. Under current institutional protocol, all stable patients with BSI grades III-V and those with contrast blush on CT are referred for angiography and consideration of embolization. Failure of non-operative management was declared if the patient required a splenectomy for bleeding after an initial plan of non-operation as stated by the admitting trauma surgeon.

RESULTS: From 5/12-5/14, 312 patients with BSI were identified. 255 patients (82%) underwent planned NOM. Seventeen (6.6%) patients overall failed NOM. Of the 255 undergoing NOM, 40 had SCH and 11 failed (27.5%, vs. 2.8% without SCH, $p=0.0001$) Overall failure rates in grades 1-4 were 2.3%, 3.8%, 8.8%, and 9.6% respectively. NOM failure rates in the subset with SCH for grade I-IV were 20%, 27.3%, 30.8%, and 75%, respectively. These are significantly higher than patients without SCH in grades II-IV (0%- $p=0.002$, 2.3%- $p=0.008$, and 9.1%- $p=0.014$) and approach significance in grade I (1.2%- $p=0.11$). There were no SCH and no failures of NOM in grade V injuries. Overall, SCH patients accounted for 64.7% of all NOM failures.

CONCLUSIONS: The NOM failure rate of BSI patients with SCH is significantly higher than those without SCH. This increased requirement for splenectomy is seen across almost all BSI grades. Patients with BSI grades I-III slated for NOM must be observed carefully as the NOM failure rate approaches 30% in such patients. Splenectomy should be considered in all patients with grade IV BSIs with SCH, as the NOM failure rate in this cohort is 75%.

Paper# 10**March 2, 4:40 pm - 5:00 pm****THE OLD MAN AND THE C-SPINE FRACTURE: IMPACT OF HALO VEST STABILIZATION IN PATIENTS WITH BLUNT CERVICAL SPINE FRACTURES**

*

JP Sharpe, LJ Magnotti, JA Weinberg, TC Fabian, MA Croce
University of Tennessee Health Science Center, Memphis, TN

Presenter: John Sharpe, MD, MS**Senior Sponsor: Jordan Weinberg, MD**

INTRODUCTION: Stabilization methods for patients with cervical spine fractures can be controversial. Placement of a halo vest is presumed to be less morbid than operative fixation. However, additional restrictions imposed by the halo vest can be detrimental, especially in older patients. The purpose of this study was to evaluate the impact of halo vest placement on outcomes by age in patients with cervical spine fractures without spinal cord injury.

METHODS: All patients with blunt cervical spine fractures managed over a 17-year period were identified. Those with spinal cord injury and severe TBI were excluded. Patients were stratified by age (cut-point determined by Youden's index), gender, halo vest, injury severity and severity of shock. Outcomes included ICU length of stay (LOS), ventilator days, ventilator-associated pneumonia, functional status, and mortality. Multivariable logistic regression (MLR) was performed to determine whether halo vest was an independent predictor of mortality in older patients.

RESULTS: 3457 patients were identified: 69% were male with a mean ISS and GCS of 19 and 13, respectively. Cut-point for age was identified as 54 years. Overall mortality was 5.3%. 179 patients were managed with a halo vest: age \leq 54 (n=133) and age > 54 (n=46). Both mortality (13% vs 0%, $p < 0.001$) and ICU LOS (12 days vs 5 days, $p = 0.02$) were significantly increased in older patients despite less severe injury (admission GCS of 14 vs 13 and ISS of 23 vs 19, $p = 0.03$) and severity of shock (admission SBP of 140 vs 132 and base excess of -1.4 vs -3.8, $p = 0.05$). MLR identified halo vest as an independent predictor of mortality after adjusting for injury severity and severity of shock (OR=2.629, 95%CI=1.056-6.543) in older patients.

CONCLUSIONS: The potential risk of operative stabilization must be weighed against that of halo vest placement for older patients with cervical spine fractures following blunt trauma. Although placement of a halo vest can eliminate the need for lengthy operative stabilization procedures, their use is not without consequence. In fact, despite less severe injury and severity of shock, the use of halo vests in older patients was an independent predictor of mortality. Thus, patient age should be strongly considered prior to placement of a halo vest for cervical spine stabilization.

Paper# 11**March 2, 5:00 pm - 5:20 pm****EARLY TRANEXAMIC ACID ADMINISTRATION: A PROTECTIVE EFFECT ON GUT BARRIER FUNCTION FOLLOWING ISCHEMIA/REPERFUSION INJURY ***

ME Diebel, DM Liberati, J Whittaker, CW Manke, LN Diebel

Wayne State University, Detroit, MI

Presenter: Mark Diebel, MD**Senior Sponsor: Lawrence Diebel, MD**

INTRODUCTION: The mucus barrier is a critical component of the gut barrier and may be disrupted by pancreatic enzymes following Trauma/Hemorrhagic Shock (T/HS). Luminal strategies against pancreatic enzyme activation or contact with the intestine are protective of the mucus layer and gut barrier integrity following T/HS. This includes luminal administration of protease inhibitors such as Tranexamic Acid (TXA). However, the effects are limited to the anatomic site(s) of administration in the gut lumen. There is increasing evidence that TXA administration reduces blood transfusion in trauma and surgical patients. The use of TXA also attenuates inflammatory responses in cardiac surgery and is readily absorbed from the gut. We therefore postulated that systemic administration of TXA would attenuate mucus degradation and gut barrier failure following T/HS. This was studied in an in vitro model.

METHODS: HT29-MTX (mucus producing clone) and Caco-2 co cultures were used to model the intestinal epithelium in vivo. Cell monolayers were exposed to 90 minutes of hypoxia followed by reoxygenation (H/R), luminal trypsin (1-5×M) or both treatment groups. In a subset of experiments, TXA (40 or 150×M) was added to the basal chamber (systemic side) of intestinal cell cultures immediately following the hypoxic period. Mucus barrier function was indexed by rheologic measurement of both mucus thickness and viscosity (G' , dyne/cm²) and lipid hydroperoxide release (LPO). Intestinal cell barrier integrity was indexed by transepithelial electrical resistance (TEER), permeability to FITC-dextran and apoptosis by flow cytometry.

RESULTS: See Table. mean \pm SD, N = 4 for each group. Only high concentrations of trypsin and TXA are shown.

CONCLUSIONS: Intestinal mucus physiochemical properties and intestinal barrier function were most severely impacted by exposure to both trypsin (concentration related) and H/R. The "systemic" administration of TXA immediately after the hypoxic period was protective and suggests an additional role for early administration of TXA in trauma patients in shock.

	Mucus barrier			Intestinal epithelial barrier		
	Thickness (µg)	Viscosity (dyne/cm ²)	LPO (pmol/mg)	TEER (ohm/cm ²)	Perm (nmol/cm ² /hr)	Apoptosis (%)
MTX/Caco	150±10	26,200±200	1.8±0.5	197±5	0.3±0.02	4.9±0.7
MTX/Caco+H/R	100±10*	19,800±170*	5.2±1.0*	181±8*	0.6±0.05*	11.7±1.2*
MTX/Caco+5tryp	100±20*	7,800±100*	2.7±0.9	198±6	0.3±0.02	6.5±1.0*
MTX/Caco+H/R+5tryp	50±5*	4,100±125*	14.8±1.6*	166±5*	1.6±0.06*	39.8±2.3*
MTX/Caco+H/R+5tryp +150 TXA	125±10*#	23,900±150#	3.1±0.8#	185±10#	0.5±0.03*#	6.2±1.5#

NOTES

Paper# 12
March 2, 5:20 pm - 5:30 pm

MESH FIXATION TO THE ILIAC CREST WITH SUTURE ANCHORS IS EFFECTIVE FOR TRAUMATIC AND POST-SURGICAL FLANK HERNIAS

K Mukherjee, RS Miller
 Vanderbilt University Medical Center, Nashville, TN

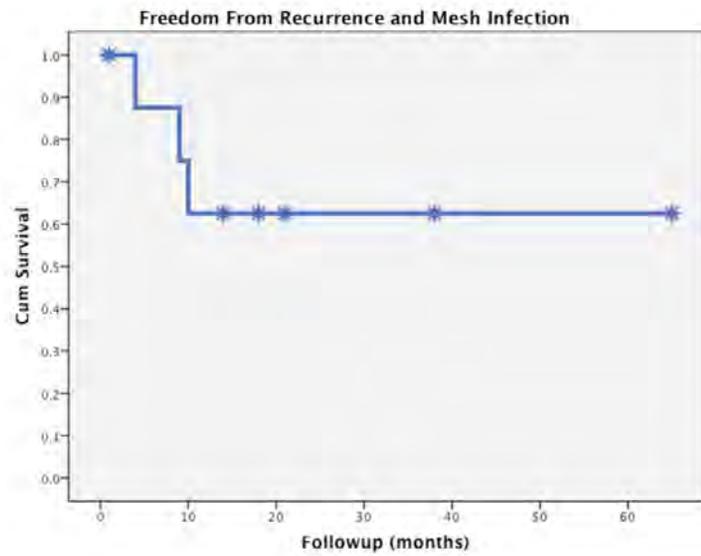
Presenter: Kaushik Mukherjee, MD MSCI
Senior Sponsor: Rick Miller, MD

INTRODUCTION: Traumatic or postsurgical flank hernias are complex and prone to recurrence, particularly at the border of the iliac crest. We have used suture anchors drilled into the iliac crest to fixate the mesh to bone. We reviewed our experience with this technique.

METHODS: Our study of 9 repairs in 7 patients was exempt from IRB review. We obtained demographics, BMI, diabetes, MRSA history, smoking status, steroid use, number of prior repairs, defect size, mesh size, number of anchors, and recurrence and infection at followup. We performed Kaplan-Meier analysis using a composite of recurrence or infection.

RESULTS: (median [IQR]): Patients were 42 years old [28, 55] with a BMI of 32.5 [30.5, 37.5] and 2 previous repairs [0, 4.5]. 1/7 (14.3%) had a history of MRSA infection. Defect size was 100 cm² [63.5, 210] and mesh size was 160 cm² [150, 305] with 4 anchors [4, 6]. 2/7 patients (28.6%) recurred and 1/7 (14.3%) became infected with MRSA. Followup was 14 months [6.5, 29.5]. Mean freedom from recurrence and mesh infection (Kaplan-Meier, Figure) was 43.5 months [95%CI 24.2, 62.8].

CONCLUSIONS: Our series is one of the largest in the literature involving the suture anchor technique. Despite a high-risk patient population due to traumatic origin, obesity, and prior smoking and MRSA history, we achieved an acceptable recurrence rate. Further study may benefit from a randomized trial design comparing repair with suture anchors to traditional repair.



PRO/CON DEBATE
March 2, 5:30 pm - 6:00 pm

PRO/CON DEBATE: Tourniquet in Civilian Trauma

Kenji Inaba, MD
 LAC+USC Medical Center, Los Angeles, CA

Carlos Brown, MD
 University of Texas at Austin, Austin, TX

NOTES

Paper# 13
March 3, 7:00 am - 7:20 am

**A NEW KID ON THE BLOCK: OUTCOMES WITH KCENTRA
ONE YEAR AFTER APPROVAL ***

AE Berndtson, W Huang, K Box, L Kobayashi, L Godat, AM Smith, R Coimbra
University of California - San Diego, San Diego, CA

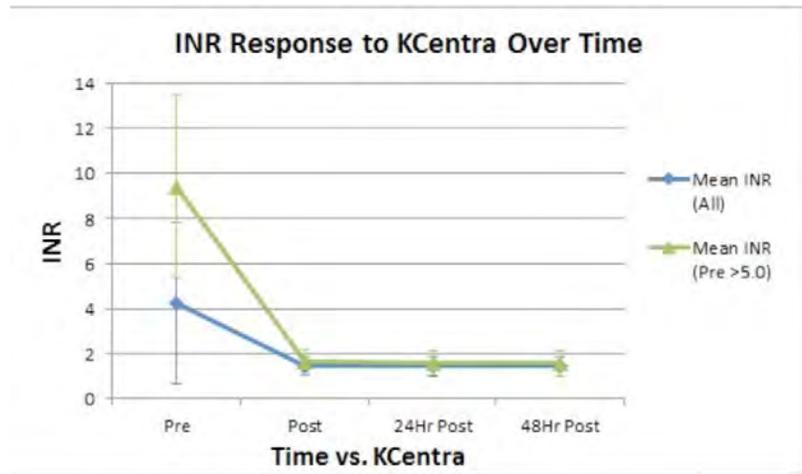
Presenter: Allison E Berndtson, MD
Senior Sponsor: Raul Coimbra, MD

INTRODUCTION: As the population ages an increasing number of trauma patients are admitted with coagulopathy. Fresh frozen plasma (FFP) is effective in reversing INR elevations due to warfarin or cirrhosis, however it is not appropriate for all patients. Prothrombin complex concentrates (PCC) are a better option for patients who require emergent reversal, minimal volume administration, have a high risk of bleeding due to supratherapeutic INR or are on novel oral anticoagulants resistant to FFP. A four-factor PCC initially approved and efficacious in Europe is now available in the U.S. We sought to review our institutional experience with Kcentra™ in trauma patients in the first year following FDA approval.

METHODS: The trauma registry and pharmacy database were retrospectively reviewed. All trauma patients admitted to an academic Level 1 trauma center between 07/15/2013 and 07/15/2014 who received Kcentra for the above indications were included. Kcentra was given at the discretion of the trauma attending or fellow. Univariate analysis was performed to examine patient demographics, injury characteristics, coagulation studies, Kcentra dose, Vitamin K use, transfusions, response to reversal, duration of reversal, length of stay, and mortality.

RESULTS: 31 patients met study criteria. 83.9% were coagulopathic due to warfarin, 9.7% the direct factor Xa inhibitor rivaroxaban and 6.5% had cirrhosis. 38.7% were reversed due to intracranial hemorrhage (ICH). The mean INR decreased from 4.3 ± 3.6 (range 1.2-15.3) to 1.5 ± 0.4 (range 1.2-2.6) after Kcentra administration. 2 patients (6.5%) received concurrent FFP. For patients with an initial INR >5.0, the mean INR decreased from 9.4 ± 4.0 to 1.7 ± 0.5. 48hrs following Kcentra administration mean INR for all patients remained 1.4 ± 0.4 (range 1.0-2.6). 26 patients (83.9%) received Vitamin K over this time period. 19 patients had a pre-Kcentra thromboelastogram (TEG); six were hypocoagulable. All normalized after Kcentra was given. 63.6% of patients with ICH showed radiographic progression of the initial insult on post-Kcentra head CT. For those on rivaroxaban, 50% progressed. Overall mortality was 0%.

CONCLUSIONS: Kcentra effectively reverses elevated INR and TEG abnormalities in coagulopathic trauma patients, with results lasting >48 hours after administration.



NOTES

Paper# 14
March 3, 7:20 am - 7:40 am

A PILOT STUDY OF CHEST TUBE VERSUS PIGTAIL CATHETER DRAINAGE OF ACUTE HEMOTHORAX IN SWINE *

RM Russo, SA Zakaluzny, RA Hight, LP Neff, JK Grayson, J Galante, DV Shatz
 University of California, Davis, Sacramento, CA

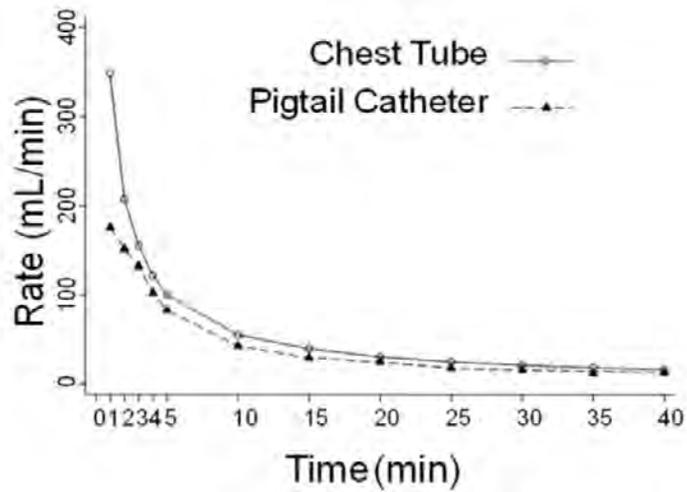
Presenter: Rachel Russo, MD
Senior Sponsor: David V. Shatz, MD

INTRODUCTION: Evacuation of traumatic hemothorax (HTx) is most often accomplished with large bore (28-40Fr) chest tubes which result in patient discomfort during and after the procedure. Management of HTx with smaller (14Fr), flexible pigtail catheters has not been readily adopted, especially in the acute care setting, due to concerns about tube occlusion and blood evacuation rates. The purpose of this study was to compare pigtail catheters with chest tubes for the drainage of acute HTx in a pig model.

METHODS: Six Yorkshire-cross pigs (44-53kg) were anesthetized, instrumented, and mechanically ventilated. A 32F chest tube was placed in one randomly assigned hemithorax and a 14F pigtail catheter was placed in the other. Each tube was connected to a Pleur-Evac® chest drainage unit with -20 cm H2O suction and clamped. Over 15 minutes, 1500 mL of blood was withdrawn from the femoral arteries of the pig, 750 mL of which was instilled into each pleural space. Fluid resuscitation was initiated. The chest drains were then unclamped. Output from each drain was measured every minute for 5 minutes, then every 5 minutes for 40 minutes. The pigs were euthanized and a thoracotomy was performed to quantify the volume of blood and clot remaining in the pleural space and to examine the position of each tube.

RESULTS: Compared to the pigtail catheter, blood drainage was more rapid from the 32F chest tube during the first three minutes (155 mL/min vs. 132 mL/min) (Figure). After that brief period, the rates of drainage between the two tubes were not substantially different. The chest tube drained a higher total percentage of the blood from the chest (87.3% vs 70.3%), but this difference was not statistically significant (p=0.21).

CONCLUSIONS: This pilot study in a pig model revealed that chest tubes are initially more effective for HTx evacuation than pigtail catheters. However, over time, there was no significant difference between the catheters. Additional refinements in the model and a larger study are needed to determine if pigtail catheter drainage is a clinically appropriate alternative to large bore chest tubes for acute HTx management.



NOTES

Paper# 15
March 3, 7:40 am - 8:00 am

UTILITY OF REPEAT MONITORING OF HEMOGLOBIN AND HEMATOCRIT FOLLOWING BLUNT SOLID ORGAN INJURY IN CHILDREN *

SN Acker, B Petrun, DA Partrick DD Bensard
 Children’s Hospital Colorado, Aurora, CO

Presenter: Shannon Acker, MD
Senior Sponsor: Denis Bensard, MD

INTRODUCTION: Current management protocols for children with blunt solid organ injury to the liver and spleen call for serial monitoring of the child’s hemoglobin and hematocrit every 6, 12, or 24 hours depending on the injury grade. We hypothesized that children who require intervention in the form of laparotomy, angioembolization, or pack red blood cell (PRBC) transfusion due to bleeding from a solid organ injury will have changes in their vital signs that alert the clinician to the need for intervention, making scheduled laboratory evaluation unnecessary.

METHODS: We performed a retrospective review of all children admitted to either of two pediatric trauma centers following blunt trauma with any grade liver or spleen injury from 1/09-12/13. Data evaluated include need for intervention, indication for intervention, and timing of intervention.

RESULTS: 245 children were admitted with blunt liver or spleen injury. Six (2.5%) patients underwent emergent exploratory laparotomy for hypotension a median of 4 hours after injury (IQR 2-4 hours), 4 of who required splenectomy. No child required laparotomy for delayed bleeding from a solid organ injury. 41 (16.7%) children received a PRBC transfusion during hospitalization a median of 6 hours following injury (IQR 1.5-22 hours). Among these 41 children, 26 were transfused for hypotension a median of 2.75 hours after injury (IQR 1-7.75); 15 were transfused due to falling hematocrit levels a median of 22 hours after injury (IQR 12-62; p<0.01). Children who underwent an intervention had a lower nadir hematocrit (23.4 vs 32.6; p<0.0001), longer time from injury to nadir hemoglobin (median 35.5 vs 16 hrs; p<0.0001), and more total blood draws for hemoglobin and hematocrit monitoring (median 20 vs 5; p<0.0001).

CONCLUSIONS: Among children with blunt liver or spleen injury, need for intervention in the form of laparotomy or PRBC transfusion for hemorrhagic shock occurs within the first 24 hours of injury. Ongoing, scheduled monitoring of serum hemoglobin and hematocrit values may not be necessary.

Paper# 16
March 3, 8:00 am - 8:20 am

**LEGALIZATION OF MARIJUANA IN COLORADO AND WASHINGTON
 DID NOT CHANGE HIGHWAY DEATHS ***

JD Aydelotte, KM Luftman, TB Coopwood, A Mardock, J Michalek,
 S Stafford, C Brown
 University Medical Center Brackenridge, Austin, TX

Presenter: Kevin Luftman, MD
Senior Sponsor: Carlos Brown, MD

INTRODUCTION: Marijuana legalization is a hotly contested political and public health topic across the country. One of the arguments against legalizing marijuana is the public health risk it poses, especially as it relates to traffic accidents and deaths in those states. We wanted to see if the legalization of marijuana in Colorado and Washington affected the numbers of motor vehicle deaths since becoming legal in November 2012.

METHODS: We accessed traffic crash records from 2003 through 2013 from Colorado and Washington State through an open records request through their Departments of Transportation. Similar requests were made for Texas, Virginia, and Utah and their data were used as controls. We compared Colorado (CO), Washington (WA), and their two-state average (COWA) against the three control states (CS). The significance of variation in rates with year was assessed with a linear Poisson model with a log link and an offset of miles in log units. A generalized estimating equations model of the binomial distribution was used to assess the significance of variation in the rate of drug testing with year. All statistical testing was 2-sided with a significance level of 5% and SAS Version 9.3 for Windows (Cary, North Carolina) was used throughout.

RESULTS: From 2003 to 2013 deaths in Colorado fell from 14.80/BillionMilesDriven (BMD) to 8.63/BMD ($p < 0.001$), in Washington from 10.95/BMD to 7.82/BMD ($p < 0.001$), and in CS from 41.4/BMD to 33.0/BMD ($p < 0.001$). Specifically in the timeframe of legalization (2012-2013), deaths in Colorado were unchanged, 8.14/BMD to 8.64/BMD ($p = 0.40$). Similarly, deaths in Washington, 7.85/BMD to 7.82/BMD ($p = 0.96$), COWA, 7.98 to 8.19 ($p = 0.59$), and the Control States, 33.6/BMD to 33.0/BMD ($p = 0.44$), were also unchanged.

CONCLUSIONS: Legalizing marijuana in the states of Washington and Colorado did not affect the numbers of traffic deaths in those states. While this is one year's worth of data, it is potentially a profound statement concerning the perceived public health risk marijuana legalization has on the rest of the United States. Data should be followed for the next several years to see if there are changes in these trends.

NOTES

PRO/CON DEBATE
March 3, 8:20 am - 9:00 am

PRO/CON DEBATE: TEC PCC

Matthew Martin, MD
Madigan Army Medical Center, Tacoma, WA

Bryan Cotton, MD, MPH
University of Texas Health Science Center, Houston, TX

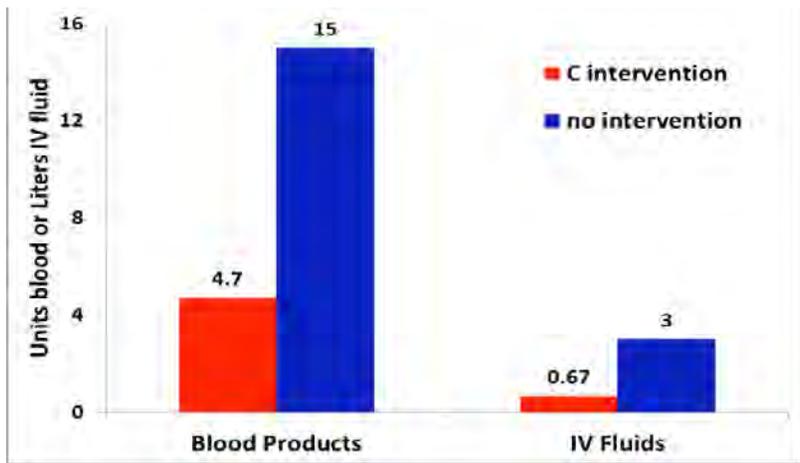
Paper# 17**March 3, 4:00 pm - 4:20 pm****PRE-HOSPITAL INTERVENTIONS IN SEVERELY INJURED PEDIATRIC PATIENTS: RETHINKING THE ABC'S. ***KK Sokol, GE Black, KA Azarow, W Long, MJ Eckert, MJ Martin
Madigan Army Medical Center, Tacoma, WA**Presenter: Kyle Sokol, MD****Senior Sponsor: Matthew J. Martin, MD, FACS**

INTRODUCTION: The current conflict in Afghanistan has resulted in a high volume of significantly injured pediatric patients being treated in an austere environment. The nature of battlefield trauma has traditionally demanded an emphasis on pre-hospital interventions (PHI) to sustain casualties during transport, but little is known about the epidemiology and effectiveness of PHI in the pediatric population in both civilian and combat settings.

METHODS: The Department of Defense Trauma Registry (DoDTR) was queried for all pediatric patients (<18 years) treated at Camp Bastion from 2004 to 2012. PHI were grouped by ATLS primary survey categories into 1) Airway - intubation or surgical airway, 2) Breathing - chest tube or needle thoracostomy, and 3) Circulation - tourniquet or hemostatic dressing application. Outcomes were assessed based on injury severity scores (ISS), hemodynamic status, blood products and fluids, and mortality rates.

RESULTS: There were 766 injured children identified over the study period, with the majority sustaining blast (51%) and gunshot wounds (28%). Overall 20% of patients required one or more PHI, most commonly Circulation (C, 59%) followed by Airway (A, 42%) and Breathing (B, 8%). The majority of C interventions were tourniquets (85%) and less frequently hemostatic dressings (15%). Of note, only 35% of patients with extremity vascular injury or amputation received a C intervention, with a significant reduction in total blood products and IV fluids associated with receiving a C pre-hospital intervention (Figure, both $p < 0.05$). Airway interventions were most commonly endotracheal intubation performed for depressed mental status ($GCS < 8$). Among patients with TBI (head $AIS \geq 3$), A interventions were associated with higher unadjusted mortality (56% vs 20%, $p < 0.01$), and remained independently associated with increased mortality after multivariate adjustment for patient and injury factors (OR 5.9, $P = 0.001$). Breathing interventions were uncommon and only performed in 4% of patients with pneumo or hemothoraces. These included needle (N=8) or tube (N=5) thoracostomy, with no tension physiology on presentation, and no deaths or adverse outcomes in this cohort.

CONCLUSIONS: There is a high incidence of PHI among pediatric patients with severe injuries in a combat setting. The most common and effective were Circulatory PHI for hemorrhage control, which should remain a primary focus of equipment and training. Airway interventions were most commonly performed in the setting of severe TBI, but were associated with worse outcomes and require further study to examine the indications and efficacy of the ABC approach in pediatric head trauma. Breathing interventions appear safe and effective, and may be under-utilized.



NOTES

Paper# 18

March 3, 4:20 pm - 4:40 pm

THE "HIGH-RISK" DVT SCREENING PROTOCOL FOR TRAUMA PATIENTS - IS IT PRACTICAL?*

Z Dietch, R Petroze, M Thames, R Willis, R Sawyer, M Williams
University of Virginia, Charlottesville, VA

Presenter: Zachary Dietch, MD

Senior Sponsor: Nicholas Namias, MD

INTRODUCTION: Many trauma centers advocate aggressive lower extremity deep venous thrombosis (DVT) screening using ultrasound (LUS) for patients meeting high-risk criteria, despite equivocal evidence of clinical benefit. We hypothesized that a high-risk screening protocol is impractical and costly to implement.

METHODS: Our institution's trauma database was queried to identify 6,656 patients who were admitted between 2009 and 2013 for traumatic injuries. Patient demographics, injury characteristics, occurrence of DVT, and frequency of LUS were recorded. Multivariate analyses were performed on a subset of patients who underwent LUS to assess the association between patient and injury characteristics and the development of DVT. A predictive model for the development of DVT was then applied to the entire study population to determine performance.

RESULTS: Overall, 2,350 (35.3%) of admitted patients underwent LUS. 146 patients (6.2%) developed a DVT during hospitalization. Patients who underwent LUS were significantly older (54.5 vs. 50.4 years, $p < 0.0001$), had higher injury severity scores (ISS) (13.5 vs. 8.6, $p < 0.0001$), and longer admissions to the intensive care unit (ICU) (5.6 vs. 0.9 days, $p < 0.0001$). Of patients who underwent LUS, those who developed DVT had higher ISS (18.5 vs. 13.2, $p < 0.0001$) and longer admissions to the ICU (14.6 vs. 5.03 days, $p < 0.0001$). Multivariable logistic regression identified ICU length of stay, transfusion of blood products, spinal cord injury, and pelvic fracture to be associated with risk for DVT. Age, $ISS > 15$, presence of spine fracture, lower extremity fracture, need for operative intervention, and penetrating mechanism were not associated with risk for DVT (c-statistic 0.76). The predictive model applied to the entire population of trauma patients had a c-statistic of 0.87. The model's predictive capabilities and costs to implement are shown in the Table.

CONCLUSIONS: Although a predictive model identified high-risk criteria for the development of DVT at our institution, the model demonstrated poor sensitivity and positive predictive value. These results suggest that implementing a high-risk screening protocol in trauma patients would require a costly and burdensome commitment of resources and that high-risk DVT screening protocols may not be practical or cost-effective for trauma patients.

Risk Factors	Sensitivity	Specificity	PPV	NPV	Patients Screened	DVTs Detected	Total Cost	Cost per DVT detected
1	52.7%	74.3%	4.4%	98.6%	1,750	77	\$413,000	\$5,363
2	28.1%	95.6%	12.9%	98.3%	318	41	\$75,048	\$1,830
3	0.0%	99.9%	0.0%	97.8%	5	0	\$1,180	N/A

NOTES

Paper# 19

March 3, 4:40 pm - 5:00 pm

NO BREAK POINT FOR MORTALITY IN PEDIATRIC RIB FRACTURES *

G Rosenberg, KM Schuster AK Bryant, FY Lui, AA Maung, KA Davis
Yale School of Medicine, New Haven, CT

Presenter: Graeme Rosenberg, MD

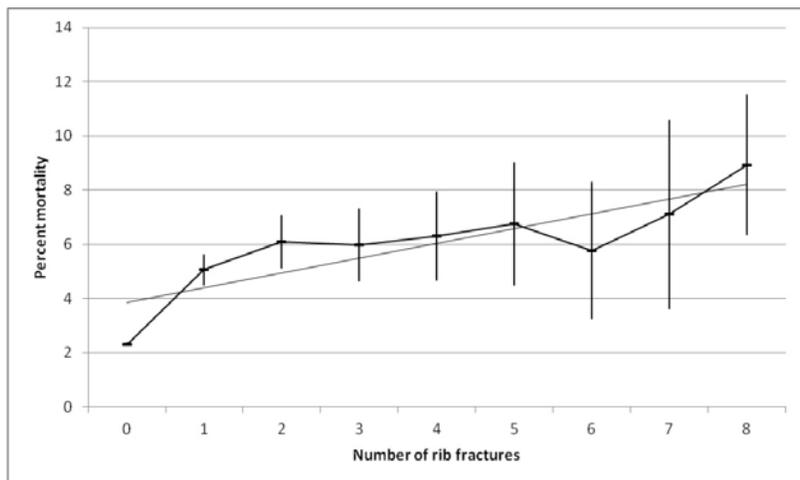
Senior Sponsor: Kim Davis, MD

INTRODUCTION: Rib fracture number correlates with mortality in adult trauma patients, sharply rising above six fracture ribs. Due to the pliability of younger ribs, pediatric ribs are believed to require more energy to fracture. We hypothesized this will result in a different rib fracture associated pediatric mortality rate.

METHODS: We queried the National Trauma Data Bank (NTDB, American College of Surgeons, Chicago, IL) for patients < 18 years old with > one rib fracture (2002-2009), abstracting the number of rib fractures, diagnoses, procedures, and outcomes. Univariate and multivariate analysis were performed with logistic regression to adjust for physiologic characteristics and concomitant injury.

RESULTS: We identified 671,410 pediatric patients, 13,884 with fractures. Mortality doubled from 2.31% without rib fracture to 5.06% for one rib fracture and then nearly linearly increased to 8.94% for eight fractures unlike the pattern in adults (Figure). This pattern persisted for those less than 15 years and those less than 10. Length of stay also increased with increasing number of rib fractures. Adjusted odds of mortality increased up to six rib fractures, after which it decreased. Penetrating injury, concomitant injury and hemothorax all predicted mortality on multivariate analysis. More rib fractures also predicted chest tube placement (p < 0.001) and laparotomy (p < 0.04), but not thoracotomy (p = 0.468) or thoracoscopy (p = 0.844).

CONCLUSIONS: Mortality increased nearly linearly for increasing numbers of pediatric rib fractures without an inflection. Odds of mortality increased with each increase in rib fractures through 6 ribs.



NOTES

Paper# 20
March 4, 7:00 am - 7:20 am

DEAD OR ALIVE? NEW CONFIRMATORY TEST USING QUANTITATIVE ANALYSIS OF COMPUTER TOMOGRAPHIC ANGIOGRAPHY *

LP Suarez-Kelly, PA Dhruv, PM Britt, EJ Clayton, CM Berenguer, JU Howington, FE Davis
 Memorial Health-University Medical Center, Savannah, GA

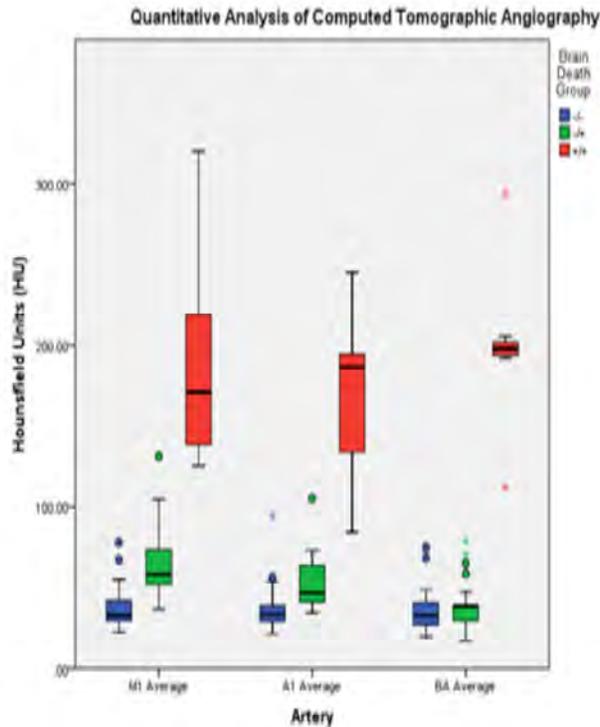
Presenter: Lorena P. Suarez-Kelly, MD
Senior Sponsor: Alvaro H. Fonseca, MD

INTRODUCTION: Established clinical guidelines exist for the diagnosis of brain death (BD), however clinical examination is not always reliable and ancillary tests may be required. Currently, the preferred confirmatory ancillary test is nuclear medicine perfusion test (NMPT). The use of computed tomographic angiography (CTA) has been recognized in detecting intracranial circulatory arrest in BD. This study is designed to quantitatively analyze CTA, assess its accuracy compared to NMPT, and define set parameters for confirmation of BD.

METHODS: Prospective clinical study, conducted from 2008-2014 at a level one trauma center. Eighty patients evaluated. Patients with clinical examination consistent with BD, NMPT was performed followed immediately by CTA (n=60). Patients with clinical examination not consistent with BD, CTA was performed (n=20). Assessment of NMPT and quantitative CTA cerebral perfusion was performed by a neuroradiologist measuring the Hounsfield units (HU) of each vessel segment.

RESULTS: Patients with clinical examination consistent with BD: 50% demonstrated intracranial circulatory arrest on NMPT and CTA (-/-), 38% demonstrated intracranial circulatory arrest on NMPT but intracranial perfusion was seen on CTA (-/+), and 12% demonstrated perfusion on both NMPT and CTA (+/+). Horizontal segment of middle cerebral artery (M1) HU values: -/- 22.3-78, +/- 36.8-131.3, and +/+ 125.5-320. Precommunicating segment of anterior cerebral artery (A1) HU values: -/- 21.3-94.8, +/- 34.2-105.1, and +/+ 84.2-245. Basilar artery (BA) HU values: -/- 19.5-75, +/- 17.2-78.7, and +/+ 112-293.5. ANOVA for M1, A1, and BA showed that +/- group varied significantly from the -/- and -/+ groups (p = .000 and p = .000) and for BA the -/- group did not vary significantly from the +/- patients (p = .775).

CONCLUSIONS: CTA is readily available, operator independent, and less expensive than NMPT. A consensus defining set parameters needs to be established for intracranial circulatory arrest to confirm BD on CTA. In this study, the data ranges within each group along with the statistical significant difference between the groups, suggest that an average M1 HU less than 125 (98% sensitive, 100% specific), A1 HU less than 80 (96% sensitive, 100% specific), and BA HU less than of 95 (100% sensitive, 100% specific) on CTA could to be used as a definitive cutoff value for confirming brain death.



NOTES

Paper# 21
March 4, 7:20 am - 7:40 am

COMPARISON OF FIBRINOLYSIS BEFORE AND AFTER TRANEXAMIC ACID IN TRAUMA PATIENTS: A 2-YEAR SINGLE-CENTER EXPERIENCE *

ME Parker, CA Thiels, DH Jenkins, DL Anderson, SP Zietlow, HJ Schiller, DS Morris, BD Kim and MS Park
 Mayo Clinic, Rochester, Rochester, MN

Presenter: Maile Park, MD
Senior Sponsor: Henry J. Schiller, MD

INTRODUCTION: Administration of tranexamic acid (TXA) within 3 hours of injury has been associated with a decrease in death due to hemorrhage. In an effort to address trauma induced coagulopathy (TIC) in exsanguinating trauma patients (pts), we have integrated administration of TXA during our blood transfusions in the prehospital setting (Pre-Hosp) and ED. We hypothesize that TXA decreases fibrinolysis as measured by thrombelastogram (TEG).

METHODS: From Aug 2012 to Sept 2014, we identified trauma patients who received TXA in the Pre-Hosp or ED. TEG was performed using kaolin within 4 minutes of blood draw. Data are presented as mean \pm SD and Wilcoxon Rank-Sum tests were performed; p-value < 0.05 was considered significant.

RESULTS: Among 3487 admissions, 55 trauma pts received TXA [ISS=27 \pm 15, hospital LOS= 16 \pm 19 days, age= 45 \pm 21 years, 75% male, 15% with penetrating mechanism, 11% rate DVT/PE, and observed mortality of 25.5% with mean predicted mortality of 35% (1- TRISS)]. In Pre-Hosp, 33% pts received TXA bolus and 50% received blood products; 64% of all pts subsequently received continuous infusion of TXA. Admission INR was 1.3 \pm 0.6 with ED SBP 103 \pm 33 mmHg, pulse 96 \pm 28 bpm and StO₂ 74 \pm 28%. During the first 6 hours after injury, 89% pts received blood products: RBC 6 \pm 4.6, plasma 4.8 \pm 4.6 and platelet 0.6 \pm 0.8 units during this time. Admission TEG parameters, irrespective of TXA, were: R time (min) 4.5 \pm 1.8, Angle 68.3 \pm 8.5, MA (mm) 62.9 \pm 7.7 and LY30 (%) 1.5 \pm 2.9. Of these pts, 10 individuals had TEG drawn both before and after (range: 4 - 24 hours) TXA and we observed a significant decrease in LY30% after TXA (Table).

CONCLUSIONS: TXA was given to critically injured pts who met criteria for blood transfusion early in their resuscitation. Despite clinical evidence of TIC, TXA significantly decreases fibrinolysis after bolus with or without subsequent infusion. The combination of an early hemostatic resuscitation protocol and use of TXA likely explains our reduced mortality rate. Future randomized studies, which includes laboratory coagulation profiles, need to be performed to assess the mechanistic role of TXA in improving outcome in this trauma patient population.

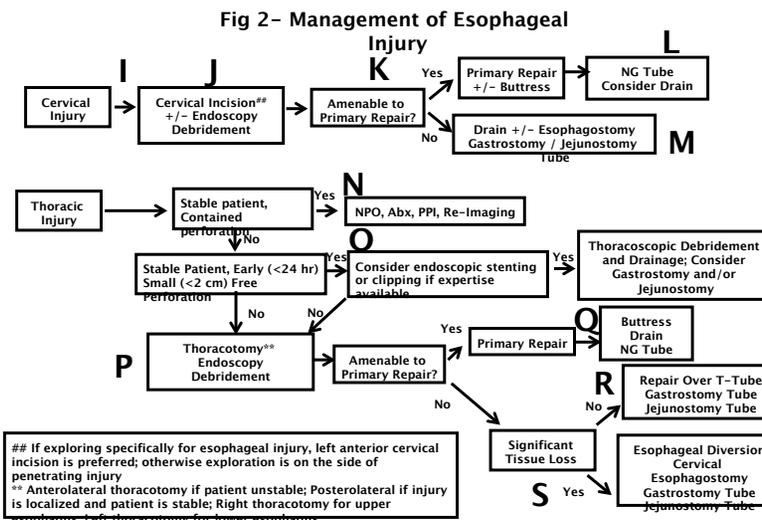
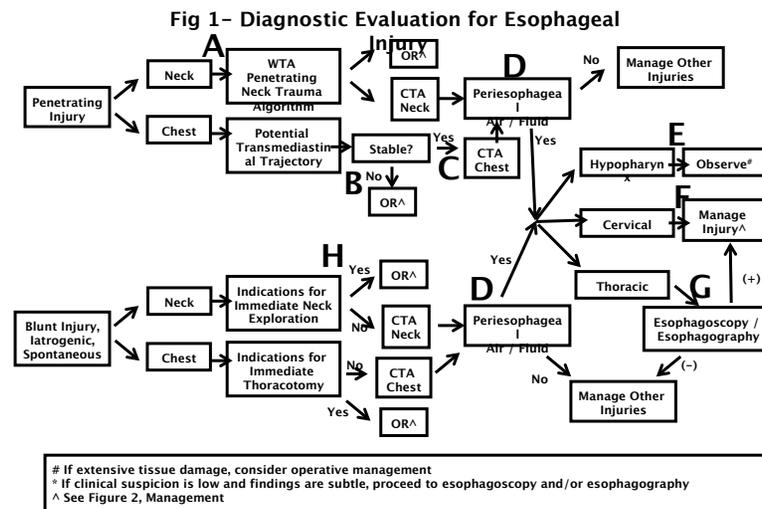
Variable	TEG-Before TXA	TEG-After TXA	p-Value
Coagulation Parameter			
Reaction Time [R] (min)	4.1 ± 0.9	5.0 ± 1.9	0.34
Alpha Angle [α](degrees)	71.6 ± 3.8	66.2 ± 9.6	0.36
Maximal Amplitude [MA] (mm)	64.6 ± 6.5	59.3 ± 9.2	0.17
Fibrinolysis Parameter			
Lysis at 30 min (LY30%)	3.7 ± 4.6	0.2 ± 0.5	0.003

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ALGORITHM
March 4, 7:40 am – 7:50 am

ALGORITHM: Esophageal Trauma

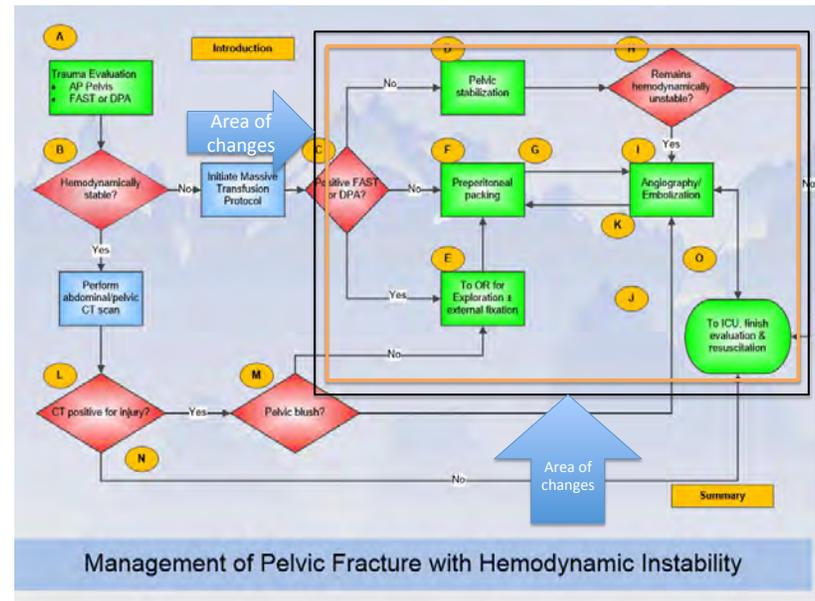
Walt Biffi, MD
Denver Health Medical Center, Denver, CO



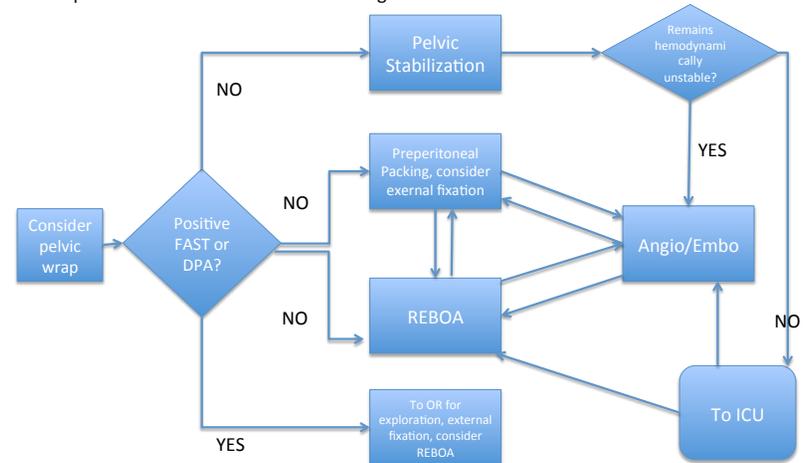
ALGORITHM
March 4, 7:50 am - 8:00 am

ALGORITHM: PELVIC TRAUMA

Nick Namias, MD
 University of Miami School of Medicine, Miami, FL



Expanded from zoomed area of Davis algorithm. Decisions will be based on local resources.



Paper# 22**March 4, 8:00 am - 8:20 am****PRESENCE OF A DEDICATED TRAUMA CENTER PHYSIATRIST IMPROVES FUNCTIONAL OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY ***

CG Greiss, PY Yonclas, AL Lequerica, IW Ward, GF Felix, LD Daghbian, NJ Jasey, NC Chiviorlotti, DL Livingston
Rutgers - NJMS, Newark, NJ

Presenter: Christine Greiss, DO**Senior Sponsor: David Livingston, MD**

INTRODUCTION: Maximizing recovery from traumatic brain injury (TBI) is an important goal. We hypothesized that introduction of early specialized care in the acute phase following TBI would lead to improved rehabilitation long term outcomes.

METHODS: Data from the Northern NJ TBI Model Systems were queried for all patients admitted to acute rehabilitation from 4 regional trauma centers; one with a full time TBI physiatrist (PHYS) and three without (No-PHYS). Demographics, mechanism, GCS, length post traumatic amnesia (PTA), length of stay, years of education, and FIM, were abstracted. Severity of TBI was determined by GCS and length of PTA. TBI medications (stimulants, sleep, and neuro-depressants) administered in the trauma center setting were collected through retrospective chart review to evaluate acute care prescription patterns. Primary outcome measures were FIM Motor (range 0-91) and Cognitive (Cog) scores (range 0-35) at admission and discharge from rehabilitation.

RESULTS: 148 patients were studied (PHYS 44; No-PHYS 104). 62 female and 86 male with a mean age of 63 years with no differences between groups. Mechanism was falls (54%), MVC (40%), and assault (6%). Overall, 72 (49%) graduated high school with patients in PHYS group having fewer years of education than No-PHYS ($p < 0.05$). Both groups had a mean GCS of 12 on admission to rehabilitation, with a PTA length of 14 days. Data for admission and discharge FIM and trauma center medication use are shown (data = mean \pm 4SD; * $p < 0.05$ vs. No-PHYS). Analysis of Covariance was conducted to examine changes in FIM Motor and FIM Cognitive Scores from rehab admission to discharge based on medications that were initiated in the trauma center. Controlling for TBI severity as measured by GCS and PTA, those who received neither a neurostimulant nor a sleep medication had significantly lower FIM Motor change scores compared with those who received at least one of these medications ($p = 0.047$) and compared with those who received both types of medication ($p = 0.17$). No significant differences were found in FIM Cognitive scores.

CONCLUSIONS: The presence of a dedicated trauma center physiatrist resulted in notable differences in the acute care of TBI patients between trauma centers as measured by medication use. Our data suggests that physiatrist directed early introduction of neuro-stimulants, and the avoidance of potentially deleterious medications can improve functional recovery following TBI.

GROUP	Admit FIM Motor	D/C FIM Motor	Admit FIM Cog	D/C FIM Cog	Stimulant use (%)	Sleep use (%)	Depressant use (%)
PHYS	26±10	62±16*	16±7	27±6	54*	34*	23
No-PHYS	29±11	58±17	17±7	25±6	5	16	32

NOTES

Paper# 23

March 4, 8:20 am - 8:40 am

RECURSIVE PARTITIONING IDENTIFIES GREATER THAN 4 UNITS OF PRBC'S PER HOUR AS AN IMPROVED MASSIVE TRANSFUSION DEFINITION *

A Moren, D Hampton, B Diggs, T Hansberry II, L Kiraly, E Fox, J Holcomb, M Rahbar, K Brasel, M Cohen, E Bulger, H Phelan and M Schreiber on behalf of the PROMMTT study group
Oregon Health and Science University, Portland, OR

Presenter: Alexis Moren, MD, MPH
Senior Sponsor: Martin Schreiber, MD

INTRODUCTION: Massive transfusion (MT) is classically defined as >10units of packed RBCs in 24 hours. This fails to capture the most severely injured patients. Extending the prior work of Savage and Rahbar, a rate based MT definition may more accurately define critically injured patients requiring early, aggressive resuscitation.

METHODS: The Prospective Observational Multicenter Major Trauma Transfusion trial collected data from ten level 1 trauma centers. Patients were placed into rate-based transfusion groups by maximal number of PRBC's transfused in any hour within the first 6 hours. A nonparametric analysis using classification trees partitioned data according to 24 hour mortality using a predictor variable of maximum units of PRBC's transfused in an hour. Dichotomous variables found to be significant in previous scores and models as predictors of MT were used to identify critically ill patients: a positive FAST exam, GCS<8, HR >120, SBP<90, penetrating mechanism of injury, INR >1.5, Hg<11 and BD >5. These critical indicators were then compared among the nodes of the classification tree. Patients omitted included those who did not receive PRBC's (n=24) and those who did not have all 8 variables included in critical indicators (n=449).

RESULTS: In a population of 1245 patients, the classification tree included 772 patients. Analysis by recursive partitioning showed increased mortality in patients receiving >13U/hr (73.9%, p<0.01). In those patients receiving ≤13U/hr, mortality was greater in patients who received >4U/hr (16.7% vs 6.0%; p<0.01)(Figure 1). Nodal analysis showed the median number of critical indicators for each node: 3 (2,4)(≤4U/hr), 4(3,5)(>4U/hr and ≤13U/hr) and 5(4,5.5)(>13U/hr).

CONCLUSIONS: A rate-based transfusion definition identifies a difference in mortality in patients who receive >4U/hr of PRBC's. Redefining MT to >4U/hr allows early identification of patients with a significant mortality risk who may be missed by the current definition.

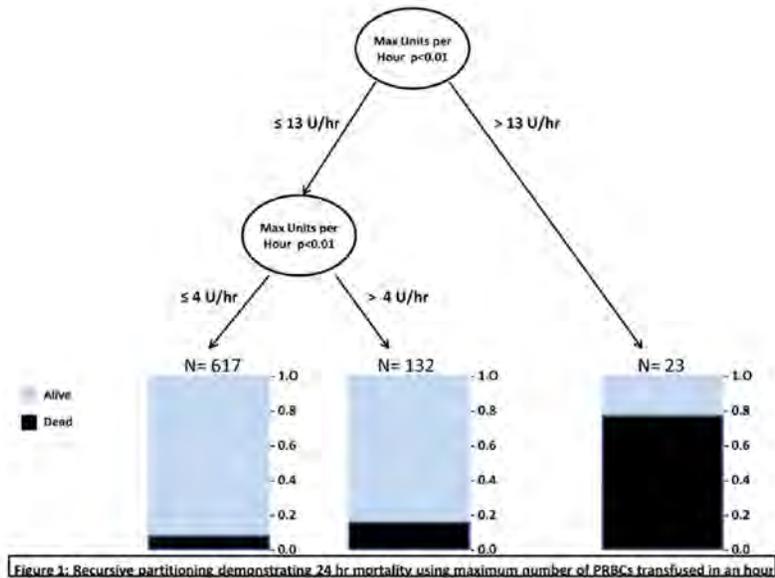


Figure 1: Recursive partitioning demonstrating 24 hr mortality using maximum number of PRBCs transfused in an hour

NOTES

Paper# 24

March 4, 8:40 am - 8:50 am

ALPINE AIRWAY EMERGENCY: CRICOTHYROTOMY AT 17,000 FEET

B Scheele, R Schnell, M Kirby, D Weber, M Brenner
Mount Sinai Medical Center, Miami, FL

Presenter: Brian Scheele, DO

Senior Sponsor: Megan Brenner, MD

INTRODUCTION: Emergency surgical cricothyrotomy is a life-saving procedure taught in Advanced Trauma Life Support®. There are no reports in the literature describing this procedure at high-altitude. We report a case of a mountaineer who suffered respiratory failure and a traumatic brain injury secondary to a 1,400 foot fall on ice and underwent emergency surgical cricothyrotomy performed by a pre-hospital medic mountain rescue unit.

METHODS: A 30 yo male was found at 17,000 feet in sub-zero Fahrenheit temperatures with a GCS of 3, apnea, hypothermia, and a fixed and dilated right pupil. An attempt at orotracheal intubation failed, and a surgical cricothyrotomy was performed with extremely limited medical supplies. Ventilation through bag-valve-mask with supplemental oxygen continued for several hours under temporary shelter until weather conditions permitted flight evacuation. Environmental exposure treatment included oxygenation, ventilation, prevention of further heat loss by convection, and abstaining from active re-warming measures. Basic immobilization techniques such as cervical spine precautions were applied as much as possible in this austere setting.

RESULTS: During the hours prior to transfer to definitive care, the patient's Glasgow Coma Scale improved from 3T to 5T as he developed decorticate posturing. The patient arrived at a local treatment facility 12 hours after the initial injury, and was treated for traumatic brain injury, hypothermia, and other injuries. Several weeks later the patient was discharged, and after aggressive rehabilitation, returned to his previous occupation.

CONCLUSIONS: Emergency surgical cricothyrotomy is a life-saving procedure. This may be successfully performed by highly-trained pre-hospital medics despite limited resources, and while facing the extreme environmental challenges present at high altitude. Mountain rescue units should maintain skills required to care for critically ill patients while understanding how to manage severe injuries occurring in the setting of hypoxia and hypothermia.

Paper# 25

March 4, 8:50 am - 9:00 am

THE FAMILY APPROACH TO THE TREATMENT OF SEPTIC SHOCK

GS Rozycki, JJ Colman, ME Falimirski, DV Feliciano
Indiana University, Indianapolis, IN

Presenter: Grace Rozycki, MD, MBA

INTRODUCTION: Have you ever noticed that some of life's best lessons occur during the most trying times? The following story was transformative for me in that it confirmed my judgment and strengthened my resilience yet challenged my constitution.

METHODS: It was January 27th, 2014, and my husband had been up all night vomiting. He assumed that he had severe gastritis and refused to go to the hospital. I noticed his abdominal pain was worsening, refused to take "no" as an answer, and then mobilized help from a trusted colleague and former fellow who arranged for an expedited assessment in the ER. My husband was in septic shock from cholangitis. His resuscitation went on all night, but after 11 liters of fluid, his base deficit had only improved to minus 13! He was then transferred to a second hospital for his ERCP several hours later but, hypotension limited what could be done. A laparoscopic cholecystectomy was performed four days later, and his postoperative course was complicated by perihepatic bleeding causing a syncopal episode. After two weeks in the intensive care unit, he was discharged only to be readmitted again. Finally, at home, we began a very slow recovery process which included deleting some of the numerous prescribed medications, and a nutrition plan to regain a 15 pound weight loss.

RESULTS: None.

CONCLUSIONS: What did I learn from the near death experience of my spouse? I learned the following: 1) when a physician is sick, "heal thyself" is not an option; 2) treatment requires a "champion" or caregiver to override the patient's judgment, intervene when needed, and provide hope and encouragement throughout the long recuperation period; 3) it was gratifying to see training and mentorship come full circle with the trust and confidence placed in a former trainee; and, 4) the caregiver also needs care, support, and others to provide perspective.

Paper# 26**March 4, 4:00 pm - 4:20 pm****BICYCLE COMMUTING: IS THERE SAFETY IN NUMBERS?**

JS Nielsen, PE Letourneau, AE Laird, DH Zonies, MA Schreiber, SE Rowell
Oregon Health & Science University, Portland, OR

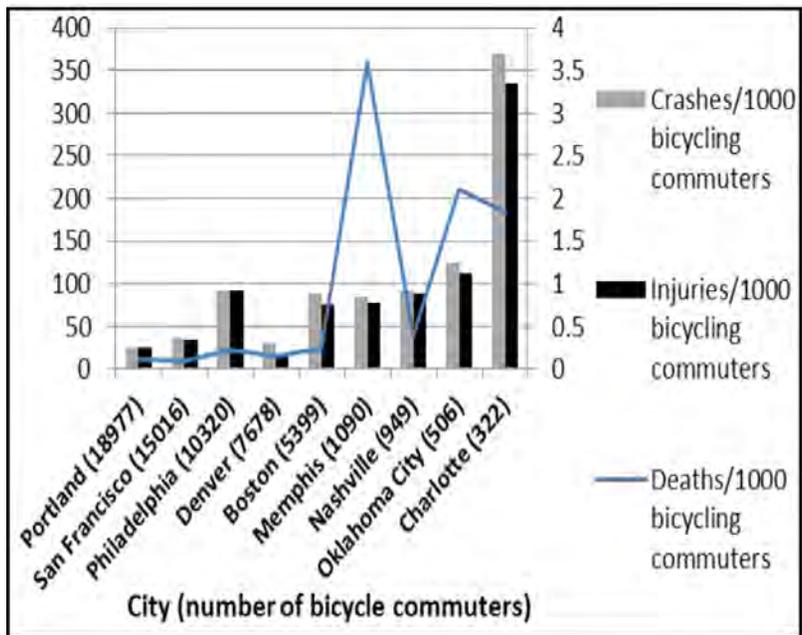
Presenter: Jamison Nielsen, DO, MBA**Senior Sponsor: Susan Rowell, MD**

INTRODUCTION: Bicycle commuter patterns and infrastructure vary widely between major cities in the United States. Head to head comparisons between cities to evaluate bicycle safety are sparse. This study seeks to evaluate the rate of bicycle deaths, crashes and injuries in a selection of bicycle avid and bicycle averse cities.

METHODS: Ten US cities with populations over 500,000 were selected for bicycle safety comparisons. Five "bicycle avid" cities (Portland, San Francisco, Philadelphia, Denver, Boston) and five "bicycle averse" cities (Memphis, Nashville, Oklahoma City, Fort Worth, Charlotte) were selected based on their Bike Score™. One city was excluded due to incomplete data (Fort Worth). Cities were compared regarding bicycle population factors including commuter volume, percentage of overall commuters, cyclist lane density (miles of bike lanes per square mile), deaths, crashes and injuries. Values obtained were from the year 2011 (death rates were a 3-year aggregate ending in 2011). Inquiries were made from local police and transportation departments for crash and injury data. All other data were retrieved from previous studies and US Census findings. Bicycle death, crash and injury rates were evaluated in the setting of cyclist commuter volumes (chi-square). Bike lane density was also evaluated for correlation.

RESULTS: Bicycle commuter volume varied widely in our cohort. Portland reported 18,977 cyclists, representing 6.29% of all commuters. Charlotte reported 322 cyclists representing 0.09% of all commuters. As the number of bicycle commuters decreased there was a marked increase in bicycle death, crash and injury rates ($p < 0.001$ across all three measures). Ranges were (in events/1,000 commuter cyclists): 0.11-3.6 deaths, 26.1-369.6 crashes, and 25.1-335.4 injuries. Crash and injury rates had a weak inverse correlation with bike lane density (r values of -0.449 and -0.445). Death rates were inversely correlated with bike lane density with an r of -0.638.

CONCLUSIONS: Bicycle commuter volume varies between major US cities. There is a protective effect as the number of bicyclists increases. This is not fully explained by differences in bike lane density. Public awareness in bicycle avid cities may contribute to this safety benefit and deserves further investigation.



NOTES

Paper# 27
March 4, 4:20 pm - 4:40 pm

THE USE OF EXTRACORPOREAL MEMBRANE OXYGENATION IN BLUNT THORACIC TRAUMA: A STUDY OF THE EXTRACORPOREAL LIFE SUPPORT ORGANIZATION DATABASE

JV Jacobs, NM Hooft, BR Robinson, E Todd, RM Bremner, SR Petersen, MA Smith
 St. Joseph’s Hospital and Medical Center, Phoenix, AZ

Presenter: Jordan Jacobs, MD
Senior Sponsor: Scott Petersen, MD

INTRODUCTION: Data addressing the use of extracorporeal membrane oxygenation (ECMO) after blunt thoracic trauma is limited. The object of this study is to describe outcomes after ECMO used in the treatment of blunt thoracic trauma using a large multicenter database.

METHODS: A retrospective analysis of ECMO patients in the Extracorporeal Life Support Organization database for the years 1998 to 2014 was performed. The ICD-9 code 861.21 for blunt pulmonary contusion was used to identify subjects treated with ECMO after blunt thoracic trauma. Physiologic data collected included preECMO PaO₂:FiO₂ (P/F) ratio, preECMO duration of ventilation, mode of ECMO utilized, and duration of ECMO support. The forms of preECMO support were also evaluated. The primary outcome was survival to discharge, and the secondary outcome was the presence of hemorrhagic complication attributable to ECMO. Results are reported as a mean with standard deviation when appropriate.

RESULTS: Eighty-five subjects met inclusion criteria. The mean age of the study population was 28.9 +/- 10.6, and 71 (84.0%) were male. The preECMO P/F ratio was 66.7 +/- 82.4, and the preECMO length of ventilation was 169.7 hours +/- 532.8 hours. PreECMO support included 15 (17.6%) patients receiving inhaled nitric oxide, 10 (11.8%) high frequency oscillation, and 58 (68.2%) vasopressor agents. The mean length of ECMO was 205.0 hours +/- 215.1 hours, and 64 (75.0 %) subjects were treated with veno-venous ECMO. Thirty-two (37.6%) subjects underwent invasive procedures prior to ECMO and 13 (15.3%) while on ECMO. Mechanical complications occurred in 31 (36.4%) subjects, and hemorrhagic complications of ECMO occurred in 25 (29.4%), including 12 (14.1%) subjects with surgical site bleeding and 16 (18.8%) with cannula site bleeding. The rate of survival to discharge was 75.3%.

CONCLUSIONS: This data suggests that outcomes after the use of ECMO in blunt thoracic trauma can be very favorable. Trauma patients are often young and healthy with a reversible pulmonary process, making them potentially ideal candidates for this therapy. Further work should be done to discern which subpopulations of trauma patients will benefit most from ECMO utilization.

Paper# 28**March 4, 4:40 pm - 5:00 pm****A PARADIGM FOR ACHIEVING SUCCESSFUL PEDIATRIC TRAUMA VERIFICATION IN THE ABSENCE OF PEDIATRIC SURGICAL SPECIALISTS WHILE ENSURING QUALITY OF CARE**

RA Falcone, WJ Millikan, DD Bensard, DW Tuggle, LM Gray, M Daugherty, L Haas, VF Garcia

Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Presenter: Richard Falcone, MD, MPH**Senior Sponsor: Denis Bensard, MD**

INTRODUCTION: In the US verified pediatric trauma centers are concentrated in urban areas leaving large geographic areas where children do not have access to verified pediatric trauma centers. Although verified adult trauma centers often serve to fill the gap, overall quality has not consistently reached the level of a pediatric center; splenectomy rates continue to be 4-6 times higher for children at these centers. Given the limited workforce in pediatric subspecialties many adult centers called upon to care for children cannot sufficiently staff their program to meet the requirements of verification as a pediatric trauma center. We hypothesized that adult trauma centers (ATC) in collaboration with a pediatric trauma center (PTC) could achieve successful American College of Surgeons (ACS) verification as a pediatric trauma center with measurable improvements in care despite the absence of onsite pediatric surgical specialists.

METHODS: Beginning in 2008, a Level I PTC partnered with three sequential ATC seeking ACS-PTC verification. The centers adopted a plan for education, simulation training, guidelines, and performance improvement support in order to improve care and achieve successful verification. To objectively examine our hypothesis we performed a retrospective review of all children with a solid organ injury pre-partnership (2005-2007) and post-partnership (2008-2011) at one center. Injury grade, imaging, lab draws and length of stay (LOS) were compared to determine changes in care. Additionally we evaluated the results of their ACS verification reviews.

RESULTS: Following partnership, each of the ATCs has achieved Level II PTC verification, including one site that has now been verified twice. As part of each review the collaborative was noted to be a significant strength; noting high quality performance improvement programs and high quality pediatric care. At the initial ATC partner site, thirty-two patients (10.7/year) with solid organ injury were treated pre-partnership and 48 (11.8/year) post-partnership. Following partnership we found a significant decrease in LOS, testing, percent of children receiving initial and repeat abdominal imaging. There have been no splenectomies performed since the partnership. (TABLE)

CONCLUSIONS: The partnership between a Level I PTC and ATCs has resulted in ACS Level II PTC verification in the absence of onsite pediatric surgical specialists. More importantly, this partnership produced measurable changes in the care of children using solid organ injuries and ACS verification as surrogate measures of improvement. We believe this paradigm advances the care of injured children at sites without access to pediatric surgical specialists and eliminates the unnecessary transfer of injured children who can be capably cared for by adult specialists in their community in partnership with a pediatric trauma center.

	Pre	Post	<i>P</i>
LOS	7.7	4.3	0.0319
# of lab draws	10.9	6.0	0.0014
% repeat abdominal CT scan	46.4	11.0	0.0001
Total abdominal CT scans (mean)	1.7	1.1	<0.0005

PRESIDENTIAL ADDRESS

Tuesday, March 3, 5:00 pm - 6:00 pm

PRESIDENTIAL ADDRESS: End of Life Care in Trauma

Christine S. Cocanour, MD

University of California, Davis
Sacramento, CA

NOTES

Paper# 29**March 5, 7:00 am - 7:20 am****ASPIRATION IN TRAUMA: FREQUENT OCCURRENCE, RARE MORBIDITY. A PROSPECTIVE ANALYSIS**

ER Benjamin, T Haltmeier, K Chouliaras, S Siboni, J Durso, K Inaba, D Demetriades

University of Southern California, Los Angeles, CA

Presenter: Elizabeth Benjamin, MD PhD**Senior Sponsor: Kenji Inaba, MD**

INTRODUCTION: Aspiration is a well-recognized complication in trauma patients and has traditionally been considered a risk factor for pneumonia. Despite this, there is no consensus on clinical significance or potential treatment of an aspiration event and the incidence and outcomes associated with aspiration in the trauma population are poorly described.

METHODS: Prospective observational study. All patients admitted as trauma team activations at our level I trauma center that were intubated in the field or on arrival from 9/2013 to 8/2014 were prospectively collected. Field and admission data including witnessed aspiration, respiratory adjuncts, and number of intubation attempts were analyzed. Additional hospital data included imaging, associated injuries, laboratory, hemodynamic, and clinical data. To distinguish from ventilator associated or hospital acquired pneumonia, CPIS score at hospital day (HD) 4 was calculated. Additional outcome variables included total ICU and hospital length of stay, ventilator days, and mortality.

RESULTS: Over the study period, 230 patients met inclusion criteria. Median age was 36 years and patients were predominately male (82%). Median ISS was 19.0 with GCS 6 on admission. Overall, 59 (25.7%) patients had witnessed aspiration events (AE). Age, gender, and percentage with penetrating mechanism were similar between those with and without AE. Patients with AE had significantly higher ISS (median 23.5 vs 17.0, $p=0.048$) and lower GCS on admission (median 4.0 vs 7.0, $p=0.010$), however both groups had similar BMI (median 27.5 vs 26.2, $p=0.292$) and rates of intoxication (84.7% vs 83.0%, $p=0.841$). Patients with AE were more likely to require multiple intubation attempts ($p<0.001$). CPIS score was similar between groups both on ICU admission and at HD4 (mean 2.2 vs 2.2, $p=0.904$ admission, 0.9 vs 1.0, $p=0.957$, HD4). Mortality in patients with AE was significantly higher than in those without aspiration (50.8% vs 29.8%, $p=0.004$), however on multivariate regression, AE was not an independent predictor of mortality (OR 1.04[0.170,6.347], $p=0.966$).

CONCLUSIONS: The rate of aspiration in trauma is high and more likely to occur in patients with increased injury burden or depressed GCS. Early pneumonia rates in patients with and without AE, however, are similar. These data suggest that aspiration is a marker of severe illness and is associated with but not an independent predictor of mortality.

Paper# 30
March 5, 7:20 am - 7:40 am

GERIATRIC TRAUMA "G-60" FALLS WITH HIP FRACTURES: PAIN MANAGEMENT USING FEMORAL NERVE FASCIA ILIACA BLOCKS

AJ Mangram, AK Hollingworth, A Steinstra, M Collins, MM Moyer, SM Stienstra, K Chaliki, MG Corneille, JK Dzandu
John C. Lincoln Hospital - North Mountain, Phoenix, AZ

Presenter: Alicia Mangram, MD, FACS

INTRODUCTION: Hip fractures due to falls cause significant morbidity and mortality among geriatric patients. A significant unmet need is the availability of an optimal pain management strategy. Consequently these patients are treated with Standard Analgesic Care (SAC) regimens, which may deliver high narcotic doses, are associated with risk of delirium and respiratory failure. The purpose of this study was to determine the safety and effectiveness of Continuous Fascia Iliaca-compartment Block (CFIB) under ultrasound guidance for patients with hip fractures, in comparison to SAC alone in the geriatric "G-60" service.

METHODS: We performed a retrospective study of 108 patients with acute pain secondary to hip fracture in patients aged ≥ 60 years from 2012-2013. A total of 64 control patients received SAC pain management and 44 patients received SAC + CFIB. Patient variables were: age, sex, co-morbidities, and ISS. Outcomes measured were pain score ratings, hospital length of stay (LOS), discharge disposition, morbidity, and mortality. The variables were analyzed using Mann Whitney U test and chi-square test. $P < 0.05$ was considered statistically significant.

RESULTS: During the study period, there were 64 control patients who received SAC pain management and 44 patients who received SAC + CFIB. Each placement of the CFIB catheter was successful on the first attempt and there were no complications. Patients who received SAC + CFIB had significantly lower pain score ratings than patients treated with SAC alone at 20 ($p = 0.016$) and 24 ($p = 0.006$) hours. There was no difference in morbidity rates between SAC vs. SAC + CFIB ($p = 0.260$). Patients treated with CFIB were more likely to be discharged home compared those treated with SAC alone ($p < 0.05$).

CONCLUSIONS: Ultra-Sound guided CFIB is safe, practical and readily integrated into the "G -60" service for pain management of hip fractures. Based on these results, we are conducting a prospective, randomized, controlled trial to confirm these observations.

Paper# 31**March 5, 7:40 am - 8:00 am****CADAVERIC COMPARISON OF THE OPTIMAL SITE FOR NEEDLE DECOMPRESSION OF TENSION PNEUMOTHORAX BY PREHOSPITAL CARE PROVIDERS ***

K Inaba, MD, E Karamanos, MD, D Skiada, MD, D Grabo, MD, P Hammer, MD, M Martin, MD, M Sullivan, PhD, MSN, M Eckstein, MD, D Demetriades, MD, PhD
Los Angeles County + University of Southern California Medical Center,
Los Angeles, CA

Presenter: Kenji Inaba, MD

INTRODUCTION: CT based anatomic modeling and cadaveric trials have demonstrated that needle decompression of a tension pneumothorax at the 5th intercostal space (ICS), anterior axillary line (AAL) has advantages over the traditional 2nd ICS, mid-clavicular line (MCL). The purpose of this study was to compare the ability of prehospital care providers to accurately decompress the chest at these two locations.

METHODS: Randomly selected navy corpsmen (n=25) underwent a standardized lecture and cadaveric training session on needle decompression. One to two weeks later, they performed timed needle decompression on an unmarked fresh cadaver. A 14G angiocatheter was inserted in each of the right and left 2nd ICS MCL and 5th ICS AAL positions in a predetermined computer generated order. The time from needle uncapping to insertion and distance from target was recorded for each of the four needles. The ease of site identification and needle insertion was rated by each participant for the four entry points using a 5-point Likert scale.

RESULTS: A total of 25 corpsmen inserted 100 needles into 25 cadavers. Mean age was 25.943.7 years, 72% were male, with 4.243.2 years of prehospital care experience and 52% had previously deployed. 60% had attempted decompression previously, 93.3% in a model and 6.7% in a patient. Overall, the time required to decompress the chest did not differ significantly between the 2nd and 5th ICS (15.347.1 vs 16.1412.3 seconds, p=0.438). Accuracy however was superior at the 5th ICS with a misplacement rate of 82% at the 2nd ICS compared to 22% at the 5th ICS (p<0.001). The aggregate distance from the target position was also significantly greater for the 2nd compared to the 5th ICS (3.141.7 vs 1.241.5cm, p< 0.001). Insertion at the 5th ICS was rated as being easier than the 2nd by 76% of providers, the same by 12% and harder by 12%.

CONCLUSIONS: Non-physician prehospital care providers were able to identify and insert a needle for decompression at the 5th ICS AAL with a higher degree of accuracy than the traditional decompression site. This location was also rated as being significantly easier than the 2nd ICS MCL for needle decompression. This data provides further support for the 5th ICS AAL as an alternative site for needle decompression of a tension pneumothorax.

Paper# 32**March 5, 8:00 am - 8:20 am****WHEN CHILDREN BECOME ADULTS AND ADULTS BECOME MOST HYPERCOAGULABLE AFTER TRAUMA: AN ASSESSMENT OF ADMISSION HYPERCOAGULABILITY BY TEG AND VENOUS THROMBO-EMBOLIC RISK**IN Liras, E Rahbar, MT Harting, JB Holcomb, BA Cotton
University of Texas Health Science Center, Houston, TX**Presenter: Ioannis Liras, BS****Senior Sponsor: John Holcomb, MD**

INTRODUCTION: Despite increasingly aggressive chemoprophylaxis, venous thromboembolism (VTE) after trauma remains a challenge in adult trauma patients. A recent exploration of the National Trauma Database demonstrated that VTE risk increases in children during adolescence (beginning at 13, peaking at age 16). A higher TEG maximal amplitude (mA) has also been shown to reflect hypercoagulability and increased VTE risk in adult trauma patients. Based on these previous works, we sought to identify when children become adults with respect to TEG mA values and whether this correlated with VTE risk.

METHODS: Following IRB approval, we evaluated all highest level trauma patients admitted 01/10-12/13 who were highest-level trauma activations. VTE was defined as the documentation of either pulmonary embolism or deep vein thrombosis within the combined adult and pediatric trauma registry. Univariate analysis was performed for baseline, laboratory and injury data. Age was evaluated as a continuous variable, followed by categorical evaluation. TEG mA values were evaluated as continuous and dichotomous (hypercoagulable $\text{mA} \geq 65$ mm). Logistic regression was then constructed controlling for age categories, gender and injury severity to assess the association with TEG mA values and VTE risk.

RESULTS: 7194 level-1 trauma patients were admitted during this time frame (819 <18 years of age). Admission TEG mA: median mA values did not change with increasing age (remaining at 62-64 mm, $p = \text{NS}$). While the likelihood of $\text{mA} \geq 65$ mm remained at 35-37% through age 30, significant increases were observed at ages 31-35 (45%) and 46-50 (49%); both $p < 0.01$. Controlling for injury severity, race and gender, logistic regression demonstrated that every five year increase in age (after age 30) was associated with a 16% increased likelihood of hypercoagulable admission $\text{mA} \geq 65$ mm. VTE risk: Beginning with age 1, VTE risk remained at 1.5% or less until age 13 at which point it increased to 2.3%. While it increased again at age 15 to 5.1% it fell and remained at 3.6% or less from age 16-30. Two additional significant increases were identified between ages 31-35 (5.5%) and 46-50 (7.6%); both $p < 0.001$. Interestingly, the risk >50 years decreased to 5.3%. Controlling for injury severity, gender, race and mA, logistic regression demonstrated a 3.4 fold increased risk for VTE among those aged 31-50 compared to those <30. The same model noted a 2.3 fold increased risk compared to those >50.

CONCLUSIONS: While VTE risk remains extremely low in those less 13 years of age, beginning in adolescence children do become adults with respect to hypercoagulable TEG mA values and VTE risk. However, the greatest VTE risk (and highest likelihood of hypercoagulable mA) is among those adults 31-50 years of age.

NOTES

BASIC SCIENCE LECTURE

Thursday, March 5, 8:20 am - 9:00 am

BASIC SCIENCE LECTURE: Advanced Cellular Therapy for TBI

Charles S. Cox, Jr.

The University of Texas Health Science Center at Houston
Houston, TX

NOTES

PAINT THE CEILING LECTURE

Thursday, March 5, 5:00 pm – 6:00 pm

PAINT THE CEILING LECTURE:

The Surgeon's Life: Trading Burnout for Engagement

Julie Ann Freischlag, MD

University of California, Davis
Sacramento, CA

Paper# 33**March 5, 4:40 pm - 4:50 pm****IT'S NOT A PARTY WITHOUT THE FIREWORKS:
A TRUE ABDOMINAL "BLOWOUT"!**KR PHARAON, M CASEY, D FEBINGER, B ROGOWAY, M SARFF, S STEELE,
T TIMMONS, GR DULABON

PeaceHealth Southwest Medical Center, Vancouver, WA

Presenter: Shad Pharaon, MD**Senior Sponsor: George Dulabon, MD FACS**

INTRODUCTION: Fireworks are a common element of many holiday celebrations in the United States. There are numerous reports of firework-associated injuries to the eyes and extremities, particularly in children. Very few articles have addressed firework-related injuries to the abdomen, and no article has addressed an abdominal wall defect after a firework mishap. Blunt trauma of the abdominal wall from a blast injury is an unfortunate occurrence often encountered in the military setting, but these injuries are extraordinarily rare in a civilian setting. Here, we discuss a case of a 37-year-old man who accidentally injured himself at home while celebrating St. Patrick's Day with commercial-grade pyrotechnics.

METHODS: This case report was conducted by reviewing the medical records involving the treatment of a fireworks-associated abdominal injury that was treated at our institution. A review of firework-related abdominal injuries and abdominal wall defect injuries in the English literature from 1965 through 2014 was also conducted.

RESULTS: From his initial injury, this patient suffered a large abdominal wall defect with destruction of skin, soft tissue, and most of his rectus muscle. Most of his small bowel had eviscerated, some of which needed resection. During a two-month hospitalization, he underwent an abdominal washout and serial debridement of the large soft tissue defect. In addition, the tissue generating product A-Cell® and negative-pressure wound therapy were used as adjuncts to the surgical management of his abdominal wound. There were no fistulas. Ultimately, a small residual abdominal wall defect was closed by skin grafting. At his latest clinic visit, he has ultrasound findings of a substantial subcutaneous layer resembling fascia.

The review of the literature revealed no reports of firework-associated abdominal wounds similar to our report. There are isolated case reports of abdominal injury after firework explosions in languages other than English.

CONCLUSIONS: While abdominal wall injuries are common in the military setting from blast injury, these are uncommon injuries in the civilian setting. We were able to successfully close this patient's abdomen with a multi-modality treatment plan that included the use of A-Cell®. This is the only report to our knowledge of a large abdominal wall defect from a fireworks explosion that was successfully closed with the use of A-Cell® mesh. Awareness of the complexities of this form of injury, its associated morbidities, and the potential contributions of A-Cell® may lead to improved care and better outcomes.



PRO/CON DEBATE
March 5, 4:50 pm - 5:20 pm

**PRO/CON DEBATE: Etoh and Prevention of Alcohol Withdrawal
In the Trauma Patients**

Gary Vercruysse, MD
University of Arizona Medical Center, Tucson, AZ

R. Lawrence Reed, MD
Indiana University, Indianapolis, IN

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NOTES

PANEL OF EXPERTS

March 5, 5:20 pm - 6:00 pm

PANEL OF EXPERTS

Moderator: Steve Shackford, MD

Scripps Mercy Trauma and Vascular, San Diego, CA

Peter Rhee, MD

University of Arizona Medical Center, Tucson, AZ

Martin Schrieber, MD

Oregon Health & Science University, Portland, OR

Riyad Karmy-Jones, MD

Legacy Emanuel Medical Center, Portland, OR

Paper# 34**March 6, 7:00 am - 7:20 am****MILD TRAUMATIC BRAIN INJURY INCREASES RISK FOR THE DEVELOPMENT OF POSTTRAUMATIC STRESS DISORDER**AM Warren, A Boals, M Reynolds, P Holtz, Z Trost, ML Foreman
Baylor University Medical Center, Dallas, TX**Presenter: Ann Marie Warren, PhD****Senior Sponsor: Michael S. Truitt, MD**

INTRODUCTION: Traumatic brain injury (TBI) and posttraumatic stress disorder (PTSD) occur in individuals who sustain physical injury and share a significant overlap in symptomology. According to the CDC, the incidence of TBI has increased over the past decade to a combined rate of 823.7 per 100,000 emergency department visits, hospitalizations, and deaths in 2010. Data from the U.S. National Comorbidity Survey Replication suggests the lifetime prevalence of PTSD among adult Americans is 6.8%, with PTSD rates in the injury population ranging from 20-40%. Debate remains regarding whether PTSD requires conscious exposure to a trauma, the extent to which PTSD and TBI etiology are related, and the causal relationship between mild TBI (mTBI) and PTSD.

METHODS: This prospective cohort study included patients 18 years and older admitted to a Level I Trauma Center for ≥ 24 hours. Demographic and injury-related data were gathered in addition to assessments of PTSD during initial hospitalization after injury, as well as three and six months later. Patients were coded as having probable PTSD if they indicated 3 or more primary symptoms on the Primary Care PTSD Screen (PC-PTSD) and evidenced a score of 50 or higher on the PTSD Checklist - Civilian Version (PCL-C). mTBI was based on ICD-9 coding.

RESULTS: 494 patients were enrolled at baseline; with data collection still ongoing, 311 (63%) completed 3 month follow-up and 231 (47%) completed 6 month follow-up at the time of analysis. Pre-injury PTSD was reported by 7% of participants. Chi-square analysis was performed to calculate p-values for each variable. At 3 months, patients with mTBI evidenced a probable PTSD rate of 18%, compared to a rate of 9% for patients with no mTBI, $\chi^2(1, N=311) = 4.19, p < .05$. At 6 months, patients with mTBI evidenced a probable PTSD rate of 26%, compared to a rate of 15% for patients with no mTBI, $\chi^2(1, N=231) = 4.06, p < .05$. Pre-injury history of TBI did not predict PTSD, but incidence of TBI for the injury in which they were hospitalized did predict PTSD.

CONCLUSIONS: TBI at time of injury predicts higher rates of PTSD at both three and six months post-injury. Despite the debates regarding the causal relationship and co-occurrence between PTSD and TBI, the implications of this data suggest that sustaining a TBI at time of injury places one at risk for later PTSD. This important finding may help clinicians identify patients at high risk for PTSD after injury and target these patients for screening, intervention and referral for treatment.

Paper# 35
March 6, 7:20 am - 7:40 am

USE OF CONTINUOUS POSITIVE AIRWAY PRESSURE FOR APNEA TESTING DURING BRAIN DEATH EVALUATION IMPROVES LUNG TRANSPLANTATION RATES

JL Hubbard, EY Tsui, JW Davis, WL Veneman
UCSF Fresno, Fresno, CA

Presenter: Jennifer L. Hubbard, MD
Senior Sponsor: James W. Davis, MD

INTRODUCTION: Evaluation for brain death includes apnea testing. There are a variety of methods used for apnea testing including oxygen blow-by with a t-piece, oxygen cannula high flow directly into the endotracheal tube, and continuous positive airway pressure (CPAP). Lung suitability for transplant is in part determined by P:F ratios (paO₂ to FiO₂). We hypothesized that use of a flow-inflating bag to deliver CPAP during apnea testing would improve post-test P:F ratios and thus lung transplantation rates.

METHODS: A retrospective review was performed at a level I Trauma Center for all patients undergoing apnea testing from January, 2010 through September, 2014. The CPAP system was made available in 2012 and was used at the discretion of the clinician. Patients were classified as having an apnea test by CPAP or by non-CPAP method (T-piece, oxygen cannula inserted into endotracheal tube, etc.). The two groups were compared for baseline characteristics (demographics, mechanism of brain injury, torso trauma, pneumonia rate, smoking status, and antibiotic usage) and the primary outcomes of post-apnea test P:F ratio and lung transplantation rates. Categorical data were analyzed by Fisher's exact test and continuous variables analyzed by t-test with significance attributed to a p value < 0.05. The study was deemed exempt by the Institutional Review Board.

RESULTS: During the study period, a total of 117 patients underwent apnea testing; 38 patients by the CPAP method and 79 by non-CPAP method. There were no significant differences in demographics, mechanism of brain injury, torso trauma, pneumonia rate, smoking status, or antibiotic usage between the two groups. There were no reported complications arising from CPAP use.
[table]

CONCLUSIONS: Apnea testing using CPAP by a flow-inflating bag led to improved oxygenation/P:F ratio and increased lung transplantation rates. This method was inexpensive, easily implemented, and without adverse effects. The use of CPAP should be considered in all patients undergoing apnea testing for brain death evaluation.

	CPAP (n=38)	Non-CPAP (n=79)	P value
Pre-test P:F	317	336	0.402
End of test P:F	323	251	0.010
Length of test (min)	10.7	10.3	0.406
Lung donor (percent of total authorized donors)	9 (50%)	13 (22%)	0.037

NOTES

Paper# 36

March 6, 7:40 am - 8:00 am

HIPS DON'T LIE: WAIST TO HIP RATIO IN TRAUMA PATIENTS

BZ Zangbar, PR Rhee, TO Orouji, MK Khalil, NK Kulvatunyou, LG Gries, DJG Green, TO O'Keeffe, RSF Friese, AT Tang, GV Vercruyse, BJ Joseph
The University of Arizona, Tucson, AZ

Presenter: Bardiya Zangbar, MD

Senior Sponsor: Peter Rhee, MD

INTRODUCTION: Obesity measured by body mass index (BMI) is known to be associated with worse outcomes in trauma patients. Recent studies have assessed the impact of distribution of body fat measured by waist/hip ratio (WHR) on outcomes in non-trauma patients. The aim of this study was to assess the impact of distribution of body fat (WHR) on outcomes in trauma patients.

METHODS: A prospective cohort analysis of all admitted trauma patients was performed at our level 1 trauma center. WHR was measured in each patient on the first day of hospital admission. Patients were stratified into two groups: patients with WHR ≥ 1 and patients with WHR < 1 . Outcomes measures were complications and in-hospital mortality. Complications were defined as infectious, pulmonary and renal complications. Regression and correlation analyses were performed.

RESULTS: During the 6 month study period, a total of 240 patients were enrolled of which, 28.8% (n=69) patients had WHR ≥ 1 . WHR had a weak correlation with body mass index. ($R^2=0.231$, $R=0.481$). 18% (n=43) patients developed complications and the mortality rate was 10% (n=24). Patients with WHR ≥ 1 were more likely to develop in-hospital complications (32.7% vs. 13.2%, $p=0.003$) and had a higher mortality rate (24.5% vs. 4.1%, $p=0.001$) compared to patient with WHR < 1 . In multivariate analysis, WHR > 1 was an independent predictor for development of complications (OR[95%CI] = 3.1, [1.08-9.2], $p=0.03$) and mortality (OR[95%CI]: 13.1 [1.1-70], $p=0.04$).

CONCLUSIONS: Distribution of body fat as measured by waist to hip ratio independently predicts mortality and complications in trauma patients. WHR is better than BMI in predicting adverse outcomes in trauma patients. Assessing the fat distribution pattern in trauma patients may help improve patient outcomes through focused targeted intervention.

Table 1: Multivariate Regression analysis for Outcomes				
	Complications		Mortality	
	OR [95%CI]	p	OR [95%CI]	p
WHR \geq 1	3.17 [1.08-9.2]	0.03	13.5 [1.1-70]	0.04
ISS	1.07 [1.03-1.1]	0.001	1.15 [1.08-1.39]	0.02
GCS	1.02 [0.9-1.1]	0.73	0.6 [0.5-0.8]	0.001
BMI > 30	1.2 [0.4-3.5]	0.72	4.9 [0.5-42]	0.14
Mechanism of injury	2.2 [0.5-8.9]	0.25	9.3 [0.7-120]	0.08

NOTES

Paper# 37
March 6, 8:00 am - 8:20 am

SELECTIVE INHIBITION OF HISTONE DEACETYLASE 6 PROMOTES SURVIVAL IN A RODENT MODEL OF HEMORRHAGIC SHOCK

Z Chang, W He, B Liu, I Halaweish, T Bambakidis, Y Li, and HB. Alam.
 University of Michigan, Ann Arbor, MI

Presenter: Hasan Alam, MD

INTRODUCTION: Hemorrhage is the leading cause of preventable trauma-related deaths. We have previously shown that treatment with Tubasatin A (Tub A), a histone deacetylase 6 (HDAC6) inhibitor, can improve survival in a rodent model of lethal sepsis. The aims of this study were to determine whether selective inhibition of HDAC 6 could similarly improve outcomes in a rodent model of hemorrhagic shock (HS), and identify the potential mechanisms.

METHODS: Experiment I: Wistar-Kyoto rats underwent lethal HS (55% blood loss), followed by post-shock intraperitoneal injection of either Tub-A (70 mg/kg) dissolved in dimethyl sulfoxide (DMSO), or DMSO only (n=8/group). Survival was monitored for 24 hours. Experiment II: Rats were subjected to a sub-lethal HS (40% blood loss), and treated with Tub A or DMSO, as described above. All animals were sacrificed 6 hours after the treatment, and liver tissues were harvested. Sham animals were handled in a similar manner, without hemorrhage and treatment. Liver lysates were analyzed by Western blot for apoptotic markers (cytochrome c, cleaved-caspase 3), high mobility group box 1 (HMGB1), and pyruvate dehydrogenase enzyme (PDH) that regulates ATP production. Blood samples were collected at baseline, end of hemorrhage, and end of experiment, and enzyme-linked immunosorbant assay (ELISA) was used to measure the levels of circulating cytokines.

RESULTS: Tub A treatment after lethal hemorrhagic shock significantly improved survival (> 60% survival; average survival time > 24 hours), compared to the DMSO group (p<0.05) (Fig 1A). Tub A also suppressed hemorrhage-induced cytochrome c release, caspase 3 activation, and HMGB1 expression in the liver. This was associated with a significant enhancement in the PDH activity compared to the control group (Fig 1B).

CONCLUSIONS: Our study has demonstrated for the first time that selective inhibition of HDAC6 can improve survival following lethal HS. This may be due to an increase in PDH activity, decrease in cellular apoptosis, and an attenuation of inflammatory cytokine production.

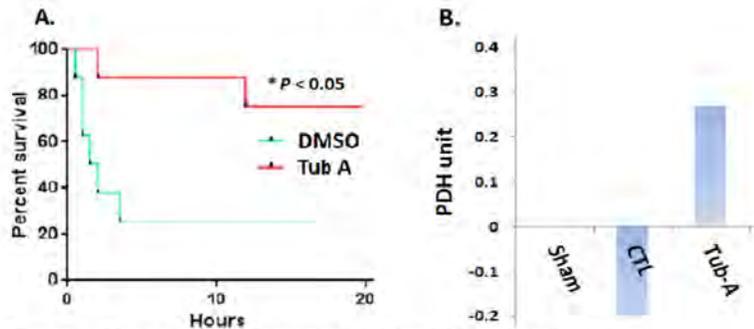


Figure 1. Effect of Tub A on survival (A) (n=8/group) and cellular PDH activity (B) (n=2/group) in a rat model of HS. CTL: control; *: p<0.05.

NOTES

Paper# 38

March 6, 8:20 am - 8:40 am

RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA RESTORES CAROTID BLOOD FLOW FASTER THAN BLOOD RESUSCITATION DURING MASSIVE HEMORRHAGE IN SWINE

A Batchinsky, S Belenkiy, T Park, B Jordan, W Baker, C Necsoiu, J Aden, M Dubick, T Rasmussen, L Cancio

United States Army Institute of Surgical Research, JBSA Ft Sam Houston, TX

Presenter: Andriy Batchinsky, MD

Senior Sponsor: Michael Dubick, MD

INTRODUCTION: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is less invasive and offers a survival benefit compared to thoracic cross clamping for treatment of massive hemorrhage. We evaluated the effects of REBOA on carotid flow in a model of massive hemorrhage in pigs and hypothesized that REBOA restores carotid blood flow faster than infusion of blood.

METHODS: Spontaneously breathing sedated Sinclair pigs underwent a computerized exponential hemorrhage of 65% total blood volume over 1 hour. They were randomized into 2 groups: control (PC, n=7) with immediate transfusion of shed blood at 100 ml/min and (REBOA, n=21) treated with a 7 F ER-REBOA catheter (Pryor Medical, Arvada, CO) placed into Zone 1 via a femoral artery introducer. Heart rate, mean arterial blood pressure, lactate and carotid flow (CF) measured using a transonic flow probe placed on the right carotid artery were recorded at baseline (BL), mid hemorrhage (MH), end hemorrhage (EH) and 30 minutes after resuscitation (R30). Median time to maximal carotid flow (MaxCF) after REBOA deployment or blood reinfusion was recorded (min). Time to MaxCF data was analyzed using Kaplan Meier Analysis. Continuous data was analyzed using repeated measures ANOVA (#), and one way ANOVA (*). Non-normally distributed data were log transformed or Wilcoxon test was performed

RESULTS: Median time to MaxCF was 3 min in REBOA group vs 9.6 min in blood transfusion group, p<0.003). Survival was 95% in REBOA group vs 71% in PC group, p<0.0001.

CONCLUSIONS: REBOA resulted in faster restoration of carotid blood flow ("cerebrovascular resuscitation"), which was associated with improved survival. Further studies of REBOA to include end-organ effects are ongoing.

	Group	BL	MH	EH	Max CF	R30
HR, bpm	REBOA	73±17	129±30#	179±28#		119±28#
	PC	84±17	151±47#	172±40#		111±30
MAP, mmHg	REBOA	117±13	63±18#	43±11#		92±21#
	PC	123±21	82±33#	31±14#		105±32
LAC, mmol/L	REBOA	0.6±0.2	1.4±0.4	5.2±2.3#		12±1.5#*
	PC	0.7±0.2	2.0±1.0	8.2±1.4#*		8.8±3.7#
CF, ml/min	REBOA	194±78	141±54#	78±36#*	218±68	180±59#
	PC	197±56	123±61#	53±29#	236±78	232±62

NOTES

Paper# 39

March 6, 8:40 am - 8:50 am

WHEN LIGHTNING STRIKES TWICE: FORT HOOD AND THE VALUE OF EXPERIENCE

ML Davis, JL Regner, RC Frazee, SW Abernathy, TS Isbell, RW Smith
Texas A&M HSC/Scott & White Memorial Hospital, Temple, TX

Presenter: Matthew Davis, MD FACS

INTRODUCTION: Mass shootings remain rare despite depictions by 24-hour news feeds and sensational journalism. However, in November of 2009 and April of 2014, the Army base at Fort Hood, Texas experienced similar traumatic events. Through the unusual event of having mass shootings occur twice at the same physical location, Scott & White Memorial Hospital and the surrounding region were able to test after-action plans, including improvements to pre-hospital care and field communication, as well as the hospital's capacity to provide emergent mass casualty care, assurance of military security, and controlled dissemination of facts to the media.

METHODS: This is a retrospective review highlighting the experience of an ACS-verified level 1 trauma center with 2 high profile mass shootings on the largest military base in the United States.

RESULTS: In November of 2009, a shooter opened fire on Fort Hood, killing 13 and wounding 30. In the immediate aftermath, there was significant disruption in regional plans for trauma and disaster management. Deviations in destination guidelines from the field and with inter-facility transfers to centers out of region were common. The chaos of the situation, military base lockdown, and poor communication increased the difficulty of maintaining normal operational procedures. Furthermore, unprecedented challenges concerning security of military patients and their families and the onslaught of massive media attention complicated previous treatment paradigms at Scott & White Memorial Hospital, the regional level 1 trauma facility. After-action reviews addressed the noted issues with trauma system performance and a corrective plan was instituted. This corrective plan contained enhanced mass disaster drills specifically regarding the military base and hospital. Communication and security were also significantly updated and enhanced. In April of 2014, the corrective plans and training initiatives were tested when yet another mass shooting occurred on the Fort Hood base. On that day, a gunman opened fire, killing 4 and wounding 16. In this event, the scene control and triage was well-orchestrated. All victims were initially triaged on base at Darnell Army Hospital, and the critically ill patients were transported by air to Scott & White Hospital. Security of patients and families was assured by placing all victims in one secure ICU wing. Communication was notably better, though issues still remained in communicating with officials on base. The 24-hour media attention was much better coordinated by controlled and frequent press updates, conferences and live interviews

CONCLUSIONS: All hospitals must have action plans in place for addressing local disasters, however, plans cannot replace the value of experience. Here, we are able to report our level 1 trauma center's experience with two very similar high profile mass shootings occurring on an active duty military base in our community. After action review, simulation drills and amendment of current protocols and guidelines are valuable and do lead to improvements in care.

NOTES

Paper# 40

March 6, 8:50 am - 9:00 am

MOVIES AND GORILLAS

E Ginzburg

University of Miami, Miami Beach, FL

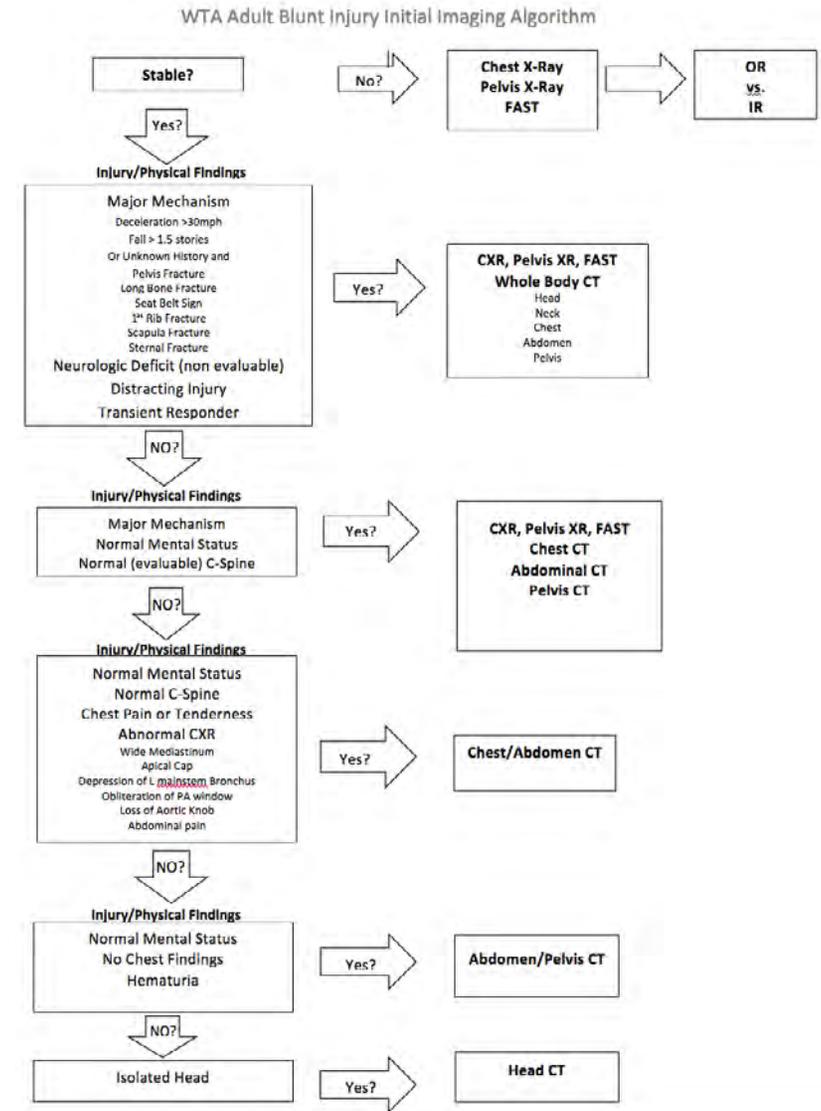
Presenter: Enrique Ginzburg, MD

From my own beliefs, karma is defined as payback not in future lives but in our current life. This was clearly seen when due to my involvement in the 2010 Haiti Earthquake, I was able to meet and help Sean Penn, Actor and Director several times over the last 4 years. In light of this brief but valuable relationship I was called by him to serve as the Surgical and Trauma Advisor in his new film, "The Last Face" based on experiences in the Liberian civil war involving foreign NGO healthcare providers. I was able to help in an advisory role to reproduce injuries, makeshift hospitals, and train actors in our craft. The trip included my wife and my son after graduating from Film School who has gone off to work on the film. After the week with the crew and cast we went off to Uganda and Rwanda to experience the wildlife trekking and view some of the most engendered primates in the world; The Mountain Gorillas, Golden Monkeys, and the Batwa forest people who have been displaced from their homes in the Virunga Volcanoes section of Central Africa. Although some believe that no good deed goes unpunished this is one of those examples where the opposite occurred.

ALGORITHM
March 6, 4:00 pm – 4:10 pm

ALGORITHM: Initial Imaging

Mitch Cohen, MD
 San Francisco General Hospital, San Francisco, CA



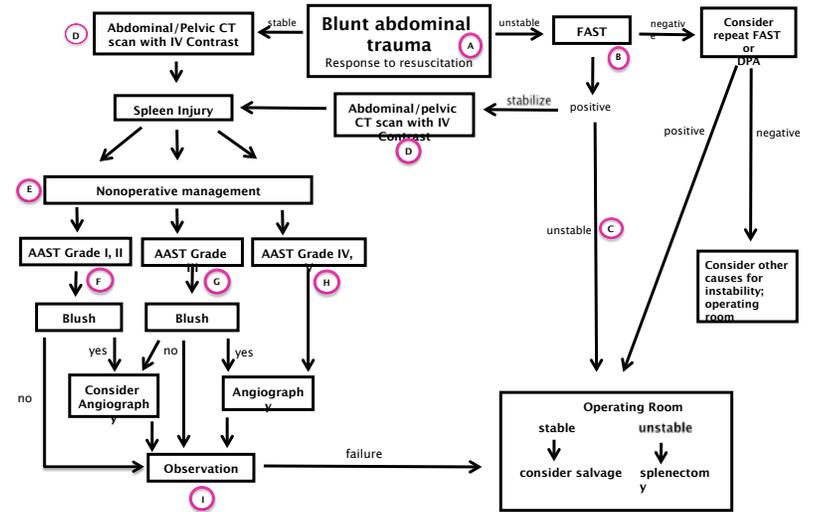
ALGORITHM

March 6, 4:10 pm - 4:20 pm

ALGORITHM: Update Splenic Trauma

Susan Rowell, MD

Oregon Health & Science University, Portland, OR



Paper# 41
March 6, 4:20pm - 4:40pm

THE ELIMINATION OF ANASTOMOSIS IN OPEN TRAUMA VASCULAR RECONSTRUCTION: A NOVEL TECHNIQUE USING AN ANIMAL MODEL

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Presenter: Andrew Tang, MD
Senior Sponsor: Peter Rhee, MD

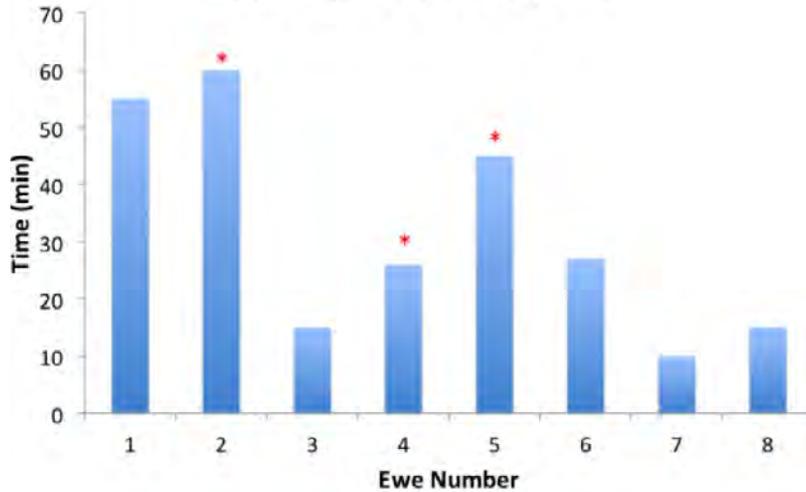
INTRODUCTION: The standard approach to vascular trauma involves arterial exposure and reconstruction using either a vein or PTFE graft. We have developed a novel technique to repairing arterial injuries by deploying commercially available vascular stents through an open approach, thus eliminating the need for suture anastomosis. The objective of this study was to evaluate the feasibility, stent deployment time (SDT) and stent patency of this technique in an ewe vascular injury model.

METHODS: After proximal and distal control, a 2cm Superficial Femoral Arterial (SFA) segment was resected in 8 Dorper ewes to simulate an arterial injury. Two stay sutures were placed in the 3 and 9 O' clock positions of the transected arterial ends to prevent further retraction. 10cc of 10IU/cc heparinized saline was flushed proximally and distally. An arteriotomy was then created 2.5cm from the transected distal end through which we deployed Gore Viabahn stents with a 20% oversize and at least 1cm overlap with the native vessel on either end. The arteriotomy was then closed with 341 interrupted 6-0 Prolene sutures. The ewes were fed ASA 325mg daily. Duplex was performed at 2 months postoperatively to evaluate stent patency. Stent deployment time (SDT) was defined as time from arteriotomy creation to closure.

RESULTS: The 8 ewes weighed an average 34.444.3 kg. The average SFA was 4.340.6mm. Six 5mmx5cm and two 6mmx5cm Gore Viabahn stents were deployed. The average SDT was 34419 minutes with a trend toward less time with increasing experience (SDTmax 60 min; SDTmin 10 min). Duplex performed at 2 months postoperatively showed stent patency in 5 of 8 stents. There was an association between increasing SDT and stent thrombosis (Figure 1).

CONCLUSIONS: Open deployment of commercially available vascular stents to treat vascular injuries is a conceptually sound and technically feasible alternative to standard open repair. Larger studies are needed to refine this technique, and minimize stent complications, which are likely technical in nature.

Figure 1: Stent Deployment Time



NOTES

Paper# 42
March 6, 4:40 pm - 5:00 pm

THE ROLE OF CT SCAN IN ONGOING TRIAGE OF OPERATIVE HEPATIC TRAUMA: A WESTERN TRAUMA ASSOCIATION MULTICENTER RETROSPECTIVE STUDY *

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 University of Pittsburgh Medical Center, Pittsburgh, PA

Presenter: Matthew Kutcher, MD

INTRODUCTION: Preliminary evidence suggests that a subset of patients undergoing immediate laparotomy for abdominal injury have persistent hepatic bleeding seen on postoperative CT and/or angiography that is either not identified or not acutely manageable at initial operation. While published algorithms suggest angiography in this setting, hepatic angiography is associated with complication rates of up to 40%. Identification and management of patients at risk for ongoing hemorrhage remains an open question; we therefore sought to investigate the relationship of CT and angiography with outcomes in operative hepatic trauma.

METHODS: Retrospective data on patients with hepatic injury taken directly to laparotomy on arrival was reviewed from 6 trauma centers spanning the years 2007-2013. Data collection was coordinated through the Western Trauma Association multicenter trials group. Demographic, injury, and outcome data as well as CT, angiography, and operative findings were analyzed.

RESULTS: 528 patients were identified with mean age 31414y, 82.2% male gender, and 36.9% blunt injury. Patients were critically injured with mean injury severity score 27416, base deficit -9.446.3, and 26.4% in-hospital mortality. 73 patients (13.8%) died during initial surgical exploration. Of 455 early survivors, 261 (49.4%) underwent damage control laparotomy, in 66.2% of blunt and 39.6% of penetrating injuries. 163 (35.8%) patients had a postoperative CT scan and 34 (7.5%) underwent angiography. CT identified hepatic contrast extravasation or pseudoaneurysm in 15 patients (8.8%), 9 (60%) of which had been hemodynamically stable postoperatively. Hepatic bleeding on CT was 80% sensitive and 83.3% specific for positive findings at later angiography, while negative CT was 96.1% sensitive and 80% specific (likelihood ratio 4.8) for absence of need for later angiogram; sensitivity and specificity were improved in the setting of damage control. Damage control patients who had a postoperative CT underwent planned reoperation 7.2h later than those with no CT (p=0.008), but this was not associated with mortality (p=0.491) or length of stay (p=0.156). In multivariate analysis, early postoperative CT scan was associated with reduced mortality (OR 0.126, p<0.001). Blunt mechanism was also identified as a multivariate predictor of mortality (OR 3.76, p<0.001).

CONCLUSIONS: Early postoperative CT scan after index laparotomy for hepatic trauma aids in identifying clinically relevant ongoing bleeding, and may guide triage to angiography. Contrast CT should be considered in the postoperative management algorithm for hepatic trauma in select patients, particularly in the setting of blunt injury and damage control. Further prospective multicenter study should be undertaken to determine optimal patient selection criteria and timing for postoperative CT scan in the operative management of hepatic trauma.

Paper# 43**March 6, 5:00 pm - 5:20 pm****ROLE OF CTA IN THE MANAGEMENT OF ZONE 2 PENETRATING NECK TRAUMA IN PATIENTS PRESENTING WITH CLINICAL HARD SIGNS**

TE Fontenot, M Lipcsey, JB Heaney, R Schroll, P Meade, A Marr, N McSwain, J Duchesne

Tulane University School of Medicine, New Orleans, LA

Presenter: Megan Lipcsey, BS**Senior Sponsor: Alan Marr, MD**

INTRODUCTION: Western Trauma Association (WTA) describes management of Zone 2 penetrating neck trauma (PNT) and recommends neck exploration (NE) for patients with clinical hard signs (HS). We hypothesize that in stable patients with HS, management of PNT augmented by Computed Tomography Angiography (CTA) results in fewer negative NE.

METHODS: This is a 4 year retrospective review of recent patients with PNT at a level 1 trauma center. Patients with age <18 years, dead on arrival status, or wounds not violating the platysma were excluded. Patients with WTA-defined HS (airway compromise, massive subcutaneous emphysema/air bubbling through wound, expanding/pulsatile hematoma, active bleeding, shock, focal neurologic deficit, and hematemesis) who received CTA as opposed to emergent exploration were identified. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated. Both positive CTA and positive NE were defined as identification of tracheal, esophageal, or vascular injury requiring surgical repair. A comparison was made between the rates of negative NE in patients with HS who received a CTA versus the rate that would have occurred in the same patients had the WTA algorithm been followed. Missed injury rates were also compared.

RESULTS: Of 185 PNT patients, 24 had HS and underwent CTA. Of the 24, 5 had a positive CTA and underwent subsequent NE while 18 had a negative CTA and did not require NE. There was one false negative representing a missed injury in a patient who developed an expanding hematoma following negative neck CTA. Sensitivity, specificity, PPV, and NPV for CTA in the presence of HS were found to be 83%, 100%, 100%, and 95%, respectively. The addition of CTA to the WTA algorithm for this patient group significantly decreased the rate of negative NE (0/24 vs 18/24, $P=0.00002$) without a significant increase in the rate of missed injury (1/24 vs 0/24, $p=0.323$).

CONCLUSIONS: CTA addition to management of hemodynamically stable patients with HS in PNT significantly decreased the rate of negative NE without increasing missed injury rate. Prospective study of CTA addition to the WTA algorithm is needed.

Total Patient Population: 24		Neck Exploration (NE)			
		Positive NE	Negative NE	Row Total	
CTA Result	(+) CTA	True (+): 5	False (+): 0	5	PPV: 100%
	(-) CTA	False (-): 1	True (-): 18	19	NPV: 95%
	Column Total	6	18	24	
		Sensitivity: 83%	Specificity: 100%		

NOTES

Paper# 44
March 6, 5:20 pm - 5:40 pm

THE FOUND DOWN PATIENT: A WESTERN TRAUMA ASSOCIATION MULTI-CENTER STUDY

MJ Cohen, LZ Kornblith, AS Conroy, CC Burlew, AE Wagenaar, JR Hill, K Chouliaras, MM Carrick, GR Mallory, JR Watkins, MS Truitt, DJ Ciesla, JA Davis, MF Nelson, RA Callcut, BM Howard
 San Francisco General Hospital; University of California, San Francisco, San Francisco, CA

Presenter: Mitchell Cohen, MD

INTRODUCTION: Unconscious patients who present after being “found down” represent a unique triage challenge. These patients are selected for either trauma or medical evaluation based on ED protocols, and have been shown in single-center studies to have significant occult injuries and/or missed medical diagnoses, often necessitating cross-consultation from the non-triaged service. We sought to further characterize this population in a multi-center study, and to identify predictors of mistriage, missed injuries and/or medical diagnoses, resource use, and outcome.

METHODS: The Western Trauma Association Multi-Center Trials Committee conducted a retrospective study of patients categorized as “found down” by ED triage diagnosis at 6 major trauma centers. Comprehensive injury, demographic, clinical and outcome data were collected. Mistriage was defined as patients being admitted to a non-triage-activated service. Logistic regression was used to assess predictors of specified outcomes.

RESULTS: Of 661 total patients, 33% were triaged to trauma evaluations, and 67% were triaged to medical evaluations. Mean age was 54 years, and 69% of patients were male; 57% were intoxicated, 21% were homeless, 28% were uninsured, and 26% had prior psychiatric history. 56% of all patients had traumatic injuries. There were no differences between trauma- and medical-triaged patients with respect to age, gender, or mortality; however, trauma-triaged patients had significantly higher rates of injury, and required more CT imaging in the ED. Medical-triaged patients had higher rates of intoxication, homelessness, and late-identified diagnoses. Among the 432 patients requiring admission, 17% of them were initially mistriaged (Table). Even among properly-triaged patients, 23% required cross-consultation from the non-triage-activated service. Mistriaged patients had lower rates of intoxication and prior ED visits, but were significantly older, and had higher rates of combined medical diagnosis and injury; age was an independent predictor of mistriage, with 40% increased odds (OR 1.40, 95% CI 1.17 - 1.66, p<0.01) for every 10-year increase in age. Combination of medical diagnosis and injury was also independently predictive of mistriage (OR 3.33, CI 1.47 - 7.52, p<0.01). All initially mistriaged patients required CT imaging in the ED before admission to the appropriate service. Mistriage was not associated with increased length of stay or mortality.

CONCLUSIONS: Patients who are “found down” experience significant rates of mistriage and triage discordance requiring cross-consultation. Though the majority of “found down” patients are triaged to non-trauma evaluation, over half have traumatic injuries. Characteristics associated with increased rates of mistriage identified here should be used to improve resource utilization and minimize missed injury in this vulnerable patient population.

Table. Demographics, Outcomes of "Found Down" Patients by Mistrriage

	Mistrriage (n=75)	Proper Triage (n=357)	<i>p</i>
Age (yr)	65.7 ± 20.0	55.7 ± 18.3	<0.01
Male	60%	66%	0.29
Prior ED visits	24%	47%	<0.01
Homeless	18%	9%	0.06
Non-residence location	23%	47%	0.01
Intoxication	30%	46%	0.04
Signs of trauma	76%	42%	<0.01
Combined med dx + injury	80%	46%	<0.01
Any CT scan obtained	100%	86%	<0.01
Cross-consult required	3%	23%	<0.01
Late-identified injuries	15%	8%	0.08
Late-identified medical dx	10%	16%	0.16
Mortality	21%	22%	1.00

NOTES

Paper# 45

March 6, 5:40 pm - 5:50 pm

FREE INTRAPERITONEAL AIR AND ACUTE MYOCARDIAL INFARCTION IN THE SETTING OF BLUNT TRAUMA: A TREATMENT DILEMMA

A LANDMANN, MD; RM ALBRECHT, MD; RB FAILS, MD
University of Oklahoma Health Sciences Center, Oklahoma City, OK

Presenter: Alessandra Landmann, MD

Senior Sponsor: Roxie Albrecht, MD

INTRODUCTION: Blunt abdominal trauma complicated by acute myocardial infarction presents a treatment dilemma for the trauma surgeon that requires a multidisciplinary approach to management including discussions regarding early systemic anticoagulation in the setting of thoracic and abdominal injuries.

METHODS: We present the case of a 90 year-old male with a history of CVD, CAD and cardiac stents was involved in a tractor accident. He presented to our urban trauma center where Primary survey was unremarkable. Vital signs were within normal limits. Focused abdominal sonography for trauma was negative for free intrapericardial and intraperitoneal fluid. The patient complained of left sided chest pain and secondary survey revealed left chest thorax and thoracoabdominal contusions. He had mild abdominal pain, tenderness in the left upper quadrant with no peritoneal signs. He began having EKG changes on continuous telemetry and a 12-lead electrocardiogram reveal ST segment elevation. He underwent computed tomography with findings of bilateral rib fractures and free intraperitoneal air. Cardiology evaluated the patient and requested loading the patient with ASA and to proceed to the cath lab for an angiogram which revealed an occlusion in the left anterior descending artery requiring balloon dilatation, loading with heparin and stent placement.

RESULTS: Acute myocardial infarction in the setting of blunt abdominal trauma with evidence of free air on CT scan necessitates a multidisciplinary approach to management. Early referral to interventional cardiology for thrombus evacuation and stent placement, while ideal in an ambulatory setting, necessitates discussion regarding the associated risks and benefits of early systemic anticoagulation in patients with blunt injuries and high bleeding risk. The management of the free air without free fluid on abdominal CT in an alert patient without evidence of peritonitis in the setting of thoracoabdominal trauma is additionally an interesting dilemma. Operate or not following a fresh MI, intervention and initiation of ASA, Plavix and heparinization.

CONCLUSIONS: We will review CT findings in this patient and evaluation options and outcome.

Paper# 46

March 6, 5:50 pm - 6:00 pm

FAMILY IS NOT AN IMPORTANT THING: ITS EVERYTHING! *

BJ Joseph, MK Khalil, BZ Zangbar, AAH Haider, VP Pandit, TO Orouji, NK Kulvatunyou, AT Tang, TO O'Keeffe, DJG Green, GV Vercruyssen, PR Rhee

The University of Arizona, Tucson, AZ

Presenter: Bellal Joseph, MD

Senior Sponsor: Peter Rhee, MD

INTRODUCTION: In most current practices the ability to meet the expected clinical load is so demanding that it is difficult to maintain strong research productivity. The ability to maintain a robust and productive research practice as part of a clinical group requires mentorship, camaraderie, and interaction learned through core principals of the Western Trauma Association. The aim of this abstract is to discuss the importance of workplace family, professional collegiality, cultural diversity and its impact on clinical and research productivity.

METHODS: We take an in depth look at the members of our work family and sacrifices that occur to maintain a robust clinical, teaching, and research group. We further discuss the impact of adopting international scholars into the family to spread both the clinical trauma worldwide as well as help impact the research support required to make a robust and productive Research group. Scholars from 6 countries as well as Trauma surgeons from 10 different training backgrounds work in harmony to nurture total growth.

RESULTS: The core principals of family and camaraderie in the work place are important to share for other programs looking to gain success in becoming a robust academic center. The invaluable diversity brought forth by international fellows coupled with invigorating team spirit of trauma family results in a successful academic model.

CONCLUSIONS: Developing a model of both clinical and research productivity is vital to the sustainability of trauma programs and sharing such experiences can only help the entire trauma community to continue to grow into one large family.

NOTES

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