February 28 – March 4, 2016
Resort at Squaw Creek
Squaw Valley, California

Western Trauma Association

46TH ANNUAL MEETING

FINAL PROGRAM

SAVE THE DATE
Western Trauma Association
47th Annual Meeting
March 5 – 10, 2017
Snowbird, Utah

Western Trauma Association

FORTY-SIXTH ANNUAL MEETING

February 28 – March 4, 2016
Squaw Valley, California

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 46th Annual Meeting in Squaw Valley, CA. The program committee, headed by Rick Miller, 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 two Pro/Con Debates, two Panel of Experts, four Algorithm sessions as well as three Family Abstracts that reflect the WTA spirit. The presidential address is Tuesday afternoon. Dr. Rosemary Kozar will present the 8th Annual Founder's Basic Science lecture on Wednesday morning and Dr. Lewis Rubinson will present the 2016 Paint the Ceiling Lecture on Thursday afternoon.

The Social Program once again includes events destined to be classic WTA moments. These include the Welcome Reception and Kids Reception Sunday evening, Residents Reception and Family Sledding/Ice Skating on Monday evening, NASTAR race, Mountain Barbeque and WTA Book Club on Wednesday, Banquet and Kids party on Thursday evening.

The WTA is about science, collegiality, family and friends and Squaw Valley 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 WTA week of science and fellowship.

Sincerely,
Thomas M. Scalea, MD
President
2015-2016

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CME INFORMATION

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership 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 18.5 *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 **13.75** credits meet the requirements for Self-Assessment.

Of the *AMA PRA Category 1 Credits™* listed above, a maximum of **18.5** credits may qualify as **Trauma**.*

** The content of this activity may meet certain mandates of regulatory bodies. ACS has not and does not verify the content for such mandates with any regulatory body. Individual physicians are responsible for verifying the content satisfies such requirements.*

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CME INFORMATION

ONLINE SELF ASSESSMENT & CME

To claim CME this year, you will need to complete an online conference evaluation, submit a verification of attendance, take self-assessment exams (optional), and print an ACS approved CME credit certificate. The link with instructions is available at www.westerntrauma.org and will be emailed to all meeting registrants. The self-assessment tests will be available at the end of each day. CME must be claimed within 10 days of the meeting.

LEARNING OBJECTIVES

This activity is designed for physicians of all specialties who are involved in the care of trauma patients.

Upon completion of this course, attendees will be able to:

- Compare various techniques to reduce bleeding from pelvic fracture; the use of open versus endovascular repair of peripheral vascular arterial injuries; the use of TEG versus standard coagulation tests to determine the adequacy of resuscitation.
- Review clinical and pre-clinical trials plus basic science research in pertinent topics in trauma: ex: hemorrhagic shock, traumatic brain injury and venous thromboembolic phenomenon.
- Discuss cervical spine clearance using CT based on the results of a prospective multi-institutional study.
- Analyze 4 algorithms to aid clinicians in the management of Colorectal injuries, Transient responder, Hemopneumothorax and rib fracture
- Analyze if it is safe to fly 24 hours after a chest tube is removed.
- Analyze professional quality of life issues amongst surgeons and recognize the significant incidence of STSD/Compassion Fatigue.
- Demonstrate various management schemes in chest trauma including hemothorax and the diagnosis of pericardial penetrating injuries.
- Recognize the ensuing epidemic of geriatric trauma and the challenges in management due to comorbidities, frailty and limited physiologic reserve.

DISCLOSURE INFORMATION

In accordance with the 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. Therefore, it is mandatory that both the program planning committee and speakers complete disclosure forms. Members of the program committee were required to disclose **all** financial relationships and speakers were required to disclose any financial relationship **as it pertains to the content of the presentations**. The ACCME defines a 'commercial interest' as "any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients". It does not consider providers of clinical service directly to patients to be commercial interests. The ACCME considers "relevant" financial relationships as financial transactions (in any amount) that may create a conflict of interest and occur within the 12 months preceding the time that the individual is being asked to assume a role controlling content of the educational activity.

ACS is also required, through our joint providership partners, to manage any reported conflict and eliminate the potential for bias during the activity. All program committee members and speakers were contacted and the conflicts listed below have been managed to our satisfaction. However, if you perceive a bias during a session, please report the circumstances on the session evaluation form.

Please note we have advised the speakers that it is their responsibility to disclose at the start of their presentation if they will be describing the use of a device, product, or drug that is not FDA approved or the off-label use of an approved device, product, or drug or unapproved usage.

The requirement for disclosure is not intended to imply any impropriety of such relationships, but simply to identify such relationships through full disclosure and to allow the audience to form its own judgments regarding the presentation.

DISCLOSURE INFORMATION

Speakers / Moderators / Discussants	Nothing to Disclose	DISCLOSURE		
		Company	Role	Received
Adriana Laser	x			
Ajai Malhotra	x			
Alicia Mangram	x			
Allison E Berndtson	x			
Anand Ganapathy	x			
Anders Davidson	x			
Andy Michaels	x			
Anne Slaughter	x			
Ansab Haider	x			
Ara J Feinstein	x			
Ben Zarzaur	x			
Bonny Baron	x			
Bradley Dennis	x			
Brian Eastridge	x			
Carl Beyer	x			
Catherine Juillard	x			
Chad Ball	x			
Charles Shahan	x			
Christopher Connelly	x			
David Livingston	x			
David Zonies	x			
E. Patricia Hill	x			
Enrique Ginzburg	x			
Eric Toschlog	x			
Fernando E. Domingo	x			
Frederick Rogers	x			
Ernest Moore		Haemonetics TEM International	PI PI	Research support and shared patents Research Support
George E. Black, IV	x			

DISCLOSURE INFORMATION

George Singer	x			
Gretchen Thomsen	x			
Hasan Alam	x			
Ihab Halaweish	x			
Jamie Anderson	x			
Jamie Coleman	x			
Jason Young	x			
Jonathan P. Meizoso	x			
Jordan Bohnen	x			
Juan Mira	x			
Karen Brasel	x			
Katsuhiro Nagata	x			
Kenji Inaba	x			
Kevin Luftman	x			
Kyle Sokol	x			
Laura Moore	x			
Lewis Rubinson	x			
Marc De Moya	x			
Mark Diebel	x			
Mark Ryan	x			
Martin Schreiber	x			
Matt Martin	x			
Megan Brenner		Pryor Medical Inc	Clinical Advisory Board	Stock
Michael Lallemand	x			
Mitch Cohen	x			
Mitch Cohen	x			
Patrick Georgoff	x			
Richard Calvo	x			
Richard Miller	x			
Riyad Karmy-Jones	x			
Robert Maxwell	x			
Rochelle Dicker	x			
Rosemary Kozar	x			

DISCLOSURE INFORMATION

S. Ariane Christie	x			
Steven Shackford	x			
Susan Rowell	x			
Tahereh Orouji Jokar	x			
Tammy Kopelman	x			
Thomas Scalea	x			
Valerie Plant	x			
Walt Biffl	x			
William Teeter	x			
Planning Committee	**Nothing to Disclose**	**DISCLOSURE**		
		Company	**Role**	**Received**
Ajai Malhotra	x			
Bonny Baron	x			
Enrique Ginzburg	x			
Eric Toschlog	x			
Hasan Alam	x			
John B Pickhardt	x			
Kenji Inaba	x			
Peter Rhee	x			
Richard Miller	x			
Rochelle Dicker	x			
Thomas Scalea	x			

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.

2015-2016 OFFICERS & COMMITTEE CHAIRS

Officers

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

Board of Directors	**Term Ends**
Mark Metzdorff, MD	2016
Martin A. Schreiber, MD	2016
Hasan B. Alam, MD	2016
David H. Livingston, MD	2017
Krista L. Kaups, MD	2017
R. Stephen Smith	2017
Christine S. Cocanour, MD	2018
Nick Namias, MD	2018
Brent King, MD	2018

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Richard S. Miller, MD, *Chair*

Publications Committee
Roxie M. Albrecht, MD, *Chair*

Nominating Committee
Christine S. Cocanour, MD, *Chair*

Multi-Center Trials Committee
Mitch Cohen, MD, *Chair*

Algorithms Committee
Karen J. Brasel, MD, *Chair*

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Kenji Inaba, MD
Ajai Malhotra, MD
Brad Pickhardt, MD
Peter Rhee, MD
Thomas M. Scalea, MD, *ex-officio*
Eric Toschlog, MD

Publications Committee
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Mitch Cohen, MD
Panna Codner, MD
C. Clay Cothren- Burlew, MD
Rochelle Dicker, MD
Larry Diebel, MD
John Kepros, MD
Robert Letton, MD
Barbara Mainville, MD
Alicia Mangram, MD
Ash Mansour, MD
Matt Martin, MD
David M Notrica, MD
Claude (Henry) Sagi, MD
Stephanie Savage, MD
Mike Truitt, MD
Nicholas Wetjen, MD

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Mitch Cohen, MD
Marc De Moya, MD
Riyad Karmy-Jones, MD
Ernest E. Moore, MD, *ex-officio*
Nick Namias, MD
Susan Rowell, MD
Martin Schreiber, MD
David V. Shatz, MD, *ex-officio*

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. Neviaser, 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, MD	2014	Steamboat Springs
Christine S. Cocanour, MD	2015	Telluride
Thomas M. Scalea, MD	2016	Squaw Valley

NEW MEMBERS

Western Trauma Association Welcomed the Following New Members at the 2015 Annual Meeting

Julie Dunn, MD
Loveland, CO
General Surgery
Senior Member

Alexander Eastman, MD
Dallas, TX
General Surgery
Active Member

Frank Mitchell, III, MD
Scottsdale, AZ
General Surgery
Senior Member

Laura Johnson, MD
Washington, DC
General Surgery
Active Member

Sherene Shalhub., MD
Seattle, WA
Vascular Surgery
Active Member

Careen Foster, MD
Austin, TX
General Surgery
Active Member

Narong Kulvatunyou, MD
Tucson, AZ
Surgical Critical Care
Active Member

WESTERN TRAUMA FOUNDATION DONORS

Current lifetime accumulation status based on 2015 year end

Summit
($25,000 and up)
Barry Esrig
Robert Volz

Extreme
($10,000-24,999)
David Feliciano
Grace Rozycki
Thomas Scalea

Couloir Society
($5,000 – $9,999)
Roxie Albrecht
Christine Cocanour
James Davis
David Livingston
Mark Metzdorff
J. Scott Millikan
Robert Neviaser
Scott Petersen
R. Lawrence Reed
Steven Shackford
Dennis Vane

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 Biffl
Karen Brasel
Miriam Bullard
Gregory Campbell
David Ciesla
Thomas Cogbill
Raul Coimbra
Marc de Moya
Doreen DiPasquale
George Dulabon
Enrique Ginzburg
K. Dean Gubler
Carl Hauser

WESTERN TRAUMA FOUNDATION DONORS

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Brent King
David Kissinger
M. Margaret Knudson
Rosemary Kozar
Guy Lanzi
William Long
Manuel Lorenzo
Barbara Mainville
James McCarthy
Robert McIntyre, Jr.
Richard Miller
Ernest Moore
Frederick Moore
Steve Moulton
M. Gage Ochsner
Patrick Offner
Peter Rhee
Anne Rizzo akaFantini
Martin Schreiber
David Shatz
Harold Sherman
Keith Stephenson
Michael Truitt
Steven Wald
Jennifer Watters
Michaela West

Blue Trail Associate
($500 - $999)
Hasan Alam
Scott Armen
Carlos Brown
Howard Champion
Roy Cobean
Alain Corcos
Clay Cothren-Burlew
James Cushman
Bruce Ferris
Richard Gamelli
Larry Gentilello
John Hall
David Hoyt
Riyad Karmy-Jones
Alicia Mangram
M. Ashraf Mansour
Frank Nastanski
David Notrica
J. Bradley Pickhardt
Basil Pruitt
Aaron Scifres
Mark Shapiro
Gordy Stephanie
George Testerman
Brian Tibbs
Eric A. Toschlog
R. Christie Wray, Jr.

WESTERN TRAUMA FOUNDATION DONORS

Green Trail Associate (up to $499)

Bonny Baron
Donald Carter
Mitch Cohen
Charles Cook
Todd Costintini
Matthew Davis
Rochelle Dicker
Jody Digiacomo
Brian Eastridge
John Fildes
Alfonso Fonseca
Charles Fox
Warren Gall
Rajesh Gandhi
Rajan Gupta
Michael Hauty
James Hebert
Jay Johannigman
Barbara Latenser
Richard Leone
Heather MacNew
Charles Mains
Ajai Malhotra
Alan Marr
Robert Maxwell
Charlene Nagy
Nicholas Namias
Keith O'Malley
George Pierce
Susan Rowell
Edmund Rutherford
Jack Sava
Carol Schermer
S. Robb Todd
Ricard Townsend
Daniel Vargo
Gary Vercruysse
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

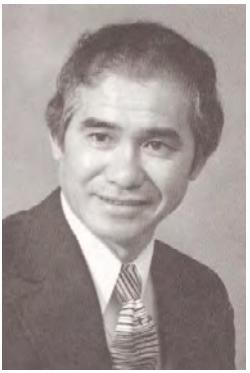
Robert B. Rutherford, MD
November 22, 2013

Doreen DiPasquale, MD
January 7, 2014

Barbara Latenser, MD
June 15, 2015

Matthew L Davis, MD
September 3, 2015

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
David J. Ciesla, MD	Denver Health/University of Colorado	2000
Ricardo J. Gonzales, MD	Denver Health/University of Colorado	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
Hunter B. Moore, MD	Denver Health/University of Colorado	2015

PRESIDENTIAL ADDRESS

Repainting the Ceiling: Do Patient Safety and Satisfaction Initiatives Make Things Safe or Satisfying?

Tuesday, March 1
5:00 pm – 6:00 pm

Thomas M. Scalea, MD
R Adams Cowley Shock Trauma Center
Baltimore, MD

"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 Schecter, 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
Lewis Rubinson, MD, PhD	2016	Squaw Valley

PAINT THE CEILING LECTURE

From Ebola Clinician to Exposed Person: My Experiences Witnessing Tragedy, Fear, Chaos and Resilience

Thursday, March 3
5:15 pm – 6:00 pm

Lewis Rubinson, MD, PhD
R Adams Cowley Shock Trauma Center
Baltimore, MD

Lewis Rubinson, MD, PhD, FCCP is Associate Professor of Medicine at University of Maryland School of Medicine and Director of the Critical Care Resuscitation Unit (CCRU) at the R Adams Cowley Shock Trauma Center. The CCRU is the first unit of its kind in the US and was designed to mimic Shock Trauma's widely revered Trauma Resuscitation Unit capabilities for non-trauma critically ill patients with time-sensitive specialty care needs. Now entering its third year, the CCRU has changed the paradigm of how non-trauma critically ill patients at outside hospitals with time-sensitive needs are transferred for University specialty care and are initially resuscitated at University of Maryland.

Lewis is also a leader in mass critical care preparedness and has published and lectured extensively on emergency mass critical care, managing severe contagious respiratory infections during outbreaks, and mass casualty mechanical ventilation. In addition, Dr. Rubinson has been an international proponent and leader for establishing systems and processes to ensure key clinically-relevant questions are answered during evolving public health emergencies. Dr. Rubinson was the Health and Human Services lead for the largest critical care registry established during the 2009 influenza pandemic and he is currently the Co-chairperson of the Protocol Committee for the United States Critical Illness and Injury Trials Group Program in Public Health Preparedness FDA and BARDA contract for rapid clinical learning during public health emergencies.

Prior to joining the University of Maryland, Dr. Rubinson was the Acting Chief Medical Officer of the National Disaster Medical System(NDMS) in the Office of Emergency Management within the Office of the Assistant Secretary for Preparedness and Response in the US Department of Health and Human Services. In that role, and previously as Deputy Chief Medical Officer he had extensive experience with medical cache development and assessment. Dr. Rubinson served as the federal CMO in the HHS Secretary's Operation Center for recent major events such as Superstorm Sandy. Lewis also has extensive field experience and has deployed on numerous occasions for NDMS as a front-line clinician and as the medical lead for the Incident Response Coordination Team. Lewis was a clinician consultant for the World Health Organization and the clinical lead at Kenema Government Hospital in Sierra Leone in Sep 2014.

Dr. Rubinson received his medical degree from Northwestern University Medical School and completed residency in Internal Medicine at the University of California San Francisco. He completed a Pulmonary and Critical Care Medicine fellowship at Johns Hopkins University, where he also received a PhD in Clinical Investigation at the Bloomberg School of Public Health.

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
Rosemary Kozar, MD	2016	Squaw Valley

FOUNDERS' BASIC SCIENCE LECTURE

The Role of Resuscitation In the Endotheliopathy of Trauma and Shock

Wednesday, March 2
8:20 am – 9:00 am

Rosemary Kozar, MD
University of Maryland
College Park, MD

Dr. Kozar is Professor of Surgery, Director of Translational Research at Shock Trauma and Associate Director of Shock Trauma Anesthesia Research (STAR) at the University of Maryland. She is a trauma surgeon and intensivist with research interests in the impact of enteral nutrients on the post-ischemic gut and more recently in hemorrhagic shock and resuscitation. Dr. Kozar has been NIH funded for over a decade and is a current member of the Surgery, Anesthesia, and Trauma Study Section of the NIH. As an active member of the Western Trauma Association, she has served on the Board of Directors and Chair of the Multicenter Trials Committee. She is active in the American College of Surgeons as current Chair of the Women in Surgery Committee and Chair of the Verification Committee for the Committee on Trauma. She is currently on the Board of Managers for the AAST and is the President of the Shock Society.

SUNDAY, FEBRUARY 28, 2016

5:00 pm - 7:00 pm
Registration Open
Alpine Prefunction

5:00 pm - 7:00 pm
Welcome Reception
Alpine Ballroom

5:00 pm - 7:00 pm
Children's Reception
Grand Sierra C

6:00 pm - 7:00 pm
Western Trauma Foundation Board Meeting (Invitation Only)
Tinker's Knob

7:00 pm - 8:00 pm
WTA Past Presidents' Meeting (Invitation Only)
Granite Chief

MONDAY, FEBRUARY 29, 2016

6:30 am - 9:30 am
Registration & Exhibits Open
Sierra Prefunction

6:30 am - 8:00 am
Attendee Breakfast
Sierra Prefunction

7:00 am – 9:00 am

Scientific Session 1 – Earl Young Competition

Grand Sierra Ballroom
Moderator: Richard S. Miller, MD

7:00 am - 7:20 am	**1.** PRE-PERITONEAL BALLOON TAMPONADE FOR PELVIC FRACTURE-ASSOCIATED MASSIVE HEMORRHAGE: A SUPERIOR AND MINIMALLY INVASIVE ALTERNATIVE TO OPEN PRE-PERITONEAL PACKING *Kyle Sokol, Tacoma, WA*	Page 41
7:20 am - 7:40 am	**2.** EARLY TREATMENT WITH LYOPHILIZED PLASMA AS A NEUROPROTECTIVE STRATEGY IN A LARGE ANIMAL SURVIVAL MODEL OF TRAUMATIC BRAIN INJURY AND HEMORRHAGIC SHOCK *Ihab Halaweish, Ann Arbor, MI*	Page 43
7:40 am - 8:00 am	**3.** TEG PLATELET MAPPING AND VERIFYNOW PROVIDE SIMILAR RESULTS TO PLATELET AGGREGOMETRY WHEN MEASURED ON ADMISSION FOR TRAUMA *Christopher Connelly, Portland, OR*	Page 45
8:00 am - 8:20 am	**4.** NONINVASIVE HEMOGLOBIN MEASUREMENT IN PEDIATRIC TRAUMA PATIENTS *Mark Ryan, Memphis, TN*	Page 47
8:20 am - 8:40 am	**5.** CHARACTERIZATION OF DISTINCT COAGULOPATHIC PHENOTYPES IN INJURY: PATHWAY-SPECIFIC DRIVERS AND IMPLICATIONS FOR INDIVIDUALIZED TREATMENT *S. Ariane Christie, San Francisco, CA*	Page 49
8:40 am - 9:00 am	**6.** UNFRACTIONATED HEPARIN AFTER TBI REDUCES IN VIVO CEREBROVASCULAR INFLAMMATION, BRAIN EDEMA AND ACCELERATES COGNITIVE RECOVERY. *Katsuhiro Nagata, Philadelphia, PA*	Page 51

MONDAY, FEBRUARY 29, 2016

7:30 am - 9:00 am
Friends & Family Breakfast (Open to Friends & Family registrants only, must present voucher)
Cascades Restaurant

3:30 pm - 6:00 pm
Registration & Exhibits Open
Sierra Prefunction

4:00 pm - 6:00 pm
Scientific Session 2 – Earl Young Competition
Grand Sierra Ballroom
Moderator: Hasan Alam, MD

4:00 pm - 4:20 pm	**7.** SUSPENSION OF BIOLOGIC TIME IN SEVERE HEMORRHAGIC SHOCK: PILOT STUDY RESULTS FROM THE BIOCHRONICITY PROJECT *George E. Black, IV, Tacoma, WA*	Page 53
4:20 pm - 4:40 pm	**8.** PTSD IN THOSE WHO CARE FOR THE INJURED *Kevin Luftman, Austin, TX*	Page 55
4:40 pm - 5:00 pm	**9.** ALTERATIONS IN HUMAN PROTEOME WITH VALPROIC ACID TREATMENT *Patrick Georgoff, Ann Arbor, MI*	Page 57
5:00 pm - 5:20 pm	**10.** GENDER DIMORPHISM IN ADIPOSE TISSUE RESPONSE TO STRESS CONDITIONS: A PLAUSIBLE MECHANISM TO EXPLAIN THE CONFLICTING DATA REGARDING TRAUMA AND OBESITY *Mark Diebel, Detroit, MI*	Page 59
5:20 pm - 5:40 pm	**11.** LOW VOLUME RESUSCITATION USING POLYETHYLENE GLYCOL-20K IN A PRE-CLINICAL PORCINE MODEL OF HEMORRHAGIC SHOCK *Valerie Plant, Richmond, VA*	Page 61
5:40 pm - 6:00 pm	**12.** GLUTAMINE METABOLISM DRIVES SUCCINATE ACCUMULATION DURING HEMORRHAGIC SHOCK *Anne Slaughter, Denver, CO*	Page 63

MONDAY, FEBRUARY 29, 2016

6:00 pm - 7:00 pm
Special Session: "How to Review a Manuscript"
Grand Sierra Ballroom

6:00 pm - 8:00 pm
WTA Board Meeting - by invitation only
Tinkers Knob

6:30 pm - 7:30 pm
Resident Reception - open to registered Residents
Granite Chief

6:30 pm - 8:30 pm
WTA Family Night
Sun & Spa Deck, Ice Skating Rink, Sledding Hill

TUESDAY, MARCH 1, 2016

6:30 am - 9:30 am
Registration & Exhibits Open
Sierra Prefunction

6:30 am - 8:00 am
Attendee Breakfast
Sierra Prefunction

7:00 am - 9:00 am

Scientific Session 3

Grand Sierra Ballroom
Moderator: Kenji Inaba, MD

7:00 am - 7:20 am	**13.** ENDOVASCULAR MANAGEMENT FOR PERIPHERAL ARTERIAL TRAUMA: THE NEW NORM? *Anand Ganapathy, Houston, TX*	Page 65
7:20 am – 7:50 am	**Pro/Con Debate** Open Versus Endovascular Repair of Peripheral Arterial Injuries *Steven Shackford, MD vs. Riyad (KJ) Karmy-Jones, MD*	Page 67
7:50 am - 7:55am	**14. Case Report** MULTIDISCIPLINARY MANAGEMENT OF BLUNT RENAL ARTERY INJURY WITH ENDOVASCULAR THERAPY IN THE SETTING OF POLYTRAUMA *Carl Beyer, Sacramento, CA*	Page 69
7:55am - 8:00 am	**15. Case Report** DIRECT SITE ENDOVASCULAR REPAIR – A NOVEL TECHNIQUE AND CASE SERIES *Anders Davidson, West Sacramento, CA*	Page 71
8:00 am - 8:20 am	**16.** SMALLER INTRODUCER SHEATHS FOR REBOA MAY BE ASSOCIATED WITH FEWER COMPLICATIONS *William Teeter, Baltimore, MD*	Page 73
8:20 am - 8:40 am	**17.** NATURAL HISTORY OF BLUNT CEREBROVASCULAR INJURIES: PROGRESSION AND RESOLUTION BY GRADE *Adriana Laser, Baltimore, MD*	Page 75
8:40 am - 9:00 am	**18.** REVISITING THE GREENFIELD RISK ASSESSMENT PROFILE IN CRITICALLY ILL TRAUMA PATIENTS *Jonathan P. Meizoso, MD, Miami, FL*	Page 77

TUESDAY, MARCH 1, 2016

7:30 am - 9:00 am
Friends & Family Breakfast
(Open to Friends & Family Registrants only, must present voucher)
Cascades Restaurant

3:30 pm - 6:00 pm
Registration & Exhibits Open
Sierra Prefunction

4:00 pm - 6:00 pm
Scientific Session 4
Grand Sierra Ballroom
Moderator: Rochelle Dicker, MD

4:00 pm - 4:20 pm	**19.** TRAUMA PATIENTS ARE SAFE TO FLY 24 HOURS AFTER TUBE THORACOSTOMY REMOVAL *David Zonies, Portland, OR*	Page 79
4:20 pm - 4:40 pm	**20.** STREAMLINING HEMOTHORAX MANAGEMENT: USE OF AN EVIDENCE-BASED ALGORITHM TO STANDARDIZE CARE *Bradley Dennis, Nashville, TN*	Page 81
4:40 pm - 4:50 pm	**21. Family Abstract** TRAUMA EDUCATION IN CUBA: A PORTAL FOR GLOBAL SURGERY *Marc deMoya, Boston, MA*	Page 83
4:50 pm - 5:00 pm	**22. Family Abstract** HOOSIER DADDY: A TRAUMA FAMILY TREE *Ben Zarzaur, Indianapolis, IN*	Page 85
5:00 pm – 6:00 pm	**Presidential Address** REPAINTING THE CEILING: DO PATIENT SAFETY AND SATISFACTION INITIATIVES MAKE THINGS SAFE OR SATISFYING? *Thomas Scalea, Baltimore, MD*	Page 87

6:00 pm - 7:00 pm
WTA Multicenter Trials Meeting
Grand Sierra Ballroom

WEDNESDAY, MARCH 2, 2016

6:30 am - 9:30 am
Registration & Exhibits Open
Sierra Prefunction

6:30 am - 8:00 am
Attendee Breakfast
Sierra Prefunction

7:00 am - 9:00 am
Scientific Session 5
Grand Sierra Ballroom
Moderator: Eric Toschlog, MD

7:00 am - 7:20 am	**23.** RECURRENT MILD TBI LEADS TO PERMANENT LONG-TERM DEFICITS AND EARLIER DEVELOPMENT OF THE ALS PHENOTYPE IN SOD1 RATS *Gretchen Thomsen, Los Angeles, CA*	Page 89
7:20 am - 7:40 am	**24.** DOES UROLOGIC CONSULTATION FOR CYSTORRHAPHY OF UNCOMPLICATED TRAUMATIC BLADDER RUPTURES IMPROVE OUTCOMES? *Jason Young, Nashville, TN*	Page 91
7:40 am - 8:00 am	**25.** AN ANALYSIS OF PROFESSIONAL QUALITY OF LIFE AMONGST SURGEONS: FEMALE TRAUMA SURGEONS AT INCREASED RISK FOR DEVELOPING COMPASSION FATIGUE *Frederick Rogers, Lancaster, PA*	Page 93
8:00 am - 8:20 am	**26.** CERVICAL SPINAL CLEARANCE USING COMPUTED TOMOGRAPHY: A PROSPECTIVE WESTERN TRAUMA ASSOCIATION MULTI-INSTITUTIONAL TRIAL *Kenji Inaba, Los Angeles, CA*	Page 95
8:20 am – 9:00 am	**Basic Science Lecture** THE ROLE OF RESUSCITATION IN THE ENDOTHELIOPATHY OF TRAUMA AND SHOCK *Rosemary Kozar, MD*	Page 97

WEDNESDAY, MARCH 2, 2016

7:30 am - 9:00 am
Friends & Family Breakfast (Open to Friends & Family registrants only, must present voucher)
Cascades Restaurant

10:00 am - 12:00 pm
NASTAR Race (Sign-up by Tuesday morning at Registration Desk)
Mountain

12:00 pm - 1:30 pm
Mountain Picnic
Sun Deck

3:30 pm - 6:00 pm
Registration & Exhibits Open
Sierra Prefunction

4:00 pm - 6:00 pm
Book Club
Granite Chief

WEDNESDAY, MARCH 2, 2016

4:00 pm - 5:00 pm

Scientific Session 6

Grand Sierra Ballroom

Moderator: Ajai Malhotra, MD

4:00 pm - 4:20 pm	**27.** SUBSTITUTING SYSTOLIC BLOOD PRESSURE WITH SHOCK INDEX IN THE NATIONAL TRAUMA TRIAGE PROTOCOL *Ansab Haider, Tucson, AZ*	Page 99
4:20 pm - 4:25pm	**28. Case Report** INTRAUTERINE FETAL DEMISE AFTER TRAUMA: A PREVIOUSLY UNRECOGNIZED SOURCE OF IMMEDIATE AND SEVERE COAGULOPATHY PROMPTING IMMEDIATE DELIVERY *Jamie Coleman, Indianapolis, IN*	Page 101
4:25pm - 4:30 pm	**29. Case Report** INCREASED BREATH SOUNDS ON THE RIGHT? TRAUMATIC RIB CAGE HERNIA SPECTRUM OF PRESENTATIONS AND MANAGEMENT STRATEGIES *Michael Lallemand, Portland, OR*	Page 103
4:30 pm - 4:45 pm	**Algorithm #1** Colorectal *Walt Biffl, MD*	Page 105
4:45 pm - 5:00 pm	**Algorithm #2** Transient Responder *Martin Schreiber, MD*	Page 107

5:00 pm - 6:30 pm

Business Meeting (WTA Members Only)

Grand Sierra Ballroom

THURSDAY, MARCH 3, 2016

6:30 am - 9:30 am
Registration & Exhibits Open
Sierra Prefunction

6:30 am - 8:00 am
Attendee Breakfast
Sierra Prefunction

7:00 am - 9:00 am
Scientific Session 7
Grand Sierra Ballroom
Moderator: Bonny Baron, MD

7:00 am - 7:20 am	**30.** THE IMPORTANCE OF EMPIRIC ANTIBIOTIC DOSING IN CRITICALLY ILL TRAUMA PATIENTS: ARE WE UNDER-DOSING BASED ON AUGMENTED RENAL CLEARANCE AND INACCURATE RENAL CLEARANCE ESTIMATES? *Jeffery Barletta, Phoenix, AZ*	Page 109
7:20 am - 7:40 am	**31.** METHICILLIN-RESISTANT STAPH AUREUS IN A TRAUMA POPULATION: DOES DECOLONIZATION PREVENT INFECTION? *Robert Maxwell, Chattanooga, TN*	Page 111
7:40 am - 8:00 am	**32.** PRE-INJURY BASELINE BLOOD PRESSURE PREDICTS INPATIENT MORTALITY IN ELDERLY TRAUMA PATIENTS: A BI-INSTITUTIONAL STUDY *Jordan Bohnen, Boston, MA*	Page 113
8:00 am – 8:15 am	**Algorithm #3** Hemopneumothorax *Marc DeMoya, MD*	Page 115
8:15 am - 8:30 am	**Algorithm #4** Rib Fracture *Karen Brasel, MD (with Matt Davis, in memoriam)*	Page 117
8:30 am – 9:00 am	**Pro/Con Debate** TEG Bases Resuscitation is Superior to 1:1:1 Resuscitation *Martin Schreiber, MD vs. Mitch Cohen, MD*	Page 119

THURSDAY, MARCH 3, 2016

3:30 pm - 6:00 pm
Registration & Exhibits Open
Sierra Prefunction

4:00 pm - 6:00 pm
Scientific Session 8
Grand Sierra Ballroom
Moderator: Enrique Ginzburg, MD

4:00 pm - 4:05pm	**33. Case Report** THE EFFICACY OF A NOVEL BIPOLAR RADIOFREQUENCY ENERGY INSTRUMENT FOR ARRESTING ONGOING SOLID AND NON-SOLID ORGAN HEMORRHAGE IN SWINE. *Chad Ball, Calgary, AB*	Page 121
4:05pm - 4:10 pm	**34. Case Report** ALTITUDE INDUCED COLONIC PERFORATION *Juan Mira, Gainesville, FL*	Page 123
4:10 pm - 4:15pm	**35. Case Report** I CAN'T FIND THE LEFT ILIAC ARTERY! ABDOMINAL STAB WOUND LEADING TO UNCONTROLLABLE HEMORRHAGE *Ara J Feinstein, Phoenix, AZ*	Page 125
4:15 pm – 5:00 pm	**Panel of Experts** *Moderator: Andy Michaels, MD* *Panelists: David Livingston, MD, Matt Martin, MD and Susan Rowell, MD*	Page 127
5:00 pm - 5:15pm	**36. Family Abstract** TREK TO EVEREST BASE CAMP, STAY FOR THE QUAKE AND PERFORM TRIAGE: A MEMORABLE FAMILY VACATION *Ajai Malhotra, Burlington, VT*	Page 129
5:15 pm – 6:00 pm	**Paint the Ceiling Lecture** FROM EBOLA CLINICIAN TO EXPOSED PERSON: MY EXPERIENCES WITNESSING TRAGEDY, FEAR, CHAOS AND RESILIENCE *Lewis Rubinson, MD, PhD*	Page 131

THURSDAY, MARCH 3, 2016

7:00 pm - 10:00 pm
Children's Party
Alpine Ballroom

7:00 pm - 8:00 pm
Reception
Sierra Prefunction

8:00 pm - 10:00 pm
Banquet
Grand Sierra Ballroom

FRIDAY, MARCH 4, 2016

6:30 am - 9:30 am
Registration & Exhibits Open
Sierra Prefunction

6:30 am - 8:00 am
Attendee Breakfast
Sierra Prefunction

7:00 am - 9:00 am
Scientific Session 9
Grand Sierra Ballroom
Moderator: Brian Eastridge, MD

7:00 am - 7:20 am	**37.** THE IMPACT OF FRAILTY ON FAILURE-TO-RESCUE IN GERIATRIC TRAUMA PATIENTS: A PROSPECTIVE STUDY *Tahereh Orouji Jokar, Tucson, AZ*	Page 133
7:20 am - 7:40 am	**38.** REPEAT HEAD IMAGING IN BLUNT PEDIATRIC TRAUMA PATIENTS: IS IT NECESSARY? *E. Patricia Hill, Wichita, KS*	Page 135
7:40 am - 8:00 am	**39.** IF SOME IS GOOD, MORE IS BETTER: AN ENOXAPARIN DOSING STRAGTEGY TO IMPROVE PHARMACOLOGIC VTE PROPHYLAXIS *Allison E Berndtson, San Diego, CA*	Page 137
8:00 am - 8:20 am	**40.** ANTI-XA GUIDED ENOXAPARIN PROPHYLAXIS REDUCES RATE OF VENOUS THROMBOEMBOLISM BY 57% IN HIGH-RISK TRAUMA PATIENTS *George Singer, Miami, FL*	Page 139
8:20 am – 9:00 am	**RebоA Expert Panel** *Moderator: Megan Brenner, MD* *Panelists: Thomas M. Scalea, MD Gene Moore, MD and Laura Moore, MD*	Page 141

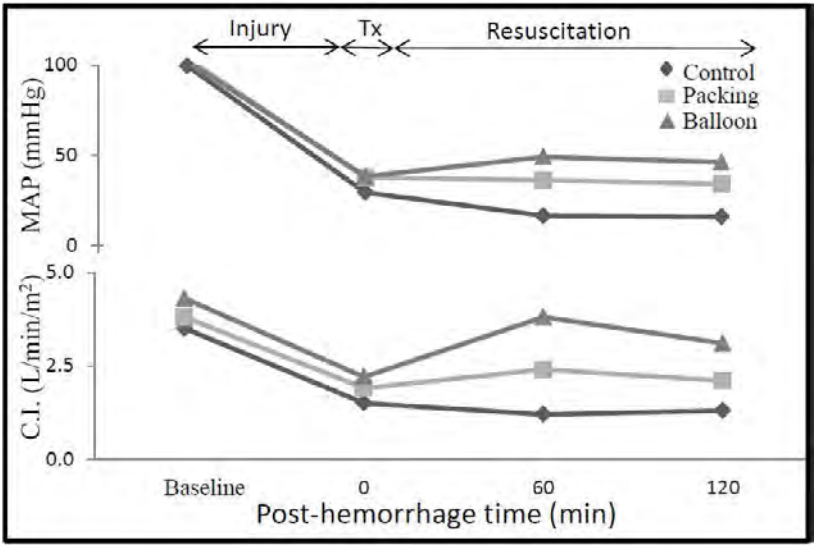
FRIDAY, MARCH 4, 2016

3:30 pm - 6:00 pm
Registration & Exhibits Open
Sierra Prefunction

4:00 pm - 6:00 pm
Scientific Session 10
Grand Sierra Ballroom
Moderator: Mitch Cohen, MD

4:00 pm - 4:20 pm	**41.** A DECADE OF HOSPITAL-BASED VIOLENCE INTERVENTION: BENEFITS AND SHORTCOMINGS *Catherine Juillard, San Francisco, CA*	Page 143
4:20 pm - 4:40 pm	**42.** GETTING A BETTER LOOK: OUTCOMES OF LAPAROSCOPIC VERSUS TRANS-DIAPHRAGMATIC PERICARDIAL WINDOW FOR PENETRATING THORACOABDOMINAL TRAUMA AT A LEVEL I CENTER *Jamie Anderson, Sacramento, CA*	Page 145
4:40 pm - 5:00 pm	**43.** COMPUTED TOMOGRAPHIC IMAGING IMPROVES FETAL OUTCOMES AFTER MATERNAL TRAUMA *Tammy Kopelman, Phoenix, AZ*	Page 147
5:00 pm - 5:20 pm	**44.** RISK FACTORS ASSOCIATED WITH POST-DISCHARGE MORTALITY IN OLDER TRAUMA PATIENTS: A PARADOX OF TIME *Richard Calvo, San Diego, CA*	Page 149
5:20 pm - 5:40 pm	**45.** TRAUMA HEALTH LITERACY: IN NEED OF REMEDIATION *Charles Shahan, Memphis, TN*	Page 151
5:40 pm - 6:00 pm	**46.** A SINGLE-CENTER RETROSPECTIVE REVIEW OF POST-OPERATIVE INFECTIOUS COMPLICATIONS IN THE SURGICAL MANAGEMENT OF MANDIBULAR FRACTURES: POST-OPERATIVE ANTIBIOTICS ADD NO BENEFIT *Fernando E. Domingo, Chattanooga, TN*	Page 153

NOTES


Injury
Tx
Resuscitation
Control
Packing
Balloon
MAP (mmHg)
100
50
0
C.I. (L/min/m²)
5.0
2.5
0.0
Baseline
0
60
120
Post-hemorrhage time (min)

NOTES

Paper #1
Monday, 2/29/2016

PRE-PERITONEAL BALLOON TAMPONADE FOR PELVIC FRACTURE-ASSOCIATED MASSIVE HEMORRHAGE: A SUPERIOR AND MINIMALLY INVASIVE ALTERNATIVE TO OPEN PRE-PERITONEAL PACKING

KK Sokol, GE Black, M Song, MJ Eckert, K Inaba, MJ Martin
Madigan Army Medical Center

Presenter: Kyle Sokol, MD
Senior Sponsor: Matthew J. Martin, MD

INTRODUCTION: The management of massive pelvic fracture-associated hemorrhage is extremely challenging, particularly in the unstable patient. Open pre-peritoneal packing (OP) has been advocated, but requires time, a major surgical procedure, and may provide highly variable tamponade. We sought to characterize and compare the efficacy of a minimally-invasive pre-peritoneal balloon technique (MIB) to standard open packing.

METHODS: Twenty-six swine were randomized to control (C), OP, and MIB groups. A closed extraperitoneal iliac vascular injury was created, followed by free bleeding and then intervention+resuscitation over a 120 min survival phase. OP and MIB efficacy was assessed by procedure time, hemodynamics, extraperitoneal tamponade pressures (ETP), blood loss, and survival. Angiography was performed in select animals to assess ongoing bleeding, and the ability to adjust the MIB to visualize active extravasation. ETPs were also measured in humans undergoing MIB placement for an elective procedure and in cadaver models.

RESULTS: Baseline parameters (MAP [29, 38, 38 mmHg], cardiac index [3.5, 3.8, 4.2], and ETPs [5, 4, 5 mmHg]) were similar among C, OP, and MIB groups respectively (all $P>0.05$). OP and MIB groups had markedly improved MAP and CI versus controls (Figure). The MIB generated significantly higher ETP (28 vs 17 mmHg), was faster to deploy (164 vs 497 sec), and had lower total blood loss versus OP (0.7 vs 1.2L, all $p<0.05$). OP and MIB had equivalent survival times that were significantly improved vs controls (91 and 116 vs 43 min, $p<0.05$). Survival to 2 hours was 80% with OP versus 100% in the MIB group. Angiography showed no active extravasation in both study groups, but controlled deflation of the MIB allowed easy visualization of extravasation. MIB inflation in 5 human subjects demonstrated a significant increase in mean ETP from 2.4 to 31 mmHg ($p<0.01$).

CONCLUSIONS: Minimally invasive extraperitoneal balloon tamponade was as effective as OP in improving hemodynamics and prolonging survival times, and was superior to OP in time to placement, blood loss, and generation of tamponade pressures. In addition, MIB allows for controlled deflation and re-inflation to facilitate angiographic interventions, and may represent a promising new bedside intervention in this patient population.

NOTES

Paper #2
Monday, 2/29/2016

EARLY TREATMENT WITH LYOPHILIZED PLASMA AS A NEUROPROTECTIVE STRATEGY IN A LARGE ANIMAL SURVIVAL MODEL OF TRAUMATIC BRAIN INJURY AND HEMORRHAGIC SHOCK

I Halaweish, MD, T Bambakidis, MS, V Nikolian MD, P Georgoff, MD, J Joseph, MD, P Piascik, A Srinivasan, MD, B Liu, MD, YLi, MD PhD, HB Alam, MD
University of Michigan

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 large animal model of combined TBI+HS, we showed that early resuscitation with fresh frozen plasma (FFP) improves neurological outcomes. There are however limitations to delivering FFP in austere environments due to need for specialized storage conditions. Lyophilized plasma is a logistically superior alternative to FFP; however, there is limited data for LP administration following TBI. We conducted this study to determine the safety and long-term outcomes of early treatment with LP in a large animal model of TBI+HS.

METHODS: Adult anesthetized swine underwent TBI using a computer-controlled cortical impact device. Volume-controlled hemorrhage (40% blood volume) was induced concurrently. After 2 h of shock, animals were randomized (n=5/group) to FFP or LP (1x shed blood). At selected time points, blood gases were drawn and thrombelastography (TEG) was performed on citrated, kaolin-activated whole blood samples. Six hours post-treatment, packed red blood cells were administered, and animals recovered from anesthesia. A 32-point objective neurologic severity score was assessed daily for 30 days (0=normal, 32=severe injury). Cognitive functions were tested by training animals to retrieve food from color-coded boxes. Brain lesion size was measured on serial magnatic resonance imaging, and an autopsy was performed at 30 days.

RESULTS: The severity of shock and the degree of resuscitation were the same in both groups. Administration of FFP and LP was well tolerated, and there were no differences in reversal of shock, or TEG parameters in both groups at different time points. Animals in both groups displayed the worst NSS on POD 1, with rapid recovery and return to baseline within 7 days of injury. Lesion size on day 3 in FFP treated animals was 645 4 85 vs. 219 4 20 mm3 in LP treated animals ($p<0.05$). Animals in both groups displayed normal cognitive functions, and no delayed treatment-related complications were noted.

CONCLUSIONS: Early treatment with LP in a severe model of TBI+HS is safe, and provides neuroprotection that is comparable to FFP.

NOTES

Paper #3
Monday, 2/29/2016

TEG PLATELET MAPPING AND VERIFYNOW PROVIDE SIMILAR RESULTS TO PLATELET AGGREGOMETRY WHEN MEASURED ON ADMISSION FOR TRAUMA

CR Connelly, SP McCully, JD Yonge, D Lape, B Houser, B Rick, TG Deloughery, MA Schreiber, LN Kiraly
Oregon Health & Science University

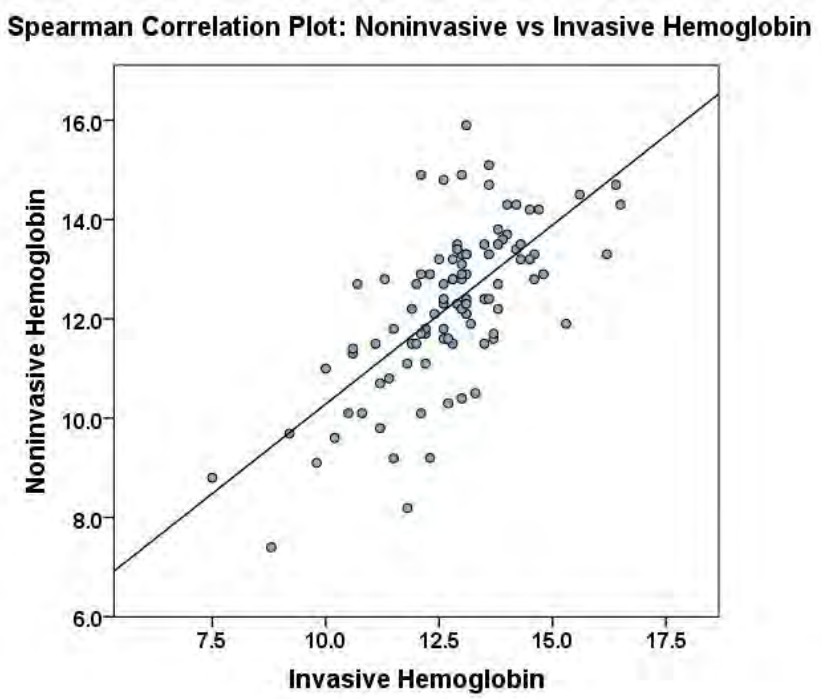
Presenter: Christopher Connelly, MD
Senior Sponsor: Martin Schreiber, MD

INTRODUCTION: Anti-platelet (AP) medication use is common among trauma patients and is associated with poor outcomes. Furthermore, acute traumatic injury and hemorrhage cause platelet dysfunction. The options for management of anti-platelet agents and platelet dysfunction in trauma patients are controversial, expensive and potentially risky. Although platelet aggregometry is considered the standard test to assess platelet function, it is cumbersome and not widely available. There are currently no accepted point-of-care tests of platelet function for acute trauma.

METHODS: Prospective observational study from 2014–2015 at a Level 1 US trauma center. Thrombelastogram (TEG) platelet mapping and the VerifyNow-P2Y12 were compared to platelet aggregometry in patients with moderate injuries (MI) (n=11), severe injuries (SI) (n=28), AP medication use (n=25) and healthy controls (HC) (n=10). Baseline TEG platelet mapping percent MA reduction with arachidonic acid (TEG multiplate AA), and VerifyNow platelet response to aspirin (ARU) were compared to platelet aggregometry aspirin area under the platelet aggregation curve (ASPI AUC). Platelet aggregometry AUC is expressed in terms of aggregation units (AU) and time, where 1U=10AU*minute.

RESULTS: 80% of patients in the AP group were taking aspirin and 20% were taking clopidogrel. Injury severity score differed across groups (21 AP, 10 MI, 22 SI, $p<0.001$), the AP group was significantly older (70yr AP vs 27yr MI, 32yr SI, 36yr HC, $p<0.001$), however, BMI, sex and mortality were not different. ASPI AUC demonstrated impaired platelet aggregation (22U AP, 63U moderate, 51U severe, 57U HC, $p<0.001$). TEG multiplate AA showed significant platelet function impairment in the AP group (51.3% AP v 21.7% moderate, 17.3% severe, 26.2% HC, $p=0.003$) and ARU indicated diminished thromboxane A2 activation (503 AP, 629 moderate, 617 severe, 632 HC, $p<0.001$).

CONCLUSIONS: TEG multiplate AA and VerfyNow ARU are rapidly available, point-of-care tests that provide results similar to the gold standard, platelet aggregometry. These tests are useful diagnostic tools for trauma patients taking AP agents, and could be used to guide reversal agents in these patients.


Spearman Correlation Plot: Noninvasive vs Invasive Hemoglobin
Noninvasive Hemoglobin
16.0
14.0
12.0
10.0
8.0
6.0
7.5
10.0
12.5
15.0
17.5
Invasive Hemoglobin

NOTES

Paper #4
Monday, 2/29/2016

NONINVASIVE HEMOGLOBIN MEASUREMENT IN PEDIATRIC TRAUMA PATIENTS

ML Ryan, AC Maxwell, L Manning, JD Jacobs, M Bachier-Rodriguez, A Feliz, RF Williams
University of Tennessee Health Science Center

Presenter: Mark Ryan, MD, MSPH
Senior Sponsor: Jordan Weinberg, MD

INTRODUCTION: Hemorrhage is a major cause of preventable death secondary to traumatic injury. Monitoring for this condition often requires multiple blood draws, which have been shown to be psychologically stressful in pediatric patients. The Pronto device is a pulse co-oximeter that measures multiple wavelengths of light and thereby calculates the total hemoglobin level. The purpose of this study was to evaluate the accuracy of the noninvasive hemoglobin measurement relative to current invasive and point of care testing methods in pediatric trauma patients.

METHODS: We performed a prospective observational trial involving patients under age 18 presenting to a Level I pediatric trauma center. Following admission, blood was sampled from each patient for testing using an i-Stat device (point-of-care hemoglobin) and for evaluation of the complete blood count within our core lab (invasive hemoglobin). Noninvasive hemoglobin analysis was performed within 15 minutes of phlebotomy. Data was evaluated using Spearman correlation and Bland-Altman analysis.

RESULTS: Over a 2 year period, 114 patients had attempted noninvasive hemoglobin measurements, with a success rate of 89%. Mean 4 SD age was 9.2 4 5.1. 68% of patients were male and 32% female. 44% were African-American, 32% Caucasian, and 6% Hispanic. 90% of admissions were for blunt injury, 6% penetrating, 3% near-drowning, and 1% burns. Mean invasive hemoglobin was 12.6 4 1.9, mean point-of-care hemoglobin was 12.2 4 2.0, and mean noninvasive hemoglobin was 12.3 4 1.6. Noninvasive hemoglobin values were strongly correlated with both invasive and point of care measurements (R = 0.672 and 0.645, respectively, $p<0.001$). Bland-Altman analysis demonstrated similar deviation from the mean for low, normal, and high hemoglobin values.

CONCLUSIONS: Noninvasive hemoglobin values had excellent correlation with both invasive and point-of-care hemoglobin measurements. Given the rapid availability of results and the lack of requirement of venipuncture, noninvasive hemoglobin monitoring is a valuable tool in both the initial assessment and the monitoring of serial hemoglobin levels in pediatric trauma patients.

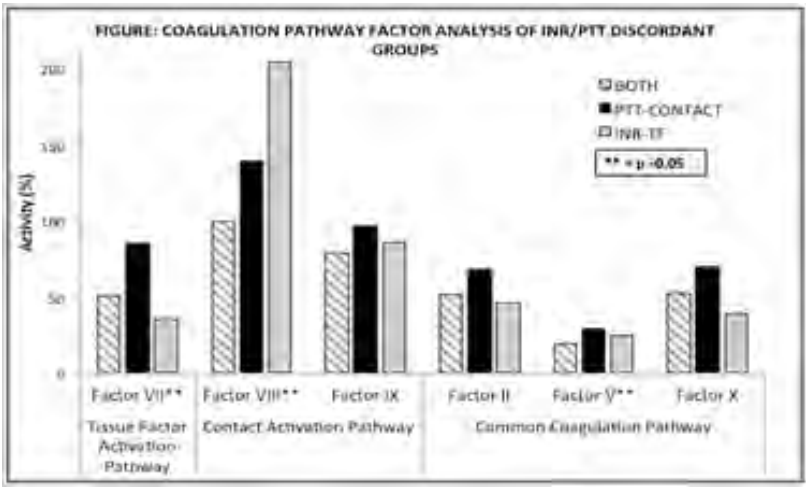


FIGURE: COAGULATION PATHWAY FACTOR ANALYSIS OF INR/PTT DISCORDANT GROUPS
BOTH
PTT-CONTACT
INR-TF
** = p =0.05
Activity (%)
Factor VII**
Factor VIII**
Factor IX
Factor II
Factor V**
Factor X
Tissue Factor Activation Pathway
Contact Activation Pathway
Common Coagulation Pathway

NOTES

Paper #5
Monday, 2/29/2016

CHARACTERIZATION OF DISTINCT COAGULOPATHIC PHENOTYPES IN INJURY: PATHWAY-SPECIFIC DRIVERS AND IMPLICATIONS FOR INDIVIDUALIZED TREATMENT

SA Christie, LZ Kornblith, BM Howard, R Kunitake, AS Conroy, MF Nelson, RA Callcut, MJ Cohen
University of California San Francisco

Presenter: S. Christie, MD
Senior Sponsor: Mitchell J Cohen, MD

INTRODUCTION: International normalized ratio (INR) and partial thromboplastin time (PTT) are used interchangeably to diagnose acute traumatic coagulopathy (ATC) but reflect disparate biological activation pathways (tissue factor vs. contact). In this study we identified injury/patient characteristics and specific coagulation factors that drive contact pathway, tissue factor pathway (TF), and common pathway dysfunction after injury by examining groups with discordant coagulopathies. We hypothesized that injured coagulopathic patients with INR/PTT discordance reflect differing phenotypes representing contact vs. tissue factor pathway perturbations, and that characterization of these different phenotypes will provide specific targets to guide more individualized resuscitation and improve outcomes.

METHODS: Longitudinal plasma samples were prospectively collected from 1262 critically-injured patients at a single Level-1 trauma center. Standard coagulation measures and an extensive panel of pro- and anti-coagulant factors were assayed and analyzed with demographic and outcome data.

RESULTS: Fourteen percent of patients were coagulopathic on admission. Among these, 48% had abnormal INR and PTT (BOTH), 43% had isolated prolonged PTT (PTT-CONTACT), and 9% had isolated elevated INR (INR-TF). PTT-CONTACT and BOTH had lower GCS than INR-TF patients ($p<0.001$). INR-TF patients had decreased factor VII activity compared to PTT-CONTACT, while PTT-CONTACT patients had decreased factor VIII activity compared to INR-TF, but no significant differences in factor IX (FIGURE). All coagulopathic patients had depressed common pathway factor V activity but levels were lowest in BOTH suggesting an additive downstream effect of disordered activation pathways (FIGURE). Coagulopathic patients received more blood than non-coagulopathic patients (PRBC, FFP, PLTS $p< 0.001$); patients with PTT-CONTACT received half as much PRBC and FFP as INR-TF or BOTH patients ($p<0.001$). Despite resuscitation, mortality was higher for coagulopathic groups than for non-coagulopathic patients (50% vs. 9%, $p<0.001$); mortality was highest in BOTH and higher in PTT-CONTACT than INR-TF (71%, 60%, 41% $p=0.04$).

CONCLUSIONS: INR and PTT are used to diagnose ATC, but only 48% have abnormalities in both. Discordant groups demonstrate differential factor deficiencies consistent with dysfunction of contact vs. tissue factor pathways with additive effects from common pathway dysfunction. Recognition and treatment of the pathway-specific factor deficiencies driving different coagulopathic phenotypes in injured patients may be critical in improving individualized resuscitation and outcomes.

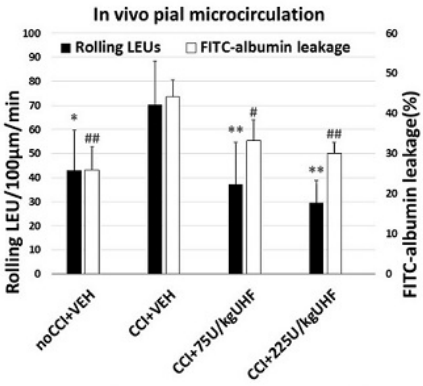


Fig1 rolling,*P<0.05,**P<0.01 versus CCI+Vehicle
FITC,#P<0.05, ##P<0.01 versus CCI+Vehicle

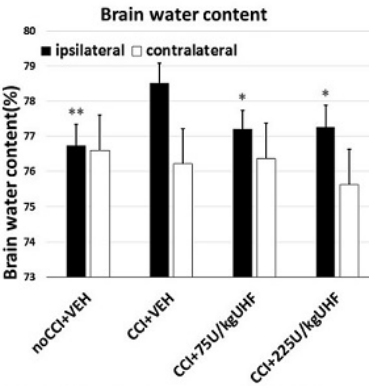


Fig2 ipsilateral,*P<0.05 versus CCI+Vehicle
ipsilateral,**P<0.01 versus CCI+Vehicle

NOTES

Paper #6
Monday, 2/29/2016

UNFRACTIONATED HEPARIN AFTER TBI REDUCES IN VIVO CEREBROVASCULAR INFLAMMATION, BRAIN EDEMA AND ACCELERATES COGNITIVE RECOVERY.

K Nagata, K Kumasaka, S Li, J St-Pierre, J Cognetti, J Marks, R Eisenstadt, V Johnson V, K Browne, DH Smith, JL Pascual
University of Pennsylvania Perelman School of Medicine

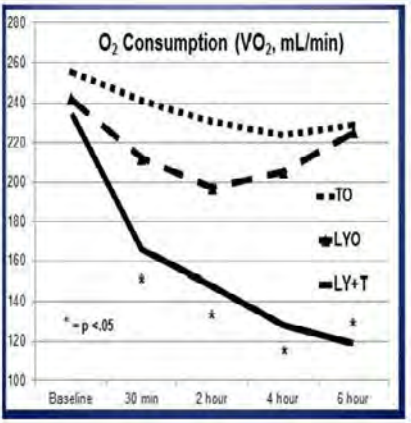
Presenter: Katsuhiro Nagata, MD
Senior Sponsor: Vicente H Gracias, MD

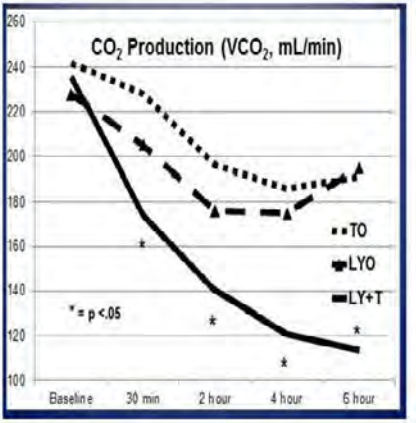
INTRODUCTION: Severe TBI may increase the risk of developing venous thromboembolic complications such as deep vein thrombosis and pulmonary embolism; however, early prevention with heparinoids is often withheld for fear it may worsen cerebral bleeding. New evidence suggests low molecular weight heparin reduces cerebral edema and improves neurological recovery following stroke and traumatic brain injury (TBI), in part through blunting of cerebral leukocyte (LEU) recruitment. It remains unknown how unfractionated heparin (UFH) affects brain inflammation and neurological recovery post TBI. We hypothesized that UFH after TBI reduces cerebral edema by reducing LEU-mediated inflammation and improves neurological recovery.

METHODS: CD1 male mice underwent either TBI by controlled cortical impact (CCI, 1mm depth, 6 m/s) or sham craniotomy. UFH (75 U/kg or 225 U/kg) or vehicle (VEH, 0.9% saline) was administered at 2, 11, 20, 27, and 34 h after TBI. At 48 h, intravital microscopy through a craniotomy was used to visualize live brain LEUs interacting with endothelium and microvascular leakage of fluorescein isothiocyanate (FITC)-albumin. Neurologic function (Garcia Neurological Test, GNT [maximum score=18]) and body weight loss ratios were evaluated at 24 and 48 h after TBI. Brain and lung wet-to-dry ratios were evaluated post mortem. ANOVA with Bonferroni correction determined significance ($p<0.05$).

RESULTS: Compared to positive control (CCI+VEH), both heparin doses reduced post-TBI in vivo LEU rolling on endothelium and cerebrovascular albumin leakage (Figure1). Both UFH doses reduced ipsilateral but not contralateral cerebral edema to near sham (no CCI+VEH) levels (Figure2). Compared to positive control (24h; 13.741.3, 48h; 14.641.2), CCI+75U/kg UFH improved GNT (24h; 15.441.1, 48h; 16.140.8, $p<0.01$ for both time frames). CCI+225U/kg UFH did not significantly improve GNT over CCI+VEH at either time frame. Only CCI+225U/kg UFH significantly increased body weight loss (12.143.2%) above sham (6.541.4%, $p<0.05$) at 48h. Differences in lung water content were not significant at either time frame.

CONCLUSIONS: Heparin after TBI reduces LEU recruitment, microvascular permeability and brain edema to injured brain. Lower UFH doses concurrently improve neurological recovery while higher UFH doses do not. Further study is needed to determine if this is due to increased bleeding form injured brain with high dose UFH.


O2 Consumption (VO2, mL/min)
280
260
240
220
200
180
160
140
120
100
TO
LYO
LY+T
* = p <.05
Baseline
30 min
2 hour
4 hour
6 hour


CO2 Production (VCO2, mL/min)
260
240
220
200
180
160
140
120
100
TO
LYO
LY+T
* = p <.05
Baseline
30 min
2 hour
4 hour
6 hour

NOTES

Paper #7
Monday, 2/29/2016

SUSPENSION OF BIOLOGIC TIME IN SEVERE HEMORRHAGIC SHOCK: PILOT STUDY RESULTS FROM THE BIOCHRONICITY PROJECT

GE Black, MD KK Sokol, MD R Shawhan, MD MJ Eckert, MD S Salgar, PhD MJ Martin, MD
Madigan Army Medical Center

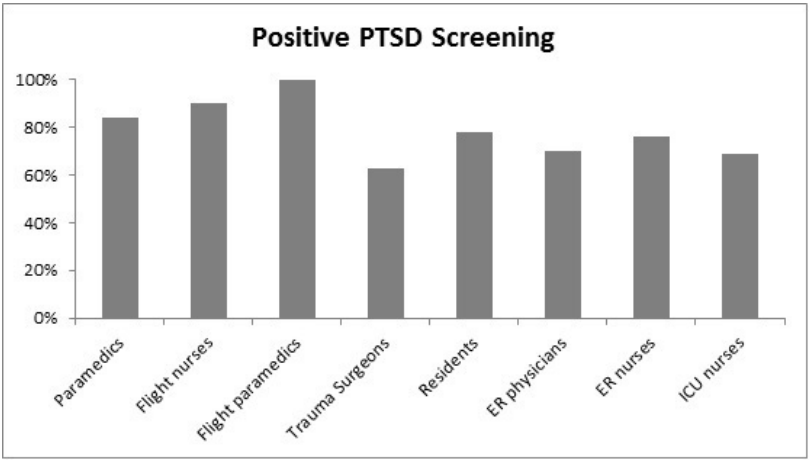
Presenter: George Black, MD
Senior Sponsor: Matthew Martin. MD

INTRODUCTION: Suspended animation-like states have been achieved in small animal models, but have not translated to larger species. Inducing profound metabolic suppression and temporary oxygen-independence could enhance survivability of massive injury. Based on prior analyses of key regulatory pathways, we hypothesized that PI3-kinase inhibition (PI3-KI) would produce metabolic suppression without worsening organ injury or systemic physiology.

METHODS: 16 swine were studied using LY294002 (LY), a non-selective PI3-KI: Animals were assigned to Trauma only (TO, N=3); LY drug only (LYO, N=3); and Experimental (N=10), trauma + drug (LY+T) groups. Both trauma groups underwent laparotomy, 35% hemorrhage, severe ischemia/reperfusion injury, and protocolized resuscitation. Laboratory, physiologic, cytokine, and metabolic cart data at baseline, and for 6 hours post-resuscitation were obtained. Histology of key end organs at 6 hours was also compared.

RESULTS: There were no significant differences between groups at baseline. Compared with the TO group, the LYO group had initial decreases in HR, MAP, cardiac output (CO), oxygen consumption, and carbon dioxide production which were reversible during the resuscitation period. Compared with TO, LY+T showed sustained decreases in HR (113 vs. 76, p=.03), MAP (40 vs. 31 mmHg, p=.02), and CO (3.8 vs. 1.9 L/min, p=.05) at 6 hours. Metabolic parameters (O2 consumption & CO2 production) showed profound suppression in the LY+T group (Figure). Despite metabolic suppression there was no worsening of acidosis (lactate 6.4 vs. 8.3 mmol/L, p=0.4) or other endpoints. IL6 showed a significant fold over baseline increase in LY+T when compared to TO at 6 hours (60.5 vs. 2.47, p=.043). TNF and IL1 were decreased from baseline and IL10 increased in TO and LY+T at 6 hours. Markers of liver and kidney injury were no different between TO and LY+T groups at 6 hours.

CONCLUSIONS: PI3-K inhibition reliably produced major metabolic suppression in both healthy and injured swine without increasing end organ injury or systemic physiologic markers, and demonstrated a prolonged efficacy in injured animals. Further study of these agents and their underlying mechanisms may lead to targeted therapies to prolong the tolerance to hemorrhage and extend the "golden hour" for severely injured patients.


Positive PTSD Screening
100%
80%
60%
40%
20%
0%
Paramedics
Flight nurses
Flight paramedics
Trauma Surgeons
Residents
ER physicians
ER nurses
ICU nurses

NOTES

Paper #8
Monday, 2/29/2016

PTSD IN THOSE WHO CARE FOR THE INJURED

JA Aydelotte, CVR Brown, A Eastman, B Eastridge, P Teixeira, B Coopwood, K Luftman, M Davis
UT - Austin

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

INTRODUCTION: Post Traumatic Stress Disorder (PTSD) has become a focus for the care of trauma victims, but the incidence of PTSD in those who care for injured patients is unknown. Our hypothesis was that a significant proportion of health care providers involved with trauma care are at risk of developing PTSD.

METHODS: A system-wide survey was applied using a modified version of the Primary Care PTSD Screen [PC-PTSD], a validated PTSD screening tool which is currently being used by the VA to screen veterans for PTSD. Pre-hospital and in-hospital care providers including paramedics, nurses, trauma surgeons, emergency medicine physicians, and residents were invited to participate in the survey. The survey questionnaire was anonymously and voluntarily performed online using the Qualtrix system. Providers screened as positive if they affirmatively answered any one or more of the four screening questions and negative if they did not affirmatively answer any of the screening questions. Respondents were grouped by age, gender, region, and profession.

RESULTS: 530 healthcare providers answered all of the survey questions. The screening was positive in 77% (406) and negative in 23% (124) of the responders. There were no differences observed in screen positivity for gender, region, or age. Prehospital providers were significantly more likely to screen positive for PTSD compared to the In-hospital providers (82% vs. 70%, P=.001). Incidence of positive PTSD screen for each professional category is demonstrated in the Figure. Only 55% of respondents had ever received any information or education about PTSD and only 13% of respondents ever sought treatment for PTSD.

CONCLUSIONS: The results of this survey are alarming, with high proportions of healthcare workers at risk for PTSD across all professional groups. PTSD is a vastly underreported entity in those who care for the injured and could potentially represent a major problem for both prehospital and in-hospital providers. A larger, national study should be done to verify this one state's results.

NOTES

Paper #9
Monday, 2/29/2016

ALTERATIONS IN HUMAN PROTEOME WITH VALPROIC ACID TREATMENT

I Halaweish, MD, P Georgoff, MD, V Nikolian, MD, T Bonham, BS, H Remmer, PhD, R Menon, PhD, B Liu, MD, Y Li, MD PhD, HB Alam, MD
University of Michigan

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

INTRODUCTION: Valproic acid (VPA) has shown "pro-survival" effects in high doses (250-300 mg/kg) in animal models of shock and brain injury. It is unclear whether lower doses are biologically effective, especially in humans. We are conducting an FDA approved phase 1, single dose, double blind, placebo-controlled trial to evaluate the safety and tolerability of ascending doses of VPA in healthy volunteers. Here, we present an analysis of the changes in the human proteome secondary to the administration of a lower dose of VPA.

METHODS: Peripheral blood mononuclear cells were obtained (baseline, 4, and 8 hrs post infusion) from three subjects randomized to receive VPA (120 mg/mL over one hour). Proteomic analyses were performed through 1D gel electrophoresis followed by liquid chromatography and mass spectrometry analyses. Proteins with differential expression were chosen for functional annotation, group clustering, and pathway analysis. Western blotting was performed for histone H3 acetylation.

RESULTS: The average number of proteins isolated per sample was 1716 4 459. Post-infusion, 114 proteins were upregulated (72 and 42 proteins at 4 and 8 hrs, respectively) and 60 were down regulated (28 and 32 proteins at 4 and 8 hrs, respectively). Functional annotation showed that 56% and 40% of proteins with a significant change in expression were involved in phosphorylation and acetylation, respectively. The top proteins clusters highlighted were "wound healing", "acute inflammatory response", and "blood coagulation". Interestingly, "retinoid metabolic processes", thought to be implicated in neurotrauma and neurodegeneration were also highlighted. There were 83 unique pathways identified, including "hemostasis", "complement and coagulation cascades", "platelet activation, signaling and aggregation", and "retinoid metabolism and transport". Western blot showed that histone H3 was significantly acetylated 4 hours after the VPA administration.

CONCLUSIONS: This is the first study to show that a lower dose of VPA (50% of the effective dose in animal models) is adequate to cause hyperacetylation, and quantitatively alter the expression of key proteins in healthy subjects to create changes consistent with a "pro-survival" effect. As the next step of this randomized trial, we will test this dose in severely injured trauma patients.

Mean ± S.D. (N = 5 for each group)

	TNF (pg/ml)	IL-6 (pg/ml)	Adiponectin (ng/ml)
ADSC/Raw (conrol)	79.8 ± 2.8	38.4 ± 1.9	41.2 ± 0.5
ADSC/Raw + Epi (10^{-3}μM)	169.2 ± 7.5*	81.9 ± 5.2*	30.5 ± 0.2*
ADSC/Raw + H/R	158.6 ± 5.8*	84.1 ± 5.8*	31.4 ± 0.2*
ADSC/Raw + Epi + H/R	248.8 ± 8.6*#	181.4 ± 6.4*#	26.9 ± 0.3*#
ADSC/Raw + Epi + H/R + E2 (10 ng/ml)	82.6 ± 2.3	50.7 ± 2.7*	40.4 ± 0.5
ADSC/Raw + Epi + H/R + DHT (100 ng/ml)	254.3 ± 8.1*#	176.7 ± 6.6*#	25.6 ± 0.4*#

*p<0.001 vs. ADSC/Raw control, #p<0.001 vs. all other groups. There was no effect of varying concentrations of E2 or DHT on TFα, IL-6 or adiponectin in our experiments.

NOTES

Paper #10
Monday, 2/29/2016

GENDER DIMORPHISM IN ADIPOSE TISSUE RESPONSE TO STRESS CONDITIONS: A PLAUSIBLE MECHANISM TO EXPLAIN THE CONFLICTING DATA REGARDING TRAUMA AND OBESITY

ME Diebel, DM Liberati, LN Diebel
Wayne State University

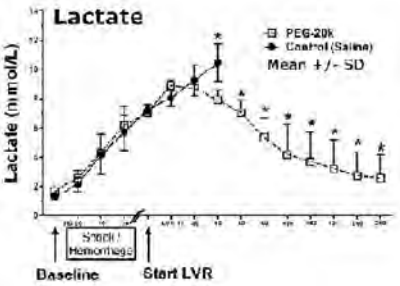
Presenter: Mark Diebel, MD
Senior Sponsor: Lawrence N. Diebel, MD

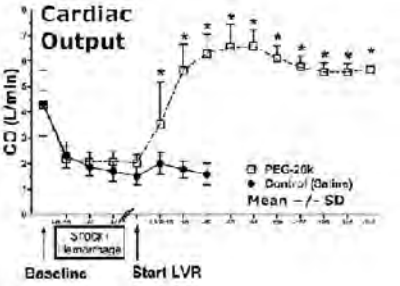
INTRODUCTION: Obesity is a chronic low grade inflammatory condition associated with the elaboration of proinflammatory cytokines and adipokines from adipose tissue. There is conflicting data regarding the impact of obesity following trauma and critical illness. Gender differences in relative fat distribution and proinflammatory responses also have been reported. Gender dimorphism, (in part due to sex hormones) has also been identified after injury and hemorrhagic shock. In this regard the sex hormone estrogen (E2) but not testosterone (DHT) has a protective anti-inflammatory effect following trauma and hemorrhagic shock. We hypothesized that E2 and DHT have disparate effects on inflammatory mediator production from adipose tissue under stress conditions. Further, these differences may account for the conflicting data regarding obesity and outcomes following trauma and critical illness. This was studied in an in vitro model.

METHODS: Mature adipocytes differentiated from adipose-derived stem cells (ADSC) were co cultured (2:1) with macrophages (RAW 264.7). ADSC/RAW co cultures were then subjected to varying experimental stress conditions including hypoxia-reoxygenation (H/R), and/or incubation with physiologic (10-6×M) or stress (10-3×M) concentrations of epinephrine (Epi). In other experimental groups, E2 or DHT was added in a range of physiologic concentrations. Culture supernatants were obtained 12 hours post incubation and TNF , IL-6 and adiponectin levels were measured by ELISA.

RESULTS: Please see attached table.

CONCLUSIONS: Stress levels of epinephrine and H/R increased proinflammatory cytokine production and decreased adiponectin levels in ADSC/RAW co cultures. E2 at physiologic concentrations decreased TNF , IL-6 and preserved adiponectin levels following Epi and/or H/R conditions. There was no effect of DHT on mitigating the proinflammatory response of adipose tissue to the stress response to Epi and/or H/R. Our results suggest a gender dimorphism in adipose tissue under stress conditions that may help explain the conflicting data in the literature.


Lactate
Lactate (mmol/L)
PEG-20k
Control (Saline)
Mean +/- SD
Shock /
Hemorrhage
Baseline
Start LVR


Cardiac
Output
CO (L/min)
PEG-20k
Control (Saline)
Mean +/- SD
Shock /
Hemorrhage
Baseline
Start LVR

NOTES

Paper #11
Monday, 2/29/2016

LOW VOLUME RESUSCITATION USING POLYETHYLENE GLYCOL-20K IN A PRE-CLINICAL PORCINE MODEL OF HEMORRHAGIC SHOCK

V Plant, A Limkemann, L Liebrecht, C Blocher, P Ferrada, M Aboutanos, and MJ Mangino
Virginia Commonwealth University

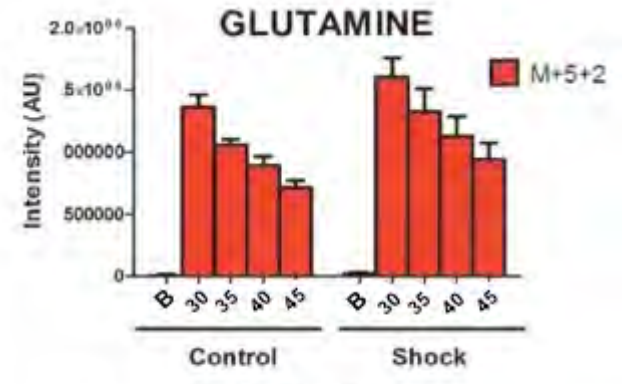
Presenter: Valerie Plant, MD
Senior Sponsor: Michel Aboutanos, MD

INTRODUCTION: Polyethylene glycol-20k (PEG-20k) is highly effective for low volume resuscitation (LVR) by increasing tolerance to the low volume state. In our rodent shock model, PEG-20k increased survival and expanded the "golden hour" eight-fold compared to saline by improving mean arterial pressure (MAP), regional capillary blood flow, and lactate clearance. The molecular mechanism is largely attributed to hybrid cell impermeant and oncotic properties that shift fluid from intracellular and interstitial spaces to the capillary compartment, thereby driving low volume microcirculatory perfusion and preventing hydropic cellular degeneration. The objective of this study was to evaluate PEG-20k for low volume resuscitation of hemorrhagic shock in a clinically relevant and translational porcine model.

METHODS: Anesthetized male Yorkshire pigs (30-40 kg) were hemorrhaged to a MAP of 35-40 mmHg. Once lactate reached 7 mM/L, either saline (n = 5) or 10% PEG-20k (n = 5) was rapidly infused at 10% calculated blood volume. The primary outcome was LVR time, defined by LVR administration to the time when lactate again reached 7 mM/L, since LVR transiently decreased or stalled the continued increase of lactate. Other outcomes measured included: MAP, heart rate (HR), cardiac output (CO), mixed venous oxygen saturation (SvO2), splanchnic blood flow, and hemoglobin.

RESULTS: Relative to saline, PEG-20k given after controlled hemorrhage increased LVR time by 8-fold, a conservative estimate given an end-lactate of only 2.6 4 1.6 compared to 9.3 4 1.1 for saline (Figure). PEG-20k also decreased HR and increased CO (Figure), MAP, splanchnic flow, and SvO2 back to baseline levels with the exception of MAP (stabilized at 60 mmHg) and hemoglobin (showed sizable hemodilution from fluid shifts into the intravascular compartment). *P<0.05 for corresponding values between groups by 2-way ANOVA (paired) and 1-sample T-Test (unpaired) (Figure).

CONCLUSIONS: In this pre-clinical model of controlled hemorrhagic shock, PEG-20k-based LVR increased tolerance to the shock state 8-fold compared to saline. PEG-20k is a superior crystalloid for low volume resuscitation that may increase safe transport times in the prehospital setting and find use in hospital emergency departments and operating rooms for patients awaiting massive transfusion and/or definitive treatment.



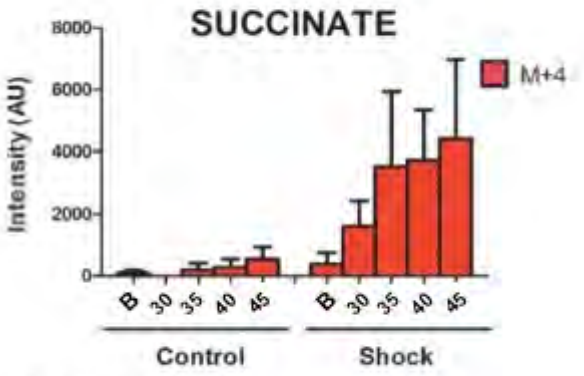


Figure 1

NOTES

Paper #12
Monday, 2/29/2016

GLUTAMINE METABOLISM DRIVES SUCCINATE ACCUMULATION DURING HEMORRHAGIC SHOCK

AL Slaughter, A D'alessandro, E Peltz, A Banerjee, K Hansen, C Silliman, T Bacon, HB Moore, M Fragoso and EE Moore
University of Colorado Trauma Research Core

Presenter: Anne Slaughter, MD
Senior Sponsor: EE Moore, MD

INTRODUCTION: Recent investigations have demonstrated that succinate accumulation in plasma during protracted shock contributes to acid/base imbalance, inflammation and platelet dysfunction, yet its biochemical precursor remains uncertain. Thus, novel resuscitation strategies to address this post-injury metabolic defect are limited. While succinate derives from glucose physiologically, labeling studies have demonstrated that glucose is not the primary source of increased succinate concentration in plasma during protracted shock. However, glutamine is an alternative parent substrate for producing high-energy phosphates via citric acid cycle intermediates, and is favored under hypoxic conditions. Thus, we hypothesize that succinate accumulation during hemorrhagic shock is driven by glutaminolysis.

METHODS: Sprague-Dawley rats (n=8) were subjected to hemorrhagic shock by controlled hemorrhage to a mean arterial pressure of 30 mmHg for 45 min. At 15 min into shock, animals received a 1mL/Kg intravenous injection of 13C-15N-glutamine solution (iLG). Blood was drawn at baseline and serial time points (30, 35, 40, 45 min). Normotensive control animals (n=8) were also injected with iLG at 15 min and blood was drawn at identical time points. Quantitative fluctuations in metabolite levels and trace heavy-labeled carbon/nitrogen distribution were determined by Ultra High Pressure Liquid Chromatography (UHPLC) mass spectrometry (MS)-metabolomic analysis.

RESULTS: Hemorrhagic shock instigated succinate accumulation compared to controls. During shock, heavy carbon/nitrogen tracing showed progressive decrease (metabolism) of injected labeled glutamine (M+5+2) with corresponding accumulation of labeled succinate (M+4 – Figure 1). In controls, labeled glutamine metabolism did not significantly increase labeled succinate levels from steady state. Kinetic analyses in control rats showed constant total levels of all the tested metabolites for the duration of the experiment without significant change due to biological variability or iLG.

CONCLUSIONS: During hemorrhagic shock, glutamine metabolism drives increased succinate concentration in plasma as measured by labeled metabolomic analysis of an in vivo animal model. This mechanism implicates the glutaminolysis pathway, isolating specific enzymes as potential therapeutic targets to prevent the contribution of post-shock succinate accumulation to acid/base imbalance, inflammation and platelet dysfunction.

Patients	Total (n=68)	Open (n=48)	Endo (n=20)	p-value
Age (median years, IQR)	27 (21-39)	25 (19-35)	38 (25-49)	**0.009**
Male Sex	62 (91%)	44 (92%)	18 (85%)	1.0
Injury Severity Score	10 (9-18)	10 (9-16)	15 (6-25)	0.4
Abbreviated Injury Score	3 (2-3)	3 (3-3)	3 (2-3)	0.7
Injuries	Total (n=70)	Open (n=50)	Endo (n=20)	p-value
Penetrating Injury	53 (75%)	39 (78%)	14 (70%)	0.5
Blunt Injury	17(24%)	11 (22%)	6 (30%)	
Vascular Surgery Involvement	45 (64%)	27 (54%)	18 (90%)	**0.005**
Upper Extremity	24 (34%)	12 (24%)	12 (60%)	**0.004**
Lower Extremity	46 (66%)	38 (76%)	8 (40%)	
Hospital Course	Total (n=68)	Open (n=48)	Endo (n=20)	p-value
Transfusion	47 (69%)	37 (77%)	10 (50%)	**0.028**
Transfusion Volume (median mL, IQR)	1250 (900-2500)	1250 (1000-2500)	1250 (875-3050)	1
Fasciotomy	25 (37%)	22 (46%)	3 (15%)	**0.026**
Amputation at Surgery	5 (7%)	5 (10%)	0 (0%)	0.3
Amputation during Hospital Stay	7 (10%)	6 (13%)	1 (5%)	0.6
Length of Hospital Stay (median days, IQR)	9 (7-19)	9 (6-18)	14 (8-25)	0.2
Mortality Rate	4 (6%)	2 (4%)	2 (10%)	0.6
Limb Salvage at Discharge	58/64 (91%)	41/46 (89%)	17/18 (94%)	0.7
Follow-Up	50 (83%)	37 (84%)	13 (81%)	1.0
Follow-Up Time (median days, IQR)	123 (42-461)	82 (44-373)	288 (46-560)	0.3

Table 1. Summary of demographics, surgical interventions, complications, and clinical outcomes for patients presenting to an urban Level 1 Trauma Center with peripheral arterial injury. IQR, interquartile range.

NOTES

Paper #13
Tuesday, 3/1/2016

ENDOVASCULAR MANAGEMENT FOR PERIPHERAL ARTERIAL TRAUMA: THE NEW NORM?

Ganapathy AV, Khouqeer AF, Anand J, Todd SR, Mills JL, Gilani R
Baylor College of Medicine

Presenter: Anand Ganapathy, BS
Senior Sponsor: Samual Robert Todd, MD

INTRODUCTION: Endovascular therapy is well studied in atraumatic conditions; however, there remains a paucity of data evaluating its application in traumatic injuries. The objective of this study is to compare open and endovascular techniques in the management of peripheral arterial trauma.

METHODS: This is a retrospective review of all patients admitted to an urban Level I Trauma Center who sustained injuries to the subclavian, axillary, superficial femoral, and popliteal arteries; who subsequently underwent an open or endovascular repair from 2009 to 2014. The medical records were used to evaluate patient demographics, surgical interventions, complications, and clinical outcomes.

RESULTS: Sixty-eight patients with a total of 70 arterial injuries were identified. There were 10 subclavian injuries – 2 open and 8 endovascular (p=0.00), 14 axillary injuries – 10 open and 4 endovascular (p=1.0), 15 superficial femoral injuries – 12 open and 3 endovascular (p=0.5), and 31 popliteal injuries – 26 open and 5 endovascular (p=0.04). Endovascular (n=20) compared to open repairs (n=50) were more commonly performed: by vascular surgeons (90% versus 54%, p=0.005); in older patients (median age: 38 years vs 25 years, p=0.009); primarily involving upper extremity injuries (60% versus 24%, p=0.004). Furthermore, endovascular repairs less commonly required packed red blood cell transfusions (50% versus 77%, p=0.028) or fasciotomy (15% vs 46%, p=0.026). However, outcomes between endovascular and open repairs were comparable: limb salvage rates at discharge (94% vs 89%), median hospital length of stay (14 days vs 9 days), and median follow-up time (288 days vs 92 days) were similar, with p-values of 0.7, 0.2, and 0.3, respectively. There was increasing utilization of endovascular repair in managing these injuries from 2009 (7% of total procedures) to 2014 (50% of total procedures).

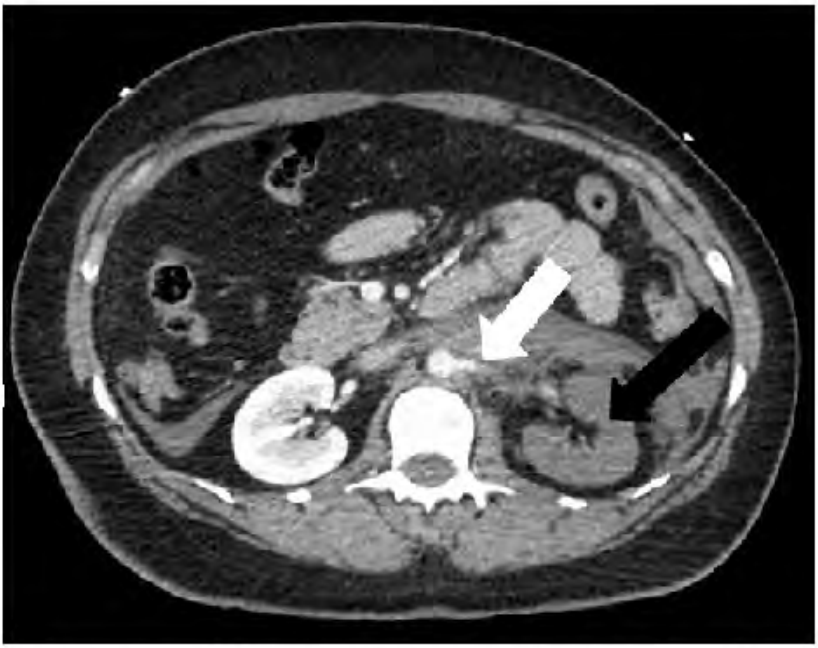
CONCLUSIONS: Overall, endovascular and open techniques result in similar outcomes; however, endovascular therapy appears to provide an advantage when it comes to: challenging anatomy, such as the thoracic inlet; decreasing blood product utilization; and minimizing physiologic derangement. Given the increasing use of endovascular techniques, close collaboration is needed between trauma and vascular surgeons to properly select the optimal management for patients with peripheral arterial trauma.

NOTES

Tuesday, March 1, 2016

PRO/CON DEBATE

OPEN VERSUS ENDOVASCULAR REPAIR OF PERIPHERAL ARTERIAL INJURIES
Steven Shackford, MD vs. Riyad (KJ) Karmy-Jones, MD



Contrast enhanced abdominal CT scan showing occlusion of the left renal artery (white arrow) and absent contrast enhancement of the left kidney (black arrow)

NOTES

Paper #14
Tuesday, 3/1/2016

MULTIDISCIPLINARY MANAGEMENT OF BLUNT RENAL ARTERY INJURY WITH ENDOVASCULAR THERAPY IN THE SETTING OF POLYTRAUMA

CA Beyer, SA Zakaluzny, MD Humphries, DV Shatz
UC Davis Medical Center

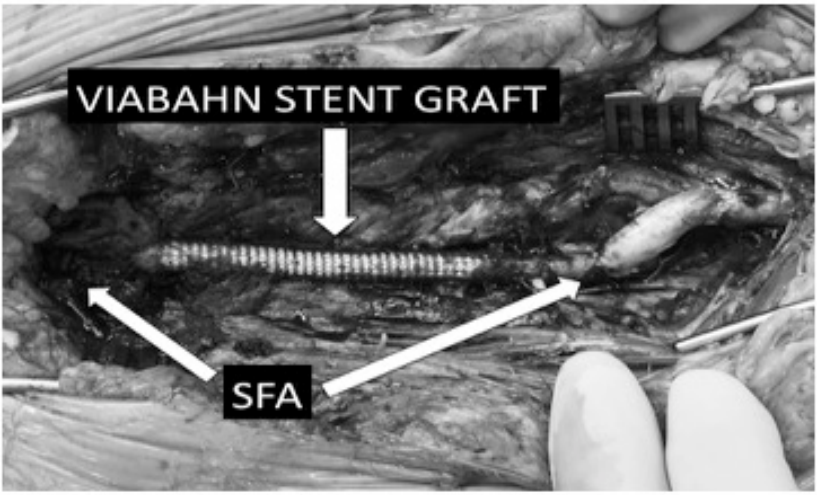
Presenter: Carl Beyer, MD
Senior Sponsor: David Shatz, MD

INTRODUCTION: Injury to the renal artery following blunt trauma is rare, but well described. The incidence ranges from 0.05% to 0.08% of all patients with blunt trauma. Complications of renovascular injury include prolonged hospitalization, kidney loss, and death. Despite being first described in 1861, there is still considerable controversy regarding the optimal treatment of blunt renal artery injury. We present a case of multidisciplinary management after blunt polytrauma which included endovascular repair of an occluded renal artery in a hybrid operating room.

METHODS: A 39 year old woman was brought to the level 1 trauma center eight minutes after a motor vehicle versus pedestrian collision. Her initial hypotension responded favorably to two liters of crystalloid resuscitation, so she was taken for computed tomography imaging of the chest, abdomen, and pelvis. This demonstrated a grade V splenic laceration with active contrast extravasation, liver lacerations, right hip dislocation, pelvic fractures, and left renal artery occlusion with no enhancement of the left kidney (See Image). She was taken to the operating room for exploratory laparotomy, splenectomy, and abdominal packing. The vascular surgeon was then able to open the occluded renal artery with angioplasty and stenting. Left kidney perfusion was restored at 2 hours and 55 minutes after the initial injury. The orthopedic surgeon was then able to reduce the right hip dislocation using the same fluoroscopic equipment in the hybrid operating room with confirmatory imaging 3 hours and 42 minutes after the initial injury. She returned to the operating room 30 hours later for removal of abdominal packing, definitive abdominal closure, and orthopedic repair of her pelvic fractures.

RESULTS: The patient remained normotensive with a normal Cr level throughout her 42 day hospitalization. Her most recent blood pressure at a primary care follow-up visit was 114/95.

CONCLUSIONS: This case demonstrates that endovascular treatment of blunt renal artery injury is feasible. This case also highlights the importance of multidisciplinary collaboration in the care of the polytrauma patient. There remain many questions that must be answered. Currently, no guidelines exist concerning this procedure, time to revascularization, or post-procedure antiplatelet therapy and further study is warranted.



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Paper #15
Tuesday, 3/1/2016

DIRECT SITE ENDOVASCULAR REPAIR – A NOVEL TECHNIQUE AND CASE SERIES

AJ Davidson, CM Abbot, LP Neff, JB Sampson, TK Williams
David Grant Medical Center

Presenter: Anders Davidson, MD
Senior Sponsor: Matt Martin, MD

INTRODUCTION: Extremity vascular injury in military and civilian trauma is a major source of morbidity and mortality. Open surgical reconstruction using stent grafts to create a "sutureless" anastomosis is a novel technique that offers stent-graft repair without need for advanced imaging, endovascular expertise, or an extensive endovascular inventory. Advantages include rapid deployment, large flow lumen, and potential for indefinite durability. Relative to standard shunts, improved flow through a larger lumen would reduce the likelihood for thrombosis, prevent ongoing limb ischemia, and allow for delayed definitive reconstruction. This technique rivals shunts in the speed and technical requirements required to deploy the device. They may be deployed on the delivery device through an adjacent arteriotomy, or they may be removed leaving a compressed semi-rigid stent with a pull string "rip cord." We have deployed 4 stents in this fashion in 3 individuals with excellent results.

METHODS: Patient 1 presented septic with a ruptured mycotic pseudoaneurysm of the femoral artery (FA). An ePTFE self-expanding covered stent was deployed through a distal arteriotomy to bridge the defect (figure). He was taken to the ICU due to gross contamination and hemodynamic instability. Patients 2 and 3 presented in hemorrhagic shock after suffering injuries to the thigh from gun shot wounds. Patient 2 had an injury to the FA and Patient 3 had an injury to the FA and femoral vein. An ePTFE stent was removed from the delivery device and deployed directly into the damaged vessels without the need for an arteriotomy large enough to accommodate the delivery system.

RESULTS: Patient 1 returned to the OR after 48 hours for revision and definitive reconstruction. He died approximately 2 months later due to medical complications unrelated to the reconstructed artery. Patient 2 recovered uneventfully. The stent remained in place and at 6 months it was widely patent on CT angio. Patient 3 developed a superficial wound infection. This was managed with VAC therapy and the stent remains patent at 1 month.

CONCLUSIONS: Open sutureless repair using commercially available stent grafts to treat vascular injuries is a technically feasible strategy for both damage control and definitive management of peripheral vascular injury.

NOTES

Paper #16
Tuesday, 3/1/2016

Smaller introducer sheaths for REBOA may be associated with fewer complications

W Teeter, J Matsumoto, K Idoguchi, Y Kon, T Orita, T Funabiki, M Brenner, Y Matsumura
RA Cowley Shock Trauma Center

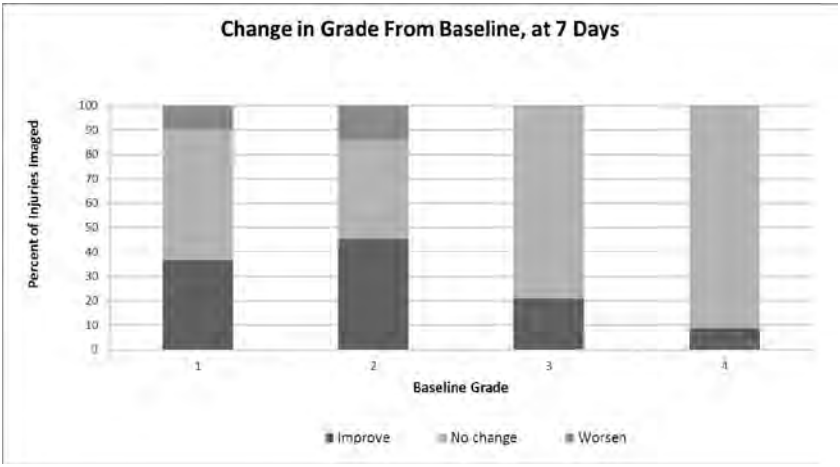
Presenter: William Teeter, MD, MS
Senior Sponsor: Megan Brenner, MD

INTRODUCTION: Large arterial sheaths currently used for Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) may be associated with severe complications. Smaller diameter catheters compatible with 7Fr sheaths may improve the safety profile.

METHODS: A retrospective review of patients receiving REBOA through a 7Fr sheath for refractory traumatic hemorrhagic shock was performed from January 2014 to June 2015 at 5 tertiary care hospitals in Japan. Demographics were collected including method of arterial access; outcomes included mortality and REBOA-related access complications.

RESULTS: 33 patients underwent REBOA at Zone 1 (level of the diaphragm). Most patients were male (70%), with a mean age (+SD) 50418 years, mean BMI 2344 and a median [IQR] ISS of 38 [34, 52]. 94% of patients presented after sustaining injuries from blunt mechanisms. 24% underwent CPR before arrival, and an additional 15% received CPR after admission. Percutaneous arterial access without ultrasound or fluoroscopy was achieved in all patients. Systolic blood pressure (SBP) increased significantly following balloon occlusion (mean 62 4 36 to 106 4 40 mmHg, $p<0.001$). Median total duration of complete initial occlusion was 26 [range 10-35] minutes. 16 patients (49%) survived beyond 24hrs, and 14 patients (42%) survived beyond 30 days. Twenty-four hour and 30-day survival were 48% and 42%, respectively. Of the patients surviving 24hrs (n=16), median duration of sheath placement was 28 [range 18-45] hours with all removed using manual pressure to achieve hemostasis. Of 33 REBOAs, 20 were performed by Emergency Medicine (EM) practitioners, 10 by EM practitioners with endovascular training, and 3 by Interventional Radiologists. No complication related to sheath insertion or removal was identified during the follow-up period, including dissection, pseudoaneurysm, retroperitoneal hematoma, leg ischemia, or distal embolism.

CONCLUSIONS: 7Fr REBOA catheters can significantly elevate SBP with no access-related complications. Our results suggest that a 7Fr introducer device for REBOA may be a safe and effective alternative to large-bore sheaths, and may remain in place during the post-procedure resuscitative phase without sequelae.


Change in Grade From Baseline, at 7 Days
Percent of Injuries Imaged
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
Baseline Grade
Improve
No change
Worsen

NOTES

Paper #17
Tuesday, 3/1/2016

NATURAL HISTORY OF BLUNT CEREBROVASCULAR INJURIES: PROGRESSION AND RESOLUTION BY GRADE

A Laser, BR Bruns, J Kufera, A Kim, T Feeney, R Tesoriero, M Lauerman, C Sliker, T Scalea, DM Stein
University of Maryland

Presenter: Adriana Laser, MD, MPH
Senior Sponsor: Deborah Stein, MD

INTRODUCTION: The natural history of blunt cerebrovascular injuries (BCVI) has been previously described in the literature. The purpose of the current study is to delineate the long-term natural history of BCVI.

METHODS: This single institution retrospective review of a prospectively collected database over 4 years (2009-2013) identified all patients diagnosed with BCVI by CT scan and graded injuries based on the modified Denver scale. Institutional practice includes initial whole body contrast enhanced CT scan (WBCT), and CTA within 24 hours for injuries on WBCT or high risk patients. Management followed institutional algorithm: CTAs at 24-72 hours, 5-7 days, 4-6 weeks, and 3 months post-injury. Follow up through 6 months after injury was recorded.

RESULTS: There were 378 patients with 509 injuries identified. 381 injuries were diagnosed as BCVI, 100 were initially 'indeterminate' on WBCT; 28 were found in patients reimaged for lesions detected in other vessels. 60% were male, mean age was 46.5 years (SD 19.9), 65% white, 48% had an ISS of ≥25. 62% were victims of a motor vehicle crash. Grade I injuries were most frequently found to be resolved at subsequent time points. Up to 30% of grade II injuries progressed, but 50% improved or resolved. Greater than 70% of all imaged grade III and IV injuries remained unchanged at subsequent time points.

CONCLUSIONS: This study of long term follow-up of BCVI revealed low grade injuries (grades I and II) are likely to remain stable and resolve. However, higher grade injuries (grades III and IV) persist, many up to six months.

NOTES

Paper #18
Tuesday, 3/1/2016

REVISITING THE GREENFIELD RISK ASSESSMENT PROFILE IN CRITICALLY ILL TRAUMA PATIENTS

JP Meizoso, CA Karcutskie, JJ Ray, B Seiden, D Horkan, XD Ruiz, N Namias, CI Schulman, KG Proctor
Ryder Trauma Center / University of Miami

Presenter: Jonathan Meizoso, MD
Senior Sponsor: Nicholas Namias, MD

INTRODUCTION: Venous thromboembolism (VTE) risk assessment tools were created to stratify risk and help guide surveillance and prophylaxis. However, a significant fraction of trauma patients who develop VTE are classified as low risk, which suggests that refinements and improvements are necessary. The objective of this study was to re-evaluate and simplify the Greenfield Risk Assessment Profile (RAP) for VTE in trauma using information readily available at the bedside.

METHODS: Review of consecutive admissions to the intensive care unit at a level I trauma center from 08/2011-01/2015. Demographics, injury characteristics, hemodynamic & laboratory parameters, RAP, & outcomes were recorded. Univariate and multivariate analyses were performed to identify independent predictors of VTE with significance at $p \leq 0.05$.

RESULTS: 1,273 patients were included (age: 44419, 75% male, 70% blunt, ISS: 21413, RAP 845). Groups were separated into +VTE (n=105) and –VTE (n=1168). They were similar in age, gender, mechanism, & mortality; but ISS (27414 vs. 21413), RTS [6.90 (5.90-7.84) vs. 7.84 (6.90-7.84)], and RAP (1346 vs. 844, $p<0.0001$) were worse in the +VTE group (all $p<0.0001$). The +VTE group had more transfusions (86% vs. 52%, $p<0.0001$), tranexamic acid (14% vs. 6%, $p=0.001$), & longer time to prophylaxis (342 vs. 242 days, $p=0.038$). Receiving a transfusion (OR: 3.478, 95% CI: 1.842-6.567), GCS≤8 (2.886, 1.714-4.859), pelvic fracture (2.336, 1.441-3.787), and >2 hour operation (1.909, 1.196-3.046) predicted VTE with an area under the receiver operator curve of 0.740, almost as good as 0.746 for RAP score alone.

CONCLUSIONS: VTE risk in trauma can be easily assessed using only four risk factors (transfusion, GCS, pelvic fracture, prolonged operation). This simplified model provides similar predictive ability to the more complicated RAP score. Prospective validation of a simplified risk assessment score is warranted.

Indication	n	proportion (%)
Pneumothorax	46	63%
Hemothorax	4	5%
Hemopneumothorax	18	25%
Other	5	7%

NOTES

Paper #19
Tuesday, 3/1/2016

TRAUMA PATIENTS ARE SAFE TO FLY 24 HOURS AFTER TUBE THORACOSTOMY REMOVAL

D Zonies, K Fejedelem, V Paul, C Burns, J Oh, J Elterman, J Cannon
Oregon Health & Science University

Presenter: David Zonies, MD, MPH
Senior Sponsor: Jennifer Watters, MD

INTRODUCTION: Current recommendations for safe air travel following traumatic pneumothorax are 2-3 weeks after radiographic resolution. These recommendations are based on several small observational studies and expert consensus that cite a theoretical risk of recurrence and hypoxia due to decreased oxygen tension at altitude. We sought to systematically study the timing of chest drain removal after traumatic pneumothorax and risk of recurrence in relation to air travel.

METHODS: A retrospective cohort study of consecutively admitted patients who sustained a traumatic chest injury treated with tube thoracostomy over a 5-year period was undertaken. Adult patients with a post-removal expiratory chest x-ray demonstrating absence of pneumothorax and a 24-hour observation period prior to flight were eligible for study. All patients were transferred to a participating medical center for continued care. In-flight medical monitoring was available for all patients. Baseline patient characteristics, interval period from drain removal to flight, in-flight medical records, and destination outcomes were studied. The primary outcome was the incidence of post-flight radiographic or clinical recurrence of pneumothorax within 30 days.

RESULTS: One-hundred eighteen chest drains were placed in 73 patients who met inclusion criteria. All were male with a mean age of 25 4 6, ISS of 31 4 11, and chest AIS of 3 4 0.9. The majority of patients sustained a penetrating injury (74%). Indications for tube thoracostomy placement are summarized (Table). The average duration of tube thoracostomy was 5 4 3 days. The average period between thoracostomy drain removal and flight was 3 4 2 days (range 1-13 days). Patients travelled an average of 4,350 nautical miles at a mean compensated cabin altitude of 8000 feet (565 mmHg). Twenty-nine (40%) patients remained mechanically ventilated during transport. There were no reported in-flight medical emergencies for the entire cohort. There were no reported post-flight radiographic or clinical pneumothorax recurrences during the subsequent 30 days.

CONCLUSIONS: Following a 24 hour period of observation, air travel after tube thoracostomy removal appears safe. Further, it is medically sound for both mechanically ventilated and spontaneously breathing patients.

NOTES

Paper #20
Tuesday, 3/1/2016

STREAMLINING HEMOTHORAX MANAGEMENT: USE OF AN EVIDENCE-BASED ALGORITHM TO STANDARDIZE CARE

BM Dennis, SP Gondek, SE Hamblin, OD Guillamondegui
Vanderbilt University Medical Center

Presenter: Bradley Dennis, MD
Senior Sponsor: Oscar Guillamondegui, MD

INTRODUCTION: Concerted management of the traumatic hemothorax is ill-defined. Surgical management of specific hemothoraces may be beneficial. A comprehensive strategy to delineate appropriate patients for additional procedures does not exist. We developed an evidence-based algorithm for hemothorax management. We hypothesize the use of this algorithm will decrease unnecessary interventions.

METHODS: A pre/post study was performed on all patients admitted to our trauma service with a diagnosis of hemothorax from August 2010 to September 2013. Patients were excluded who had length of stay (LOS) <24 hours or required surgical intervention within 24 hours of admission. An evidence-based management algorithm was initiated for the management of retained hemothoraces. Patients admitted during the implementation phase (March and April 2012) were excluded from the study. Study data included age, ISS, AIS chest, mechanism of injury, ventilator days, ICU LOS, total hospital LOS and interventions required. Our primary outcome was number of patients requiring >1 intervention. Secondary outcomes were empyema rate, number of patients requiring specific interventions (video-assisted thoracoscopy, thoracotomy, intrapleural thrombolytics, or interventional radiology-placed catheter), ventilator days, ICU LOS, hospital LOS, all-cause six-month readmission rate, and hospital charges. Standard statistical analysis was performed for continuous and categorical data.

RESULTS: 642 patients (326 pre and 316 post) met study criteria. There were no demographic differences in either group. Number of patients requiring >1 intervention was significantly reduced (49 pre vs 28 post, $p=0.02$). Number of patients requiring VATS decreased (27 pre vs 10 post, $p<0.01$). Number of catheters placed by interventional radiology increased (2 pre vs 10 post, $p=0.02$). Intrapleural thrombolytic use, open thoracotomy, empyema and six-month readmission rates were unchanged. The "post" group required less ventilator days (median 0 vs 1, $p=0.01$), but ICU and hospital LOS were unchanged.

CONCLUSIONS: Employing an evidence-based hemothorax algorithm reduced the number of patients requiring additional interventions without increasing complication rates. Defined criteria for surgical intervention allows for more appropriate utilization of resources.

NOTES

Paper #21
Tuesday, 3/1/2016

TRAUMA EDUCATION IN CUBA: A PORTAL FOR GLOBAL SURGERY

MA deMoya and AG deMoya
Massachusetts General Hospital

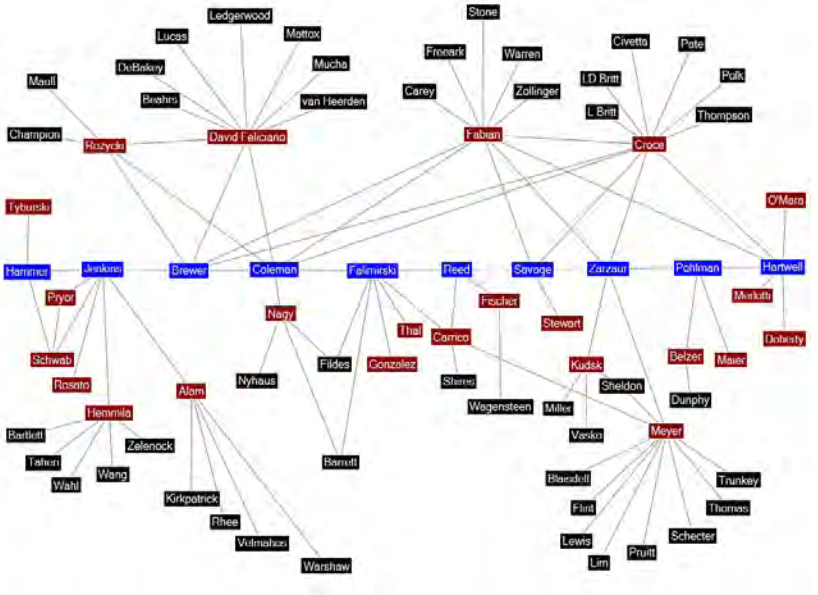
Presenter: Marc deMoya, MD
Senior Sponsor: Marc de Moya, MD

INTRODUCTION: My father immigrated to the USA in 1959 soon after the Cuban Revolution. Growing up he never spoke about Cuba and in 1987 when I was 16 he tragically passed away at an early age. This is the story of how I discovered my paternal roots and at the same time developed trauma educational and research programs in Cuba. Cuba exports 36,000 physicians per year to run hospitals and services throughout the world; a hospital in Uganda, a pediatric office in Nigeria, or a surgical department in Angola. As I learned more about the influence of Cuban physicians I realized that if I made an impact on a fraction of those 36,000 physicians that, in turn, the education could be impacting many more outside the boundaries of the island. This opportunity is unique to other countries around the globe. In some sense Cuba is a portal for the promulgation of best practices in trauma around the world. This talk is meant to shed some light on the black box of Cuban healthcare but primarily to talk about the programs that we developed over the last 4 years, how I almost landed in jail by getting the American College of Surgery in trouble (inadvertently), crossed paths with a family member I did not know I had, and how I managed to find my father's spirit while giving lectures in the same auditorium he sat in as a medical student at the University of Havana. This will be a talk that will entertain, educate, and perhaps inspire the members of the WTA. It would be a privilege to share this story at Lake Tahoe.

METHODS: see above

RESULTS: see above

CONCLUSIONS: see above


Ledgerwood
Lucas
Mattox
DeBakey
Mucha
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van Heerden
Champion
Rozycki
David Feliciano
Stone
Freeark
Warren
Civetta
Pate
Carey
Zollinger
LD Britt
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Thompson
Fabian
Croce
Tyburski
O'Mara
Hammat
Jenkins
Brewer
Coleman
Falemirski
Reed
Savage
Zarzaut
Pohlman
Hartwell
Pryor
Nagy
Fischer
Stewart
Merlotti
Thal
Carrico
Dohrety
Schwab
Fildes
Gonzalez
Kudsk
Belzer
Mauer
Rosato
Nyhaus
Alam
Sterns
Sheldon
Hemmila
Wagensteen
Miller
Dunphy
Bartlett
Vasko
Meyer
Zelenock
Tahan
Barnett
Wang
Wahl
Blasdell
Trunkey
Kirkpatrick
Flint
Thomas
Rhee
Schecter
Velmahos
Lewis
Pruitt
Warshaw
Lim

NOTES

Paper #22
Tuesday, 3/1/2016

HOOSIER DADDY: A TRAUMA FAMILY TREE

SA Savage, JL Hartwell, BL Zarzaur
Indiana University School of Medicine

Presenter: Ben Zarzaur, MD, MPH
Senior Sponsor: Stephanie A. Savage, MD

INTRODUCTION: Families form our basic social unit, with parents providing direction and guidance and children carrying cumulative experiences into the next generation. The common knowledge within a family contributes to cohesiveness and culture. The same principle applies for a surgical family. Mentors in trauma surgery surround us – both literally and philosophically. Their mentorship influences how we practice, with whom we work and how we mentor others in turn. To begin to comprehend our own surgical heritage, we sought to describe a 'Trauma Surgery Family Tree' for the Trauma Service at one Midwestern Level One Trauma Center.

METHODS: The attending trauma surgeons from the focus hospital were asked to name mentors from residency, fellowship and/or their first academic position. Those mentors were then contacted to name their mentors in turn. Using social networking analysis, we constructed a non-hierarchical social network diagram using the Sugiyama graphic output from Node XL.

RESULTS: The Trauma Family Tree is depicted in the Figure.

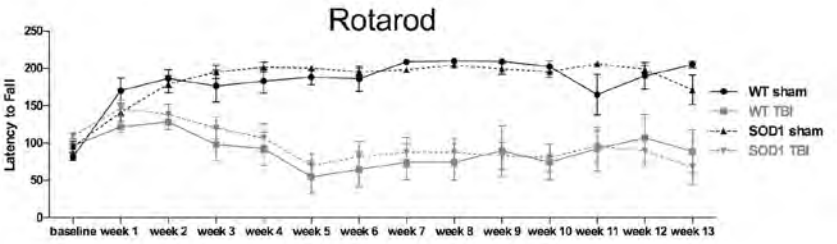
CONCLUSIONS: This pilot investigation was designed to graphically demonstrate generations of mentors in the 'Trauma Family Tree' of trauma surgeons at one academic trauma center. Our goal is to develop a 'Trauma Family Tree' for the larger trauma community. Understanding our trauma family culture may shed light on both the history of trauma surgery, as well as have a profound impact on the understanding of issues such as academic productivity and practice variations. We hope to use the social networking analytics to understand the role of mentorship in career trajectory, academic productivity or practice patterns in future studies.

NOTES

Tuesday, March 1, 2016

PRESIDENTIAL ADDRESS

REPAINTING THE CEILING: DO PATIENT SAFETY AND SATISFACTION INITIATIVES MAKE THINGS SAFE OR SATISFYING?
Thomas M. Scalea, MD


Rotarod
Latency to Fall
250
200
150
100
50
0
baseline
week 1
week 2
week 3
week 4
week 5
week 6
week 7
week 8
week 9
week 10
week 11
week 12
week 13
WT sham
WT TBI
SOD1 sham
SOD1 TBI

NOTES

Paper #23
Wednesday, 3/2/2016

RECURRENT MILD TBI LEADS TO PERMANENT LONG-TERM DEFICITS AND EARLIER DEVELOPMENT OF THE ALS PHENOTYPE IN SOD1 RATS

GM Thomsen, MY Harada, A Ko, A Ma, L Wyss, JP Vit, P Rhee, CN Svendsen, EJ Ley
Cedars-Sinai Medical Center

Presenter: Gretchen Thomsen, PhD
Senior Sponsor: Peter Rhee, MD

INTRODUCTION: Concussion injury is the most common cause of traumatic brain injury (TBI). How recurrent concussion injuries, including those that occur during full-contact sports and military service, alter long-term outcomes is poorly understood especially as related to the development of neurodegenerative disease. Using SOD1 rats genetically predisposed to amyotrophic lateral sclerosis (ALS), we evaluated whether recurrent concussive events lead to permanent deficits and earlier onset of ALS.

METHODS: A total of 32 rats, 11 wild type (WT) and 21 SOD1 rats, were examined over a 14-week study period. At postnatal day 60, repeat, mild TBI was administered to 6 WT and 12 SOD1 rats with a controlled cortical impact device, while 5 WT and 9 SOD1 rats underwent sham injury with anesthesia alone. Injury continued once weekly for five weeks. Weekly weights and rotarod performances were recorded.

RESULTS: Although significant deficits were observed in TBI rats relative to sham controls, injured rats initially demonstrated motor function recovery compared to their baseline rotarod performance (Graph). However, after a third injury, rats showed significant deficits relative to uninjured controls and a failure to recover past their baseline performance. These deficits persisted even after injury ceased on week 5 and were observed in both WT and SOD1 rats. While WT TBI rats continued to gain weight similarly to their naïve counterparts, SOD1 TBI rats reached a peak body weight earlier than sham SOD1 rats, indicating earlier onset of the ALS phenotype (SOD1 TBI 122.0 days 4 2.9 vs. SOD1 sham 134.4 days 4 1.6, p=0.0025).

CONCLUSIONS: Recurrent, mild TBI demonstrates permanent long-term deficits in WT rats even after injury ceases, as well as earlier development of the ALS phenotype in SOD1 rats. This research can provide an understanding of the effects of head injury on professional athletes, military personnel, and those predisposed to neurodegenerative diseases as well as allow testing of novel therapeutic strategies, thus having significant potential for application in clinical translation.

NOTES

Paper #24
Wednesday, 3/2/2016

DOES UROLOGIC CONSULTATION FOR CYSTORRHAPHY OF UNCOMPLICATED TRAUMATIC BLADDER RUPTURES IMPROVE OUTCOMES?

JB Young, NV Johnsen, RR Dmochowski, OD Guillamondegui
Vanderbilt University Medical Center

Presenter: Jason Young, MD
Senior Sponsor: Oscar Guillamondegui, MD

INTRODUCTION: Both Trauma surgeons (TS) and urologists (GU) care for patients with traumatic bladder injuries. We sought to determine if urologic consultation for operative repair of simple blunt traumatic bladder ruptures improves outcomes.

METHODS: Patients who underwent operative repair of bladder ruptures secondary to blunt trauma between January 2000 and June 2014 were identified. Patients with urethral, bladder neck, or ureteral injuries were excluded. Demographics, ISS, and management strategies were analyzed. Outcomes evaluated were LOS, inpatient complications, time to cystography, and duration of catheterization.

RESULTS: 84 patients were included. 58.3% patients had intraperitoneal injuries, 31% extraperitoneal, and 10.7% combined intra/extraperitoneal. 75% patients had cystorrhaphy by TS and 25% by GU. No differences in age or mean ISS between groups existed, though GU patients were more likely to have preoperative cystography (p=0.0007) and extraperitoneal ruptures (p=0.0003). Median [IQR] ICU LOS (3 [1, 11] vs 4 [2, 12]) and hospital LOS (12 [5, 17] vs 11 [9, 22]) were similar between TS and GU. No differences in complication rates or mortality existed. All GU patients had cystograms prior to catheter removal, while 57% of TS patients underwent cystography (p=0.007). All cystograms performed were negative regardless of operating service or timing. Median time to cystogram was 14 [10, 20] days for TS and 20 [14, 30] days for GU (p=0.0059). There were no urologic complications in any patient.

CONCLUSIONS: For patients undergoing cystorrhaphy of simple bladder rupture secondary to blunt trauma, urologic consultation does not affect outcomes or complication rates.

N=60	Female Trauma Mean ± SD (Median; Range)	Female Other Mean ± SD (Median; Range)	p-value
N (%)	9 (15.0%)	51 (85.0%)	
Compassion Satisfaction (CS)	34.8 ± 4.63 (36.0; 30.0-38.0)	38.8 ± 5.99 (39.0; 35.0-43.0)	0.038
Burnout (BO)	29.1 ± 3.14 (29.0; 26.5-31.5)	25.3 ± 6.41 (26.0; 20.0-30.0)	0.049
Secondary Traumatic Stress (STS)	25.4 ± 7.40 (27.0; 18.5-30.5)	23.9 ± 6.13 (23.0; 20.0-28.0)	0.578

NOTES

Paper #25
Wednesday, 3/2/2016

AN ANALYSIS OF PROFESSIONAL QUALITY OF LIFE AMONGST SURGEONS: FEMALE TRAUMA SURGEONS AT INCREASED RISK FOR DEVELOPING COMPASSION FATIGUE

FB Rogers, D Wu, BW Gross, K Rittenhouse, C Harnish, M Horst, C Mooney, JA Miller
Lancaster General Health

Presenter: Frederick Rogers, MD, MS, FACS
Senior Sponsor: James C. Hebert, MD

INTRODUCTION: Professional quality of life is composed of compassion satisfaction (CS) and compassion fatigue (CF). CF, a state of physical/emotional distress caused by repeatedly caring for those experiencing traumatic episodes, is a pervasive issue for today's health care provider. We hypothesized that an analysis of professional quality of life in a multi-specialty surgeon population would show trauma surgeons exhibit higher levels of CF and lower levels of CS compared to surgeons of other specialties.

METHODS: The ProQOL Scale, a validated tool assessing CS and CF (interaction of burnout [BO] and secondary traumatic stress [STS]), was included in a survey distributed to members of the American College of Surgeons. ProQOL scores were calculated and demographic data were compared within specialty and gender subgroups of the surgeon population. Univariate analysis was used to compare groups.

RESULTS: A total of 178 surgeons responded. Respondents were predominantly male, general surgeons, aged >55. Trauma surgeons were the second largest sub-population. Levels of CS were significantly lower in the trauma surgeon population compared to other surgical specialties ($p=0.044$). Female surgeons from all specialties exhibited significantly higher levels of BO and STS compared to male surgeons ($p=0.035$; $p=0.021$). A sub-analysis comparing female trauma surgeons to female surgeons of other specialties found female trauma surgeons exhibited significantly lower levels of CS ($p=0.038$) and higher levels of BO ($p=0.049$) (Table 1).

CONCLUSIONS: CF in surgical populations remains understudied. These results suggest female surgeons, particularly female trauma surgeons, may be at risk for developing higher levels of CF compared to male counterparts. Future efforts to curb CF may need to be tailored toward the female surgeon.

NOTES

Paper #26
Tuesday, 3/1/2016

CERVICAL SPINAL CLEARANCE USING COMPUTED TOMOGRAPHY: A PROSPECTIVE WESTERN TRAUMA ASSOCIATION MULTI-INSTITUTIONAL TRIAL

K Inaba, S Byerly, LD Bush, D Martin, KA Peck, G Barmparas, MJ Bradley, JP Hazelton, R Coimbra, AJ Choudhry, CVR Brown, CG Ball, JR Cherry-Bukowiec, CC Burlew, B Joseph, J Dunn, T Minshall, MM Carrick, GM Berg, D Demetriades, WTA C-Spine Study Group
LAC+USC Medical Center

Presenter: Kenji Inaba, MD
Senior Sponsor: Kenji Inaba, MD

INTRODUCTION: For blunt trauma patients at risk of a C-spine injury who have failed the NEXUS low risk criteria, the adequacy of CT as the definitive imaging modality for clearance remains controversial. The purpose of this study was to prospectively evaluate the accuracy of CT for the detection of clinically significant C-spine injury.

METHODS: Prospective multicenter observational study (09/2013-03/2015), at 18 Trauma Centers in the US and Canada. All adult (≥18yo) blunt trauma patients underwent a structured clinical examination. NEXUS failures underwent a CT of the C-spine with clinical follow up to discharge. The primary outcome measure was sensitivity and specificity of CT for clinically significant injuries requiring surgical stabilization or halo placement using the gold standard of final diagnosis at the time of discharge, incorporating all imaging and operative findings.

RESULTS: 10,765 patients met inclusion criteria, 489 (4.5%) were excluded (previous spinal instrumentation or outside hospital transfer). 10,276 patients [4,660 (45.3%) were unevaluable or had distracting injuries, 5040 (49.0%) had midline C-spine tenderness and 576 (5.6%) had neurologic symptoms] were prospectively enrolled: mean age 48.1yo (range 18-110), SBP 138 (SD 26), median GCS 15 (IQR 14,15), ISS 9 (IQR 4,16). Overall, 178 (1.7%) had a clinically significant C-spine injury requiring surgery [153 (1.5%)] or halo [25 (0.2%)] placement. The overall sensitivity and specificity for clinically significant injury was 98.3% and 90.9% with a NPV of 99.97%. There were 3 (0.03%) false negative CT scans that missed a clinically significant injury, all had a focal neurologic abnormality on their index clinical examination consistent with central cord syndrome and 2 of the 3 had a CT demonstrating severe degenerative disease. For NEXUS failures without a focal neurologic abnormality, the sensitivity, specificity and NPV of CT was 100%, 91.4% and 100%.

CONCLUSIONS: For patients requiring acute imaging for their C-spine after blunt trauma, a negative CT was effective for ruling out clinically significant injury with a sensitivity of 98.3%. For patients with an abnormal neurologic exam as the trigger for imaging however, there is a small but clinically significant incidence of a missed injury and further imaging with MRI may be warranted.

NOTES

Wednesday, March 2, 2016

BASIC SCIENCE LECTURE

THE ROLE OF RESUSCITATION IN THE ENDOTHELIOPATHY OF TRAUMA AND SHOCK
Rosemary Kozar, MD

NOTES

Paper #27
Wednesday, 3/2/2016

SUBSTITUTING SYSTOLIC BLOOD PRESSURE WITH SHOCK INDEX IN THE NATIONAL TRAUMA TRIAGE PROTOCOL

A Haider, P Rhee, A Hassan, N Kulvatunyou, A Tang, T O'Keeffe, L Gries, H Iftikhar, R Latifi, B Joseph
The University of Arizona

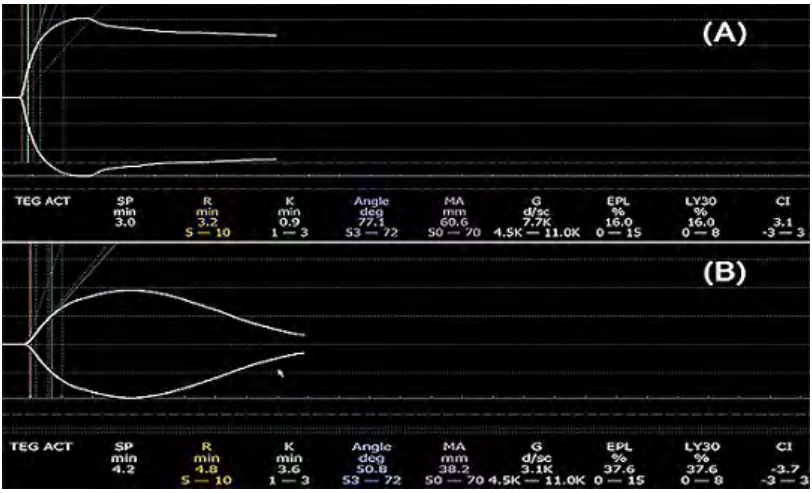
Presenter: Ansab Haider, MD
Senior Sponsor: Peter Rhee, MD

INTRODUCTION: The National Trauma Triage Protocol (NTTP) is an algorithm that guides emergency medical service providers (EMS) through four decision steps to identify the patients that would benefit from trauma center care. The most recent update to the NTTP defines a systolic blood pressure (SBP) <90 mmHg as one of the criteria for Trauma Center Need (TCN). The aim of our study was to determine the impact of substituting SBP <90 mmHg with shock index (defined as Heart Rate/Systolic blood pressure) on triage performance.

METHODS: A 2-year (2011-2012) retrospective analysis of all trauma patients (18-85 years) in the National Trauma Databank was performed. Transferred patients, patients dead on arrival, and with missing data were excluded. Our outcome measure was trauma center need (TCN) defined by ISS greater than 15, need for emergent operation, death in the ED, and ICU stay > 1 day. Area under curve (AUC) and triage characteristics were compared between EMS SBP <90mmHg and EMS SI>1.0. Logistic regression analysis was performed to compare the mortality between patients triaged under current protocol of SBP<90 mmHg and patients triaged using the new defined protocol (SI> 1.0).

RESULTS: A total of 505,296 patients were included with a mean age of 47.1419.7 years and median [IQR] ISS of 8 [4-12]. Overall mortality rate was 2.9%. Compared to EMS SBP<90 mmHg, EMS SI>1.0 had a higher sensitivity (44.4% vs. 41.7%) but lower specificity (80.2% vs. 82.4%). The AUC [95% CI] was significantly higher for SI>1.0 (0.623 [0.622-.625] vs. 0.620 [0.619-0.622]). Substituting EMS SBP<90 mmHg with EMS SI>1.0 resulted in a decrease in under-triage rate by 5.9% (n=30,223) with an increase in over-triage of 1.3% (n=6,386). Patients triaged using EMS SI>1.0 had a similar mortality compared to patients triaged using EMS SBP<90 mmHg (OR [95% CI]; 1.06 [0.93-1.19]).

CONCLUSIONS: Substituting the current criteria of SBP<90 mmHg in the NTTP with a SI>1.0 results in significant reduction in under-triage rate without causing large increase in over-triage. The current NTTP should consider revising the existing algorithm for trauma center need with substitution of Systolic Blood Pressure with Shock Index.


(A)
TEG ACT
SP min 3.0
R min 3.2 5 — 10
K min 0.9 1 — 3
Angle deg 77.1 53 — 72
MA mm 60.6 50 — 70
G d/sc 7.7K 4.5K — 11.0K
EPL % 16.0 0 — 15
LY30 % 16.0 0 — 8
CI 3.1 -3 — 3
(B)
TEG ACT
SP min 4.2
R min 4.8 5 — 10
K min 3.6 1 — 3
Angle deg 50.8 53 — 72
MA mm 38.2 50 — 70
G d/sc 3.1K 4.5K — 11.0K
EPL % 37.6 0 — 15
LY30 % 37.6 0 — 8
CI -3.7 -3 — 3

NOTES

Paper #28
Wednesday, 3/2/2016

INTRAUTERINE FETAL DEMISE AFTER TRAUMA: A PREVIOUSLY UNRECOGNIZED SOURCE OF IMMEDIATE AND SEVERE COAGULOPATHY PROMPTING IMMEDIATE DELIVERY

JJ Coleman, TH Pohlman, BL Zarzaur, RL Reed, DV Feliciano, GS Rozycki
Indiana University

Presenter: Jamie Coleman, MD
Senior Sponsor: Grace Rozycki, MD

INTRODUCTION: Guidelines from the American College of Obstetricians and Gynecologists state that the timing of delivery after intrauterine fetal demise (IUFD) is not critical because ensuing maternal coagulopathy and disseminated intravascular coagulation (DIC) is uncommon. Injured patients with IUFD are unique, and we present three cases whereby severe coagulopathy developed within hours of injury.

METHODS: Data were reviewed from three gravid patients involved in motor vehicle collisions (MVC). All three patients were initially hemodynamically normal with IUFD confirmed on initial ultrasound examination. All patients underwent CT scan of the abdomen and pelvis, and required emergent laparotomy with surgical delivery of the fetus. Of note, no signs of placental abruption (PA) were noted on initial ultrasound examination, but were present on all three CT scans.

RESULTS: Case 1: A 29 year old at 35 weeks gestational age (GA) was an unrestrained passenger and ejected from her automobile during a MVC. Within four hours of injury, she became hemodynamically unstable and coagulopathic with hypofibrinogenemia and thrombocytopenia. Despite massive transfusion and emergent laparotomy with surgical delivery of the fetus, the patient died. Case 2: An 18 year old at 26 weeks GA presented also after being unrestrained and ejected in an MVC. An admission thromboelastography (TEG) showed platelet dysfunction and hyperfibrinolysis. The patient became hemodynamically unstable and required massive transfusion. After surgical delivery of the fetus, she improved postoperatively and was discharged to home. Case 3: A 17 year old, 40 weeks GA was admitted with findings of uterine rupture on CT scan. The admission TEG revealed DIC and hyperfibrinolysis. Multiple transfusions were required, but she did well after surgical delivery of the fetus and was discharged home.

CONCLUSIONS: The release of tissue thromboplastin into the maternal circulation of injured gravid patients with PA and uterine rupture can result in rapid and life threatening coagulopathy. We have now changed our management of patients who present with IUFD. TEG is performed on admission and immediate delivery of the nonviable fetus is coordinated. Although IUFD secondary to trauma is uncommon, the morbidity is significant, and future evaluation with a multicenter trial is warranted.

NOTES

Paper #29
Wednesday, 3/2/2016

INCREASED BREATH SOUNDS ON THE RIGHT? TRAUMATIC RIB CAGE HERNIA SPECTRUM OF PRESENTATIONS AND MANAGEMENT STRATEGIES

MS Lallemand MD, MJ Martin MD, JR Bingham MD, R Karmy-Jones MD, JS David MD, N Kulvatunyou MD, S Izenberg MD, W Long MD
Legacy Emanuel Medical Center

Presenter: Michael Lallemand, MD
Senior Sponsor: William Long, MD

INTRODUCTION: Traumatic Rib Cage Hernias (TRCH) are a relatively rare but challenging problem in thoracic trauma. The original Morel-Lavelle classification described TRCH according to location and etiology, and was modified by Sonnett in 1994. However, these fail to quantify the size of the hernia or associated tissue damage, and do not help guide the optimal repair. Here we present a challenging case of TRCH to highlight the key management issues, and the results of an analysis of a small series of these injuries.

METHODS: Case report and retrospective review of a series of TRCH was performed. The presenting characteristics, type of repair undertaken, and postoperative courses were evaluated. A new TRCH grading system is proposed that includes size and associated tissue/bone injury, and can guide surgical repair

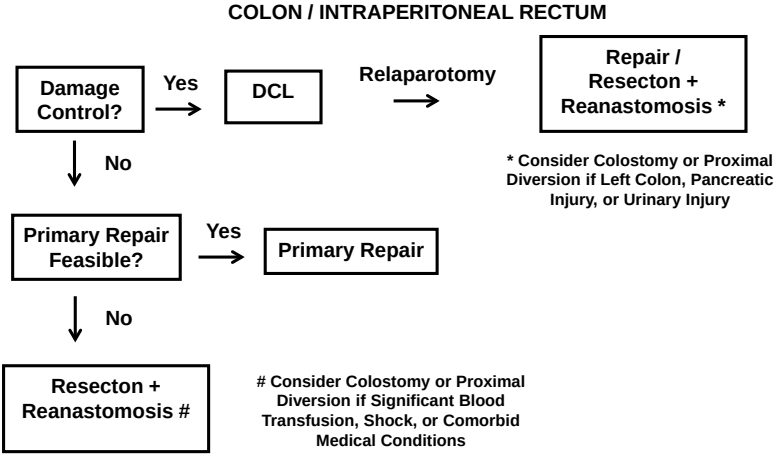
RESULTS: A 27-year-old male presented with a large TRCH with near complete exteriorization of his right lung after a motorcycle crash (Figure). A CT scan demonstrated the herniated structures and the associated soft tissue and bone injury. Successful operative repair included organ reduction, primary repair of the soft tissue defect, and reconstruction of the bony chest wall. We collected a series of 16 cases of TRCH, and grouped injuries into 5 grades based on the extent of tissue/bone damage, size of hernia, and location. The most commonly herniated organs were lung (80%) and liver (20%). The types of operative repair were well clustered by the assigned TRCH grade. Most repairs required prosthetic mesh (70%) and/or mechanical rib plating (81%). A complex tissue flap reconstruction was required in 20% of cases. Operative time, EBL, and length of stay showed good correlation with the proposed TRCH grade. All patients survived and there were no recurrences.

CONCLUSIONS: Modern management of these uncommon injuries requires assessment and intervention for the organ herniation, chest wall defect, and bony injuries. This patient is one in a series of patients which have led us to propose an expansion of the TRCH classification to include these factors. This system may be useful in operative decision making when dealing with these complex and rare injuries.

NOTES

March 2, 2016

ALGORITHM 1
COLORECTAL
Walt Biffl, MD

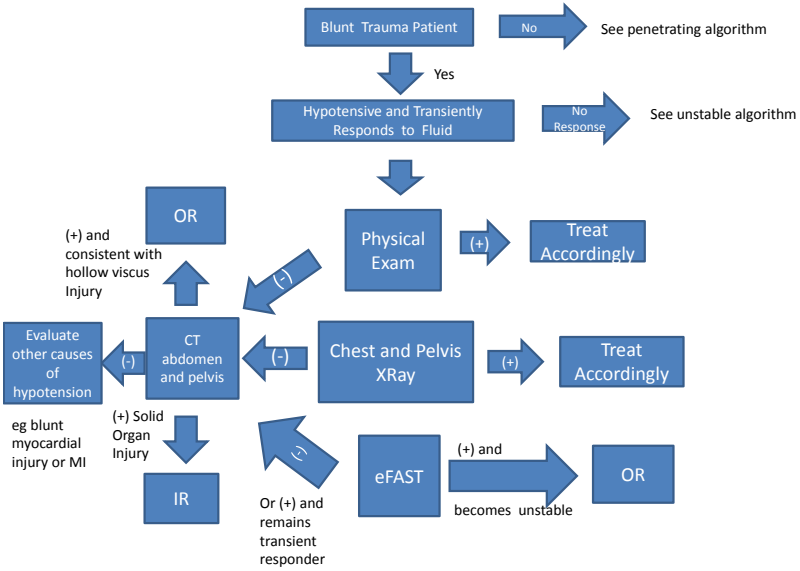


NOTES

March 2, 2016

ALGORITHM 2
TRANSIENT RESPONDER

Martin Schreiber, MD



NOTES

Paper #30
Thursday, 3/3/2016

THE IMPORTANCE OF EMPIRIC ANTIBIOTIC DOSING IN CRITICALLY ILL TRAUMA PATIENTS: ARE WE UNDER-DOSING BASED ON AUGMENTED RENAL CLEARANCE AND INACCURATE RENAL CLEARANCE ESTIMATES?

AJ Mangram, JF Barletta, M Byrne, A Hollingworth, JF Sucher, FR Ali-Osman, GR Shirah, JK Dzandu
HonorHealth John C. Lincoln Medical Center

Presenter: Jeffery Barletta
Senior Sponsor: Jeffery Barletta

INTRODUCTION: An accurate and valid calculation of creatinine clearance (CRCL) is essential for correct dosing of medications in critically ill trauma patients. Trauma patients are known to experience augmented renal clearance (ARC) and the use of CRCL estimations may be inaccurate leading to under/over dosing of medications. As such, our level I trauma center began using measured CRCL from timed urine collection to better assess CRCL. The purpose of this pilot was to determine the prevalence of ARC and the accuracy of calculated CRCL in critically ill trauma patients.

METHODS: This was an observational study of consecutive ICU trauma patients who had a timed 12 hour urine collection for CRCL (February-September, 2015). Data abstracted were patient demographics trauma-related factors (e.g., mechanism of injury, ISS, AIS, SBP, GCS) and CRCL. ARC was defined as measured CRCL ≥ 130 ml/min. Bias and accuracy were determined by comparing measured and calculated CRCL using the Cockcroft-Gault formula. Bias was defined as measured minus calculated CRCL and accuracy was calculated CRCL that was within 30% of measured.

RESULTS: There were 65 patients, mean age 48 years, 95% white, 74% male. 46 % were involved in MVC and 40% had TBI. ISS was 22414. The serum creatinine was 0.840.3mg/dL. 69% of patients had ARC. ARC was most common when age <67 years and SCr < 0.8 mg/dL. Calculated CRCL was significantly lower than measured (131445 ml/min vs. 169470 ml/min, p<.001) and only moderately correlated (r=.610, p<.001). Bias was 38456 ml/min which was independent of age quartile (p=.731). Calculated CRCL was inaccurate in 33% of patients and trauma-related factors were not predictive.

CONCLUSIONS: The prevalence of ARC in critically ill trauma patients is high. Formulas used to estimate CRCL in this population are inaccurate and could lead to under dosing of medications. More accurate measures are needed to better estimate CRCL in this setting to minimize treatment failure. Further studies are needed to examine the relationship between ARC and clinical outcomes.

NOTES

Paper #31
Thursday, 3/3/2016

METHICILLIN-RESISTANT STAPH AUREUS IN A TRAUMA POPULATION: DOES DECOLONIZATION PREVENT INFECTION?

RA Maxwell* MD, CA Croft MD, CB Creech MD, LE Brown RN, BW Dart MD, VA Mejia MD, PW Smith MD, DE Barker* MD, RP Burns MD,
University of Tennessee, Chattanooga

Presenter: Robert Maxwell, MD
Senior Sponsor: Robert A Maxwell, MD

INTRODUCTION: The purpose of this study was to determine if a decolonization regimen reduces MRSA infections and if nasal MRSA isolates are related to subsequent MRSA infections.

METHODS: Trauma patients admitted to the ICU with +MRSA nasal swabs were randomized to daily chlorhexidine gluconate (CHG) baths and mupirocin (MUP) ointment to the nares or soap and water baths(soap) and placebo ointment for 5 days. Nasal swabs were performed at the end of the treatment and invasive MRSA infections were compared to the original nasal isolate via pulsed-field gel electrophoresis for MRSA subtype, CHG and MUP resistance. Primary outcomes were incidence and species of invasive MRSA infection and secondary measures were infection and mortality.

RESULTS: 678 ICU admissions were screened and 92 (13.6%) had + MRSA nasal swabs over a 22 month period ending in 3/2014. Of the 92 +MRSA patients, 43 were enrolled and 32 completed treatment with 22 randomized to CHG+MUP and 10 to S+P. The CHG and soap groups were comparable regarding age (47.5418.1 vs 47.8414.3, p not significant (NS)), APACHEII (15.746.1 vs 17.345.1, NS), intubation at admission (14 (63.6%) vs 8(80.0%) and GCS (9.045.1 vs 9.645.5, NS) except that ISS was lower for CHG (25.649.8 vs 33.145.9, p=0.035). After the 5 day treatment period there were 9 (90%) +MRSA second nasal swabs for soap and 13 (59.1%) for CHG. Testing for plasmid-encoded efflux genes mupA, qacA/B or smr showed no evidence for MUP or CHG resistance. There were 7 (31.8%) MRSA infections in the CHG group and 6 (60%) for soap. All 13 patients with MRSA infections had the same MRSA subtype present in the original nasal swab. There was a trend for reduced all cause Gram-/+ infection for CHG vs soap 12 (54.5%) vs 7 (70%), p=0.18. Mortality was lower for CHG 3 (8.8%) vs 7 (35%), p=0.028.

CONCLUSIONS: This is the only MRSA decolonization study of its kind in an exclusive trauma population. MRSA carrier status was higher than previously reported and 59.1% of patients receiving CHG and MUP remained colonized after treatment. MRSA infections were all the same species isolated from the patients nares.

Table 1: Multivariable analysis: Mortality Risk, by Baseline & Trauma SBP, n=2,563†

		Trauma SBP		
		<110 OR [95% CI, *p-value*]	110-139 OR [95% CI, *p-value*]	≥140 OR [95% CI, *p-value*]
Baseline "Pre SBP"	<110	**6.17** [2.18 – 17.47, p=0.001]	**3.90** [1.44 – 10.55, p=0.007]	**1.33** [0.28 – 6.35, p=0.720]
	110-139	**1.54** [0.65 – 3.64, p=0.329]	**reference**	**0.90** [0.51 – 1.59, p=0.725]
	≥140	**2.92** [0.75 – 11.36, p=0.122]	**0.68** [0.19 – 2.47, p=0.562]	**1.50** [0.78 – 2.90, p=0.228]

†Logistic regression model included: Pre-SBP, Trauma SBP, Age, Race, Gender, GCS, ISS, Mechanism, Transfer status, Charlson comorbidity score. AUROC = 0.8661

NOTES

Paper #32
Thursday, 3/3/2016

PRE-INJURY BASELINE BLOOD PRESSURE PREDICTS INPATIENT MORTALITY IN ELDERLY TRAUMA PATIENTS: A BI-INSTITUTIONAL STUDY

JD Bohnen, DC Chang, EP Ramly, O Olufajo, HMA Kaafarani, DD Yeh, D King, PJ Fagenholz, K Butler, R Askari, A Salim, GC Velmahos, M deMoya
Division of Trauma, Emergency Surgery and Surgical Critical Care, Massachusetts General Hospital, Harvard Medical School

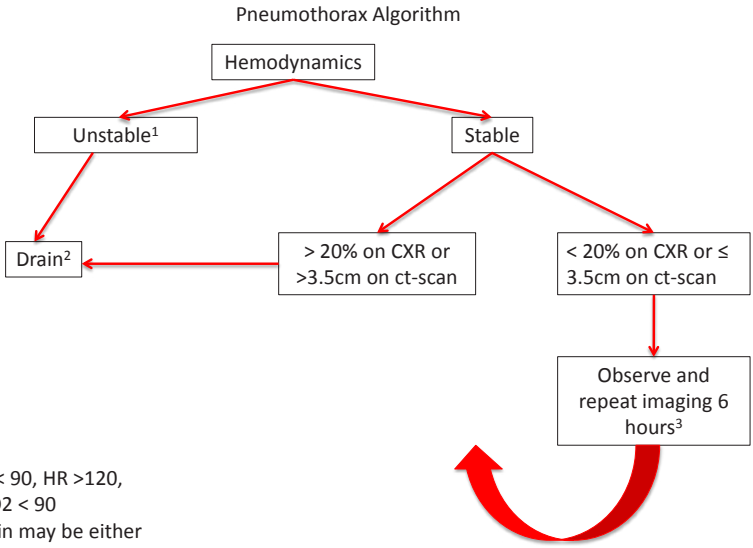
Presenter: Jordan Bohnen, MD, MBA
Senior Sponsor: Marc de Moya, MD

INTRODUCTION: Little is known about the relationship between pre-injury (i.e. "baseline") blood pressure and outcomes following trauma in the elderly population. We therefore aimed to identify the independent impact of baseline systolic blood pressure on inpatient mortality amongst elderly trauma patients.

METHODS: In this bi-institutional study, the June 1, 2004 - June 30, 2014 trauma registries from two tertiary care, Level I Trauma Centers were linked to electronic health records. All patients ≥ 65 years old with available baseline vital signs and comorbidity data were included. Baseline systolic blood pressure (Pre-SBP) was defined as mean outpatient SBP within two years prior to injury, and grouped into Low Pre-SBP (<110mmHg), Normal Pre-SBP (110-139), and High Pre-SBP (≥140mmHg). Trauma-SBP was defined as the first recorded SBP reading after presentation for trauma. Logistic multivariable regression models were constructed to assess the independent impact of Pre-SBP on inpatient mortality, controlling for demographics, comorbidities, injury mechanism and severity, and Trauma-SBP.

RESULTS: 41,319 patients were entered into the combined trauma registries during the study period, of which 4,275 met inclusion criteria. Mean age was 80.38 years. 63.7% were female. Overall inpatient mortality was 5.43%. In unadjusted analyses, mortality rates were 11.01%, 5.33%, and 4.57% in the Low, Normal, and High Pre-SBP groups, respectively. In multivariable analyses, patients with Low Pre-SBP had a significantly increased mortality risk [OR 3.17 (95% CI 1.61-6.22), p=0.001] when compared to patients with Normal Pre-SBP, in particular when they presented with Low Trauma-SBP (<110mmHg) [OR 6.17 (2.18-17.47), p=0.001] or Normal Trauma-SBP (110-139mmHg) [OR 3.90 (1.44-10.55), p=0.007] (Table 1). The mortality risk associated with Low Pre-SBP increased further among patients who also carried a diagnosis of hypertension [OR 4.74 (1.94-11.54), p=0.001].

CONCLUSIONS: Low pre-injury baseline systolic blood pressure is independently predictive of a greater than three-fold increase in inpatient mortality amongst elderly trauma patients, and carries a nearly five-fold increase in mortality risk among patients with a pre-existing diagnosis of hypertension. Given that blood pressure control in the elderly population offers a long-term survival advantage, the paradoxical finding of decreased survival after trauma should be further explored.



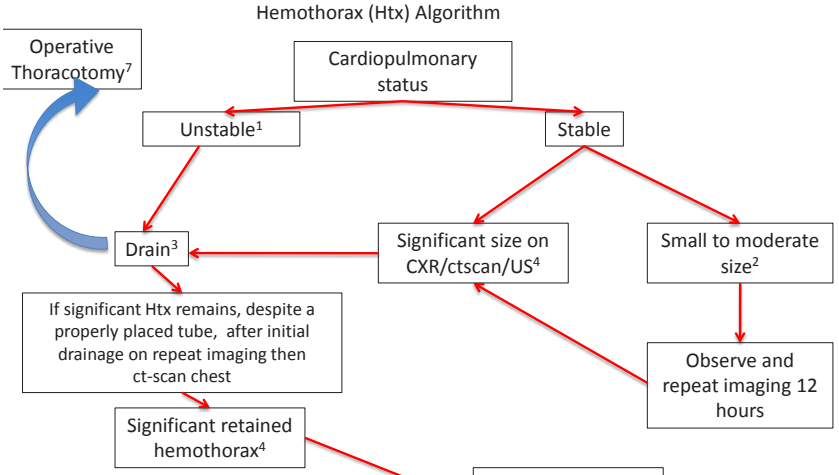
1. BP < 90, HR >120, SpO2 < 90
2. Drain may be either percutaneous 14Fr or larger open technique
3. Enter algorithm again

NOTES

March 3, 2016

ALGORITHM 3
HEMOPNEUMOTHORAX

Marc De Moya, MD



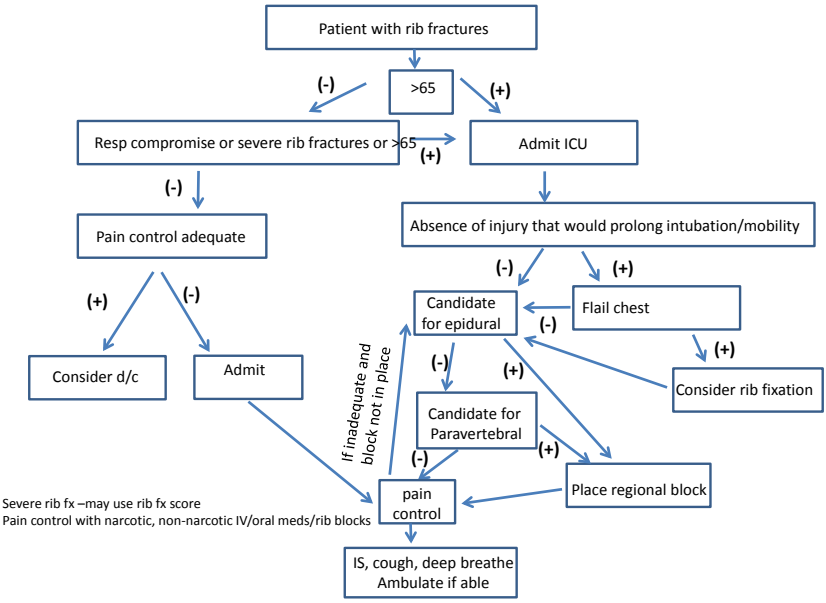
1. BP < 90, HR >120, SpO2 < 90, RR > 30
2. Estimated < 300cc on ctscan
3. Drain may be 28Fr – 36Fr
4. >300cc: est. Vol= d²l on ctscan or judged to be significant by the clinician on CXR or ultrasound
5. Give examples of regimen
6. VATS is optimal early <3 days; should not exceed 7 days
7. >1500cc output, >200cc/hr x 4 hr, continued instability with ongoing output

NOTES

March 3, 2016

ALGORITHM 4
RIB FRACTURE

Karen Brasel (with Matt Davis, in memoriam)



NOTES

March 3, 2016

PRO/CON DEBATE
TEG BASES RESUSCITATION IS SUPERIOR TO 1:1:1 RESUSCITATION
Martin Schreiber, MD vs. Mitch Cohen, MD

NOTES

Paper #33
Thursday, 3/3/2016

THE EFFICACY OF A NOVEL BIPOLAR RADIOFREQUENCY ENERGY INSTRUMENT FOR ARRESTING ONGOING SOLID AND NON-SOLID ORGAN HEMORRHAGE IN SWINE.

CG Ball, A Campbell, E Dixon, SC Grondin
University of Calgary

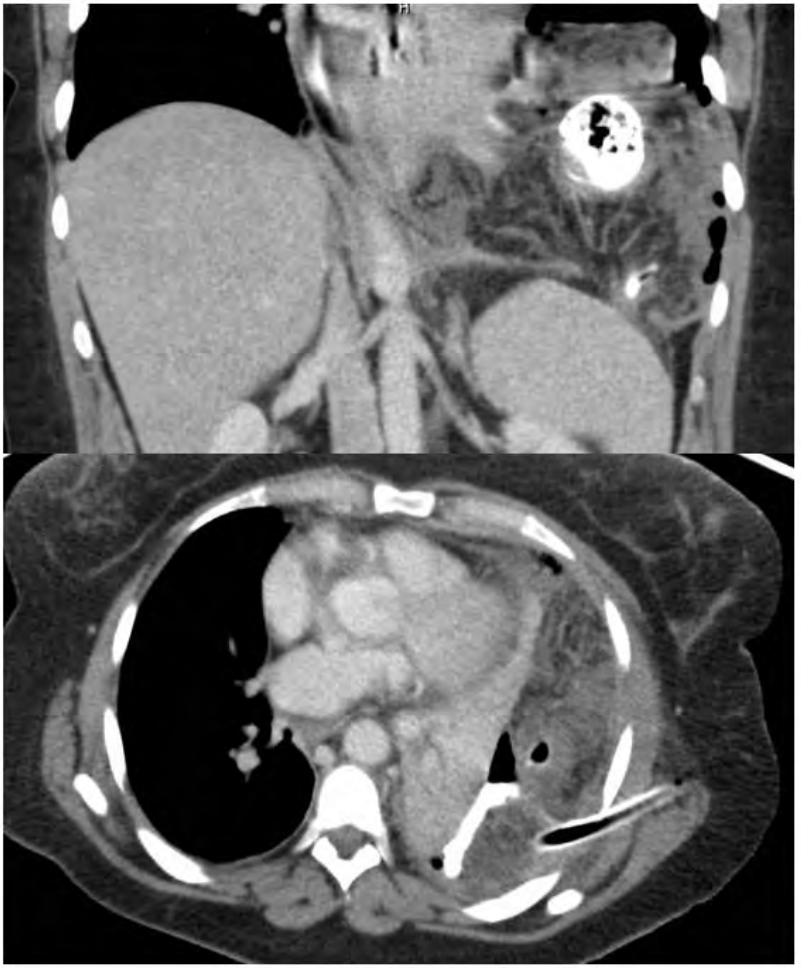
Presenter: Chad Ball, MD
Senior Sponsor: Chad Ball, MD

INTRODUCTION: Solid organ (liver, spleen and kidney) hemorrhage is often life threatening and can be challenging to stop in critically injured patients. Traditional techniques for addressing this issue include high voltage cautery (Bovie), topical hemostatic application, and the delivery of ignited argon gas. The goal of this study was to evaluate the efficacy of a novel energy device for arresting ongoing bleeding from both solid and non-solid organs.

METHODS: A novel instrument utilizing bipolar radiofrequency (RF) energy which acts to ignite/boil dripping saline from a small hand piece was employed to arrest ongoing hemorrhage from an escalating series of injuries in large male swine. Liver, spleen, kidney, lung, heart, inferior vena cava and abdominal wall targets were evaluated and digitally recorded. Methodology was descriptive.

RESULTS: Four large male swine received escalating injuries to their liver, spleen, kidney, lung, heart, inferior vena cava and abdominal wall. Injury patterns included a variety of surface decapsulation, superficial lacerations, deep lacerations, "through and through" missiles and complete transections. Application of the bipolar/RF instrument to sites of ongoing hemorrhage was successful in 96% of all scenarios. Depth of tissue penetration via microscopic evaluation ranged from 1mm to 3mm depending on the target organ composition. No air leaks were observed following application to the bleeding lung. Surgeon reported 'ease of use' score was high (4.7/5).

CONCLUSIONS: This novel saline/RF energy instrument is highly efficacious in arresting ongoing hemorrhage from multiple organs. It is simple to employ and represents a technical leap forward in trauma surgery.



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Paper #34
Thursday, 3/3/2016

ALTITUDE INDUCED COLONIC PERFORATION

JC Mira, MD Rosenthal, RS Smith
University of Florida, College of Medicine

Presenter: Juan Mira, MD
Senior Sponsor: R. Stephen Smith, MD

INTRODUCTION: With increasing altitude, changes in barometric pressure can compromise incarcerated loops of bowel by limiting perfusion or provoking perforation by increasing intraluminal pressure.

METHODS: A 46 year old female developed apparent gastroenteritis with severe vomiting while on vacation in Puerto Rico provoking her early return home. She clinically deteriorated inflight prompting admission to a hospital upon arrival, but was later discharged without a clear diagnosis. The patient further deteriorated at home and was found to have a large left pneumothorax on readmission with fecal matter and gas return upon thoracostomy tube placement.

RESULTS: A posterolateral thoracotomy revealed an acute diaphragmatic hernia, a stool saturated pleural cavity and two small colonic perforations without necrosis. The patient underwent a transverse colectomy with end colostomy and had an uncomplicated postoperative course.

CONCLUSIONS: Acute diaphragmatic hernia, colonic incarceration and in flight changes in barometric pressure are the suspected cause of this patient's presentation. To our knowledge, this is the first reported case of altitude induced colonic perforation following diaphragmatic herniation.

NOTES

Paper #35
Thursday, 3/3/2016

I CAN'T FIND THE LEFT ILIAC ARTERY! ABDOMINAL STAB WOUND LEADING TO UNCONTROLLABLE HEMORRHAGE

AJ Feinstein, TL Freeborn, R Shinar, B Siegrist, N Keric, NY Patel
Banner University Medical Center Phoenix

Presenter: Ara Feinstein, MD, MPH
Senior Sponsor: Nirav Patel, MD

INTRODUCTION: A hemodynamically unstable 32-year-old male presented to the trauma bay after being stabbed in the left lower abdomen. Examination revealed a single 3 cm stab wound just medial to the left anterior superior iliac spine with copious pulsatile hemorrhage.

METHODS: Blood transfusion was initiated and the patient was taken immediately to the operating room where a midline laparotomy was performed while maintaining direct pressure on the wound. A large hematoma was noted in the left zone 2 and zone 3 of the retroperitoneum. A left medial visceral rotation was performed. The distal aorta and right iliac artery were controlled. The left iliac artery could not be located. Several attempts were made to follow distal from the aorta without success. Paradoxically, distal aortic occlusion increased the pulsatile hemorrhage from the wound. Another incision was made inferior to the inguinal ligament. The left proximal femoral artery was controlled, but this did not diminish the hemorrhage. The patient was becoming more unstable and the decision was made to enter the hematoma in the absence of proximal control. The hematoma was entered at the point approximating the trajectory of the knife. On exposure of the psoas muscle, a large amount of arterial hemorrhage was encountered. Several large bites were taken with an absorbable suture around the muscular defect until the arterial hemorrhage stopped. There was a diminished but palpable pulse in the left foot. The retroperitoneum and groin were packed and a negative pressure dressing was placed in the abdomen. Postoperative contrast CT revealed congenital absence of the left iliac artery. Large collaterals, some arising from the thoracic aorta, reconstituted the left femoral artery and were in the knife trajectory. The following day he underwent removal of packing and closure.

RESULTS: The patient was discharged home on POD 7 without deficits.

CONCLUSIONS: Congenital malformations of the iliofemoral arteries are rare-6 in 8,000 in one series. We present the first case of a penetrating injury to a collateral vessel resulting from congenital atresia of the iliac artery. This results in a situation where proximal control of bleeding is not feasible and thus requires ligation with concurrent hemorrhage.

NOTES

March 3, 2016

PANEL OF EXPERTS
Moderator: Andy Michaels, MD
Panelists: David Livingston, MD, Matt Martin, MD, Susan Rowell, MD

NOTES

Paper #36
Thursday, 3/3/2016

TREK TO EVEREST BASE CAMP, STAY FOR THE QUAKE AND PERFORM TRIAGE: A MEMORABLE FAMILY VACATION

AK Malhotra, NR Malhotra, A Malhotra
Univ of VT Medical Center

Presenter: Ajai Malhotra, MD
Senior Sponsor: Ajai K Malhotra, MD

INTRODUCTION: One of the authors was volunteering in Nepal with a non-profit working with women in the sex trade. She was staying as a paying guest with a local family that owned a trekking company. Trek to Everest Base Camp (EBC)? - Why not!

METHODS: Three members of a family trekked to EBC with porter and guide.

RESULTS: A hard but exhilarating trek. Dealt with acclimatization and altitude related issues. On the way back experienced the April earthquake while on a swinging bridge over a 200 feet gorge - that bridge really swung! Made it back to trek origin town of Lukla but got stranded there since no flights were operating back to Kathmandu. During this time, EBC was being evacuated and injured climbers were being brought to Lukla. In response the family organized and took part in first cleaning the local hospital to make it semi-functional and then in triage, stabilization and onward evacuation of the injured. Approximately 90 climbers were managed - 15 critically injured, 20 moderately injured, 50 walking wounded and 5 deceased.

CONCLUSIONS: Physically demanding family vacations offer unique family time, introspection and inner peace. Disasters can strike anytime. Anticipating needs, accepting limitations and working with locals are key to providing care in emergent conditions with limited resources.

NOTES

March 3, 2016

PAINT THE CEILING LECTURE

FROM EBOLA CLINICIAN TO EXPOSED PERSON: MY EXPERIENCES WITNESSING TRAGEDY, FEAR, CHAOS AND RESILIENCE
Lewis Rubinson, MD

NOTES

Paper #37
Friday, 3/4/2016

THE IMPACT OF FRAILTY ON FAILURE-TO-RESCUE IN GERIATRIC TRAUMA PATIENTS: A PROSPECTIVE STUDY

P Rhee, A Hassan, N Kulvatunyou, A Tang, T O'Keeffe, R Latifi, L GriesH Phelan, B Joseph
the University of Arizona

Presenter: Tahereh Orouji Jokar, MD
Senior Sponsor: Peter Rhee, MD

INTRODUCTION: Failure-to-rescue (FTR) (defined as death from a major complication) is considered as an index of hospital quality in trauma patients. However, the role of frailty status in FTR remains unclear. We hypothesized that frail trauma patients have a greater FTR.

METHODS: We performed a prospective cohort analysis of all elderly (age ≥ 65 yrs.) trauma patients at a level one trauma center. Patient's frailty status was calculated utilizing the Trauma Specific Frailty Index (TSFI) within 24 hours of admission. Patients were stratified into: non-frail, pre-frail, and frail. FTR was defined as death from a major complication (respiratory, infectious, cardiac, and renal). Binary logistic regression analysis was performed after adjusting for age, gender, injury severity (ISS), and vital parameters to assess the independent association between frailty status and FTR.

RESULTS: A total of 368 trauma patients were evaluated of which 25% (n=93) were non-frail, 38% (n=139) pre-frail, and 37% (n=136) frail. Overall 99 of the 368 patients (27%) developed in-hospital complications of which 29% (29/99) died from a major complication (FTR). In the 29 patients with FTR, they were more commonly frail 69% (20/29 [p=0.002]) compared to pre-frail 17% (5/29) and non-frail 14% (4/29) patients. (Table 1) On multivariate regression analysis, frail status was an independent predictor of FTR (OR, 95% [CI]= 2.67[1.37 – 5.20]; p=0.004).

CONCLUSIONS: In elderly trauma patients, the presence of frailty increased the odds of FTR almost three-fold as compared to non-frail. Although FTR has been considered as an indicator of health care quality, the findings of this study suggest that frailty status independently contributes to FTR. This needs to be considered in the future development of quality metrics, particularly in the case of geriatric trauma patients.

NOTES

Paper #38
Friday, 3/4/2016

REPEAT HEAD IMAGING IN BLUNT PEDIATRIC TRAUMA PATIENTS: IS IT NECESSARY?

EP Hill , PJ Stiles, RJ Nold, SD Helmer, JM Haan
The University of Kansas School of Medicine – Wichita

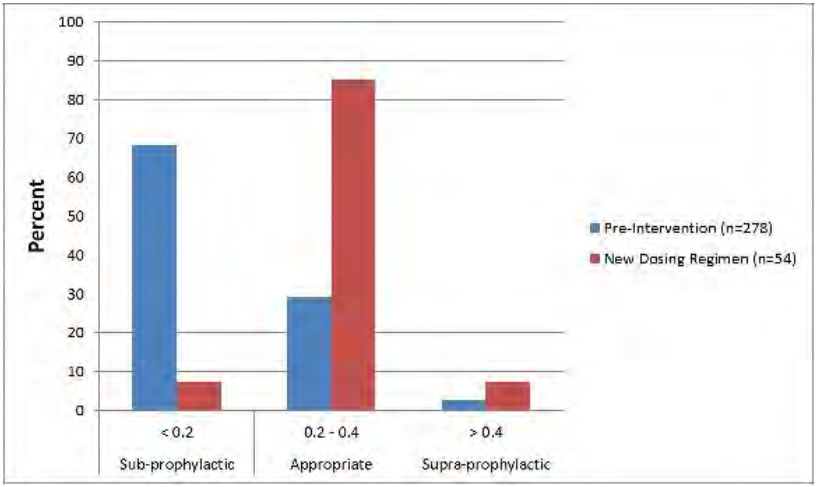
Presenter: E. Patricia Hill, MD
Senior Sponsor: James M. Haan, MD

INTRODUCTION: Children with suspected brain injury usually undergo head CT, and if an injury is identified, follow-up CT is routine within 24 hours. To date, no evidence exists to validate the diagnostic or therapeutic value of these repeat CTs. The purpose of this study was to: (1) evaluate progression of traumatic brain injuries, (2) determine if routine repeat imaging changes patient management, and (3) to compare the efficacy of detecting worsening hemorrhage with serial neurologic exams versus repeat imaging.

METHODS: A 5-year retrospective review was conducted of all trauma patients aged ≤ 17 years with blunt traumatic head injury (N=100). Data included demographics, head injury details, number of repeat scans and findings, change in GCS or neurological exam, management changes following CT scans, and hospital outcomes.

RESULTS: Most patients (73%) had at least one repeat CT, with approximately two-thirds (69.4%) showing no change or a reduction in bleeding. In only one patient did a repeat CT scan result in the patient undergoing a surgical procedure. Among patients with more than two head CTs, 12.3% led to a change in management, most frequently an additional CT scan. Presence of neurological symptoms ($p=0.026$) and changes in GCS ($p=0.004$) were significantly associated with having repeat CT scans. Changes in GCS ($p=0.026$) and neurological symptoms ($p=0.055$) were associated with increases in bleed size. However, in the majority of cases, increased bleed size only resulted in an additional head CT and prolonged ICU stay. Repeat CT scans were associated with increased length of stay in the hospital ($p<0.001$) and in the ICU ($p=0.048$). Excluding patients who arrived with brain death, there was no difference in mortality between patients with and without repeat imaging.

CONCLUSIONS: Findings from this study support a selective approach for repeating head CTs with emphasis on neurologic symptoms and changes in GCS, as the majority of clinical treatment decisions were based on these. Prospective studies on timing and indications for repeat CT scans are needed to support the development of clinical guidelines.


100
90
80
70
60
50
40
30
20
10
0
Percent
< 0.2
Sub-prophylactic
0.2 - 0.4
Appropriate
> 0.4
Supra-prophylactic
Pre-Intervention (n=278)
New Dosing Regimen (n=54)

NOTES

Paper #39
Friday, 3/4/2016

IF SOME IS GOOD, MORE IS BETTER: AN ENOXAPARIN DOSING STRAGTEGY TO IMPROVE PHARMACOLOGIC VTE PROPHYLAXIS

AE Berndtson, TW Costantini, J Lane, K Box, R Coimbra
University of California, San Diego

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

INTRODUCTION: Empiric enoxaparin dosing is inadequate for most trauma patients, leading to below target initial heparin anti-Xa levels and requiring dose-adjustment for optimal venous thromboembolism(VTE) prophylaxis. We hypothesize that patient factors affecting initial anti-Xa levels can be identified based on drug pharmacokinetics, allowing creation of new dosing guidelines that will provide a higher percentage of in-target (anti-Xa level 0.2-0.4 IU/mL) patients at initial anti-Xa level assessment.

METHODS: Records of 318 trauma patients were evaluated, and NONMEM and PSN software used to analyze 28 variables for their effects on anti-Xa levels. A Monte Carlo Simulation was used to select a new dosing protocol, which was implemented on the trauma service as a quality improvement project. The first 54 patients appropriately enrolled were assessed for response and complications.

RESULTS: Only 29.1% of the pre-intervention group had initial anti-Xa levels in the appropriate prophylactic range (Figure1). Levels were most strongly influenced by patient weight, outweighing contributions from all other variables. A new regimen for initial dosing was therefore designed with three weight-defined categories for ease of administration. The post-intervention group showed an increase in in-target initial anti-Xa levels to 85.2% ($p<0.001$), with a corresponding decrease in sub-prophylactic patients from 68.4% to 7.4%. There was an increase in supra-prophylactic levels to 7.4%, but no hemorrhagic complications were identified.

CONCLUSIONS: Institution of a new, categorized, weight-based enoxaparin dosing protocol was safe and significantly improved the percentage of trauma patients with in-target anti-Xa levels on initial assessment. Further studies are needed to determine whether such dosing decreases VTE rates.

NOTES

Paper #40
Friday, 3/4/2016

ANTI-XA GUIDED ENOXAPARIN PROPHYLAXIS REDUCES RATE OF VENOUS THROMBOEMBOLISM BY 57% IN HIGH-RISK TRAUMA PATIENTS

GA Singer, G Riggi, HM Lieberman, E Ginzburg, E Lineen
Ryder Trauma Center, Jackson Memorial Hospital

Presenter: George Singer, MD
Senior Sponsor: Enrique Ginzburg, MD

INTRODUCTION: Appropriate prophylaxis against venous thromboembolism (VTE) in trauma patients remains undefined. Prior investigation at this institution demonstrated a VTE rate of 28% in high-risk patients based upon Greenfield Risk Assessment Profile (RAP) score of ≥ 10 despite pharmacologic and mechanical prophylaxis. This study evaluated the effect of anti-Xa guided enoxaparin dosing on the incidence of VTE in this high-risk group.

METHODS: This is a prospective review of patients admitted to a Level 1 trauma center's intensive care unit over an 8-month period. Anti-Xa levels were obtained in patients that received enoxaparin VTE prophylaxis and enoxaparin dosing was adjusted to maintain a therapeutic anti-Xa level of 0.2-0.4 IU/ml. Analysis was performed on patients with a RAP score of ≥ 10. These high-risk patients also underwent weekly duplex evaluations to screen for asymptomatic lower extremity VTE.

RESULTS: 92 patients received enoxaparin VTE prophylaxis guided by anti-Xa levels. 57 patients met inclusion criteria including a RAP score ≥ 10 with mean demographic data as follows: age 41 years (range 19-87), Injury Severity Score 26 (range 4-50), RAP score 15 (range 10-26), and length of stay 35 days (range 5-114). Therapeutic anti-Xa levels were achieved in 31.6% of patients receiving the initial dose of 30 mg twice daily (BID). An additional 31.6% required increased doses of 40-60 mg (mean 47) BID to reach therapeutic levels. 36.8% never reached therapeutic levels despite a mean dose of 42 mg BID. Bleeding complications were identified in two patients (3.5%); only one requiring intervention. No patient developed intra-cerebral bleeding or heparin-induced thrombocytopenia. Screening duplexes were obtained in 33 patients. Four VTEs (12.1%) occurred, including a single pulmonary embolism (3.3%). All VTEs occurred in the high-risk group. All deep vein thromboses were asymptomatic. Previous rates of VTE and pulmonary embolism were 28% and 5.8%, respectively, in similar patients (mean ISS 27 and RAP score 15).

CONCLUSIONS: Targeted enoxaparin dosing to an anti-Xa level of 0.2-0.4 IU/ml reduced the rate of VTE from 28% to 12% in high-risk trauma patients. Therapeutic anti-Xa levels were achievable in 63% of patients; 50% required increased enoxaparin doses of 40-60 mg BID to reach therapeutic levels.

NOTES

March 4, 2016

REBOA EXPERT PANEL
Moderator: Megan Brenner, MD
Panelists: Thomas M. Scalea, MD, Gene Moore, MD and Laura Moore, MD

Table 1. Odd ratios for VIP client re-injury by race/ethnicity and modifiable risk factors (unadjusted and adjusted analyses), (n = 466)

	Unadjusted		Adjusted	
Ethnicity (n=436)	OR (95% CI)	p Value	OR (95% CI)	p Value
Black	Referent		Referent	
Latino	5.19 (1.92, 13.99)	< 0.001	19.9 (4.16, 95.22)	< 0.001
White	1*		1*	
Other**	4.42 (0.80, 24.34)	0.090	27.7 (3.01, 255.23)	0.003
Housing Need (n=396)				
Met	1.42 (0.67, 2.99)	0.364	1.92 (0.65, 5.62)	0.235
Unmet	3.62 (1.52, 8.61)	0.004	19.22 (3.93, 94.09)	< 0.001
Education Need (n=395)				
Met	1.95 (0.97, 3.91)	0.061	2.16 (0.73, 6.37)	0.164
Unmet	1.41 (0.46, 4.34)	0.547	0.11 (0.01, 1.52)	0.099
Other Need (n=395)+				
Met	0.98 (0.39, 2.45)	0.970	0.65 (0.14, 3.07)	0.587
Unmet	8.03 (1.5, 41.23)	0.013	9.72 (0.0007, 0.02)	0.049

*Predicts re-injury perfectly

**Asian, Pacific Islander, Native American, Native Hawaiian, Native Alaskan, & mixed race

+Includes gang intervention, subtance abuse treatment, and healthcare services

Reference group for Housing, Education, and Other Need is "not needed"

NOTES

Paper #41
Friday, 3/4/2016

A DECADE OF HOSPITAL-BASED VIOLENCE INTERVENTION: BENEFITS AND SHORTCOMINGS

C Juillard, L Cooperman,,R McGrath, T Henderson, R Marquez, J Orellana, M Texada, RA Dicker
UCSF

Presenter: Catherine Juillard, MD
Senior Sponsor: Rochelle Dicker, MD

INTRODUCTION: Initial analyses of hospital-based violence intervention programs (VIPs) have demonstrated decreased violent injury recidivism. Long term VIP performance has not been assessed. VIP quality improvement requires data-driven evaluation to identify shortcomings and client sub-populations who warrant enhanced risk-reduction resources. We evaluated our case manager-based VIP's 10-year experience in meeting client needs to identify modifiable risk factors that most impact violent injury recidivism and determine sub-populations that need modification of targeted services.

METHODS: Information on demographic variables, pre-injury socio-economic factors, needs, and injury recidivism from 2005 to 2014 was collected through our institutional VIP database. Possible client needs included housing, education, employment, court advocacy, driver's license obtainment, and "other" (gang intervention, healthcare services assistance, and substance abuse treatment). Needs were assessed by VIP case managers as "not needed," "identified (unmet)," and "met". Chi-square tests and logistic regression models were built to identify factors associated with recidivism reduction.

RESULTS: Over the 10-year period, 466 clients were enrolled in VIP. During the program period the violent re-injury rate was 4%, as compared to a historical control of 8% from 2000-2005. Women had lower rates of re-injury than men (3% vs 13%, respectively, $p=0.023$). Blacks had the lowest recidivism (2%, $p<0.0001$), with a higher re-injury rate observed among Latinos (11%). While comprising the minority of VIP clients (23, 5%), 100% of White clients were re-injured. Mental health services (51.1%), Victim of Crime state financial compensation (47.6%), employment (36.2%), and housing (30%) were the needs most frequently identified by case managers. In the adjusted analysis, those with unmet housing needs had 19 times the odds of being re-injured as those who did not need housing assistance ($p=0.0001$).

CONCLUSIONS: This unique 10-year experience of a case-manager driven VIP demonstrates sustained recidivism reduction and success in addressing client needs in a large sample from a traditionally underserved population. Efforts to identify root causes of Latino and White client re-injury and strengthen programmatic services for these populations should be increased. VIP prioritization of housing needs may improve future re-injury. This longitudinal study demonstrating sustainable success underscores the importance of increased integration of VIP into trauma centers nationally.

NOTES

Paper #42
Friday, 3/4/2016

GETTING A BETTER LOOK: OUTCOMES OF LAPAROSCOPIC VERSUS TRANS-DIAPHRAGMATIC PERICARDIAL WINDOW FOR PENETRATING THORACOABDOMINAL TRAUMA AT A LEVEL I CENTER

JE Anderson, KM Rounds, ES Salcedo, JM Galante
UC Davis Medical Center

Presenter: Jamie Anderson, MD, MPH
Senior Sponsor: David Shatz, MD

INTRODUCTION: In penetrating thoracoabdominal trauma, it is necessary to directly evaluate both pericardial fluid and the diaphragm. Trans-diaphragmatic pericardial windows provide direct access to the pericardium and diaphragm, but expose the patient to the risks of laparotomy. We hypothesize that transabdominal laparoscopic pericardial windows are a safe and effective alternative to trans-diaphragmatic pericardial windows in stable patients.

METHODS: We reviewed patient records from a Level I Trauma Center between January 2007 and June 2015 and compared patient outcomes after trans-diaphragmatic (TDW) versus laparoscopic pericardial windows (LPW).

RESULTS: A total of 99 patients with penetrating trauma had a diagnostic pericardial window, 33 of which were laparoscopic. Stab wounds were most common (80, 80.8%), compared to gunshot wounds (19, 19.2%). Of 11 patients with a positive pericardial window, 10 (90.9.%) were associated with a cardiac injury. There was no difference in the ratio of positive pericardial windows between patients who had TDW vs. LPW (8/66, 12.1% vs. 3/33, 9.1%, p=0.651). One patient had a complication related to a negative pericardial window in the laparoscopic group. There was no difference in complication rates between TDW and LPW (p=0.155). Mean length of stay (LOS) was longer in TDW compared to LPW (12 vs. 5 days, p=0.046). One patient died during index admission in the TDW group, but there was no difference in mortality rates between TDW and LPW during the index admission (p=0.477). Median length of follow-up was 29 days (range 0-2,709). On long-term follow-up, there was also no difference in mortality rates between TDW and LPW (2/66, 3.0% vs. 2/33, 6.1%, p=0.470).

CONCLUSIONS: In hemodynamically stable patients with thoracoabdominal injuries, LPW is a safe and effective technique for evaluating both pericardial fluid and the diaphragm. Laparoscopic pericardial window is a viable alternative to exploratory laparotomy and trans-diaphragmatic pericardial windows.

NOTES

Paper #43
Friday, 3/4/2016

COMPUTED TOMOGRAPHIC IMAGING IMPROVES FETAL OUTCOMES AFTER MATERNAL TRAUMA

TR Kopelman,JW Walters, D Gridley, PG Pieri, JN Bogert, KM Davis, SJ Vail
Maricopa Medical Center

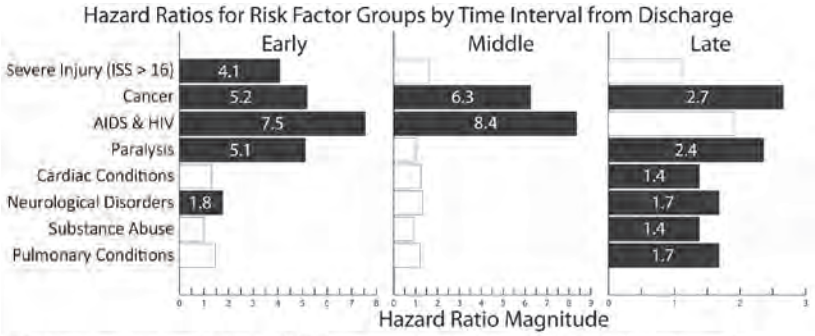
Presenter: Tammy Kopelman, MD
Senior Sponsor: Patrick J. O'Neill, MD

INTRODUCTION: Computed tomography (CT) has been validated to identify and classify placental abruption (PA) following blunt trauma. The purpose of this study was to demonstrate improvement in fetal survival when delivery occurs by protocol at the first sign of class III fetal heart rate tracing (FHT) in pregnant trauma patients with a viable fetus on arrival and CT evidence of < 50% placental perfusion secondary to PA.

METHODS: Retrospectively reviewed pregnant trauma patients > 26 weeks gestation who underwent abdominopelvic CT as part of their initial evaluation. Charts were reviewed for CT interpretation of placental pathology with classification of PA based upon enhancement (Grade 1, >50% perfusion; Grade 2, 25-50% perfusion; Grade 3, <25% perfusion) as well as need for delivery and fetal outcomes.

RESULTS: Forty-one patients met inclusion criteria. CT revealed evidence of PA in 6 patients (15%): Grade 1, 1 patient, Grade 2, 1 patient, and Grade 3, 4 patients. Gestational age ranged from 26 to 37 weeks. All patients with > Grade 2 PA developed class III FHT and underwent delivery emergently at first sign. Abruption was confirmed intraoperatively in all cases. Each birth was viable and Apgar Scores at 10 minutes were >7 in 80 % of infants, all of whom were ultimately discharged home. The remaining infant was transferred to an outside facility with no follow up.

CONCLUSIONS: Delivery at first sign of non-assuring FHTs in pregnant trauma patients with >/= Grade 2 PA can lead to improved fetal outcome.



* Dark bars denote significant effects ($p < 0.05$); Empty bars are not significant ($p \geq 0.05$); Values are age-adjusted

NOTES

Paper #44
Friday, 3/4/2016

RISK FACTORS ASSOCIATED WITH POST-DISCHARGE MORTALITY IN OLDER TRAUMA PATIENTS: A PARADOX OF TIME

RY Calvo, SP Lindsay, SD Edland, CA Macera, DL Wingard, L Ohno-Machado, SR Shackford
Scripps Mercy Hospital

Presenter: Richard Calvo, MPH, PhD
Senior Sponsor: Steven R. Shackford, MD

INTRODUCTION: Older adults constitute a vulnerable and growing trauma population. While most survive their trauma admission, little is known of their outcome following discharge. Less is known about risk factors for predicting post-discharge mortality. We sought to characterize survival after discharge among older trauma patients and to evaluate injury-related factors and pre-existing conditions (PECs) as risk factors for mortality after discharge.

METHODS: All blunt-injured trauma survivors aged 55 years and older admitted to a level I trauma center between 01/2006 and 12/2012 were eligible. Patients with a hospital length of stay (HLOS) less than 6 hours were excluded. Post-discharge status was identified by matching trauma registry data to four external sources: administrative data, county death certificate registry, state death registry, and Social Security Death Index. Injury-related probability of death, Injury Severity Score (ISS), Glasgow Coma Scale score, HLOS, readmissions, discharge location and 47 PECs were evaluated using proportional hazards regression. Mortality after the date of discharge was evaluated at the following time intervals: within 30 days (early), 30 to 90 days (middle), and 90 days to 2 years (late).

RESULTS: Among 4442 survivors, 938 (21%) died within 2 years of discharge. Patients discharged to nursing facilities, hospice care, or care facilities showed significantly lower survival across all intervals. Injury-related measures were associated with mortality only within the first 30 days of discharge. Of 47 PECs evaluated, 25 were associated with a constant increased risk for death over all intervals. Cancers, HIV/AIDS, and paralysis were associated with the highest early-interval risk overall, but each diminished in strength over time.

CONCLUSIONS: Mortality after discharge is high among older trauma patients, but the relevance and strength of risk factors vary by time. Factors related to injury impact mortality risk early, while most PECs confer a greater risk later after discharge. Additional focus must be placed on the management of PECs to improve long-term survival after discharge following trauma.

NOTES

Paper #45
Friday, 3/4/2016

TRAUMA HEALTH LITERACY: IN NEED OF REMEDIATION

CP Shahan, JA Weinberg, LJ Magnotti, MA Croce, TC Fabian
University of Tennessee Health Science Center

Presenter: Charles Shahan, MD
Senior Sponsor: Jordan A. Weinberg, MD

INTRODUCTION: Little is known regarding health literacy among trauma patients. Anecdotal experience at our institution has suggested that a profound lack of understanding of basic healthcare information exists at some level in our patients after hospital discharge. The purpose of this study is to report the results of a pilot quality improvement project to determine trauma patient injury comprehension and how this impacts their overall satisfaction with care received.

METHODS: Trauma patients were surveyed for knowledge of their injuries, operations, and satisfaction with their care at the first outpatient visit following hospital discharge from a level 1 trauma center.

RESULTS: 175 surveys were distributed and 35 were returned complete and eligible for analysis. Average time from discharge to survey completion was 16 days. 75% of patients were male, and the mean age was 37. 56% of the injuries were from a blunt mechanism. 71% reported household income of less than $25,000 per annum, and 61% had an education level of high school diploma or less. 40% of patients were unable to correctly recall their injuries, and 54% were unable to correctly recall operations performed. 72% were unable to recall the name of any physician that provided care during their hospital stay. Nonetheless, 90% of patients were at least somewhat satisfied with their injury understanding, and only 3% felt that their level of understanding had a negative impact on their overall satisfaction with care received. There was no correlation between education or income level and ability to correctly recall injuries or operations. In addition, there was no correlation between ability to recall injuries or operations and patient satisfaction.

CONCLUSIONS: The observed deficiency in post-discharge health literacy among our patients is alarming, and demonstrates that current hospital discharge education is lacking. Although this deficit did not affect satisfaction with care, we feel a responsibility to improve the health literacy of our patients. The next step at our institution will be to implement a revised discharge education program followed by surveillance to evaluate for improvement.

NOTES

Paper #46
Friday, 3/4/2016

A SINGLE-CENTER RETROSPECTIVE REVIEW OF POST-OPERATIVE INFECTIOUS COMPLICATIONS IN THE SURGICAL MANAGEMENT OF MANDIBULAR FRACTURES: POST-OPERATIVE ANTIBIOTICS ADD NO BENEFIT

FE Domingo, E Dale, C Gao, C Groves, JD Stanley, RA Maxwell, JL Waldrop
University of TN College of Medicine Chattanooga

Presenter: Fernando Domingo, MD
Senior Sponsor: Robert A. Maxwell, MD

INTRODUCTION: Mandibular fractures are common facial injuries and their treatment may be complicated by post-operative infection. Risk of infection due to contamination with oral flora is well established but no consensus exists regarding antibiotic prophylaxis. The purpose of this study is to assess the risk factors and the effect of perioperative antibiotics on surgical site infection (SSI) rates following surgical fixation of mandibular fractures.

METHODS: Retrospective medical record review was completed for trauma patients of any age surgically treated for mandibular fractures at a Level I Trauma Center from September 2006 to June 2012. Outcomes analysis was performed to determine SSI rates related to perioperative antibiotic use, type and timing of operation, and patient risk factors that may contribute to SSI.

RESULTS: 359 patients met inclusion criteria with complete records for analysis. 76% were male. Mean age was 30.5 years with a range from 2 years to 84 years. Of these patients, 38 developed SSI (10.6%). SSI rate was lower in closed versus open surgery (3.2% vs. 16.3%, p=0.0001), and in closed versus open fractures (1% vs. 14%, p=0.0005). SSI rate was increased in patients with tobacco, alcohol, and/or drug use (p<0.0001), patients that sustained traumatic dental injuries (p=0.0110), and those with fractures as a result of motor vehicle crashes (p=0.0062). The mean Injury Severity Score (ISS) and Abbreviated Injury Score (AIS) were 12.6 4 10.6 and 1.68 4 0.47 with SSI and 10.35 4 10.4 and 1.73 4 0.54 without SSI, difference not significant. SSI rate was similar in patients who did and did not receive post-operative antibiotics (14.7% vs. 9.6%, p=0.2556). Type of antibiotic, duration of post-operative antibiotic administration, and duration between injury and surgery did not impact SSI rate.

CONCLUSIONS: Findings suggest that following surgical treatment of mandible fractures, open surgical management, open fractures, and patient risk factors including substance use, traumatic dental injury, and mechanism of injury significantly increased SSI rates. In this population, post-operative antibiotics did not appear to provide additional benefit compared to pre-operative antibiotics alone.

NOTES

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