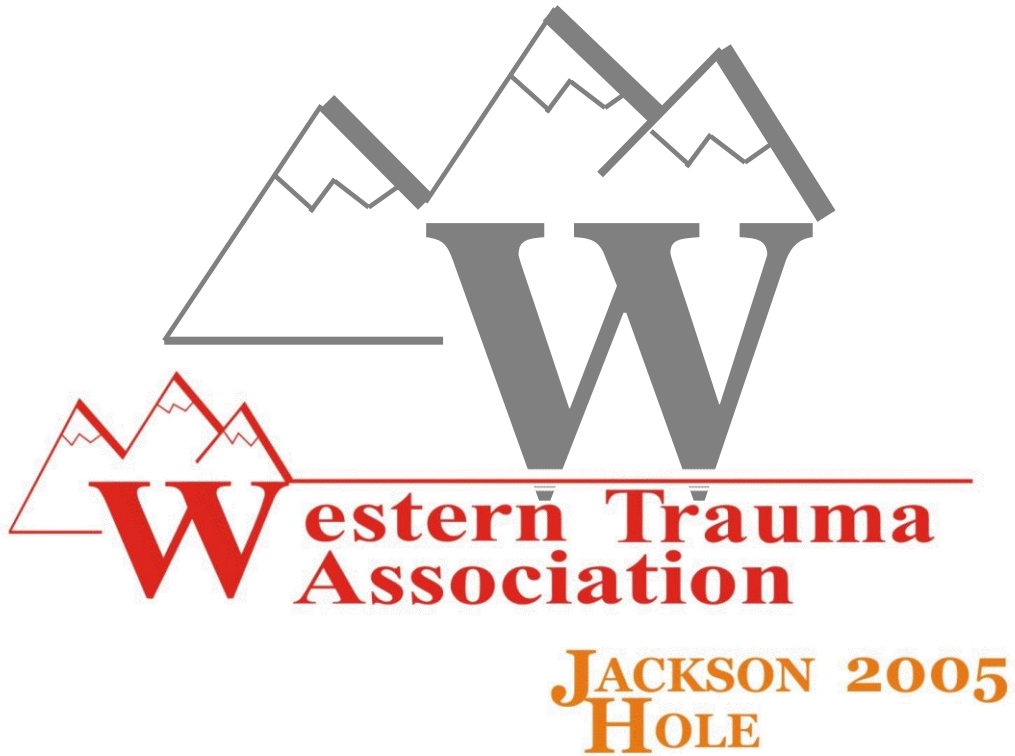


THIRTY-FIFTH ANNUAL MEETING



February 27 - March 4, 2005

Jackson Hole, Wyoming

WESTERN TRAUMA ASSOCIATION

35TH Annual Meeting
Jackson Hole, Wyoming
February 27 - March 4, 2005

THE WESTERN TRAUMA ASSOCIATION GRATEFULLY
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The Gundersen Lutheran Medical Foundation designates this educational activity for a maximum of 18.5 category I credits towards the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity.

**35th Annual Meeting
Jackson Hole, Wyoming**

2003-2004

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

The 2006 WESTERN TRAUMA ASSOCIATION Meeting will be:

**Big Sky, Montana
February 26 – March 3, 2006**

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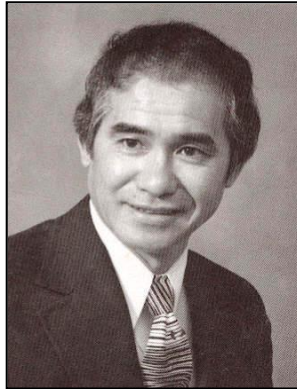
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**Earl G. Young, M.D.
(1928-1989)**



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. Wangenstein 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

<u>Resident</u>	<u>Institution</u>	<u>Year</u>
Joseph Schmoker, M.D.	University of Vermont	1991
Joseph Schmoker, M.D.	University of Vermont	1992
CharlesMock, M.D.	University of Washington	1993
Gino Travisani, M.D.	University of Vermont	1994
Phillip C. Ridings, M.D.	Medical College of Virginia	1995
David Han, M.D.	Emory University	1996
Preston R. Miller, M.D.	Wake Forest University	1997
Geoffrey Manley, M.D., PhD.	UC – San Francisco	1998
JamesM. Doty, M.D.	Medical College of Virginia	1999
D.J. Ciesla, M.D.	Denver Health Medical Center	2000
Ricardo J. Gonzales, M.D.	Denver Health Medical Center	2001
Scott C. Brakenridge	Cook County Hospital	2002
Adena J, Osband, M.D.	UMDNJ at Newark	2003
Cindy Lee, M.D.	UMDNJ at Newark	2004

WESTERN TRAUMA ASSOCIATION

IN MEMORIUM

Earl G. Young, MD
February 27, 1989

Gerald S. Gussack
August 25, 1997

“Paint the Ceiling” Lectureship

G. Jerry Jurkovich, M.D.	1997	Snowbird, Utah
John W. McGill, M.D.	1998	Chateau Lake Louise, Alberta
William T. Close, M.D.	1999	Crested Butte, Colorado
Jimmy Cornell	2000	Squaw Valley, California
Geoff Tabin, M.D.	2001	Big Sky, Montana
James H. “Red” Duke, M.D.	2002	Chateau Whistler, British Columbia
David V. Shatz, M.D.	2003	Snowbird, Utah
Susan and Tim Baker	2004	Steamboat Springs, Colorado
Alex Habel, M.D.	2005	Jackson Hole, Wyoming

WESTERN TRAUMA ASSOCIATION

SCHEDULE

Sunday, February 27, 2005

4:30 – 7:30pm	Registration	Sundance Lobby
5:00 – 7:00pm	Welcome Reception	Sundance
5:00 – 7:00pm	Children's Reception	Rendezvous Room
7:00pm	Past Presidents' Meeting	Sundance

Monday, February 28, 2005

6:30 – 7:00am	Attendee Breakfast	Sundance Lobby
7:00 – 9:00am	Scientific Session I	Sundance
7:30 – 9:00am	Friends & Family Breakfast	Gamefish Restaurant
4:00 – 6:00pm	Scientific Session II	Sundance

Tuesday, March 1, 2005

6:30 – 7:00am	Attendee Breakfast	Sundance Lobby
7:00 – 9:00am	Scientific Session III	Sundance
7:30 – 9:00am	Friends & Family Breakfast	Gamefish Restaurant
4:00 – 5:00pm	Scientific Session IV	Sundance
5:00 – 6:00pm	Presidential Address	Sundance

Wednesday, March 2, 2005

6:00 – 7:00am	Attendee Breakfast	Sundance Lobby
7:00 – 9:00am	Scientific Session V	Sundance
7:30 – 9:00am	Friends & Family Breakfast	Gamefish Restaurant
10:00 – 12:00pm	Ski Race	Mountain
2:00 – 1:30pm	BBQ Lunch on the Mountain	Events Tent
4:00 – 5:00pm	Scientific Session VI	Sundance
5:00 – 6:00pm	Business Meeting	Sundance

Thursday, March 3, 2005

6:30 – 7:00am	Attendee Breakfast	Sundance Lobby
7:00 – 9:00am	Scientific Session VII	Sundance
7:30 – 9:00am	Friends & Family Breakfast	Gamefish Restaurant
4:00 – 5:00pm	Scientific Session VIII	Sundance
5:00 – 6:00pm	"Paint the Ceiling" Lecture	Sundance
7:45 – 11:30pm	Awards Banquet	Mangy Moose
7:30 – 11:30pm	Children's Party	TBD

Friday, March 4, 2005

6:30 – 7:00am	Attendee Breakfast	Sundance Lobby
7:00 – 9:00am	Scientific Session IX	Sundance
7:30 – 9:00am	Friends & Family Breakfast	Gamefish Restaurant
4:00 – 6:00pm	Scientific Session X	Sundance

ABSTRACTS



Greetings from your friends at
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Annual Meeting Attendees

Western Trauma
Association

Jackson Hole, WY

. . . Wish we were there!

Scientific Session 1

Monday AM, February 28

Moderator: Scott Petersen, MD

Location: Sundance

Paper	Time	Title/Authors	Page
1	07:20 AM	~ Hypertonic Saline Resuscitation After Mesenteric Ischemia/Reperfusion Induces Ileal Apoptosis Via Cytochrome C Pathway E.A. Gonzalez, M.D., R.A. Kozar, M.D., J.W. Suliburk, M.D., D.J. Tweardy, M.D., D.W. Mercer, M.D., F.A. Moore, M.D.	21
2	07:40 AM	~ Troponin Elevation In The Critically Injured Patient: Mechanical Trauma Or Physiologic Stress? M Martin, P Mullenix, P Rhee, D Demetriades, A Salim	24
3	08:00 AM	~ The Failure Of Non-Operative Management In Solid Organ Injury: A Multi-Institutional Pediatric Trauma Center Experience J.H. Holmes IV, M.D.(1); M. Tataria, M.D.(2); K.D. Mattix, M.D.(3); D.J. Wiebe, Ph.D.(1); D.P. Mooney, M.D.(4); E.R. Scaife, M.D.(5); R.L. Brown, M.D.(6); J.I. Groner, M.D.(7); S.I. Brundage, M.D.(2); L.R. Scherer, M.D.(3); M.L. Nance, M.D.(1)	26
4	08:20 AM	~ Prospective Analysis Of Senior Surgical Trauma Residents' Accuracy In The Interpretation Of Computerized Tomography JC Pooler, MD; DL Ciraulo, DO; JS Hourigan, MD; NL Poppe; CM Richart, MD; RA Maxwell, MD; DE Barker, MD	29
5	08:40 AM	~ A Single Bolus Of 3% Hypertonic Saline With Dextran Provides Optimal Resuscitation After Uncontrolled Hemorrhagic Shock J.M. Watters, M.D., J.A. Differding, B.S., P.J. Muller, B.S., M.A. Schreiber, M.D.	31

Scientific Session 2

Monday PM, February 28

Moderator: Peter M. Rhee, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
6	04:00 PM	The Decreasing Incidence And Mortality Of Postinjury Ards: A 5-Year Prospective Study M. Martin, MD; A. Salim, MD; J. Murray, MD; D. Demetriades, MD, PhD; H. Belzberg, MD; P. Rhee, MD	33
7	04:20 PM	Who Has Life Sustaining Therapy Withdrawn After Severe Injury LS Watch, CR Schermer, S Saxton-Daniels	35
8	04:40 PM	Recombinant Activated Factor Vii: An Adjunct To Damage Control In The Coagulopathic Trauma Patient M. Gunst, MD, B. Pickard, MD, C. White, RN, K. Halow, MD, D. Van Boerum, MD, A. Demar, MD, M. Ridgeway, MD, P. Bosco, MD, J. Perlstein, MD	37
	05:00 PM	Panel on Hemostatic Agents in Trauma: 1. Peggy Knudson, M.D. (Moderator): Overview Of Hemostatic Agents In Trauma. 2. John Zelko, M.D.: WTA Multi-Institutional Experience With Recombinant Factor VIIa. 3. Tom Scalea, M.D.: The Maryland Experience With Recombinant Factor VIIa 4. Peter Rhee, M.D.: The Role Of Other New Hemostatic Agents (Quikclot, Floseal, Fibrin Glue, Etc.)	
	1800	Board of Directors Meeting	

Scientific Session 3

Tuesday AM, March 1

Moderator: Tom Phillips, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
9	07:00 AM	Urgent Prehospital Endotracheal Does Not Cause Increased Septic Morbidity. S. Tracy MD, M.A. Schinco MD, M.M. Griffen MD, A.J. Kerwin MD, T. Devin RN, H. Herrin, J.J. Tepas III MD	39
10	07:20 AM	Abdominal Insufflation Decreases Blood Loss And Mortality After Blunt Liver Injury AD Jaskille, M.D.; J Sava, M.D.; A Schechner, M.D.; K Park, M.D.; M Williams, M.D.; D Wang, M.D.	41
11	07:40 AM	Correlation Of Clinical Findings And Autopsy Results Following Fatal Injury From Motor Vehicular-Related Accidents L.Y. Shen, M.D.*; K.N. Marcotte, B.S.*; S.D. Helmer, Ph.D.*; M.H. Dudley, M.D.†; R.S. Smith, M.D.*	43
12	08:00 AM	Golf Cart Injuries A. Goldsmith, A. Mansour, W. VanderKolk, B. McKenzie	45
13	08:20 AM	** Utilization Of Vena Cava Filters In Pediatric Trauma Patients: Data From The National Trauma Data Bank A. Cook, MD, S. Shackford, MD, T. Osler, MD, K. Sartorelli, MD, B. Littenberg, MD	47
14	08:40 AM	Reasons To Omit Digital Rectal Exam In Trauma Patients: No Fingers, No Rectum, No Useful Additional Information T. Esposito, A. Ingraham, F. Luchette, B. Sears, J. Santaniello, K. Davis, S. Poulakidas, R. Gamelli	49

Scientific Session 4

Tuesday PM, March 1

Moderator: Larry Reed, M.D.

Location: Sundance

Time	Activity	Presenters
04:00 PM	Panel on New Opportunities For Trauma Surgeons 1. Activities Of AAST Committee To Develop Reorganized Specialty Of Trauma, Surgical Critical Care, And Emergency Surgery 2. Development And Implementation Of A Fellowship In Trauma, Surgical Critical Care, And Emergency Surgery 3. Experience With The National Resident Matching Program For Surgical Critical Care 4. Financial Aspects Of Surgical Critical Care	1. Dave Hoyt, M.D. (Moderator) 2. Rick Miller, M.D. 3. Chris Cocanour, M.D. 4. Kimberly Davis, M.D. Scott Petersen, M.D.
05:00 PM	Presidential Address: "Patients Crossing Our Borders: An Ethical Or Economic Conundrum."	
06:00 PM	Multi-Institutional Trials Committee Meeting	Chair: Peggy Knudson MD

Scientific Session 5

Wednesday AM, March 2

Moderator: Brent King, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
15	07:00 AM	Is Hypothermia Simply A Marker Of Shock And Injury Severity, Or An Independent Risk Factor For Mortality? An Analysis Of A Large National Trauma Registry (NTDB) S. Shafi, M.D., L. Gentilello, M.D.	51
16	07:20 AM	Outcome Effects Of A Clinical Protocol For Management Of Severe Brain Injury At A Level One Trauma Center J. Fox, T. P. Clemmer, MD, J. C. Macfarlane, MD, H. Lazarus, MD, M. H. Stevens, MD.	53
17	07:40 AM	The Inefficiency Of Plain Radiography To Evaluate The Cervical Spine After Blunt Trauma S. Gale, V. Gracias, P. Reilly, C. W. Schwab	55
18	08:00 AM	The Creation Of A Geriatric Trauma Unit: Would We Achieve Better Outcomes? M Lorenzo MD, BA Bernstein PhD, AS Morgan MD, GR Collin MD, CA Barba MD.	57
19	08:20 AM	Prospective Evaluation Of Screening Multislice Helical Computed Tomographic Angiography In The Initial Evaluation Of Penetrating Neck Injuries K Inaba, MD, F Munera, MD, M McKenney, MD, L Rivas, MD, E Marecos, MD, M de Moya, MD, H Bahouth, MD and S Cohn, MD	60
20	08:40 AM	IgA Modulates Inflammatory Responses In An In Vitro Model Of Pneumonia LN Diebel, MD, DM Liberati, MS, CA Diglio, PhD, WJ Brown, PhD	62

Scientific Session 6

Wednesday PM, March 2

Moderator: Chris Cocanour, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
21	04:00 PM	Brief Intervention Vs. Personalized Feedback For Young Adult Problem Drinking In Emergency Care: A Randomized Controlled Trial P.M. Monti, Ph.D., N.P. Barnett, Ph.D., S.M. Colby, Ph.D., C.J. Gwaltney, Ph.D., A. Spirito, Ph.D., D.J. Rohsenow, Ph.D., & R. Woolard, M.D.	64
22	04:20 PM	Effect Of A Graduated Driver Licensing System On The Proportion Of Crashes And Injuries Involving Drivers Under Age 18 R. O'Connor, G. Tinkoff, L. Lin	66
23	04:40 PM	Improving Outcomes In A Regional Trauma System - Impact Of A Level Iii Trauma Center M Barringer, MD, M Thomason, MD, P Kilgo, MS	68
	1700	Business Meeting (Members Only) Scott Petersen MD, President	

Scientific Session 7

Thursday AM, March 3

Moderator: Soumitra Eachempati, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
24	07:00 AM	The Impact Of Obesity On The Outcomes Of 1,153 Critically Injured Patients C. Brown, A. Neville, P. Rhee, A. Salim, G. Velmahos, D. Demetriades	70
25	07:20 AM	High Frequency Oscillatory Ventilation Improves Oxygenation In Critically Ill Trauma Patients With Adult Respiratory Distress Syndrome W. Miles, J. Hylton, J. Burns, T. Huynh, T. Nelson, R. Sing, D. Jacobs, M. Thomason	72
26	07:40 AM	Impact Of Age On Recovery At One Year Following Isolated Traumatic Brain Injury: A WTA Prospective Multicenter Trial D Livingston, R Lavery, A Mosenthal, M Knudson, S Lee, D Morabito, G Manley, A Nathens, G Jurkovich, D Hoyt, R Coimbra	74
27	08:00 AM	The National Renal Trauma Experience: Analysis Of The NTDB R. Reed, K. Davis, F. Luchette, T. Esposito, J. Santaniello, S. Poulakidas, R. Gamelli	76
28	08:20 AM	Complications Of Nonoperative Management Of High Grade Blunt Hepatic Injuries R.A.Kozar, MD, PhD, J.B. Moore, MD, S.E. Niles, MD, J.B. Holcomb, MD, E.E. Moore, MD, C. Cothren, MD, F.A. Moore	78
29	08:40 AM	Abdominal Ct For Mechanism: What's The Mechanism? R Nirula, D Talmor, K. Brasel	80

Scientific Session 8

Thursday PM, March 3

Moderator: Denis Bensard, M.D.

Location: Sundance

Time	Activity	Presenters
04:00 PM	Panel of Experts: Interesting Case Presentations	Dave Feliciano, M.D. Steve Shackford, M.D. Scott Petersen, M.D.
04:45 PM	History Of The Western Trauma Association	Bob Volz , M.D., and, Peter Teal, M.D.
05:00 PM	Paint The Ceiling: "Emerging From The Shadows: Changing Lives In A Developing Country"	Dr. Alex Habel

Scientific Session 9

Friday AM, March 4

Moderator: Harold Sherman, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
30	07:00 AM	National Nosocomial Infections Surveillance System Pneumonia Definition: From Benchmark To Bedside In Trauma Patients PR Miller, MD., JC Johnson, PA-C, T Karchmer, MD., JJ Hoth, MD., J.Wayne Meredith, MD., MC Chang, MD.	82
31	07:20 AM	Halo Vest Immobilization Increases Early Morbidity And Mortality In Elderly Patients With Odontoid Fractures R. Tashjian MD, S. Majercik MD, W. Biffi MD, W. Cioffi MD	84
32	07:40 AM	A Mobile Trauma Database With Charge Capture S. Moulton MD, D. Myung AB, A. Chary BS, J. Chen MA, S. Agarwal MD, T. Emhoff MD, P. Burke MD, E. Hirsch MD	86
33	08:00 AM	Damage Control In A Combat Environment B Eastridge, J Owsley, R Ellison, J Sabesta, A Beekley, P Rhee, J Holcomb	88
34	08:20 AM	Retrievable Inferior Vena Caval Filters Are Not Always Temporary P. Offner, M.D., M.P.H., A. Hawkes, M.D.	90
35	08:40 AM	White Blood Cell And Platelet Counts Can Be Used To Differentiate Between Infection And Normal Response After Splenectomy For Trauma: Prospective Validation J. Weng, C. Brown, P. Rhee, A. Salim, D. Demetriades, G. Velmahos	92

Scientific Session 10

Friday 9M, March 4

Moderator: Larry Reed, M.D.

Location: Sundance

Paper	Time	Title/Authors	Page
36	04:00 PM	Endovascular Management Of A Thoracic Gunshot Wound: Advancement Or Abuse Of Technology? TD Fang MD, RA Dicker MD, NN Kirilcuk BA, D Peterson MD, DA Spain MD, and SI Brundage MD, MPH	94
37	04:15 PM	Traumatic Psuedocoarctation Treated With An Endograft R. Karmy-Jones, J. Cook, T. Burdick, M. Meissner	97
38	04:30 PM	Blunt Aortic Transection: Improved Results With Endovascular Repair? B.G. Peterson, M.D.; J.S. Matsumura, M.D.; M.D. Morasch, M.D.; M.A. West, M.D.; M.K. Eskandari, M.D.	99
39	04:45 PM	Controversial Management Of The Pregnant Patient With An Open Abdomen: A Case Report S. Aboutanos, MD; M. Aboutanos, MD, MPH; T. Duane, MD; A. Malhotra, MD; R. Ivatury, MD	101
40	05:00 PM	Non-Operative Management Of Severe Tracheobronchial Injuries With Peep And Low Tidal Volume Ventilation M. Self, M.D., A. Mangram, M.D., E. Dunn, M.D., S. Norwood, M.D.	103
41	05:15 PM	Utility From Futility: Non Heart-Beating Organ Donation Following Fatal Injury	105
42	05:30 PM	Blunt Transection Of The Duodenum C. Myers, MD, H. Sherman, MD, FACS	107
43	05:45 PM	Surviving A Right Ventricular Rupture From Blunt Trauma L. Omert, MD, V. Cortes, MD, A. Rodriguez, MD	109

HYPERTONIC SALINE RESUSCITATION AFTER MESENTERIC ISCHEMIA/REPERFUSION INDUCES ILEAL APOPTOSIS VIA CYTOCHROME C PATHWAY

E.A. Gonzalez, M.D., R.A. Kozar, M.D., J.W. Suliburk, M.D., D.J. Tweardy, M.D., D.W. Mercer, M.D., F.A. Moore, M.D.
University of Texas Health Science Center at Houston

Presenter: Ernest A. Gonzalez, M.D.

Senior Sponsor: Frederick A. Moore, M.D.

Introduction: We have previously demonstrated that hypertonic saline (HS) compared to LL isomeric Lactated Ringer's (LR) resuscitation decreased inflammation and ileal injury after mesenteric ischemia/reperfusion (I/R). In contrast to I/R cell necrosis, apoptosis provides controlled cell death that minimizes inflammation. We therefore hypothesized that HS resuscitation after mesenteric I/R would induce ileal mucosal apoptosis and decrease cell necrosis.

Methods: Rats underwent 60 min of superior mesenteric artery occlusion (SMAO) and then received no resuscitation or intravenous resuscitation with 4 cc/kg 7.5% HS, 4cc/kg LR (equal volume) or 32 cc/kg LR (equal salt load) 5 minutes prior to clamp removal. Animals were sacrificed at 6 hours of reperfusion and ileum was harvested for analysis. Bcl-XL (anti-apoptotic inhibitor of cytochrome-c release) and Caspase 3 (pro-apoptotic stimulator of cytochrome-c pathway) protein expression were analyzed by Western immunoblot, presence of DNA fragmentation (apoptosis) was assessed by TUNEL, and cell necrosis by histology (Chiu score 0-5). Data are reported as mean \pm SEM ($n > 5$ /group; ANOVA). Means with different letters are significantly different.

Results:

Model	Bcl-XL (AU)	Caspase-3 (AU)	TUNEL (cells/hpf)	Mucosal Injury (Chiu score)
Sham/No Resus	0.17 \pm 0.01 a	0.19 \pm 0.01 a	2.11 \pm 0.58 a	0.83 \pm 0.08 a
SMAO/No Resus	0.41 \pm 0.06 b	0.32 \pm 0.04 b	11.16 \pm 2.66 b	3.66 \pm 0.11 b
SMAO/LR 4 cc/kg	0.23 \pm 0.03 b	0.36 \pm 0.05 b	8.87 \pm 1.88 b	2.66 \pm 0.21 b
SMAO/LR 32cc/kg	0.28 \pm 0.05 b	0.41 \pm 0.07 b	18.96 \pm 3.13 b	3.16 \pm 0.30 b
SMAO/HS 4cc/kg	0.15 \pm 0.01 a	0.71 \pm 0.02 c	55.58 \pm 4.71 c	1.83 \pm 0.20 c

SMAO/no resus, SMAO/LR 4 cc/kg, and SMAO/LR 32cc/kg increased both anti-apoptotic Bcl-XL and pro-apoptotic Caspase 3 expression to similar levels. The net result was increased apoptosis (quantitated by TUNEL) and increased I/R cell necrosis (quantitated by Chiu Score). In contrast, SMAO/HS 4cc/kg had no effect on anti-apoptotic Bcl-XL but further increased pro-apoptotic Caspase 3 expression. This resulted in a further increase in apoptosis and a decrease in cell necrosis.

Conclusion: HS resuscitation after mesenteric ischemia/reperfusion significantly increased ileal mucosal apoptosis while decreasing necrosis via the cytochrome c pathway and may

represent a novel mechanism by which HS resuscitation following mesenteric I/R reduces inflammation and imparts protection to the gut.

Notes

TROPONIN ELEVATION IN THE CRITICALLY INJURED PATIENT: MECHANICAL TRAUMA OR PHYSIOLOGIC STRESS?

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Presenter: Matthew J. Martin, MD

Senior Sponsor: Peter M. Rhee, M.D.

Introduction: Serum troponin is a sensitive and specific marker of myocardial injury. Post-injury troponin elevation is usually attributed to mechanical chest trauma, but this relationship remains unproven. We sought to examine the etiologic factors and prognostic significance of elevated troponin levels in a widely screened trauma population.

Methods: Review of all trauma ICU admissions over a 5-year period with serial troponin I (TnI) measurements as part of a screening protocol. TnI was categorized as normal (0-1.2), intermediate (1.3-5), or high (>5) and mortality rates were compared between groups.

Multivariate regression analysis was used to identify independent predictors of TnI elevation and mortality.

Results: There were 1081 patients identified. An elevated TnI was found in 29% of patients. Mortality significantly increased from 16% in the normal group to 33% and 44% in the intermediate and high TnI groups (see table). Independent predictors of an elevated TnI were admission base excess ($p=0.04$), ISS ($p<0.001$), and APACHE II score ($p<0.001$). Chest AIS and the presence/absence of severe chest injury did not independently predict TnI elevation ($p=0.5$ and 0.83). Any elevation of TnI (>1.2) was a strong independent predictor of mortality (OR 2.1, 95% CI 1.4-3.1) after controlling for age, gender, mechanism, base excess, GCS, and ISS. Beta-blocker use was associated with a 50% reduction in mortality among patients with an elevated troponin (38% vs 16%, $p<0.01$).

Conclusions: Elevated serum TnI following trauma is related to the degree of overall injury and physiologic stress and not mechanical chest trauma. Intermediate and high TnI elevations are associated with increased mortality, which may be improved by selective use of beta-blockade.

	TnI: Normal (0-1.2)	Intermediate (1.3-5)	High (>5)	p value*
N	773 (71%)	196 (18%)	116 (11%)	NS
Age	40	39	37	NS
BE	-4.7	-6.8	-6.7	<0.01
ISS	21.2	26	34	<0.01
APACHE	22	28	31	<0.001
Chest Injury	325 (42%)	86 (44%)	72 (62%)	0.05
Mortality	16%	33% (OR 2.04)	42% (OR 3.0)	<0.01

Notes

THE FAILURE OF NON-OPERATIVE MANAGEMENT IN SOLID ORGAN INJURY: A MULTI-INSTITUTIONAL PEDIATRIC TRAUMA CENTER EXPERIENCE

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 (1)Univ of Pennsylvania, (2)Stanford Univ, (3)Indiana Univ, (4)Harvard Univ, (5)Univ of Utah, (6)Univ of Cincinnati, (7)Ohio State Univ

Presenter: James H. Holmes IV, M.D.

Senior Sponsor: Susan I. Brundage, M.D.

Introduction: Non-operative management (NOM) is the accepted treatment of most pediatric solid organ injuries (SOI) and, is typically successful. We sought to elucidate predictors of, and the time course to, failure in the subset of children suffering SOI who failed NOM.

Methods: A retrospective analysis was performed from 1/97-12/02 of all pediatric (age 0-20 y) SOI cases (liver, spleen, kidney, pancreas) from the trauma registries of 7 designated, Level 1 pediatric trauma centers. Failure of NOM was defined as the need for intra-abdominal operative intervention. Data reviewed included demographics, mechanism of injury (MOI), injury severity (ISS, AIS, SOI grade, and GCS), and outcome. For the failures of NOM, time to operation and relevant clinical variables were also abstracted. A summary AIS (sAIS) was calculated, wherein the AIS values for each SOI were summed, to account for multiple SOI in the same patient. Univariate and multivariate analyses were employed and significance was set at $p < 0.05$.

Results: 1880 children were identified. Of these, 62 suffered non-survivable head injuries that precluded assessment of NOM outcome and were excluded. Thus, 1818 patients comprised the overall study population. There were 1729 successful NOM patients (controls - C) and 89 failures (F), for an overall NOM failure rate of 5%. For isolated organ injuries, the failure rates were: kidney 3%, liver 3%, spleen 4%, and pancreas 18%. There were 14 deaths in the failure group from non-salvageable injuries (mean ISS = 54 ± 15). The 2 groups did not differ with respect to mean age or gender. With respect to mechanism, MVC was the most common MOI in both groups. Only bicycle crashes were associated with a significantly increased risk of failing NOM (RR=1.76, 95% CI=1.02-3.04, $p < 0.05$).

Injury severity & specific organ injuries were associated with NOM failure (Table).

When controlling for ISS and GCS, multivariate regression analysis confirmed that sAIS ≥ 4 , isolated pancreatic injury, and >1 organ injured were significantly associated with NOM failure ($p < 0.01$). The median time to failure was 3 h (range 0.5-144h) with 38% having failed by 2h, 59% by 4h, and 76% by 12h.

	F (n=89)	C (n=1729)	Rel Risk (95% CI)	<i>p</i>
Mean ISS \pm STD	28 \pm 17	14 \pm 10		< 0.001
ISS \geq 25	60%	16%	14.95 (7.5-29.79)	< 0.001
Mean GCS \pm STD	12 \pm 5	14 \pm 3		< 0.001
GCS \leq 8	28%	7%	5.09 (3.04-8.52)	< 0.001
Isolated Pancreas	22%	4%	7.49 (3.74-15.01)	< 0.001
Mean sAIS \pm STD	5 \pm 2	3 \pm 1		< 0.001
sAIS \geq 4	72%	27%	6.84 (4.26-10.99)	< 0.001
>1 organ	38%	13%	4.11 (2.62-6.45)	< 0.001

Conclusions: Failure of NOM is uncommon (5%) and typically occurs within the first 12 hours following injury. Failure is associated with injury severity and organ multiplicity, as well as isolated pancreatic injuries.

Notes

PROSPECTIVE ANALYSIS OF SENIOR SURGICAL TRAUMA RESIDENTS' ACCURACY IN THE INTERPRETATION OF COMPUTERIZED TOMOGRAPHY

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Presenter: Jason C. Pooler, MD

Senior Sponsor: David L. Ciraulo, D.O.

Introduction: Computerized Tomography (CT) has evolved as an integral part in the evaluation of trauma patients. Trauma teams often act upon their independent interpretation of CT's without radiologist input for a variety of reasons. As an assessment of proficiency, the accuracy of senior (PGY4-5) surgical residents' interpretations of CT's was evaluated against that of final radiology reports.

Methods: This IRB approved prospective study was completed over a 4 month period (11/03-2/04). The CT's of 93 trauma victims (309 individual studies) were reviewed by senior surgical residents, independent of faculty input, and dictations performed. Final radiology CT reports were collected and scored. Critical comparisons were made comparing the residents' readings to the accepted accuracy of the Radiologists' dictations. Scoring categories were true positive (agreement between the readings), true negative (agreement that no trauma injury exists), false negative, (resident missed clinically significant injuries), false positive (over read by the resident). Strict criteria were used in interpreting results. For example, if the resident read a thorax CT as pulmonary contusion to one lung and the radiology report identified bilateral pulmonary contusions, that CT was scored as a false negative and not in agreement with the Radiologist. Additionally, strength of agreement between resident interpretation and final radiology report was analyzed using Kappa. Statistical significance is indicated by $p < 0.05$.

Results:

Study performed	N	Sensitivity	Specificity	PPV*	NPV #	Accuracy	Kappa **	p value of Kappa
CT head	86	92%	97%	86%	99%	97%	.868	< 0.001
CT neck	82	60%	99%	75%	97%	96%	.648	< 0.001
CT thorax	60	74%	100%	100%	86%	90%	.778	< 0.001
CT a/p+	81	80%	98%	95%	92%	93%	.818	< 0.001

*PPV – positive predictive value; #NPV – negative predictive value; +a/p – abdomen/pelvis;

**Kappa measure of strength of agreement is evaluated as < 0.20 Poor, 0.21-0.40 Fair, 0.41-0.60 Moderate, 0.61-0.80 Good; 0.81-1.00 Very good.

Conclusions: Sensitivities are lower than expected because of the strict criteria used to measure missed injuries. High specificities reflect senior surgical residents' skill at recognizing true negatives and reflect a developing ability at interpreting CTs without assistance. Senior surgical residents CT interpretations have demonstrated ample agreement with final radiology reports as evidenced by moderate to very good Kappa values.

Notes

A SINGLE BOLUS OF 3% HYPERTONIC SALINE WITH DEXTRAN PROVIDES OPTIMAL RESUSCITATION AFTER UNCONTROLLED HEMORRHAGIC SHOCK

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Presenter: Jennifer M. Watters, M.D.

Senior Sponsor: Martin A. Schreiber, M.D.

Introduction: The optimal fluid quantity and composition for the treatment of hemorrhagic shock is not known. An ideal fluid for early resuscitation would restore perfusion without increasing blood loss, hypothermia, acidosis, or coagulopathy. This study sought to examine the effects of a single bolus of hypertonic saline (HTS) with or without (\pm) dextran (D) following uncontrolled hemorrhagic shock (UHS) and to determine the optimal fluid composition.

Methods: 50 female Yorkshire crossbred swine were anesthetized and underwent invasive line placement, celiotomy, splenectomy, and suprapubic catheterization. Following a 15-minute stabilization period, a grade V liver injury was created. After 30 minutes of UHS, blinded resuscitation was initiated with a single 250cc fluid bolus. Animals were randomized to 5 groups: normal saline (NS), 3% HTS (3%), 3% HTS/6% D (3%/D), 7.5% HTS (7.5%), or 7.5% HTS/6% D (7.5%/D). Mean arterial pressure (MAP) and tissue oxygen saturation (StO₂) were continuously monitored. Laboratory data were collected every 30 minutes. Animals were sacrificed 120 minutes after injury. ANOVA was used to compare groups. Significance was defined as $p < 0.05$.

Results: Baseline weight (33kg), baseline MAP, number of central veins injured, nadir MAP, and nadir StO₂ were similar in all groups. Two NS and two 3% animals did not survive. Fluids containing dextran produced a significantly greater increase in MAP ($p < 0.02$). Animals receiving 3%/D maintained a higher MAP 90 minutes after fluid bolus. 7.5% \pm D produced a significantly greater initial increase in StO₂ ($p < 0.05$). This effect declined within 15-30 min while 3%/D continued to improve tissue oxygenation throughout the study. Primary (23.3 ± 5.7 cc/kg) and secondary (1.8 ± 0.9 cc/kg) blood loss and resuscitation volumes (7.3 ± 0.7 cc/kg) were equal in all groups. 7.5% \pm D animals produced significantly more urine than any other group ($p < 0.03$). Baseline laboratory values were similar in all groups. After resuscitation, significant differences developed between groups in hematocrit, fibrinogen, urine Na, serum Na, and serum Cl.

120 min values	NS	3%	3%/D	7.5%	7.5%/D
HCT	23.8 \pm 3.0 bde	22.4 \pm 2.7 bde	19.6 \pm 2.1 abc	20.7 \pm 2.2 ab	16.7 \pm 2.7 f
Fibrinogen	161 \pm 47 b	186 \pm 54 b	150 \pm 47	185 \pm 51 b	127 \pm 31 ce
Urine Na	144 \pm 3 be	147 \pm 3 be	146 \pm 3 be	153 \pm 5 acd	154 \pm 3 acd
Serum Na	136 \pm 2 f	139 \pm 1 abe	140 \pm 1 abe	147 \pm 1 acd	148 \pm 1 acd
Serum Cl	107 \pm 3 bde	109 \pm 4 be	111 \pm 3 abe	118 \pm 5 acd	120 \pm 4 acd

$p < 0.05$ a: v NS, b: v 7.5%/D, c: v 3%, d: v 3%/D, e: v 7.5%, f: v all others

Conclusions: A single bolus of 3%/D following uncontrolled hemorrhagic shock produces an adequate and sustained rise in mean arterial pressure and tissue oxygen saturation. Resuscitation with 7.5% \pm D produces significantly increased urine output. This may account for the decline in mean arterial pressure and tissue oxygen saturation in these groups over time. A single bolus of 7.5%/D results in significant dilutional anemia and hypofibrinogenemia.

Notes

THE DECREASING INCIDENCE AND MORTALITY OF POSTINJURY ARDS: A 5-YEAR PROSPECTIVE STUDY

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Presenter: Matthew J. Martin, MD

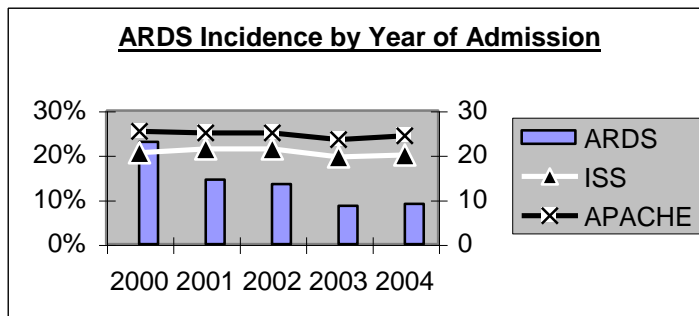
Senior Sponsor: James Murray, M.D.

Introduction: Adult respiratory distress syndrome (ARDS) after major trauma has been associated with increased morbidity and mortality rates. Recently there have been marked advances in defining etiologic factors and optimal management strategies for ARDS. We sought to examine whether there has been a corresponding change in the incidence and outcomes of postinjury ARDS in recent years.

Methods: A prospective observational study of all adult trauma ICU admissions over 5 years. Patients were evaluated daily for predefined ARDS criteria. Patient data, illness and injury severity, and ARDS incidence were compared by year of admission. Logistic regression analysis was used to identify independent predictors of ARDS and mortality.

Results: There were 1931 patients identified, the majority were male (79%) and suffered blunt trauma (62%). 274 patients (14%) met criteria for ARDS. The incidence of ARDS showed a significant decline from 23% in 2000 to rates of 8.4% and 9% for 2003 and 2004 ($p < 0.01$). There was no significant difference by year for trauma mechanism, age, gender, ISS, APACHE, ICU length of stay, or mortality (see figure). The strongest independent predictor of ARDS was year of ICU admission, with an odds ratio of 2.9 (95% CI 1.7 – 5.0) for admission in 2000 vs subsequent years ($p < 0.001$). After adjusting for age and injury severity, patients with ARDS had more days on mechanical ventilation as well as longer hospital and ICU stays (all $p < 0.01$), but there was no significant difference in mortality with or without ARDS ($p = 0.57$).

Conclusions: There has been a greater than 50% reduction in the incidence of postinjury ARDS over the past 5 years in our institution despite similar patient demographics and injury severities. Development of ARDS increased hospital and ICU stays but not hospital mortality.



Notes

WHO HAS LIFE SUSTAINING THERAPY WITHDRAWN AFTER SEVERE INJURY

LS Watch, CR Schermer, S Saxton-Daniels
University of New Mexico

Presenter: Libby S. Watch

Senior Sponsor: Carol R. Schermer, M.D., M.P.H.

Background: Trauma scoring systems have been developed to help surgeons predict who will die after injury. However, some patients may not actually die of their injuries but may undergo withdrawal of life sustaining therapy (WLST). The goal of this study was to determine factors associated with WLST for older trauma patients. We hypothesized that 1) patients with co-morbid illnesses, higher injury severity scores (ISS), complications, and existing advanced directives (AD) would be more likely to have WLST and 2) patients having WLST would receive more medication for symptom relief in the 24 hours prior to death.

Methods: Data were collected via a retrospective chart review of patients age 55 and older admitted to the ICU after injury. In addition to demographic and injury information, formal ADs and documentation of family discussions regarding care wishes were evaluated. Patients dying despite curative attempts were compared to those who underwent WLST by t-test and Chi-square where appropriate.

Results: In a 3-year period, of 330 patients age 55 and older admitted to the ICU, 66 (20%) died. Complete records were available for 64 patients. More than half (n=35, 54.7%) had WLST. ADs were available for 15 patients (23.4%), and 11 (17.2%) patients had expressed to their families desires to not undergo aggressive curative care. Family discussions were documented for 50 (78%) cases. Co-morbid illnesses were present in 45 (70.3%) patients and 35 (54.7%) developed at least one complication. The table shows the associations of factors with WLST.

N= 64	WLST n=35	Death despite Curative Attempts n=29	p-value
Age (mean years)	72.9	74.8	0.59
ISS (mean)	28.0	23.2	0.21
Any Co-morbid illness (%)	23 (51%)	22(49%)	0.40
Any Complication (%)	20 (57%)	15 (43%)	0.80
Advanced Directives (%)	11 (73%)	24 (49%)	0.14
Family Discussion (%)	32 (64%)	3 (21%)	0.006
MSO4 equivalents 24 hours (mg)	103.7	43.1	0.03
Benzodiazepine 24 hours (mg)	16.2	25.4	0.05

Conclusions: Expected associations with WLST such as age, ISS, co-morbidities, and complications were not present in this population. Although trends may exist regarding patient wishes and ADs, larger studies are needed to corroborate these findings. Given the percentage of patients having supportive care withdrawn, trauma registries and scoring systems should include WLST.

Notes

RECOMBINANT ACTIVATED FACTOR VII: AN ADJUNCT TO DAMAGE CONTROL IN THE COAGULOPATHIC TRAUMA PATIENT

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David Grant USAF Medical Center, Sutter Roseville Medical Center

Presenter: Mark Gunst, MD

Senior Sponsor: George R. Dulabon, M.D.

Introduction:

Uncontrollable hemorrhage and coagulopathy are major causes of morbidity and mortality in trauma patients. An ideal hemostatic agent would result in rapid hemostasis at the site of injury, without systemic activation of the coagulation cascade and would therefore reduce the complications associated with massive transfusion. Recombinant activated factor VII (rFVIIa) is approved for use in hemophiliacs, however its use in the trauma setting has been relatively limited, presumably due to the potential for thromboembolic events. We report on our experience with the use of rFVIIa in coagulopathic patients in the setting of major trauma.

Patients and Methods:

We conducted a retrospective chart review of 24 trauma patients who received rFVIIa. Of the 24 patients, the mechanism of injury involved blunt trauma in 20, predominantly motor vehicle and motorcycle accidents. Four were admitted after penetrating trauma. Eight patients required either surgical intervention or angiographic embolization. Most patients received between one and three doses of rFVIIa. All patients had prolongation of the INR with evidence of ongoing blood loss. We compared the coagulation profiles as well as the transfusion requirements before and after administering each dose of rFVIIa. In addition, we reviewed the charts for any thromboembolic complications. Thirteen of the 24 patients underwent surveillance duplex of the lower extremities to evaluate for deep venous thrombosis and 4 underwent a diagnostic pulmonary arteriogram.

Results:

A total of 24 patients received rFVIIa. The mean PT, PTT, and INR prior to giving each dose were 23.37, 52.04, and 2.308, respectively. Following administration of rFVIIa, the mean PT, PTT, and INR decreased to 13.14 ($p=0.0016$), 42.08 ($p=0.1482$), and 0.998 ($p=0.0019$), respectively. The transfusion requirements were significantly reduced from a mean 7.5 units of packed red blood cells transfused to 2.0 units transfused ($p=0.0017$) after the rFVIIa was administered. There were no thromboembolic complications identified in our series. Nine of the 24 patients died from their injuries or complications during their hospitalization. Of the nine fatalities, seven suffered severe traumatic brain injuries. The remainder died as a consequence of multi organ system failure.

Conclusion:

The use of rFVIIa can safely and effectively be used as an adjunct to reverse coagulopathy in trauma patients. The efficacy of rFVIIa seems to be superior in trauma patients with dilutional coagulopathy after massive transfusion. In addition to rapidly correcting coagulopathy, the use of rFVIIa decreases the transfusion requirements and aids in quickly arresting the shock state. In our experience, there were no thromboembolic events associated with the use of rFVIIa.

Notes

URGENT PREHOSPITAL ENDOTRACHEAL INTUBATION DOES NOT CAUSE INCREASED SEPTIC MORBIDITY

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Presenter: Susanne Tracy, M.D.

Senior Sponsor: Dennis W. Vane, M.D.

PURPOSE: Recent studies indicate that pre-hospital endotracheal intubation (EI) is associated with increased septic morbidity. Because the decision to intubate in the field is considered a life-sustaining mandate we analyzed our experience to validate these reports and to compare field intubation to that done in more controlled circumstances on patient arrival at the trauma center.

METHODS: The registry of our Level 1 Trauma Center was queried from January 2002 through December 2003 for patients who required emergent endotracheal intubation and had a hospital stay > 2 days. Patients were stratified by site of EI into pre-hospital (PHEI) and trauma center intubation (TCEI). Demographic data (age, gender, GCS, ISS) as well as outcome measures (incidence of pneumonia (PNA), ICU stay (LOS ICU) and mortality) were compared between groups. Results were subjected to χ^2 or unpaired t-test, accepting $p < .05$ as significant.

RESULTS: The 527 patients requiring EI consisted of 228 in PHEI and 299 in TCEI. Within these groups, patients with PNA were comparable on the basis of the demographic data, incidence of PNA and injury severity.

	No (%)	Mort (%)	ISS	Vent days	LOS ICU
PHEI	67 (29)	10.4 *	30.7	20.8	18.2 [§]
TCEI	89 (30)	13.5 *	27.8	18.8	17.8 [§]

*p = NS per chi square [§] p = NS per t-test

Both demonstrated similar time of onset after injury, and had similar incidence of resistant organisms (46%).

CONCLUSIONS: These data demonstrate no increased risk of PNA for urgent pre-hospital intubation. Moreover, the onset of PNA and the similar bacteriology is reflective of injury severity and not of additional infectious risk posed by these pre-hospital life-saving maneuvers.

Notes

ABDOMINAL INSUFFLATION DECREASES BLOOD LOSS AND MORTALITY AFTER BLUNT LIVER INJURY

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M.D.; D WANG, M.D.

WASHINGTON HOSPITAL CENTER

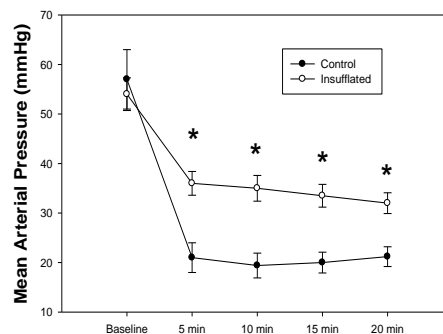
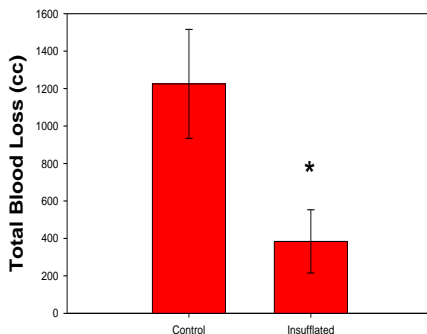
Presenter: Amin D. Jaskille, M.D.

Senior Sponsor: Anne G. Rizzo, M.D.

Background: Uncontrolled intra-abdominal bleeding is a common cause of death in trauma patients in the prehospital and perioperative settings. The detrimental effects of abdominal hypertension are well studied, but the potential therapeutic use of abdominal insufflation for hemostasis has not been fully explored. We measured the effect of abdominal insufflation on blood loss and physiologic outcomes in a swine model of blunt liver injury.

Methods: 21 anticoagulated swine (32 ± 3 Kg) were anesthetized, and laparotomy performed to localize liver anatomy and to allow placement of loose tourniquets isolating the porta hepatis and supra/intrahepatic vena cava. A captive bolt gun was used to create a grade V hepatic laceration, producing massive parenchymal injury as well as complex tears of the middle and right hepatic veins. Animals were randomized into either control (n=10) or abdominal insufflation at 20 cm H₂O pressure (n=11). Crystalloid was used to maintain a mean arterial pressure of 30 mm Hg. Arterial pressure and other physiologic variables were recorded for 20 minutes. Animals were then sacrificed and blood loss measured.

Results: Blood loss was 69% lower in insufflated animals compared to controls (384 ± 51 versus 1252 ± 88 cc, $p < 0.05$). After 20 minutes, insufflated animals had significantly higher mean arterial blood pressure (32.2 ± 2.1 vs 21.2 ± 2.0 mm Hg) and lower total resuscitation volume (195 ± 83 versus 1356 ± 95 cc). 3 pigs died in the control group (30%), while no insufflated animals died ($p < 0.05$).



Conclusion: In a swine model of catastrophic blunt hepatic injury, abdominal insufflation significantly decreases blood loss and mortality, and improves hemodynamics. Despite well documented deleterious effects, abdominal insufflation might be useful in the management of uncontrolled abdominal hemorrhage.

Notes

CORRELATION OF CLINICAL FINDINGS AND AUTOPSY RESULTS FOLLOWING FATAL INJURY FROM MOTOR VEHICULAR-RELATED ACCIDENTS

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University of Kansas School of Medicine – Wichita, Department of Surgery*; Via Christi Regional Medical Center, Trauma Department †; Sedgwick County Regional Forensic Science Center, Wichita, Kansas ‡

Presenter: Luke Y. Shen, M.D.

Senior Sponsor: R. Stephen Smith, M.D.

Introduction: Rapid assessment of trauma victims is essential to direct appropriate care and treatment. Unfortunately, there exists a population of trauma victims in which death is non-preventable. In the past, autopsy has served as the gold standard to prove diagnostic accuracy. Although a valuable contributor to medical education, information collected from autopsies are often underutilized and delayed.

Purpose: To determine the degree of concurrence between clinical findings and autopsy results of trauma patients involved in fatal vehicular-related accidents. To identify the potential impact of clinically significant and non-significant missed injuries on decedent outcome and survival.

Method: A retrospective chart review of trauma patients involved in a fatal vehicular-related accident and subsequently had an autopsy completed during a ten-year period was performed. Each patient was evaluated and treated at an American College of Surgeons Verified Level I Trauma Center. The clinical findings from the medical record and trauma registry and the autopsy results were reviewed and collected separately. The degree of concurrence was evaluated by utilizing the Goldman Classification System (I-V) for autopsy discrepancies. Goldman Class I and IV type errors represent major and minor injuries, respectively, which would have affected outcome or survival if the injuries had been identified clinically. Goldman Class II and III type errors represent major and minor injuries, respectively, which would not have affected the outcome or survival. A Goldman Class V type error represents complete concurrence between the pre-mortem clinical findings and autopsy results.

Results: A total of 207 decedents were included. Average age was 41 years (range: 10 – 92) and 63% were male. Average hospital length of stay was 57.5 hours. Injuries were severe as indicated by an average presenting Glasgow Coma Score (GCS) of 4.4, with >80% of patients arriving with a GCS of 3. The mean Injury Severity Score (ISS) was 38 with >93% of patients with ISS > 16, and average survival probability of 25.0%. Mechanism of injury included motor vehicle crashes (69.6%), pedestrian versus motor vehicle (15.7%), motorcycle (9.8%), and bicycle (4.9%). Total hospital time was <15 minutes in 29.0%, <6 hours in 59.4% and <24 hours in 73.9% of deaths. The location of death was the emergency room (43.0%), ICU (49.8%), operating room (5.4%), and hospital ward (1.0%). The major cause of death was attributed to cranial / traumatic brain injury, cardio-thoracic, and abdominal injuries. There were no major or minor discrepancies that may have altered therapy or survival of the decedent. A Class Q was designated for those situations where there was inadequate time to evaluate the injuries. As expected, there was an increasing trend of clinical accuracy of identifying traumatic injuries and a decreasing trend of Class Q with increasing hospital time prior to death.

Conclusion: Following ATLS protocols result in appropriate identification of clinically significant injuries of patients involved in motor vehicular-related accidents. The routine use of autopsy results offers little useful information to a mature Level I Trauma Program.

Notes

GOLF CART INJURIES

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Spectrum Health Butterworth Hospital

Presenter: Austin Goldsmith

Senior Sponsor: M. Ashraf Mansour, M.D.

Background: Golf carts are electric or gasoline-powered recreational vehicles designed to transport players on golf courses. Although these vehicles are only capable of reaching speeds of 15 miles per hour, falls, collisions, crashes and rollovers have been reported.

Purpose: Analysis of injury pattern, management and outcome of patients admitted to our Level I Trauma Medical Center following a golf cart associated injury.

Patients & Methods: From our trauma database, over a 16-year period, we identified 44 patients, 16 females (36%) and 28 males (average age: 59, range: 2 to 81) who were admitted for treatment of an injury sustained from a golf cart. The most common mechanism of injury was fall from a moving cart, collision or rollover.

Results: The injury categories were: 22 orthopedic, 14 traumatic brain, 4 pulmonary, 3 vascular and 3 intraabdominal organ. Alcohol intoxication was confirmed in two orthopedic and vascular cases. Fourteen patients had multisystem injuries and the average injury severity score was 7.7 for the entire group. There were 16 (36%) pediatric patients. Thirteen patients required open reduction internal fixation of their orthopedic injury. Two patients needed vascular repair of a lacerated vessel. One patient had a craniotomy to evacuate a subdural hematoma. The vast majority of patients were discharged home after an average length of stay of 4.9 days (range 1 to 35). One patient required a lower extremity amputation after a failed vascular and orthopedic reconstruction, and one patient died from a severe head injury.

Conclusion: Although golf cart associated injuries represent a small fraction of our trauma admissions, nearly half the patients require a surgical procedure. The majority of patients are discharged home after a short hospital stay; however, serious complications and even death may occur after those injuries. Safety restraints may play a role in preventing or decreasing the incidence of severe injuries.

Notes

UTILIZATION OF VENA CAVA FILTERS IN PEDIATRIC TRAUMA PATIENTS: DATA FROM THE NATIONAL TRAUMA DATA BANK

A. Cook, MD, S. Shackford, MD, T. Osler, MD, K. Sartorelli, MD, B. Littenberg, MD
University of Vermont College of Medicine

Presenter: Alan Cook, MD

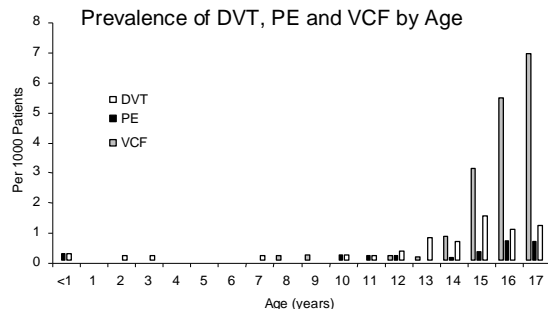
Senior Sponsor: Steven R. Shackford, M.D.

Background: Placement of vena cava filters (VCF) in high-risk adult trauma patients is a well-described intervention for prophylaxis against pulmonary embolism (PE) due to venous thromboembolism (VTE). Few data exist regarding the utilization of VCF in pediatric trauma. This study describes the current practice of VCF placement in pediatric trauma nationally.

Methods: We performed a retrospective cohort analysis using the National Trauma Data Bank (NTDB). Patients 17 years old or younger were identified. Data regarding demographics, injuries, hospitalization, survival, and treating institution were analyzed. The prevalence of deep vein thrombosis (DVT), PE and VCF placement were calculated. Odds ratios (OR) for predictors of VCF placement were determined using multivariate logistic regression.

Results: There were 116,357 pediatric trauma patients entered into the NTDB between 1988 and 2003. Of those, 214 (0.18%) received a VCF. The prevalence of DVT, PE, and VCF increases with age. See figure. VCF patients had longer mean hospital (23.99 vs. 4.12 days) and intensive care unit (ICU) stays (13.65 vs. 1.12 days) and had more severe injuries (mean ISS 30.89 vs. 9.04) than those without VCF. University-associated teaching hospitals placed 72.4% (95% CI 65.9-78.3%) of VCF and Level I trauma centers placed 46.3% (95% CI 39.4-53.2) of VCF. In multivariate analysis, VCF placement was associated with increasing age (OR 1.986, $P < 0.001$), Injury Severity Score (ISS) (OR 1.05, $P < 0.001$), probability of survival (Ps) (OR 10.52, $P = 0.012$), length of stay (LOS) (OR 1.017, $P = 0.011$), and ICU stay (OR 1.041, $P = 0.001$). The presence of spinal cord injury increased the likelihood of VCF placement (OR 15.279, $P < 0.001$), as did severe femur fracture (OR 3.391, $P < 0.001$), and lower extremity deep vein thrombosis (DVT) (OR 33.126, $P < 0.001$). Higher Glasgow Coma Score (GCS) decreased the likelihood of VCF placement (OR 0.87, $P = 0.002$).

Conclusion: The placement of VCF in pediatric trauma patients is uncommon and is associated with several characteristics of the patient, the injury, and the treating institution. The efficacy of VCF in the pediatric trauma population is not known and their application in this group requires further investigation.



Notes

REASONS TO OMIT DIGITAL RECTAL EXAM IN TRAUMA PATIENTS: NO FINGERS, NO RECTUM, NO USEFUL ADDITIONAL INFORMATION

T. Esposito, A. Ingraham, F. Luchette, B. Sears, J. Santaniello, K. Davis, S. Poulakidas, R. Gamelli

Loyola University Medical Center and the Burn Shock Trauma Institute

Presenter: Thomas J. Esposito

Senior Sponsor: James W. Davis, M.D.

Introduction: Performance of digital rectal exam (DRE) on all trauma patients during the secondary survey has been advocated by the ATLS® course. However, there is no clear evidence of its efficacy as a diagnostic test for traumatic injury. The purpose of this study is to analyze the value of a policy mandating DRE on all trauma patients as part of the initial evaluation process and to discern whether it can routinely be omitted.

Methods: Prospective study of patients treated at a Level I Trauma Center. Clinical indicators (OCI) other than DRE denoting GI bleeding (GIB), urethral disruption (UD) or spinal cord injury (SCI) were sought and correlated with DRE findings suggesting the same. Impression of the examining physician as to the need and value of DRE was also studied. Patients with a GCS=3 and pharmacologically paralyzed were excluded from the SCI analyses. UD analysis included only males.

Results: 512 cases were studied, 72% male 28% female ranging in age from 2 mo. to 102 yrs. 30 index injuries (II) were identified in 29 patients (6%), 17 SCI (3%), 11 GIB (2%), 2 UD (0.4%). DRE findings agreed positively or negatively with one or more OCI of II in 93 % of all cases (92% seeking SCI, 90% seeking GIB, 96 % seeking UD). Overall, NPV of DRE was the same as that of OCI, 99% (SCI 98% vs 99%, GIB, 97% vs 99%, UD both 100%). PPV for DRE was 27% and for OCI 24% (SCI 47% vs 44%, GIB 15% vs 18% UD 33% vs 6%). Efficiency of DRE was 94% and OCI 93%. For confirmed II, indicative DRE findings were associated with 41% and OCI 73% (SCI 36% vs 79%, GIB 36% vs 73%, UD 50% vs 100%). OCI were present in 81% of II cases. In all II cases where OCI were absent, positive DRE findings were also absent. DRE was felt to give additional information in 5% of all cases and change management in 4%. In cases where the clinician felt DRE was definitely indicated (29%) it reportedly gave no additional information in 85% and changed management in 11%.

Conclusion: DRE is equivalent to OCI for confirming or excluding the presence of II. When II are demonstrated, OCI is more likely to be associated with their presence. DRE rarely provides additional accurate or useful information that changes management. Omission of DRE in virtually all trauma patients is permissible, safe and advantageous. Routine elimination of DRE from the secondary survey will conserve time and resources, minimize unpleasant encounters and protect patients and staff from the potential for further harm without any significant negative impact on care and outcome.

Notes

IS HYPOTHERMIA SIMPLY A MARKER OF SHOCK AND INJURY SEVERITY, OR AN INDEPENDENT RISK FACTOR FOR MORTALITY? AN ANALYSIS OF A LARGE NATIONAL TRAUMA REGISTRY (NTDB)

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Presenter: S. Shafi

Senior Sponsor: Larry M. Gentilello, M.D.

Successful application of induced hypothermia (HT) after stroke and cardiac arrest has led to resurgence of interest in its use as a therapeutic modality in trauma patients. Multiple animal studies have established that mild HT reduces cytokine production and improves survival after hemorrhagic shock. Although clinical studies demonstrate an adverse effect, they consist of small studies from single institutions. We tested the hypothesis that HT is associated with increased survival in trauma patients by analyzing a large, national trauma database.

Methods: The study group included all patients in the National Trauma Data Bank (1994-2002) aged 18-55 yrs with ED core temperature and base deficit (BD) recorded. HT ($T < 35^{\circ}\text{C}$, $n=3267$) and normothermic (NT, $n=35,283$) patients were compared. Two analyses were conducted to control for the association between HT and injury severity. HT and NT patients were first stratified by injury severity score (ISS) and shock (ED BP ≤ 90) (Table). Next, logistic regression was used to control for effects of age, gender, mechanism, ISS, head, chest, abdominal injuries, initial BP, GCS and BD, with survival as the dependent and HT as the predictor variable.

Results: Although HT was more common in more seriously injured patients, stratified analysis revealed that HT patients have significantly higher mortality than patients with the same severity of injury who remain NT. Even after controlling for injury severity and multiple

ISS	Shock	N	NT (% alive)	HT (% alive)	p-value
1-9	> 90 mmHg	16914	99	97	<.001
	≤ 90 mmHg	535	96	90	.033
10-16	> 90 mmHg	6960	98	94	<.001
	≤ 90 mmHg	334	89	76	.008
17-25	> 90 mmHg	7198	92	80	<.001
	≤ 90 mmHg	522	82	55	<.001
26-34	> 90 mmHg	3424	87	80	<.001
	≤ 90 mmHg	403	72	62	.059
≥ 35	> 90 mmHg	1836	73	64	.001
	≤ 90 mmHg	424	50	40	.051

other potential confounders listed above, HT remained a strong, independent predictor of mortality (OR 1.25, 95% C.I. 1.10 - 1.41)

Conclusion: There is no apparent protective effect of HT in trauma patients. HT itself, not just its association with shock, injury severity and other co-factors, leads to a significant increase in mortality in injured patients. Continued, aggressive efforts to prevent and treat HT are warranted.

Notes

OUTCOME EFFECTS OF A CLINICAL PROTOCOL FOR MANAGEMENT OF SEVERE BRAIN INJURY AT A LEVEL ONE TRAUMA CENTER

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Presenter: Mark H. Stevens

Senior Sponsor: Scott R. Petersen, M.D.

Introduction: In 1997, the trauma service at an ACS verified Level I trauma center began utilization of a standardized protocol in the management of all head-injured patients admitted to Shock Trauma ICU (STICU). Our study purpose was to examine the effect of protocol adoption on practice and outcomes.

Methods: Traumatic brain injured (TBI) patients admitted to STICU (1995-2000) were studied. GCS,ISS and status at discharge were determined. Use of intracranial pressure (ICP) monitoring devices and values for both ICP and CPP were obtained to describe practice trends. We compared the group of patients admitted 3 years prior to protocol implementation with patients admitted during the 3 year period following protocol implementation. The groups were compared with respect to use of ICP monitor, ICP value, length of stay (LOS) functional outcome, and mortality.

Results: The two groups were similar in respect to GCS and ISS. During study years, 216 patients (28.9%) had ICP monitoring. ICP use increased significantly after protocol institution in those patients with GCS less than 6. Variability of ICP values was greater in non-survivors than survivors, both before and after protocol adoption. CPP variability in survivors was not changed by protocol use, but variability in non-survivors was greater during protocol use. Prior to protocol initiation, 34% of patients died and 10% had severe disability at the time of discharge. After protocol initiation, 23% of patients died and 23% had severe disability. Days in ICU and hospital LOS were unaffected by protocol use.

Conclusions: ICP monitor use increased in patients with more severe TBI after protocol adoption. Variability in CPP measurements increased in the most seriously injured patients after protocol initiation, likely reflecting increased efforts to maintain CPP values in this seriously injured group by supporting mean blood pressure. Adoption of protocol use in the ICU for brain injured patients improved standardization of care. Though there was a non-statistically significant trend toward lower overall mortality, there was also a concomitant increase in the number of patients discharged with severe disabilities. We found no evidence that institution of the protocol increased the chances of leaving the hospital alive and without severe disability following traumatic brain injury.

Notes

THE INEFFICIENCY OF PLAIN RADIOGRAPHY TO EVALUATE THE CERVICAL SPINE AFTER BLUNT TRAUMA

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Presenter: Stephen Gale, MD

Senior Sponsor: Vincent H. Gracias, M.D.

Background: Controversy persists regarding the most efficient and effective method of cervical spine evaluation after blunt trauma. Historic guidelines for patients undergoing computed tomography (CT) of the head advocate imaging C1-C2 as part of that study. For the remaining cervical spine, plain cervical spine radiographs (CSR) with supplemental CT are recommended (www.east.org/tpg.html, accessed 10/14/04). Patient charges are the same for segmental versus complete cervical spine CT. Many patients who require head CT also undergo supplemental cervical spine CT after plain CSR which leads to separate, discontinuous cervical spine CT scans. We sought to determine the incidence of this in our population and hypothesized that a majority of patients who undergo head CT have inadequate cervical spine evaluation based on plain CSR and require supplemental CT scanning.

Methods: The EAST guidelines for cervical spine evaluation after blunt trauma were previously adopted and followed during the study period 12/1/2002 to 7/1/2003. Our protocol included cross-table lateral and anteroposterior CSR with C1-C2 imaged with the head CT and the use of supplemental cervical spine CT for regions inadequately visualized by plain films or suspicious for fracture. Clinical cervical spine examination was performed before cervical collar removal, irrespective of radiographic evaluation. The electronic charts of 848 consecutive blunt trauma victims were retrospectively reviewed. The data abstracted included demographics and injury severity score (ISS), as well as the use and results of head CT and radiographic evaluation of the cervical spine.

Results: Of 848 consecutive blunt trauma patients, 716 (84.4%) underwent head CT. Average age was 44 years and average ISS was 9. Seventy-six patients (11.6%) had clinical cervical spine examination alone while 640 (89.4%) underwent plain CSR. In 178 patients (27.8%) plain 2-view CSR visualized the entire cervical spine and excluded injury. Plain CSR were inadequate to visualize the complete cervical spine in 462 patients (72.2%) patients. Of these patients, segmental CT was performed in 400 (87.6%). The remaining 62 (13.4%) patients did not have radiological completion of their cervical spine evaluation before clinical examination. Nineteen patients (3.0%) had cervical spine fractures diagnosed on CT of which only 6 (31.6%) were seen on plain CSR. The sensitivity and specificity of CSR to detect fractures was 31.6% and 98.6% respectively.

Conclusions: Plain CSR are often inadequate to fully evaluate the cervical spine after blunt trauma. Complete cervical spine CT is available, efficient, and accurate. This modality should be used for all blunt trauma patients who require radiographic evaluation of the cervical spine.

Notes

THE CREATION OF A GERIATRIC TRAUMA UNIT: WOULD WE ACHIEVE BETTER OUTCOMES?

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St. Francis Hospital & Medical Center

Presenter: Manuel Lorenzo MD

Senior Sponsor: James W. Davis, M.D.

Background: The percentage of elderly people in our population is dramatically increasing and the trauma care we provide to them has not been customized to their unique health requirements. Do patient outcomes improve if we admit patients to a specialized geriatric unit in the trauma center? The purpose of this study is to compare two populations of geriatric trauma patients, one which went initially to a step-down area and the other to the regular ward.

Methodology: A retrospective review of the trauma registry evaluating the geriatric trauma patients admitted to a Level One trauma center in a 1.5 year period was done (2002-03). The geriatric population was defined as patients with an age above 55 years. Data included length of stay, ISS, GCS, discharge status, and mortality. T-test and Chi square statistical analyses were used.

Results: A sample of 165 patients was included in the study. Descriptive statistics showed a mean age of 75 years old, an ISS of 11.95, a GCS of 14.28 and a hospital length of stay of 9.09 days. Forty-four percent were females and fifty-six percent were males. T-test analysis showed a significant difference in the ISS between the two groups ($p < .001$).

	<u>LOS</u>	<u>ISS</u>	<u>Mortality</u>	<u>GCS</u>	<u>Discharge Status</u>	
					<u>Home</u>	<u>Facility</u>
Unit	12.5	14.9	0%	14.9%	29%	68%
Ward	7.28	8.28	4.2%	14.9%	59%	32%

Conclusion: The geriatric trauma population has been shown to demand a high percentage of the health care system resources. We found that patients who were transferred initially to the step-down unit, even with a higher ISS, had a lower mortality rate, although not statistically significant with this sample size. Further studies are required to evaluate the effectiveness of managing geriatric trauma patients in these specialized units.

Notes

**PROSPECTIVE EVALUATION OF SCREENING MULTISLICE HELICAL
COMPUTED TOMOGRAPHIC ANGIOGRAPHY IN THE INITIAL EVALUATION OF
PENETRATING NECK INJURIES**

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Ryder Trauma Center (KI,FM,MM,LR,EM,MD,HB), University of Miami School of Medicine, Miami, Florida and Department of Surgery (SC), University of Texas Health Science Center, San Antonio, Texas

Presenter: Kenji Inaba, MD

Senior Sponsor: Stephen M. Cohn, M.D.

Background: The optimal management strategy for stable patients with penetrating neck injury remains controversial. The objective of this study was to prospectively assess Multislice Helical CT Angiography (M-CTA) as a stand alone screening modality for the initial evaluation of hemodynamically stable patients with penetrating neck injuries. Our hypothesis was that M-CTA is a sensitive, solitary diagnostic screening test that could non-invasively evaluate the vascular, aerodigestive and bony structures of the neck.

Methods: After IRB approval, all penetrating neck injuries assessed over a 7 month time period were prospectively evaluated at a Level I Trauma Center. Patients without an indication for urgent neck exploration underwent M-CTA screening. M-CTA accuracy was tested against an aggregate gold standard of final diagnosis encompassing all imaging, surgical procedures and clinical follow-up obtained.

Results: 51 injuries penetrated the platysma; 7 required urgent exploration and 44 underwent M-CTA (16 GSW/28 SW). 8 external wounds were in zone 1, 15 in zone 2, 5 in zone 3 and 16 traversed multiple zones. Follow-up was achieved in 90.5% of patients for a mean of 40.3 days (range: 7-196). M-CTA was non-diagnostic in 4.5% secondary to artifact from retained missile fragments. M-CTA achieved 100% sensitivity and 89.3% specificity in detecting all vascular, aerodigestive and bony injuries sustained. M-CTA correctly identified 2 tracheal and 2 carotid artery injuries requiring operative and endovascular repair in asymptomatic patients. No injuries requiring intervention were missed by M-CTA.

Conclusion: In the initial evaluation of stable penetrating neck injuries, Multislice CT Angiography appears to be a sensitive and safe screening modality.

Notes

IGA MODULATES INFLAMMATORY RESPONSES IN AN IN VITRO MODEL OF PNEUMONIA

LN Diebel, MD, DM Liberati, MS, CA Diglio, PhD, WJ Brown, PhD
Wayne State University - Surgery

Presenter: Lawrence N Diebel, MD

Senior Sponsor: Lawrence N. Diebel, M.D.

Introduction

Preservation of mucosal immunity has been shown to effect the risk and outcome of pneumonia in severely injured patients. Secretory immunoglobulin A (SIgA) is the principle humoral defense of mucosal surfaces in the body and has several anti-inflammatory properties. Neutrophils (PMN) function to kill invading microorganisms but their exaggerated inflammatory responses may cause tissue injury to the host. The purpose of this study was to compare the ability of different immunoglobulin (Ig) isotopes to modulate PMN cytotoxic potential co cultured with respiratory epithelial cells challenged with bacteria.

Methods

Calu-3 cell monolayers were established on membranes (0.1 μ pore) in a two-chamber culture system. *E. coli* (EC) incubated with either polyclonal SIgA or IgG was inoculated into the apical chamber and PMNs (10^6 /ml) added to the basal chamber. PMN cytotoxic potential was indexed by % CD11b expression, superoxide anion (O_2^-) production and % elastase release. Dextran flux was used to index Calu-3 monolayer permeability.

Results (m \pm S.D, n = 5, 3 hr data

	Group (Gp)	% CD11b	O_2^-	% Elastase
I	PMN/Calu-3	50.4 \pm 2.9	3.2 \pm 0.8	5.8 \pm 0.5
II	PMN/Calu-3/EC	128.5 \pm 6.0*	12.9 \pm 1.1*	17.0 \pm 1.1*
III	PMN/Calu-3/EC + IgG	118.6 \pm 5.2*	13.6 \pm 2.6*	16.0 \pm 0.8*
IV	PMN/Calu-3/EC + SIgA	46.5 \pm 2.5	8.3 \pm 1.6	7.4 \pm 0.8

* p < 0.001 vs. Gp I or IV by ANOVA, Calu-3 monolayer permeability was the highest at 3 hr in Gp II and III

Conclusion

PMN cytotoxic potential was decreased by the presence of SIgA but not IgG in an *in vitro* model to simulate pneumonia *in vivo*. SIgA may not only function to protect against microbial invasion of mucosal surfaces but may also protect against tissue injury from an exaggerated inflammatory response.

Notes

**BRIEF INTERVENTION VS. PERSONALIZED FEEDBACK FOR YOUNG ADULT
PROBLEM DRINKING IN EMERGENCY CARE: A RANDOMIZED CONTROLLED
TRIAL**

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1 Providence VA Medical Center, 2 Brown University Center for Alcohol and Addiction Studies,
3 Brown University Medical School/Rhode Island Hospital

Presenter: Peter M. Monti, Ph.D.

Senior Sponsor: Carol R. Schermer, M.D., M.P.H.

Background: Alcohol consumption is a primary cause of accidental injuries among young adults. However, no brief alcohol intervention that can be used in medical settings with this population exists. This randomized controlled clinical trial assessed the efficacy of a brief intervention delivered in an emergency care setting, relative to a personalized feedback-only control, for reducing alcohol use and alcohol-related problems among young adults.

Methods: Patients were assessed immediately before and 6 and 12 months after delivery of the intervention. Participants were 215 emergency care patients who were either alcohol positive upon admission to the emergency care unit (via blood test or self-report) or met criteria for alcohol problems on the AUDIT. The average age of the sample was approximately 21 years. Patients were randomized to receive either a one session motivational intervention (MI; 30-45 minutes; n = 104) or a computer generated personalized feedback sheet only (FO; n = 111). All patients received boosters one month and three months after the initial session.

Results: Using intent-to-treat analyses, MI consistently and robustly reduced alcohol consumption. After controlling for baseline variables, MI patients drank on fewer days, had fewer heavy drinking days, and drank fewer drinks per week at 6 months than did FO patients. These effects were maintained at 12 months. MI and FO patients did not report significantly different rates of alcohol-related problems, drinking and driving, or alcohol-related injuries at the 6 or 12-month follow-ups.

Conclusion: This brief intervention holds promise as a means to reduce subsequent alcohol consumption among high-risk young adults.

This study was funded by the National Institute on Alcohol Abuse and Alcoholism.

Notes

EFFECT OF A GRADUATED DRIVER LICENSING SYSTEM ON THE PROPORTION OF CRASHES AND INJURIES INVOLVING DRIVERS UNDER AGE 18

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Presenter: Robert E. O'Connor, M.D., MPH Senior Sponsor: Gregory J. (Jerry) Jurkovich, M.D.

Purpose: Motorists less than 18 years -of-age account for disproportionately more crashes including those that result in injury, hospitalization or death. Many advocate policy changes to reduce the proportion of crashes involving this age group. We conducted this study to determine whether a graduated driver licensing program is associated with a reduction in the proportion of crashes in which 16 and 17 year-old drivers were involved and injured.

Methods: This is a before-and-after study. A graduated driver's licensing program was instituted in 1999, that required newly licensed 16 and 17 year-olds to drive only when supervised, with no nighttime driving, limits on number of other passengers, and zero -tolerance blood alcohol rules. The study population included drivers aged 16 and 17 who had either a learner's permit, or driver's license. Data was collected from crash reports, EMS run sheets, and hospital records from 1998 to 2002. Outcome measures included injury, EMS transport, hospitalization, death, hospital charges and length of stay. Descriptive statistics and logistic regression were used. Rates were calculated per 100,000 drivers less than 18 years -of-age.

Results: The rates per 100,000 decreased after the graduated license program implementation for death (49 to 24), hospitalization (203 to 119), and injury (3645 to 2430). ($p < 0.001$) The average hospital charges decreased from \$11,621 to \$10,860. ($p = 0.02$) The proportion with traumatic brain injury decreased from 52% to 41%. ($p = 0.01$) Regression analysis showed there to be a significant reduction in nighttime crashes, and those involving cars with passengers. There was no change in the proportion of crashes involving alcohol.

Conclusions: A graduated licensing program for drivers less than 18 years of age resulted in a reduction in deaths, hospitalizations and injuries. There was also a reduction in mean hospital charges and in the proportion of patients with traumatic brain injury. Factors associated with these reductions included a lower odds ratio for nighttime crashes, and those involving multiple passengers.

Notes

IMPROVING OUTCOMES IN A REGIONAL TRAUMA SYSTEM - IMPACT OF A LEVEL III TRAUMA CENTER

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Presenter: Michael L Barringer, M.D.

Senior Sponsor: Preston Miller, M.D.

A retrospective study was conducted to determine the effect of referring hospitals trauma designations on the mortality and resource utilization of patients transferred to a Level I trauma center.

NTRACS data on patients transferred from other hospitals to a Level I trauma center during a 6 year period (1996-2002) were subdivided into three categories: Group 1 – Level III designated trauma center; Group 2 – Potential Level III trauma centers; Group 3 - Hospitals without size and resources necessary for being designated. TRISS methodology was utilized to provide a probability estimate of survival and to adjust for the effect due to injury severity and physiological host factors. The W statistic was calculated for each type of referring hospital to gauge the number of patients per hundred that survived above what the TRISS model predicted. Differences in W, length of stay (LOS), ICU days and ventilator days were examined with general linear models.

Differences by hospital type are summarized in the table below:

	Group 1 (n=329)	Group 2 (n=1305)	Group 3 (n=1109)	p-value
TRISS	.724	.839	.859	.0001**
W Statistic	11.2	5.7	5.5	.0018**
LOS*	8.74	9.23	9.53	.7523
ICU Days*	3.10	3.16	3.18	.9776
Vent. Days*	2.71	2.85	2.92	.9232

* Risk adjusted for TRISS and survival

** Group 1 value is statistically different than values for Groups 2 and 3 at alpha=.05 level

Mortality outcomes of patients transferred to a Level I trauma center were significant influenced by the referring hospital's trauma designation. Patients transferred from a Level III trauma center (Group 1) were more seriously injured and had improved survivals compared to those from non-designated hospitals (Groups 2 and 3). Patients transferred by large non-designated hospitals (Group 2) had outcomes similar to patients transferred hospitals lacking resources necessary to become designated (Group 3). Resource utilization among hospital types did not show significant differences.

Notes

THE IMPACT OF OBESITY ON THE OUTCOMES OF 1,153 CRITICALLY INJURED PATIENTS

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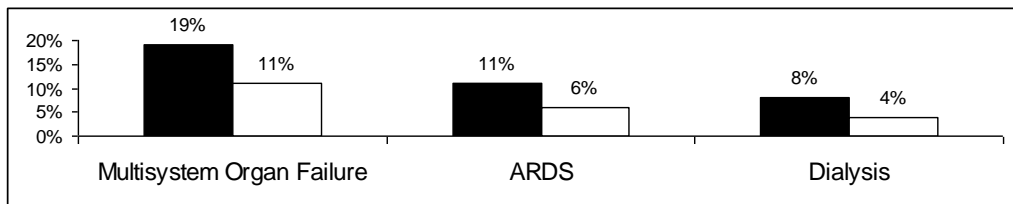
Presenter: Carlos V.R. Brown, M.D.

Senior Sponsor: Peter M. Rhee, M.D.

BACKGROUND: Several small series have had mixed conclusions regarding the impact of obesity on outcomes of trauma patients. The purpose of the present study was to evaluate a large cohort of critically injured patients to better understand the influence of obesity on the outcomes of patients after severe blunt trauma.

METHODS: Retrospective review using the trauma registry and intensive care unit (ICU) database of all blunt trauma patients admitted to the ICU at our urban, level I trauma center over a five year period (1998 to 2003). Obese patients (BMI > 30 kg/m²) were compared to non-obese patients (BMI < 30 kg/m²).

RESULTS: There were 1,153 blunt trauma patients admitted to the ICU during the study period, including 283 (25%) obese (BMI = 35 ± 6 kg/m²) and 870 (75%) non-obese (BMI = 25 ± 3 kg/m²) patients. There was no difference between groups regarding age, gender, injury severity score, or admission vitals. Obese patients had fewer head injuries (42% vs. 55%, p=.0001) but more chest (45% vs. 38%, p=.05) and lower extremity (53% vs. 38%, p<.0001) injuries. There was no difference in the need for laparotomy, thoracotomy, or craniotomy. Obese patients (dark bars) more often suffered complications (42% vs. 32%, p=.002). P<.05 for the following complications:



In addition, obese patients more often suffered myocardial infarction (4% vs. 1%, p=.02) and required vasopressors (36% vs. 27%, p=.005). Though there was only a trend towards higher mortality in obese patients (22% vs. 17%, p=.10), stepwise logistic regression revealed obesity as an independent risk factor for mortality (odds ratio: 1.6, 95% confidence interval: 1.0 – 2.3, p=.03). Though head injury was the most common cause of death in both groups, non-obese patients more often died of head injury (47% vs. 29%, p=.01). Among survivors, obese patients required longer stays in the hospital (24 ± 21 days vs. 19 ± 17 days, p=.01), the ICU (13 ± 14 days vs. 10 ± 10 days, p=.005), and two more days of mechanical ventilation (8 ± 13 days vs. 6 ± 9 days, p=.07).

CONCLUSIONS: Obese patients incur different injuries after severe blunt trauma than their non-obese counterparts. Despite sustaining fewer head injuries, obese patients suffer more complications, require longer stays in the hospital, more days of mechanical ventilation, and obesity is independently associated with mortality.

Notes

HIGH FREQUENCY OSCILLATORY VENTILATION IMPROVES OXYGENATION IN CRITICALLY ILL TRAUMA PATIENTS WITH ADULT RESPIRATORY DISTRESS SYNDROME

W. Miles, J. Hylton, J. Burns, T. Huynh, T. Nelson, R. Sing, D. Jacobs, M. Thomason
Carolinas Medical Center

Presenter: William Miles, M. D.

Senior Sponsor: Edmund J. Rutherford, M.D.

Background: Conventional ventilation (CV) strategies may induce lung damage in patients with Adult Respiratory Distress Syndrome (ARDS) while falsely inflating hemodynamic variables. Studies in pediatric patients have shown that High Frequency Oscillatory Ventilation (HFOV) improves gas exchange and reduces secondary lung injury. There are few reports of the effect of HFOV in adult trauma patients (TP).

Methods: HFOV has been utilized at our institution as a lung protective strategy since the 3100B ventilator (Viasys) received Food and Drug Administration approval in 2001. Trauma patients with ARDS were placed on HFOV if the FIO_2 could not be reduced to less than or equal to 0.60 with CV techniques within 12 hours. Medical patients (MP) and surgical patients (SP) were randomly placed on HFOV when CV was judged to be ineffective. Prospectively collected HFOV data was retrospectively analyzed. Variables evaluated included $\text{PaO}_2/\text{FIO}_2$ ratio (PF), Oxygen Index (OI), Mean Airway Pressure (MAP), Pulmonary Capillary Wedge Pressure (PCWP), End Diastolic Volume Index (EDVI), Cardiac Index (CI), Injury Severity Score (ISS), and mortality. Statistical analysis was performed with one-way ANOVA, Student's t-Test, and Pearson correlation coefficients.

Results: Sixty-three critically ill patients (M:F 48:15) undergoing HFOV were evaluated with a mean age of 39 (range 14-82). There were 47 TP (40 Blunt, 7 Penetrating), 8 SP, and 8 MP. Mean ISS was 23 ± 5 . Initially, and 24 hours after starting HFOV, PF and MAP significantly increased when compared to pre-HFOV variables. Oxygen Index improved at 24 hours post-HFOV. Survival to discharge for all patients was 57%. Trauma patients had higher survival (68%) than SP (33%) and MP (40%) with fewer days of CV prior to initiating HFOV. There was a significant increase in PCWP when initiating HFOV, which was associated with an increase in MAP. Increased MAP did not result in changes in EDVI or CI.

Oxygen and Hemodynamic Variables

	Pre-HFOV	Initial HFOV	24 hr Post-HFOV
$\text{PaO}_2/\text{FIO}_2$	99 ± 52	$147 \pm 117^+$	$186 \pm 101^*$
MAP	25 ± 6	$33 \pm 5^*$	$33 \pm 5^*$
OI	31 ± 17	35 ± 19	$24 \pm 14^*$
PAWP	19 ± 5	$23 \pm 7^*$	28 ± 20
EDVI	115 ± 34	113 ± 38	114 ± 50
CI	4.5 ± 1.5	4.4 ± 1.5	4.2 ± 1.2

* $p < 0.0001$, + $p < 0.05$

Conclusions: HFOV improves oxygenation in critically ill patients with ARDS. Trauma patients had a higher survival rate than SP and MP. Improved survival may result from shorter duration of CV prior to HFOV. Changes in PAWP may be seen when initiating HFOV, and this is associated with an increase in MAP. Improvement in OI is associated with a decrease in FIO_2 , likely secondary to a higher MAP.

Notes

IMPACT OF AGE ON RECOVERY AT ONE YEAR FOLLOWING ISOLATED TRAUMATIC BRAIN INJURY: A WTA PROSPECTIVE MULTICENTER TRIAL

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Group

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Objective: Age has been shown to be a primary determinant of survival following isolated traumatic brain injury (TBI). We have previously reported that patients ≥ 60 years surviving mild TBI have decreased functional outcome at discharge and at 6 months compared to younger patients. The purpose of this study was to further investigate the effect of age on outcome at 1 year, in all patients surviving isolated TBI.

Methods: WTA Multicenter prospective study of all patients sustaining isolated TBI defined as Abbreviated Injury Scale (AIS) score for Head ≥ 3 with an AIS score in any other body area = 1. Outcome data included discharge disposition, Glasgow Outcome Scale score (0=dead to 5=full recovery) and modified Functional Independence Measure (FIM) score which measures feeding, expression and locomotion (3=total dependence to 12=total independence) at discharge, 6 months and 1 year.

Results: 295 patients were enrolled. Follow-up was achieved in 82%. The mean and median time for the last follow-up was 307 and 357 days. 3 late deaths secondary to TBI occurred, all in patients ≥ 60 years. More severe TBI, as measured by admitting GCS, were observed in the younger group. Age was a major determinant in the outcome at discharge and last follow-up (see Table; $p < 0.05$ vs. * patients 18-29; #all other groups, ANOVA/Kruskal-Wallis).

	18-29 yrs	30-44 yrs	45-59 yrs	≥ 60 yrs
Number of patients	78	73	65	79
% with admitting GCS 3-8	39#	16	14	8
% with admitting GCS 9-13	12	8	18	8
% with admitting GCS 14-15	49	75	68	84*
% with GOS <5 @ D/C who improve	85	73	63	37#
% with GOS =5 @ D/C who deteriorate	8	5	16	10
FIM score at D/C (\pm SD)	9.7 \pm 3.2	11.0 \pm 2.4	10.7 \pm 2.2	9.9 \pm 2.8
Final FIM score (\pm SD)	11.8 \pm 0.6	11.7 \pm 1.3	11.7 \pm 0.6	10.6 \pm 2.8#

Conclusion: Older patients following TBI have poorer functional status at discharge and make less improvement at 1 year compared to all other patients. These worse outcomes occur despite what appears to be less severe TBI as measured by a better GCS upon admission. Further investigations using more detailed instruments are required to better understand the qualitative limitations of a patient's recovery and to devise strategies to maximize functional outcome following TBI. The impact of age on survival and recovery from TBI cannot be underestimated.

Notes

THE NATIONAL RENAL TRAUMA EXPERIENCE: ANALYSIS OF THE NTDB

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Presenter: R. Lawrence Reed

Senior Sponsor: R. Lawrence Reed, M.D.

Background: We previously evaluated our own experience with renal trauma to identify those factors predicting the need for nephrectomy. Because of the recent availability of the NTDB data set, we sought to apply the same analysis in this much larger data set.

Methods: Data files from the NTDB were extracted into Microsoft SQL Server 2000 and a relational structure between the files was created. Multiple queries (or views) were created to extract data. Patients with renal injuries were identified using ICD-9 and AIS codes.

Nephrectomies were identified using procedural ICD-9 codes. Queries were performed to determine the relationship between renal injuries, nephrectomy rates, and mortality. Differences in proportions were evaluated using R x C contingency tables distributed as χ^2 . Multiple variables were evaluated with respect to their potential to predict nephrectomy using binary logistic regression techniques.

Results: Out of 731,823 trauma incidents, 7,308 patients were identified as having had 7,482 renal injuries by both ICD-9 & AIS Codes. Thus, renal injury occurs in slightly less than 1% of all trauma patients. 71.8% were male. Mean age of patients with renal injuries was 26.2 ± 0.35 (SEM) years (range 0-119 years). Blunt mechanisms were responsible for renal injuries in 80.17%. A total of 1,108 patients underwent 1,263 renal & ureteral procedures, while 6,200 (84.84%) patients with renal injuries were managed by observation. There were a total of 733 nephrectomies. 591 nephrectomies (75.5% of all nephrectomies) were performed within 24 hours of admission.

AIS Score	# pts. (%)	# nephrectomies (%)	# nephrectomies within 24 hours (%)
1	0 (0)	0 (0)	0 (0)
2	5,574 (74.5)	119 (2.1)	73 (1.3)
3	953 (12.7)	109 (11.4)	93 (9.8)
4	627 (8.4)	264 (42.1)	207 (33.0)
5	328 (4.3)	241 (73.5)	218 (66.5)
Total	7,482 (100)	733 (9.8)	591 (7.9)

Logistic regression indicated that the strongest single variable influencing the potential for urgent nephrectomy was the renal AIS score. Lesser contributions were provided by the abdominal evaluation, abdominal evaluation type, and the presence of drugs. Overall mortality for all patients with renal injuries was 13.7%. A significantly higher mortality rate of 26.4% was experienced by patients who underwent nephrectomy ($p < 0.00001$), representing the greater severity of injury in that subset of patients.

Conclusions: Renal trauma is uncommon, occurring predominately in young males following blunt trauma. The renal AIS score is the single parameter most predictive of nephrectomy, which occurs in roughly 1 out of every 10,000 trauma patients.

Notes

COMPLICATIONS OF NONOPERATIVE MANAGEMENT OF HIGH GRADE BLUNT HEPATIC INJURIES

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Departments of Surgery, University of Texas - Houston School of Medicine, Denver Health
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Presenter: Rosemary A. Kozar, MD, PhD

Senior Sponsor: Rosemary A. Kozar, M.D., Ph.D

Introduction: Nonoperative management of blunt hepatic injuries is highly successful. Complications associated with high grade injuries, however, have not been well characterized. The purpose of the present study was therefore to review hepatic-related complications and associated treatment modalities in patients managed nonoperatively for high grade liver injuries.

Methods: A retrospective study was conducted over a 41 month period ending May 2003 at two urban Level I Trauma Centers of patients presenting with high grade (Gr 3-5) blunt hepatic injuries who were managed nonoperatively (not requiring laparotomy in the first 24 hours). Data included demographics, injury severity score (ISS), mortality, complications related to the hepatic injury, and treatment of hepatic-related complications.

Results: Of 17,409 blunt trauma admissions, 1037 patients presented with blunt hepatic injuries, of which 337 patients had a Grade 3-5 injury. Of these, 230 (68%) patients were initially managed nonoperatively, 130 Gr 3, 92 Gr 4, and 8 Gr 5 injuries. Mean age was age 31 years (range 15-84); 127 (55 %) males, blunt mechanisms included 188 motor vehicle accidents, 12 pedestrian accidents, 8 falls, and 22 other. ISS was 24 ± 11 (Gr 3: 21 ± 10 , Gr 4: 27 ± 11 , and Gr 5: 40 ± 1.5). Overall mortality was 4% (10/230); no death was directly attributable to the hepatic injury. There were 35 hepatic-related complications in 25 (11%) patients. 50% (4/8) of patients with Gr 5 injuries developed complications, 21% (19/92) of patients with Gr 4, but only 2% (2/130) with Gr 3 injuries. Complications included bleeding in 13 patients requiring

Complications	#
Bleeding	13
Liver abscess/necrosis	3
Biloma/ bile duct injury/bile peritonitis	13
Missed/suspected viscus injury	2
Abdominal compartment syndrome	4

angioembolization in 11 and laparotomy in 2 patients (both Gr 5), liver abscess in 2 patients managed with IR drainage (2) and subsequent laparotomy (1). Hepatic necrosis following surgical ligation of a right hepatic artery required delayed hepatic lobectomy in one patient. Thirteen biliary complications

were managed with ERCP/ stenting (7), IR drainage (3), and laparoscopy (3). Two patients had suspected viscus injury/peritonitis and underwent a negative laparotomy while an additional 4 patients underwent laparotomy for abdominal compartment syndrome.

Conclusions: Nonoperative management of high grade liver injuries can be safely accomplished. However, complications in Grade 4 and 5 injuries should be anticipated and require a combination of operative and nonoperative management strategies.

Notes

ABDOMINAL CT FOR MECHANISM: WHAT'S THE MECHANISM?

R Nirula, D Talmor, K. Brasel
Medcial College of Wisconsin

Presenter: Ram Nirula

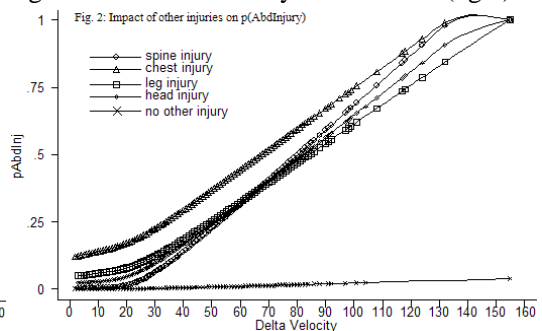
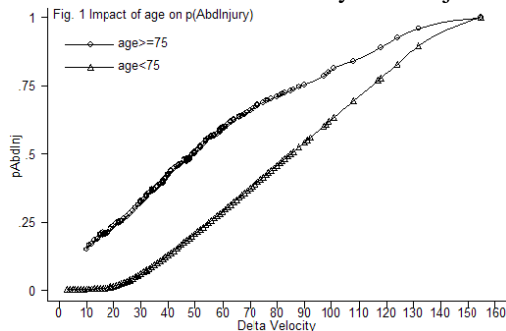
Senior Sponsor: Karen J. Brasel, M.D., M.P.H.

Abdominal CT for mechanism: what's the mechanism?

Background: Significant resources are spent on radiographic assessment of the abdomen in motor vehicle crash (MVC) patients based solely upon the crash mechanism. The majority of patients, however, have little or no clinically significant injuries found on these abdominal CT scans. We sought to define crash and occupant characteristics associated with a low probability of clinically significant abdominal injury thereby obviating the need for abdominal CT.

Methods: Drivers in frontal MVCs were analyzed from the National Automotive Sampling System from 1993-2001. The probability of an abdominal injury with an Abbreviated Injury Score > 1 (AAIS >1) was measured over a range of crash velocities while controlling for other covariates using multivariate logistic regression. A receiver operating curve (ROC) was used to assess the sensitivity and specificity of the model. Probability of AAIS >1 was plotted against change in velocity adjusting for covariates significantly affecting the likelihood of injury.

Results: There were 21,888 drivers involved in frontal MVCs with 20,976 (95.8%) having an abdominal AIS of 0 or 1. Age, weight, height, other injuries, net change in velocity, restraint use, ejection, rollover, and vehicle deformation were modeled yielding an area under the ROC of 0.96. The probability of AAIS >1 increased significantly at velocities >20 km/hr reaching 5.0% at 30 km/hr. Age >75 or associated head, leg or chest injuries increased the risk of AAIS >1 even at low velocities (fig.1, 2). The absence of any injury to the head, spine, legs and chest indicated that the abdomen was unlikely to be injured regardless of the velocity of the crash (fig.2).



Conclusion: Abdominal CT scan is required for drivers >75 years of age in frontal MVCs even at low speed. The absence of injury to the head, chest, spine and legs indicates an extremely low probability of abdominal injury even at high speed and therefore abdominal CT in this group of patients for reason of mechanism alone is unnecessary.

Notes

**NATIONAL NOSOCOMIAL INFECTIONS SURVEILLANCE SYSTEM PNEUMONIA
DEFINITION: FROM BENCHMARK TO BEDSIDE IN TRAUMA PATIENTS**

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Presenter: Preston R. Miller

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Introduction: Ventilator associated pneumonia (VAP) is an important cause of morbidity and mortality in the injured patient. Identification of those with VAP is important both in immediate clinical decision making as well as for the epidemiologic evaluation of the disease and benchmarking of rates across institutions with variable practice patterns. Despite this, controversy exists over the optimal method of VAP diagnosis. Many centers currently use invasive culture methods such as bronchoalveolar lavage (BAL) for diagnosis. Another diagnostic method, and the most common epidemiologic tool used to track VAP is the definition employed by the National Nosocomial Infections Surveillance (NNIS) system. This relies on a combination of clinical and culture data. Our goal was to evaluate the accuracy of the NNIS definition as compared to BAL diagnosis in trauma patients.

Methods: Records of all ventilated patients admitted to the trauma ICU at a level I center who were evaluated for the presence of pneumonia over a 2.5 year period were reviewed. VAP diagnosis was established if $\geq 10^5$ cfu/ml were cultured on BAL. VAP rates and time of onset were compared to the hospital infection control database which defines VAP by NNIS criteria. Assuming BAL to be correct, sensitivity, specificity, positive and negative predictive value (PPV, NPV) were calculated for NNIS VAP.

Results: From 9/1/01-12/31/03, 292 patients underwent BAL for suspected pneumonia. Pneumonia rate in this group was 35.1 per 1000 ventilator days. The NNIS definition showed excellent overall agreement with a rate of 36.0 per 1000 ventilator days. The use of the NNIS definition for bedside decision making, however, is less accurate. Sensitivity and PPV were reasonably good, while specificity and NPV suffer (table). Most importantly, use of NNIS would have led to no treatment in 31% of patients diagnosed with VAP by BAL.

<u>NNIS accuracy vs. BAL</u>	
Sensitivity	83%
Specificity	69%
PPV	83%
NPV	70%

Conclusions: As compared to strict bacteriologic criteria for VAP, the NNIS definition has good overall agreement and appears to have utility as an epidemiologic benchmarking tool in trauma patients. The NNIS definition has less utility as a bedside decision making tool in this population, however, leading to under-treatment of up to 1/3 of patients, and its use in this context must be questioned.

Notes

HALO VEST IMMOBILIZATION INCREASES EARLY MORBIDITY AND MORTALITY IN ELDERLY PATIENTS WITH ODONTOID FRACTURES

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Presenter: Sarah Majercik

Senior Sponsor: Walter L. Biffl, M.D.

Background: Odontoid fractures are the most common c-spine fracture in the elderly patient. Previous work suggests that the use of the halo vest (HALO) as treatment for elderly odontoid fractures is associated with increased morbidity and mortality. This study reviews the largest series of elderly odontoid fractures and evaluates for predictors of morbidity and 30-day mortality. Methods: Retrospective chart review of all patients older than 65 who sustained a type II or III odontoid fracture from January 1997-June 2004. Patients with GCS=3 or death within 48 hours were excluded. Patients were divided into 2 groups: HALO (either halo vest alone or after operative fixation) and NO HALO (rigid cervical orthosis or operative fixation only.) Data were compared using chi-squared and Students' T-test, with $p < 0.05$ considered significant. Results: 78 patients met study criteria. Mean age was 81 years. Fracture types included 50 type II odontoids, 18 type III, 9 combined type II or III with a concurrent C1 ring fracture, and 1 type II combined with a C5 compression fracture. 38 (49%) were treated with HALO, and 40 (51%) were treated with NO HALO. 24 (31%) total patients died within 30 days of admission. Mortality in the HALO group was higher than the NO HALO group (42% vs. 20%, $p=0.03$). There was no difference between the HALO and NO HALO group with regard to ISS, GCS, admission SBP, number of pre-existing medical conditions, or the presence of other injuries. 66% of the HALO group had at least one significant complication (pneumonia, cardiac or respiratory arrest, DVT, PE). This was significantly higher than the NO HALO, which had a 36% complication rate ($p=0.03$). Conclusion: Morbidity and early (30 day) mortality are significantly increased in elderly patients with odontoid fractures treated with HALO. The potential risks of HALO should be carefully weighed before using it in an elderly patient.

Notes

A MOBILE TRAUMA DATABASE WITH CHARGE CAPTURE

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Presenter: Steve Moulton, MD

Senior Sponsor: Dennis W. Vane, M.D.

Purpose: Charge capture plays an important role in every surgical practice. We have developed and merged a custom mobile database (DB) system with our trauma registry (TRACS), to better understand our billing methods, revenue generators, and areas for improved revenue capture.

Materials and Methods: The mobile database runs on Compaq iPAQ Pocket PCs utilizing the Windows CE platform. The front end was written in C# and the back end is SQL. The mobile database operates as a thick client; it includes active and inactive patient lists, billing screens, hot pick lists, and the 2005 CPT and ICD-9 code sets. Microsoft Information Internet Server provides secure data transaction services between the back ends stored on each device.

Three of six trauma surgeons trialed the software. Their billing information was averaged over the preceding six month period. Point of care billing information was then collected over a three month period by one trauma surgeon, and a two month period by two trauma surgeons. This billing information was combined with TRACS data to determine the clinical characteristics of the trauma patients who were and were not captured using the mobile database.

Results: Total charges increased by 228%, 148%, and 135% for each of the three trauma surgeons who used the mobile DB application. Most of the additional charges were for evaluation and management (E&M) services. Patients who were captured and billed at the point of care using the mobile DB had higher injury severity scores, were more likely to undergo an operative procedure, and had longer lengths of stay, compared to those who were not captured.

	Captured (n = 73)	Not Captured (n = 43)
AVG LOS (days)	8.5	4.3
AVG RTS	10.4	11.1
AVG GCS	12.7	13.4
AVG ISS	14	9.8
AVG Ps	0.861	0.916

LOS = Length of Stay
 RTS = Revised Trauma Score
 GCS = Glasgow Coma Scale
 ISS = Injury Severity Score
 Ps = Probability of Survival

Conclusion: Total charges more than doubled using a mobile database to bill at the point of care. A subsequent comparison of TRACS data with billing information revealed a large amount of un-captured patient revenue. Greater familiarity and broader use of mobile database technology holds the potential for even greater revenue capture.

Notes

DAMAGE CONTROL IN A COMBAT ENVIRONMENT

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Presenter: Brian J. Eastridge

Senior Sponsor: Peter M. Rhee, M.D.

Objective: To validate damage control concepts and identify specific factors associated with the necessity for damage control modalities in a combat environment.

Methods: Our study was a retrospective analysis of 1,118 patients requiring evaluation for injury during the support and stabilization phase of Operation Iraqi Freedom (January -July 2004). Injured patients were evaluated with respect to acute physiology (admission heart rate, blood pressure, and temperature ≤ 34 C), base deficit, ISS, necessity for operation, operative blood loss, 24 hour PRBC requirement, requirement for damage control procedure and mortality. A damage control procedure was identified by attending surgeon documentation in the medical record. Damage control procedures were defined as any procedure expedited for ongoing hemorrhage or patient instability and included thoracic, abdominal, vascular, and extremity procedures. In this analysis, continuous variables were represented by means and were compared using an independent samples t-test. Categorical variables were represented as percentages and compared by using a Pearson Chi-square methodology.

Results: Of the 1,118 patients, 771 patients required operative intervention. Fifty (6.5%) of the

operative patients required damage control procedures. In general, patients requiring damage control procedures were more severely injured and had worse measures of acute physiology and worse outcomes when compared to patients

	Damage Control	No Damage Control
Heart rate	118 bpm	100 bpm
Blood pressure	93 mmHg	120 mmHg
Temperature	34.2 C	36.1 C
Base deficit	13.3	5.1
ISS	30	17
OR blood loss	2,384 cc	539 cc
24 hour PRBC	8.6 u	2.8 u
Mortality	28.0 %	4.8 %

not requiring damage control. A comparison between damage control and non -damage control groups are shown in the attached table. The p values for all data listed were ≤ 0.05 .

Conclusions: Our data substantiate the findings from the civilian literature that patients requiring damage control procedures are a higher acuity patient population. Most importantly, surgeons in the resource constrained combat environment should have a low threshold to perform damage control procedures once control of surgical hemorrhage is obtained when clinical and laboratory data are suggestive of ongoing shock and hypothermia.

Notes

RETRIEVABLE INFERIOR VENA CAVAL FILTERS ARE NOT ALWAYS TEMPORARY

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Presenter: Patrick J. Offner M.D.

Senior Sponsor: Patrick J. Offner, M.D.

Background: The prophylactic placement of inferior vena cava (IVC) filters in high risk patients has become more prevalent with the availability of retrievable filters. Our early experience suggested that this practice was safe and efficacious in these difficult patients. With new technology, however, early enthusiasm often gives way to caution as experience increases. Our **purpose** was to critically re-evaluate our experience with prophylactic placement of retrievable IVC filters in high risk trauma patients.

Methods: Trauma patients admitted our urban level I trauma center who meet pre-defined high risk criteria undergo prophylactic retrievable IVC filter placement within 48-72 hours of admission. High risk patients include those sustaining complex pelvic fractures, stable pelvic fractures with lower extremity long bone fractures, bilateral lower extremity long bone fractures and severe traumatic brain injury or spinal cord injury with contraindications to prophylactic low-dose heparin therapy. Filter removal is attempted at 2 weeks unless there is continued contraindication to low-dose heparin prophylaxis, in which case, the filter is repositioned for another two weeks. At that time, the IVC filter is either removed or left in place permanently.

All patients are entered into a prospective database that includes name, hospital number and dates of filter insertion, repositioning and removal. Patients are followed clinically for the development of complications related to IVC filter placement, presence and removal; including bleeding, hematoma, deep venous thrombosis, IVC thrombosis and inability to retrieve the filter.

Results: Between April 2001 and June 2004, retrievable IVC filters were placed in 145 patients. The mean age was 39 ± 18 years and the 64% were male. All but one of the patients suffered blunt injury. The mean ISS was 34 ± 13 . Pelvic fractures were present in 63(43%) patients, femur fractures in 52(35%), tibia fractures in 44(30%), spinal cord injury in 38(26%) and traumatic brain injury with intracranial hemorrhage was present in 55(37%) patients. The type of IVC filter placed was Gunther-Tulip in 59(41%) patients, Optease in 80(55%), Recovery in 4(3%) and Trapease in 2(1%) patients. The femoral approach was used for placement in 98% of patients. 31 patients required filter repositioning prior to removal. There were 2 instances of bleeding related to filter placement. 14(10%) patients developed a deep venous thrombosis but there were no diagnosed pulmonary emboli. The IVC filter was not removed in 30(21%) patients. In 10 patients, the filter was left in place as a permanent IVC filter for clinical reasons. In 17 patients, the filter was not removed due to clot trapped beneath it. In 3 patients, the filter could not be retrieved due to technical factors such as filter tilt. Surprisingly, it could not be determined if the filter had been removed in 9(6%) patients.

Conclusions: Prophylactic retrievable IVC filters are a useful adjunct in the management of high risk trauma patients. However, they commonly cannot be removed secondary to trapped clot and technical factors. Moreover, these patients require close follow-up to ensure that filter removal occurs when appropriate.

Notes

WHITE BLOOD CELL AND PLATELET COUNTS CAN BE USED TO DIFFERENTIATE BETWEEN INFECTION AND NORMAL RESPONSE AFTER SPLENECTOMY FOR TRAUMA: PROSPECTIVE VALIDATION

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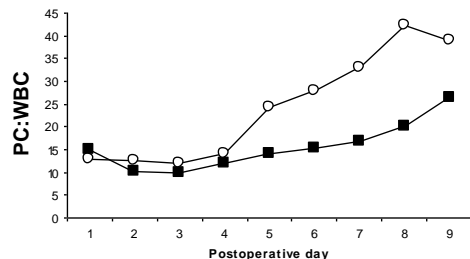
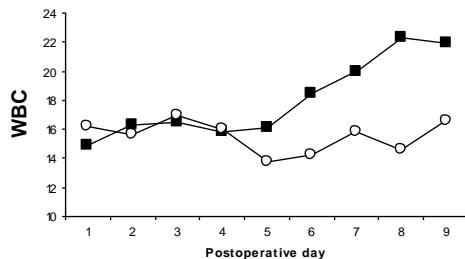
Presenter: Janie Weng, BA

Senior Sponsor: Peter M. Rhee, M.D.

BACKGROUND: Transient elevations of the serum white blood cell count (WBC) and platelet count (PC) are normal physiologic responses after splenectomy. The clinician is often challenged to identify an infection in a postsplenectomy patient with an elevated WBC count. A previous retrospective study found that a WBC greater than $15 \times 10^3/\mu\text{L}$ and a PC:WBC ratio less than 20 on postoperative day five were highly associated with infection and should not be considered as part of the physiologic response to splenectomy. The current study intends to prospectively validate the WBC and PC:WBC ratio on postoperative day five as markers of infection after splenectomy for trauma.

METHODS: Consecutive trauma patients admitted to an urban, level I trauma center who underwent splenectomy from June 2002 to September 2004 were collected prospectively. In addition to admission demographics, variables collected included daily WBC, PC, and PC:WBC ratio during the first nine postoperative days. Outcome was the presence of infection. Patients with infection (infected group) were compared to those without infection (non-infected group).

RESULTS: There were 89 trauma patients who underwent splenectomy during the study period, 40 (45%) developed a postoperative infection. Infectious complications included pneumonia ($n=25$, 63%), urinary tract infection ($n=11$, 28%), intra-abdominal abscess ($n=7$, 18%), and bacteremia ($n=7$, 18%). The WBC ($\times 10^3/\mu\text{L}$) and PC:WBC ratio of infected (solid square) and non-infected patients (hollow circle) during the first 10 hospital days are shown below.



Postoperative day five was the first day that infected patients had a higher WBC ($16 \pm 5 \times 10^3/\mu\text{L}$ vs. $14 \pm 4 \times 10^3/\mu\text{L}$, $p=.03$) and a lower PC:WBC ratio (14 ± 8 vs. 24 ± 12 , $p=.001$) than non-infected patients. On postoperative day five, 71% of patients with a WBC greater than $15 \times 10^3/\mu\text{L}$ and a PC:WBC ratio less than 20 were infected.

CONCLUSIONS: On postoperative day five after splenectomy for trauma, a WBC greater than $15 \times 10^3/\mu\text{L}$ and a PC:WBC ratio less than 20 are reliable markers of infection.

Notes

ENDOVASCULAR MANAGEMENT OF A THORACIC GUNSHOT WOUND: ADVANCEMENT OR ABUSE OF TECHNOLOGY?

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Stanford University

Presenter: Tony D. Fang, MD

Senior Sponsor: Susan I. Brundage, M.D.

Background: Penetrating trauma with unstable vitals demands immediate surgical intervention. However, management of stable patients continues to evolve with new technological advances. Blunt aortic injuries have been successfully treated with endovascular techniques. Should endovascular approaches be applied to the treatment of penetrating thoracic vascular trauma?

Case Report: A 23 year old man walked into the emergency department of a community hospital after sustaining a gunshot wound to the angle of the right mandible. Initial chest radiograph showed a bullet in the perihilar area of the left chest and widened mediastinum without evidence of hemo/pneumothorax (Figure 1). A conventional arteriogram revealed an aorto-innominate fistula. Twenty-four hours after initial presentation, the patient was transferred to our Level I trauma center with the following vital signs; HR 85, BP 125/67 mmHg. Subsequent CT angiogram (CTA) of the thorax showed injury to the innominate vein and aorta distal to the left subclavian artery with pseudo-aneurysm and arteriovenous (a-v) fistula formation. Additionally, a large pulmonary embolus (PE) occluded the right inferior pulmonary artery. The PE most likely originated from the pseudoaneurysm with migration through the a-v fistula. Cardiothoracic surgery was consulted for a combined team approach. Concern regarding the patient's ability to tolerate a thoracotomy in light of his PE led to consideration of an endovascular approach. A Gore thoracic aortic stent graft was placed with immediate cessation of blood flow through the a-v fistula. Follow-up CTA confirmed excellent stent position (Figure 2).



Figure 1

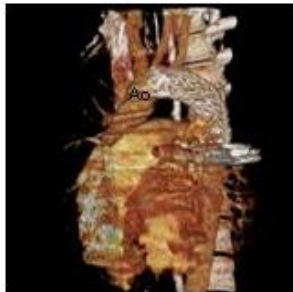


Figure 2

Conclusion: This novel approach to the management of a penetrating thoracic vascular injury provided a less invasive and potentially less morbid intervention with a good initial outcome. However, application of this technology should be approached with caution. Risks as associated with endovascular procedures include unknown durability of the graft and the possibility of stent

graft complications. The indications, timing, and long term outcome need to be elucidated.

Notes

TRAUMATIC PSEUDOCOARCTATION TREATED WITH AN ENDOGRAFT

R. Karmy-Jones, J. Cook, T. Burdick, M. Meissner
Harborview Medical center

Presenter: Riyad Karmy-Jones

Senior Sponsor: Riyad C. Karmy-Jones, M.D.

Introduction: Endografts have been used successfully for the emergent treatment of traumatic aortic ruptures. A concern has been that significant oversizing may result in kinking of the aorta with secondary obstruction. While this may be true in non-trauma cases, in trauma significant disparities are most likely secondary to external compression and stent-grafts may be safely used. We present an illustrative case.

Case Report: A 51 year old male was admitted following motor cycle crash. He had been transferred (intubated and ventilated) from an outlying institution 4 hours after the event. A CT scan had identified a traumatic aortic rupture. Additional findings included right sided pelvic ring fractures, pneumocephaly, left tibia/fibula fracture. In addition, original ECG documented anterior ST changes consistent with ischemia and/or blunt cardiac injury. On arrival blood pressure was 120-130 mm Hg systolic in the upper extremities but the patient was acidotic (pH 7.05) with PaO₂ 240 and PaCO₂ 15. Physical examination identified loss of femoral pulses, making the clinical diagnosis of pseudocoarctation. Review of the outside CT identified the tear to be at the level of the mid descending aorta, with aortic diameter above the injury 22 mm and below 10-12 mm. The patient was taken to combined angio/operative suite. Through a right femoral artery cutdown, three 23 mm diameter 3.3 mm aortic cuffs were placed. A slight type III endoleak was sealed with an additional 26 mm cuff. Following the procedure flow was restored to the mesenteric and distal vessels. Angiography confirmed transection of the left popliteal artery. Following restoration of flow, the patient remained stable for approximately two hours but then developed massive reperfusion, with abdominal compartment syndrome, requiring decompressive laparotomy. Despite all resuscitative efforts the patient continued to manifest cardiac failure, ultimately dying.

Conclusion: In traumatic pseudo-coarctation the aorta distal to the injury appears much smaller than it really is, being collapsed by a combination of reduced flow (flap) and external compression (hematoma). As long as wire access is maintained across the defect, endograft sized according to the aortic diameter proximal to the injury can be placed. Outcome is linked to the duration of ischemia to the lower body and subsequent reperfusion phenomenon.

Notes

BLUNT AORTIC TRANSECTION: IMPROVED RESULTS WITH ENDOVASCULAR REPAIR?

B.G. Peterson, M.D.; J.S. Matsumura, M.D.; M.D. Morasch, M.D.; M.A. West, M.D.; M.K. Eskandari, M.D.

Feinberg School of Medicine, Northwestern University

Presenter: Brian G. Peterson, M.D.

Senior Sponsor: Michael A. West, M.D.

Background: Untreated traumatic aortic transection carries a mortality rate greater than 85%. Standard therapy has been open repair via a left thoracotomy with systemic heparinization. Even in experienced centers this operation is associated with a 5-25% risk of paralysis and 20-30% mortality rate. Endoluminal stent grafts, originally designed for the treatment of abdominal aortic pathology, have broadened the surgeon's armamentarium to address thoracic aortic injuries and do not require the use of systemic heparin. We reviewed our experience of stent graft repair for acute thoracic aortic transections.

Methods: Between November 2002 and August 2004, 46 patients underwent thoracic endovascular stent graft placement at our institution. Of these, 6 patients (13%) involved in high speed motor vehicle collisions sustaining multiple injuries underwent endovascular repair for thoracic aortic transection in the acute setting. Diagnosis of aortic transection was initially suggested by chest radiograph or CT, and confirmed with intraoperative angiography. The devices used to treat the aortic transections consisted of "off-the-shelf" commercially available proximal aortic cuffs. All procedures were performed in an operating room angi suite without the use of systemic heparin. Access to the aorta was either through a femoral/iliac cutdown (3), or percutaneously through the femoral artery (3). In one case, subclavian to carotid transposition was performed prior to endovascular repair in order to ensure adequate proximal fixation of the stent graft. Mean follow-up was 14 months (range 1-22 months).

Results: Each patient (average age 44, range 20-73) suffered multiple injuries; with a mean injury severity score of 41 (range 25-66). Technically successful repair was achieved in 100% of patients, as determined by completion angiography demonstrating apposition of the stent grafts to the aortic wall, normal perfusion of the aortic branches, and exclusion of the aortic transections without evidence of extravasation. All patients in this series tolerated endovascular repair of their aortic transections, requiring no secondary interventions. Patient outcome was determined by the associated injuries present rather than the thoracic aortic transection. There were no deaths or paralysis. All patients have subsequently been followed using CT angiography at 6-12 months demonstrating durability of endovascular repair in all cases without evidence of endoleak, stent migration, or late pseudoaneurysm formation.

Conclusion: Adaptation and use of these commercially available abdominal devices in the thoracic aorta has proven to be technically feasible. Repair of thoracic aortic transection in the setting of blunt trauma - a once, daunting and often lethal undertaking fraught with complications, can be transformed into a well-tolerated surgical intervention given the advent of endovascular techniques. Long-term durability of endovascular repair of traumatic thoracic transections is unknown, but early results are promising.

Notes

CONTROVERSIAL MANAGEMENT OF THE PREGNANT PATIENT WITH AN OPEN ABDOMEN: A CASE REPORT

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Virginia Commonwealth University Health System

Presenter: Sharline Aboutanos, M.D.

Senior Sponsor: Michael Aboutanos, M.D.

Introduction: Traumatic injury is the principle nonobstetric cause of maternal death. Approximately 3-6% of traumatized pregnant women suffer from penetrating trauma^{1,2}. Previous multi-institutional studies from Level I trauma centers have shown that emergent cesarean sections in pregnant trauma patients are not justified¹. Fetal delivery is advocated during laparotomy for penetrating abdominal injuries only when the fetus is in distress or when intraoperative exposure is inadequate. No data or recommendations are available for the pregnant patient undergoing damage control. A case of gunshot wound (GSW) of a pregnant uterus is discussed to illustrate difficult decisions in damage control and open abdominal management in advanced pregnancy. **Case Report:** A 20-year-old woman at 29 weeks gestation, gravida 1, sustained gunshot wounds to the right chest and abdomen. Initial vital signs were blood pressure 127/91 mm Hg, heart rate of 115/ minute, and respirations 18/ minute. Fetal heart tones (FHT) were 140 beats per minute. Physical exam revealed three superficial GSW to chest and a right flank GSW. The patient's abdomen was firm and the gravid uterus was symmetrically enlarged. She was taken to the operating room for exploratory laparotomy. Intraoperative findings included an enlarging retroperitoneal hematoma due to transection of engorged right gonadal vessels and a through-and-through GSW to the cecum. An excessively protuberant uterus sustained no injuries. The gonadal veins were ligated and the colon repaired primarily. Intraoperative blood loss was approximately 1500 cc. Massive resuscitation (12 L of crystalloids, 12 units of RBC, 3 packs of platelets and 1 unit of cryoprecipitate), bowel edema and an enlarged uterus precluded abdominal closure. Delivery of the fetus was considered but delayed secondary to fetal prematurity and to avoid further blood loss. FHT remained stable in the 140s. The patient was hypothermic (32.6°C) and acidotic (pH 7.25, lactate 3.9); therefore, she underwent temporary abdominal closure with vacuum pack technique. After 24 hours of ICU resuscitation, the patient returned to the operating room; only skin closure was feasible. However, with progressive uterine growth, necrosis of the skin edges and partial wound dehiscence were noted. The patient was placed on strict bed rest until 32 weeks gestation. She was then induced and underwent spontaneous vaginal delivery of a healthy baby girl. The patient and her baby were discharged on HD 31. **Discussion:** GSW to the abdomen in a pregnant female may present difficulty even when there is no evidence of fetal distress or limited intraoperative exposure. Abdominal closure in advanced pregnancy is challenging. This case supports that expectant obstetric management is still feasible even when open abdominal management is deemed necessary for maternal care.

1. Morris JA, Rosenbower TJ, Jurkovich GJ, et al. Infant survival after cesarean section for trauma. *Ann Surg.* 1996 May; 223(5):481-8.
2. Esposito TJ, Gens DR, Smith LG, et al. Trauma during pregnancy. *Arch Surg.* 1991 September; 126:1073-1078.

Notes

NON-OPERATIVE MANAGEMENT OF SEVERE TRACHEOBRONCHIAL INJURIES WITH PEEP AND LOW TIDAL VOLUME VENTILATION

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Methodist Hospitals of Dallas

Presenter: Michael Self, M.D.

Senior Sponsor: Frederick A. Moore, M.D.

Tracheobronchial injury resulting from blunt trauma presents a therapeutic challenge. Traditionally, significant tracheal tears have been repaired through operative intervention. We describe two cases of thoracic tracheal injuries which were successfully managed in a non-operative manner.

Case 1 is a 47 year-old female involved in a high-speed collision. Pre-hospital, the patient was hypotensive and had massive subcutaneous emphysema. On arrival, her physical exam revealed an anterior chest wall contusion and bilateral rib fractures with flail segments. Bilateral tube thoracostomies were performed as well as endotracheal intubation. Arterial blood gas measurements demonstrated a worsening hypoxia and repeat chest x-ray showed a persistent right pneumothorax. Therefore, a second right chest tube was placed with resolution of the pneumothorax and minimal leak from the tubes. Later, the patient developed a sudden increase in her peak inspiratory pressure (PIP). Chest x-ray showed no change and the air leak remained minimal. Emergent bronchoscopy revealed complete obstruction of the endotracheal tube (ETT). Despite manipulative efforts, the patient's ETT could not be cleared and an emergent cricothyroidotomy was performed. The PIP decreased; however, subcutaneous emphysema increased dramatically. Repeat bronchoscopy identified a 4cm tear beginning 3 cm above the carina extending into the right mainstem bronchus. Operative intervention was not considered a possibility due to the severity of her hypoxemia. She was managed with PEEP and low tidal volumes.

Case 2 involves a 43 year-old male who sustained crush injuries to the head and chest after being caught between two dump trucks. He arrived with significant facial and chest trauma. Intubation was performed for airway protection. Chest CT scan showed a moderate pneumomediastinum, bilateral first rib fractures, and multiple, lower right rib fractures. The following morning chest x-ray demonstrated a large left pneumothorax for which tube thoracostomy was performed. No air leak was evident. He remained stable throughout the day. That evening, he had progressive respiratory distress and subcutaneous crepitus in the upper torso. Tube thoracostomy was then performed on the right. A repeat chest CT suggested a tracheal injury at the level of the carina with increased pneumomediastinum. The patient's clinical status did not permit operative intervention as his hypoxia continued to worsen despite 100% FiO₂ and increased PEEP. Therefore, the ETT was advanced beyond the level of the carina into the right mainstem bronchus. The patient improved immediately. After stabilization, bronchoscopy revealed a substantial injury at the carina. He was managed non-operatively with low tidal volumes and PEEP.

Select cases of substantial tracheal lacerations may be managed in a non-operative fashion. Key elements of this therapy are close bronchoscopic evaluations, low tidal volumes, PEEP, and antibiotics to prevent mediastinitis. While early surgery is the optimal treatment in most cases, this form of nonoperative therapy may be a life-saving option in those patients who are considered too critically ill to undergo operative intervention.

Notes

UTILITY FROM FUTILITY: NON HEART-BEATING ORGAN DONATION FOLLOWING FATAL INJURY

J Weng, M Martin, J Murray, B Roth
University of Southern California Medical Center

Presenter: Janie Weng, B.S.

Senior Sponsor: James Murray, M.D.

Introduction: The decision to perform heroic resuscitation versus expectant management in the most severely injured patients is commonly driven by the surgeon's estimation of survival probability and quality of life. With the rapidly growing transplant waiting lists, the ability to salvage transplantable organs should also be a consideration in resuscitation efforts. We present a case of "futile" resuscitation resulting in the harvest of viable organs using non-heart beating organ donation.

Case Report: A 23 year old male presented with massive brain injury (GCS 3) and hemodynamic instability following a transcranial gunshot wound. The admission base deficit was 25 with a pH of less than 6.8, and the patient suffered an asystolic cardiac arrest on arrival. After restoring sinus rhythm, large-volume fluid and blood product resuscitation was performed. His immediate course was complicated by disseminated intravascular coagulation, diabetes insipidus, and ARDS requiring high-frequency percussive ventilation. His endocrine collapse was treated with steroids, desmopressin, and continuous infusion of intravenous thyroxin (T_4). A decision to withdraw care was made by the responsible physician and family members, however the family expressed their (and the patient's) strong desire for organ donation. Brain-death declaration was not possible due to respiratory and hemodynamic instability. With coordination between the trauma service, coroner's office, organ procurement agency, and transplant team, the patient and family were offered the option of donation after controlled cardiac death (non heart-beating donation). Twenty-two hours after hospital admission the patient was taken to the operating room. Supportive care was withdrawn, the patient was pronounced dead by his primary physician and organ harvest was successfully performed by a separate transplant team. The harvested organs were transplanted to 3 recipients who are doing well postoperatively and have excellent allograft function.

Discussion: Resuscitation of the most severely injured patients with low survival probability is often withheld or withdrawn in order to conserve resources and minimize futile interventions. However, this may result in a loss of transplantable organs. The limited availability of organs contributes to the widening gap between organ supply and demand and has prompted national efforts to increase the organ donor pool. One of these initiatives is to increase the awareness and utilization of non heart-beating organ donation in patients who do not meet criteria for brain death declaration. Adoption of this practice will both expand the pool of available organs and extend to patients and their families the choice of organ donation. Aggressive resuscitation in select "futile" trauma cases may be justified in terms of patient and societal benefit.

Notes

BLUNT TRANSECTION OF THE DUODENUM

C. Myers, MD, H. Sherman, MD, FACS
The Mercy Hospital of Pittsburgh

Presenter: Christopher J. Myers, MD

Senior Sponsor: Harold F. Sherman, M.D.

Fewer than 1% of all victims of blunt trauma sustain hollow viscus injury. Small bowel injury occurs in approximately 0.3% of all blunt traumas with duodenal injuries even more rare. Most blunt duodenal injuries described are partial perforations. Our patient is a 13-year-old female who presented following a rollover mini-van crash in which she was a restrained back-seat passenger. Her presenting complaints were difficulty breathing and abdominal pain. Her vital signs upon arrival to the Emergency Department were blood pressure 78/50, pulse 126, respirations 20, and oxygen saturation 91% on FIO₂ of 1.0. Her physical examination was significant for labored breathing with decreased right-sided breath sounds and generalized abdominal tenderness. Chest radiograph illustrated a large right hemothorax with elevated right hemi-diaphragm. A right thoracostomy tube was placed with immediate withdrawal of bright red blood. Respiratory symptoms improved and follow-up chest radiograph demonstrated improvement, although the diaphragm remained elevated. FAST showed free fluid. Abdominal computed tomography demonstrated the right hemi-diaphragm and liver elevated to the level of the carina, Grade IV liver injury, Grade II Spleen injury, Grade III left renal injury, and an unclear course of the duodenum, suggesting injury. An upper gastrointestinal contrast study confirmed the diagnosis of duodenal disruption. At laparotomy, the patient was found to have complete transection of the first part of her duodenum as well as a Grade IV liver injury with herniation of the right lobe through a 15 centimeter diaphragmatic laceration, and a small laceration of the tail of the pancreas. The lacerated ends of the duodenum were stapled closed and a side-to-side gastro-jejunostomy was performed. A T-tube was left in the duodenum. In addition, the right lobe of the liver was reduced and the right hemi-diaphragm repaired primarily. Drains were left along the superior border of the pancreas and in the sub-hepatic space. Post-operative complications included a bleeding anastomotic ulcer and high bilious output from the sub-hepatic drain. The ulcer was treated with endoscopic cauterization and injection of epinephrine and pantoprazole. The liver laceration was treated expectantly. Hepatic drainage ceased and liver function tests returned to normal. Five months later, the patient has returned to normal activity and is maintained on pantoprazole and famotidine for ulcer prophylaxis.

Notes

SURVIVING A RIGHT VENTRICULAR RUPTURE FROM BLUNT TRAUMA

L. Omert,MD, V. Cortes,MD, A. Rodriguez,MD
Allegheny General Hospital

Presenter: Laurel Omert, MD

Senior Sponsor: Laurel Omert, M.D.

Background: An 86-year-old male was the restrained driver in a head-on MVC. He was seen at a referral hospital where a CT of the chest was performed that showed a ruptured right ventricle. Transfer was then arranged to our Level I trauma center with an estimated time of arrival of 45 minutes.

Presentation and Diagnosis: On arrival, the patient was awake, alert and hemodynamically stable. His past medical history was significant for CABG and renal insufficiency and on physical exam a median sternotomy scar was noted. He complained of mainly right-sided chest pain. An unenhanced CT illustrated a pseudo-aneurysmal projection at the apex of the right ventricle that was filled with contrast, and a small pericardial effusion. Transthoracic echocardiography (TTE) was performed in the trauma bay and was suspicious for contained RV apical rupture. Cardiac MRI confirmed this finding, delineating an area that was 1.3 cm wide. Thrombus was also noted on the epicardium along with a small pericardial effusion. His only other injuries were right-sided rib fractures.

Outcome: Due to the patient's age and also because he had been stable for 12 hours post-trauma, non-operative management was chosen. He subsequently was intubated due to respiratory failure and pneumonia. His course was also complicated by an anterior wall MI. A repeat transesophageal echo demonstrated complete thrombosis of the ruptured area on post-trauma day 5. Despite his somewhat protracted ICU stay of four weeks, he was able to be transferred to rehab on post-trauma day 38 and is currently doing well.

BY-LAWS



BYLAWS OF THE WESTERN TRAUMA ASSOCIATION

ARTICLE I

Name, Objectives, Organization, and Jurisdiction

SECTION 1: Name

The name of this organization is the Western Trauma Association, henceforth referred to as the Association.

SECTION 2: Objectives, Core Value and Mission Statement

1) Objectives to promote the exchange of educational and scientific information and principles, at the highest level, in the diagnosis and management of traumatic conditions and to advance the science and art of medicine.

2) Core value:

Continuing education by participation in a diverse, multi-disciplinary scientific program with the goal of improving the care of injured patients.

3) 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.

SECTION 3: Organization

This is a non-profit membership corporation entity, duly incorporated on the 25th day of January 1971 under, and by virtue of, the provisions of the laws of the State of Colorado. The Association received a final determination of its 501(c)(3) status in October 2002.

SECTION 4: Jurisdiction and Territory

The territory in which this Association shall act will be the United States of America. It shall not be constrained, however, from holding its annual meetings at any designated site.

SECTION 5: Governing Board

The affairs of the Association shall be conducted by the Board of Directors.

ARTICLE II Membership

SECTION 1: Membership Limitation

Membership shall be limited 125 active members. No single specialty shall comprise more than 40% of this total membership of 125.

SECTION 2: Membership and Qualifications

A. Active members shall be limited to Doctors of Medicine or Doctors of Osteopathy who are Board Certified in their particular medical specialty and are under the age of 55 years. The Board of Directors is hereby given discretionary powers to interpret if foreign physicians who apply for membership have credentials comparable to Board Certification. Active status is conferred by a two-thirds vote of the Board of Directors. Active members have the right to vote on any business presented to the organization

during the business meeting, serve on, or chair any committee and be elected to any elected position within the organization.

- B. Associate members include qualified members of other (non-M.D.) health care disciplines with a special interest or expertise in trauma. Approval of a majority of the Board of Directors is required. Associate members must satisfy the same requirements for election to and retention of membership as active members. Associate members may not vote, serve on committees or hold office.
- C. Senior membership is automatically conferred on all members in good standing upon reaching the age of 55, assuming the member is in good standing. A senior member retains all voting privileges and rights of active members, and must pay dues annually but is exempt from attendance requirements. The senior member is not counted as part of a given specialty's membership quota or membership total.
- D. Retired membership: Members in good standing who retire from practice are, upon notification of the Secretary and/or Treasurer, entitled to continued membership, but are exempt from all membership requirements, including the payment of dues. They shall not have the right to vote and their membership shall not be counted towards specialty or membership quotas. The change to "retired status" is voluntary.
- E. Emeritus membership: Senior members of the Association who have made a significant contribution to the organization may be awarded Emeritus membership by a majority vote of the Board of Directors.
- F. Candidates for membership must submit a completed application and a letter of support (sponsorship) from a member of the Association. They must also submit an abstract for consideration by the Program Committee. A prospective member must attend a meeting within three (3) years prior to the meeting in which he/she is voted on for membership.

SECTION 3: Membership Retention

To retain membership in the Association, each member must comply with the following:

- A) Be a physician in good standing before his or her professional specialty board.
- B) Attend at least one out of every three consecutive meetings of the Association.
- C) Agree to be responsible for annual membership dues and any assessments as set by the Board of Directors at a special meeting or the annual meeting. He/she must remain current in the payment of dues and assessments.
- D) Maintain behavior befitting a physician by adhering to the code of ethical and moral standards as described by either the American College of Surgeons or the American Medical Association.

SECTION 4: Termination of Membership

- A) Membership can be terminated for a violation of one or more of the items set forth in Article II, Section 3 of the Bylaws of the Association by a vote of two-thirds of the Board of Directors.

- B) Any member may resign by filing a written resignation with the Secretary; however, such resignation shall not relieve the member so resigning of the obligation to pay any dues or other charges accrued and unpaid.

ARTICLE III

Meetings

SECTION 1: Annual Meetings

There shall be an annual meeting of the membership of the Association held in some suitable location chosen by the President-elect and approved by a majority vote of the Board of Directors and the membership. Funds shall be made available for the conduct of the scientific program at the annual meeting.

SECTION 2: Special Meetings

Special meetings of the Association may be called by the Board of Directors or two-thirds of the members in good standing, entitled to vote. The location for a special meeting of the Association shall be chosen by the Board of Directors.

SECTION 3: Notice

Notice of the time and place of the annual or special meetings of the Association shall be mailed by the secretary of the Association to each and every member at his address as it last appears on the records of the Association with postage thereon prepaid. Notice shall be deemed delivered when deposited in the United States Mail, so addressed to the respective member. Notification by electronic mail (e-mail) may be substituted for regular mail.

SECTION 4: Quorum

Subject to provisions of Article VI, Section 3, one-fourth of the membership present at any meeting of the Association shall constitute a quorum.

ARTICLE IV

Board of Directors, Meetings, and Responsibilities

SECTION 1: Composition

- A. The President, President-elect, Vice- President, Secretary, Treasurer, immediate Past President, program committee chairman and six members-at-large shall constitute the Board of Directors.
- B. The President of the Association shall serve as Chairman of the Board of Directors. The Chair of the Multicenter Trials Committee, the Historian and the President of the Western Trauma Foundation for Education and Research shall serve as ex-officio members of the Board of Directors. The ex-officio members shall not have any vote on matters before the board.
- C. At each annual meeting, two members of the Association in good standing named by the Nominating Committee and elected by the membership, shall replace the two outgoing members-at-large of the Board unless the membership should, by majority vote, elect to retain the then existing at-large Directors.
- D. The tenure of elected members of the Board of Directors shall be for no more than three years unless such member shall be elected to a position as an officer in the Association.

Section 2: Annual Meetings

- A. The annual meeting of the Board of Directors shall be held during and in the same general location as the annual meeting of the Association, but at least one day in advance of the general business meeting. The agenda will be determined by the President of the Association who will preside at the meeting. Additional agenda items may be proposed for discussion and/or vote by any Board member.
- B. Unless otherwise determined by a majority vote of the Directors, all meetings of the Board of Directors shall be considered executive sessions and, thus, closed to all but Board Members and invited guests.

SECTION 3: Special Meetings

- A. Special meetings of the Board of Directors may be held at any time and place upon the call of the President, or a majority of the Board providing ten days prior written notice shall be given to each Director, stating the time, place and purpose of the special meeting. Notices of special meetings shall be mailed to the Directors by the Secretary of the Association in the same form and manner as provided above for mailing notices of meetings for the general membership of the Association.
- B. In lieu of special meetings, the Board of Directors may conduct business by conference telephone call including a quorum of Members of the Board. The same rules for notification of special meetings shall apply to conference calls.

SECTION 4: Quorum

A majority of the Board of Directors shall constitute a quorum. (No member of the Board may vote by proxy.)

SECTION 5: Powers

Subject only to the limitations of the provisions of the Colorado Nonprofit Corporation Act, all corporate powers shall be exercised by or under the authority of, and the affairs and activities of the Association shall be controlled by, or under the authority of, the Board of Directors.

Section 6: Ex-officio Members of Board of Directors.

The President of the Western Trauma Foundation for Education and Research, Chairman of the Program Committee, Chair of the Multicenter Trials Committee and the Historian shall be ex-officio members of the Board of Directors and may participate in any meeting of the Board of Directors.

ARTICLE V

Registration, Fees, Dues, and Assessments

SECTION 1: Registration Fees

Registration fees for annual meetings shall be paid and used to defray the cost of the functions of the annual meeting. The amount of the registration fee shall be determined by the President, in consultation with the Treasurer, and notice thereof shall be sent to the membership along with the written notice of the annual meeting.

SECTION 2: Dues

Dues of the Association shall be set by the Board of Directors. Each member shall pay dues to the Treasurer of the Association for each fiscal year, beginning with the first new fiscal year after election to membership. The Treasurer shall notify each member of his/her dues obligation during the first quarter of the fiscal year by regular or electronic mail. This notification shall follow the rules for notification of the annual meeting. Associate members shall be required to pay the same dues required of active members. Failure to pay dues for three (3) years shall be considered cause for termination of membership.

SECTION 3: Assessments

A two-thirds majority vote of the Board of Directors of the Association can institute a special assessment of the general membership. Special assessments can be voted by the Board of Directors only for the promotion of scientific programs at the annual meetings, research papers or other purposes designed to achieve the exchange of ideas and principles pertaining to the diagnosis and management of traumatic injuries and conditions. Notice of any special assessment of the membership so voted by the Board of Directors shall be sent, by either regular or electronic mail, to all active and senior members at the last address on record with the Association, postage pre-paid.

SECTION 4: Waiver of Dues and Responsibilities

All requirements for retention of membership including payment of dues and attendance at meetings may be waived by a vote of the majority of the Board of Directors upon petition. Eligibility for such waivers shall include induction into the Armed Forces of the United States on a temporary basis, physical disability, or other reasons that would place unreasonable hardship, physical disability, or other reason upon the petitioner.

ARTICLE VI

Voting

SECTION 1: Voting Rights

Each active member or senior member in good standing shall be entitled to one vote on each matter submitted to a vote of the membership.

SECTION 2: Majority

A majority of the votes entitled to be cast on a matter at a meeting at which a quorum is present shall be deemed necessary for the adoption of such matters unless otherwise noted in the Bylaws.

SECTION 3: Manner of Voting

Each member of the Association is entitled to vote in one of three following manners:

1) In person.

2) With respect to matters described in any notice of meeting, by written instruction or ballot, delivered by United States Mail, postage pre-paid, addressed to the secretary of the Association at the Association's registered office or such other address as specified in any notice of meeting, postmarked and received on or before the date of the meeting of the membership where the vote is to be taken. A member who has voted by such written instruction or ballot shall be counted for purposes of determining whether quorum of members is present at a meeting, but only with respect to the matter voted upon by such Member.

3) By proxy duly executed in writing by the member or his authorized attorney-in-fact. No voting member in attendance at a meeting shall hold or vote more than one duly executed proxy for absent members.

SECTION 4: Amendments

As to the Articles of Incorporation, consolidation or dissolution of the Association shall be passed only in the event of a two-thirds vote of the members in good standing.

SECTION 5: Elections

Elections and all other matters raised to a vote of the membership cannot be held unless a quorum is present and shall be by majority vote.

ARTICLE VII

Officers

SECTION 1: Officers

The officers of the Association shall consist of the President, President-Elect, Vice-President, Secretary, Treasurer, Historian, and such other officers as from time to time may be appointed by the Board of Directors. The President, President-Elect, Vice-President, Secretary, Historian, and Treasurer shall be elected at the annual meeting of the members by simple majority of a quorum.

SECTION 2: Terms and Vacancies

The President, President-Elect, and Vice-President shall hold office for one (1) year. The Secretary and Treasurer shall each hold office for the term of three years. All elected officers, except the Treasurer, shall be automatically inaugurated at the close of the annual meeting at which they are elected. The newly elected treasurer shall assume the responsibilities of his/her office at the beginning of the next fiscal year following his/her election. The Historian shall serve until his/her death, resignation or inability to perform the duties subsequently described in Article VIII, Section 6. If an officer cannot complete his/her term, his/her successor shall be chosen by the Board of Directors by special meeting to fill the vacancy for the unexpired term of the office. No officer shall serve more than one term.

SECTION 3: Removal

Any officer may be removed, with or without cause, by a vote of a majority of the members of the Board of Directors present at any meeting for that purpose.

SECTION 4: Resignation

Any officer may resign at any time by giving written notice to the Board of Directors and receiving their approval.

ARTICLE VIII **Duties and Authority of Officers**

SECTION 1: President

The President shall preside at all meetings of the members and shall serve as ex-officio member of all committees. The president shall be Chairman of the Board of Directors and shall serve as the liaison to the American Association for the Surgery of Trauma.

SECTION 2: President-Elect

The president-elect shall plan and organize the next annual meeting and assume whatever responsibilities the president or Board of Directors shall assign.

SECTION 3: Vice President

The vice president shall preside at all business meetings in the absence of the president. The Vice-President shall serve as Chair of the Website Committee and perform such other duties as requested and assigned by the President or the Board of Directors.

SECTION 4: Secretary

The secretary shall

- 1) Keep the minutes of all meetings of the association and the Board of Directors
- 2) Be responsible for applications for membership, elections and terminations of members and communications to the membership, especially those whose membership is in jeopardy because of violations of the bylaws.
- 3) Maintain the Membership database, with the help of the Treasurer.
- 4) Record the reports from the other officers and committees and any bylaw changes.
- 5) Maintain copies of all corporate documents, including contracts, except for those that specifically relate to financial matters.
- 6) Prepare a report for the membership at the annual business meeting and for the Board of Directors at each of their annual meetings.

SECTION 5: Treasurer

The treasurer shall:

- 1) Keep the books of account of the Association.
- 2) Have custody of, and be responsible for all funds, securities, financial documents, and other properties of the Association and shall deposit all such funds in the name of the Association in such banks or other depositories as shall be approved by the Board of Directors.
- 3) Assist the Secretary in keeping the roster of the membership that is current and accurate.
- 4) Engage a certified public accountant, approved by the President, to prepare such tax documents as are required by law and file said documents in a timely manner. He/she will require said certified public accountant to audit the books of the Association upon the request of the Board of Directors and present the report of that audit to the Board.

- 5) Manage all accounts receivable and payable, including such expenses as may be incurred in the name of the Association.
- 6) Send to all active and associate members a statement of dues in the first quarter of the fiscal year, and make all necessary efforts to collect those dues.
- 7) Serve on the Website Committee and prepare the website annually for the meeting registration process.
- 8) Prepare registration packets, including name badges, and other items, for all those attending the annual meeting.
- 9) Organize, with assistance from the other Officers and Board Members, the registration process at the annual meeting.

SECTION 6. Historian

The Historian should maintain and safeguard the archives of the Association. The Historian shall be an ex-officio member of the Board of Directors. In case of a vacancy by reason of death, resignation, or inability to fulfill the responsibilities of the office, the vacancy may be filled by the Board of Directors until the next annual meeting of the members. The historian shall keep a continuous account of the history of the Association for the use of the membership. This shall include significant information concerning each annual meeting, including the site of the meeting, recipients of honors, invited lecturers, highlights of the scientific program, and important actions arising from the Business Meeting. The historian shall also record significant action of the Board of Directors at its meeting. Each five years the historian shall prepare the history of the Association from the time of the last recorded history to be part of the archives of the Association. Memorabilia of the Association shall be retained by the Historian.

ARTICLE IX **Committees**

SECTION 1: Nominating Committee

The Nominating Committee shall be composed of three (3) members of the Association appointed by the President. These individuals should represent General Surgery, Orthopedic Surgery, and another specialty. The Chairman of this Committee shall be the immediate Past President. This committee shall submit a slate of nominees for the various offices of the Association to the annual meeting of the members.

SECTION 2: Program Committee

The Program Committee shall consist of a Chairman, appointed by the President, and a Committee including at least one General Surgeon, one Orthopedic Surgeon, another specialist (if available), and as many other members as the Program Chairman and President deem necessary to a maximum of ten (10) members. The Chair and the President will appoint the committee members. The President and the Chairman of the Publications Committee shall serve as ex-officio members. The Chairman will serve a two year term and is an ex-officio member of the Board of Directors. This Committee will be responsible for the organization and conduct of the program at the annual meeting.

SECTION 3: Membership Committee

The Secretary of the Association shall serve as Chairman of the Membership Committee. The secretary shall present to the Board of Directors at its annual meeting, a list of candidates who have satisfied the requirements for membership. Upon approval of the Board of Directors, this group shall be then presented to the membership for its approval as previously outlined.

SECTION 4: Publications Committee

The Publications Committee will consist of a Chairman and a Committee including at least one General Surgeon, one Orthopedic Surgeon, one Plastic Surgeon and another specialist (if available), and as many other members as the Chairman and President deem necessary and appropriate. The Chairman of the Program Committee shall serve as an ex-officio member of the committee. The Chairman of the Publications Committee will be appointed by the President and serve a two (2) year term. The other members, selected from the membership, will be appointed by the President in consultation with the Chairman, annually. This committee will be responsible for reviewing all manuscripts submitted in association with presentations at the annual meeting and for choosing those which will be submitted to The Journal of Trauma. The Chairman will serve as the liaison to The Journal of Trauma. Should the Chairman not be an Editorial Consultant to The Journal of Trauma, the Chairman will consult with a member of the Editorial Board of The Journal of Trauma designated by the President.

Section 5: Multicenter Trials Committee

The multicenter trial committee shall consist of a Chairman and other interested members of the association. This committee will be responsible for coordinating and reviewing all the multicenter trials conducted under the aegis of the association. The Chairman will be appointed by the President to a five (5) year term. The Chairman will report to the president and board of directors, and at the annual business meeting and serve as an ex-officio member of the Board of Directors.

Section 6: Website Committee

The Website Committee shall consist of a Chairman and four (4) members. The Vice President shall serve as the Chairman of the Committee. The Treasurer will serve as a member. The two other members, selected from among the Association membership, will be appointed by the Vice President for a two (2) year term. The Committee shall be responsible for development and maintenance of the Association's Website.

Section 7: Other Committees

Other ad hoc committees may be established by the Board of Directors. The creation of additional standing committees, proposed by the Board of Directors, requires the approval of a majority of members in good standing.

ARTICLE X **Conduct and Order of Business**

SECTION 1: Business Sessions of the Members

There shall be an annual business meeting of the members during the annual meeting. It shall be preceded by a meeting of the Board of Directors also held during the annual meeting of the Association.

SECTION 2: Order of Business

The President shall set the agenda and where possible should follow Robert's Rules of Order.

ARTICLE XI **Indemnification**

Section 1. Definitions. For purposes of this Article:

- A. The terms "director or officer" shall include a person who, while serving as a director or officer of the Association, is or was serving at the request of the Association as a director, officer, partner, member, manager, trustee, employee, fiduciary or agent of another foreign or domestic Association. The term "director or officer" shall also include the estate or personal representative of a director or officer, unless the context otherwise requires.
- B. The term "proceeding" shall mean any threatened, pending, or completed action, suit, or proceeding, whether civil, criminal, administrative, or investigative, whether formal or informal, any appeal in such an action, suit, or proceeding, and any inquiry or investigation that could lead to such an action, suit, or proceeding.
- C. The term "party" includes an individual who is, was, or is threatened to be made a named defendant or respondent in a proceeding.
- D. The term "liability" shall mean any obligation to pay a judgment, settlement, penalty, fine or reasonable expense incurred with respect to a proceeding.
- E. When used with respect to a director, the phrase "official capacity" shall mean the office of director in the Association, and, when used with respect to a person other than a director, shall mean the office in the Association held by the officer or the employment, fiduciary or agency relationship undertaken by the employee or agent on behalf of the Association, but in neither case shall include service for any foreign or domestic Association or for any other person.

Section 2 General Provisions.

The Association shall indemnify any person who is or was a party or is threatened to be made a party to any proceeding by reason of the fact that such person is or was a director or officer of the Association, against expenses (including attorneys, fees), liability, judgments, fines, and amounts paid in settlement actually and reasonably incurred by such person in connection with such proceeding if such person:

- (i) acted in good faith;
- (ii) reasonably believed, in the case of conduct in an official capacity with the Association, that the conduct was in the best interests of the Association, and, in all other cases, that the conduct was at least not opposed to the best interests of the Association; and
- (iii) with respect to any criminal proceeding, had no reasonable cause to believe that the conduct was unlawful.

However, no person shall be entitled to indemnification under this Section 2 either:

- (i) in connection with a proceeding brought by or in the right of the Association in which the director or officer was adjudged liable to the Association; or
- (ii) in connection with any other proceeding charging improper personal benefit to the director or officer, whether or not involving action in that person's official capacity, in which the officer or director is ultimately adjudged liable on the basis that the director or officer improperly received personal benefit.

Indemnification under this Section 2 in connection with a proceeding brought by or in the right of the Association shall be limited to reasonable expenses incurred in connection with the proceeding. The termination of any action, suit, or proceeding by judgment, order, settlement, or conviction or upon a plea of solo contender or its equivalent shall not of itself be determinative that the person did not meet the standard of conduct set forth in this Section 2.

Section 3 Successful Defense on the Merits; Expenses.

To the extent that a director or officer of the Association has been wholly successful on the merits in defense of any proceeding to which he was a party, such person shall be indemnified against reasonable expenses (including attorneys' fees) actually and reasonably incurred in connection with such proceeding.

Section 4 Determination of Right to Indemnification.

Any indemnification under Section 2 of this Article (unless ordered by a court) shall be made by the Association only as authorized in each specific case upon a determination that indemnification of the director or officer is permissible under the circumstances because such person met the applicable standard of conduct set forth in Section 2. Such determination shall be made:

- (i) by the Board of Directors by a majority vote of a quorum of disinterested directors who at the time of the vote are not, were not, and are not threatened to be made parties to the proceeding; or
- (ii) if such a quorum of the Board of Directors cannot be obtained, or even if such a quorum is obtained, but such quorum so directs, then by independent legal counsel selected by the Board of Directors in accordance with the preceding procedures, or by the voting members (other than the voting members who are directors and are, at the time, seeking indemnification). Authorization of indemnification and evaluation as to the reasonableness of expenses shall be made in the same manner as the determination that indemnification is permissible, except that, if the determination that indemnification is permissible is made by independent legal counsel, authorization of indemnification and evaluation of legal expenses shall be made by the body that selected such counsel.

Section 5. Advance Payment of Expenses; Undertaking to Repay.

The Association may pay for or reimburse the reasonable expenses (including attorneys' fees) incurred by a director or officer who is a party to proceeding in advance of the final disposition of the proceeding if:

- (i) the director or officer furnishes the Association a written affirmation of the director's or officer's good faith belief that the person has met the standard of conduct set forth in Section 2;
- (ii) the director or officer furnishes the Association with a written undertaking, executed personally or on the director's or officer's behalf, to repay the advance if it is determined that the person did not meet the standard of conduct set forth in Section 2, which undertaking shall be an unlimited general obligation of the director or officer but which need not be secured and which may be accepted without reference to financial ability to make repayment; and
- (iii) a determination is made by the body authorizing indemnification that the facts then known to such body would not preclude indemnification.

Section 6. Reports to Members.

In the event that the Association indemnifies, or advances the expenses of, a director or officer in accordance with this Article in connection with a proceeding by or on behalf of the Association, a

report of that fact shall be made in writing to the member with or before the delivery of the notice of the next meeting of the members.

Section 7. Other Employees and Agents.

The Association shall indemnify such other employees and agents of the Association to the same extent and in the same manner as is provided above in Section 2 with respect to directors and officers, by adopting a resolution by a majority of the members of the Board of Directors specifically identifying by name or by position the employees or agents entitled to indemnification.

Section 8. Insurance.

The Board of Directors may exercise the Association's power to purchase and maintain insurance (including without limitation insurance for legal expenses and costs incurred in connection with defending any claim, proceeding, or law suit) on behalf of any person who is or was a director, officer, employee, fiduciary, agent or was serving as a director, officer, partner, member, trustee, employee, fiduciary of another domestic or foreign corporation, nonprofit corporation against any liability asserted against the person or incurred by the person in any such capacity or arising out of the person's status as such, whether or not the Association would have the power to indemnify that person against such liability under the provisions of this Article.

Section 9. Nonexclusivity of Article.

The indemnification provided by this Article shall not be deemed exclusive of any other rights and procedures to which one indemnified may be entitled under the Articles of Incorporation, any bylaw, agreement, resolution of disinterested directors, or otherwise, both as to action in such person's official capacity and as to action in another capacity while holding such office, and shall continue as to a person who has ceased to be a director or officer, and shall inure to the benefit of such person's heirs, executors, and administrators.

Section 10. Notice to Voting Members of Indemnification.

If the Association indemnifies or advances expenses to a director or an officer, the Association shall give written notice of the indemnification in advance to the voting members with or before the notice of the next voting members' meeting. If the next voting member action is taken without a meeting, such notice shall be given to the voting members at or before the time the first voting member signs a writing consenting to such action.

ARTICLE XII **Conflicts Of Interest, Loans And Private Inurement**

Section 1. Conflicts of Interest.

If any person who is a director or officer of the Association is aware that the Association may or is about to enter into any business transaction directly or indirectly with himself, any member of such person's family, or any entity in which he has any legal, equitable or fiduciary interest or position, including without limitation as a director, officer, shareholder, partner, beneficiary or trustee, such person shall:

- (a) immediately inform those charged with approving the transaction on behalf of the Association of such person's interest or position;
- (b) aid the persons charged with making the decision by disclosing any material facts within such person's knowledge that bear on the advisability of such transaction from the standpoint of the Association; and

(c) not be entitled to vote on the decision to enter into such transaction.

Voting on such transaction shall be conducted as follows:

(i) Discussion of the matter, with the interested officer or director, shall be held by the board with such person present to provide information and answer any questions.

(ii) The interested officer or director shall withdraw from the meeting.

(iii) Discussion of the matter outside of the presence of the interested officer or director shall be held by the Board.

(iv) The remaining members of the Board shall vote. Such voting shall be by written ballot. Such ballots shall not reflect the name or identity of the person voting.

Section 2. Loans to Directors and Officers Prohibited.

No loans shall be made by the Association to any of its directors or officers. Any director or officer who assents to or participates in the making of any such loan shall be liable to the Association for the amount of such loan until it is repaid.

Section 3. No Private Inurement.

The Association is not organized for profit and is to be operated exclusively for the promotion of social welfare in accordance with the purposes stated in the Association's articles of incorporation. The net earnings of the Association shall be devoted exclusively to charitable and educational purposes and shall not inure to the benefit of any private individual. No director or person from whom the Association may receive any property or funds shall receive or shall be entitled to receive any pecuniary profit from the operation thereof, and in no event shall any part of the funds or assets of the Association be paid as salary or compensation to, or distributed to, or inure to the benefit of any member of the board of directors; provided, however, that:

(a) reasonable compensation may be paid to any director while acting as an agent, contractor, or employee of the Association for services rendered in effecting one or more of the purposes of the Association;

(b) any director may, from time to time, be reimbursed for such director's actual and reasonable expenses incurred in connection with the administration of the affairs of the Association; and

(c) the Association may, by resolution of the board of directors, make distributions to persons from whom the Association has received contributions previously made to support its activities to the extent such distributions represent no more than a return of all or a part of the contributor's contributions.

ARTICLE XIII **Amendments**

These Bylaws may be amended at any annual meeting of the Association provided that a notice stating the purpose of each proposed amendment and the reason therefore, and a copy of the proposed amendment is sent to every member in good standing not less than thirty (30) days prior to the date of the meeting at which the proposed amendment is to be voted upon. It shall require a two-thirds vote of a quorum of the membership present at the meeting to amend a Bylaw.