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**THIRTY-FIRST
ANNUAL MEETING**



Western Trauma
Association

FEBRUARY 25 - MARCH 1, 2001

BIG SKY, MONTANA

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Reference: 1. Basia RJ, Bryg DJ, Gilani DJ. Immunonutrition in the critically ill: a systematic review of clinical outcome. *Crit Care Med*. 1999;27:2736-2802.

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WESTERN TRAUMA ASSOCIATION

**31st Annual Meeting
Big Sky
Montana
February 25 - March 3, 2001**

**THE WESTERN TRAUMA ASSOCIATION GRATEFULLY
ACKNOWLEDGES UNRESTRICTED EDUCATIONAL GRANTS
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WESTERN TRAUMA ASSOCIATION

31st Annual Meeting Big Sky Montana

February 25 - March 3, 2001

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WESTERN TRAUMA ASSOCIATION

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| President | Year | Location |
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| Robert G. Volz, M.D. | 1972 | Vail |
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| Gerald D. Nelson, M.D. | 1979 | Snowmass |
| Kevin G. Ryan, M.D. | 1980 | Snowbird |
| David S. Bradford, M.D. | 1981 | Jackson Hole |
| Erick R. Ratzler, M.D. | 1982 | Vail |
| William R. Olson, 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 |
| Robert J. Neviasser, M.D. | 1987 | Jackson Hole |
| 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, M.D. | 1999 | Crested Butte |
| Barry C. Esrig, M.D. | 2000 | Squaw Valley |
| Steven R. Shackford, M.D. | 2001 | Big Sky |

****The 2002 WESTERN TRAUMA ASSOCIATION Meeting will be:
Whistler-Blackcombe
February 23 - March 2, 2002**

WESTERN TRAUMA ASSOCIATION

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, NY 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.

Dr. Young 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. Wagensteen Award for Academic Excellence from 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 at the Annual Meeting.

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

WESTERN TRAUMA ASSOCIATION

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 |
| Charles Mock, 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 |
| James M. Doty, M.D. | Medical College of Virginia | 1999 |
| David J. Ciesla, M.D. | University of Colorado | 2000 |

WESTERN TRAUMA ASSOCIATION

Schedule

Sunday, February 25, 2001

1630 - 1930 Registration & Reception
1700 - 1800 Nominating Committee Meeting
1800 - 1930 Reception

Monday, February 26, 2001

0630 - 0700 Breakfast
0700 - 0720 Welcome Remarks, Dr. Shackford
0720 - 0900 Scientific Session I
1600 - 1800 Scientific Session II
1800 - Past Presidents Committee / WTA Multicenter Trial

Tuesday, February 27, 2001

0630 - 0700 Breakfast
0700 - 0900 Scientific Session III

1600 - 1700 Scientific Session IV
1700 - 1800 Invited Guest Lecture: Dr. Dan Benson, "Management of Thoraco Lumbar Spine Injuries"
1800 Board of Directors Meeting

Wednesday, February 28, 2001

0630 - 0700 Breakfast
0700 - 0800 Dr. Fred Moore "Creating Value with a Business Plan for Your Trauma Center"
0800 - 0900 Scientific Session V
1000 NASTAR
1200 Mountain Picnic / Picture
1600 - 1700 Scientific Session VI
1700 - Paint the Ceiling Lecture: Geoff Tabin: "Ultimate Challenges - The Last Unclimbed Face on Mount Everest and Eradicating Treatable Blindness"
1800 - 1900 WTA Business Meeting

Thursday, March 1, 2001

0630 - 0700 Breakfast
0700 - 0750 Scientific Session VII
0800 Panel Point - Counterpoint Free Fluid on CT Mandates Laparotomy
Moderator: Gregory J. Jurkovich, M.D.
CON: David H. Livingston, M.D.
PRO: Krista L. Kaups, M.D.

1600 - 1700 Scientific Session VIII Mini Series
1700 - 1800 Presidential Address: Dr. Steven R. Shackford
1800 Annual Dinner/Banquet

Mountain Walk Monument Room

Friday, March 2, 2001

0630 - 0700 Breakfast
0720 - 0840 Scientific Session IX
1600 - 1750 Scientific Session X

WESTERN TRAUMA ASSOCIATION

IN MEMORIAM

Earl G. Young, M.D.
February 27, 1989

Gerald S. Gussack
August 25, 1997

Scientific Paper Session I
Monday AM, February 26, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Steven R. Shackford, MD

0720 AM

PAGE

01 Evaluation of the Lumbar Spine Following Blunt Trauma Using Abdominal Computed Tomography (CT) Supplemented with Lateral CT Scout Images 18
ML Gestring, MD, VH Gracias, MD, MA Feliciano, MD, MB Shapiro, MD, MW Johnson, MD, DR Kauder, MD, CW Schwab, MD
University of Pennsylvania Medical Center, Philadelphia, PA

0740 AM

02 Hypotension Increases the Concentration of Interstitial Glutamate Following Brain Injury** 20
EJ, Okum, MD, DM Alspaugh, MD, SR Shackford, MD, K Sartorelli, MD, S. Buckingham, MS
University of Vermont Department of Surgery, Burlington, Vermont

0800 AM

03 Pulmonary Tractotomy Improves Outcome Compared with Anatomic Resection for Lung Injuries 22
C Cothren, MD, PH Offner, MD, EE Moore, MD, WL Biffi, MD, RJ Franciose, MD, JM Burch, MD
Denver Health Medical Center, Denver, CO

0820 AM

04 Multiple Head Injuries in Rats: Effects on Behavior ** 24
AL DeRoss, MD, JE Adams, MD, DW Vane, MD, SJ Russell, LATG, AM Terella, S Wald, MD
University of Vermont, Department of Surgery, Burlington, VT

0840 AM

05 The Effects of Hemodynamic Shock and Increased Intra-Abdominal Pressure on Bacterial Translocation ** 26
JM Doty, MD, J Oda, MD PhD, Ivatury, MD, CR Blocker, BS, GE Christie, PhD, J Yelon, MD, HJ Sugerman, MD
Medical College of Virginia of Virginia Commonwealth University, Richmond, VA

** Earl Young Resident Competition

Scientific Paper Session II
Monday PM, February 26, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Jim Davis, MD

| | <u>PAGE</u> |
|---|-------------|
| 1600 PM | |
| 06 The Role of Limited Upper Cervical Computerized Tomography in the Evaluation of the Trauma Patient** | 28 |
| M Miller, MD, J Benjamin, MD, J Ruth, MD, J Fortune, MD University of Arizona Health Sciences Center, Tucson, AZ | |
| 1620 PM | |
| 07 Role of the Emergency Medicine Physician in Airway Management of the Trauma Patient** | 30 |
| W Yeane, MD, S Mizikowski, MD, L Omert, MD Allegheny General Hospital, Pittsburgh, PA | |
| 1640 PM | |
| 08 Redefining the Role of Arteriography in Penetrating Zone 3 Neck Injuries** | 32 |
| J Sekharan, MD, JW Dennis, MD, HC Veldenz, MD, S Khansarinia, MD, JA Hertz, MD, LR Atteberry, MD, ER Frykberg, MD University of Florida Health Science Center, Jacksonville, FL | |
| 1700 PM | |
| 09 Hepatic Angiography in the Damage Control Population | 34 |
| JW Johnson, MD, VH Gracias, MD, PM Reilly, MD, DR Kauder, MD, CW Schwab, MD University of Pennsylvania Medical Center, Philadelphia, PA | |
| 1720 PM | |
| 10 Blunt Splenic Injuries: Splenic Embolization Improves Rate of Nonoperative Management | 36 |
| G Alsbrook, D Dent, MD, J Myers, MD, M Wholey, R Stewart, MD, O Blow, MD, R Pullarkat, MD H Root, MD, B Pruitt Jr, MD The University of TX Health Science Center at San Antonio, San Antonio, TX | |
| 1740 PM | |
| 11 Field Hypotension: Is Trauma Team Mobilization Required? | 38 |
| DP Schwab, MD, RS Miller, MD, RM Graham, MS Greenville Hospital System, Greenville, South Carolina | |

To Follow:

Past Presidents Meeting / WTA Multi-Center Trial Committee Meeting

** Earl Young Resident Competition

Scientific Session III
Tuesday AM, February 27, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Fred Moore, MD

| | <u>PAGE</u> |
|---|-------------|
| 0700 AM | |
| 12 Early Use of Recombinant Factor VIIa Decreases Mortality in Experimental Hemorrhagic Shock a Randomized Double-Blind Trial M Lynn, MD, I Jerohmimov, MD, EW Johnson, BS, D Jewelewitz, MD, E Gomez-Fein, Pharm.D, M Brown, RN MSN, S Cohn, MD University of Miami School of Medicine | 40 |
| 0720 AM | |
| 13 ARDS, Hypoxia, and Related Outcome Following Traumatic Brain Injury M Holland, MD, JF Pittet, MD, D Morabito MPH, AC Campbell, MD RC Mackersie MD UCSF, San Francisco General Hospital, San Francisco, California | 42 |
| 0740 AM | |
| 14 IGA Protease is a Virulence Factor for Gram Negative Pneumonia LN Diebel, MD, DM Liberati, MS, WJ Brown, PhD, T Painter, MS, SA Dulchavsky, MD, J Devlin, RPh Wayne State University, Detroit Michigan | 44 |
| 0800 AM | |
| 15 Mesenteric Lymph is Responsible for Post-Hemorrhagic Shock Systemic Neutrophil (PMN) Priming ** RJ Gonzales, MD, EE Moore, MD RS Hamilton, MD, WL Biffi, MD, CC Silliman MD PhD, Denver Health Medical Center, Denver, CO | 46 |
| 0820 AM | |
| 16 Migrating Motility Complexes (MMC'S) Persist after Severe Trauma in Patients Who Tolerate Enteral Nutrition (EN) MV Maszewski, MD, C Cocanour, MD, E McKinley, PhD, R Kozar, MD PhD, R DeSoignie, MS, N Weisbrodt, PhD, F Moore, MD University of Texas – Houston Medical School, Houston, Texas | 48 |
| 0840 AM | |
| 17 The Value of CT Imaging in Predicting the Need for Pelvic Fracture Embolization RA Dicker, MD, S Marder, MD, RC Mackersie, MD UCSF, San Francisco General Hospital, San Francisco, California | 50 |

** Earl Young Resident Competition

Scientific Session IV
Tuesday PM, February 27, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Scott Millikan, MD

| | <u>PAGE</u> |
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| 1600 PM | |
| 18 Minimal Aortic Injury: A Lesion Associated with Advancing Diagnostic Techniques A Malhotra, MD, T Fabian, MD, M Croce, MD, D Weiman, MD, M Gavant, MD, J Pate, MD University of Tennessee, Departments of Surgery and Radiology, Memphis, TN | 52 |
| 1620 PM | |
| 19 Minor Traumatic Intimal Flaps of the Aorta: Natural History and Nonoperative Management J Kepros, MD, P Angood, MD, R Rabinovici, MD Yale University School of Medicine, New Haven, CT | 54 |
| 1640 PM | |
| 20 Management of Traumatic Lung Injury: A WTA Multicenter Review R Karmy-Jones, MD, GJ Jurkovich, MD, D Shatz, MD, S Brundage, Md, M Wall Jr, MD, S Engelhardt, MD, D Hoyt, MD, J Holcroft, MD, MM Knudson, MD The Western Trauma Association Multi-Center Trial Group, Seattle, WA | 56 |
| 1700 PM | |
| Invited Guest Lecture: Dr. Dan Benson "Management of Thoraco Lumbar Spine Injuries" UC Davis <i>Sponsored by an unrestricted educational grant from Synthes</i> | 58 |
| 1800 PM | |
| WTA Board of Directors Meeting | |

Scientific Session V
Wednesday AM, February 28, 2001
Location: Talus Conference Room
Moderator: Robert C. Mackerle, MD

0700 - 0800 AM

PAGE

Invited Lecture: Dr. Fred Moore, "Creating Value with a Business Plan For Your Trauma Center"
University of Texas – Houston Medical School, Houston, Texas

60

0800 AM

21 Intoxicated Motor Vehicle Passengers Warrant Screening and Treatment Similar to Intoxicated Drivers
C Shermer, MD, RM Albrecht, MD, SW Lu, MD, GB Demarest, MD
University of New Mexico Health Sciences Center, Albuquerque, NM

62

0820 AM

22 Motor Vehicle Restraints: Primary Vs. Secondary Enforcement and Ethnicity
JW Davis, MD, L Bennink, BSN, KL Kaups, MD
UCSF/Fresno, Fresno, California

64

0840 AM

23 Violence Related Injuries Treated at a Level I Trauma Center with Linkage to Police Records: A Larger View of Patterns of Youth Victimization
A Hall, PhD, E Williams, MPH, P Goslar, PhD, SR Petersen, MD
Trauma Center St. Joseph's Hospital and Medical Center, Phoenix, AZ

66

1000 AM

NASTAR

1200 PM

Mountain Picnic/Picture

Scientific Session VI
Wednesday PM, February 28 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Gage Ochsner, MD

| | <u>PAGE</u> |
|---|-------------|
| 1600 PM | |
| 24 Comparison of Intermittent Pneumatic Compression Devices and Low Molecular Weight Heparin in Trauma | 68 |
| E Ginzburg, MD, S Cohn MD, J Lopez, RN, M Brown, RN, J Jackowski, RN, I Diaz, MD, JE Varela, MD, J Augenstein, MD, D Sleeman, MD, M McKenney, MD, E Barquist, MD, M Lynn, MD, | |
| University of Miami, Daughtry Family Department of Surgery, Miami, FL | |
| 1620 PM | |
| 25 Prophylactic Vena Cava Filtration is Not Indicated Following Acute Spinal Cord Injury | 70 |
| RA Maxwell, MD, M Chavarria-Aguilar, MD, WT Cockerham, MD, PL Lewis, RN, De Barker, MD, RM Durham, MD, DL Ciraulo, DO, CM Richart, MD, | |
| University of Tennessee College of Medicine, Chattanooga, TN | |
| 1640 PM | |
| 26 Autopsies in Trauma Do Not Add to Peer Review nor Quality Assurance ** | 72 |
| R Forsythe, MD, DH Livingston, MD, RF Lavery, MA, AC Mosenthal, MD, CJ Hauser, MD | |
| St. Michaels Medical Center, Heart Institute | |
| Division of Trauma, Department of Surgery, UMDNJ, New Jersey Medical School, Newark, NJ | |
| 1700 PM | |
| Lecture: Geoff Tabin, MD "Ultimate Challenges – The Last Unclimbed Face on Mount Everest and Eradicating Treatable Blindness" | 74 |
| University of Vermont | |
| 1800 PM | |
| WTA Annual Business Meeting | |

** Earl Young Resident Competition

Scientific Session VII
Thursday AM, March 1, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Tom Phillips, MD
JIM DAVIS

| | <u>PAGE</u> |
|---|-------------|
| 0700 AM | |
| 27 When to Bone Graft Contaminated Wounds | 76 |
| G Cierny, MD, MJ Matava, MD, JT Mader, MD, KE Zorn, RN Atlanta, GA, Galveston, TX | |
| 0720 AM | |
| 28 Hypertonic Saline: Intraosseous Infusion Causes Myonecrosis in a Dehydrated Swine Model of Uncontrolled Hemorrhage | 78 |
| H Alam, Md, C Pounzalan, MD, K Stanton, MS, E Koustova, PhD, M Bowyer, MD, P Rhee MD, MPH Uniformed Services University of the Health Sciences, Bethesda, MD | |
| 0740 - 0750 AM | |
| 29 Flap for all Seasons | 80 |
| N Kellam, Noah Gray OTR/L, M Smith, RN BSN, E Polack, MD West Virginia University, Wheeling, WV | |
| 0800 AM – 0900 AM | |
| Panel: | |
| Point – Counterpoint Free Fluid on CT Mandates Laparotomy | 82 |
| Moderator: GJ Jurkovich, MD | |
| CON: D Livingston, MD | |
| PRO: KL Kaups, MD | |

** Earl Young Resident Competition

Scientific Session VIII
Thursday PM, March 2, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: John McGill, MD

1600 PM - 1610 PM

PAGE

30 Neuroleptic Malignant Syndrome in Major Trauma Patients
NE Perlman, MD, R Marburger, MD, SE Ross, MD
Cooper Health Systems, Camden, NJ

84

1610 PM - 1620 PM

31 Nonvascular Migrating Missiles
DV Feliciano, MD, GS Rozycki, MD,
Grady Memorial Hospital/Emory University School of Medicine, Atlanta, GA

86

1620 PM - 1630 PM

32 The Use of Telemedicine for Real-Time Video Consultation Between Trauma
Center and Community Hospital in a Rural Setting Improves Early Trauma Care
Preliminary Results
F Rogers, MD, M Ricci, MD, S Shackford, MD, L Caputo, MD, K Sartorelli, MD, J
Dwell, MD, S Daye, MD
University of Vermont, Burlington Vermont

88

1630 PM - 1640 PM

33 Percutaneous Treatment of Secondary Abdominal Compartment Syndrome
A Corcos, MD, H Sherman, MD
The Mercy Hospital of Pittsburgh, Pittsburgh, PA

90

1700 PM

Presidential Address: Steven R. Shackford, MD
"How, then, shall we live?"

92

1900 PM

WTA Banquet

Location: Mammoth Room, 2nd Level Mountain Mall

** Earl Young Resident Competition

Scientific Session IX
Friday AM, March 2, 2001
Location: Talus Conference Room, Summit Lodge
Moderator: Harvey Sugerman, MD

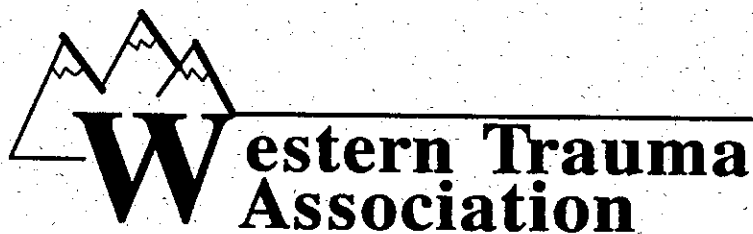
| | <u>PAGE</u> |
|---|-------------|
| 0700 AM | |
| 34 IL-6 Secretion in LPS-Stimulated Whole Blood Does Not Predict Clinical Outcome in ICU Patients W Heagy, PhD, C Hansen, MD, K Nieman, MS, Cohen M, J Rodriguez, MD, M West, MD University of Minnesota, Minneapolis, MN | 94 |
| 0720 AM | |
| 35 The Morbidity of Colostomies Following Penetrating Colon Injury EM Bulger, MD, KM McMahon, MD, GJ Jurkovich, MD Harborview Medical Center, University of Washington, Seattle, WA | 96 |
| 0740 AM | |
| 36 Impact of Gender on Outcome in Trauma Patients M Croce, MD, T Fabian, P Miller, T Bee, M Chang, MD University of Tennessee Health Science Center, Memphis, Tennessee | 98 |
| 0800 AM | |
| 37 Outcome After Major Trauma in the Elderly: Functional and Psychologic Outcomes in the Old Versus the Young T Holbrook, PhD, D Hoyt, MD University of California, San Diego, California | 100 |
| 0820 AM | |
| 38 Reducing Trauma Payments Denials with Collaborative Billing R Reed, MD, K Davis, MD, G Silver, MD, T Esposito, MD, V Tsitlik, MS, T O'Hern, MHA, R Gamelli, MD Loyola University Medical Center, Maywood, IL | 102 |

** Earl Young Resident Competition

Scientific Session X
Friday PM, March 2, 2001
Location: Talus conference Room, Summit Lodge
Moderator: Steve Wald, MD

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| 1700 PM | |
| 39 "Tuning" The Cardiovascular System During Resuscitation: A Thermodynamic Tool for Improving Perfusion and Cardiac Efficiency M Chang, MD, RS Martin, MS, L Scherer, MD, J Meredith, MD Wake Forest University School of Medicine, Winston Salem, N. Carolina | 104 |
| 1715 PM | |
| 40 Unsuspected Fracture Penetrations of the Heart A Mangram, MD, R Kozar, MD, I Gregoric, MD, P Grant, MD, F Moore, MD University of TX – Houston Medical School, Houston, TX | 106 |
| 1730 PM | |
| 41 Abdominal Decompression Prior to Organ Procurement B Manning, MD, A Arrillaga, MD, RS Miller, MD, T Kopelman, MD Greenville Hospital System, Greenville, SC | 108 |
| 1740 PM | |
| 42 Bicarbonate Administration in the Setting of Cardiac Arrest from an Extrathoracic Stab Wound JW Migill, MD Hennepin County Medical Center, Minneapolis, MN | 110 |
| 1750 PM | |
| 43 Alternatives in Abdominal Wall Reconstruction After Damage Control Surgery: A Photo Essay D Cottam, MD, J DiGiacomo, MD, L Riina, MD, L Angus, MD, C Simpkins, MD, R Simpson, MD, G Schaftan, MD The Long Island Comprehensive Trauma Center, Nassau University Medical Center, East Meadow, NY | 112 |
| Adjourn | |

ABSTRACTS





EVALUATION OF THE LUMBAR SPINE FOLLOWING BLUNT TRAUMA
USING ABDOMINAL COMPUTED TOMOGRAPHY (CT)
SUPPLEMENTED WITH LATERAL CT SCOUT IMAGES

M.L. Gestring, M.D., V.H. Gracias, M.D., M.A. Feliciano, M.D., M.B. Shapiro,
M.D., J.W. Johnson, M.D., D.R. Kauder, M.D. & C.W. Schwab, M.D.

University of Pennsylvania Medical Center

M.L. Gestring, M.D.

T.J. Esposito, M.D.

Philadelphia, PA

Objective: Patients at risk for lumbar spine (LS) injury following blunt trauma are frequently evaluated using both abdominal CT and conventional LS radiographs (LSR). Standard abdominal CT usually includes an AP scout film (scanogram) done prior to the cross-sectional imaging. The objective of this study was to determine whether the addition of a lateral scanogram would provide sufficient diagnostic information to allow evaluation of the LS without the need for additional radiographs.

Methods: Patients evaluated at this level I trauma center over a three month period who sustained blunt injury and required both CT of the abdomen as well as LSR were prospectively identified. Lateral scanograms were added to all helical CTs of the abdomen. The AP and lateral scanograms were then used to assess the LS. Specifically, these views provided information regarding vertebral alignment, loss of height and visible fractures. The standard abdominal CT (5mm cuts) was then used to evaluate the LS in the cross-sectional plane. The results of this protocol (CT+S) were then compared to readings done of the LSR (AP and Lateral) in a blinded fashion by a "trauma" radiologist. Images were evaluated for quality as well as ability to detect fractures. The addition of the lateral scanogram generated no additional costs or charges, and added no time to the imaging process. A General Electric digital workstation (Pathspeed) was used to evaluate all images.

Results: Lateral scanograms were generated for seventy-one patients. All LS scanograms were technically adequate, with image quality equal or superior to plain X-ray. AP scanograms and conventional AP radiographs were affected equally by the presence of bowel gas and oral contrast. Abnormal findings included ten LS fractures, nine acute and one chronic. All abnormalities identified by plain X-ray were seen using CT+S. (Sensitivity 100%, Specificity 100%) Three transverse process fractures not seen on LSR were identified using CT+S.

Conclusion: The addition of a lateral CT scanogram appears to enhance the ability of abdominal CT to screen the LS following blunt trauma. CT+S outperformed conventional LSR in the detection of fractures. In addition, scanogram imaging is less dependent on body habitus and adds no additional cost or time to the abdominal examination. Further study is suggested to determine if CT+S can replace conventional radiographs of the LS following blunt trauma.

Notes:

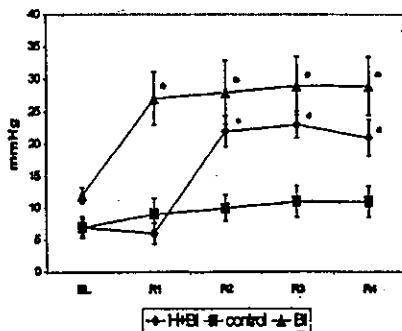
HYPOTENSION INCREASES THE CONCENTRATION OF INTERSTITIAL GLUTAMATE FOLLOWING BRAIN INJURY
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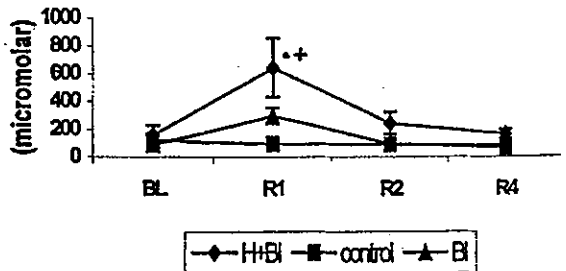
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Brain injury (BI) is the leading cause of traumatic death in the United States. Hypotension associated with BI doubles mortality by causing secondary cerebral ischemia. Despite extensive investigation, the pathophysiology of secondary cerebral ischemia is poorly understood. The excitatory amino acid glutamate (Glu) is known to be released in occlusive ischemia and mediates neuronal death. We hypothesized that BI with hypotension is associated with increased interstitial Glu levels compared to BI alone. Adult swine were randomized to isolated cryogenic BI, BI with hypotension (H+BI, hemorrhage to mean arterial pressure [MAP]= 50 mm Hg for 30 minutes), or control. Intracranial pressure (ICP), MAP, and brain interstitial levels of Glu (by microdialysis) were obtained at baseline (BL) and at 1 (R1), 2 (R2), 3 (R3), and 4 (R4) hours after lesion at which time animals were euthanized and brain biopsies were obtained for histology. The number of ischemic neurons per high power field (400X) assessed secondary injury. MAP was significantly reduced in the H+BI group at R1 ($p < 0.05$). ICP was increased from baseline at R2, R3, and R4 in both experimental groups ($p < 0.05$). Interstitial Glu levels were increased from baseline at R1 in both experimental groups ($p < 0.05$). The levels were greatest in the H+BI group. The H+BI group had significantly more ($p < 0.05$) ischemic neurons per high power field. These data suggest that glutamate mediates the worsened outcome when hypotension accompanies severe brain injury. For figures, * = $p < 0.05$ vs. BL. + = $p < 0.05$ vs. control.

ICP



Glutamate



Notes:

PULMONARY TRACTOTOMY IMPROVES OUTCOME COMPARED WITH ANATOMIC RESECTION FOR LUNG INJURIES

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Background: Since its introduction in 1994, pulmonary tractotomy has been considered the preferred technique for managing penetrating lung wounds. Recently, tractotomy has been suggested to increase morbidity and, thus, its practice has been questioned. The **purpose** of this study was to compare the morbidity and mortality associated with pulmonary tractotomy and anatomic lung resection in the management of pulmonary injuries.

Methods: Using our trauma registry, patients admitted to our urban level I trauma center since January 1, 1989 with thoracic injuries requiring thoracotomy and pulmonary operation were identified. Retrospective chart review was performed with attention to patient demographics, operative treatment and outcome. Statistical analysis was performed using ANOVA, Chi-square and logistic regression as appropriate.

Results: 36 patients were identified; 34 male and 2 female. The mean age was 29 ± 2 years. Mechanism of injury was predominantly penetrating with 26(72 %) gunshot wounds and 8(22 %) stab wounds. The mean systolic blood pressure in the emergency department (ED) was 78 ± 6 mmHg and 8(22 %) patients required ED thoracotomy. Outcomes with each operative technique are shown below: * $p < .05$

| | Mortality | Pulmonary Complications | Hospital days | ICU days | Ventilator days | ISS |
|-------------------------|---------------|----------------------------|------------------|-------------|--------------------|------------|
| Wedge resection N=10 | 1/10 (10%) | 4/9 (44%) | 15 ± 4 | 9 ± 4 | 7 ± 3 | 23 ± 5 |
| Tractotomy N=13 | 0/13* (0%) | 5/13 (39%) | 12 ± 3 | 8 ± 3 | 6 ± 3 | 21 ± 2 |
| Lobectomy N=10 | 7/10 (70%) | 4/5 (80%) | 22 ± 6 | 17 ± 7 | 12 ± 6 | 30 ± 5 |
| Pneumonectomy N=3 | 3/3 (100%) | 1/1 (100%) | 9 | 9 | 9 | 21 ± 5 |

Intraoperative blood loss and early red cell transfusion requirement were less in patients managed with tractotomy compared to lobectomy (3.65 L vs 10 L, 14.7 U vs 28.6 U, respectively; $p < .05$). Logistic regression showed that tractotomy was associated with a significant reduction in mortality after adjusting for ISS ($p = .004$).

Conclusions: Pulmonary tractotomy results in improved morbidity and mortality compared to anatomic resection in the management of lung injuries. This may, in part, be related to decreased intraoperative blood loss with significantly reduced early transfusion requirement. This technique should replace anatomic resection whenever possible in treating serious thoracic injuries.

Notes:

MULTIPLE HEAD INJURIES IN RATS: EFFECTS ON BEHAVIOR

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PURPOSE: Mild head trauma is a serious public health concern today. Evidence suggests that mild head injuries in both adults and children can result in cumulative damage and that recovery from a concussion is prolonged if a person has had a prior concussion. Coaches, physicians, and parents continue to outline criteria for an individual's continued participation in an activity following a concussion. Some animal research in the area of mild head injury has been performed, but to date no investigator has considered the effect of multiple mild head injuries.

HYPOTHESIS: Multiple minor head injuries adversely affect trained performance in a rat model.

METHODS: Twenty Long Evans hooded rats were trained in a Morris Water Maze. The maze is a standard method for evaluating rat behavior and memory, and is well described in the literature. Animals underwent a period of training until an optimal performance level in the maze was achieved. Optimal performance was defined as failure to improve as a function of time for completion of the maze over three or more consecutive days (4 trials per day). This performance level served as a pre-injury baseline. Animals were also required to negotiate a balance beam so that future evaluation of motor skills would be possible. Animals were then fitted with a hollow 2-mm intracranial screw through a left lateral burr hole into the extradural space. Following a recovery period, the animals were randomly assigned to one of four groups. Group 0 animals served as a sham group and received no concussive event. Groups I, II, and III received concussive events. Concussions were created using a fluid percussion device delivering a pulse of saline through the screw into the extradural space at a pressure of 1 atmosphere. The animals were then evaluated in the water maze until performance returned to baseline. Repeat performance on the balance beam was used to confirm retention of adequate motor skills. Group I animals were euthanized after reaching baseline. Group II and III animals received two and three concussions, respectively, were allowed to return to baseline and were then sacrificed.

RESULTS: Three animals died from anesthesia or required euthanization because of complications and were not evaluated. Control animals showed no performance deviation from baseline. All animals in all groups retained motor skills. 80% of animals showed performance deviation after 1 concussion (mean return to baseline 2.66 days, 4 trials per day). 60% of animals showed performance deviation after 2 concussions (mean return to baseline 1.78 days), and 66% of animals showed performance deviation after 3 concussions (mean return to baseline 1.33 days). After one concussion, animals appeared to exhibit complete return to baseline with consistent baseline performance. After 2-3 concussive events, even after return to baseline performance, animals exhibited deviations in performance (developed new baselines with more performance inconsistency).

CONCLUSIONS: These data indicate that minor concussive events not only cause immediate impairment in cognitive function (which lasts several days) but also appear to have long term effects on baseline cognitive performance. This study further shows that even multiple concussive events do not appear to adversely effect motor function in this animal model. Follow-up studies are indicated to further define these observations.

Notes:

THE EFFECTS OF HEMODYNAMIC SHOCK AND INCREASED INTRA-ABDOMINAL PRESSURE ON BACTERIAL TRANSLOCATION

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Hypothesis

We hypothesized that hemorrhagic shock followed by the abdominal compartment syndrome (ACS) would result in bacterial translocation (BT) from the gastrointestinal (GI) tract.

Methods

Nineteen Yorkshire swine (20-30 kg) were divided into 2 groups. In the experimental group, group 1 (N=10), animals were hemorrhaged to a mean arterial pressure (MAP) of 25-30mmHg for a period of 30 minutes, resuscitated and then an ACS was created with normal saline to an intra-abdominal pressure (IAP) 30mmHg above baseline for 60 minutes. Acid/ base status, gastric tonometry, superior mesenteric artery (SMA) blood flow and hemodynamic parameters were measured and recorded. Blood samples were analyzed by polymerase chain reaction (PCR). Spleen, lymph node and portal venous blood cultures were obtained at 24 hours. Results were analyzed by ANOVA and are reported \pm SEM.

Results

SMA blood flow in group 1 (baseline 0.87 ± 0.10 l/min) decreased in response to hemorrhage (0.53 ± 0.10 l/min, $p=0.0001$) and ACS (0.63 l/min ± 0.10 , $p=0.0006$) as compared to control and returned towards baseline (1.01 ± 0.5 l/min) when the ACS was relieved. Gastric tonometry showed that the pHi (baseline of 7.21 ± 0.03) decreased with hemorrhage (7.04 ± 0.03 , $p=0.0003$) and ACS (6.99 ± 0.03 , $p=0.0001$) in group 1 compared to control, but returned to baseline at 24 hours (7.28 ± 0.04). The mean arterial pH decreased to 7.27 ± 0.014 at its nadir from baseline (7.43 ± 0.014) within group 1 ($p=0.0001$) and control ($p=0.0001$). Base excess also decreased as compared to group 2 with hemorrhage (3.30 ± 0.71 vs 0.057 ± 0.60 , $p=0.001$) and ACS (3.08 ± 0.71 vs. -1.17 ± 0.60 , $p=0.0001$).

In group 1, 8 of the 10 animals had positive lymph node cultures, 2 of the 10 had positive spleen cultures and 2 of the 10 had positive portal venous blood cultures for gram negative enteric bacteria. Only 2 of the 10 animals had a positive PCR. In group 2, 5 of the 9 animals had positive lymph node cultures, 0 of the 9 had positive spleen cultures and 1 of the 9 had positive portal venous blood cultures. Two of the 9 animals had positive PCRs. There was no significant difference in cultures or PCR between the 2 groups (Fisher's exact test, $p=0.3$).

Conclusions

In this study, hemorrhage, followed by resuscitation and then ACS caused significant GI mucosal acidosis and ischemia as well as systemic acidosis based on gastric tonometry, SMA blood flow and arterial blood gases. However, we did not see a significant increase in bacterial translocation based on PCR measurements nor by tissue or blood cultures between the 2 groups. Our study does not support the hypothesis that hemorrhagic shock followed by ACS causes bacterial translocation in this porcine model.

Notes:

THE ROLE OF LIMITED UPPER CERVICAL
COMPUTERIZED TOMOGRAPHY IN THE EVALUATION OF
THE TRAUMA PATIENT

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Evaluation of the cervical spine in trauma patients with altered level of consciousness, either from head injury or severe multi-system trauma, continues to be a challenge. There remains much controversy on the appropriate management of the cervical spine in unresponsive patients. Recently, recommendations have been made to include thin cut axial CT scans from the occiput through the second cervical vertebrae along with screening cervical spine radiographs (three view plain radiographs and limited axial CT through poorly visualized or suspicious areas) in the evaluation of the spine in trauma patients. If all of these studies are technically adequate and properly interpreted, than the cervical spine could be considered stable and the immobilization devices safely removed.

After institution of this protocol, a review was undertaken to evaluate the effectiveness of limited upper cervical spine computerized tomography in determining cervical spine injury in trauma patients with an altered level of consciousness. Seventy-eight limited CT scans of C1-2 were performed over an 18-month period on trauma patients with an altered level of consciousness (GCS < 12). Standard screening cervical spine radiographs obtained on all patients were normal. CT scans of the head were also performed on all patients and were positive for intracranial hemorrhage in 53 patients (68%). Three patients (3.8%) with negative cervical spine screening radiographs had evidence of fracture on CT scans of C1-2. All three had a positive head CT. There were no cases identified of missed cervical spine injury and no cases of neurological deficit that could be attributed to spinal cord injury after the cervical spine was cleared.

Cervical spine radiographs continue to be the standard for detecting cervical spine injuries in the trauma patient. Computerized tomographic evaluation of suspicious or poorly visualized areas greatly enhances the sensitivity of the screening process. The addition of limited axial CT scan from the occiput through C2 can identify fractures not apparent on plain radiographs and should be included in the evaluation of patients with evidence of head injury on CT.

Notes:

- Prod CT
- 3 units C expense
- CT 1-2 easy to do head CT
- fine out of view of any suspicious areas on remaining C expense

ROLE OF THE EMERGENCY MEDICINE PHYSICIAN IN
 AIRWAY MANAGEMENT OF THE TRAUMA PATIENT
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OBJECTIVES/METHODS: A Level I trauma center recently underwent a policy change wherein airway management of the trauma patient is under the auspices of Emergency Medicine (EM) rather than Anesthesiology. We prospectively collected data on the first 93 EM intubations (EMI) since this policy change and compared them to the last 50 Anesthesia managed intubations (ANI) in order to answer the following questions: 1) Is intubation of trauma patients being accomplished effectively by EM? 2) Has there been a change in complication rates since the policy change? 3) How does the complication rate at our trauma center compare to other institutions?

RESULTS: EM residents successfully intubated trauma patients on their first attempt 81% of the time compared to 83% ANI. In the event they were unsuccessful, EM attendings intubated on their first attempt 55% of the time whereas anesthesia staff did so 33% of the time. The airway was successfully secured by EM staff 100% of the time while a surgical airway was performed in two ANI's. Complications were as follows:

| | EMI (n=93) | ANI (n=50) |
|------------------|-----------------|-----------------|
| Hypoxemia | 15 (16.0%) | 9 (18.0%) |
| Aspiration* | 1 (1.0%) | 2 (4.0%) |
| R mainstem | 5 (5.4%) | 2 (4.0%) |
| Bradycardia | 2 (1.1%) | 2 (4.0%) |
| Esophageal | 4 (4.3%) | 1 (2.0%) |
| Dental trauma | 2 (1.0%) | 0 (0%) |
| Surgical airway* | 0 (0.0%) | 2 (4.0%) |
| Mortality | 0 (0.0%) | 0 (0.0%) |
| TOTAL | 29 (31%) | 18 (36%) |

* $p < 0.02$ (aspiration), $p < 0.00$ (surgical airway) by independent t-test

CONCLUSIONS: EM residents and staff can safely manage the airway of trauma patients. There is no statistically significant difference in overall peri-intubation complications, although the individual complications of aspiration and need for surgical airway occurred significantly more frequently with ANI in our series. The complication rate for EDI (31%) and ANI (36%) is higher than reported in the literature (13%), although the populations are not entirely comparable.

Notes:

REDEFINING THE ROLE OF ARTERIOGRAPHY IN
PENETRATING ZONE 3 NECK INJURIES

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Purpose: The purpose of this study was to assess the role of arteriography (AG) in the diagnosis and treatment of vascular trauma in patients with Zone 3 penetrating neck injuries.

Methods: The records of all cases of penetrating neck trauma for the past 10 years at a Level 1 trauma center were retrospectively reviewed.

Results: A total of 624 penetrating neck injuries were documented of which 50 (8.0%) traversed Zone III (gunshot-24, stab-23, shotgun-3). Fourteen patients (28%) had hard signs of vascular injury (hemorrhage, hematoma, bruit/thrill, neurologic deficit). Nine of these (64%) underwent immediate exploration, one had no injury and 8 (89%) had successful surgical repair of vascular injuries. AG in the other 5 patients with hard signs revealed injuries requiring embolization (2), urokinase infusion (1), observation only (1), and one normal exam. Thirty-six patients had no hard signs of vascular injury. Twenty of these underwent AG, of which 15 were negative. Positive findings included ICA narrowings (2), external ICA compression (1), vertebral artery intimal flap (1), and non-bleeding injuries to the facial and lingual arteries (1), none of which required treatment. Thirteen of the 16 remaining patients with no hard signs were clinically observed and three had negative explorations. There were four deaths (8 %) in this entire group resulting from lethal head injury (2), multi-system organ failure (1), and ARDS (1). There was no cervical vascular related mortality or morbidity among all 50 patients.

Conclusion: The absence of hard signs reliably excludes surgically significant vascular injury in penetrating Zone 3 neck trauma, suggesting AG is not necessary. Hard signs in stable patients should mandate AG, as these vascular injuries may be amenable to endovascular therapy.

Notes:

- I below arcoid
- II arcoid to a mandible
- III angle of mandible - base of skull

HEPATIC ANGIOGRAPHY IN THE DAMAGE CONTROL POPULATION

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Jon W. Johnson, MD
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Objective: Damage Control (DC) patients require intensive and ongoing resuscitation. This aggressive management must continue throughout all phases of DC. Those patients suffering significant hepatic injury often require angiography in addition to hepatic packing in an effort to halt exsanguination. We sought to determine the safety of hepatic angiography in this DC population.

Methods: A three year (June 1997-May 2000) retrospective review generated 38 patients of which 19 (50%) had hepatic trauma. Admission vitals; lowest pH and HCO₃ in the OR; pH, lactate, PT, PTT, and HCO₃ upon admission to the ICU, and prior to definitive laparotomy were abstracted. Fluid requirements during DC were also compared. Aggressive resuscitation and intensive physiologic monitoring was continued throughout the angiographic procedure.

Results: Of the 19 patients with hepatic injury, there was one grade I, five grade II, three grade III, and ten grade IV (AAST grade). Eleven patients sustained penetrating hepatic injury and 8 patients suffered blunt hepatic injury. Nine patients underwent hepatic angiography, 8 of which underwent embolization of bleeding hepatic vessels, for a therapeutic angiography rate of 87%. All patients undergoing angiography were grade IV. Two angiograms were obtained prior to operation and six were obtained in the immediate post-operative period, following hepatic packing. There was no statistically significant difference in complications, physiologic parameters, lactate levels, coagulation profiles, or fluid requirements between the hepatic angiography and nonangiography groups.

Conclusion: Hepatic angiography for high-grade hepatic trauma during DC has a high therapeutic rate with no significant untoward effect in this study population. Hepatic angiography is a safe adjunct to the principles of DC when employed in conjunction with ongoing aggressive resuscitation and physiologic monitoring.

Notes:

BLUNT SPLENIC INJURIES: SPLENIC EMBOLIZATION IMPROVES RATE OF NONOPERATIVE MANAGEMENT

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Background: Nonoperative management (NOM) of blunt splenic injuries has become the standard of care for hemodynamically stable patients. Since publication of a series of splenic injuries in which high NOM rates were demonstrated in patients of all ages, splenic embolization has been added to the NOM armamentarium at our institution. This retrospective review tests the hypothesis that adding selective splenic embolization to a previously existing NOM strategy will result in higher rates of successful NOM in patients with blunt splenic injury.

Methods: Using a trauma registry and surgical database, all patients documented with blunt splenic injuries (documented by CT, operative findings, or both) cared for over a 24-month period, ending in July 2000 at a single American College of Surgeons verified Level I trauma center, were reviewed. Chart review was performed to examine admission demographics, laboratory data, radiologic findings, outcome measures, and patient management strategy. Nonpediatric trauma surgeons managed all patients. We previously identified 251 patients with splenic injury (Group 1) and compared them to the 190 patients which comprise this review (Group 2).

Results: Eighteen patients in Group 1 and 22 patients in Group 2 who died in the immediate post injury period were excluded from statistical evaluation. No deaths occurred as a result of the splenic injury. Twelve patients in Group 2 underwent a total of 13 splenic embolization procedures with 11 (91.7%) being successfully treated without operation.

| Group | n | Mean Age | Mean ISS | Initial NOM | Successful NOM% | Overall NOM |
|---------|-----|----------|----------|-------------|-----------------|-------------|
| Group 1 | 233 | 30.4 | 22.4 | 160 (69%) | 151/160 (94%) | 151 (65%) |
| Group 2 | 168 | 33.4 | 19.3 | 148 (88%) | 145/148 (98%) | 145 (86%)* |

Table 1: * $p < 0.00001$ versus Group 1

Group 2 patients had a significantly higher likelihood of ultimately being managed without operation.

Conclusion: Since introduction of embolization of blunt splenic injury, nonoperative management rate at our institution has increased significantly. Angiographic embolization is an effective adjunct to the nonoperative management of blunt spleen injuries.

Notes:

FIELD HYPOTENSION: IS TRAUMA TEAM
MOBILIZATION REQUIRED?

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Purpose: To evaluate whether confirmed field hypotension (FH) is an accurate criteria to mobilize a trauma team, including attending surgeon for a major resuscitation.

Methods: A database of all trauma admissions with field hypotension (FH) was obtained from our trauma registry between 1/1/97 and 12/31/99. Data gathered included: field and emergency department (ED) systolic blood pressure (SBP); amount of fluid received in the field; transport time; abbreviated injury score (AIS); injury severity score (ISS); and outcome. Field hypotension was defined as a SBP ≤ 90 mmHg and ED hypotension as SBP ≤ 100 mmHg.

Results: Of 3,806 trauma admissions, 551 (14%) were hypotensive in the field. Excluding transfer patients, those with missing data and age ≤ 14 , left 262 evaluable patients. 69% survived, 31% died. 76% were blunt while 24% were penetrating injuries. Upon arrival in the ED, three groups with FH were identified. Those that arrived and stayed normotensive (NL/NL, n=105 or 40%), those that arrived normotensive but became hypotensive during their stay in the ED (NL/Low, n=82 or 31%) and those that arrived hypotensive (arrived low, n=75 or 29%).

| | NL/NL (N=105,40%) | NL/Low (N=82,31%) | Arrived low (N=75,29%) | P Value |
|------------------------|----------------------|----------------------|---------------------------|---------|
| Field BP (mmHg) | 80 | 80 | 60 | <0.001 |
| AIS | 3 | 3 | 4 | <0.001 |
| ISS | 14 | 19 | 25 | <0.001 |
| Penetrating Trauma | 26(25%) | 14(18%) | 26(35%) | 0.017 |
| Mortality | 12(11%) | 21(26%) | 49(65%) | 0.001 |
| Field fluid (ml) | 800 | 850 | 800 | NS |
| Transport Time (mins.) | 35 | 35 | 33 | NS |

Median field SBP of patients with any ED hypotension was 70 mmHg. 30 patients had field SBP=0. 19(63%) remained 0 in ED and all died. 11(37%) increased from 0 and 8/11 died.

Conclusion: A single field SBP ≤ 90 mmHg yields a potential over triage of 40%. Patients who arrived or became hypotensive in the ED had a significantly lower field SBP, higher ISS and mortality rate. Based on this data, we recommend trauma team mobilization for any field SBP ≤ 70 mmHg, any penetrating torso trauma with field hypotension and any patient with field hypotension who arrives or becomes hypotensive in the ED. Those with field SBP=0 and no signs of life, trauma team mobilization should be withheld until ED evaluation.

Notes:

EARLY USE OF RECOMBINANT FACTOR VIIa DECREASES MORTALITY IN EXPERIMENTAL HEMORRHAGIC SHOCK - A RANDOMIZED DOUBLE-BLIND TRIAL

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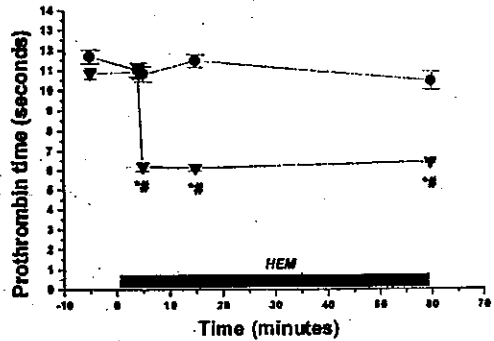
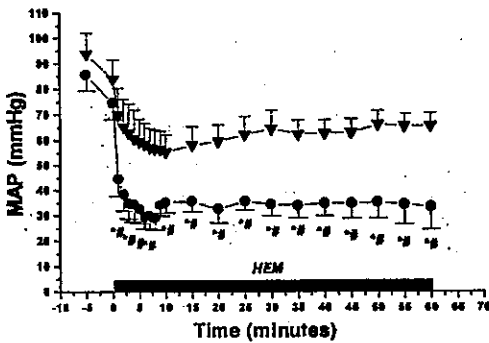
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Background: The initiating mechanism of blood coagulation is the formation of factor VIIa/tissue factor complexes, resulting in thrombin formation. Anecdotal use of recombinant factor VIIa (rFVIIa) in moribund coagulopathic trauma patients appears to terminate bleeding.

Objective: To test the hypothesis that early administration of rFVIIa would decrease bleeding and improve survival after experimental hepatic trauma.

Methods: Pigs (n=6, rFVIIa; n=7, placebo) were pentobarbital anesthetized (IV 10mg/kg and ventilated (FiO2 0.5; Vt 7.0ml/kg), to maintain pCO₂ 40±5mmHg. Arterial and venous femoral catheters were placed for blood sampling and hemodynamic monitoring. Avulsion of Rt. medial lobe of the liver induced uncontrolled hemorrhage. After a 10% reduction of MAP animals were double blind randomized to receive intravenous rFVIIa (180mcg/kg) or placebo. Data were collected before drug injection and at 5, 15 and 60 minutes.

Results: Mortality was 43% (3/7) in controls vs. 0% with rFVIIa (p=0.08, X²). Significantly shorter PT and higher MAP were observed in the rFVIIa group.



Values=mean±SEM vs. time (minutes). * = p < 0.05 within group vs. t=0min, # = p < 0.05 between groups by ANOVA-Tukey's test. Circle=placebo, triangle=rFVIIa, MAP=mean arterial pressure, HEM=Hemorrhage.

Conclusion: Intravenous administration of rFVIIa early after induction of hemorrhage shortens prothrombin time and improves mean arterial pressure. A trend towards improved survival was observed.

Notes:

ARDS, HYPOXIA, AND RELATED OUTCOME FOLLOWING TRAUMATIC BRAIN INJURY

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Previous studies have suggested a causal relationship between hypoxia and outcome from traumatic brain injury (TBI). While the development of acute post-traumatic inflammatory lung injury (ALI/ARDS) may produce hypoxia, it is not known whether ALI/ARDS independently affects the outcome from traumatic brain injury (TBI). The purpose of this study was to test the hypothesis that ALI/ARDS, possibly through a hypoxic mechanism, is an independent factor increasing the mortality following TBI, and to identify any correlation between the severity or type

of TBI and the development of ALI/ARDS. **Patients & Methods:** Clinical data were collected over a 4 year period, prospectively for 3 years, for all trauma patients intubated > 1 day with predominant head injury. Inclusion criteria were: AIS(head) \geq 3; 18 < age < 54, no other AIS > 3. ALI/ARDS was defined using international consensus criteria. Physiologic data for quantitative assessment of organ dysfunction were collected on a daily basis. The patient's admission head CT was graded using the Marshall system, and the presence, size, and type of TBI (e.g. epidural hematoma) was noted. Glasgow outcome scores (GOS) were calculated at 3 and 12 months. Bivariate comparisons were made between groups with and without ALI/ARDS,

| | ALI/ARDS (n = 42) | No ALI (n = 95) |
|------------|----------------------|--------------------|
| Mortality | 38% * | 15% |
| GOS 3mo | 3.4 ± .76 | 3.4 ± .91 |
| GOS 12mo | 3.8 ± .69 | 3.9 ± .96 |
| GCS arriv. | 7.2 ± 4.2 | 7.7 ± 4.0 |
| AIS (head) | 4.7 ± .54 | 4.6 ± .58 |
| ISS | 31 ± 9.6* | 27 ± 7.0 |
| Vent. days | 13.2 ± 14* | 7.2 ± 6.3 |
| BP arriv. | 129 ± 40 | 139 ± 32 |
| Age | 32 ± 8.5 | 36 ± 10 |
| Blood trx. | 1.8 ± 3.5 | 1.5 ± 2.6 |

Mean ± S.D. * p < .01

and logistic regression was used to assess the independent effects of ALI/ARDS on mortality and neurological outcome (GOS). **Results:** Death attributable to ARDS occurred in only 7% of patients. The development of ALI/ARDS was associated with a substantially higher mortality (p=.004). There was no correlation between the development of ALI and 3,12 month GOS in survivors. Multivariate regression identified ALI/ARDS, age, and GCS as independent factors significantly influencing mortality. The development of ALI/ARDS was not correlated with GCS, Marshall score or type of traumatic brain injury. Within the ALI/ARDS group, mean PaO₂/FiO₂ (P/F) ratios were significantly different in survivors vs. non-survivors (224 vs 145, p=0.03). This was not the case within the non-ALI group. **Conclusions:** The development of ALI/ARDS appears to be a critical, independent factor influencing mortality following severe head injury. This may be directly related to transient hypoxia occurring in the setting of impaired gas exchange - as suggested by differences in mean P/F ratios in survivors versus non-survivors within the ALI group. In spite of its effect on mortality, ALI does not appear to influence long-term neurological outcome in survivors. In this more severely injured group, there is no correlation between the severity or type of TBI and the subsequent development of ALI/ARDS.

Notes:

**IGA PROTEASE IS A VIRULENCE FACTOR FOR GRAM
NEGATIVE PNEUMONIA**

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Background: Pneumonia develops when virulent organisms reach the lower airways and overwhelm host lung defenses. Secretory IgA (sIgA), the principle humoral defense of mucosal surfaces of the body, prevents colonization and subsequent systemic invasion by these potential pathogens. sIgA may be rendered immunologically inactive by bacterial protease activity. This may be important in the pathogenesis of ICU-acquired pneumonia.

Methods: Respiratory tract secretions were obtained from trauma-ICU patients in whom pneumonia was clinically suspected. Bacteria isolated from these specimens were incubated with sIgA obtained from human colostrum *in vitro*. IgA degradation was indexed by the concentration of the secretory component (SC) fragment noted by size exclusion ultrafiltration. IgA proteolytic cleavage was confirmed using gel electrophoresis.

Results: (mean \pm S.D., ng/ml)

| | Intact IgA | SC Fragment |
|---|------------------|------------------|
| Gp I IgA only (n=5) | 480.8 \pm 1.8 | 3.12 \pm 0.9 |
| Gp II gm pos. bacteria + IgA (n=17) | 465.8 \pm 13.2 | 3.14 \pm 0.9 |
| Gp III gm neg bacteria + sIgA (n=10) | 3.19 \pm 0.9* | 473.5 \pm 8.7* |

* p < 0.001 vs. Gp I and II by ANOVA

Gel electrophoresis confirmed sIgA cleavage by gram-negative bacteria only. The most common gram-negative isolates were *Pseudomonas* and *Acinetobacter*. **Conclusions:** IgA protease activity is evident in gram-negative respiratory tract isolates from ICU patients. This may be important in the pathogenesis of gram-negative pneumonia acquired in the ICU. Further, impaired mucosal immunity may contribute to adverse outcomes in this setting.

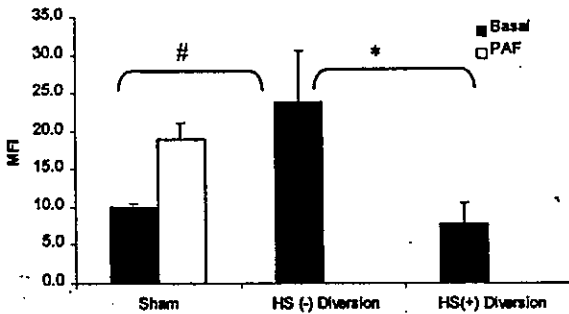
Notes:

MESENTERIC LYMPH IS RESPONSIBLE FOR POST-
HEMORRHAGIC SHOCK SYSTEMIC NEUTROPHIL (PMN)
PRIMING

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Hemorrhagic shock induced splanchnic hypoperfusion has long been implicated as a priming event in the two event model of multiple organ failure (MOF). We have previously shown that early post-injury neutrophil (PMN) priming identifies the injured patient at risk for acute respiratory distress syndrome (ARDS). Recent animal studies have demonstrated that mesenteric lymph duct diversion prevents post-hemorrhagic shock acute lung injury - but the mechanism remains unclear. We hypothesize that lymphatic diversion prior to hemorrhagic shock abrogates systemic PMN priming. **METHODS:** Sprague-Dawley rats (n≥5 per group) underwent hemorrhagic shock (MAP40mmHg x 30min) and resuscitation (shed blood + 2x crystalloid) with and without mesenteric lymphatic duct diversion. Sham animals underwent anesthesia and laparotomy. Whole blood was taken two hours after resuscitation, heparinized, and incubated for 5 min. at 37°C platelet activating factor (PAF) served as (+) control. Anti-CD11b antibody was added for 30 min. at 4°C, samples were then lysed of red cells, washed, and fixed with 4% paraformaldehyde. Surface expression of CD11b (a marker for PMN priming) was read under flow-cytometry compared to isotype controls. Data are presented as mean ± SEM of mean fluorescence intensity. # = p < 0.05 sham vs. non-diverted, * = p < 0.05 non-diverted vs. diverted by ANOVA. **RESULTS:** Hemorrhagic shock resulted in increased surface expression of PMN CD11b relative to sham (23.8±6.7 vs. 9.9±0.6). Mesenteric lymphatic diversion before hemorrhagic shock abrogated this effect (Figure). **CONCLUSION:** Post-hemorrhagic shock mesenteric lymph primes circulating PMNs in-vivo. This further implicates the role mesenteric lymph in hemorrhagic shock induced lung injury. Characterizing the PMN priming agents could provide further insight into the pathogenesis of ARDS.



abrogated this effect (Figure). **CONCLUSION:** Post-hemorrhagic shock mesenteric lymph primes circulating PMNs in-vivo. This further implicates the role mesenteric lymph in hemorrhagic shock induced lung injury. Characterizing the PMN priming agents could provide further insight into the pathogenesis of ARDS.

Notes:

**MIGRATING MOTILITY COMPLEXES (MMC'S)
PERSIST AFTER SEVERE TRAUMA IN PATIENTS WHO
TOLERATE ENTERAL NUTRITION (EN)**

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Introduction: Early postinjury EN is believed to be beneficial, but some of the most severely injured patients are intolerant and are at risk for the rare, but devastating complication of nonocclusive small bowel necrosis. Ileus may play a role in both, but is poorly characterized. We, therefore, placed jejunal motility catheters in patients undergoing repeat laparotomy after damage control laparotomy to ask three questions a) were "fasting MMC's" present, b) at goal rate feeding (60 cc/hr) did a "fed pattern" exist, and c) how do these relate to intolerance.

Methods: With IRB approval and next of kin consent, a 7 Fr manometer (6 sensors 10 cm apart) and a feeding tube were placed in the proximal jejunum. Continuous manometry readings were obtained during overnight fasting and the next morning jejunal feeding was advanced by a standard protocol (15 cc/hr, increased by 15 cc/hr every 12 hrs to 60 cc/hr) with concurrent monitoring of intolerance. Significant intolerance was defined as the need to decrease rate or stop EN. Fasting and goal rate manometry tracings were given to a blinded investigator. "MMC" was defined by migrating Phase III contractions. "Fed pattern" was defined by randomly occurring contractions not as intense as Phase III. Data are expressed as mean \pm SEM.

Results: 9 patients (5 were female, age 42 ± 7 yrs) with severe blunt trauma (ISS= 33 ± 3) and shock (lowest ED base deficit= 9.3 ± 2.6 , units PRBC's in first 12 hrs= 17.6 ± 2.8) were studied. Five (53%) patients had "fasting MMC's" of which 2 were at normal intervals (1 per 90 min) while 3 were at shorter intervals (1 per 20 min, 1 per 30 min, 1 per 42 min). Of the 9 study patients, 8 were ultimately fully supported by EN, but 4 experienced significant early intolerance (i.e. during initial advancement); none of these had fasting MMC's. Of the 9 study patients, 4 did not convert to a "fed pattern" when at goal rate feeding; however, this was not associated with late intolerance.

Conclusion: After severe blunt trauma and damage control laparotomy, "fasting MMC's" were present in half of the patients indicating intact motor function. Of note, these patients tolerated advancement of EN. With jejunal feeding at the goal rate some patients did not convert to a "fed pattern", but this was not related to late intolerance.

Notes:

THE VALUE OF CT IMAGING IN PREDICTING THE NEED FOR PELVIC FRACTURE EMBOLIZATION

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 Presenter: Rochelle A. Dicker, M.D.
 Senior sponsor: Robert C. Mackersie, M.D.
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Pelvic arteriography (a/g) and therapeutic embolization has become perhaps the most important means of controlling major hemorrhage from pelvic fractures. Conventional clinical indicators for performing pelvic a/g have included the presence of attributable hemorrhagic shock, or clinical evidence of major ongoing blood loss (dropping Hct, transfusion requirements). Use of these rough clinical indicators, however, may result in delayed treatment of active pelvic fracture hemorrhage in some patients. More recently, the potential utility of high resolution, dynamic CT imaging in detecting active pelvic fracture hemorrhage has been described. We hypothesized that objective features in dynamic CT imaging can be identified and used to accurately predict the severity of injury seen on arteriography and identify patients who would potentially benefit from arteriographic embolization. The purpose of this study was to develop an objective pelvic CT imaging score and assess its ability to discriminate between higher and lower pelvic vascular injury severity seen on arteriography.

Patients and Methods: In order to objectively assess the magnitude of pelvic fracture hemorrhage, a CT extravasation score (CTES) was developed. The CTES (0-16) is composed of 5 scaled variables including pelvic fracture hematoma size, presence, extent and density of IV contrast extravasation, and number of bleeding sites. The CTES was tested on a small subgroup of patients, revised and then applied to a series of 31 patients who had major pelvic fractures (AIS = 4-5) with abd/pelvic dynamic CT imaging and subsequent pelvic arteriography. The principal outcome measure was a graded severity score for arteriographic findings: 1= minimal or no significant vessel injury or extravasation. 2= active vessel extravasation or significant proximal vessel damage (pseudoaneurysm etc.) 3 = major active hemorrhage, multiple sites. Embolization was clinically indicated for grades 2

and 3 and thought to be potentially life saving for grade 3 arteriograms. Optimal CTES cut-points were determined using scatter plot analysis for grade 2 & 3 vrs grade 1 and grade 3 vs. grade 1 & 2 severity scores. **Results:** The overall injury severity was high (mean ISS=34; pelvic AIS=4.8), with an average age of 51 years. The mean blood transfusion requirement at 24 hours was 5.7+4U. A CTES cutoff of 8 had a relatively high

| | CTES > 8 | |
|---------------------|-----------------------------|-----------------------------|
| | a/g severity score = 2 or 3 | a/g severity score = 3 only |
| SENSITIVITY | 96% | 100% |
| SPECIFICITY | 80% | 29% |
| Pos Pred Val | 96% | 35% |
| Neg Pred Val | 80% | 100% |
| Accuracy | 90% | 42% |

sensitivity and specificity for arteriographically indicated embolization. For grade 3 (potentially life threatening) a/g findings, a CTES \geq 11 had a sensitivity of 89% and a specificity of 38%.

Conclusions: These results demonstrate that dynamic CT imaging can be used as a sensitive indicator for pelvic arteriography and the need for therapeutic embolization. Objective features of pelvic CT imaging studies can be identified and used to create a score capable of distinguishing between levels of arteriographic (pelvic vascular injury) severity. The extent to which early pelvic embolization, based on CT findings, can reduce morbidity or mortality remains to be determined, however.

Notes:

MINIMAL AORTIC INJURY: A LESION ASSOCIATED WITH ADVANCING DIAGNOSTIC TECHNIQUES

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Introduction: With high-resolution diagnostic techniques [helical CT (HCT), intravascular ultrasound (IVUS), transesophageal echo], traumatic rupture of the aorta (TRA) is being recognized more frequently. At surgery some patients are found to have minimal aortic injury (MAI) that in the past may not have been detected. Previously we have shown the safety of using beta-blockers and antihypertensives as initial therapy for preventing rupture, until the patient can be operated upon. Recently we have used this therapy as definitive treatment for patients with MAI. The current study examines our institutional experience with these patients from July 1994 to June 2000.

Methods: All patients with non-trivial blunt torso trauma underwent a screening HCT examination of the chest, abdomen, and pelvis. Patients suspected of TRA underwent confirmatory aortography with or without IVUS. MAI was defined as a small (<1cm) intimal flap with minimal to no periaortic hematoma. Non-operative management consisted of beta blockade and nitroprusside infusion to control heart rate and blood pressure. The charts of all these patients were reviewed.

Results: Approximately 15,000 patients were evaluated by screening CT for non-trivial blunt torso trauma at a level I trauma center during the study period. 198 were suspected of having TRA and 189 of these underwent aortography. TRA was confirmed in 87 (44%) patients. 71 (81%) of these were operatively repaired. Of the 16 (19%) patients managed non-operatively, 8 (9.5%) had MAI, and the remaining 8 (9.5%) had contraindications to aortic repair (traumatic brain injury, cardio-respiratory instability). The initial aortogram was considered normal in 3 (37.5%) of the 8 MAI patients, and the correct diagnosis was confirmed by IVUS (2 patients) and video angiography (1 patient). IVUS was done on 5 of the 8 MAI patients and was positive in all. 2 (25%) of the 8 MAI patients died of causes not related to the aortic injury: 1 pulmonary embolism and 1 multi-organ failure. Follow-up studies were done on the 6 MAI patients that were discharged. In 2 patients the flap had completely resolved by 3 weeks, and in 1 the flap was not seen on aortography, but persisted on IVUS done 2 weeks after injury. 3 patients had formed small (<1cm) pseudoaneurysms on follow-up CT done 8 weeks later. 1 of these underwent thoracotomy with aortotomy where a healed intimal scar was seen. 1 of the remaining 2 has since died of cancer, and the other refused surgery, and is being observed.

Conclusion: Approximately 10% of TRA diagnosed with high-resolution techniques have MAI. The results from this study demonstrate that with non-operative management these injuries can resolve with intimal healing. However some patients may develop pseudoaneurysms. The natural history of these pseudoaneurysms is not known, and hence caution should be exercised in using this form of treatment.

MINOR TRAUMATIC INTIMAL FLAPS OF THE AORTA:
NATURAL HISTORY AND NONOPERATIVE MANAGEMENT

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Objective: To investigate the natural history of trauma-induced minimal aortic intimal injury (TMAI) and to evaluate the non-operative management of these injuries.

Methods: The natural course of trauma-induced minimal aortic intimal injury was prospectively evaluated by serial trans-esophageal echocardiography (TEE) studies in five blunt trauma patients admitted to a level I Trauma Center. All injuries were identified when screening patients for the presence of a possible traumatic aortic injury. Once identified, the patients were assigned to a non-operative management strategy and the decision to continue non-operative management was individualized based upon clinical findings, overall injury severity, hemodynamic stability and subsequent TEE findings. The pharmacologic management strategy was similar to that for patients with non-traumatic aortic dissection.

Results: All patients remained hemodynamically stable. The injuries were located in the area of the ligamentum arteriosum and in the descending aorta adjacent to the diaphragm in 3 and 2 patients, respectively. The mean size of the injury was 12.5 mm and an associated thrombus was present in 3 of the 5 patients. Complete resolution of injury occurred within 9.4 +/- 6.6 days (range 3 to 19 days). The pharmacologic strategies were successful in keeping systolic blood pressures in the range of 80 to 90 mm Hg and heart rates in the range of 60 to 80. Mean Injury Severity Score for these patients was 29 and there were no adverse physiologic effects on the overall resuscitations with this management. Anticoagulation was temporarily used in only one patient. All were managed non-operatively and no complications related to the aortic injuries were identified during a mean follow up of 16.8 months.

Conclusions: Based on this prospective series it appears that resolution of TMAI occurs within a few days of initial injury. Serial TEE studies are helpful to safely manage these injuries non-operatively. The patients should be hemodynamically controlled by a pharmacologic regimen similar to that for non-traumatic aortic dissection. The treatment algorithm for patients with TMAI requires further delineation but should include an option for non-operative management.

Notes:

MANAGEMENT OF TRAUMATIC LUNG INJURY: A WTA
MULTICENTER REVIEW

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The Western Trauma Association Multi-Center Trial Group
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Purpose: A number of differing techniques have been suggested when lung injury necessitates resection of parenchyma. The purpose of this multi-center review is to examine treatment and outcome following thoracotomy (TCY) for parenchymal lung injury.

Methods: A retrospective multi-center 4-year review of patients who underwent urgent TCY and lung resection or repair was performed. Patient demographics, mechanisms, systolic blood pressure on admission (SBP-initial), SBP on arrival in OR (SBP-OR), total chest tube output prior to OR, injury severity (ISS and AIS), TRISS probability of survival (Ps), surgical techniques and outcome were recorded.

Results: 143 patients (blunt B=28; penetrating P=115) sustained a lung injury and underwent TCY. "Minor" lung resection (suture, tractotomy, wedge) was employed in 107 patients, with an overall mortality of 23%. "Major" resections (lobectomy, pneumonectomy) were used on 36 patients with a 44% mortality (p=0.02). Patients undergoing major resection had greater chest AIS scores (4.3±0.7) compared to minor resections (3.7±1.0, p=0.001). Blunt trauma patients had more severe systemic injuries (ISS blunt 40.3±15.3 vs. ISS penetrating 23.7±12.4, p=0.001), and likewise had a higher mortality, B=68% v. P=19% (p=0.001). Blunt trauma was more likely to require more extensive resection than penetrating injuries (p=0.03), although there were no differences in chest AIS. The following table illustrates operative techniques employed in the 143 patient who had pulmonary resection or repair.

| | Suture | Tractotomy | Wedge | Lobectomy | Pneumonectomy |
|----------------|------------|------------|-------------|------------|---------------|
| N(B/P) | 22(1B/21P) | 16(2B/14P) | 69(15B/54P) | 28(8B/20P) | 8(2B/6P) |
| Preop bld loss | 1.2+0.5(L) | 1.0+0.5(L) | 1.7+0.8(L) | 2.0+1.3(L) | 1.6+0.9(L) |
| Chest AIS | 3.5+1.1 | 4.1+1.3 | 3.7+0.8 | 4.3+0.77 | 4.4+0.5 |
| ISS | 18.0+9.5 | 30.1+14.2 | 25.3+13.6 | 34.1+15.1 | 34.1+18.1 |
| SBP-initial | 86.8+26 | 99.3+29 | 97.9+31 | 87.8+41 | 82.4+22 |
| SBP-OR | 73.0+29 | 81.3+27 | 81.9+31 | 70.8+36 | 70.0+9 |
| TRISS Ps | 0.80+0.25 | 0.83+0.21 | 0.70+0.31 | 0.57+0.4 | 0.65+0.4 |
| Mortality(%) | 2(9%) | 2(13%) | 21(30%) | 12(43%) | 4(50%) |

Regression analysis identified the following to be significantly associated with mortality: Increasing complexity of lung resection (p=0.02), blunt trauma (p=0.003), and lower systolic blood pressure on arrival in OR (p=0.01). An increased incidence of adult respiratory distress in "major" resection (23%) vs. "minor" resection (8%) was also noted (p=0.09).

Conclusion: This multicenter review documents higher mortality with increasing amounts of pulmonary parenchymal resection. Tractotomy is primarily used in penetrating wounds. Blunt lung injury has a higher mortality due to more severe lung injury and systemic injury, and generally requires more extensive pulmonary resections. While more extensive resection is associated with greater mortality, it is not so prohibitively high as to preclude its use.

Notes:

Invited Guest Lecture:

Dr. Dan Benson

“Management of Thoraco Lumbar Spine Injuries”

UC Davis

Sponsored by an unrestricted educational grant from Synthes

Notes:

Invited Lecture:

Dr. Fred Moore

“Creating Value with a Business Plan For Your Trauma Center”

University of Texas – Houston Medical School, Houston
Texas

Notes:

**INTOXICATED MOTOR VEHICLE PASSENGERS
WARRANT SCREENING AND TREATMENT
SIMILAR TO INTOXICATED DRIVERS**

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GB Demarest MD

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Presenter Carol R. Schermer

Sponsor: Larry M. Gentilello

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Background: Recent studies have demonstrated that alcohol interventions in trauma centers decrease alcohol consumption and recurrent injury. Intoxicated drivers are viewed as a public health problem and often screened for treatment referral. We hypothesize that intoxicated passengers should be screened for treatment as they are similar to intoxicated drivers in terms of involvement in motor vehicle crashes and driving under the influence of alcohol. We also hypothesize that DUI conviction rates after injury are low and may not deter recurrent DUI.

Methods: We evaluated intoxicated (BAC > .08%) motor vehicle drivers and intoxicated passengers hospitalized for injury in 1996-1998. Passengers and drivers discharged from the hospital alive were matched to the state motor vehicle crash and DUI registries to ascertain intoxicated driving events. Data include number of study patients cited for crashes in the two years prior to admission, the number cited for crashes in the one year after admission and whether or not the intoxicated driver admitted for injury was issued a DUI citation for the crash leading to admission. In addition, all DUI citations for the group during the three year period were recorded. Drivers and passengers were compared using Fisher's exact test.

Results: A total of 674 patients, 474 drivers and 190 passengers, met inclusion criteria. In the two years prior to admission 13.4% of study passengers and 15.2% of drivers had been cited for crashes ($p=.63$). In one year after admission, 5.3% of study passengers and 5.5% of drivers were cited for crashes ($p=1.0$). Only 15% of intoxicated drivers were given a DUI citation for the crash resulting in admission of which 47% were ultimately dismissed. A total of 349 DUI citations were issued to the group during the study; 80% to the study drivers, 20% to the study passengers. 30% of all DUI citations were eventually dismissed.

Conclusion: Few intoxicated drivers injured enough to require admission are cited for DUI. Intoxicated passengers and drivers admitted for injury are equally likely to be cited for motor vehicle crashes prior to and after admission for injury. Intoxicated passengers in motor vehicle crashes are as likely as intoxicated drivers to experience the adverse consequences of alcohol use and pose a similar threat to society. Screening of all alcohol related motor vehicle crash occupants is justified.

Notes:

MOTOR VEHICLE RESTRAINTS: PRIMARY VS.
SECONDARY ENFORCEMENT AND ETHNICITY

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Efforts to increase motor vehicle restraint use have been broadly based rather than focused on specific populations. Identifying populations with low restraint use can help target educational campaigns. Limited data is available concerning restraint use by ethnicity. This study was performed to determine if differences exist in motor vehicle restraint use by ethnicity and whether these differences are altered by the presence primary versus secondary restraint laws.

METHODS: Data was collected on motor vehicle crash (MVC) victims from 10/1/97 through 1/31/98 from 2 Level I trauma centers, one in a state with primary restraint enforcement (motorist can be stopped for the restraint violation), the other with a secondary restraint law (restraint violation may be enforced if the motorist is stopped for another violation). Data was obtained from the trauma registry.

RESULTS: Restraint use was significantly different between the primary and secondary enforcement states. Restraint use varied markedly by ethnicity in the secondary enforcement state (vs. Caucasian, $p < 0.004$, X^2).

Secondary Enforcement Primary Enforcement

| Ethnic Group | Restrained | Unrestrained | Restrained | Unrestrained |
|------------------|------------|--------------|------------|--------------|
| Caucasian | 118 (42 %) | 140 (50 %) | 64 (60%) | 38 (36%)+ |
| African-American | 9 (21 %) | 29 (69 %)# | 26 (76%) | 7 (21%)* |
| Latino | 18 (26 %) | 48 (68 %)# | 65 (50%) | 57 (44%)* |

$p < 0.02$, X^2 vs. Caucasian; + $p < 0.01$, * $p < 0.001$, X^2 , primary vs. secondary enforcement

CONCLUSIONS: In a state with secondary enforcement laws, restraint use varied significantly with ethnicity. Restraint use was markedly increased by the presence of a primary enforcement law. Efforts to improve restraint use must include primary enforcement laws and educational strategies to reach all ethnic groups.

Notes:

VIOLENCE RELATED INJURIES TREATED AT A
LEVEL I TRAUMA CENTER WITH LINKAGE TO
POLICE RECORDS: A LARGER VIEW OF PATTERNS
OF YOUTH VICTIMIZATION

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Background: Isolated incidents of violent victimization resulting in injuries or death may capture the attention of the media for a brief time. However, the problem of youth violence remains a major issue in our society. Patterns underlying the majority of assaults involving youth must be better understood in order to develop appropriate prevention strategies. The present study was undertaken to identify patterns of youth violence with respect to prior police history.

Methods: Patients were identified through a review of the emergency department log and a search of medical records by E-codes for the period of December, 1997 to December, 1998. All patients, aged 10-25 years, with assault injuries were reviewed. Information regarding clinical aspects and circumstances surrounding the incident was abstracted from the records and entered into a database (SPSS) for analysis. A random sample of all cases (156/366) was submitted to the police department to identify police reports of the incident and to identify victims with a prior police history. Thirty-six patients overall, and 20 patients in the study group, sustained their injuries outside of the police jurisdiction and were excluded from further analysis.

Results: Through the linkage process, 58.8% (80/136) of the victims were linked with a police report. A prior police history as either a victim or perpetrator of a crime was identified in 62.5% (85/136) by police "rap" sheets. Chi-square analysis found no significant differences between the group of all injured victims (n=330) and the sample with police reports (n=80) with respect to multiple key variables (age, sex, ISS, mechanism of injury, etc.) except in the reporting of the victim's relationship with the perpetrator ($p < 0.001$). In addition, there was no difference in patients with prior police contact with respect to whether or not they were previously victims (33/85) or perpetrators (30/85; $p = 0.273$). A history of prior felony arrest was evident in 36.8% (50/136) of patients. Of the 80 reviewed police reports, 15 (18.8%) of the incidents were considered to be gang-related. Illicit drug use was identified in 52.3% of patients (56/107) when urine toxicology screens were obtained and blood alcohol levels were positive in 40.5% (38/108). Patterns of victimization for females differed significantly from males with 33.8% of their injuries attributable to intimate partner violence.

Conclusions: The data suggest that prevention programs must target specific populations.

Notes:

COMPARISON OF INTERMITTENT PNEUMATIC
COMPRESSION DEVICES AND LOW MOLECULAR
WEIGHT HEPARIN IN TRAUMA.

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MD, P Byers MD, N Namias MD, J Augenstein MD, D Sleeman
MD, M McKenney MD, E Barquist MD, M Lynn MD
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Enrique Ginzburg, M.D. Miami, Florida

OBJECTIVE: The objective of this study was to compare the protective effects of low molecular weight heparin (LMWH) to intermittent pneumatic compression devices (IPC) against thromboembolic disease (TED) in trauma patients.

METHODS: Over a two year period, we enrolled 495 patients stratified into two groups composed of Group A/ISS 9-19 (N=299) and Group B/ISS ≥ 20 (N=163). Patient groups were then randomized to receive IPC device (Huntleigh Flowtron®) or the use of LMWH (enoxaparin 30 mg SQ BID). Patients had baseline duplex study of bilateral lower extremities upon admission, and weekly thereafter until discharge, 30 days, or a TED event.

RESULTS: There were nine TED events consisting of two pulmonary emboli and seven deep vein thrombosis (DVT). One PE occurred in each group. There were six DVTs (1.3% incidence) in the IPC group and one DVT (.25% incidence) in the enoxaparin group ($p=.71$, X^2). Patient age and demographics were similar and were not significant predictive factors for DVT formation. The average ISS score for a TED event was 18. There were 13 (4 IPC/9LMWH) minor bleeds and eight (4 IPC/4 LMWH) major bleeds, none of which required operative intervention. There were no significant differences in average ICU days, hospital days, number of pelvic fractures, spinal cord injuries, or head injury patients between groups. Three of nine DVTs (33%) had neurologic injury (2 IPC group/1 LMWH).

CONCLUSION: Although there were increased numbers of TED events in the IPC group (N=7) versus the enoxaparin group (N=2), results did not reach statistical significance. The low rate of TED in the IPC group and the cost savings (\$25.00/IPC hospitalization vs. \$22/day for enoxaparin) support IPC use as an alternate therapy in all trauma patients.

Notes:

Intermittent assessments
low molecular wt requires 30 mg/dl
fid
ultrasound ^{95%} sensitivity

1. no significant difference in intermittent + Lbwt ^{not additive} _{not better than}
2. recommend both legs rest bar
1 leg - Krustan - don't use on arm

PROPHYLACTIC VENA CAVA FILTRATION IS NOT INDICATED FOLLOWING ACUTE SPINAL CORD INJURY

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Objective: Acute spinal cord injury (SCI) is a devastating problem with over 10,000 new cases annually. Pulmonary embolism (PE) is a well-recognized risk in SCI patients although no clear recommendations for prophylaxis exist. We therefore evaluated whether placement of prophylactic caval filters is appropriate in SCI patients.

Methods: The trauma registry of a regional trauma center was used to identify patients sustaining acute SCI resulting in tetraplegia or paraplegia after blunt or penetrating trauma for a five year period beginning in January 1995. Patients were analyzed for demographics, mechanism, ISS, associated long bone or pelvic fracture, severe closed head injury (CHI, GCS \leq 8), type of deep venous thrombosis (DVT) prophylaxis, level of SCI and incidence of DVT and PE. Data are expressed \pm SD and analyzed using chi-square.

Results: There were 8,269 admissions during the study period with an overall incidence of DVT and PE of 12.9% and 0.9% respectively. There were 111 patients who sustained SCI with an incidence of DVT and PE of 9.0% and 1.8% respectively.

Average hospital length of stay was 23 ± 20 days for SCI patients with surveillance duplex ultrasound performed on average of 2.3 ± 2.1 times during hospitalization. Average ISS was 30.0 ± 12.2 . There were 41.4% paraplegics and 58.6% tetraplegics, and 17.1% patients with severe CHI with no statistical difference in the incidence of DVT or PE between these groups and all SCI patients. DVT prophylaxis was performed in all patients with sequential compression devices (SCDs) when extremity fracture status permitted. The incidence of DVT and PE in those patients with SCDs alone was 7.1% and 2.3%; for SCDs + sq heparin (hep), the incidence was 11.1% and 2.8%; and for SCDs + low molecular wt. heparin (LMWH), 7.4% and 0% respectively with no statistical difference between groups. The incidence of DVT in patients with long bone fractures was 37.5%, which was significantly greater than the total SCI population ($p < 0.05$).

| | SCDs | + Hep | + LMWH | Tetra | Para | Long bone | CHI |
|-----|------|-------|--------|-------|------|-----------|------|
| DVT | 3/42 | 4/36 | 2/29 | 5/65 | 5/46 | 3/8* | 1/19 |
| PE | 1/42 | 1/36 | 0/29 | 1/65 | 1/46 | 0/8 | 1/19 |

* $p < 0.05$

Conclusions: DVT incidence in SCI patients and the overall trauma population appears equivalent and the risk of PE in SCI patients appears low. Subgroup analysis demonstrates that SCI associated with long bone fracture significantly increases the incidence of DVT but not PE. The type of DVT prophylaxis did not appear to influence the incidence of DVT or PE. Based on the low incidence of PE in the present study, routine placement of prophylactic caval filters does not appear warranted.

Notes:

| | DVT | PEI |
|---------------------|-----|-----|
| All Spinal Cord inj | 9.0 | 1.8 |

All Trauma

11.8

- Long bone fractures & neck & spine
contusions

- lower incidence due to prophylaxis

- Schackelberg argues high incidence in
Relief: recommends Vena Caval filter

AUTOPSIES IN TRAUMA DO NOT ADD TO PEER REVIEW NOR QUALITY ASSURANCE (QA)

RM Forsythe MD, DH. Livingston MD, RF Lavery MA,
AC. Mosenthal MD, CJ. Hauser MD

Presenter: Raquel M. Forsythe, MD

Division of Trauma, Department of Surgery, UMDNJ-
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The literature supports the concept that autopsies are useful in uncovering missed injuries or undiagnosed conditions that contribute to death after injury, especially late deaths that take place in the ICU. Review of autopsies are also used in part of the trauma QA and autopsy rates are queried by the ACS-COT in their reviews. Our hypothesis was that autopsies add little useful clinical or diagnostic information to a mature trauma program, especially compared to physician peer review.

Autopsies for all mortalities at a Level I trauma center between Jan 98 and Oct 99 were reviewed. The autopsies were reviewed in a "blinded" fashion such that each review occurred prior to examination of the chart, the trauma registry and the findings of the trauma QA peer review. Findings from all sources were compared and examined for Goldman Type errors (I-IV).

263 mortalities were identified. 10% of autopsy reports were unavailable pending legal proceedings and 10% patients had no autopsy performed. 155 (59%) mortalities were considered dead on arrival to the trauma center by QA review with no management errors identified (Group 1). Autopsy data confirmed lethal injuries in all patients. 61 patients survived more than 48h (Group 2). There were no Goldman Type I errors (major diagnostic discrepancies that might have influenced mortality) identified in this group. In four patients final QA peer review was held pending autopsy results. In all four cases the autopsy finding did not help in resolving the QA issues identified by peer review. There was no difference between Group 1 and 2 patients with respect to mechanism of injury, including being the victim of a violent act. The mean age of patients in Group 1 was significantly younger, 36 years (95%ci 33-38), than those patients in group 2, 51 years (95%ci 47-55, $p < 0.001$).

We conclude that autopsy information for either group appeared to add little useful information to the QA peer review of deaths in a mature trauma program. This was true even in cases where the final QA determination was held pending the results of the autopsy. One possible explanation for these data is that these autopsies were forensic, rather than pathologic, thus the focus of the examination may have influenced the results reported. Autopsy rates may not

Notes:

Paint the Ceiling Lecture:

Geoff Tabin, MD

University of Vermont

“Ultimate Challenges – The Last Unclimbed Face on Mount Everest and Eradicating Treatable Blindness”

Notes:

WHEN TO BONE GRAFT CONTAMINATED WOUNDS

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K.E. Zorn, R.N.
Resurgens Orthopaedics*; University Texas, Galvesto

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*Atlanta, GA., Galveston, TX

PURPOSE: Is it necessary to establish a sterile wound prior to bone grafting osteomyelitic defects requiring reconstruction?

CONCLUSION: Bacterial contamination at the time of cancellous bone grafting has no effect on wound healing, union, nor the arrest rates when performed in a live, clean, stable wound.

CLINICAL SIGNIFICANCE: Following an adequate debridement and a short course of pathogen-specific antibiotics, clean-contaminated wounds with healthy soft tissue coverage may be safely reconstructed without further delay (open fractures, osteomyelitic defects). Infected wounds managed with antibiotic beads may not be sterile at the time of reconstruction.

METHODS: 352 consecutive patients with adult osteomyelitis were treated on a prospective protocol wherein debridement and reconstruction were performed within a 6 week interval of systemic antibiotics. 184 patients received cancellous bone grafts either 5-7 days post-debridement at the delayed closure or 4-5 weeks after a staged closure/implantation of pathogen-specific antibiotic beads. 91 of the wounds were culture positive at the time of bone grafting: 58% of the delayed closures and 42% of the wounds initially receiving antibiotic beads.

The success rates for the delayed (N=83) and staged (N=101) grafts were 93% and 39% respectively. The 2 year salvage rate for each group was 95%. Culture positive wounds had complication/failure rates of 8% /4% in normal hosts and 38% / 18% in compromised hosts with wound healing deficiencies. Sterile wounds yielded rates of 4% / 0% and 29%/14% in normal and compromised hosts respectively. There was no statistical difference between the sterile and contaminated groups when matched according to the host classification.

DISCUSSION: The organisms isolated at bead removal were nosocomial in profile, not initial isolates, frequent in cases treated after an open wound phase and rare when beads were immediately implanted at the time of the initial debridement. There was no correlation between bacteria isolated at failure and those present at the time of bone grafting.

Notes:

indications:

- compromised
- 75000 grafts: this is about all cancellous graft that will take
- internal fixation
- complex wound closure

**HYPERTONIC SALINE: INTRAOSSEOUS INFUSION
CAUSES MYONECROSIS IN A DEHYDRATED SWINE
MODEL OF UNCONTROLLED-HEMORRHAGE.**

H Alam MD, C Pounzalan MD, K Stanton, MS, E Koustova, PhD,
M Bowyer, MD, and P Rhee MD, MPH.

Uniformed Services University of the Health Sciences

H Alam, MD

P Rhee, MD, MPH

Bethesda, MD

Introduction: The Institute of Medicine has recently recommended interosseous infusion of hypertonic saline (7.5% HTS, two 250ml bolus) for treating combat casualties in hemorrhagic shock. We tested the safety and efficacy of this recommendation in a long term survival model of uncontrolled hemorrhagic shock using dehydrated swine.

Methods: 13 Yorkshire swine were denied access to water for a period of 24 hrs resulting in a loss of approx. 5% body weight. Under isoflurane anesthesia, pulmonary and carotid arterial catheters were placed. An I/O (Cook[®], 12G) needle was placed in the right anterior tibia using and its position was confirmed with a small test dose of epinephrine. After a period of stabilization, uncontrolled hemorrhage was induced by creating a through and through arteriotomy in the left common iliac artery and partial transection of the iliac vein branch. Animals were kept in shock for up to 2 hours and then resuscitated over 2 hrs with pyrogen /endotoxin free 7.5% HTS (5ml/kg). Animals received 7.5% HTS either as two large boluses, or ten small boluses to compare the physiologic response and blood loss. Control animals received equal volumes of 0.9% saline (NS) x2 via I/O route and additional fluid via intravenous route to complete the resuscitation. The total salt load was similar in all groups.

Results: Data presented as mean±SEM.

| Groups | n | MAP (mmHg) | | Lactate (mmol/L) | | Blood loss (ml/ kg) |
|-----------------------|---|------------|-----------|------------------|----------|---------------------|
| | | Shock | End Res | Shock | End Res | |
| 7.5%HTS bolus x2 | 6 | 38.6± 6.9 | 51.0± 4.5 | 2.8± 1.4 | 3.5± 1.9 | 22.68 |
| 7.5%HTS bolus x 10 | 3 | 47.6± 4.6 | 66.3± 3.4 | 2.3± 0.3 | 1.6± 0.2 | 20.19 |
| 0.9%NS bolus x 2 | 4 | 58.7± 3.5 | 68.2± 7.1 | 2.1± 0.6 | 1.3± 0.4 | 23.08 |

The three groups were comparable in physiologic response, blood loss and all animals survived. However, between the 2nd -3rd post resuscitation day, the animals that received interosseous infusion of 7.5% HTS developed tenderness and progressive swelling of the right hind leg, along with loss of function. Autopsy revealed myonecrosis or bone marrow necrosis or venous thrombosis (Group I - 66.6%, Group II - 100%). The control group had none of these complications.

Conclusions: Further investigations using long term survival models utilizing dehydrated hemorrhage models should be undertaken prior to use of 7.5% HTS through the I/O route in humans.

Notes:

A FLAP FOR ALL SEASONS

Nicholas Kellam

Noah Gray, OTR/L

Monica Smith, RN, BSN

E.P. Polack, M.D.

Clinical Associate Professor of Surgery

West Virginia University

Wheeling, WV

Presenter: Nicholas Kellam

Senior Sponsor: E.P. Polack, M.D.

This is a retrospective outcome study of a single plastic surgeon's ten year experience with V-Y [slide flap] fingertip reconstructions. The study asks the question "No matter how much bone remains, is a slide flap a good reconstruction with distal fingertip amputation in Foucher Zones II and III"?

MATERIALS AND METHODS:

Evaluations were performed on 19 patients encompassing 20 digits. The evaluation included completion of the disabilities of the arm, shoulder and hand [DASH] questionnaire, a radiograph, active and passive range of motion, and sensory testing with standard two point discrimination and Semmes-Weinstein monofilament examinations.

RESULTS:

When one calculates the permanent partial disability, the percentage of disability of those using Volar V-Y advancement flaps was 3.7% permanent partial disability [ten (10) digits] versus lateral V-Y advancement flaps was 3.28% permanent partial disability [seven (7) digits]. The average permanent partial disability of the Foucher Zone II injuries when using volar V-Y advancement flaps [two (2) patients] was 3.5% versus the single patient with lateral V-Y advancement flaps was 5.0%, permanent partial disability.

CONCLUSION:

The slide flap reconstruction of a fingertip amputation is an excellent means of reconstruction. These data were reviewed in an effort to look at the issues separating amputations in Foucher Zone II versus Foucher Zone III. Based on the small numbers in Foucher Zone II, it is our hypothesis that in more proximal amputations, slide flap reconstructions are acceptable if preservation of length and function in proximal fingertip amputations is important to the patient's vocation and / or avocation. Slide flap reconstruction provides the surgeon with an option other than amputation revision and digital shortening when the standard cross finger or thenar flap is not appropriate due to patient age, arthritis or prior injury. This paper is the first contribution looking at slide flap reconstruction as a "Flap For All Seasons" in distal digital amputations.

Notes:

Panel:

Point – Counterpoint

“Free Fluid on CT Mandates Laparotomy”

Moderator: **GJ Jurkovich, MD**

CON: **D Livingston, MD**

PRO: **KL Kaups, MD**

Notes:

NEUROLEPTIC MALIGNANT SYNDROME IN MAJOR TRAUMA PATIENTS

N.E.Pertman, R.K.Marburger, S.E.Ross
Cooper Health Systems
Nancy E.Pertman,MD

Steven E. Ross,MD

Camden, NJ

Neuroleptic malignant syndrome (NMS) is a rare, potentially fatal reaction occurring in 0.2-0.5 percent of patients receiving neuroleptic drugs. Haloperidol is the most common causative agent, although other medications, such as metoclopramide, have been implicated. Both of these drugs are commonly used in critically ill, injured patients. In order to examine the occurrence, presentation, treatment, and mortality of NMS in critically ill trauma patients, we undertook a 7 year retrospective review in our Level I Trauma Center.

Review of all patients admitted to the center during this time revealed five cases of NMS. All patients suffered major trauma, with a mean ISS of 32; three sustained major brain injury. Mean age was 33 (range 11-57). On average, diagnosis was made on the 28th hospital day. All patients presented with hyperpyrexia (mean peak temperature 105.2°F) out of proportion to septic focus or unresponsive to resolution of infection, and/or withdrawal of suspected pyrogenic drugs. All presented with signs of autonomic instability, including diaphoresis (5), tachycardia (5), and pallor (3); all prevalent signs in ICU patients. Three had muscle rigidity and elevated CPK levels. Predisposing agents included haloperidol (4), chlorpromazine (4), and metaclopramide (3). Upon suspicion of NMS, causative agents were discontinued and bromocriptine (3), dantrolene (1), or both (1) were begun and benzodiazapenes were administered to all. Mean ICU and hospital length of stay were 26 and 40 days. All patients survived.

NMS must be suspected in injured patients who develop fever out of proportion to, or unrelated to infection, particularly if they are receiving known causative agents. Prompt withdrawal of those drugs coupled with treatment with bromocriptine can lead to survival.

Notes:

NONVASCULAR MIGRATING MISSILES

D.V. Feliciano MD, G.S. Rozycki, MD

Grady Memorial Hospital/Emory University School of Medicine

David V. Feliciano, MD

David V. Feliciano, MD

Atlanta, Georgia

Objective: While the presentation and outcomes of patients with intravascular migratory missiles have been well-documented, the migration of missiles secondary to coughing, swallowing, peristalsis or cardiac pulsations is infrequently described. This is a report of eight consecutive patients with nonvascular migrating missiles following penetrating wounds.

Methods: Sequential data collection at two Level I trauma centers.

Results: From 1981-1998, eight patients with nonvascular missile migration were treated. In all patients, "blurring" of the edges or a gross change in position of the missile on serial x-rays of the chest or abdomen was evident. Six patients had luminal migration of missiles, four after gunshot wounds to the pharynx or larynx and two after gunshot wounds to the lungs. Three required bronchoscopic removal of aspirated missiles, including one patient in whom the missile moved from one lung to the other; two had missile migration into the gastrointestinal tract (one swallowed; one coughed from lung and swallowed); and one patient underwent an unnecessary laparotomy for a swallowed missile. The two remaining patients had migrating intrapericardial missiles, and both had delayed recognition of associated cardiac injuries (one right atrium; one left atrium). In four patients, the tentative diagnosis of missile migration was made in the emergency room based on clinical suspicion after reviewing all x-rays. In the remaining four patients, the correct diagnosis was either delayed or not made until the time of surgery.

Conclusion: In patients with missile migration, diagnosis depends on a high degree of suspicion whenever no exit wound is found, when all missiles are not accounted for, or when a missile is blurred or noted in an unexpected location on a x-ray. Early recognition will eliminate unnecessary or delayed surgical procedures.

Notes:

THE USE OF TELEMEDICINE FOR REAL-TIME VIDEO CONSULTATION BETWEEN TRAUMA CENTER AND COMMUNITY HOSPITAL IN A RURAL SETTING IMPROVES EARLY TRAUMA CARE. PRELIMINARY RESULTS.

F. Rogers, M.D., M. Ricci, M.D., S. Shackford, M.D., L. Caputo, M.D., K. Sartorelli, M.D., J. Dwell, M.D., S. Daye, M.D.

University of Vermont

Frederick B. Rogers, M.D.

Steven R. Shackford, M.D.

Burlington, Vermont

BACKGROUND: In a rural setting, geographic reality dictates that many trauma patients undergo initial resuscitation at the local community hospital (CH) prior to transfer to the trauma center for definitive care. We hypothesized that real-time visual and verbal communication via telemedicine between trauma surgeons at an ACS verified Level I Trauma Center (TC) and the CH physicians could positively impact CH trauma care.

METHODS: Desktop PC-based telemedicine systems capable of transmitting real-time audio and motion video over digital phone lines were installed in 4 CH Emergency Departments in NY State and VT. 3 trauma surgeons had similar telemedicine systems placed in their homes to provide coverage 24 hours/7 days per week.

RESULTS: Between 6/00 and 9/00, there were 16 teleconsults for trauma performed. The patients were overall severely-injured as attested to by a mean ISS 25.41 ± 9.8 and RTS 4.757 ± 2.98 . Three patients died. In two instances, teleconsults were felt to be lifesaving:

- 1) A patient with a severe closed head injury who was unable to be intubated. The trauma surgeon talked the ED physician through a cricothyroidotomy he had never done.
- 2) A multitrauma patient who was persistently hypotensive (systolic B.P. 40's). The CH wanted to do an abdominal CT. The trauma surgeon recommended a DPL and when positive, the CH surgeon was advised to take the patient to the OR to control intracavitary hemorrhage. Two patients were kept at referring facility when it was determined that the injuries could be managed at CH. 12/16 (75%) of referring providers felt that the teleconsult improved the quality of their patients' healthcare.

CONCLUSION: Telemedicine is a promising new innovation that provides immediate visual and verbal trauma consultations between a TC and CH in a rural setting. This technology allows the eyes and ears of experienced trauma surgeons to be virtually "in-house" at the CH, positively impacting trauma care.

Notes:

PERCUTANEOUS TREATMENT OF SECONDARY
ABDOMINAL COMPARTMENT SYNDROME

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The Mercy Hospital of Pittsburgh

Alain Corcos, M.D.

H.F. Sherman, M.D.

Pittsburgh, PA

Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) are well described complications in trauma and general surgery. Several reports have described these complications during the initial resuscitation of patients with major burns. In patients with ACS, early decompression of the abdominal cavity is imperative and decompressive celiotomy is the generally accepted therapeutic approach. We treated ACS in three major burn patients by percutaneous drainage achieved by insertion of a peritoneal catheter.

Case 1: A 3 year old boy with a 40% immersion burn developed oliguria, hypotension, and hypercarbia during his initial resuscitation. Bladder pressure measured 38 cm H₂O. After an 18-gauge catheter was inserted into the peritoneal cavity, 400 ml of serous fluid was removed immediately. This was accompanied by increases in blood pressure from 77/54 to 122/79 and urine output from 20 to 75 ml/hr and a decrease in PaCO₂ from 87 to 65 torr. His pulmonary status also improved with an increase in tidal volume from 200 to 275 cc while ΔP was reduced from 54 to 44 cm H₂O on pressure control ventilation (PCV). Thirteen hundred ml drained over the following 24 hours.

Case 2: A 36 year old man with a 65% flame burn and inhalation injury developed anuria, hypoxemia, hypercarbia, and a peak airway pressure of 68 cm H₂O 11 hours into his initial resuscitation. Bladder pressure measured 82 cm H₂O. A peritoneal dialysis catheter yielded an immediate return of 1800 ml of fluid. Urine output returned to 75 ml the hour following the procedure and remained in the range of 100 ml/hr thereafter. Tidal volumes increased from 250 to 675 cc on PCV with a ΔP of 60 cm H₂O. Twenty-eight hundred ml of additional fluid drained over the ensuing 24 hours.

Case 3: A 10 year old boy with 51% flame burn and inhalation injury developed poor pulmonary compliance, hemodynamic instability, and hypercarbia on hospital day 2. Bladder pressure measured 34 cm H₂O and a pediatric peritoneal dialysis catheter was inserted into the abdominal cavity. Four hundred and fifty ml of fluid drained immediately and cardiac output increased from 3.02 to 6.17 L/min. Tidal volumes also increased from 300 to 455 cc while ΔP was reduced from 45 to 37 cm H₂O and PaCO₂ fell from 72 to 58 torr. Six hundred and sixty ml drained over the following 24 hours.

In these three patients, this method of abdominal decompression appears to have been quite effective in arresting the progression of ACS. Percutaneous drainage has some compelling advantages over celiotomy; the avoidance of: an open midline abdominal wound in association with a colonized abdominal wall burn, secondary closure with possible additional skin grafting, and celiotomy during the phase of care most risky for such an intervention. Although we treated ACS, this less invasive approach to decompression may afford the opportunity to treat IAH prior to the development of ACS without compromising the resuscitation by limiting fluids or adding diuretics; "conservative" methods often employed. We believe this approach warrants prospective investigation to confirm its efficacy and allow subset analyses that could more clearly identify appropriate indications.

Notes:

Presidential Address: 31st Annual Meeting
Steven R. Shackford, MD
University of Vermont
“How, then, shall we live?”

Notes:

IL-6 SECRETION IN LPS-STIMULATED WHOLE BLOOD DOES NOT PREDICT CLINICAL OUTCOME IN ICU PATIENTS

W Heagy PhD, C Hansen MD, K Nieman, MS, Cohen M, JL Rodriguez, MD, MA West, MD, PhD

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In vitro pretreatment of monocytes with lipopolysaccharide (LPS) induced blunted TNF and IL-6 release with LPS rechallenge. We found that impaired ex vivo LPS-stimulated whole blood TNF production was associated with poorer clinical outcomes. In contrast to TNF, IL-6 (an acute phase protein) may have beneficial effects, although other authors suggest that vigorous IL-6 response may be a marker of worse outcome. In this preliminary study we sought to determine the relationship of ex vivo LPS-stimulated IL-6 release to outcome.

Methods: Heparinized whole blood (WB) was obtained from 50 ICU pts or 13 controls and incubated ± 10 ng/ml of LPS at 37°C for 3 hr (TNF levels) or 18 hr (IL-6 levels). Serum cytokine levels were measured using ELISA (mean \pm SEM). Clinic data, such as ICU length of stay (LOS), ventilator days (VentD), WBC, and positive cultures (Clt+), were obtained. The distribution of the plotted LPS-stimulated IL-6 values (ng/ml) were used to identify "quartiles" of IL-6 production. Statistics by Chi-square and student t-test.

| Quartile of IL-6 | N | IL-6 | ICU LOS | VentD | % Clt+ |
|------------------|----|-----------------|----------------|----------------|--------|
| I (1-25%) | 13 | 3.0 \pm 3 | 14.9 \pm 3.3 | 12 \pm 3.5 | 62% |
| II (26-50%) | 13 | 6.1 \pm .4* | 8.5 \pm 2.6* | 5.1 \pm 2.6* | 62% |
| III (51-75%) | 12 | 10.4 \pm .5* | 11.8 \pm 2.7 | 5.3 \pm 1.9* | 36%* |
| IV (76-100%) | 12 | 18.7 \pm 2.3* | 15.3 \pm 2.6 | 13.8 \pm 2.1 | 17%* |

* p<0.05, versus Quartile I

Results: A wide range of LPS-stimulated WB IL-6 production was observed in ICU patients (4.9 \pm .5) and controls (6.7 \pm .5). Patients with the lowest IL-6 release (quartile I) had significantly lower production than normal controls (p<.05) or any other quartile of ICU patients (p<.05). Patients identified in the lowest quartile of IL-6 producers (< 4.3 ng/ml) had significantly lower TNF production. Low IL-6 producers (Quartiles I+II) had a higher incidence of infection (62 vs.27%), but no difference in ICU LOS (11.7 vs. 13.6 d) or VentD (8.6 vs. 9.6 d) compared to high IL-6 producers (III+IV). Quartile IV had the lowest incidence of positive cultures.

Conclusion: Low levels of ex vivo LPS-stimulated whole blood IL-6 production was associated with the presence of infection, but did not correlate with outcome. Ex vivo LPS-stimulated IL-6 is less useful than TNF to identify severe sepsis in ICU patients.

Notes:

THE MORBIDITY OF COLOSTOMIES FOLLOWING
PENETRATING COLON INJURY

EM Bulger, KM McMahon, GJ Jurkovich

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Washington

Eileen M. Bulger, M.D.

Gregory J. Jurkovich, M.D.

Seattle, WA

Over the past 20 years, there has been a trend toward primary repair of penetrating colon injuries rather than fecal diversion via a colostomy. However patients continue to require a colostomy due to hemodynamic instability, significant associated injuries, or severe colon injury. As a result, patients who currently receive a colostomy are more severely injured than those in previous reviews. In addition, the added morbidity of colostomy takedown has not been well defined. Purpose: To define the current morbidity and mortality associated with a colostomy formation and colostomy takedown following penetrating trauma. Methods: A retrospective review of all penetrating colon injuries managed at a Level I trauma center over the past ten years, n=186. Stepwise logistic regression was performed to determine the independent predictors of colostomy formation in these patients. Outcome parameters included total complication rate, intrabdominal infection, wound infection & dehiscence, incisional hernia, length of stay (LOS), and mortality. Logistic regression was used to determine the impact of colostomy on these outcomes, controlling for confounding factors including: age, ISS, hypotension, associated injuries, mechanism of injury, amount of fecal contamination, and location of injury. Results: There were 186 patients with penetrating colon injuries identified of whom 5 were excluded for death in the OR; 95 (57.5%) were managed with primary repair or anastomosis while 86 (47.5%) received a colostomy.

| Predictors of Colostomy | OR | CI | P |
|------------------------------|-----|----------|--------|
| Gunshot Wound vs. Stab Wound | 3.8 | 1.5-9.8 | 0.006 |
| Moderate contamination | 4.5 | 1.8-11.2 | 0.001 |
| Gross contamination | 8.7 | 3.2-23.5 | <0.001 |
| Descending or Sigmoid injury | 3.8 | 1.7-8.3 | 0.001 |

The unadjusted complication rate for patients receiving a colostomy was 57% (49/86) vs. 42% (40/95) for the primary repair group, p=0.01. After controlling for confounding variables, the presence of a colostomy (OR 2.9, CI 1.4-6.9, p=0.01) and hypotension on admission (OR 3.6, CI 1.4-9.6, p=0.009) were associated with an increase in complication rate. There was no difference in mortality. Data was available for colostomy takedown in 60 patients, with a complication rate of 17% (10/60). The only independent predictor of a complication following colostomy takedown was the presence of shock at the time of the initial injury (OR 8.8, CI 1.3-58, p=0.02). Time to takedown and type of colostomy did not affect complication rate, although there was a higher anastomotic stricture rate associated with loop colostomies (3/13, 23%) compared to Hartman's pouch (1/36, 2.8%) or mucous fistula (1/11, 9%), p=0.08. Conclusion: Colostomy formation following penetrating trauma correlates with significant morbidity. Complications following colostomy takedown are related to the severity of shock at initial presentation. Loop colostomies are associated with a higher rate of post-operative stricture.

Notes:

IMPACT OF GENDER ON OUTCOME IN TRAUMA PATIENTS

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University of Tennessee Health Science Center

Martin A. Croce, M.D.
Michael Chang, M.D.
Memphis, Tennessee

Introduction: Recent laboratory studies have demonstrated that immune responses differ between male and female rodents, and some clinical studies have suggested gender differences regarding incidence and mortality from sepsis. The differences appear due to both deleterious testosterone and beneficial estrogen effects; clinical trials of testosterone blockade and/or estrogen administration for males has been suggested. However, hepatotoxicity, cardiovascular side effects, and a hypercoagulable state are risks of hormonal therapy. We evaluated the effect of gender on various outcomes in trauma patients.

Methods: Trauma patients over a 40 month period were identified from the trauma registry. Outcomes included mortality, pneumonia (PN; $\geq 10^5$ cfu/mL in bronchoalveolar lavage effluent), bacteremia (+BC), ventilator days (VD), and ICU length of stay (ILOS).

RESULTS: 14,139 patients (73% male, 27% female) were identified. The table demonstrates the outcomes by gender and injury mechanism (* $p < .02$):

| <u>Injury type</u> | <u>Sex</u> | <u>N</u> | <u>% Mortality</u> | <u>% PN</u> | <u>% +BC</u> | <u>VD</u> | <u>ILOS</u> |
|--------------------|------------|----------|--------------------|-------------|--------------|-----------|-------------|
| Penetrating | M | 3013 | 11.8 | 2.3 | 2.4 | 0.7 | 1.1 |
| | F | 445 | 12.8 | 0.9 | 1.8 | 0.8 | 1.2 |
| Blunt | M | 7182 | 7.4 | 6.8* | 4.9* | 1.7 | 2.6 |
| | F | 3329 | 7.1 | 5.3* | 3.2* | 1.5 | 2.4 |

Blunt injured patients were analyzed by age, assuming females aged <40 were premenopausal and those >50 were postmenopausal to determine potential protective effect of estrogens. There was no difference in mortality between gender for the younger (age ≤ 40 : 5.6% M v 5.1% F) or older groups (age >50 : 15.1% M v 14.8% F). Response to sepsis by age group was analyzed by mortality following PN and +BC. There were no differences in mortality between gender for PN (age ≤ 40 : 14.1% M v 20.2% F; age >50 : 29.9% M v 31.4% F) or +BC (age ≤ 40 : 15.9% M v 17.9% F; age >50 : 30.1% M v 35.7% F). There also were no mortality differences between gender when patients were stratified by ISS group.

Conclusion: There are no clinically relevant outcome differences between genders following trauma. This data would not support clinical trials of hormonal manipulation in trauma patients.

Notes:

OUTCOME AFTER MAJOR TRAUMA IN THE ELDERLY: FUNCTIONAL AND PSYCHOLOGIC OUTCOMES IN THE OLD VERSUS THE YOUNG

T.L. Holbrook, Ph.D. and D.B. Hoyt, M.D.
University of California, San Diego
Troy L. Holbrook, Ph.D.
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Introduction: Trauma in the elderly, aged 65+, is gaining attention in light of increasing injury rates in this population. Functional and psychologic outcomes have not been examined in the elderly. A prospective epidemiologic study was conducted to examine multiple outcomes after major trauma, including quality of life, depression (DEPR) and post-traumatic stress disorder (PTSD). The specific objectives of the present report are to examine short and long-term functional and psychologic outcomes in the elderly after major trauma.

Methods: 1048 eligible trauma patients were enrolled in the study. Admission criteria for patients were age 18 or older and length of stay (LOS) greater than 24 hours. Functional outcome after trauma was measured using the Quality of Well-being (QWB) scale (range; 0 = death to 1.000 = optimum functioning). Depression was assessed using the Center for Epidemiologic Studies CES-D scale and PTSD was assessed using DSM-IV criteria. Patient outcomes were assessed at discharge, and at 6, 12, and 18 months after discharge.

Results: Functional outcome was significantly worse at each follow-up timepoint in elderly subjects age 65+ (N = 60) versus younger subjects aged (N = 512).

| <u>QWB Score</u> | <u>Age 65+</u> | <u>Age 25-44</u> |
|------------------|----------------|------------------|
| 6-Month | 0.602 | 0.633 (P= 0.08) |
| 12-Month | 0.603 | 0.669 (P<.01) |
| 18-Month | 0.626 | 0.678 (P<0.05) |

The elderly were significantly less likely to be depressed (Discharge Odds Ratio (OR) = 0.6, P < 0.05; 6-Month OR= 0.1, P < 0.01; 18-Month OR= 0.4, P < 0.05) and to have PTSD at 6 months (OR = 0.3, P < 0.05).

Conclusions: The elderly are at risk for markedly worse functional outcomes after major trauma than younger trauma survivors. In contrast, they have much lower rates of psychologic morbidity. Age differences in short and long-term trauma outcomes have important implications for future studies of recovery from trauma.

Notes:

REDUCING TRAUMA PAYMENT DENIALS WITH
COLLABORATIVE BILLING

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Background: Trauma patient care demands constant attending physician coverage. Hence, many trauma patients are cared for by more than one trauma surgeon. Yet third-party payors, notably the Health Care Financing Administration (HCFA), treat their bills as originating from the same individual. Because of global surgical package rules, payments are typically denied for evaluation and management (E&M) services and procedures during the postoperative period. However, reimbursement should be expected for services unrelated to the operative procedure.

Objective: Trauma surgeons are often unaware of their colleagues' billing history on jointly managed patients. We sought to determine if a shared billing program would reduce the denials for postoperative services and procedures.

Methods: A networked relational database was created using Microsoft® Access. Trauma surgeons entered their billable encounters in the program. The program displayed the global periods and operative diagnoses, prompting the surgeon for a postoperative modifiers ("-24" or "-78") when appropriate. Professional billing denials were compared for equivalent 8-month time periods (January through August, 1999 vs. 2000).

Results: The program was initiated on January 11, 2000. Denials for E&M services that were deemed to be "bundled" in the operative procedure fell from 361 to 16. Denials for postoperative procedures similarly considered bundled or already paid dropped from 55 to 13. Improvements in procedure and diagnostic coding were also responsible for reductions in denials. The time it took for surgeons to complete their daily billing dropped dramatically from a 1- to 3-hour process to a 20-minute episode, producing a legible report compared to often illegible handwriting on a charge template. Overall, there was an 85% improvement in payable charges, reducing the potential losses from \$210,648 to \$27,244.

Conclusion: Collaborative billing through a computerized networked system with built-in intelligence to enhance the quality of the submitted claim can improve the likelihood of payment for professional trauma care.

Notes:

"TUNING" THE CARDIOVASCULAR SYSTEM DURING RESUSCITATION: A THERMODYNAMIC TOOL FOR IMPROVING PERFUSION AND CARDIAC EFFICIENCY

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Introduction: Efficacy of circulation depends upon interactions between the heart and the vascular system. Current textbooks of trauma/critical care¹⁻³ describe ventricular-vascular coupling (VVC) as a major determinant of cardiovascular function. However, no prospective studies examining VVC and systemic perfusion have been performed. VVC is measured by the ratio of afterload (aortic input impedance, E_a) to contractility (end-systolic elastance, E_{es}). Lowering E_a/E_{es} is associated with better VVC and improved myocardial work efficiency (EFF).

Hypothesis: Optimizing ventricular-vascular coupling during resuscitation results in improved myocardial work efficiency while simultaneously improving systemic perfusion.

Methods: Prospective study in a consecutive series of critically injured patients. After pulmonary artery catheterization and adequate fluid resuscitation, left ventricular power output (LVP) and E_a/E_{es} were optimized with inotropic agents and/or afterload reduction. EFF was calculated as stroke work/total left ventricular work. Tissue perfusion was estimated by calculating base deficit (BD) clearance (mEq/L per hour).

Results: Sixteen patients were studied over a 7 month period. Ten patients required

inotropic support or afterload reduction to improve VVC. Post-optimization E_a/E_{es} and LVP improved, with a

| Variable | pre-optimization | post-optimization |
|----------------------------------|------------------|-------------------|
| LVP (mmHg•L/min/m ²) | 296±71 | 368±79* |
| E_a/E_{es} | 1.0±0.4 | 0.6±0.2* |
| EFF (%) | 69±8 | 77±5* |
| BD clearance (mEq/L/hr) | 0.14±0.43 | -0.16±0.08* |

*p < 0.05, paired t-test

concomitant improvement in both EFF and base deficit clearance.

Conclusions: Improving ventricular-vascular coupling during resuscitation improves myocardial efficiency and systemic tissue perfusion. Perfusion can be improved at lower energy cost to the heart by focusing on thermodynamic principles during resuscitation.

¹ *Trauma*, Mattox et al, 2000

² *Care of the Surgical Patient*, Wilmore et al, 2000

³ *Critical Care*. Civetta et al. 1992

Notes:

UNSUSPECTED FRACTURE PENETRATIONS OF THE HEART

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We describe here two cases of cardiac penetration from chest wall fractures following blunt thoracic trauma. The first case was a 53 year old male involved in a motor vehicle crash (MVC) who presented hemodynamically stable with left rib fractures and a small left pneumothorax. A left chest tube was placed with only minimal output of blood. He was admitted to the ICU. Shortly after admission, the patient had a run of ventricular tachycardia. An ECHO was performed which demonstrated a hypokinetic left ventricular anterioseptal wall, consistent with cardiac contusion. There was no evidence of pericardial effusion or tamponade. Cardiac enzymes were also obtained and were elevated. On the second post injury day, he developed a large left hemothorax and decline in hemoglobin. On operative exploration, he was found to have a puncture wound of the left ventricle from a fractured rib in the area of the previously identified cardiac contusion. The wound was repaired primarily. The second case is a 40 year old female also involved in a MVC. Injuries included multiple left rib fractures, left pneumothorax and a positive FAST (ultrasound) exam. Following placement of a left chest tube, she was taken emergently to the operating room for hemodynamic instability. An exploratory laparotomy was performed which revealed a ruptured spleen and grade II liver laceration. A splenectomy was performed and the liver was packed. However, despite adequate control of the abdominal bleeding, the patient remained hypotensive. A positive pericardial window was followed by a median sternotomy. She was found to have a laceration of the superior vena cava-atrial junction underlying a displaced sternal fracture, which was successfully repaired. Cardiac puncture or laceration is rare in blunt trauma. The incidence of this type of injury is not defined; the majority of cases are identified at the time of autopsy. In conclusion, penetrating cardiac injuries secondary to chest wall fractures can be associated with blunt thoracic trauma. A high index of suspicion and rapid diagnosis and treatment are mandatory.

Notes:

ABDOMINAL DECOMPRESSION PRIOR TO ORGAN PROCUREMENT

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Introduction: Thousands of people die each year waiting for a transplant due to a worldwide shortage of organs. The problem worsens yearly as the gap between availability and need widens. Many organs initially accepted by transplantation centers are later refused or discarded, presumably due to problems with organ function. As a result, improved preservation of function prior to procurement could potentially increase organ acceptability for transplantation. We present a case of a patient diagnosed with a severe closed head injury and brain death in which an abdominal decompression procedure allowed for the preservation of organ function prior to organ procurement.

Case Report: The patient was a 23-year-old healthy, white male in a motor vehicle collision. During pre-hospital assessment, the patient was unresponsive to verbal and painful stimuli. Attempts at oral tracheal intubation were unsuccessful. On arrival to our trauma resuscitation bay, the patient's initial oxygen saturation was 33% on 100% O₂. The patient was immediately intubated with a gradual return of his oxygen saturation to 100%. The patient was found to have a depressed skull fracture of the left occiput. The pupils were dilated and nonreactive to light. There was no corneal or gag reflex. Computer tomography of the head revealed a severe closed head injury with diffuse cerebral edema and loss of the grey/white matter junction. There was massive subarachnoid hemorrhage with effacement of the basal cisterns. The patient was transferred to the trauma intensive care unit for further evaluation and resuscitation. A large amount of volume and vasopressor resuscitation was required to maintain a mean arterial blood pressure of 70mmHg. Progressive increases in positive end expiratory pressure to a level of 30 cm. H₂O were required to maintain borderline saturations. The peak inspiratory pressure increased to 71 cm.H₂O. Physical exam revealed a firm abdomen and abdominal compartment syndrome (ACS) was suspected and confirmed with bladder pressure measurement of 55mmHg. A full neurologic evaluation confirmed a brain dead patient and, thus, organ donation was discussed with the family.

Due to a long time delay prior to potential organ procurement, a decompressive laparotomy was performed in an attempt to preserve organ function. Massive bowel edema and ascites was evident upon decompression. Following laparotomy, the patient's ventilatory and hemodynamic status improved significantly. Both kidneys and the liver were retrieved approximately fourteen hours after decompression. All subsequently transplanted organs were doing well as of the last entry in this report.

Discussion: Abdominal compartment syndrome left untreated uniformly leads to multisystem organ failure and death. Decompressive laparotomy can be performed as a procedure to potentially preserve organ function in a brain dead patient awaiting procurement. Abdominal decompression should thus be considered in all cases of brain death where ACS is occurring concurrently and organ procurement is being contemplated.

Notes:

BICARBONATE ADMINISTRATION IN THE SETTING OF
CARDIAC ARREST FROM AN EXTRATHORACIC STAB
WOUND

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Hennepin County Medical Center

Presenter: JW McGill, MD

Sponsor: same

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Standard treatment of hemorrhagic shock is bleeding and airway control, and fluid resuscitation. The treatment of metabolic acidosis is rarely mentioned. The following is a case of a patient with an out-of-hospital cardiac arrest from a stab wound to the groin who responded dramatically to sodium bicarbonate administration and went on to a complete neurologic recovery:

18:45 911 called- patient stabbed. First responders find a 27 y. o. awake male with a stab wound to the left groin, lying in approx. one liter of blood.. 18:51 Paramedics arrive and are told that patient arrested just prior to their arrival; history was that patient had a prolonged struggle before being stabbed. Patient in cardiac arrest, no respirations, pupils fixed and dilated. Positive pressure ventilation and CPR begun, Mast trousers inflated. 19:09 Pt. transported - intubated and 16 gauge left antecubital IV placed en route. Pre-hospital fluids: 1 liter NS. 19:19 Arrival in ED; no pulse or spontaneous resp., pupils F&D, monitor shows SVT at 100. the 16 gauge IV is converted to an 8.5 French catheter. Cardiac US shows barely perceptible but organized contractions, no pericardial effusion, Morison's negative. 19:22 Sodium bicarbonate, 2 amps, IV push through the 8.5 Fr catheter. Immediately following the bicarb, the patient was noted to pink up, a carotid pulse was palpated and a repeat cardiac US, less than one min. after the first, revealed rapidly beating heart with good contractility. 19:27 BP 93/65; HR 135, right 16 gauge IV placed, one unit of O neg in. Active bleeding from under the MAST trousers, removed and direct pressure successfully applied. 19:31 ABG pH 7.19, pCO2 31, pO2 542, bicarb 12. 19:31 Pupils 2 mm and reactive, patient was starting to move; the 3rd unit of O- blood was completed. 3 liters crystalloid in. 19:39 To OR BP 100/57 HR 127 total time 20 min. total fluids 3800 crystalloid, 3 units O neg.

In the OR, the abdomen was noted to be distending; laparotomy revealed a large retroperitoneal hematoma. Proximal control was achieved followed by anastomosis of the transected femoral artery and vein as well as repair of the lacerated femoral nerve. The patient's post-operative course was complicated by abdominal compartment syndrome day three and persistent coagulopathy as well as ARDS and acute renal failure. His pulmonary and renal problems resolved by the second week post injury and he was discharged three weeks after injury to a rehab unit. Aside from a persistent femoral nerve deficit, his neurologic recovery was complete.

Complete neurologic recovery following out of hospital cardiac arrest from penetrating extrathoracic trauma is uncommon. In this case, the administration of sodium bicarbonate for presumed severe metabolic acidosis and resultant clinical electromechanical dissociation appeared to hasten the return of effective cardiac function and may have contributed to the excellent neurologic outcome. Bicarbonate, in conjunction with airway control and fluid resuscitation, should be considered early in the management of these patients.

Notes:

**ALTERNATIVES IN ABDOMINAL WALL RECONSTRUCTION
AFTER DAMAGE CONTROL SURGERY: A PHOTO ESSAY**
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CO Simpkins MD, R Simpson MD, GW Shaftan MD
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Nassau University Medical Center
DR Cottam MD
JC DiGiacomo MD
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Introduction: A fundamental component of the damage control paradigm is the second look laparotomy (Damage control stage III) after the physiologic resuscitation (Damage control stage II) of the critically injured patient. Occasionally, however, it is not possible to close the abdomen after the final abdominal operation due to swelling of the abdominal contents or lateral retraction of the open abdominal wall. While a number of options for the temporary coverage of the open abdomen have been developed, including skin closure, the bogata bag, and the vacuum sandwich, it remains unclear how to optimally manage the short term issues of the permanent open abdomen and long term problem of the giant ventral hernia with loss of domain. **Cases:** 6 patients over the past 5 years have survived abdominal injuries which were initially managed with damage control surgery. Four have completed their abdominal wall reconstruction and have not redeveloped an abdominal wall hernia. One patient is 5 months post discharge and did not undergo skin grafting of the open abdomen because of a duodenal fistula. There still is granulation tissue present. One patient who had native abdominal wall skin closed over the open abdominal fascia is two months post discharge.

Discussion: It has become clear that the highest priority for managing the open abdomen is avoiding an entero-atmospheric fistula. To this end we have abandoned early use of permanent mesh and "percutaneous" feeding tubes in favor of promoting granulation tissue with absorbable mesh and early split thickness skin grafting, using nasojejunal feeding tubes for nutrition. The patient is discharged with the plan for abdominal wall reconstruction after 6 to 12 months. The abdomen ultimately is closed in a co-ordinated effort between the trauma and plastic surgeons and entails the use of tissue expanders, pedicled flaps, and separation of abdominal wall components.

Conclusions: The positive impact of damage control laparotomy has created a small but significant number of patients in whom primary abdominal wall closure can not be done. A planned ventral hernia, however, can be successfully managed and fully closed in a delayed fashion through the coordinated efforts of trauma and plastic surgeons.

Notes:

BYLAWS





BYLAWS OF
WESTERN TRAUMA ASSOCIATION

ARTICLE I

Name, Objectives, Organization, and Jurisdiction

SECTION 1: Name

The name of this organization is the Western Trauma Association.

SECTION 2: Objectives

The objectives of the Association are 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.

SECTION 3: Organization

This is a non-profit membership corporation entity, duly incorporated on this 25th day of January, 1971 under, and by virtue of, the provisions of the laws of the State of Colorado.

SECTION 4: 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 throughout the "free world".

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

SECTION 2: Qualifications

Active members shall be limited to Doctors of Medicine who are Board Certified in their particular medical specialty. The Board of Directors is hereby given discretionary powers to interpret if foreign physicians who apply for membership have the credentials comparable to Board Certification. Certified members of other (non-M.D.) health care disciplines with a special interest or expertise in trauma may be elected to associate membership with the approval of the Board of Directors and the membership. Associate members shall have all the rights and privileges and must satisfy the same requirements for election to and retention of membership as active members except the right to vote or hold office. For applications to be considered, candidates must submit a completed application with a letter of support (sponsorship) from a member of the Association, and submit an abstract for consideration by the Program Chairman. A new member must attend a prior meeting in which he/she is voted on for membership in the capacity of a resident, physician or certified specialist.

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 or the annual meeting and to remain current in the payment of same.

At age 55, members in good standing will automatically accept the position of senior membership in the West Trauma Association. A senior member must pay dues annually and retains all voting privileges and rights of active members, but does not have to attend the meetings, and his membership is not counted as part of a given specialty's membership quota or the total membership number.

SECTION 4: Board Action Concerning Membership

Applicants to the Association can obtain membership on a two-thirds vote of the Board of Directors.

Termination of membership can only be obtained on a two-thirds vote of the Board of Directors for a violation of one or more of the items set forth in Article II, Section 3 of the Bylaws of this association.

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 Board of Directors. Funds shall be made available for the conduct of the scientific program at the annual meeting (the exact amount of the funds shall be set by the Board of Directors).

SECTION 2: Special Meetings

Special meetings of the Association may be called by the Board of Directors or two-thirds of the membership 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.

SECTION 4: Quorum

One-fourth of the membership present at any meeting of the Association shall constitute a quorum.

ARTICLE IV

Meetings of the Directors

Section 1: Annual Meetings

The annual meetings of the Board of Directors shall be held on the same day or days and at the same place as the annual meeting of the Association.

SECTION 2: Special Meetings

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.

SECTION 3: Quorum

A majority of the Board of Directors shall constitute a quorum.

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 treasurer and president 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 prior to the annual meeting. Failure to pay dues 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 to respective members at their last address on record with the Association, postage pre-paid.

SECTION 4: Waiver of Dues

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

ARTICLE VI

Voting

SECTION 1: Voting Rights

Each 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.

12) By United States Mail, postage pre-paid, addressed to the secretary of the Association at the Association's registered office, postmarked on or before the date of the meeting of the membership where the vote is to be taken.

13) 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: Cumulative Voting

Cumulative voting shall not be allowed.

SECTION 5: 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 6: 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 corporation 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.

SECTION 2: Terms and Vacancies

The Secretary, Historian, and Treasurer shall each hold office for the term of three years. The remaining officers shall be elected at the annual meeting of the members. In the event that an officer cannot fill his term, his successor shall be chosen by the Board of Directors to fill the vacancy for the unexpired term of the office.

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 of Officers

SECTION 1: President

Following his ascension to the chair, the president shall preside at all meetings of the members and shall serve as ex-officio member at 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 shall assign to him.

SECTION 3: Vice President

The vice president shall preside at all business meetings in the absence of the president.

SECTION 4: Secretary

The secretary shall keep the minutes of all meetings of the members and the Board of Directors; shall keep all records and information pertaining to the history of the Association; and be responsible for applications for membership, approvals, and deletions as well as communications to the membership, especially those whose membership is in jeopardy.

SECTION 5: Treasurer

The treasurer shall have the following duties:

- (1) Shall keep the books of account of the Association and shall cause to be prepared an annual audit for presentation at the annual meeting.
- (2) Shall have custody of, and be responsible for all funds, securities, 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 selected by the Board of Directors.
- (3) Shall assist the secretary in keeping the roster of the membership which is current and accurate.
- (4) Shall engage a certified public accountant, approved by the president, to audit annually the books of the Association. The accountant's report shall be reviewed by the auditing committee.

SECTION 6: Historian

The Historian should maintain and safeguard 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 otherwise, 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

Board of Directors

SECTION 1: Composition

The Board of Directors of the Association shall consist of the following individuals:

(1) The president, president-elect, vice president, secretary, and treasurer, immediate past president, and six members-at-large.

(2) Two members of the Association in good standing shall be elected annually to replace two existing members-at-large of the Board unless the membership should, by majority vote, elect to retain the then existing Board of Directors.

(3) 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: 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 corporation shall be controlled by, or under the authority of, the Board of Directors.

ARTICLE X

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 and a Committee including a General Surgeon, an Orthopedic Surgeon, another specialist, and the Chairman of the Publications Committee (ex-officio), all appointed by the President. The Chairman is appointed for a two year term. This Committee will be responsible for the organization and conduct of the program at the annual meeting.

SECTION 3: Membership Committee

The Membership Committee shall consist of the Board of Directors. 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 a General Surgeon, an Orthopedic Surgeon, a Plastic Surgeon, another specialist, and the Chairman of the Program Committee (ex-officio), all appointed by the President. 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.

ARTICLE XI

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

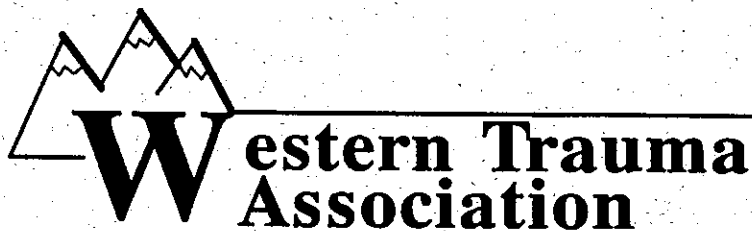
The President shall set the agenda and where possible should follow Robert's Rules of Order.

ARTICLE XII

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.

MEMBERSHIP LIST





**WESTERN TRAUMA ASSOCIATION
2001
MEMBERSHIP LISTING**

| | | |
|---|--|---|
| <p>Andrassy, Richard J. (Mary Shinn, MD)</p> <p>Email:</p> | <p>Univ of Texas Health Sciences Center 6431 Fannin, MSB 4-020 Houston, TX 77030 randrass@ctsurg.med.uth.tmc.edu</p> | <p>O: 713-500-7200 H: 713-667-9785 Pediatric Surgery</p> |
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