729

KAPPEL

THIRTY-THIRD ANNUAL MEETING

Western Trauma Association

February 23 - February 28, 2003

Snowbird, Utah

WESTERN TRAUMA ASSOCIATION

33RD Annual Meeting
Snowbird, Utah
February 23 – 28, 2003

THE WESTERN TRAUMA ASSOCIATION
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Robert J. Neviaser, M.D.	1987	Jackson Hole
Robert C. Edmondson, M.D.	1988	Steamboat
Ernest E. Moore, M.D.	1989	Snowbird
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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
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Barry C. Esrig, M.D.	2000	Squaw Valley
Steven R. Shackford, M.D.	2001	Big Sky
James A. Edney, M.D.	2002	Whistler-Blackcomb
J. Scott Millikan, MD	2003	Snowbird

**** The 2004 WESTERN TRAUMA ASSOCIATION Meeting will be:**

Steamboat Springs, Colorado
February 22 – 27, 2004

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

RESIDENT PAPER COMPETITION

'. Earl G. Young of Minneapolis was a founding member of the Western Trauma Association and its 1 'esident. He died of a myocardial infarction, Monday, February 27, 1989, while skiing at Snowbird during t)th Annual Meeting of the Association.

r. Young received his medical degree from the University of Rochester, N.Y. and Ph.D. in surgery from t niversity of Minnesota. He completed advanced training in cancer research at Harvard, a fellowship ırdiovascular surgery at Baylor University in Houston and studied microvascular surgery at the University alifornia–San Diego.

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

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

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

EARL G. YOUNG AWARD RECIPIENTS

Resident	Institution	Year
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
D.J. Ciesla, M.D.	Denver Health Medical Center	2000
Ricardo J. Gonzales, M.D.	Denver Health Medical Center	2001
Scott C. Brakenridge	Cook County Hospital	2002

WESTERN TRAUMA ASSOCIATION

SCHEDULE

Sunday, February 23, 2003

1600 – 1700	Nominating Committee Meeting	Board Room
1630 - 1930	Registration	Golden Cliff
1700 – 1900	Welcome Reception	Golden Cliff
1700 – 1900	Children's Reception	Magpie
1900	Past Presidents Meeting	Board Room
2000	WTA Foundation Board Meeting	Board Room

Monday, February 24, 2003

0700 – 0720	Welcome Remarks - Dr. Millikan	Ballroom 1
0720 – 0900	Scientific Session I	Ballroom 1
1600 – 1800	Scientific Session II	Ballroom 1
1800 – 1900	Board of Directors Meeting	Board Room

Tuesday, February 25, 2003

0700 – 0900	Scientific Session III	Ballroom 1
1000 – 1200	NASTAR Ski Race	Race Hill (Lower Wilbere Ridge)
1200 – 1330	BBQ Lunch on the Mountain	Gad Valley
1600 – 1700	Scientific Session IV	Ballroom 1
1700 – 1800	Presidential Address – Dr. Millikan	Ballroom 1
1800	WTA Multicenter Trials Meeting	Board Room

Wednesday, February 26, 2003

0700 – 0900	Scientific Session V	Ballroom 1
1600 – 1700	Scientific Session VI	Ballroom 1
1700 – 1800	Business Meeting (members only)	Ballroom 1

Thursday, February 27, 2003

0700 – 0900	Scientific Session VII	Ballroom 1
1600 – 1700	Scientific Session VIII	Ballroom 1
1700 – 1800	"Paint the Ceiling" Lecture	Ballroom 1
1830 – 1930	Reception	Ballroom Lobby
1930 – 2330	Adult Banquet & Dance	Ballroom 1-2

Friday, February 28, 2003

0700 – 0900	Scientific Session IX	Ballroom 1
1600 –1800	Scientific Session X	Ballroom 1
1800	Adjourn	

*Monday – Friday: 0630 – 0700 – Attendee Breakfast,Outside Ballroom 1
*Monday – Friday: 0730- 0900 – Friends & Family Breakfast, Golden Cliff

Speaker Ready Room (Little Pine) – Available Sunday at 1400 thru Friday at 1800

WESTERN TRAUMA ASSOCIATION

IN MEMORIAL

Earl G. Young, MD
February 27, 1989

Gerald S. Gussack
August 25, 1997

cientific Session I
onday AM, February 24
oderator: Scott Millikan, MD
ocation: Ballroom 1

** Earl Young Resident Competition

Scientific Session II
Monday PM, February 24
Moderator: David Tuggle, MD
Location: Ballroom 1

			Page
06	1600	Blunt vascular injuries in the extremities: diagnosis management and outcome GS Rozycki MD, LN Tremblay MD, DV Feliciano MD, WB McCLelland, BA Emory University School of Medicine/Grady Memorial Hospital Atlanta, GA	28
07	1620	**Establishing a team committed to trauma care improves patient outcomes ME Cinat MD, F Nastanski MD, S Lush MSN, C Atkins MHA University of California, Irvine Medical Center, Los Angeles, CA	30
08	1640	Expanding death on scene criteria resulting in significant cost reductions J MacLeod MD, M McKenney MD, D Mishkin BS, D Shatz MD, E Barquist MD, SM Cohn MD, N Namias MD University of Miami School of Medicine, Ryder Trauma Center, Miami, FL	32
09	1700	Can cervical spine fracture patterns predict risk for blunt vertebral artery injury? CC Cothren MD, EE Moore MD, JL Johnson MD, WL Biffl MD, RJ Franciose MD, JM Burch MD Denver Health Medical Center, Denver, CO	34
10	1720	The combination of platelet enriched autologous plasma with bovine collagen and thrombin decreases the need for multiple blood transfusions in trauma patients G Bochicchio MD MPH, J Dunne MD, K Bochicchio RN, T Scalea MD R Adams Cowley Shock Trauma Center, Baltimore, MD	36
11	1740	**Vacuum assisted wound closure (VAWC) allows for early abdominal fascial closure in severely injured trauma patients requiring aggressive resuscitation JW Suliburk, DN Ware, Z Balogh, BA McKinley, CS Cocanour, RA Kozar, FA Moore University of Texas-Houston Medical School, Houston, TX	38

** Earl Young Resident Competition

1800 Board of Directors Meeting

cientific Session III
uesday AM, February 25
oderator: Jay Johannigman, MD
ocation: Ballroom 1

** Earl Young Resident Competition

Scientific Session IV
Tuesday PM, February 25
Moderator: James Davis, MD
Location: Ballroom 1

			Page
18	1600	**A prospective analysis of concordance in cultured pathogens obtained by broncho-alveolar sampling using four standard techniques for diagnosis of ventilator associated pneumonia AE Wood MD, DL Ciraulo DO, AJ Davit III MD, NW Arp BS, CM Richart MD, RA Maxwell MD, DE Barker MD University of Tennessee College of Medicine, Chattanooga, TN	52
19	1620	Serum albumin level fails to accurately reflect colloid oncotic pressure (COP) in critically ill patients RL Reed MD, SR Eachempati MD Loyola University Medical Center, Maywood IL and Cornell University Medical Center, New York, NY	54
20	1640	National survey of trauma surgeons' use of alcohol screening and brief intervention CR Schermer MD, LM Gentilello MD, DB Hoyt MD, EE Moore MD, JB Moore MD, GS Rozycki MD, DV Feliciano MD University of New Mexico, Harvard Medical School, University of California at San Diego, University of Colorado and Emory University	56

** Earl Young Resident Competition

1700 Presidential Address – Scott Millikan, MD
"On the Other Side of the Door"

1800 Multicenter Trials Meeting

entific Session V
dnesday AM, February 26
derator: Grace Rozycki, MD
:ation: Ballroom 1

Page

ientific Session VI
ednesday PM, February 26
ıcation: Ballroom 1

1600	Invited Lecturer, "Explosive Issues", Howard R. Champion
1700	Business Meeting

Scientific Session VII
Thursday AM, February 27
Moderator: Larry Diebel, MD
Location: Ballroom 1

Scientific Session VIII
Thursday PM, February 27
Location: Ballroom 1

1600	Panel of Experts – Interesting Case Presentations Steve Shackford, MD Gene Moore, MD Howard Champion, MD
1700	Paint the Ceiling Lecture "The United States in Domestic and International Disaster Response" David Shatz, MD

Scientific Session IX
Friday AM, February 28
Moderator: Mark Metzdorff, MD
Location: Ballroom 1

Scientific Session X
Friday PM, February 28
Moderator: Gage Ochsner, MD
Location: Ballroom 1

ABSTRACTS

Notes

FUNCTIONAL OUTCOME AFTER TRAUMATIC BRAIN INJURY IS INDEPENDENT OF AGE: A PROSPECTIVE MULTICENTER TRIAL

AC Mosenthal MD, DH Livingston MD*, RF Lavery MS, M Knudson* MD, S. Lee MD, D Morabito RN, GManley MD, A Nathens MD, G Jurkovich* MD, D Hoyt* MD, R Coimbra MD, Presentor: Anne C. Mosenthal, MD
Department of Surgery, UMDNJ-New Jersey Medical School, Newark, NJ 07103 and WTA Multicenter Trials Group

Objective: Elderly patients (age ≥60) have been demonstrated to have an increased mortality following isolated traumatic brain injury (TBI). The functional outcome of those patients surviving their acute hospitalization is unknown.

Methods: Multicenter prospective study of all patients with isolated moderate-severe TBI defined as Head AIS ≥3 with an AIS in any other body area ≤1. Patients surviving to discharge were consented and enrolled. Data collected: demographics, GCS at admission and 24 hrs, CT findings and co-morbidities. Outcome data included discharge disposition and Glasgow outcome score (GOS) and modified FIMS score at discharge and at 6 months.

Results: 236 patients were enrolled. The mean age was 46 years (CI_{95}:44-48 years) with 60 patients ≥60 years. Mechanisms of injury were falls (34%), assault (28%), MVC (14%), pedestrian (11%) and other (12%). Falls were more common in the older patients and assaults in the younger group. The admitting GCS was 12 (CI_{95}:12.2-13.1). There was no difference in GCS between younger and older patients at any time-point. Although older patients had significantly more co-morbidities, they did not have an increase in hospital complications. 80% of younger patients were discharged to home compared with 74% of older patients (NS). GOS at discharge was considered good in 76% of younger and 66% of older patients (p=0.19). Stratifying by both Head AIS and GCS (grouped 3-8; 9-13; 14-15) there were no differences in GOS and total FIMS at discharge or at 6 months between younger and older patients. There was a trend toward a decreasing locomotion score (p=0.09) of the FIMS in the older patients.

Conclusions: Although older patients may have an increased mortality following isolated TBI, those patients who survive have a similar functional outcome as measured by GOS and FIMS as their younger counterparts. No differences could be discerned even when controlling for degree of head injury. Aggressive management and care of older patients with TBI is warranted and efforts should be made into decreasing in-patient mortality. Continued follow-up is ongoing to determine if these outcomes persist at 12 months

GOS

FIMS

Notes

1

2 VERBAL

3 Locomotion

1

2

3

4 Total 1.

1 45.5

3-12

10.6 vs 9.8

RELATIONSHIP OF EARLY HYPERGLYCEMIA TO MORTALITY IN TRAUMA PATIENTS

AM LAIRD MD, PR Miller MD, JW Meredith MD, MC Chang MD
Wake Forest University School of Medicine
AM LAIRD MD
MC Chang, MD
Winston Salem, North Carolina

Introduction: Recent randomized prospective data suggest that hyperglycemia is ssociated with excess mortality in critically ill patients, and tight glucose control ads to improved outcome. This concept has not been carefully examined in auma patients, and the relationship of early hyperglycemia to mortality from psis in this population is unclear. The objective of this study was to determine ie relationship of early blood glucose levels to outcome in a trauma ICU opulation.

Methods: The records of all patients admitted to the ICU over a 1 year period at level I trauma center were reviewed for injury severity scores (ISS), admission lasgow Coma Scale (GCS) score, base deficit (BD), blood glucose and mortality. atients were categorized according to blood glucose as HIGH (≥ 150 mg/dl) and OW (<150 mg/dl). Those with diabetes mellitus were excluded.

Results: From 1/00-12/00, 189 eligible patients were admitted to the ICU after jury. The table shows the relationship of admission characteristic and blood lucose to outcome. The HIGH group on day 1 was older, had more severe juries and shock with concomitant higher mortality. By day 2 however, those with ersistent hyperglycemia, while still older, had similar degree of injury and shock. hey continued to show significantly higher mortality

	Day 1			Day 2		
	HIGH(n=91)	LOW(n=98)	p	HIGH(n=49)	LOW(n=81)	p
Age	50	42	.004	57	40	<.0001
ISS	27	19	<.0001	25	23	.30
GCS	11	13	.001	12	12	.58
BD	-8.3	-6.3	.01	-7.3	-7.7	.63
Mort.	33(36%)	10(10%)	<.0001	18(38%)	9(11%)	.0005

Conclusions: Early hyperglycemia is associated with a significantly higher ortality in trauma patients independent of injury characteristics. These data upport the need for a prospective analysis of aggressive glucose control in ritically ill trauma patients.

Notes

7200 Significant

PORTABLE HAND PUMP IS EFFECTIVE IN THE TREATMENT OF HEMO/PNEUMOTHORAX

A Jaskille MD, P Rhee MD, R Inocencio BS, T Hancock BS, E Koustova PhD, A Seufert, H Alam MD
USUHS, Washington Hospital Center and University of Southern California.

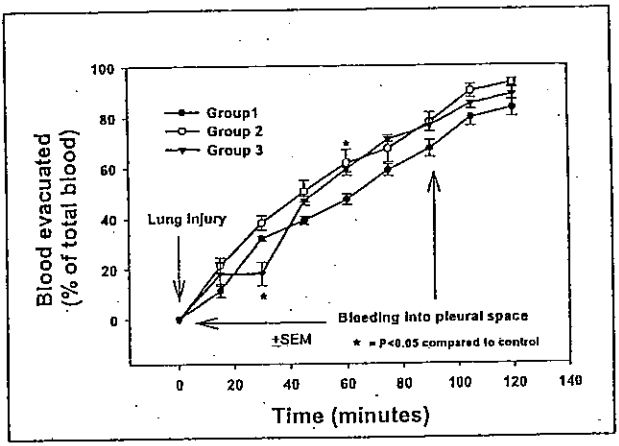
Amin Jaskille MD

Peter Rhee MD
Los Angeles, CA

The use of standard pleural evacuation devices is not practical for battlefield use. A small, portable, easy to use hand pump (HP) that does not require continuous suction for treating hemo-pneumothorax would offer a major logistical advantage. Also using endotracheal tubes instead of chest tubes would help minimize supplies carried in the battlefield.

Methods: A 2 cm lung laceration was created in 18 Yorkshire swine (35-51 kg) under inhaled anesthesia and 1.4 liter of blood was infused into the pleural space (200 cc every 15 min). Fluid resuscitation (2000 cc of LR) was started 15 min following injury, and animals were randomized into one of three groups: 1) 36 F Argyle pleural tube and Pleur-Evac chest drainage unit with 20 cm water suction (control), 2) 36F pleural tube attached to the HP, 3) No 8 endotracheal tube in pleural space attached to the HP. After 120 minutes, a thoracotomy was performed to determine amount of residual blood in the pleural space.

Results: Effectiveness of the three methods as percent of total blood (evacuated and retained) removed is shown in the figure. There was no significant difference in the amount of blood evacuated at the end of the experiment between the groups.



Conclusion: Using the hand pump with a chest tube or an endotracheal tube was as effective as the standard of care in treating traumatic hemo-pneumothorax. The use of an endotracheal tube and a hand pump could offer portability and logistical advantages in the field setting.

Notes

TITLE:

AUTHOR(S):

INSTITUTION:

PRESENTER:

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CITY, STATE:

ISOLATED HEAD INJURY AS A CAUSE OF HYPOTENSION IN THE BLUNT TRAUMA PATIENT

E Mahoney, M. D., W Biffl, M.D., D Harrington, M.D., and W Cioffi, M.D.

Brown Medical School/Rhode Island Hospital

Eric Mahoney, M.D.

Walter L. Biffl, M.D.

Providence, R.I.

ABSTRACT COPY MUST STAY WITHIN THE BLUE MARGINS BELOW

Background: A standard trauma care dictum is that brain injury does not cause hypotension. However, a recent series reported that 43% of hypotensive pediatric patients had isolated head injuries, without clear evidence of hemorrhage. We hypothesized that brain injury is a more frequent cause of hypotension in adults than has been previously reported. The purpose of this study was to determine the cause of hypotension in an adult blunt trauma population.

Methods: We queried the trauma registry at our Level I trauma center to identify adult (age>17) blunt trauma patients who were hypotensive (SBP<90) either at the scene or upon initial ED presentation, for the period 1997-2001. The etiology was categorized as hemorrhagic (Hgb<11.0 in the first 12 hours), neurogenic (i.e. spinal cord injury), cardiac, or brain injury. The subgroups were compared in order to identify differences in presentation or outcome. Continuous data were analyzed using analysis of variance testing; categorical data were analyzed by chi-square. Data is presented as mean±SEM. (*) Denotes difference from hemorrhagic shock subgroup ($p<0.05$)

Results: 291 patients were hypotensive; 75 had mixed etiologies for their hypotension and the primary etiology could not be determined. The etiologies in the remaining 216 patients were categorized as follows (2 patients had cardiogenic shock):

	Hemorrhagic	Brain Injury	Neurogenic
n	122 (56%)	71 (33%)	21 (10%)
Age	44.6±1.9	43.7±2.6	48.8±6.2
ISS	28.0±1.8	29.1±2.7	34.2±6.4
ED SBP	72.2±5.3	50.7±7.3	68.0±17.5
Mortality	44.6%	64%*	66.7%

Conclusion: In one-third of patients presenting to the ED with hypotension, brain injury was the only identifiable cause. Patients with hypotension due to brain injury have a higher mortality rate when compared to patients whose hypotension is of hemorrhagic origin. Furthermore, contrary to popular teaching, brain injury is not an infrequent cause of hypotension in trauma patients.

Notes

FATE OF BOWEL ANASTAMOSIS IN TRAUMA PATIENTS REQUIRING VACUUM PACK CLOSURE OF THE ABDOMEN

M Chavarria-Aguilar, MD, RA Maxwell, MD,
WT Cockerham, MD, DL Ciraulo, DO, CM Richart, MD,
DE Barker, MD
University of Tennessee College of Medicine-Chattanooga Unit
M Chavarria-Aguilar, MD
RA Maxwell, MD

Chattanooga, TN 37403

Introduction: Damage control laparotomy (DCL) has revolutionized the management of trauma patients sustaining life-threatening injuries to the abdominal viscera. While general acceptance of this technique has demonstrated improved survival, little attention has been directed to the specific management of bowel injury when resection is necessary. We therefore sought to review our institutional experience for patients sustaining bowel resection and DCL using the vacuum pack (vac) closure technique.

Methods: The trauma registry at a level I trauma center was used to identify patients sustaining bowel injury for an eleven year period beginning in May of 1990. A retrospective chart review was then performed for patient demographics, mechanism, ISS, bowel injury score (BIS), need for resection, primary repair (PR) vs. stoma formation, leak and fistula (Fist) rate, abdominal abscess (AA) formation, length of stay (LOS) and mortality (Mort). Deaths within 72 hrs from admission were excluded. Statistical analysis was performed using ANOVA and Chi-square.

Results: 478 patients were identified with bowel injury. Of these, 101 patients required bowel resection and constitute the study population. Patients were then divided into four subgroups: those receiving vac and stoma formation (vacoma), vac and primary anastamosis (vacnas), primary fascial closure and stoma (novacoma) and primary fascial closure and anastamosis (novacnas). The average age was 38±16 years with 74 (73.3%) males with no difference between groups. There were 64 (63%) penetrating injuries, which was not different between groups. Outcomes are represented in the following table.

Group	#	ISS	BIS	Leak(%)	Fist(%)	AA	LOS	Mort(%)
vacoma	9	24.4±7.7	3.9±1.8	0	1(11.1)	2*(22)	41.2±31.1	1(11.1)
vacnas	17	22.3±9.9	3.5±0.9	1(5.8)	0	4*(23.5)	27.5±18.0	2(5.8)
novacoma	12	22.6±18.0	3.8±1.1	0	0	1(8.3)	13.3±7.6	1(8.3)
novacnas	63	17.9±11.1	3.5±0.9	1(1.6)	1(1.6)	5(7.9)	12.7±10.6	0

*p< 0.05

Conclusion: Resection and PR of bowel injury with primary fascial closure remains the most common method for managing destructive bowel wounds. However leak rate, fistula formation and mortality are comparable when either primary anastamosis or stoma formation is performed in conjunction with vac closure. Therefore bowel resection with PR appears to be a safe alternative following destructive bowel injury and should result in the lowest long-term morbidity following this life saving technique. AA rates occur significantly more frequently when vac closure is performed relative to primary fascial closure.

Notes

BLUNT VASCULAR INJURIES IN THE EXTREMITIES: DIAGNOSIS, MANAGEMENT AND OUTCOME

G.S. Rozycki, MD, L.N. Tremblay, MD, DV Feliciano, MD, WB McClelland, BA
Emory University School of Medicine/Grady Memorial Hospital
G.S. Rozycki, MD
Atlanta, Georgia

Introduction: While much has been written about the management of penetrating vascular injuries in the extremities, patients with blunt trauma account for 60-95% of current admissions to major trauma centers. This is a review of the diagnosis, management and outcome of patients with blunt vascular injuries in the extremities at a Level I Trauma Center.

Methods: Retrospective review of data from the Trauma Registry and the Department of Surgery records of patients admitted with the diagnosis of blunt vascular injury in an extremity and who did not undergo an amputation within 24 hours of admission. Demographic data, associated injuries, preoperative tests, location if injury, vessel injured, treatment, complications and outcome were recorded.

Results: From 1995-2002, 60 patients (78% male; $age_{(mean)} = 32.6 \pm 15.4$ years; Injury $Severity\ Score_{(mean)} = 14.4 \pm 10.9$) sustained 96 blunt vascular injuries in 63 extremities (19 upper; 44 lower). The most common associated injury was a fracture or dislocation of a joint in the involved extremity (58/63 = 92%). Arterial and/or venous injuries occurred in the upper (most common = brachial artery in 7 patients) and lower (most common = anterior tibial artery in 15 patients) extremities. No delay in treatment occurred in 52 patients, a delay in diagnosis and treatment occurred in 6 patients, and in 2 other patients, multiple severe injuries precluded appropriate treatment. The reasons for delay in diagnosis and treatment in the 6 patients mentioned, 4 of whom had diminished or absent pulses, were failure to perform an admission arteriogram (#4), need for operative control of hemorrhage elsewhere (#1), and missed diagnosis of a knee dislocation (#1). Temporary intraluminal vascular shunts (8 artery; 3 artery/vein) were used in 11 patients. All shunts were subsequently removed, the vessels repaired with interposition grafts and 9 functional limbs/2 amputations resulted. Arterial injuries (#86) were treated by resection/graft interposition (#44), ligation (#26, 25 of which were in the forearm or shank), primary repair (#9), or other (#7). Venous injuries (#10) were treated with ligation (#7) or resection/graft interposition (#3). Compartmental syndromes in association with the vascular injury occurred in 37 extremities in 35 patients, including 6 extremities in which fasciotomies were performed at a later operation. Overall, amputation after operative management was necessary in 9 extremities (9/63 = 14%) in 8 patients, while 4 patients died (7%). No deaths were related to the blunt vascular injury in the extremity.

Conclusions: 1) Blunt vascular injuries in the lower extremities occur most commonly in the anterior tibial artery rather than in the superficial femoral artery as in penetrating trauma. 2) Delays in diagnosis are surprisingly rare, and 4 of 6 patients in this group should have had pre-fixation arteriography. 3) Injured arteries in the arm/elbow and the thigh/knee most commonly require resection with interposition grafting, while those in the forearm or shank are usually ligated. 4) The amputation rate in 63 extremities with blunt vascular injuries was 14%, a figure that is 3 to 7 times greater that that seen with penetrating vascular injuries.

Notes

ESTABLISHING A TEAM COMMITTED TO TRAUMA CARE IMPROVES PATIENT OUTCOMES

M.E. Cinat MD, F. Nastanski MD, S. Lush MSN, C. Atkins MH

University of California, Irvine Medical Center

Marianne Cinat, M.D.

James A. Murray, M.D.

Los Angeles, CA

Introduction: Due to changes in trauma division staffing at a Level 1 Trauma Center, th impact on patient outcome of a dedicated trauma and critical care faculty could be evaluated.

Methods: Data was retrieved from the Trauma One database (Lancet Technology, Inc., Cambridge, MA), which is prospectively collected and recorded. From 1995 – 2001, the da from 10,780 patients admitted to the trauma service was analyzed. Patient outcomes were assessed using the Z-Score which compares actual patient survival to predicted survival usi TRISS norms

Results: In 1995-1996, trauma call was staffed by 12 general surgeons (avg. 17 yrs post-residency surgical experience). In 1997–1998, a core of three committed, critical care fellowship-trained trauma surgeons was formed, which was supplemented with three genera surgeons (avg. 5.9 yrs experience). From 1999 to present, a group comprised entirely of fellowship-trained trauma/critical care surgeons (avg 5.4 yrs experience) assumed the care all trauma admissions and managed their care in the ICU. The impact on patient outcome shown in Figure 1 (ANOVA, $p<0.001$). Improved survival was significant in patients with ISS > 15 (mortality 35% vs. 30% $p=0.008$) and with an ISS > 25 (mortality 55% vs. 50% $p=0.05$). Non-operative management for traumatic injuries resulted in a trend toward a decreasing total number of operations performed by trauma surgeons (11% of admissions v 9% of admissions).

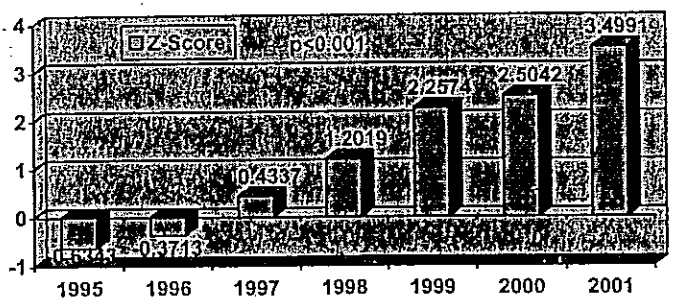

Figure 1: Trauma Patient Z-Scores from 1995 – 2001. (Values > 1.96 are statistically significant – more patients survived tha predicted using TRISS norms).

Conclusion: These results demonstrate that a team comprised of physicians dedicated trauma care improves patient outcomes. Commitment to trauma care results in the development of systems that improve the delivery of trauma care and improve patient survival. This trend becomes most evident at high levels of injury severity (ISS > 15).

Notes

EXPANDING DEATH ON SCENE CRITERIA RESULTING IN SIGNIFICANT COST REDUCTIONS

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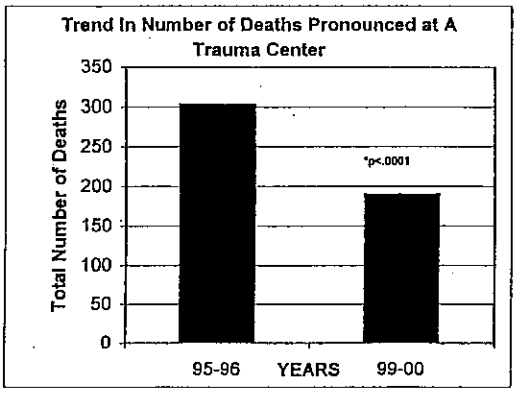
Introduction: Many victims have already died on the scene and will not be salvaged by prehospital or trauma center resuscitation. It was previously shown at our institution and others that all blunt trauma patients who were without signs of life in the field were unsalvageable. In order to minimize the number of futile resuscitations, a policy was implemented over 1997 and 1998 expanding our death on scene criteria. Revised criteria included blunt trauma and isolated gunshot wounds to the head with no signs of life upon EMS arrival; these patients could be pronounced dead at the scene. We hypothesized that appropriate implementation of this policy would lead to fewer unsalvageable patients activating the trauma system and this would reflect a cost saving to the hospital system.

Methods: We reviewed all the deaths in our county from trauma related causes for the 2 years before and after changing the death on scene criteria. The records for this population-based survey of mortality were obtained from the Medical Examiners Office responsible for all deaths in this jurisdiction. We extracted time and location (scene, local hospital, level 1 trauma center) of death. Using Stata 6.0 statistical software, R x C contingency tables were constructed and proportions were compared utilizing chi-squared statistics for analysis of linear trend in proportions. Trauma Center costs for room activation were estimated at $1,212 by our business office (physician fees excluded).

Results: The total number of deaths occurring from homicides, suicides, traffic or other accidents remained consistent over the study time period with 2701 occurring before the rule change and 2504 occurring after. Deaths pronounced at the scene were 1209 [45%] in 1995-1996 and rose to 1397 [56%] in 1999-2000, while deaths pronounced at our level 1 trauma center decreased from 303 [11.2%] in 1995-1996 to 190 [7.6%] in 1999-2000 (X^2 for trend = 37.845, p<0.0001). This absolute reduction of 113 in hospital deaths, which reflects the reduction of trauma system activation requiring assessment and initial treatment in the trauma resuscitation bay resulted in $136,956 cost saving to the trauma center with an annual savings of $68,478.



Conclusions: Our data confirmed the successful implementation of a simple change in EMS policy, which was introduced as a result of previous research findings. This resulted in significant cost savings to the Trauma Center.

Notes

CAN CERVICAL SPINE FRACTURE PATTERNS PREDICT RISK FOR BLUNT VERTEBRAL ARTERY INJURY?

CC Cothren, MD; EE Moore, MD; JL Johnson, MD; WL Biffl, MD; RJ Franciose, MD; JM Burch, MD

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Background: Aggressive screening for blunt cerebrovascular injury (BCVI) has uncovered an astonishing incidence of vertebral artery injuries and associated stroke rate. Stroke incidence is reduced with early recognition and prompt anticoagulation. We hypothesized that cervical fracture patterns are predictive of vertebral artery injuries and, thus, may guide screening protocols.

Methods: Four-vessel cerebrovascular angiography remains our standard screening test for patients at risk for BCVI. Patients undergoing angiographic screening for blunt cerebrovascular injuries have been prospectively followed at our regional trauma center since 1/90, but in 1/96 we began aggressive screening based on injury patterns.

Results: 92 patients with vertebral artery injuries were identified during the study period from 1/96 to 6/02. 71 patients (77%) had associated cervical spine fractures. Of these, 19 patients had a single affected cervical level (27%) and 73% of patients sustained multiple levels of injury. The majority of fracture patterns were subluxation (38 pts - 49%) or involved extension of the fracture through the foramen transversarium (18 pts - 25%). The majority of remaining injuries were located in the upper cervical spine - isolated C1 arch (8 pts) or C2/3 body (5 pts) fractures. Two of the patients with vertebral injuries had minor cervical fractures, a C6 body fracture and a C7 spinous process/laminar fracture: both underwent diagnostic angiography for injury mechanism. Of the 21 patients without spine fracture, angiographic screening for BCVI was performed for neurologic symptoms/DAI (11), occipital/basilar skull fracture (6), or mechanism associated with either mandibular or LeFort facial fractures (4).

Conclusions: Blunt vertebral artery injury is associated with complex cervical spine fractures involving subluxation, extension into the foramen transversarium, or upper C1-3 fractures. Routine screening should incorporate these findings to maximize yield while limiting the use of invasive procedures.

24% VA inj's Stroke

Notes

39% of corneal apex inj's had VA inj's

THE COMBINATION OF PLATELET ENRICHED AUTOLOGOUS PLASMA WITH BOVINE COLLAGEN AND THROMBIN DECREASES THE NEED FOR MULTIPLE BLOOD TRANSFUSIONS IN TRAUMA PATIENTS.

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Objectives: Bleeding from blunt and penetrating retroperitoneal injuries during operative exploration are often difficult to control surgically and can be associated with significant blood loss. Our goals were to evaluate and compare the efficacy of a topical autologous platelet enriched plasma combined with bovine collagen and thrombin (PCT) to gelfoam/thrombin (G/T) in relation to hemostatic control/blood transfusion requirements (BTx) and subsequent outcome.

Methods: Prospective data was collected on all patients who underwent operative exploration for retroperitoneal injuries in which either PCT was applied or G/T with or without packing over a 2.5 year period. Patients were stratified by age, gender, mechanism of injury, pre-operative INR, pH and hematocrit, and intra-operative blood loss and BTx requirements. Subsequent BTx were calculated within 48 hours of the surgical procedure. Outcome was measured by intensive care unit and hospital length of stay and mortality.

Results: A total of 78 patients met study criteria. 70% of the injuries were penetrating and 30% blunt. The mean age was 42 ± 13 years with no significant difference in age or mechanism of injury or incidence of packing between the 2 groups.

	PCT ± packing	G/T ± packing	p-values
N	38	40	NS
ISS	26 ± 8	28 ± 11	NS
Intra-operative blood loss	1275 ± 310 cc	1373 ± 403 cc	NS
Intra-operative BTx	4.2 ± 2.8 U	4.7 ± 3.1 U	NS
Post-operative BTx (48 hrs)	1.1 ± 0.6 U*	3.1 ± 1.2 U	$p < 0.001$
ICU length of Stay	12.5 ± 7 days*	17.2 ± 8 days	$p = 0.007$
Hospital length of Stay	19.1 ± 7 days*	26.8 ± 9 days	$p < 0.001$
Damage Control (n)	12	16	NS
INR (pre-operative)	1.5 ± 0.6	1.6 ± 0.7	NS
pH (pre-operative)	7.24 ± .23	7.22 ± .26	NS
Hematocrit (pre-operative)	24.6 ± 7.1	23.7 ± 8.2	NS
Mortality	17%	19%	NS

Data are presented as mean ± standard deviation

Conclusion: PCT is a rapidly available topical hemostat, which is associated with a significant decrease in the need for post-operative blood transfusions and ICU and hospital length of stay. A randomized prospective trial to confirm these results is warranted.

Notes

"Cohesive"

COSTASIS

Vacuum Assisted Wound Closure (VAWC) Allows for Early Abdominal Fascial Closure in Severely Injured Trauma Patients Requiring Aggressive Resuscitation

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INTRODUCTION: Damage control laparotomy and decompressive laparotomy for abdominal compartment syndrome with initial "Bogotá Bag" closure salvages severely injured patients who would have previously died. Unfortunately, this has created an epidemic of open abdomens for which VAWC has become our standard of care. The purpose of this study was to determine the utility of VAWC in a severely injured cohort who met specific criteria for shock resuscitation.

METHODS: Over 26 months ending May 2002, 106 major torso trauma patients were resuscitated by our standardized shock resuscitation protocol. Of these, 35 (33%) had open abdomens managed using the VAWC. Our standard care is to remove the "Bogotá Bag" 2 days after the laparotomy at which it was placed. If fascial closure is not feasible, VAWC is implemented. A non-adherent perforated dressing is placed over the bowel, followed by a polyurethane sponge and an overlying occlusive barrier. The airtight dressing is then placed at –175 mmHg using a vacuum system (V.A.C. Therapy, Kinetic Concepts Inc, San Antonio TX). The dressing, sponge, and barrier are changed at 2–3 day intervals. At each dressing change, the fascia is closed inferiorly and superiorly as much as possible using interrupted sutures and the sponge component is downsized to match the defect size of the fascia. The dressing changes are repeated until fascia is completely closed. Demographic, shock related, and outcome data were obtained from the prospective shock resuscitation protocol database and a focused medical record review was done for the data related to the wound closure. Data are expressed as mean ± SEM.

RESULTS: Of the 35 study patients, six died during hospitalization on post injury days 4 thru 7 of early multiple organ failure and were too unstable for fascia closure to be completed. This left 29 (83%) patients who were ultimately discharged, of which 67% were male, age was 38±3 yrs, 73% had a blunt mechanism, and mean ISS was 26±2. In the first 24 hours, these patients received 12±2 units of blood and 16±2 liters of crystalloid. Complete fascia closure was achieved in 25 (86%) discharged patients at 7±1 days (range 3-18 days). There were no infections or eviscerations. Of the four discharged patients who failed VAWC, two subsequently developed GI fistulas.

CONCLUSION: VAWC was utilized in one third of our shock resuscitation protocol patients of which 83% survived hospitalization. In these survivors definitive fascial closure was achieved with VAWC in 86%, thus avoiding the need for delayed closure of large ventral hernias.

Notes

SPLENIC EMBOLIZATION REVISITED: A MULTICENTER REVIEW

Haan J, MD, Knudson P, MD, Davis K, MD, Scalea TM, MD
And the WTA Multiinstitutional trials committee
J Haan MD
TM Scalea MD

Background: Splenic embolization can be useful for non-operative splenic salvage ,but complications are poorly defined. A retrospective, multicenter review was performed to better delineate the risks and benefits of splenic embolization.
Methods: Retrospective review of all patients undergoing splenic embolization from 1997-2002. We reviewed patient demographics, admission and follow-up abdominal CT scan (ACT) results, angiographic technique and patient outcomes.
Results: A total of 107 patient were reviewed. The majority were young males involved in motor vehicle crashes. These patients had an overall high ACT grade, average 3.4 (Table 1). While salvage rates decreased with increasing injury grade, over 80% of grades 4 and 5 were managed non-operatively. This success rate is significantly higher, especially for higher grade injury, than previous studies which did not use embolization. Significant hemoperitoneum did not effect success rate but arteriovenous fistula(AVF) had a high failure rate even with embolization(Table 2.)

Table 1

Intial ACT Grade	I	II	III	IV	V
# Patients(%)	1(1%)	10(9%)	47(44%)	44(41%)	5(5%)
Salvage Rate	0	100%	91%	82%	80%

Table 2

ACT Finding	Heme	Extrav	PA	AVF
% Patients	65%	41%	31%	5%
Failure Rate	13%	20%	15%	40%

Heme = large hemoperitoneum Extrav=active uncontained leak PA= pseudoaneursym AVF = arteriovenous fistula

Salvage rates were similar between main coil and selective embolization groups (Table 3). The reembolization rate and significant infarct rate (greater than 25% of the gland) were higher with distal embolizatiion. Complications included one splenic abscess requiring splenectomy, and 3 coil migrations, (2 retrieved, 1 left in a polar artery after planned main coil embolization.) There were no episodes of vascular injury, contrast reaction, or renal failure.

Table 3

Embolization	ACT Grade	Failure	Reembolization	Infarct
Main Coil	3.5	11%	4.5%	20%
Distal	3.2	13%	11%	30%
Both	3.7	20%	0	67%

Conclusion: Splenic embolization remains a valuable adjunct in splenic salvage, especially in higher-grade injuries. Main coil embolization appears to have a better salvage rate and lower infarct rate in this retrospective review while AV fistula seemed to fail more often than other vascular injuries.

Notes

AT presentation

SMALL VOLUME ALBUMIN ADMINSTRATION PROTECTS AGAINST HEMORRAHGIC SHOCK INDUCED BONE MARROW DYSFUNCTION

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Objective: While the controversy between colloid and crystalloid as the optimal resuscitative fluid continues, unexpected immunomodulatory effects of each solution have begun to be described. Small doses of albumin have been shown to have a beneficial effect in a model of pancreatitis. This study investigated both the *in vitro* and *in vivo* the effects of albumin on bone marrow (BM) suppression following hemorrhagic shock (HS).

Methods: *In vitro*: Normal donor rat BM (n=4-5/group) was plated for granulocyte-macrophage and erythrocyte colony forming units (CFU-GM and BFU-E) with 2% v/v plasma from sham or HS (MAP 30 for 90 minutes) rats. Increasing doses of albumin (2, 4 and 8 mg/ml) were added to the plates. *In vivo*: Male rats (n=4/group) were subjected to sham or HS (MAP 30 for 90 minutes). HS rats were resuscitated with blood alone or blood and albumin (50mg/ml) at 1, 2, or 3 ml. Bone marrow was harvested 6 hours post-resuscitation and plated for CFU-GM and BFU-E.

Results: HS decreased BM CFU-GM and BFU-E growth. (Tables below) In addition, HS plasma suppressed normal BM red and white cell progenitor growth *in vitro*. Small doses of albumin given both *in vitro* and *in vivo* prevented HS induced BM suppression.

IN VITRO	Sham	HS	HS + 2mg	HS + 4mg	HS + 8mg
CFU-GM	96±27	37±10*	61±6	84±25	89±33
BFU-E	96±26	37±6*	59±2	85±30	89±39

IN VIVO	Sham	HS	HS + 1ml	HS + 2ml	HS + 3ml
CFU-GM	84±6	28±12*	81±12	121±14	129±18
BFU-E	73±4	27±7*	95±17	117±23	126±14

Data expressed as mean±SD colonies/femur. *$p<0.05$ vs. all others (Tukey)

Conclusions: Small, "non-resuscitative" doses of albumin appear to have an immunomodulatory effect on BM suppression after HS. As little as 1ml (50mg) restored CFU-GM and BFU-E to sham values. While the mechanisms of action remain to be elucidated, we postulate that the adsorption of circulating toxic factors may play a role.

Notes

TIMING OF VASCULAR AND ORTHOPAEDIC REPAIR IN MANGLED EXTREMITIES. DOES IT REALLY MATTER?

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Introduction: The timing of orthopaedic and vascular repair of lower extremities with open fractures and arterial injuries is controversial. The purpose of this study was to determine if the order of vascular and orthopaedic repair affected limb salvage.

Materials and Methods: A review of all patients presenting at a single institution with Gustilo IIIC fractures of the lower extremity between 1994 and 2002 was performed. Timing of revascularization and orthopaedic fixation was evaluated, and the hospital course was reviewed for complications and ultimate limb salvage.

Results: Nineteen patients were identified who met inclusion criteria. Thirteen patients underwent vascular repair first (VF), and five underwent orthopedic stabilization first (OF). One patient underwent temporary vascular shunting followed by orthopaedic stabilization, and subsequent definitive vascular repair. Mean mangled extremity severity scores (MESS) were 7.6 overall (range 2-11), 7.5 in limb salvage patients (range 2-11), and 10 in amputated patients (range 9-11). The time interval from presentation to the operating room to the completion of revascularization averaged 137 minutes in the VF patients, and 273 minutes in the OF patients. Average time from injury to revascularization was 370 minutes in the successful limb salvage patients, and 474 minutes in the patients ultimately requiring amputation. In the VF group, two patients (15%) required subsequent amputation of the limb, and one patient died (8%), although his limb was viable at the time of death. In the OF group, two patients (40%) required amputation, as did the single patient who was shunted prior to definitive vascular repair. Orthopaedic procedures following vascular repair did not result in graft injury or vascular compromise in any patients. While limb salvage could not be predicted by MESS alone, all patients requiring amputation had a MESS ≥ 9.

Conclusion: This study is one of the largest single institution reviews of Gustilo IIIC fractures, and represents the only study specifically evaluating limb salvage based on timing of orthopaedic and vascular intervention. The data presented support the performance of definitive vascular repair prior to orthopaedic stabilization in limb salvage attempts of Gustilo IIIC fractures. Operative time before revascularization was nearly twice as long in patients who underwent orthopaedic stabilization first. Average ischemia time was longer for patients requiring amputation than for those who underwent successful limb salvage. Ultimately, limb salvage depends upon many factors, including severity of injury; however, minimizing ischemia time by prioritizing vascular repair may improve outcomes.

Notes

THE IMPACT OF INTRAABDOMINAL HYPERTENSION ON GENE EXPRESSION IN THE KIDNEY

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Introduction: Intraabdominal Hypertension (IAH) has been recognized as a source of morbidity and mortality in the injured patient. Research concerning this entity has predominantly focused on the pathophysiology. We developed a model of IAH to determine whether gene expression is altered in the presence of this condition.

Methods: Adult Sprague Dawley rats (n=8) were anesthetized, intubated, instrumented with a carotid and jugular catheter. Two pairs of rats (2-control; 2-IAH 25mmHg; n=4) were used at each time interval. Continuous measurements of HR, BP, CO and Temp were recorded. ABGs were measured every thirty minutes. A catheter was placed in the peritoneum and warm saline was infused up to a pressure of 25 mm hg. IAH was measured through the catheter continuously and saline was added as needed to maintain IAH. At 30 and 60 minutes the kidneys were harvested, combined according to time interval, and standard protocols were used for extraction of RNA to be screened for the expression changes of every gene with known function (4000) using high throughput methodology (Clontech).

Results:

IAH 25 mm Hg	Genes Up5x	Genes Up 10x	Genes Down 2x
30 min	452	330	107
60 min	315	167	129
Genes in Common	38	12	5

Hemodynamic changes occurred which were consistent with IAH, including depression of cardiac output and acidosis. While widespread changes in gene expression were identified, only genes that were up regulated by a ratio of ten-fold and a difference in magnitude of 150 molecular dynamic counts were considered significant. When comparing IAH of 25-mm hg at 30 min and 60 min there is a surprising decrease in up regulated genes from 330 to 167 genes. There are 12 genes in common at the two time points, which include genes from transcription, cell growth, immune response and cell communication. Of note are the genes from the neuroendocrine response: dopamine receptor 3, thyroid hormone responsive protein, cytochrome p450, Vasopressin receptor V1a, and calcitonin receptor which are found only at the 60 min point.

Conclusion: This is the first report demonstrating that IAH causes substantial gene up-regulation in the kidney. The number and types of genes up regulated change over time with only 12 remaining constant. Further investigation into gene expression may allow for clinical application and gene modulation in this condition.

Notes

CEREBRAL PERFUSION PRESSURE ELEVATION W OXYGEN CARRYING PRESSOR AFTER TRAUMATIC BR INJURY AND HYPOTENSION IN SWINE

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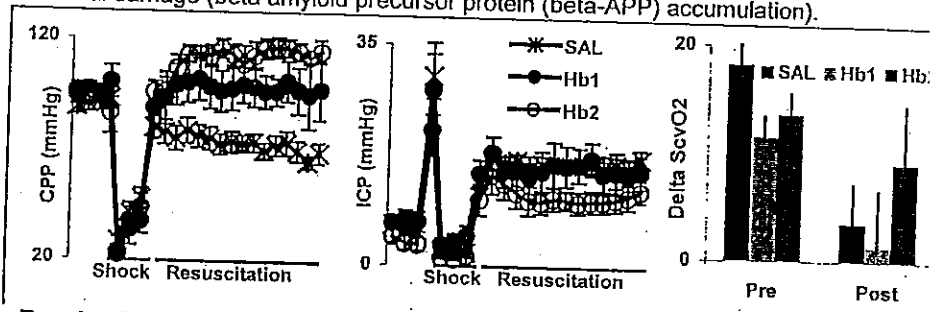
Background: Previously we had shown that elevation of cerebral perfusion pressure (CPP) using pressors improved short-term outcomes following traumatic brain injury (TI and hypotension in swine (EAST 2002). The current study evaluates outcomes following resuscitation with Diaspirin Cross-linked Hemoglobin (DCLHb) – a hemoglobin based oxygen carrier with pressor activity – in the same swine model of TBI and hypotension.

Methods: Anesthetized and ventilated swine received TBI via cortical fluid percussion (6-8 ATM) and 45% blood volume hemorrhage. 1 hour later animals were resuscitated with saline – 3Xshed blood (n=20: SAL) – control group, or DCLHb – 250ml (n=5: Hb1), or 500ml (n=8: Hb2) – experimental groups, and observed for 210minutes. Outcomes: 1. cerebro-venous oxygen saturation ($S_{cv}O_2$); 2. cerebro-vascular CO_2 reactivity; and 3. structural damage (beta amyloid precursor protein (beta-APP) accumulation).



Results: Post resuscitation, CPP was higher in DCLHb groups ($p<0.05$ Hb1 & Hb2 vs SAL), and intra-cranial pressure (ICP) was lower in Hb2 ($p<0.05$ vs SAL) (Fig.). $S_{cv}O_2$ was similar in all groups ($p>0.05$). At baseline, 5% CO_2 evoked 16±1% increase in $S_{cv}O_2$, indicating vasodilatation. At 210minutes this was nearly absent in SAL (4±4%) and Hb1 (1±5%), but partially preserved in Hb2 (9±5%) (Fig.). There was no inter-group difference in beta-APP accumulation. 5/20 SAL and 0/13 DCLHb animals developed brain death (flat EEG). Post resuscitation, DCLHb animals maintained higher mean pulmonary arterial pressure – 28±1 (SAL); 42±1 (Hb1); 45±1 (Hb2) mmHg – ($p<0.05$ Hb1 & Hb2 vs SAL) and, lower cardiac output – 3.9±1.6 (SAL); 2.6±0.1 (Hb1); 2.7±0.1 (Hb2) L/min. – ($p<0.05$ Hb1 & Hb2 vs SAL). 3 Hb2 animals died from cardiac failure and, 1 SAL animal died from irreversible shock.

Conclusions: In this large animal swine model of TBI and hypotension, resuscitation with DCLHb maintained a higher CPP. Low dose DCLHb (minimal increase in oxygen carriage) failed to significantly improve short-term outcome. With high dose DCLHb (significant improvement in oxygen carriage), ICP was lower and cerebro-vascular CO_2 reactivity was partially preserved, however this was at the cost of poorer cardiac performance secondary to high afterload.

(Supported by ONR)

Notes

PELVIC FRACTURE PATTERN DOES NOT PREDICT NEED FOR URGENT EMBOLIZATION

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:kground: The intimate relationship between the pelvis and related vasculature can lead ife-threatening arterial hemorrhage following blunt trauma. Previous clinical reviews e associated fracture geometry with arterial hemorrhage, implicating those injuries with lence of major ligamentous disruption (MLD). The specific fracture types are combined :hanism (CM), lateral compression type III (LC-III), anterior-posterior compression type II (APII-III), and vertical shear (VS) injuries. We analyzed pelvic fractures at our itution for evidence of a relationship between MLD and need for angiographic bolization.

thods: Our trauma registry was reviewed from 1995-2002 to identify pelvic fractures in ients hospitalized for blunt trauma. Of the 296 patients with pelvic fractures, 31(10.5%) ients required emergent angiographic embolization for control of arterial hemorrhage. e records of these patients were then reviewed for pelvic fracture classification.

sults: Of the 31 patients, 20 were men. The mean age for the entire group was 45. The vic fracture classification totals within the group were as follows:

	LC-I	LC-II	LC-III	APC-I	APC-II	APC-III	CM	VS	Total
Male	2	3	1	2	2	3	5	2	20
Female	5	2			1		2	1	11
Total	7	5	1	2	3	3	7	3	31

of 31(55%) patients undergoing therapeutic embolization had fractures consistent with LD (72% of all men, 36% of all women). 7 patients (2 male, 5 female) required bolization for hemorrhage related to LC-I fractures, indicating arterial injury in the sence of ligamentous injury.

nclusions: Although a majority of patients (55%) requiring arterial embolization had uries consistent with MLD a significant minority (45%) did not. Furthermore, 22% of the tients embolized had fracture patterns that did not indicate MLD. The greater than 2 to 1 edominance of women in this category is an interesting relationship that warrants further vestigation. Ultimately, fracture pattern alone should not be used to predict a patient's ed for angiographic embolization.

Notes

TITLE:

AUTHOR(S):

INSTITUTION:

PRESENTER:

[illegible]

[illegible]

A PROSPECTIVE ANALYSIS OF CONCORDANCE IN CULTURED PATHOGENS OBTAINED BY BRONCHO-ALVEOLAR SAMPLING USING FOUR STANDARD TECHNIQUES FOR DIAGNOSIS OF VENTILATOR ASSOCIATED PNEUMONIA

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ABSTRACT COPY MUST STAY WITHIN THE BLUE MARGINS BELOW

OBJECTIVE: The purpose of this study is to compare techniques for the diagnosis of suspected ventilator associated pneumonia in the trauma patient. Per the literature, bronchoscope protected brushings were set as the standard for comparison due to its high specificity and sensitivity. We hypothesized that blind protected brushings were equivalent to bronchoscope directed protected brushings and broncho-alveolar lavage.

METHODS: With informed consent, 90 trauma patients with two or more of the following were accepted into the study: $\geq$ 48 hrs on the ventilator, infiltrate on chest radiograph, excess or purulent secretions, suspected aspiration, temperature $\geq$ 38.5°C, WBC $\geq$ 12,000 th/mm^3, respiratory distress. Four samplings were performed on each patient using bronchoscopic assisted and nonbronchoscopic techniques. Each patient had cultures obtained by, and significances quantified, as follows: endotracheal aspirate (ETA, 10^5 CFU/ml or moderate/many/abundant classification in non-speciated), bronchoscope directed protected brushings (BDPB, 10^3 CFU/ml), blind protected brushing via endotracheal tube (BPB, 10^3 CFU/ml), bronchoscopic broncho-alveolar lavage (BBAL, 10^4 CFU/ml). Quantitative cultures were obtained and compared for the following pathogens: gram + cocci (gpc), gram + rods (gpr), gram - cocci (gnc), gram - rods (gnr), anaerobic bacteria (ana), yeast. An assessment of agreement for cultured pathogens between the sampling modalities was completed using kappa analysis (κ), significance set at $p \leq 0.05$.

RESULTS:

	BDPB vs ETA						BDPB vs BPB					
culture	gpc	gnc	gpr	gnr	ana	yeast	gpc	gnc	gpr	gnr	ana	yeast
κ value	.309	.465	X	.372	X	X	.366	.632	X	.209	.662	X
p value	.002	.000	X	.000	X	X	.000	.000	X	.048	.000	X

	BDPB vs BBAL					
culture	gpc	gnc	gpr	gnr	ana	yeast
κ value	.257	.591	X	.323	X	X
p value	.003	.000	X	.001	X	X

X: not capable of analysis due to zero cases in one comparator

CONCLUSION: A quantitative analysis of bacteriologic cultures of broncho-alveolar specimens obtained by four standard sampling techniques has demonstrated with statistical significance that no difference exists between modality of sampling in reliability in obtaining and culturing clinically significant pathogens. In reviewing the literature, this study is the first assessment of agreement for cultured pathogens between the four different sampling modalities and the largest to assess the efficacy of the blind protected brush technique.

Notes

SERUM ALBUMIN LEVEL FAILS TO ACCURATELY REFLECT COLLOID ONCOTIC PRESSURE (COP) IN CRITICALLY ILL PATIENTS

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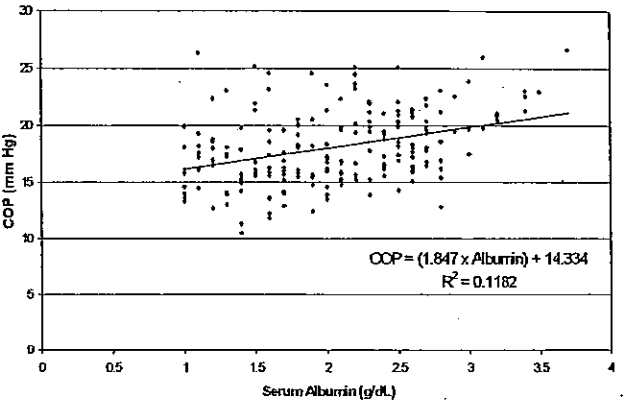
Background: Patients often receive albumin infusions for a variety of reasons. A common clinical trigger for the administration of albumin is the finding of a low serum albumin concentration that could represent an inadequate colloid oncotic pressure. We hypothesized that serum albumin may not correlate with measured colloid oncotic pressure in critically ill patients.

Methods: Patient data captured in an electronic flowsheet charting application (CareVue, Hewlett-Packard, Andover, MA) used in a surgical intensive care unit was extracted over a fifteen-month period. Patient-specific values charted for colloid oncotic pressure (COP), serum albumin, and total protein were linked for time concurrency. COP measured directly using a Weil oncometer was compared to the Landis-Pappenheimer estimate of COP using least-squares regression techniques.

Results: There were a total of 1,502 COP, 1,041 albumin, and 114 total protein determinations available in the database. Correlation between COP and albumin values obtained within 6 hours of each other on the same patient was weak ($R^2 = 0.114$) although there was a statistically significant relationship ($p < 0.001$). Fifty patients exhibited albumin values < 2.0 gm/dL, yet 12 (24%) of them manifested COP values in the normal range (≥ 20 mm Hg). Landis-Pappenheimer equation estimation of COP was poor ($R^2 = 0.304$) for this group of critically ill patients.



Conclusion: In critically ill patients, estimation of COP using albumin or total protein determinations is often misleading. Direct measurement of COP should be determined prior to administration of expensive colloid agents in patients with low serum albumin concentrations.

Notes

NATIONAL SURVEY OF TRAUMA SURGEONS' USE OF ALCOHOL SCREENING AND BRIEF INTERVENTION

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Background: A variety of policy groups have recommended that screening and brief interventions (BI) for alcohol disorders be widely implemented in healthcare settings. This study was conducted to determine the current status of screening and intervention programs in trauma centers and to evaluate specific barriers to implementation of screening and BI. The hypotheses tested were that surgeons who support screening and brief interventions would be less likely to endorse the purported barriers to screening and intervention and would have a better understanding of the concept of brief interventions.

Methods: A postal survey of 711 members of the AAST and Western Trauma Associations was performed to assess current screening and treatment practices, along with barriers to screening and intervention. Two logistic regression models were constructed to determine which factors result in support for screening and which factors predict support of BI to help determine potentially modifiable issues to facilitate implementation.

Results: 304 (51%) evaluable surveys were returned. The majority of surgeons (253, 84%) agreed that a trauma center is an appropriate setting to address harmful alcohol consumption. Over two-thirds frequently check a blood alcohol concentration, with one-third of the group reporting they always do. The use of formal screening questionnaires was much less frequent (25%). Nearly one-half (49%) understood the concept of BI. However, the majority report that less than one-half of patients with a suspected alcohol problem at their center have their alcohol problem addressed while they are hospitalized. Several barriers to screening and BI were identified. While only 2% thought screening and counseling would significantly increase healthcare costs; 7% thought screening was too time consuming and 13.6% thought it would compromise patient confidentiality. Screening was perceived to threaten reimbursement by 27%. Over half (55%) stated their facility is currently performing screening. One-third (36%) stated their facility is currently performing BI. Logistic regression revealed that surgeons who did not support screening were those that thought patients should be referred for professional alcohol treatment (OR 14.4, CI 4.9,89.9), a trauma center was an inappropriate setting to address alcohol disorders (OR 6.1, CI 3.5,14.0) , and that the time constraints of screening were too great (OR 1.8, CI 1.4,2.5). In the stepwise model of support for BI, the surgeon's confidence in negotiating behavior change (OR = 8.48, CI 4.2, 24.3), understanding the concept of BI (OR = 7.6, CI 4.4,15.8) and the belief that screening would not increase cost (OR 1.6, CI 1.4,2.1) were the most potent predictors of support for BI.

Conclusion: Trauma surgeons are screening for alcohol disorders more frequently than five years ago. Reported barriers to screening are not as prevalent as previously reported. Support for implementing screening and intervention programs depends on whether surgeons believe trauma centers are appropriate sites for addressing alcohol disorders, or whether patients with alcohol problems should be referred for professional treatment and whether surgeons are confident in negotiating behavior change. Widespread education in the effectiveness and methods of BI would facilitate implementation of alcohol screening and intervention programs to help reduce recurrent alcohol related injury.

Notes

ENDOVASCULAR STENT GRAFTS AND AORTIC RUPTURE:CORRELATING ANATOMY AND OUTCOME

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ıtroduction: Endovascular stent grafts (EVSG) offer an alternative in the ıanagement of traumatic rupture of the aorta(TRA) particularly in patients who are at rohibitive operative risk.

lethods: A retrospective review of 10 cases managed by EVSG over a 4-year eriod. EVSG were defined as "non-commercial" (graft material hand sewn over ıetallic stents) or "commercial" (grafts marked or designed for infra-renal aortic or ıoracic aneurysms). Data collected included the length of tear, the difference etween EVSG length and tear length (δ) as well as location of the tear relative to the ft subclavian artery (LSCA). Incidence of "telescoping", defined as shortening of ıe EVSG, was determined.

esults: EVSG (3 non-commercial, 7 commercial including AneuRx cuff 5, Talent 1, ncure aortic tube graft 1) were used to treat TRA in 10 patients. 6 were placed ≤8 ours from injury, 1 14 hours and 3 after 5 days. Contraindications to operative epair included severe lung injury (10), cardiogenic shock (3), coagulopathy (3). 6 atients had open abdomens at the time of EVSG placement. Routes of access ıcluded femoral (3), iliac (3) and abdominal aorta (4). Average landing zone iameter was 18.8±3.5 mm, distance from LSCA 2.85±2.1 cm, tear length 1.54±1.0 m. In 4 cases the _ was ≤2 cm. Persistent endoleak in 2/3 "non-commercial" EVSG, ıcluding one recognized at surgery in which 2 further EVSG were placed. One was ssociated with "telescoping" when the _ was ≤2 cm, the other due to telescoping as ıe EVSG had to be placed into the arch for an injury 1 cm from the LSCA. This latter ase was managed by open repair 3 weeks later when the patient had stabilized. lltimately there were 3 deaths, 2 due to severe closed head injury, 1 due to espiratory failure.

:onclusions: EVSG can be placed emergently. "Commercial" grafts result in better esults than "homemade". Available "cuff extenders" are sufficient for the majority of ortic injuries, but often require deployment via the iliac or aorta due to the shorter elivery system. Tears > 1.5 cm resulting in _ ≤ 2 cm or those needing to be placed ıto the curvature of the aorta are associated with increased endo-leak risk. The leal thoracic EVSG would be > 5 cm in length and mounted on a system > 70 cm in engtn.

Notes

MINOR DESIGN CHANGES IN MOTOR VEHICLES MAY GREATLY REDUCE TRAUMATIC BRAIN INJURY

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Background: Traumatic brain injury (TBI) secondary to motor vehicle crashes (MVC) is the leading cause of death for those under 45 years of age in the US. Identifying and modifying vehicle designs associated with TBI will have a significant impact upon the likelihood and severity of TBI in MVC.

Purpose: 1) Identify interior vehicle contact points associated with severe TBI (Head AIS>3) among drivers.

2) Determine the extent to which modifications to these contact points impact the likelihood of TBI.

Methods: We analyzed drivers in MVC from the 1993 to 2001 National Automotive Sampling System (NASS) database. The odds of severe TBI with respect to various vehicle contact points were estimated while adjusting for vehicle, occupant and crash related covariates using multivariate logistic regression.

Using computer simulation software, the magnitude of driver head deceleration was modeled while altering roof side rail padding thickness.

Results: There were 23,279 victims of TBI of which 8536 (36.7%) were restrained and 14,743 (63.3%) were unrestrained. Among restrained drivers, the odds of severe TBI were highest with instrument panel contact (OR=4.6, 95% CI=2.7-7.6). Among unrestrained drivers, the odds of severe TBI were highest with A-pillar (OR=2.2, 95% CI=1.3-3.5), or roof rail (O=1.7, 95% CI=1.1-2.5) contact.

Head deceleration in the computer model was 700 g with a 5.0 mm roof side rail. A 5.0 cm roof side rail reduced this to 218 g. Further increases in roof side rail thickness produced minimal reductions in head deceleration (Figure 1). This reduction corresponds to a decrease in the probability of severe TBI from 7.2% to 1.3% based upon National Highway Traffic Safety Administration studies.

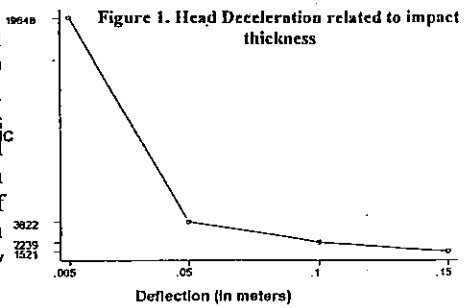

Figure 1. Head Deceleration related to impact thickness

Conclusions: Contact with the instrument panel, A-pillar and roof rail significantly increase the likelihood of TBI in MVC. Minor increases in padding at these points can reduce the magnitude of head deceleration forces which have the potential to decrease the incidence of TBI by more than 500%. It has been estimated that the average hospital charge for care of patients with severe TBI is $2.5 billion/year. Implementation of this minor design change could potentially reduce this burden to $ 500 million annually.

Notes

ARE AUTOMATED BLOOD PRESSURE READINGS ACCURATE IN TRAUMA PATIENTS?

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BACKGROUND: Automated blood pressure determinations by oscillometry are reported to be as accurate as invasive monitoring for systolic pressures as low as 80 torr. Automated blood pressure (A-BP) devices are widely used in hospital operating rooms, emergency departments and by pre-hospital providers, although the accuracy of A-BP has not been demonstrated in trauma patients. We hypothesized that A-BP is less accurate than manual blood pressure (M-BP) in trauma patients.

PURPOSE: To determine the accuracy of A-BP versus M-BP in trauma patients.

METHODS: A retrospective review of patients, who met trauma activation criteria, admitted to a Level I trauma center over 18 months, was conducted. Patients were included if they had both methods of blood pressure determination done within 5 minutes of admission. Automated and manual BP devices were calibrated on a regular basis. Additional data included ISS, base deficit (BD) and ED resuscitation fluid volume. Statistical analysis was done using paired t-test and linear regression analysis. Significance was attributed to a p value < 0.05.

RESULTS: From 01/00 through 06/02, 350 patients met inclusion criteria. Patients were categorized by M-BP readings. Data are expressed as mean $\pm$ 95% confidence interval.

BP Group	N	M-BP	A-BP	BD	ISS	Fluid (mL)
1 ($\leq$ 90 torr)	86	80 ± 2	104 ± 6*	-5 ± 1	30.1 ± 3.7	4810 ± 664
2 (91-110 torr)	110	103 ± 1	119 ± 4*	$-3 \pm 1^{\#}$	$24.7 \pm 3.0^{@}$	$3336 \pm 447^{\#}$
3 (> 110 torr)	154	135 ± 3	138 ± 4	$-1 \pm 1^{\#}$	$17.6 \pm 1.8^{\#}$	$2763 \pm 362^{\#}$

* $p < 0.001$ vs M-BP; $^{\#}$ $p < 0.01$, $^{@}$ $p < 0.03$ vs Group 1 (BP $\leq$ 90)

Of the 86 patients with M-BP $\leq$ 90, 42 (49%) had A-BP $\geq$ 100. Linear regression of M-BP to A-BP showed R^2 values ($p < 0.05$) of 0.102 (Group 1), 0.039 (Group 2) and 0.144 (Group 3).

CONCLUSIONS: M-BP was more reflective of BD, ISS and fluid requirement. A-BP determinations were consistently greater than M-BP, particularly in hypotensive patients. Automated BP devices should NOT be used for field or hospital triage decisions. Manual BP determinations should be utilized until systolic blood pressure is $\geq$ 110 torr.

Notes

Acute Stress Disorder in Adults: the holistic nature of a major complication

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Emanuel Hospital and the Pacific Wellness Foundation
Presenter/Sponsor: Andy Michaels
Portland, Oregon

Objective: Post Traumatic Stress Disorder (PTSD) compromises outcome after injury. Patients with Acute Stress Disorder (ASD) have a seven times increased relative risk of developing PTSD. We evaluate the contributions of social, psychological, injury-related, spiritual, occupational, behavioral, and physical factors on the development of ASD.

Methods: Adults (>18 years) were interviewed in a Level I Trauma Center after injury. The interview protocol included measures of general and mental health and social function (SF36), depression (Beck Depression Inventory), occupational function (Sickness Impact Profile work), alcohol use (AUDIT), peritraumatic dissociation (Michigan Critical Events Perception Scale), social support (Duke Social Support Scale), religiousness (Daily Spiritual Experience Scale), demographics, and ASD (Stanford Acute Stress Reaction Questionnaire). ASD diagnosis was made by DSM-IV criteria. Injury mechanism and severity (ISS) were obtained from the Trauma Registry (Collector®). Chi square, t-test and linear regression assess association with ASD. Significance is noted at the 95% confidence level ($p<.05$).

Results: 200 consecutive eligible adults were consented and interviewed (10/2001 to 6/2002). They were, on average, 40.6 ± 1.2 years old, 60% male, earned $49,200 ± $2,340 / year, and had an ISS of 10.6 ± .65. ASD was identified in 18%. In univariate analysis, patients with ASD had worse pre-injury status (than those without ASD) in numerous areas including: social (education-p=.038, income-p<.001, social support-p=.003, social function-p<.001), psychological (mental health-p<.001, depression-p<.001, dissociation-p<.001, alcohol use-p=.021), and occupational domains (SIPw-p=.002), religiousness (p=.042), physical function (p=.003), and injury character (intentionality-p=.046, subjective threat-p<.001). Linear regression identified mental health, dissociation, assault, and social function as independent factors in the development of ASD.

Conclusions: Recovery after injury is much worse in those with stress disorder. Adults who develop ASD differ from those without in many ways, including measures of mind, body, spirit, social function, and response to injury. Appreciation of the complexity of the response to injury is the key to developing treatment protocols that will attend to the multidisciplinary needs of the trauma patient.

STRESS EVENT?
FOR ALI
early separation from family - event?

Notes

TIME IN THE ER: A HAZZARD TO TRAUMA PATIENTS' HEALTH?

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HF Sherman, MD

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NTRODUCTION: Timely administration of appropriate care, critical to injury management, has n a goal in trauma systems development. Some maintain that ER length of stay (ERLOS) ects time to appropriate care and is thus a marker of trauma program quality.

YPOTHESIS: ERLOS correlates with patient outcome.

ETHODS: Data was culled from the Pennsylvania Trauma Systems Foundation registry for all ents admitted to accredited trauma centers from 1/95 through 10/00. The independent variable l was ERLOS, with ISS, TRISS probability of survival (Ps) and, injury mechanism as ariates. Outcome data used as dependent variables included vital outcome (survival/death), ICU ' (ICU), hospital stay (HLOS), time on mechanical ventilation (Vent), and number of plications (Comps). Data was analyzed using linear, logistic and multiple regression analyses , ANOVA. Significance was taken at $R^2 > 0.20$.

ESULTS: Data was available for 83,739 patients meeting inclusion criteria. Ninety-five percent ived. Overall mean ERLOS was 180 minutes. Linear regression analyses failed to demonstrate significant contribution of ERLOS to vital outcome, ICU, Vent, HLOS or, Comps. Logistic ression to 7 standard deviations failed to demonstrate any correlation between ERLOS and the come variables. ERLOS did not independently predict outcome, for the population as a whole or en stratified by ISS, Ps, and mechanism of injury.

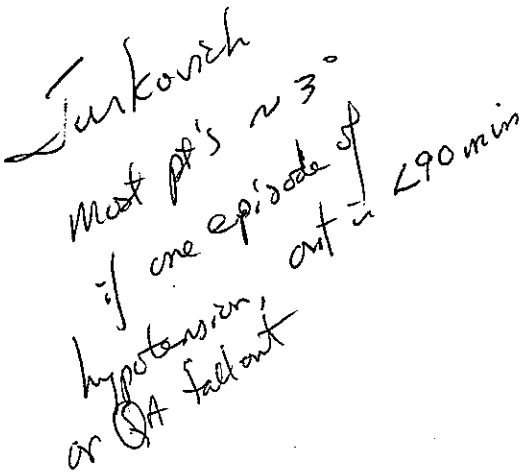
CORRELATION WITH ERLOS (R^2)

	N	Vital Outcome*	ICU*	Vent Days*	HLOS*	Comps*
All	83,739	0.009	0.011	0.006	0.002	0.004
ISS ≥16	21,852	0.016	0.008	0.004	0.002	0.004
ISS < 16	61,887	0.001	0.006	0.002	0.001	0.000
Ps < 0.5	4,249	0.038	0.015	0.013	0.004	0.007
Ps ≥ 0.5	71,045	0.002	0.007	0.003	0.001	0.002
Blunt	72,272	0.029	0.013	0.007	0.001	0.004
Penetrating	8,857	0.033	0.009	0.007	0.001	0.010

* All Statistically Insignificant

ONCLUSION: ERLOS may reflect internal, clinically insignificant, patient flow issues. However, mature trauma system, outcome is not related to ERLOS and should not be considered to ect the timely administration of appropriate care nor be used as a marker for trauma program lity. Outcome based QA filters can be expected to identify significant timeliness of care issues.

Notes


Jerkovich
Most pt's ~ 3°
if one episode of
hypotension,
or QA fallout
out ~ < 90 min

BURN INJURY AND PULMONARY SEPSIS: DEVELOPMENT OF A CLINICALLY RELEVANT MODEL

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KA Davis MD
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Introduction: Despite improvements in the early resuscitation of the critically injured, mortality from multiple organ failure has remained stable, with the lung often the first organ to fail. Early intubation and mechanical ventilation predispose patients to the development of pneumonia and respiratory failure. **Objective:** To establish a two-hit murine model of trauma and pulmonary sepsis with reproducible mortality, and to describe the resultant hematopoetic response.
Methods: Male $B_6D_2F_1$ mice were divided into four groups: burn/infection (B/I), Burn (B), Infection (I), and Sham (S). Burned animals had a full-thickness 15% dorsal scald burn. Infected animals had 5000 CFU of Pseudomonas aeruginosa injected intratracheally. S animals received saline intratracheally. All animals were resuscitated with 2ml of intraperitoneal saline. Mortality was recorded at 24, 48 and 72 hours. Bacterial sepsis was confirmed by tissue gram stain of the lungs and positive organ and blood cultures for Pseudomonas aeruginosa. Femoral bone marrow cells were collected at 72 hours from surviving animals. Clonogenic potential was assessed by response to M-CSF and GM-CSF in a soft agar assay and the data represented as colonies/femur. **Results:** Mortality at 72 hours was 30% in B/I, 10% in I, 0% in B and S groups. Pneumonia was documented in all infected animals at 24 hours by gram stain and positive tissue cultures for Pseudomonas aeruginosa. Systemic sepsis as confirmed by blood and remote organ cultures was seen in BI animals only. Maximal responsiveness to GM-CSF stimulation was noted in the B/I group (11932 ± 982, $p<0.05$) while similar GM responsiveness noted in all other groups (B 7135 ± 548, I 7023 ± 810 and S 6829 ± 1439).
Conclusion: While minimal perturbations were seen after burn or pulmonary infection alone, the combined two-hit insult of burn and pulmonary sepsis resulted in statistically significant hematopoetic changes with increased monocytopoiesis. Only the combined injury resulted in systemic sepsis and increased mortality. We have developed a clinically relevant model of trauma and pulmonary sepsis, which will allow further clarification of the inflammatory response after injury and infection.

Notes

Mobile Surgical Transport Team: on site surgical consultation and resuscitation for desparately ill and injured patients

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Legacy / Emanuel Hospital and the Lifeflight Network
Presenter/Sponsor: Bill Long
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Objective: We report the experience of a mobile surgical transport team (MSTT) providing additional emergency surgical, critical care and trauma resources to regional hospitals (RH) in the Pacific Northwest.

Methods: Data were abstracted from retrospective review of medical records from RH and the receiving Level I Trauma Center (TC) for all cases of MSTT since 1985. Data include patient age and gender, patient physiology, resuscitative requirements, and laboratory values (Hct, INR, base deficit, pH), distance to RH, response time to RH, primary and secondary diagnoses, procedures (both at RH and upon return to TC), complications and outcomes. Patient charges and actual costs were noted.

Results: MSTT responded to 14 RH (range 12 to 190 miles) for 33 patients (age 3 to 68), of whom 14 (42%) had non trauma critical illnesses. Three patients had ARDS (all transported on ECMO – 1 survivor). Five patients had iatrogenic injuries during elective surgery with 3 survivors (60%). Three patients had vascular catastrophes (massive pulmonary embolism, dehisced mitral prosthesis, and superior mesenteric artery embolization - 100% survival). Five patients had extreme hypothermia (core temperature <26 C); 3 salt water drownings - no survivors, and 2 exposure hypothermia - one survivor. Seven trauma patients had MVCs; 4 with inadequate resuscitation (75% survival), 3 with complex injuries requiring technical assistance (hepatic vein – non-survivor, ruptured right ventricle, and a pericardial herniation with instability - both survived). Nine trauma patients were assaulted: 2 stab wounds (heart and ascending Aorta), both survived, and 6 with GSWs: 1 through the trachea, 1 through the right ventricle, 3 through the head of the pancreas, 1 shot gun blast through the apex of the left ventricle and the left lower lobe (all survivors); and one child abuse with a duodenal rupture (survivor). The ISS range was 25 to 75 (mean 27.5). MSTT costs were $3000 to $10,000, and overall survival was 72%, and only 2 did not reach functional independence.

Conclusions: Rural trauma hospitals have limited resources and experience in dealing with complex injuries and surgical complications. MSTT can bring significant resources to the rural hospital, help stabilize the patient too unstable to transport, and achieve improved survival and functional outcome with moderate additional cost.

Notes

ave. cost #5500
(surgeons don't bill)
telemedicine cheaper - Shackford
data #'s to justify 60+ cameras

Military question: minimal level of expertise to
transport critically injured *.

PROSPECTIVE RANDOMIZED TRIAL OF AN ISCHEMIA REPERFUSION PREVENTION (IRP) PROTOCOL VERSUS TRADITIONAL RESUSCITATION IN TRAUMA PATIENTS

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OBJECTIVES: A clinical trial was constructed to examine the ability of a novel regimen (IRP), which provides antioxidants, micronutrients, free radical scavengers, and membrane stabilizers to prevent damage from ischemia reperfusion injury. The study purpose was to prospectively validate retrospective data showing benefits of IRP on survival and length of stay (LOS). The incidence of organ failure, septic complications as well as mortality and LOS were examined. The hypothesis stated that IRP would provide better outcomes with shorter LOS.

METHODS: Trauma patients requiring ICU admission with ISS >9 were eligible. Patients who arrived >12 hours after injury, pregnant patients and those meeting brain death criteria within initial 24 hours were excluded. Patients were randomized to IRP or Control. IRP consisted of parenteral mannitol, folic acid, hydrocortisone, vitamin C, lidocaine, selenium, and polymyxin B as well as enteral vitamin E, vitamin A, N-acetylcysteine, and glutamine. Both groups were treated equally in all other resuscitation measures. Data were acquired for demographics, mortality, length of stay, organ failures, and septic complications. Tests of significance included Pearson's Chi square, Fisher's exact test, Z statistic and standard T-test. A p value <0.05 was considered significant.

RESULTS: A total of 188 patients were randomized over 2 years.

	IRP (n=101)	Control (n=87)	P value
ISS (mean)	33	26	n.s.
mortality	12 (11.8%)	14 (16%)	n.s.
LOS (days)	19.6	17	n.s.
Organ failures	7.43	5.87	n.s.

A prior subgroup analysis for GCS≤8, APACHE >15, and ISS >20 showed no significant differences. A trend for survival benefit was seen in IRP patients with GCS > 8.

CONCLUSION: In a prospective trial of seriously injured adult patients, IRP therapy proved to have no significant benefits on LOS or survival.

PI grading scale

1 Source of MRSA

2 altered care - no comorbidity

3 no " - "

4 Incidental finding not related to care

5 Indefinite finding

A POPULATION BASED EPIDEMIOLOGIC STUDY OF SEVERE INJURY

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University of California-San Diego
Presenter: B.M. Potenza, .M.D.
Sponsor: DB Hoyt, M.D.
San Diego, CA

Introduction: Examining the mechanism and severity of injury over time may allow for the planning of adequate resources for primary prevention programs.

Methods: A retrospective, population-based study examining severe traumatic injury in a single county was undertaken. A composite data set of severe trauma within the county was performed by merging data from the county trauma registry, state mortality data files and data from the medical examiner's office (1988-1998).

Results: There were 55,664 patients included study. A total of 40,897 (73.5%) patients survived and 14,767 (26.5%) died. Of those patients who died, 11,312/14,767 (76.6 %) were fatally injured in the field and were not transported to the trauma center. The overall annual injury rate decreased from $189/10^5$ to $186/10^5$ and the annual fatality rates decreased 58.9 to 37.8 per 10^5. The mean age of survivors increased from 29.8 to 33.6 and the mean age of non-survivors increased from 41.3 to 46.2 ($p<0.01$). The mean ISS decreased from 14.7 to 11.6 ($p<0.01$); however, ISS for fatal patients remained constant (39.7).

Leading Causes of Injury 1988-1998 by Rank Order (1-5) Rates per 10^5
1988 MVC(64.5) Assaults(31.9) Peds(24.8) MCC(20.7) Suicide(16) Falls(14.6)
1998 MVC(58.8) Falls(31) Assaults(30.5) Suicide(15.8) Peds(13.6) MCC(8.4)

Leading Causes of Fatal Injury 1988-1998 by Rank Order (1-5) Rates per 10^5
1988 Suicide(13.0) MVC(10.6) Assault(7.6) Peds(5.1) Falls(2.6) MCC(2.6)
1998 Suicide(12.7) MVC(5.1) Assault(5.0) Falls(3.5) Peds(2.0) MCC(0.9)

MVC=motor vehicle crashes, MCC=motorcycle crashes, Peds=pedestrians struck

The leading cause of injury was motor vehicle crashes. Violent behavior remained the leading cause of fatal injury. Assault and suicide led MVC deaths by 3 fold. Significant reductions of injuries due to pedestrians struck, non-fatal (43.2%) and fatal (61.8%) were observed. Injuries due to MCC also decreased, non-fatal (60%) and fatal (26%). There was a 210% increase in injuries due to falls as well as a 136% increase in fatal falls.

Conclusion: 1) There has been a modest reduction in the overall incidence of severe trauma within our county, however, fatal traumatic injuries have significantly decreased by 35.5%. 2) The leading causes of nonfatal injury did not correlate with the rank order of fatal injury. Motor vehicle collision related injuries led in the category of injury morbidity, whereas, suicide is the leading cause of injury mortality. 3) Violent behavior, (suicide or assault) were the leading causes of death in all age groups. 4) Despite increasing patient survival, there were 11,312 patients who died at the scene of their injury. 5) Field fatalities represent an unstudied group of patients for primary prevention research.

Notes

HEMORRHAGE-INDUCED LUNG INJURY IS TLR-4 DEPENDENT

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K.A. Barsness, MD – presenter
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Background: Toll-like receptor 4 (TLR-4), initially identified as the LPS receptor, is tical to the signaling of a variety of danger signals, including heat shock protein-60, rinogen and platelet activating factor. Interestingly, a point mutation in TLR-4 nfers a survival advantage in both endotoxemia (LPS) and hemorrhagic shock (HS). e hypothesized that a functional TLR-4 is required for HS and LPS -induced acute ıg injury. The purposes were to determine the role of a functional TLR-4 after HS or 'S on 1) NFkB activation 2) TNFα protein production 3) lung neutrophil cumulation and 4) acute lung leak.

Methods: TLR-4 intact (WT) and mutant (TLR-4m) mice underwent 30% morrhage or intra-peritoneal injection of 1mg/kg LPS. NFκB was determined by p65 LISA, measured by absorbance at 450 nm (A^{450}), and confirmed by EMSA. TNFα otein was determined by ELISA. Lung neutrophil accumulation was determined by /eloperoxidase assay (A^{460}). Acute lung leak was determined by permeability to an's Blue Dye (A^{450}). Data analyzed by ANOVA, $P<0.05$ considered significant.

Results: HS activated NFκB in both WT and TLR-4 m (0.251±0.01 WT and 313±0.01 TLR-4m vs. 0.128±01 control, $P<0.05$). HS stimulated TNFα production WT (48.4 ± 5.8 pg/mL vs. 26.8 ± 6.9 pg/mL control, $p = 0.03$). However, morrhaged TLR-4 mutants did not produce TNFα (30.35 ± 5.5 pg/mL vs. 36.9 ± 3.4 /mL control, $p = 0.51$). HS-induced lung neutrophil accumulation increased in WT ice (6.6±1.0 HS vs. 4.1±0.7 control, $P<0.01$), but not in TLR-4m mice (4.6±0.6 HS . 4.2±0.4 control, $P=0.8$). Finally, HS-induced lung permeability increased in WT .217±0.03 vs. 0.122±0.01 control, $P<0.01$), but not TLR-4 m (0.132±0.01 vs. 105±0.02 control, $P<0.01$). LPS results paralleled HS data in TNFα production, utrophil accumulation and lung leak. In contrast, while HS-induced NFκB activation ıs equivalent between WT and TLR-4m, LPS-induced NFκB activation was creased in WT compared to TLR-4m ($P<0.01$).

Conclusions: HS and LPS-induced lung cytokine production, neutrophil cumulation and protein permeability are dependent on a functional TLR-4. terestingly, HS-induced NFκB activation is independent of a functional TLR-4, while 'S-induced activation of NFκB requires a functional TLR-4 for full response. ıerefore, HS has a different and distinct TLR-4-dependent intracellular activation echanism as compared to LPS.

Notes

ABSORBABLE PLATES FOR RIB FRACTURE REPAIR: PRELIMINARY EXPERIENCE

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INTRODUCTION: Absorbable plates are currently used in a variety of bone reconstructions and fixations.

METHODS: Case series of rib fracture surgery utilizing absorbable plates and screws consisting of 70:30 Poly(L-lactide-co-D,L-lactide) from 4/3/01 - 6/1/02.

RESULTS: During this period, nine patients underwent rib fracture stabilization with absorbable plates and screws. Indications for rib fracture surgery included chest wall deformity/defect (one patient), flail chest (five patients), and acute pain/instability (three patients). The period of follow-up on these patients ranged from 7 to 18 months. The chest wall deformity/defect consisted of comminuted rib fractures with an intercostal muscle defect. The rib fractures and defect were repaired through muscle sparing incisions with thorascopic assistance. At 18 months, the patient is back to full athletic activity without limitations. The five patients with flail chest all weaned from the mechanical ventilator successfully. All three patients that underwent stabilization for acute pain/instability reported rapid subjective improvement/resolution. Two patients with screw fixation only subsequently developed loss of rib fracture reduction. One patient developed a wound infection requiring drainage.

CONCLUSION: Absorbable plates produce good clinical results and are an option for rib fracture surgery. Two-point fixation (screw fixation plus suture cerclage) is required. Further refinements in technique should focus on minimally invasive methods.

Notes

NON-OPERATIVE MANAGEMENT OF BLUNT PANCREATIC INJURIES IN CHILDREN – IS IT A SAFE ALTERNATIVE?

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Background: Although practice patterns for non-operative management of blunt liver, spleen and kidney injuries are well-established, similar guidelines for the uncommon blunt pancreatic injuries (BPI) in children have not been clearly defined. A couple of recent publications address this issue, demonstrating full recovery without operative intervention. We analyzed our pediatric experience with BPI to address the safety of this approach.

Methods: A retrospective review of our trauma registry, inpatient records and follow-up visits between January 1992 and December 2001 was performed. The diagnosis of BPI was established by CT scan and/or celiotomy. In the last five years non-operative management of blunt pancreatic injury became the preferred approach.

Results: Fourteen children with BPI were identified. A six year old with an associated Grade V liver laceration exsanguinated and was excluded. Seven were boys. Ages ranged from 2 to 17 years (mean:9.5 years, prior to 1997:11.6; after 1997:7.3). The injuries were: head - 2, neck - 1, body - 6, tail - 2, diffuse - 2. Abdominal pain was the main presenting symptom in all. All seven managed before 1997 underwent a celiotomy. Conversely, the six thereafter were not operated upon. Two complications occurred in the first (pre – 1997) group: a pseudocyst and a bowel obstruction, and two in the second group: two pseudocysts. All pseudocysts were successfully treated with CT – guided drainage. Average length of stay was 18.9 days in the first group and 14.8 in the second. Follow-up ranged from 6 months to 9 years.

Conclusion: In this series, a shift from operative to non-operative management of blunt pancreatic injuries in children did not increase the incidence of complication. Although some will need operative intervention, a non-operative approach for most children with blunt pancreatic injuries should prove safe and effective.

Notes

THE IMPACT OF MAJOR TRAUMA ON QUALITY OF LIFE: WHY ARE WOMEN AT RISK FOR WORSE OUTCOMES THAN MEN?

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Introduction: The importance of gender differences in quality of life and psychological morbidity after major trauma, such as depression (DEPR) and Post-traumatic stress disorder (PTSD), is a newly recognized focus of trauma outcomes research. A prospective epidemiologic study was conducted to examine multiple outcomes after major trauma, including quality of life (QoL), DEPR and PTSD. The specific objectives of the present report are to examine gender differences in the early incidence of DEPR and PTSD after injury, controlling for mechanism and injury severity, and to report the combined impact of early psychological morbidity on QoL at 6, 12, and 18-month follow-up time points in the population.

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. QoL 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. Early onset PTSD (Acute Stress Disorder) (ASD) was assessed using the Impact of Events (IES) scale. Patient outcomes were assessed at discharge, and at 6, 12, and 18 months after discharge.

Results: Women (N = 198) were significantly more likely to develop early combined DEPR + ASD symptoms at discharge than men (N = 458), independent of mechanism and ISS (Odds Ratio (OR) = 1.7, $P < 0.01$) and to have continuous DEPR at 18-month follow-up (OR = 2.3, $P < 0.001$). In women versus men with combined DEPR + ASD diagnoses, QoL was significantly worse at each follow-up time.

QWB Score	Women	Men
6-Month	0.597	0.619 *(P<0.05)
12-Month	0.626	0.685 **(P<0.01)
18-Month	0.638	0.678 **(P<0.01)

These differences were independent of ISS, mechanism and age.

Conclusions: Women with early onset combined DEPR and PTSD are at risk for markedly worse QoL outcomes after major trauma than men. These associations are independent of mechanism, ISS and age. Gender differences in the impact of psychological morbidity and QoL outcomes after major trauma provide new and important research initiatives in trauma outcomes research.

Notes

LUMINAL IGA LEVELS ARE INCREASED FOLLOWING HYPOXIA-REOXYGENATION OF MUCOSAL-LIKE EPITHELIAL CELLS

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Introduction

Secretory immunoglobulin A (sIgA) is the principal immune defense in the gut and other mucosal surfaces in the body. Its dimeric form (dIgA) binds to the polymeric immunoglobulin receptor (pIgR) located at the basal aspect of mucosal epithelial cells and is then transported to the apical surface where it is proteolytically cleaved and released as sIgA into the luminal microenvironment.

Shock and other oxidative stresses activate proteases in the gut. We studied the effect of simulated ischemia reperfusion on protease activity and sIgA release at the apical surface of epithelial cells *in vitro*.

Methods

Dimeric IgA was added to either the basal or apical chambers of monolayers of MDCK cells transfected with cDNA for pIgR at 4°C. This allowed maximal binding of dIgA to pIgR. Monolayers were then subjected to 21% 0_2 or 5% 0_2 for 90 minutes followed by 21% O_2 in both. The protease inhibitor leupeptin (Leu) was added in subsets. Apical or basal media was sampled at 1,3, and 12 hours and sIgA levels determined by ELISA. Monolayer integrity was monitored by measurement of transepithelial electrical resistance (TEER).

Results

Apical chamber sIgA (mean ± S.D., ng/ml, n = 4 in each group)

	Time	
	3 hr	12 hr
21% 0_2	5.2 ± 0.7	18.4 ± 1.9
5% 0_2 – 21% 0_2	18.6 ± 3.4[a]	25.2 ± 1.2[a]
5% 0_2 – 21% 0_2 + Leu	1.5 ± 0.6[b]	6.1 ± 1.1 [a,b]

[a] $p < 0.001$ vs. 21% 0_2 at same time

[b] $p < 0.001$ vs. 5% 0_2 – 21% 0_2 at same time

Basal recovery of sIgA when added to the apical chamber was negligible in all treatment groups, confirming pIgR mediated IgA transport only. TEER remained stable throughout the study.

Conclusions

Proteolytic cleavage and release of sIgA from the apical surface membrane of epithelial cells is enhanced following hypoxia-reoxygenation. This may be a protective mechanism against luminal pathogens under shock conditions *in vivo*.

Notes

THE HIGH RATE OF OPERATIVE INTERVENTION, BUT LOW MORTALITY, FOR CHILDREN WITH PENETRATING TRAUMA

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Introduction: Although the incidence of penetrating trauma in children is ɔw, a mortality rate of up to 30% has been reported. This review assessed the ɔcent need for operative intervention and mortality of penetrating trauma in hildren in an urban trauma center.

Methods: Retrospective review of the trauma registry, operative logs, ıorbidity and mortality records and hospital charts for all patients 16 years of ge or younger assessed by the trauma service from January, 1995, to January, 002, for penetrating trauma. Patients dying in the emergency center were xcluded. Data collected included demographics, mechanism of injury, dmission vital signs, operations, hospital course, length of stay, and mortality.)ata are presented as mean ± SD.

Results: From 1995-2002, 233 pediatric patients (age 12.9±4.5 years; 76% nale) were assessed for penetrating trauma (1.5% of all trauma admissions; 6.6% of pediatric trauma admissions). The mean Injury Severity Score was 3.3±8.7 (range 1-50) in all patients, and admission base deficit was -6.7±5.6 range 2.7- -28.7) in 78 patients. The mechanism of injury included 177 gunshot wounds (76%), 52 stab wounds/lacerations (22%), and 4 dog bites 2%). Operative intervention was required in 62.6% (146/233) of patients, with the largest number of operations in patients with wounds to the extremities (#61), abdomen/thoracoabdomen (#42) and chest (#34). Mean ength of stay was 6.7±7.4 days (range 1-74). Overall mortality was 6.4%; ıowever, 11 of the 15 deaths (73.3%) were due to gunshot wounds to the head ınd only 4 (26.7%) due to wounds elsewhere.

Conclusions: 1. In contrast to adult patients, the rate of operative intervention in wounded children is relatively high; 2. Gunshot wounds to the head have the highest mortality (11/20=55%); 3. Mortality for patients with penetrating wounds not involving the head was only 1.9% (4/213) in an adult trauma center with a pediatric commitment.

Notes

FORMALIZED RADIOLOGY ROUNDS: THE FINAL COMPONENT OF THE TERTIARY SURVEY

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Purpose: An important objective of organized trauma care is to minimize elayed diagnoses and missed injuries. Discrepant interpretations of adiographs initially read by trauma surgeons represents a unique source of elayed diagnoses. The purpose of this study was to evaluate the efficacy of ormalized Radiology Rounds as a formal component of the tertiary survey.

Methods: Over an 18-month period, 432 consecutive patients admitted to the rauma Service at a regional (Level II) trauma center were studied rospectively. Radiographs performed as part of the initial evaluation were ead by an attending trauma surgeon. All radiographs from the previous 24- our admissions were reviewed by the trauma team with an attending adiologist at Radiology Rounds. New diagnoses (NDx) were defined as adiographic findings identified at Radiology Rounds which were not recorded t the time of initial evaluation. The clinical significance of any NDx was lescribed as follows: Level 1 = NDx resulted in significant morbidity/mortality; evel 2 = NDx resulted in alteration in care/no morbidity; Level 3 = NDx esulted in no alteration in care.

Results: 50 NDx were identified in 44 patients (10.2%). Of the 50 NDx, 20 40%) were Level 3 and 30 (60%) were Level 2. No Level 1 NDx were dentified. 47 alterations in care were documented in the Level 2 group. New onsults were ordered in 8 patients: orthopedic surgery (6); neurosurgery (1); hysical therapy (1). Additional diagnostic procedures were required in 18 atients: plain radiographs (11); CT scans (7). Therapeutic changes were equired in 21 patients: splint/immobilization device (7); modified level of ctivity (6); surgical procedures (4); transfer (1); serial CBC (1); increased requency of neurologic evaluation (1); home equipment (1).

Conclusion: A small number of radiographic findings are not detected by rauma surgeons during the initial evaluation. While these findings are not of najor clinical significance, the majority required some alteration in care plan. Formalized Radiology Rounds promotes clinical efficiency through early dentification of these injuries which facilitates any necessary alteration in the are plan.

Notes

INJURY PATTERNS AMONG FEMALE TRAUMA PATIENTS: RECOGNIZING INTENTIONAL INJURY

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Presenter: Marie Crandall, M.D.
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Context:

Intimate partner violence (IPV) is a major source of morbidity and mortality among women. The lifetime risk of IPV ranges from 26-37%. IPV is responsible for approximately 21% of violent injuries sustained by women and 33% of homicides. An estimated 2-4% of Emergency Department visits for acute injury are due to IPV. However, identification of victims continues to be a challenge.

Objective:

To identify patterns of injury consistent with intentional injury in female trauma patients admitted to the hospital.

Materials and Methods:

This was a cross-sectional descriptive and multivariate analysis of all women patients ages 16-65 discharged from acute care hospitals in a single year with a primary diagnosis of injury (ICD-9 diagnoses: 800-999.9 excluding burns, asphyxiation and late effects of injury). Data were collected from fourteen states across all geographic regions of the United States. 92,480 women trauma patients were observed, of which 3513 (3.8%) were known victims of intentional injury.

Results:

1,811 women had identified mechanisms of intentional trauma. The most common mechanisms of intentional injury were blunt trauma (n=705, 38.9%) stab/impalement (n=519, 28.7%), and injuries due to firearms (n=442, 24.4%). Among women with blunt intentional injury, the face was the most commonly injured body region (n=363,51.5%), followed by the head (n=169, 24%) and chest (n=110, 15.6%). Falls (n=50,858), in contrast, exhibited different patterns of injury. The lower extremities (n=30,145, 59.3%) were most often injured, followed by the upper extremities (n=11,784, 23.2%), and the head (n=5427, 10.7%). The face was injured much less frequently (n=3885, 7.6%). Motor vehicle collisions (n=22,259) demonstrated yet another pattern of injuries by body region. The lower extremities (n=12,045, 54.1%) were most often injured, followed by the chest (n=7559, 34%) and upper extremities (n=7280, 32.7%). The face was injured less frequently (n=6408, 28.8%).

The risk of facial injury with blunt intentional trauma is much higher than for other mechanisms (adjusted OR=4.9, 95% CI=4.2-5.7). Head injury is also more common in these women (adjusted OR=1.4, 95% CI=1.2-1.7). Finally, women who suffered intentional injuries were significantly younger (36.7±15.6 years) than women who suffered unintentional injuries (61.3±22.6 years, $p<0.001$), particularly women with firearm injuries (30.9±12.0 years, $p<0.001$).

Discussion:

Physicians can improve identification of cases of intimate partner violence. This can be facilitated by understanding common injuries associated with interpersonal violence, and recognizing higher risk age groups.

Notes

GASTRIC ALKALINIZATION FOLLOWING MAJOR TRAUMA

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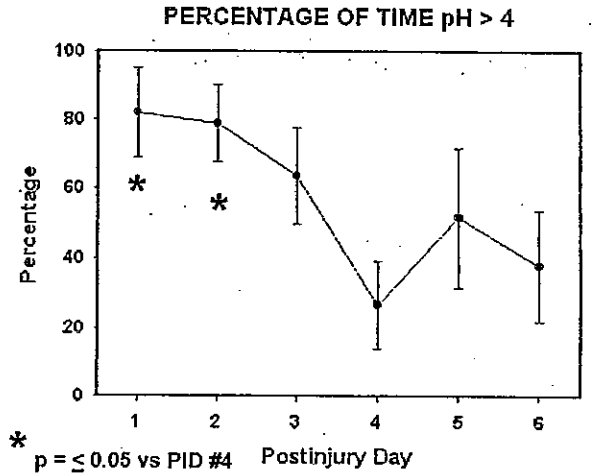
n the controversy over the use of sulcralfate (to maintain gastric acidity) instead of H2 lockers to prevent pneumonia, trauma studies have consistently failed to document ny difference. Two studies revealed a potentially confounding variable that some ulcralfate treated patients had alkalinized stomachs. We hypothesized that severely ijured patients have gastric alkalinization and that this is due to bile reflux. All trauma atients without head injuries that required resuscitation for shock were eligible for nclusion. Once consent was obtained, a 12.5 Fr silastic pH probe (Sandhill Scientific) 'as placed in the stomach and the gastric pH continuously monitored for 7 days. atients received no H2 blockers or sucralfate during this time. The percentage of me that the gastric pH was greater than 4 was calculated. A Student's t-test was sed for comparison. A gastric sample was also obtained each day and subsequently ssayed for bile acid with a kit (Sigma). Correlation between bile acid measurements nd gastric pH was performed using a Pearson Correlation. Results: There were 7 study patients, 67% male, mean age was 32±3 years, 78% had a blunt mechanism of injury, and the mean ISS was 31±5. The stomach was significantly more alkaline for the first two days of monitoring ($p < 0.05$) when compared to the 4th day. 5 of 7 patients had no episodes of pH < 4 during the first day of pH monitoring. Over subsequent days the gastric pH began to drop until the majority of each day was spent a pH < 4. There were 36 gastric samples. Bile acid measurements ranged from 0 2850 uM (mean = 330 ± 95 uM). Greater than 1 mM bile acid is considered imaging. There was a significant correlation between the amount of bile acid esent in the stomach and gastric pH ($p<.01$) which was most prominent at bile levels 900 uM. In summary, severe injury causes gastric alkalinization that appears to be lated to bile reflux.



Notes

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TAMING OF THE SCREW: A CASE REPORT AND LITERATURE REVIEW OF LIMB THREATENING COMPLICATIONS FOLLOWING PLATE OSTEOSYNTHESIS OF CLAVICULAR NONUNION

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Iypertrophic nonunion following clavicular fracture is an established cause of urogenic thoracic outlet syndrome (NTOS). The NTOS can be effectively treated th screw and plate osteosynthesis (ORIF), but such treatment has also been reported cause a delayed recurrent NTOS and, recently, symptomatic arterial compression. ɔ cases of limb threatening ischemia have been reported until now. A 31 year-old ale developed a NTOS associated with a hypertrophic nonunion following a avicular fracture 2 years prior. This was effectively treated with ORIF. 8 years later mptoms recurred. Physical exam was normal with a 2+ radial pulse and no bclavian bruit; x-rays showed good alignment without callus. Nerve conduction and MG were normal. He was treated conservatively with physical therapy for 2 years ith some improvement until he presented acutely with arm claudication, severe hand in and loss of the radial pulse. Angiogram revealed a fusiform focal dilatation of the bclavian artery (apparently penetrated by one of the fixator screws), brachial artery clusion and embolic debris in the ulnar and digital arteries. Following TPA infusion d heparinization he underwent resection of a subclavian pseudoaneurysm (perforated the screw), interposition grafting and claviculectomy. He is well with a patent graft 3 months later with excellent upper extremity function. A search of the literature vealed a similar case in which an ORIF screw indented but did not perforate the artery d produced only claudication without limb threat. ORIF of the middle third of the avicle is prone to screw impalement of surrounding structures because of repeated rsional forces, little cancellous bone, and the small volume of subclavius muscle in is area. Orthopedic and vascular surgeons should be aware of this potential delayed omplication that can be prevented by either placing screws in locations away from the nderlying neurovascular structures or by interval removal of the plate and screws after ealing. TOS (either neurogenic or vascular) following ORIF, when it occurs, should e promptly treated by either plate removal, partial or total claviculectomy, or first rib section (or a combination of these procedures). Prolonged physical therapy is not ffective and may be contraindicated.

Notes

AN UNLUCKY HORSESHOE: BLUNT AORTIC RUPTURE FOLLOWING HORSE KICK

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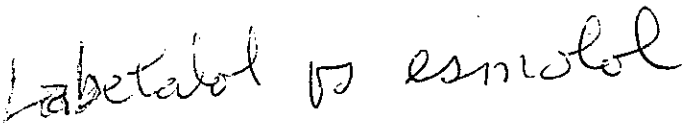
Background: Optimal outcome for patients with a torn descending thoracic aorta demands prompt recognition. Classically, blunt aortic injury is associated with high-speed deceleration and associated thoracic injuries as seen with motor vehicle crashes. We present an atypical mechanism in the case of a patient who sustained isolated aortic rupture after being kicked in the chest by a horse.

Case Report: A 42 year-old cowboy was kicked once to the left chest by a horse. He arrived in the emergency department of a rural hospital hemodynamically stable, complaining only of mild chest pain at the site of the kick. A plain chest radiograph revealed a widened mediastinum. Computed tomography of the chest revealed a mediastinal hematoma and the patient was transferred to our facility on beta blockade. Aortography demonstrated an aortic laceration with some extravasation of contrast just distal to the subclavian artery. The injury was repaired promptly with a Dacron interposition graft under partial left-heart bypass. The patient had an uneventful post-operative course and was discharged on the tenth post-operative day.

Discussion: Horses routinely weigh over one thousand pounds and a single kick can deliver up to one ton of force to a very focused area. Horse kicks are second only to falls from horseback as the leading cause of horse-related mortality. While closed head injuries predominate among the fatalities, thoracoabominal injuries are the next leading cause of death. Our review of the literature revealed only one other report of aortic injury by a similar mechanism. Other case reports have linked horse kicks with cardiac rupture, irreversible heart block, as well as fatal abdominal solid organ injury.

Conclusions: A horse kick represents a major transfer of kinetic energy to a relatively small area. Patients with this injury should undergo prompt evaluation for life threatening occult injury.



ALANTO-OCCIPITAL DISSOCIATION ASSOCIATED WITH INTRACARDIAC IVC INJURY: A CASE REPORT

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Introduction: Alanto-occipital dissociation (ACD) is a devastating injury with significant nortality. Patients who survive the initial insult have a very poor neurologic outcome. ntracardiac IVC injuries are seen in blunt trauma, but happen rarely. There is limited data ıvailable on their incidence or their outcome. We describe a patient who suffered both of these njuries secondary to a motor vehicle crash.

Case Report: The patient is a 35-year-old male who was involved in a freeway speed motor /ehicle crash with ejection. He was intubated in the field and brought to our ACS verified ⊿evel 1 trauma center. While in the trauma bay, he developed hypotension. Due to his body ıabitus (weight > 160 kg) a FAST exam was unsuccessful so he was taken to the operating oom for exploration. No significant intraabdominal injuries were identified. He remained ıypotensive so a pericardial window was performed with gross blood noted. A sternotomy was ɔerformed and an IVC injury was noted at the entrance to the right atrium. This was repaired vith pledgeted 4-O Prolene suture, his chest and abdomen closed, and he was taken to the ICU. Spinal precautions were continued, as his neck could not be evaluated due to his size. After reatment of thoracic and abdominal compartment syndromes and fluid loss in the ICU, a CT ıcan of the cervical spine with sagittal and coronal reconstructions was obtained which showed ı complete alanto-occipital dissociation. The patient was returned to the OR once stable from ıll other injuries at which time he under fusion from the base of the skull to C3. He spent the ıext several weeks in the ICU and on the rehabilitation unit, at which point he was discharged o home. His abdomen has been reconstructed, he has a solid neck fusion, and he is completely ıeurologically intact.

Discussion: ACD (or craniocervical dislocation) is an injury that is frequently fatal in the ield. Patients that arrive at the hospital rarely survive to discharge, and those that do typically ıre quadriplegic, ventilator dependent, and have other neurologic manifestations from the ıssociated head injury. Similarly, blunt cardiac injury that results in a cardiac or great vessel aceration is typically fatal in the field. Survivors usually have venous injuries and enough :ardiac reserve to survive the slow, progressive tamponade. Our patient is unusual in that he uffered two injuries, both with a high mortality, without any significant sequelae. It is a estimonial for the basics of ATLS (rapid transport, spinal immobilization), trauma center ɔerformance (rapid operative intervention), and ICU care (ongoing resuscitation and nonitoring, nursing care with regards to continuing full spinal precautions).

Notes

ATLANTO-OCCIPITAL DISLOCATION: TWO SURVIVORS AND A REVIEW

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Objective and Importance: Traumatic atlanto-occipital dislocation is a devastating injury with fewer than 100 survivors reported in the literature. Diagnosis in the neurologically intact patient requires a high index of suspicion and correct interpretation of radiologic studies, including plain radiographs, CT, and MR imaging. Early diagnosis and treatment are essential to preserve good outcomes. We report two cases of survival after atlanto-occipital dislocation (AOD) who have presented to our institution.

Clinical Presentations and Interventions: Case #1: A 17-year old male was an unrestrained passenger in a motor vehicle crash. Upon presentation, the patient had a GCS of 15, was alert and oriented and complained of severe neck pain. A lateral c-spine plain film revealed significant pre-vertebral swelling. Subsequent CT and MRI imaging revealed widening of the atlanto-occipital joint, with STIR changes and pre-vertebral hematoma on MRI. The patient was externally immobilized with a Halo and taken to the operating room for atlanto-occipital transarticular screw fixation. Post-operatively the patient was neurologically intact and was discharged home in a Halo. Case #2: A 4-year old female was an unrestrained front seat passenger in a motor vehicle crash with airbag deployment. She lost consciousness for 1-2 minutes and was incontinent of urine. She was evaluated at an outside institution and her neck was cleared after a normal head CT and normal c-spine plain films. The patient was placed back in a cervical collar for transport to our institution. Upon arrival, outside films were not available and a CT of the head and cervical spine were ordered. After the patient exhibited upper extremity weakness, a MRI and MRA of the head and neck were also ordered. Imaging studies were diagnostic for AOD with pre-vertebral swelling on c-spine CT, pre-vertebral hematoma and STIR changes in the AO joint on MRI, and SAH in the interpeduncular cistern on CT scan of the head. The patient was externally immobilized with a Halo vest. Upright and supine films showed no instability in the Halo and the patient was mobilized. The patient continued to suffer from bilateral upper extremity weakness (L>R) and was also found to have decreased oral motor function when evaluated by speech therapy. The patient was discharged to the rehabilitation service.

Conclusions: Survival of traumatic AOD is rare and may be difficult to diagnose in the intact patient. Prevertebral swelling on lateral c-spine films, severe neck pain, or neurologic deficits should prompt additional studies with CT or MRI for definitive diagnosis. Urgent external fixation with or without subsequent internal fixation is imperative for preventing neurologic deterioration and securing the best possible long-term prognosis.

Notes

BLUNT RUPTURE OF THE INNOMINATE ARTERY

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Introduction: Blunt traumatic rupture of the innominate artery is uncommon. Management is affected by patient stability, presence of associated injuries and location of the injury within the artery. It has been proposed that endovascular approaches may provide an alternative to operative repair.

Methods: A retrospective review of was performed of patients admitted between January 1, 1998 and July 1, 2002 with traumatic innominate artery rupture. Injuries were defined as proximal if they were ≤ 0.5 cm from the origin, distal if ≤ 0.5 cm from the bifurcation and in the mid portion if between.

Results: Over the 4-_ year study period, 61 patients were admitted with aortic or great vessel injury (45 blunt aortic rupture, 1 blunt and 2 penetrating common carotid, 2 blunt and 3 penetrating left subclavian artery, 2 penetrating and 6 blunt innominate artery). The injuries were located at the origin in 4 cases (3 repaired by ascending aortic-innominate artery graft following over-sewing the site of injury, 1 by ligation alone), 1 mid injury treated by interposition graft and 1 distal managed with resection and primary anastomosis. All patients with proximal injuries had evidence of active bleeding (large expanding hematoma and/or frank bleeding) requiring control of the injury site prior to reconstruction. All patients had associated injuries (including closed head injury in 3 and splenic rupture in 2). The only mortality was in the sole patient who presented in shock, and suffered carinal rupture and severe blunt cardiac injury requiring cardiopulmonary bypass. The remaining patients were stable on presentation, were diagnosed after chest radiography demonstrated widened mediastinum prompting angiography or CT and all survived without complications. In 2 cases helical CT angiography were diagnostic and specific for the site of injury. Neither cardiopulmonary bypass nor aorto-carotid shunting was utilized in these cases.

Conclusions: Patients with innominate artery rupture that survive to admission are usually stable and the diagnosis is suggested by initial chest radiograph. The injuries are usually proximal, requiring aortic-distal innominate bypass. The majority of patients will not be anatomic candidates for endovascular approaches. Cardiopulmonary bypass is required only if there is evidence of heart failure (either before or after partial occlusion of the aorta) or to manage specific associated injuries. Aorto-carotid shunting is required only if it anticipated that there will be a long clamp time or there are associated left carotid lesions.

Notes

SURVIVAL AFTER A DOCUMENTED 19-STORY FALL: A CASE REPORT

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Introduction: Urban free falls, or "Jumper's Syndrome," present frequently. Survivors of falls over 20 feet are rare; those over 60 feet, reportable. We present a case of survival following a documented 19-story fall.

Case Report: A 23 year old male under the influence of PCP presented after a 19 story (200 ft) fall impeded by a tree. On initial presentation, the patient was alert, awake, and conversant with injuries including massive scalp and back degloving, multiple extremity fractures, bilateral hemothoraces, a left flank ecchymosis and free fluid in the abdomen by FAST. After 20 minutes and brief hypotension to 90mmHg SBP, the patient was taken to the OR for emergent splenectomy and concurrent ventriculostomy. An immediate post-op head CT confirmed a cerebellar hemorrhage. He then returned to the OR for external fixation of grade II left forearm and Grade III open, comminuted left tibia and fibular fractures. Intraoperatively, he lost pulses in his left forearm and received fasciotomy and on table angiography which revealed complete transection of the axillary artery. An interposition vein graft placement was performed, but an associated brachial plexus injury with multiple cord disruption rupture was not repaired. A 20 x 25 cm degloving injury to the back was also explored, irrigated of plant material, and ultimately required complete debridement of the overlying skin flap. CT of the chest confirmed a left scapulo-thoracic dissociation. His 32 day ICU course was notable for early tracheostomy, IVC filter placement and enteral feeding. Other interventions included treatment for rhabdomyolysis, fracture fixation, extensive skin grafting, and multiple nosocomial infections. He was discharge to a rehabilitation facility for continued physical therapy and psychotherapy after a six-week hospital stay.

Discussion: Studies of "Jumper's Syndrome" have substantiated the intuitive premise that the height of the fall correlates directly with the extent of injury, requirement for surgical intervention, hospital stay and mortality. Survival after high fall is possible through successful management requiring the multidisciplinary expertise of trauma, orthopedics, nursing, an critical care and rehabilitation teams.

Notes

BLUNT DIAPHRAGMATIC RUPTURE IN CHILDREN

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Background: Diaphragmatic injury after blunt abdominal trauma (BAT) is a rare but potentially devastating injury that occurs in less than 5% of all BAT victims and is associated with a 22-27% mortality rate. Although several series of blunt diaphragmatic rupture in adults have been published, this injury remains largely uncharacterized in the pediatric population. Accordingly, we reviewed our experience with pediatric patients treated for blunt diaphragmatic rupture at our Level I trauma center.

Methods: We queried our trauma registry database for all children admitted for BAT over a 7-year period. Data were analyzed for all children diagnosed with blunt diaphragmatic rupture.

Results: Over the study period, 1397 children were admitted for BAT, with 387 children diagnosed with intra-abdominal injuries. Six children (age 2-15 years, mean 7 years) were identified with blunt diaphragmatic rupture (3 right, 2 left, 1 bilateral) representing 0.4% of admissions and 1.5% of abdominal injuries. All children had associated injuries (4.5 per child) with a mean ISS of 32. Four diaphragmatic injuries were diagnosed during the initial evaluation and/or at emergent laparotomy. One missed injury was diagnosed by bilious chest tube output on post-injury day 5. The other missed injury was diagnosed at time of thoracotomy for presumed empyema on post-injury day 8. All 6 children had successful primary repair of the diaphragmatic injury with a mean ICU stay of 6.5 days (range 1-21) and a mean hospital stay of 21 days (range 7-66). There were no deaths and all children were eventually discharged without sequelae.

Conclusions: Blunt diaphragmatic rupture occurs in children with a frequency and severity commensurate with that observed in adults. The majority of pediatric blunt diaphragmatic injuries can be diagnosed during the initial trauma evaluation and/or at time of emergent laparotomy for hemodynamic instability. Although associated injuries are common, our data suggests improved survival compared to adult patients with this injury.

Notes

BY-LAWS

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 or Doctors of Osteopathy 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.
(d) Maintain behavior befitting a physician by adhering to the code of ethical and moral standards as described by either the American College of Surgeons or the American Medical Association.

At age 55, members in good standing will automatically accept the position of senior membership in the Western 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.
(41 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.

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WESTERN TRAUMA ASSOCIATION
2003
MEMBERSHIP LISTING

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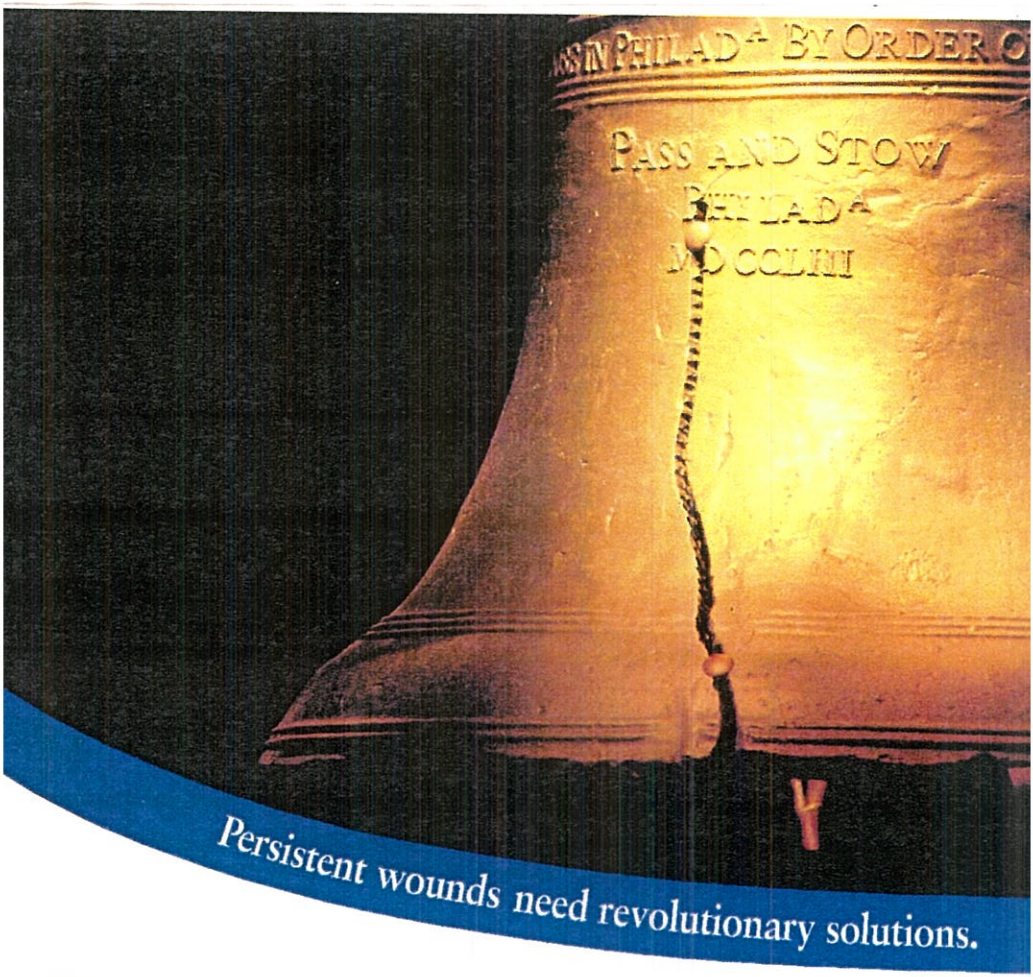

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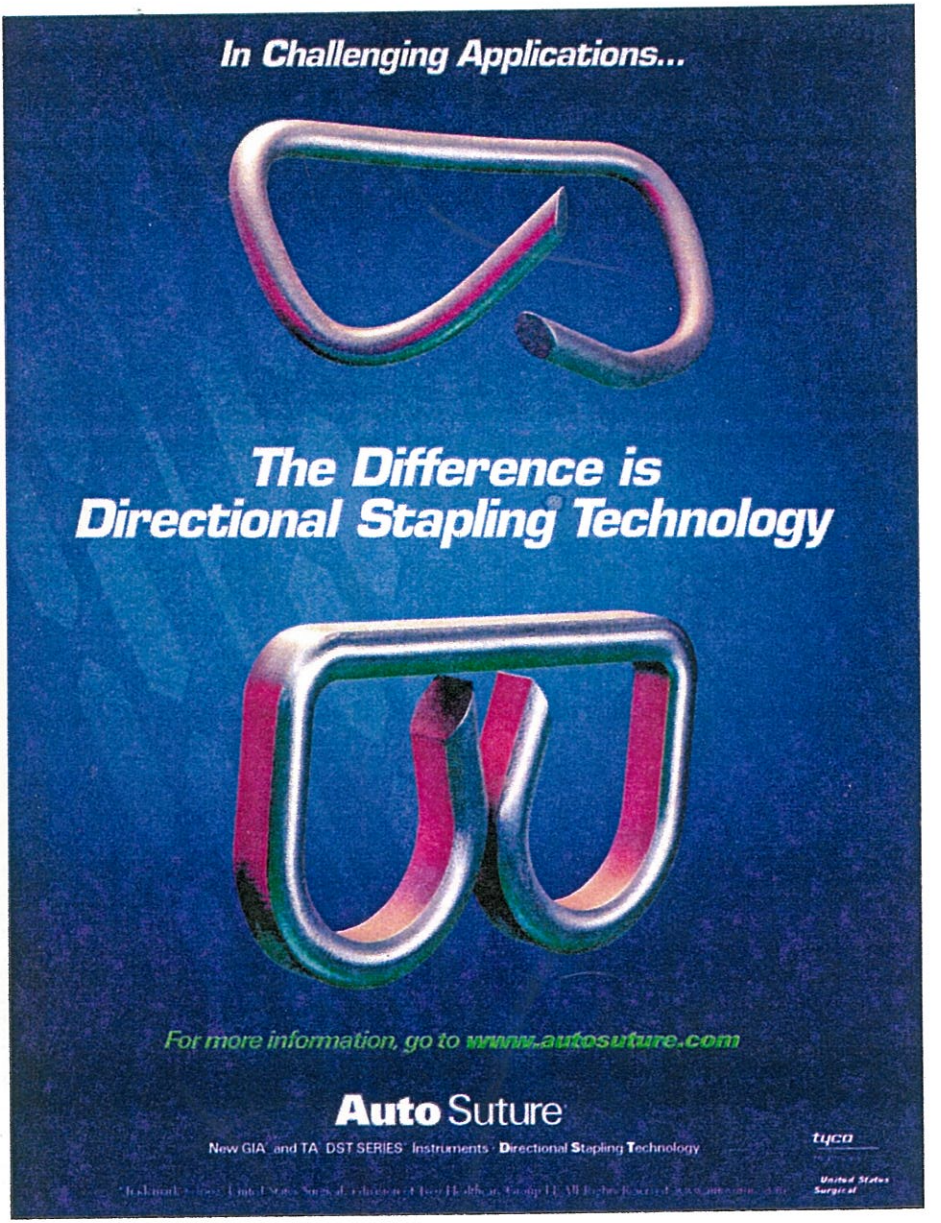
Note: Specific indications, contraindications, precautions and safety tips exist for this product and therapy. Please consult your physician, product instructions and safety tips prior to applications.



United States Surgical