

**TWENTY-FOURTH ANNUAL MEETING**



**February 28 - March 4, 1994**

**Crested Butte, Colorado**

~~Kingie - B & C~~  
~~Hennery - B~~

Keys  
2335

~~Mid Night - B & C~~

~~Jutovich~~

~~Gen. Miller - B (B) / st~~

~~11/24 - 11/30 3C~~

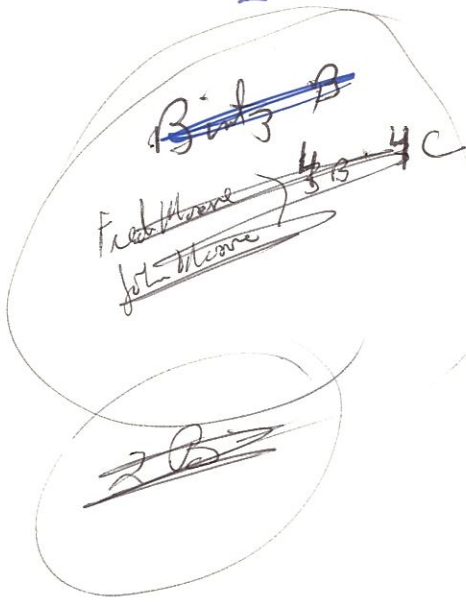
~~Romano - B~~

~~Benjamin - 4B~~

~~Mattoney - 1C~~

~~1/24 Bkfst Tally;~~

~~Coybill 6 28 - 3C~~



Coffee runs out each AM,  
203

To Kevin, Director  
rec / Services  
Tracy

2-143 A  
24 K



~~Robert McInerney~~  
~~Needs it tomorrow 11/24.~~  
~~SMITH~~

Letter to Edna re Bosnia Paper  
Barbara Hansen

**WESTERN TRAUMA ASSOCIATION  
PAST PRESIDENTS**



President	Year	Location
Robert G. Volz, M.D.	1971	Vail
Robert G. Volz, M.D.	1972	Vail
Peter V. Teal, M.D.	1973	Vail
William R. Hamsa, M.D.	1974	Aspen
Arthur M. McGuire, M.D.	1975	Sun Valley
Lynn Ketchum, M.D.	1976	Snowmass
X Fred C. Chang, M.D.	1977	Park City
Glen D. Nelson, M.D.	1978	Steamboat
Gerald D. Nelson, M.D.	1979	Snowmass
Kevin G. Ryan, M.D.	1980	Snowbird
David S. Bradford, M.D.	1981	Jackson Hole
X Erick R. Ratzer, M.D.	1982	Vail
William R. Olsen, M.D.	1983	Jackson Hole
Earl G. Young, M.D.	1984	Steamboat
Robert B. Rutherford, M.D.	1985	Snowbird
X Rudolph A. Klassen, M.D.	1986	Sun Valley
X Robert J. Neviasser, M.D.	1987	Jackson Hole
? Robert C. Edmondson, M.D.	1988	Steamboat
Ernest E. Moore, M.D. ✓	1989	Snowbird
Stephen W. Carveth, M.D.	1990	Crested Butte
George E. Pierce, M.D. ✓	1991	Jackson Hole
Peter Múcha, Jr., M.D. ✓	1992	Steamboat
-David V. Feliciano, M.D.	1993	Snowbird
X Chris Wray		

\*\*\*\*The 1995 WESTERN TRAUMA ASSOCIATION MEETING will be:  
February 25 - March 4, 1995  
Big Sky, Montana

WESTERN TRAUMA ASSOCIATION  
 TWENTY-FOURTH ANNUAL MEETING  
 CRESTED BUTTE, COLORADO



1993 - 1994

OFFICERS:

R. Chris Wray, M.D.	President
David A. Kappel, M.D.	President-elect
Thomas H. Cogbill, M.D.	Vice-President
H. Tom Thomas, M.D.	Secretary
G. Jerry Jurkovich, M.D.	Treasurer

BOARD OF DIRECTORS:

	<u>Term Ends</u>
Alan Rosenberger, M.D.	1994
James B. Benjamin, M.D.	1994
John W. McGill, M.D.	1995
Steven E. Ross, M.D.	1995
Harvey J. Sugerman, M.D.	1996
Alexander S. Rosemurgy, M.D.	1996

PROGRAM COMMITTEE:

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△ Edmund J. Rutherford, M.D.	
Scott R. Petersen, M.D.	
William M. Iannacone, M.D.	
△ Alexander Rosemurgy, M.D.	
Barry C. Esrig, M.D.	
Steven R. Shackford, M.D., ex-officio	

PUBLICATIONS COMMITTEE:

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Steve Cohn, M.D.	
Harold Sherman, M.D.	
Jim Benjamin, M.D.	
James A. Edney, M.D. - ex-officio	

NOMINATING COMMITTEE:

David V. Feliciano, M.D.	Chairman
Gerald Gussack, M.D.	
Edward Phil Polack, M.D.	

CME Credits from Gundersen Medical Foundation  
 20 Hours Category I

*baggage to Denver?*

*Colorado Gen  
(Univ. of.)*

*Barb Holmsten  
> Tues*

WESTERN TRAUMA ASSOCIATION  
TWENTY-FOURTH ANNUAL MEETING  
CRESTED BUTTE, COLORADO

SCHEDULE  
1993 - 1994

Sunday, February 27, 1994  
5 - 7:00 p.m.

Registration and Welcoming Reception

Monday, February 28, 1994

6:30 - 7:00 a.m.  
7:00 - 7:10 a.m.  
7:10 - 9:00 a.m.  
4:00 - 5:20 p.m.  
5:20 - 6:00 p.m.

*not audience*

Breakfast  
Welcome Message from President and Program Chairman  
First Scientific Session  
Second Scientific Session  
Presidential Address - "Morality, Ethics and Surgery" \*  
Chris Wray, M.D.  
Rochester, New York  
Past President's Meeting

Tuesday, March 1, 1994

6:30 - 7:00 a.m.  
7:00 - 8:30 a.m.  
10:00  
4:00 - 5:00 p.m.  
5:00 - 6:00 p.m.  
6:00 - 7:00 p.m.

Breakfast  
Third Scientific Session  
NASTAR Race and Picnic to follow \* Dick  
Fourth Scientific Session  
Special Lecture - "Resuscitation of the Injured Brain for Non-Neurosurgeons"  
Steven Shackford, M.D.  
Board of Director's Meeting

Wednesday, March 2, 1994

6:30 - 7:00 a.m.  
7:00 - 8:40 a.m.  
4:00 - 5:00 p.m.  
5:00 - 6:00 p.m.

*Holmes*

Breakfast  
Fifth Scientific Session  
Sixth Scientific Session  
Panel Discussion - "Management of Complex Trauma Cases"  
Moderator: John Moore, M.D.  
Panelists: David Feliciano, M.D.  
Ron Fischer, M.D.  
Peter Mucha, M.D.  
Business Meeting - Members Only

Thursday, March 3, 1994

6:30 - 7:00 a.m.  
7:00 - 8:40 a.m.  
4:00 - 5:00 p.m.  
5:00 - 6:00 p.m.

*Panel*

Breakfast  
Seventh Scientific Session  
Eighth Scientific Session  
Guest Presentation - "Adventures on and in Caribbean Waters" \*  
Jim Benjamin, M.D.  
Reception  
Banquet/Awards and Dance

Friday, March 4, 1994

6:30 - 7:00 a.m.  
7:00 - 8:40 a.m.  
4:00 - 5:20 p.m.  
5:20 p.m.

Breakfast  
Ninth Scientific Session  
Tenth Scientific Session  
Adjourn

Spouses', Children, Significant Others' Breakfast Monday thru Friday 8:00-9:00 a.m.

*Administrative  
Staff & Thiers*

WESTERN TRAUMA ASSOCIATION  
TWENTY-FOURTH ANNUAL MEETING  
CRESTED BUTTE, COLORADO

PROGRAM

Monday, February 28, 1994

Morning

TIME	TITLE	PRESENTER
<b>MODERATOR: CHRIS WRAY, M.D.</b>		
7:00 a.m.	Welcome Message from President and Program Chairman	
7:10 a.m.	* Who Warrants Exploration for a Gluteal Gunshot Wound?	Jody DiGiacomo
7:30 a.m.	* Prospective Evaluation of Laparoscopy in Abdominal Stab Wounds	Joseph Dalton
7:50 a.m.	Closure of the Open Abdomen	Danny Sleeman
8:10 a.m.	Initial Sonographic Assessment of Blunt Abdominal Trauma	Mark McKenney
8:30 a.m.	Abdominal Trauma Assessment in Pregnancy: Comparison of Computed Tomography (CT) & Diagnostic Peritoneal Lavage (DPL)	John Fildes

Evening

**MODERATOR: JERRY JURKOVICH, M.D.**

4:00 p.m.	* Regional Differences in Lymphocyte Function Following Hemorrhagic Shock	James Tyburski
4:20 p.m.	* ECMO in the Resuscitation of Massively Injured Trauma Patients with Pulmonary Hemorrhaging	Michael Perchinsky
4:40 p.m.	* Dismal Outcome from Blunt Thoracic Aortic Laceration (TAL) in Elderly Patients: A Study of Two Rural Trauma Centers	P.C. Camp
5:00 p.m.	* Experimental Lethal Thoracoabdominal Airgun Wounds in a Porcine Model	H.J. McKenzie
5:20- 6:00 p.m.	<b>Presidential Address:</b> "Morality, Ethics and American Surgery" Chris Wray, M.D., Rochester, New York	
6:00 p.m.	Past Presidents' Meeting	

\* Earl Young Resident Competition

Tuesday, March 1, 1994

Morning

TIME	TITLE	PRESENTER
MODERATOR: ED RUTHERFORD, M.D.		
7:00 a.m.	Extent of Disability Following Traumatic Extremity Amputation	David Livingston
7:20 a.m.	* Brain Edema Formation After Brain Injury Shock & Resuscitation: Effects of Venous and Arterial Pressure	Gino Trevasani <i>U. V.M.</i>
7:40 a.m.	* A Proposed Grading Scale for Traumatic Subarachnoid Hemorrhage in Non-Penetrating Head Trauma	Fred Marciano
8:00 a.m.	Civilian Gunshot Wounds of the Head: Admission Glasgow Coma Scale as a Predictor of Survival and Neurological Outcome	Paul Apostoliodes
8:20 a.m.	Death in the Operating Room-A Multicenter Review	David Hoyt

Evening

MODERATOR: SCOTT PETERSEN, M.D.		
4:00 p.m.	* Management of Civilian Penetrating Laryngotracheal Injuries	Harsh Grewal
4:20 p.m.	* Serious Ski Injuries at an Intermountain Multi-Hosp Trauma Complex: A Three Year Experience	Jane Poretta
4:40 p.m.	* Deaths from Motor Vehicle Accidents: Patterns of Injury in Restrained and Unrestrained Victims	Mark Swierzewski
5:00-6:00 p.m.	Special Lecture: "Resuscitation of the Injured Brain for Non-Neurosurgeons" Steve Shackford, M.D., Burlington, Vermont	
6:00 p.m.	Board of Directors Meeting	

Wednesday, March 2, 1994

Morning

TIME	TITLE	PRESENTER
<b>MODERATOR: JOHN MORRIS, M.D.</b>		
7:00 a.m.	* Gastric Tonometry Supplements Information Provided by Systemic Indicators of Oxygen Transport	Michael Chang
7:20 a.m.	Cardiopulmonary Effects of Permissive Hypercapnia (PHC) in Adult Respiratory Distress Syndrome (ARDS)	Robert McIntyre
7:40 a.m.	Evaluation of an Immune-Enhancing Diet for Immediate Post Injury Enteral Feeding	Fred Moore
8:00 a.m.	* Functional Equivalence of Hypothermia to Specific Clotting Factor Deficiencies	Tom Johnston
8:20 a.m.	* Effects of Diaspirin Crosslinked Hemoglobin on Blood Pressure, Blood Loss and Survival in a Model of Uncontrolled Hemorrhage	Scot Schultz

*Uniformed Services  
of Health Sciences  
Blunt*

②

Evening

**MODERATOR: TOM THOMAS, M.D.**

4:00 p.m.	* Influence of Reamer Type on Lung Function After Intramed Nailing in Sheep	Hans-Christoph Pape
4:20 p.m.	Early Exchange in Nailing of Distal Femoral Fractures with Associated Vascular Injury Initially Stabilized with External Fixation	Robert Taffet
4:40 p.m.	The Ilizarov Method for Complex Fracture , Nonunions	Doreen DiPasquale
5:00 - 6:00 p.m.	<b>Panel Discussion:</b> "Management of Complex Trauma Cases" <b>Moderator:</b> Dr. John Moore Wheatridge, Colorado <b>Panel:</b> Dr. David Feliciano, Atlanta, Georgia Dr. Ron Fischer, Houston, Texas Dr. Peter Mucha, Bethlehem, Pennsylvania	
6:00 p.m.	Business Meeting – Members Only	



Thursday, March 3, 1994

Morning

TIME	TITLE	PRESENTER
<b>MODERATOR: FRED MOORE, M.D.</b>		
7:00 a.m.	The Unreliability of Initial Chest Radiographs and CT Scans in Evaluating Diaphragmatic Rupture	Marc Shapiro
7:20 a.m.	Role of Pancreatogastrostomy Following Pancreatoduodenectomy for Trauma	Roman Delcore
7:40 a.m.	Non-Operative Management of Blunt Hepatic Injuries: Safe at any Grade?	Harold Sherman
8:00 a.m.	Is Triple Contrast CT Scanning Useful in the Selective Management of Stab Wounds to the Back	Earl McAllister
8:20 a.m.	Do Prehospital Trauma Car Triage Criteria Identify Major Trauma Victims	Thomas Esposito

Evening

<b>MODERATOR: BARRY ESRIG, M.D.</b>		
4:00 p.m.	Falls, Epidemiology & Strategies for Prevention	Anne Mosenthal
4:20 p.m.	The Rising Cost of Violence: Six Years Experience in an Urban Trauma Center	Kimberly Joseph
4:40 p.m.	Decreased Limb Loss with Aggressive Treatment of Blunt Popliteal Trauma	Benjamin Chang
5:00-6:00 p.m.	Guest Presentation: (Families invited) *Adventures on and in Caribbean Waters* Jim Benjamin, M.D., Tucson, Arizona	
7:00 p.m.	Reception	
8:00 p.m.	Banquet and Awards	

Friday, March 4, 1994

Morning

TIME	TITLE	PRESENTER
<b>MODERATOR: DAVID FELICIANO, M.D.</b>		
7:00 a.m.	Quality of Well Being Scale Captures Outcome of Trauma	Christian Mohme
7:20 a.m.	A Rationale for Enteral Nutritional Support in Severe Closed Head Injury	Anthony Borzotta
7:40 a.m.	Effects of Nitric Oxide Inhibition on Regional Blood Flow in Septic Shock	Patrick Offner
8:00 a.m.	Economic Impact and Clinical Predictors of Successful Non-Operative Treatment of Adult Splenic Injury	John Sutyak
8:20 a.m.	Prevention of Venous Thromboembolism in Trauma Patients	M. Margaret Knudson

Evening

**MODERATOR: PEGGY KNUDSON, M.D.**

4:00 p.m.	Practice Guidelines for Evaluation of the Abdomen in Blunt Trauma Victims; Step One, Identifying Clinical Risk Factors	Brad Cushing
4:20 p.m.	Antithrombin III and Trauma Patients: Factors that Determine Low Levels	Richard Miller
4:40 p.m.	Blunt Carotid Artery Injuries - Multicenter Review	Thomas Cogbill
5:00 p.m.	The Use of Inferior Vena Cava Filters in the Trauma Patient	Steven Matous

**ADJOURN**

# ABSTRACTS



**TITLE:** WHO WARRANTS EXPLORATION FOR A GLUTEAL GUNSHOT WOUND?  
**AUTHOR(S):** DiGiacomo, J.C., MD, Schwab, C.W., MD, Rotondo, M.F.R, MD, Kauder, D., M.D., Angood, P.A., M.D., McGonigal  
**INSTITUTION:** University of Pennsylvania Medical Center  
**PRESENTER:**  
**SENIOR SPONSOR:** Steven Shackford, MD  
**CITY, STATE:** Philadelphia, PA

**Objective:** It is difficult to determine which stable patients with gluteal gunshot wounds warrant exploration since only 22-32% have major injuries. The ability of pre-operative studies to identify major injuries was evaluated to determine which studies accurately identify the presence or absence of injury.  
**Methods:** The hospital records of all patients with gunshot injuries to the gluteal region from 1 Jan 90 to 31 May 93 were retrospectively reviewed. Patients with concomitant non-gluteal wounds between the nipple line and knees were excluded.

**Results:** 52 patients were identified, 19 of whom underwent surgery. 15 had therapeutic laparotomies and 3 had non-therapeutic laparotomies. 33 patients were managed non-operatively, but 1 required laparotomy for a retroperitoneal colon injury on his second hospital day. The mean age and presenting vital signs for the 2 groups were similar. The only mortality occurred in a patient with a concomitant gunshot wound to the head, and was excluded from further analysis. The presence or absence of gross blood in the urine or on rectal exam was 100% accurate in identifying GU and rectosigmoid injuries respectively. Rigid proctosigmoidoscopy was falsely negative in 1 of 4 cases, but 100% accurate when positive. The abdominal exam and the location of the wound above or below the inter-trochanteric line was not predictive of the presence or absence of major injury. X-rays which demonstrated a transpelvic trajectory or a bullet within the pelvis correlated with major injury in 14 of 16 patients. No patients whose pelvic x-rays lacked bony injury or trajectory across the ring of the pelvis had major injuries.

**Conclusions:** 1) Gross blood in the urine, on digital rectal exam, or on proctosigmoidoscopy is 100% predictive of an injury warranting exploration. There were no false negative urine or digital rectal exams, but proctosigmoidoscopy had a false negative rate of 25%. 2) Trajectory across the bony ring of the pelvis is of utmost importance, correctly identifying 14 of 16 patients requiring exploration, with 2 false positives and no false negatives. Gluteal wound location is not predictive of injuries requiring exploration. 3) The combination of physical and rectal exam, pelvic x-ray, and urinalysis identified all major injuries warranting exploration, with no false negatives and a false positive rate of 5.9%.

## NOTES

**TITLE:** PROSPECTIVE EVALUATION OF LAPAROSCOPY IN ABDOMINAL STAB WOUNDS

**AUTHOR(S):** J.M.Dalton M.D., E.J.DeMaria M.D., D.C.Gore M.D, J.M.Kellum M.D., AND H.J.Sugarman M.D.

**INSTITUTION:** Medical College of Virginia

**PRESENTER:** Joseph M. Dalton M.D.

**SENIOR SPONSOR:** Harvey J. Sugarman M.D.

**CITY, STATE:** Richmond, Virginia

To determine if Laparoscopy (L) is beneficial in the evaluation of abdominal stab wounds, we compared L to current abdominal stab wound evaluation in a large urban level I trauma center. 65 patients with stab wounds penetrating the anterior fascia between the nipple line, pubis, and posterior axillary lines over the last 19 months were prospectively evaluated. 26 patients underwent emergent open celiotomy (OC) for hemodynamic instability, peritonitis, or evisceration. The remainder were randomized (by call schedule) into OC or L followed by selective OC (L±O). OC was avoided if L demonstrated no peritoneal penetration (PP), PP with no viscus injury, or PP with a clearly identified injury not requiring treatment. Therapeutic OC (TC) was defined as OC requiring surgical intervention. Results for randomized patients and for all those with injuries not requiring TC are below:

	<u>Randomized</u>			<u>Injury not requiring TC</u>	
	<u>OC only</u>	<u>L±OC</u>		<u>OC only</u>	<u>L±OC</u>
N(%)	13	26	N(%)	15	19
TC	6(46)	7(27)	Non-TC	15(100)	5(26)#
Non-TC	7(54)	5(19)#	Cost(\$±SE)	7886±837	6623±1523*
No C	0(0)	14(54)#	HD(±SE)	5.0±1.6	2.9±1.9*

(p<0.05 vs OC, #Fisher's Exact Test, \*ANOVA; HD=hospital days). Peritoneal lavage (PL) was performed in 28 cases. A positive PL was defined by 5ml of gross blood or >5000 RBC/ml. 8/8 PL's in patients requiring TC were positive. 13/20 PL's in patients that did not require a TC were negative and 7/20 were positive. The data indicate that L decreases cost and hospital stay by reducing the rate of non-TC in stable patients. L did not significantly increase costs in patients who subsequently underwent OC. L prevented unnecessary OC in 14 of 19 patients not requiring TC with no additional morbidity demonstrated on follow-up. 5 of 19 patients without injury required a non-TC following inclusive L. L proved no advantage over a negative PL (0 % false negative rate). If used diagnostically, PL would have prevented 8 L's and 5 non-TC's. This study suggests that the most beneficial algorithm for the treatment of stable abdominal stab wounds begins with PL. Positive PL can then be evaluated by L to help further decrease unnecessary OC.

## NOTES

**TITLE:** CLOSURE OF THE OPEN ABDOMEN

**AUTHOR(S):** D. Sleeman, M.D.; A. Gonzalez, B.S.; J. Sosa, M.D.; M. McKenney, M.D.; I. Puente, M.D.; E. Ginzburg, M.D.;

**INSTITUTION:** Larry Martin, M.D.  
University of Miami School of Medicine

**PRESENTER:** Danny Sleeman, M.D.

**SENIOR SPONSOR:** James A. Edney, M.D.

**CITY, STATE:** Omaha, Nebraska

The Open Abdomen method for the treatment of diffuse persistent peritonitis has gained acceptance in the past decade. Our approach has been to use the zipper technique with daily irrigations in the Surgical Intensive Care Unit (SICU). Once the abdominal problem has resolved, the mesh and zipper are removed. The wound is allowed to contract and a skin graft is placed. Surgeons are reluctant to reoperate on such patients due to the anticipation of a hostile abdomen with severe adhesions.

Our study is a retrospective review of 12 patients admitted to our trauma service and were treated by the open abdomen technique and at a later date reoperated on electively.

The 12 patients (9 trauma, 3 surgical) had a mean age of 38 years (range 22 to 58). They were reoperated on after a mean of 9 months after SICU discharge from the original injury (range 3 - 16 months). The reason for reoperating were closure of enteric fistula in 4, closure of jejunostomy/ileostomy in 3 and closure of a colostomy in 5. Reconstruction of the abdominal wall was undertaken in 9 patients, Prolene Mesh was used in 5 patients. In the other 3 patients, a lateral incision was used to enter the abdomen and reanastomose the bowel. We elected to close the patients with enteric fistula early (3 to 4 months) due to the complexity of wound care in patients with an open abdomen and a fistula.

All patients in our group survived. There were five complications. Two patients had ischemic skin grafts that responded to hyperbaric oxygen (HBO) therapy. Two patients had ischemic flaps which were covering mesh. They also responded to HBO with minimal slough of superficial tissue. One patient developed a low output fistula that closed after two weeks of total parental nutrition.

These results led us to conclude that a history of an open abdomen is not a contraindication for later surgery. Bowel continuity can be restored and abdominal wall reconstruction can be performed safely. This can be done as early as 3 - 4 months after recovery from the original insult. This early approach is recommended in patients with an open abdomen and an enteric fistula.



## NOTES

**TITLE:** INITIAL SONOGRAPHIC ASSESSMENT OF BLUNT ABDOMINAL TRAUMA

**AUTHOR(S):** M. McKenney, M.D.; K. Lentz, M.D.; D. Nunez, M.D.; J.L. Sosa, M.D.; L. Martin, M.D.; A. Axelrod, M.D.; O. C. Kirton, M.D.; D. Sleeman, M.D.; C. Oldham.

**INSTITUTION:** University of Miami/Jackson Memorial Medical Center

**PRESENTER:** Mark McKenney, M.D.

**SENIOR SPONSOR:** Miami, Florida.

**CITY, STATE:**

**INTRODUCTION:** Evaluation of the traumatized abdomen continues to present a clinically challenging picture. Currently diagnostic peritoneal lavage (DPL) and computed tomography (CT) serve as primary diagnostic modalities in the evaluation of patients with suspected blunt abdominal trauma (BAT). DPL is fast and accurate but associated with complications. CT has emerged as an extremely sensitive diagnostic aid, yet requires some degree of stability and transportability of the patients. A prospective study was designed to determine the utility of emergency ultrasound (US) in the initial assessment of BAT.

**PATIENTS AND METHODS:** Two hundred acutely injured patients with suspected BAT were evaluated with emergency US. Patients were eligible for the study if they met trauma criteria and had suspected BAT. Subsequently, without knowledge of the US results, DPL or CT was performed.

**RESULTS:** In this group 145 had subsequent CT while 54 had DPL (see table), one patient was taken directly to surgery. There were 123 patients with a negative US and negative CT, no subsequent intraabdominal injury was identified. There were 40 patients with negative US and negative DPL. There were no missed injuries in this group. Seventeen patients had positive US and subsequent positive CT, in 11 patients positive US was confirmed with positive DPL. Eight of the 200 patients in this study had a CT or DPL that did not correlate. Four patients had a negative US followed by a positive CT. In this group, 3 patients had a small contained liver hematoma with no free fluid and one patient had a splenic laceration with no free fluid. None of these patients required operation. Two patients had a negative US followed by a positive DPL. Both patients were taken to the operating room. One patient, with a marginally positive (130,000 RBC) DPL, at exploratory laparotomy, had a non-bleeding, one centimeter liver laceration that did not require treatment. The second patient was found to have a splenic laceration with 150 milliliters of blood in the abdomen. The spleen was not bleeding. One patient had a positive US followed by a negative DPL. The patient had a subsequent cystogram which revealed an intraperitoneal bladder rupture. The bladder rupture was surgically repaired. If US results had been used in all 200 patients, 199 would have had appropriate care.

CORRELATES		NON CORRELATES	
US (-) AND CT (-)	123	US (-) AND CT (+)	4
US (-) AND DPL (-)	40	US (-) AND DPL (+)	2
US (+) AND CT (+)	17	US (+) AND CT (-)	1
US (+) AND DPL (+)	11	US (+) AND DPL (-)	1
US (+) AND E. LAP (+)	1		
	192		8

We conclude US is reliable in the detection of free intraperitoneal fluid and may be used in place of DPL. The results of US can be obtained more rapidly than DPL. If the US results had been used instead of DPL in our series, no significant injuries would have been missed and one non-therapeutic operation would have been avoided. The sensitivity of US is sufficient to exclude significant injury requiring emergent laparotomy.

NOTES

**TITLE:** Abdominal Trauma Assessment in Pregnancy: Comparison of Computed Tomography (CT) and Diagnostic Peritoneal Lavage (DPL).  
**AUTHOR(S):**  
**INSTITUTION:** J Fildes, M Seymour, S Gilke, C Wey, K Nagy, J Barrett  
**PRESENTER:** Division of Trauma, Cook County Hospital, Chicago, IL  
 John Fildes, MD  
**SENIOR SPONSOR:** Steven Shackford, MD  
**CITY, STATE:** Burlington, VT

**Introduction:** The use of CT for abdominal trauma assessment in pregnancy has been limited because of the concern of increased radiation exposure. This retrospective study from a large urban Level I trauma center compares CT to DPL in 36 pregnant patients.

**Interventions:** Two hundred eleven injured pregnant patients were evaluated from 1982-1993. Ninety of these sustained blunt abdominal trauma. Thirty six required diagnostic studies to evaluate intraperitoneal injuries when their physical exams were unreliable, equivocal or if they would be unavailable for serial exams. CT and DPL were used.

**Results:** Eighteen patients had CT and 18 had DPL. CT was performed on 7 patients in the 1st trimester, 8 in the 2nd and 3 in the 3rd. Necessary diagnostic radiographs were performed in both groups. In 3 patients the CT diagnosed extraperitoneal injuries of the pelvis, lumbar spine and retroperitoneum thus reducing the need for additional radiographs. The table below shows the number of laparotomies (LAP), observations (OBS), delayed laparotomies (DELAY LAP), number of radiologic examinations (XRAY TESTS), maternal radiation dose in Rads (RADS) and fetal survival (FETAL SURVIVAL).

	LAP	OBS	DELAY LAP	XRAY TESTS	MATERNAL RADS	FETAL SURVIVAL
CT (n=18)	2	16	0	2.83 ± 1.07	1.95 ± 1.03	16/18
DPL (n=18)	3	15	0	2.17 ± 1.25	1.10 ± 1.5	15/18
				p = 0.098	p = 0.054	p = 0.50

**Conclusion:** CT and DPL are useful in identifying patients who required laparotomy or observation. No patient required a delayed laparotomy for a missed intraabdominal injury. In addition, CT was useful in the diagnosis and management of extraperitoneal injuries in 3 patients. The number of radiologic procedures, maternal radiation exposure and fetal survival were not different between groups. CT was not associated with increased radiation exposure in this retrospective series and should be evaluated in a prospective study.

## NOTES

**TITLE:** REGIONAL DIFFERENCES IN LYMPHOCYTE  
FUNCTION FOLLOWING HEMORRHAGIC SHOCK

**AUTHOR(S):** J. Tyburski, M.D., L. Diebel, M.D., M. Pieroni, B.S.,  
P. Montgomery, Ph.D., R. Wilson, M.D., I. Zitron, Ph.D.

**INSTITUTION:** Wayne State University

**PRESENTER:** J. Tyburski, M.D.

**SENIOR SPONSOR:** R.F. Wilson, M.D.

**CITY, STATE:** Detroit, MI

Although it is well known that hemorrhagic shock causes immune suppression, there have been no attempts made to define these changes in the various immune compartments. Accordingly, 8 male Fischer rats were bled into severe hemorrhagic shock (MAP  $35 \pm 5$  mmHg x 60 min). Twenty four hours following resuscitation, the animals were sacrificed. Splenic, mesenteric, and peripheral lymphocytes were harvested for analysis by flow cytometry with monoclonal antibodies and mitogen stimulation assays.

The relative number of T-lymphocytes (CD4 and CD8) and B-lymphocytes in three immune compartments in sham animals (n=4) were:

	<u>Peripheral</u>	<u>Mesenteric</u>	<u>Splenic</u>
T Cells	$54 \pm 8\%$	$55 \pm 8\%$	$35 \pm 4\%$
B Cells	$31 \pm 6\%$	$44 \pm 4\%$	$55 \pm 2\%$

Cell marker expression analysis revealed no changes in B cell or T cell subpopulations in splenic, peripheral or mesenteric lymph nodes following shock.

The response to mitogens (sham = 100%) were:

	<u>Peripheral</u>	<u>Mesenteric</u>	<u>Splenic</u>
Concanavalin A (T Cells)	- 49%*	+ 41%	- 45%*
Lipopolysaccharide (B Cells)	+ 8%	+ 15%	- 58%*

\* p < 0.05 Sham vs Shock

Thus, there are different populations of T and B cells in the different immune compartments, and the response to mitogens after shock is considerably varied, with the biggest immune suppression occurring in splenic lymphocytes and peripheral T cells. In contrast, mesenteric T cells mitogen stimulation was actually increased by shock. To our knowledge, this the first demonstration showing these immune compartment differences after shock. Descriptions and mechanisms of these findings need further study.

## NOTES

**TITLE:** ECMO IN THE RESUSCITATION OF MASSIVELY INJURED  
TRAUMA PATIENTS WITH PULMONARY HEMORRHAGING  
**AUTHOR(S):** W.B. Long, MD, M. Perchinsky, MD, J.G. Hill,  
MD, J. Parsons, PA, J. Bennett, CCP, P. Bruhn,  
**INSTITUTION:** RN, J. Pennings, MD, M. Metzdorff, MD  
Emanuel Hospital and Health Center  
**PRESENTER:** Michael Perchinsky, M.D.  
**SENIOR SPONSOR:** Barry C. Esrig, MD  
**CITY, STATE:** Portland, Oregon

We propose that Extracorporeal Membrane Oxygenation (ECMO) with heparin-bonded Cardiopulmonary Bypass Circuits (HBCPBC) might be useful for stabilizing trauma patients dying from hypovolemia, hypothermia, hypoxemia, disseminated intravascular coagulation (DIC), and metabolic acidosis.

We developed in conjunction with Medtronic, Inc. a simplified HBCPBC with a centrifugal pump (Bio-Medicus) and heparin coated percutaneous cannulas (Bio-Medicus) and aortic and atrial cannulas. The HBCPBC and pump is mounted on a cart containing a D/C battery for power during patient transport.

We treated with four consecutive massively injured patients (MIP's) who had potentially survivable injuries but were dying from pulmonary hemorrhaging and hypoxemia, hypothermia, DIC, and metabolic acidosis.

Two patients survived (50%) with excellent neurological and pulmonary recovery. The other two patients died from uncorrectable pulmonary hemorrhaging. The average ISS was 50.

We believe ECMO with HBCPBC offers another dimension for the resuscitation and support of selected massively injured trauma patients.



## NOTES

**TITLE:** DISMAL OUTCOME FROM BLUNT THORACIC AORTIC LACERATION (TAL) IN ELDERLY PATIENTS: A STUDY OF TWO RURAL TRAUMA CENTERS

**AUTHOR(S):** P.C. Camp, Jr., M.D., F.B. Rogers, M.D.\*

**INSTITUTION:** S.R. Shackford, M.D.\*, B.J. Leavitt, M.D., R.A. Cobean, M.D., D.E. Clark, M.D.

**PRESENTER:** University of Vermont/Medical Center Hospital of Vermont; Maine Medical Center

**SENIOR SPONSOR:** P.C.Camp, Jr., M.D.

**CITY, STATE:** S.R.Shackford, M.D.  
Burlington, Vermont / Portland, Maine

The expected survival after blunt thoracic aortic laceration (TAL) in patients who survive to reach the hospital and undergo operation is 70-90%. Numerous studies have shown that age is a predictor of outcome in the trauma patient but little is known regarding the effect of age on outcome after TAL. We hypothesized that elderly patients would have a significantly worse survival after TAL and that surgical intervention would not be of benefit. A 20 year retrospective review of TAL at two regional trauma centers was performed. Patients with TAL were assigned into YOUNG (age < 55 yrs) and OLD (age ≥ 55 yrs) groups and compared with regard to overall survival and outcome of operative and nonoperative treatment. A mean probability of survival (Ps) was calculated on each group utilizing TRISS methodology. Odds ratios (OR) were determined for patient outcome (survive or expire) between age groups and operative intervention. Data are mean ± SEM.

	YOUNG (N=58)	OLD (N=17)	
Ps	0.92±0.21	0.71±0.42	NS
Actual Survival	88%	17%	p < 0.001*
# Operative Pts/ Survivors	52/49 (94%)	11/1 (9%)	OR=163:1; p < 0.001*
# Nonoperative Pts/Survivors	6/2 (33.3%)	6/2 (33.3%)	OR=1:1; NS

+ Fisher's Exact

No survivors of nonoperative treatment died during hospitalization. These data suggest:

- 1) OLD patients have a significantly greater mortality after TAL than YOUNG patients;
- 2) survival in OLD patients after TAL was greater with nonoperative treatment; and
- 3) the ominous outcome in OLD patients with TAL, especially with operative intervention, may support selective nonoperative management in hemodynamically stable patients as has been recently advocated for other major vascular injuries.

## NOTES

**TITLE:** EXPERIMENTAL LETHAL THORACOABDOMINAL AIRGUN  
WOUNDS IN A PORCINE MODEL  
**AUTHOR(S):** H.J. McKenzie, M.D. and J.A. Coil, M.D.  
**INSTITUTION:** Conemaugh Memorial Hospital  
**PRESENTER:** H.J. McKenzie, M.D.  
**SENIOR SPONSOR:** J.A. Coil, M.D.  
**CITY, STATE:** Johnstown, Pennsylvania

The Consumer Safety Commission reports 27,000 airgun injuries annually, two-thirds in children under 14 years; more than 150 serious or lethal pediatric injuries are reported. Pennsylvania restricts sales to minors as a third degree misdemeanor, but not shooting on private property. No experimental studies of lethality exist; animal activism in our county led us to develop a unique model for study.

Study Design: Three commonly available 0.177 caliber airguns with differing speeds were used to generate a spectrum of impact velocities by firing from varying distances. Four common types of projectiles were also compared for perforation. A chronograph measured pellet velocities. A packing plant provided a 60 pound pig, newly killed, which we studied under USDA supervision. Injuries were inflicted on a template, the animal autopsied, and chest and abdominal organs were examined.

Results: The chest wall was 3.2cm thick, the abdomen 2.2cm. Thoracic wall perforation velocity was 407 ft/sec, the abdominal 391 ft/sec. One airgun had an impact velocity of 471 ft/sec at 100 ft. Point tip pellets pierce better than flat tip pellets. Human skin stops an 8 grain pellet up to 330 ft/sec, but when penetrated enough energy remains to pierce muscle and organs. Of 18 projectiles shot at the chest, 8 passed through the chest wall, 4 pierced a rib, and 15 injuries were counted in lung, descending aorta, and diaphragm. Eleven abdominal wall penetrations from 18 missiles produced 49 organ injuries to stomach, liver, gallbladder, small and large intestine. Fecal spill was profuse. The thoracoabdominal wall was perforated at speeds of the common department store retail models.

Conclusions: 1) Ballistic research is possible in unusual surroundings, i.e. a packing plant. 2) Research cost is that of fresh pork per pound. 3) Airguns create lethal wounds in a pig model. 4) Shooter education and safety is important in these lightly regulated weapons.

## NOTES

**TITLE:** EXTENT OF DISABILITY FOLLOWING  
TRAUMATIC EXTREMITY AMPUTATION  
**AUTHOR(S):** D. Livingston MD, D. Keenan MD, J. Elcavage  
RN, D. Kim BA, M. Malangoni MD  
**INSTITUTION:** UMD-New Jersey Medical School, Newark, NJ &  
Case Western Reserve University, Cleveland OH  
**PRESENTER:** Presenter: David H. Livingston, MD  
**SENIOR SPONSOR:** Sponsor: Stephen Ross MD  
**CITY, STATE:** Camden NJ

Extremity amputation remains a devastating injury whose long-term outcome remains unknown. Forty-two patients who sustained traumatic amputation were contacted 3-57 months (mean 25 and median 24 months) after injury to evaluate residual disability and to determine what factors were associated with a good recovery. Patients with severe head injuries were excluded. There were 35 men and 7 women with ages ranging from 5-73 years (mean 34 years). Amputation was due to motor vehicle accidents in 20, work related in 11, motorcycle accidents in 7 and other causes in 4. There were 46 amputations done: 8 above knee (AK), 25 below knee (BK), 5 above elbow (AE), 9 below elbow (BE). 14 patients required amputation revision. 20 patients reported no problems with their prosthesis, 6 had minor (e.g. skin breakdown) and 8 had major problems (e.g. infections). 8 patients did not receive or did not use a prosthesis. Time to be fitted for a permanent prosthesis ranged 2-45 months. 14 patients were discharged to an inpatient rehab facility, 25 to home with outpatient rehab and 3 had no rehabilitation.

Of the 33 people who worked prior to their injury only 16 (48%) returned to work. The amputation level in patients returning to work was BK in 12, BE in 3, and AE in 1. No patient with an AKA and only 1 (9%) patient with a work related injury returned to work. The mean and median time to return to work was 15 and 12 months respectively. Age, associated injuries or inpatient rehabilitation did not correlate with returning to work. 88% of patients were satisfied with their adjustment and could perform all activities of daily living. While physical rehabilitation of traumatic amputees may be acceptable, the rate of return to work is poor. More emphasis on vocational retraining is needed to avoid permanent disability and unemployment.

## NOTES

**TITLE:** BRAIN EDEMA FORMATION AFTER BRAIN INJURY, SHOCK AND RESUSCITATION: EFFECTS OF VENOUS AND ARTERIAL PRESSURE

**AUTHOR(S):** G.T. Trevisani, MD; S.R. Shackford, MD; J. Zhuang, MD; J.D. Schmoker, MD.

**INSTITUTION:** University of Vermont, College of Medicine.

**PRESENTER:** G.T. Trevisani, MD.

**SENIOR SPONSOR:** S.R. Shackford, MD.

**CITY, STATE:** Burlington, Vermont 05401.

Recent work suggests that increased intracranial pressure (ICP) following brain injury and shock is related to the central venous pressure (CVP) following resuscitation. In a porcine model of focal cryogenic brain injury and hemorrhagic shock, we studied CVP, mean arterial pressure (MAP), ICP, and cortical water content (CWC, as specific gravity) at baseline (BL), 45 minutes after shock (H45), and 1, 3, 6, 12, 24 hours (H) after resuscitation. Group (G) 1 was control, G2 brain injury only, G3 shock only, and G4 brain injury and shock. Data are mean±SEM.

	Group	BL	H45	1H	3H	6H	12H	24H
ICP (mmHg)	1	8±2	7±2	8±2	8±2	8±2	10±1	10±1
	2	6±1	13±1*	14±1*	14±1*	14±1*	14±1*	14±1*
	3	6±1	2±1	12±2*	12±2*	14±1*	14±1*	13±1*
	4	6±1	7±1	13±2*	16±2*	17±2*	20±2*	21±3**
CVP (mmHg)	1	9±1	10±1	9±1	10±1	9±1	8±1	8±1
	2	9±1	10±1	10±1	10±1	10±1	9±1	9±1
	3	10±1	6±1	11±1	11±1	11±1	11±1	11±1
	4	9±1	2±1*	7±1	7±1	8±1	8±1	8±1
MAP (mmHg)	1	109±6	105±3	104±3	101±4	94±4	94±5*	99±7
	2	116±4	110±3	109±3	107±4	107±3*	108±3	109±3
	3	107±3	48±1*	90±3*	103±2	98±2	107±3	104±3
	4	110±2	50±1*	100±2	107±2	105±2	107±3	104±3

\*p<0.05, ANOVA; +p<0.05 vs BL

Brain injury significantly increased ICP and CWC. MAP significantly correlated with ICP ( $r=0.54$ ,  $p=0.02$ ) and with CWC ( $r=-0.48$ ,  $p=0.03$ ) in G4 at 24H but not in the other groups at any time period. There was no significant correlation between CVP and ICP or CWC in any group at any time interval. These data suggest that brain edema formation in the injured hemisphere is related to MAP and not CVP, but variability in MAP accounts for only 25% of the variability in CWC and ICP suggesting the importance of factors other than hydrostatic pressure in determining the amount of edema and the ICP after brain injury. Previous work demonstrating the significant correlation of polymorphonuclear leukocyte infiltration with ICP ( $r=0.71$ ,  $p<0.001$ ) and with CWC ( $r=-0.63$ ,  $p<0.001$ ) suggests that inflammation may be one of these factors.



## NOTES

**TITLE:** A PROPOSED GRADING SCALE FOR TRAUMATIC SUBARACHNOID HEMORRHAGE IN NON-PENETRATING HEAD TRAUMA.  
**AUTHOR(S):** F.F. Marciano, M.D., Ph.D.; K.A. Greene, M.D., Ph.D.; B.A. Johnson, M.D.; R. Jacobowitz, M.D.; R.F. Spetzler, M.D.; and T.R. Harrington, M.D.  
**INSTITUTION:** Barrow Neurological Institute, and Department of Mathematics, Arizona State University, Tempe, AZ, USA  
**PRESENTER:** F.F. Marciano, M.D., Ph.D.  
**SENIOR SPONSOR:** Scott R. Peterson, M.D.  
**CITY, STATE:** Phoenix AZ,

Traumatic subarachnoid hemorrhage (SAH) resulting from non-penetrating head injury has been shown to confer a poorer neurological outcome when present on admission computed tomography (CT) scan. No study to date has provided a simple means of characterizing the amount of SAH, its location, or associated other abnormal findings on initial head CT with regard to outcome in patients with non-penetrating head trauma. Admission head CT scans from 252 patients with traumatic SAH were examined prospectively. Thickness of SAH; location; mass lesion(s); shift of midline structures ( $< 5$  mm vs  $> 5$  mm); basal cistern effacement; and hemispheric edema. The CT scans were then graded from I to IV: I = thin SAH ( $< 5$  mm); II = thick SAH ( $> 5$  mm); III = thin SAH with mass lesion(s); and IV = thick SAH with mass lesion(s). Shift of midline structures was not found to be a significant variable in the equation relating admission CT variables to GOS. Chi-squared analysis was then performed between CT grade and GOS. Patients with SAH were matched with non-SAH patients in terms of admission GCS, age, sex, and the presence of one or more types of mass lesion. Patients with non-penetrating head injury and traumatic SAH as a whole have a worse outcome at the time of discharge from acute hospitalization when compared to those without traumatic SAH regardless of admission GCS. Stepwise regression analysis of CT features ranked them in order of contribution to discharge GOS: Basal cistern effacement  $>$  thickness of SAH  $>$  hemispheric edema  $>$  presence of mass lesion(s)  $>$  location of SAH. Relationship between admission CT grade and GOS was found to be highly significant. Patients with lower admission CT grades had a better outcome in terms of GOS than did those with higher CT grades. Our CT grading scale is simple, reliable, and significantly relates to outcome at the time of discharge from acute hospitalization.

## NOTES

**TITLE:** CIVILIAN GUNSHOT WOUNDS OF THE HEAD:ADMISSION GLASGOW COMA SCALE AS A PREDICTOR OF SURVIVAL AND NEUROLOGICAL OUTCOME:

**AUTHOR(S):** Apostolides, P. J., Karahalios, D. K., Greene, K. A., Peterson, S. R., Harrington, T. R.

**INSTITUTION:** St. Joseph Hospital/Barrow Neurological Inst.

**PRESENTER:** P. J. Apostolides, M.D.

**SENIOR SPONSOR:** S. R. Peterson, M. D.

**CITY, STATE:** Phoenix, AZ 85013

Civilian gunshot wounds of the head(GSWH) represent a serious medical problem and a growing public health concern in the United States. Treatment remains controversial and outcome remains difficult to predict. The purpose of this prospective study was to determine whether the admission Glasgow Coma Scale(GCS) was predictive of survival and/or neurologic outcome in patients who presented to our institution after sustaining a GSWH. Each patient was assigned an admission GCS after having received aggressive resuscitation in the trauma room. Other variables including age, circumstance (e.g., suicide/assault) weapon caliber, pupillary response, brainstem function, and radiologic findings were also evaluated. Neurologic outcome was determined at the time of discharge using the Glasgow Outcome Scale. For surviving patients, satisfactory outcome was defined as either resumption of normal lifestyle or disabled but independent; unsatisfactory outcome was defined as either conscious but dependent or vegetative.

Three hundred fifty-six patients with the diagnosis of GSWH presented to our facility from 1986-1992. There were 310 males and 46 females with a mean age of 32.2 years(range one year to 99 years.) Of these patients, 55.7% presented after an attempted suicide. There were 229(64.3%) patients with a GCS of 3-4, 21 ( 5.9%) patients with a GCS of 5-6, 18(5.1%) patients with a GCS of 7-9, 24 (6.7%) patients with a GCS 10-12, and 64(18%) patients with a GCS of 13-15. Overall survival was 32% with a range of 2.2% in those patients representing a GCS of 3-4 to 100% in those patients with a GCS of 13-15. Satisfactory outcome of surviving patients was 84.2% with a range of 40% in patients with a GCS of 3-4 to 95.3% in patients with a GCS of 13-15. The admission of GCS based on this retrospective review was clearly predictive of both mortality and response and brainstem evaluation proved equivocal in predicting outcome. Patients with ocular and/or brainstem abnormalities but with high GCS scores usually had direct injury to one or more cranial nerves. Patients with bihemispheric or unilateral dominant hemispheric injuries had poor outcomes.

We conclude that the post-resuscitation admission GCS is predictive of both survival and neurologic outcome in those patients presenting with a civilian gunshot wound to the head.

## NOTES

**TITLE:** DEATH IN THE OPERATING ROOM - A MULTICENTER REVIEW

**AUTHOR(S):** Sixteen Authors from Eight WTA Member Institutions

**INSTITUTION:** San Diego, CA, Seattle, WA, San Francisco, CA, Nashville, TN, Richmond, VA, Camden, NJ, Burlington, VT, La Crosse, WI

**PRESENTER:** David B. Hoyt, M.D.

**SENIOR SPONSOR:** David B. Hoyt, M.D.

**CITY, STATE:** San Diego, California

To characterize causes of death in the operating room (OR) following major trauma a retrospective review of eight academic trauma centers' admissions (38 total admission years) was conducted to define patterns of ineffective resuscitation, the etiology of death, and challenges for improvement in outcome. 459 OR deaths of 73,215 admissions (.06%) were reviewed for mechanism of injury, physiologic presentation, resuscitation, patterns of injury and operative procedures, cause of death, and then analyzed for preventability.

Blunt injuries accounted for 62%; of penetrating injuries, GSW were 76%. 63% of all patients presented in shock. Average BP was 52 torr at the scene and 62 torr on admission, with shock > 10 min. in 74%, and present prior to operation in 85%. Only 50% were resuscitated to BP > 100 torr before OR. Average time to OR was 37 min. and mean best post resuscitation pH was 7.19 after a mean blood loss of 5195cc and replacement with 4215cc. Mean best OR temp was 32.5 degrees C.

Recurrent injury patterns judged as causing patient death included:

Injury Type	Subtype	Total#	#Blunt	#Penetrating
Head Injury		71	62	9
Chest		118	47	71
	Heart	51	14	37
	Lung	25	9	16
	Aorta	22	18	4
	Vascular	18	4	14
Abdomen		232	143	89
	Liver	82	59	23
	Spleen	23	21	2
	Vascular	44	15	29
	Multiple Inj.	66	33	33
Pelvic/ Retroperitoneal Hem.		27	26	1
Other		30	22	8

Cause of death was head injury - 62 pts, air embolus - 8 pts, irreversible shock (BP<60 torr for >30 min.)-159 pts, and bleeding ( too much from one site, too many sites or coagulopathy)- 408 pts.

A different strategy for improved outcome was identified in 60 patients with the following conclusions: 1. Delayed transfer to OR remains a problem with significant BP deterioration during delay. 2. Combined thoraco-abdominal injuries particularly with thoracic aortic disruption often requires a different sequence to effect optimal results 3. Staged injury isolation and repair to allow better resuscitation and warming may lead to improved results 4. Aggressive evaluation of retroperitoneal hematomas is essential 5. OR management of severe liver injuries remains a technical challenge 6. Resuscitative thoracotomy applied to OR patients in extremis from exsanguination would appear to offer little.

## NOTES

Peel stuck  
GSW

more likely to die

**TITLE:** MANAGEMENT OF CIVILIAN PENETRATING LARYNGOTRACHEAL INJURIES

**AUTHOR(S):** H. Grewal, M.D., P. M. Rao, M.D., S. Mukerji, M.D., R. J. Simon, M.D., R. R. Ivatury, M.D.

**INSTITUTION:** Department of Surgery, Lincoln Medical & Mental Health Center, New York Medical College.

**PRESENTER:** H. Grewal, M.D.

**SENIOR SPONSOR:** Keith F. O'Malley M.D.

**CITY, STATE:** Bronx, N.Y.

**OBJECTIVE:** To evaluate the diagnostic and operative management of civilian penetrating laryngotracheal injuries (PLI).

**METHODS:** We reviewed the records of patients admitted to a Level I trauma center who required operative management for penetrating laryngotracheal injuries (1977-1991). During this period all patients with penetrating neck injuries were managed according to a protocol of selective exploration for patients with: blood in the oropharynx, subcutaneous emphysema, expanding hematoma, voice change, neurologic deficit or a positive diagnostic test. Minor laryngotracheal injuries were repaired by simple suture without tracheostomy; complex injuries required tracheostomy as well as laryngeal/tracheal reconstruction.

**RESULTS:** Of 57 patients with PLI, 36 (63%) were in Zone-II of the neck, 10 (17.5%) in Zone-III, 9 (16%) in Zone-I, and 2 (3.5%) in the chest. 46 (81%) had isolated airway injuries. 11 (19%) had airway and digestive tract injuries. Diagnostic tests performed were (#/positive): Laryngoscopy (17/5), Esophagoscopy (12/0), Contrast swallow (9/2), Angiography (8/2), and Bronchoscopy (3/0). Emergent airway management in 32 (56%) patients included: endotracheal intubation (14), cricothyroidotomy (3), and tracheostomy (15). There were 2 early deaths (3.5%) from associated vascular injury. Management and results according to site are shown below.

SITE (#)	MANAGEMENT (#)	RESULTS (#)
Larynx (18)	Repair, No tracheostomy (5)	Stenosis(1)
	Repair + Tracheostomy (13)	Hoarseness(7)
Trachea (28)	Repair, No tracheostomy (5)	Stenosis(1)
	Repair + Tracheostomy(14)	Hoarseness(3)
	Tracheostomy only (9)	
Combined (11)	Repair+Tracheostomy+Drain (8)	Leak(2),Stenosis(1)
	Repair+Drain,No tracheostomy(3)	

**CONCLUSION:** Endotracheal intubation can be accomplished safely in selected patients with PLI. Digestive tract injuries are often clinically occult and have a high morbidity, therefore early evaluation of the esophagus is vital. Flexible laryngoscopy and angiography are useful in stable patients. Simple repair of PLI may be accomplished safely. In patients with minor injuries, tracheostomy does not appear to be mandatory.



## NOTES

**TITLE:** SERIOUS SKI INJURIES AT AN INTERMOUNTAIN MULTI-HOSPITAL TRAUMA COMPLEX:A THREE YEAR EXPERIENCE  
**AUTHOR(S):** J.M.Poretta, M.D., R.G.Barton, M.D., J.R. Saffle, M.D., M.Mone, R.N.,  
**INSTITUTION:** R.S.Richardson, Ph.D.  
University of Utah, School of Medicine  
**PRESENTER:** J.M. Poretta  
J.R. Saffle  
**SENIOR SPONSOR:**  
**CITY, STATE:** Salt Lake City, Utah

While commonly thought of in terms of orthopedic injuries, alpine skiing can result in severe multiple trauma or death. This study is a retrospective, descriptive review of serious ski injuries managed at Utah level I trauma centers over the three season period from 1989 to 1992, the purpose of which is to demonstrate the incidence, severity and impact of these injuries.

Information was obtained from the medical records of a major university hospital, a pediatric hospital, and a university affiliated private hospital, which collectively, provide all regional level I trauma care. Local slopes support 2.5 million skier visits/year. While National Ski Patrol estimates suggest 2.9 injuries per 1,000 skier visits, only those injuries resulting in emergency admission or death are included in this review.

There were 232 serious injuries requiring hospital admission and 12 deaths. All deaths occurred within 24 hours of injury, and only one patient survived to require hospital admission. The mean age of the victims was 33 (range 6-75) years, with a male:female ratio of 2:1. The mean length of hospital stay(LOS) was 4.6(range 1-29) days. Most injuries resulted from collisions with an inanimate object and half of the patients were transported emergently by helicopter. The mean Injury Severity Score was 7.8 (6.24 in survivors vs 38.8 in nonsurvivors,  $p < 0.05$ ). The average hospital cost was \$8,442.00 (range \$399.00 - \$129,391.00), and cost correlated with LOS and Injury Severity Score ( $p < 0.001$ ). There were 58 head injuries, including closed head injuries, facial/skull fractures and serious soft tissue injuries, and 36 spinal column injuries including 10 unstable cervical spine fractures. There were 41 chest injuries including pulmonary contusion, hemo/pneumothorax and aorta/great vessel injury, and 16 abdominal injuries, most survivors of which required laparotomy. There were 125 major skeletal injuries including 43 femur and 44 tibia/fibula fractures requiring surgery, and 18 pelvic fractures. Thirty two patients required ICU admission with a mean ICU LOS of 2.84(range.1-20) days. One hundred fifty eight patients required surgery and 44 injuries were considered immediately life threatening. At least 10 patients suffered significant permanent disability as a result of head or spinal cord injuries.

In conclusion, injuries sustained as a result of alpine skiing are not limited to orthopedic extremity trauma, but include serious chest, abdominal and debilitating central nervous system trauma and even death. Acute care hospital charges for survivors of these injuries approximated \$2,000,000.00.

## NOTES

**TITLE:** DEATHS FROM MOTOR VEHICLE ACCIDENTS: PATTERNS OF INJURY IN RESTRAINED AND UNRESTRAINED VICTIMS

**AUTHOR(S):** M.J. Swierzewski, M.D., K.A. Illig, M.D., D.V. Feliciano, M.D., U.S. States, M.D.

**INSTITUTION:** University of Rochester, Rochester, NY, and Emory University School of Medicine, Atlanta, GA

**PRESENTER:** Mark J. Swierzewski, M.D.

**SENIOR SPONSOR:** D.V. Feliciano, M.D.

**CITY, STATE:** Atlanta, Georgia

Studies of the patterns of injury in restrained and unrestrained survivors of motor vehicle accidents document significant differences. Similar comparisons of the patterns of injury in restrained and unrestrained nonsurvivors of motor vehicle accidents may also be useful, particularly in redesign of motor vehicles and restraint devices.

The patterns of injury in all 118 nonsurvivors (27 restrained--22.9%, 91 unrestrained--77.1%) of motor vehicle accidents for a four-year period in an urban county (population 1,275,000) were analyzed. A consolidated data base of police accident reports, hospital records, and autopsy reports ensured capture of all nonsurvivors. A comparison of injuries and cause of death between restrained and unrestrained nonsurvivors is presented in the following table (chi sq;  $p < 0.05 = \text{signif}$ ):

Injury	Restrained	Unrestrained	p Value
ISS	47	50	NS
Cranial-- Fractured skull	41%	41%	NS
Intracran. hemorrhage	41%	62%	NS
Cerebral contusion	37%	71%	.002
Thoracic-- Fractured ribs	55%	52%	NS
Cardiac injury	22%	20%	NS
Aortic injury	15%	19%	NS
Abdominal--Hepatic injury	41%	41%	NS
Splenic injury	33%	31%	NS
Pelvic fracture	22%	15%	NS
Cause of Death--Cranial injury	63%	64%	NS

Patterns of injury in restrained and unrestrained nonsurvivors of major vehicle accidents are remarkably similar, with the only significant difference in the incidence of cerebral contusions. Restraints cannot prevent severe deceleration injury and may have minimal effect on contact with the steering wheel or hub in accidents with severe intrusion.

## NOTES

**TITLE:** GASTRIC TONOMETRY SUPPLEMENTS INFORMATION PROVIDED BY SYSTEMIC INDICATORS OF OXYGEN TRANSPORT

**AUTHOR(S):** M.C. Chang, MD, M.L. Cheatham, MD, E.J. Rutherford, MD, L.D. Nelson, MD, J.A. Morris, Jr., MD

**INSTITUTION:** Vanderbilt University Medical Center

**PRESENTER:** M. C. Chang, MD

**SENIOR SPONSOR:** J. A. Morris, Jr. MD

**CITY, STATE:** Nashville, Tennessee

**Hypothesis:** Assessment of splanchnic perfusion by gastric intramucosal pH (pHi) adds to the information provided by systemic indicators of oxygen transport.

**Setting:** University Level I Trauma Center

**Design:** Prospective study comparing pHi with systemic variables of oxygen transport in 20 critically ill trauma patients admitted between January 1 - September 15, 1993. Values studied were: pHi, base deficit (BD), lactate (LAC), mixed venous oxygen saturation (SvO2), oxygen delivery (DO2), and oxygen consumption (VO2). Study patients had an admission BD worse than 5.0 mmol/liter or a LAC greater than 5.0 mmol/liter and a pulmonary artery catheter. All variables were obtained at admission, 1, 2, 4, 8, 16, and 24 hours or at death. pHi was measured using a nasogastric tonometer (TRIP NGS, Tonometrics, Inc.) in a blinded fashion. Data were analyzed using the Fisher exact test and paired or unpaired t-test. Significance was defined at  $p < 0.05$ .

**Results:** Patients with a low pHi ( $< 7.32$ ) on admission who did not correct within the initial 24 hours had a higher mortality (50% vs 0.0%,  $p = 0.03$ ) and incidence of organ dysfunction (Table 1) than those who did. Values for pHi, BD, LAC, SvO2, and DO2 were all different between survivors and nonsurvivors during the first four hours of resuscitation (Table 2).

**Table 1 Organ Dysfunction Rate\***

	Normal	Abnormal	p
pHi	0.62	2.6	.02
BD	1.6	1.6	NS
LAC	1.2	2.1	NS

\* denotes number of organ dysfunctions per patient  
NS = not significant

**Table 2 Mean values - Initial 4 hours**

	Survivors	Nonsurvivors	p
pHi	7.22 ± .18	7.13 ± .11	.002
BD	5.7 ± 2.5	10.5 ± 3.7	<.001
LAC	4.1 ± 2.4	6.0 ± 1.9	<.001
SvO2	.87 ± .08	.63 ± .08	.02
DO2	508 ± 177	428 ± 141	.03
VO2	147 ± 40	146 ± 52	NS

NS = not significant

**Conclusions:** Gastric tonometry reflects splanchnic malperfusion. Uncorrected splanchnic malperfusion is associated with a higher rate of organ dysfunction and mortality. Gastric tonometry supplements the information provided by systemic indicators of oxygen transport.

## NOTES

**TITLE:** CARDIOPULMONARY EFFECTS OF PERMISSIVE HYPERCAPNIA (PHC) IN ADULT RESPIRATORY DISTRESS SYNDROME (ARDS)  
**AUTHOR(S):** JB Haenel, RC McIntyre, Jr, FA Moore, RR Read, J Burch, EE Moore  
**INSTITUTION:** University of Colorado Health Sciences Center and Denver General Hospital  
**PRESENTER:** RC McIntyre, Jr, MD  
**SENIOR SPONSOR:** FA Moore, MD  
**CITY, STATE:** Denver, Colorado

**Background:** Despite numerous advances, the mortality of ARDS remains high. Traditional ventilator management in ARDS has been to maintain normal PaCO<sub>2</sub> by positive pressure ventilation (PPV). However, high levels of PPV may worsen the lung injury. PHC has been proposed as an alternative method of ventilation, but the resulting respiratory acidosis may adversely affect the hemodynamics of the hyperdynamic, critically ill patient. The purpose of this study was to determine the effect of PHC on cardiopulmonary performance in severe ARDS.

**Methods:** Nine men and 5 women with established ARDS (mean Murray lung injury score 3.39, range 2.5-4.0) were entered into a prospective protocol when the static pulmonary plateau pressure (SPPP) exceeded 40 cm H<sub>2</sub>O. The initial tidal volume (Vt) was decreased to achieve a SPPP <40 cm H<sub>2</sub>O or to a lower limit of 5 cc/kg. Serial arterial blood gases and hemodynamic data were obtained. Data below represent the group mean ± SEM. Analysis was by ANOVA, \*p ≤ 0.05 significant vs. baseline.

**Results:** Mean age was 33.9 (range 16-62). PHC resulted in a significant decrease in the Vt (10.1 ± 0.5 vs. 7.7 ± 0.5 cc/kg\*), minute ventilation (Ve: 18.0 ± 1.6 to 11.9 ± 0.7 L/min\*), and peak airway pressure (PAP: 55 ± 2 vs. 45 ± 3 cm H<sub>2</sub>O\*) at 24 hours.

	Baseline	1 hour	12 hours	24 hours
PaO <sub>2</sub> /FIO <sub>2</sub>	91.4 ± 7.4	93.6 ± 9.2	100.6 ± 9.9	99.8 ± 9.2
PaCO <sub>2</sub> (torr)	37.9 ± 1.3	49.3 ± 1.8*	55.3 ± 1.8*	56.7 ± 3.0*
pH	7.41 ± 0.01	7.34 ± 0.02*	7.31 ± 0.01*	7.31 ± 0.01*
PVR	276 ± 42	279 ± 47	239 ± 33	229 ± 39
CI	4.5 ± 0.3	4.7 ± 0.3	4.8 ± 0.3	4.7 ± 0.3
DO <sub>2</sub> I	636 ± 57	691 ± 55	720 ± 42	731 ± 41
VO <sub>2</sub> I	170 ± 12	175 ± 10	156 ± 10	187 ± 17

PVR=pulmonary vascular resistance, CI=cardiac index, DO<sub>2</sub>I=oxygen delivery index, and VO<sub>2</sub>I=oxygen consumption index. There were 4 deaths (Mortality: 28.6%).

**Conclusions:** PHC: 1) decreased PAP and Ve while maintaining oxygenation, 2) causes a mild partially compensated acidosis, 3) does not adversely affect PVR, CI, DO<sub>2</sub>I, and VO<sub>2</sub>I, and 4) appears to improved survival. Future studies should be done to compare PHC with conventional ventilation in ARDS.



## NOTES

**TITLE:** EVALUATION OF AN IMMUNE-ENHANCING DIET FOR IMMEDIATE POSTINJURY ENTERAL FEEDING

**AUTHOR(S):** F.Moore, E.Moore, K.Kudsk, C.Baker, M.Koruda, R.Brown, R.Bower, A.Barbul

**INSTITUTION:** Denver General, Presley Memorial, UNC, UCMC, Johns Hopkins

**PRESENTER:** Frederick A. Moore, M.D.

**SENIOR SPONSOR:** Frederick A. Moore, M.D.

**CITY, STATE:** Denver CO, Memphis TN, Chapel Hill NC, Cincinnati OH, Baltimore MD

Animal studies suggest that arginine, glutamine, nucleic acids and omega-3 fatty acids are immune-enhancing (IE). This prospective study randomized severely injured patients to early feeding with either an IE diet [(IED) Immun-Aid<sup>®</sup>] or a standard enteral diet [(SED) Vivonex<sup>®</sup>TEN]; 98 of 105 high risk patients (IED: n=51; SED: n=47) completed the study. Groups were comparable in age, injury mechanism and Injury Severity Scores (IED =  $20.6 \pm 1.2$ , SED =  $21.8 \pm 1.2$ ). Mean intake (IED =  $24 \pm 1$  Kcal/kg/d, SED =  $24 \pm 1$  Kcal/kg/d), GI intolerance (IED = 22%, SED = 30%), pneumonia (8% each group), hospital stay (IED =  $14.6 \pm 1.3$ , SED =  $17.2 \pm 2.8$ ) and deaths (IED = 2%, SED = 4%) were not significantly different. IED resulted in the following significant differences (Mean  $\pm$  SEM, Fisher's Exact Test for nominal variables, Wilcoxon Rank Sum for comparing changes in lymphocyte counts from day 0 to day 7):

	IED	SED	p value
Abdominal Abscess n (%)	0	5(11%)	0.02
Multiple Organ Failure n (%)	0	5(11%)	0.02
Change in Total Lymphocytes	+630 $\pm$ 160	-250 $\pm$ 300	0.014
Change in T Lymphocytes	+530 $\pm$ 110	-180 $\pm$ 230	0.004
Change in Helper Cells	+450 $\pm$ 60	+50 $\pm$ 150	0.004

Conclusion: This multi-institutional study confirms that an IED enriched with arginine, glutamine, nucleic acids, and omega-3 fatty acids is well tolerated and associated with improved lymphocyte proliferation, fewer abdominal abscesses, and less MOF than a standard enteral diet.

## NOTES

**TITLE:** FUNCTIONAL EQUIVALENCE OF HYPOTHERMIA TO SPECIFIC CLOTTING FACTOR DEFICIENCIES

**AUTHOR(S):** T.D. Johnston, M.D., Y. Chen, M.S., R. L. Reed, II, M.D.

**INSTITUTION:** The University of Texas Medical School at Houston and Duke University Medical Center

**PRESENTER:** Thomas D. Johnston, M.D.

**SENIOR SPONSOR:** R. Lawrence Reed, II, M.D.

**CITY, STATE:** Box 3501, Duke University Medical Center, Durham, NC 27710

Hypothermia produces abnormalities in kinetic clotting tests when the tests are performed at hypothermic temperatures, in contrast to standard clinical clotting test performance methods. The ability to determine the functional impairment produced by a hypothermic environment in terms of an equivalence to specific clotting factor deficiencies was assessed in these experiments. Clotting factor concentration curves were constructed for clotting factors II, V, and VII through XII using assayed reference plasma (ARP) diluted with specific factor-deficient plasmas (FDP). Prothrombin times (PT) and partial thromboplastin times (PTT) were performed as appropriate for each factor at assay temperatures ranging from 37° to 25° C using a modified fibrometer. The clotting times obtained at each temperature for undiluted ARP were compared to the clotting time at 37° C obtained with FDP dilution. The clotting factor activity equivalency of normal plasma at hypothermic temperatures is tabulated:

Factor→	II	V	VII	VIII	IX	X	XI	XII
° C ↓								
25	5%	3%	5%	0%	0%	4%	2%	1%
27	7%	5%	7%	0%	0%	6%	2%	1%
29	10%	8%	12%	3%	3%	10%	4%	1%
31	17%	22%	34%	16%	7%	20%	16%	10%
33	24%	50%	60%	59%	32%	44%	60%	17%
35	82%	75%	82%	79%	66%	81%	85%	65%
37	100%	100%	100%	100%	100%	100%	100%	100%

Thus, hypothermia at temperatures below 33° produces a coagulopathy that is functionally equivalent to significant (<50% of normal activity) factor-deficiency states under normothermic conditions. Furthermore, temperatures ≤ 31° C should produce a clinical coagulopathy. This functional impairment in hypothermic patients is not represented by standard clinical clotting tests.

## NOTES

**TITLE:** EFFECTS OF DIASPIRIN CROSSLINKED HEMOGLOBIN ON BLOOD PRESSURE, BLOOD LOSS AND SURVIVAL IN A MODEL OF UNCONTROLLED HEMORRHAGE

**AUTHOR(S):** S. Schultz, MD, C. Powell, MD, D. Burris, MD, H. Nguyen, BS, J. Jaffin, MD and D. MalcolmPhD

**INSTITUTION:** Dept. of Surgery, Uniformed Services University of the Health Sciences, Bethesda, MD 20814

**PRESENTER:** Scot Schultz, M.D.

**SENIOR SPONSOR:** Mims Gage Ochsner, Jr., MD, FACS

**CITY, STATE:** Bethesda, Maryland

Successful resuscitation of critically injured trauma victims requires the rapid restoration of intravascular volume and pressure to maintain adequate tissue perfusion and oxygen delivery. Controversy exists whether early aggressive fluid therapy worsens outcome by increasing blood loss from injured vessels. Since diaspirin crosslinked hemoglobin (DCLHb™; Baxter Healthcare Corp.) is a vasoactive oxygen-carrying solution which holds promise as a resuscitative fluid, we chose to compare the effects of DCLHb to other resuscitative fluids on blood loss and survival in a model of uncontrolled hemorrhage.

Anesthetized rats (250-350 grams) were subjected to a 50% tail transection. Fifteen minutes following injury, animals were resuscitated with 1:1 DCLHb, 3:1 lactated Ringer's solution (LR), 1:1 hypertonic saline (7.5% HTS) or 1:1 human serum albumin (8.3% HSA) based on volume of blood loss. An unresuscitated group (DNR) served as a control. Blood was collected for 5 hrs and mean arterial pressure (MAP) was continuously monitored. MAP data were analyzed using ANOVA with Dunnett's test and survival data were analyzed using Chi-Square;  $p \leq 0.05$  was significant.

**RESULTS:** 50% tail transection resulted in  $4.7 \pm 0.3$  ml/kg blood loss and a decrease in MAP of  $19.2 \pm 3.8$  mm Hg over 15 minutes.

group n=10-12	baseline (mm Hg)	15 min PR (mm Hg)	1 hr PR (mm Hg)	3 hr PR (mm Hg)	blood loss PR (ml/kg)	24 hr survival
DNR	102±3	84±6	78±6#	80±8	6.9±3	9/12
DCLHb	103±6	111±8	88±8	90±4	14.3±3*	7/11
LR	101±4	62±5#	58±4#	66±5#	16.6±3*	7/12
HTS	101±5	69±8#	59±5#	75±10	20.3±4*	5/11
HSA	102±5	78±8#	61±7#	60±8#	26.7±4*@	6/10

PR = post-resuscitation; # =  $p \leq 0.05$  compared to treatment group baseline; \* =  $p \leq 0.05$  compared to DNR; @ =  $p \leq 0.05$  compared to DCLHb

DCLHb restored and maintained MAP to baseline better than all other resuscitative fluids. Although blood loss in DCLHb-resuscitated animals was greater than in unresuscitated animals, it was no different from other resuscitative fluids and less than HSA. Furthermore, there was no difference in 24 hr survival between all treatment groups. In conclusion, resuscitation with DCLHb elevates MAP but does not exacerbate blood loss or influence survival compared to other resuscitative fluids in this model of uncontrolled hemorrhage. Compared to other resuscitative fluids, DCLHb may improve tissue perfusion and oxygen delivery without increased blood loss from injured vessels.

## NOTES

**TITLE:** INFLUENCE OF REAMER TYPE ON LUNG FUNCTION AFTER INTRAMED. NAILING IN SHEEP.

**AUTHOR(S):** H.-C. Pape M.D., G. Regel M.D., M. Grotz M.D.

**INSTITUTION:** A. Dwenger PhD, J. Sturm M.D., H. Tischerne M.D.

**PRESENTER:** Dept. of Trauma Surgery, Hannover Med. School  
30625 Hannover, GERMANY

**SENIOR SPONSOR:** H.-C: PAPE  
J.A. Morris

**CITY, STATE:** Hannover, Germany

**Introduction:** In multiple trauma patients with associated lung contusion primary (<24 hrs.) intramedullary femoral nailing after reaming can cause adverse effects on pulmonary function and permeability. Different modes of intramedullary stabilization therefore have been discussed to allow primary fracture reduction of the femur without the risk of impairment of lung function. We evaluated different reaming systems with regard to pulmonary effects in the presence of lung contusion in a large animal model. **Methods:** Staub Sheep model (lung lymph fistula), Protocol: day 1: two hrs. hem. shock + lung contusion, day 2: recuperation, day 3: Reamed intramedullary femoral nailing. Groups: gr. A (n=13): flexible AO-reamers, gr. B (n=7): flexible wire reamer (Biomet 698048), Gr. H (n=6): flexible reamer (Howmedica, 0222-0120). gr. C (n=2): no femur instrumentation. **Parameters:** Pulmonary artery pressure (PA, mmHg), lymph/plasma protein-clearance (PCL, ml/30 min.), central venous triglyceride concentrations (TG, mg/dl) **Statistics:** Student T-test ( $p < 0.05$ , \*=significant difference between groups / += significant to baseline). **Results:**

	DAY 3					Basel. ream.	
	Basel.	ream.	30'	60'	120'	DAY 3	Basel. ream.
A (PCL)	3.7	4.3	6.5	7.7+*	8.56*+	A (PA)	19.0 26+*
B (PCL)	5.2	5.3	3.9	3.9	3.7	B (PA)	20.1 25.5*
H (PCL)	3.3	3.9	3.8	3.6	2.8	H (PA)	19.7 19.3
C (PCL)	3.2	3.6	3.1	3.4	3.3	C (PA)	19.5 19.9

In Gr. A animals TG (18.3 mg/dl basel. to 33.0 ream.,  $p < 0.05$ ) and PA rose intraoperatively, PCL increased postoperatively, indicating lung dysfunction ( $p < 0.05$ ). Gr. B showed an increase of PA, but no TG or PCL rise; in other groups reaming or ext. fixateur caused no change of PA, TG or PCL.

**Conclusions:** Pulmonary damage and pulmonary vascular changes after intramedullary reaming are reduceable according to the type of reamer used. In multiple trauma patients with lung contusion unreamed nailing might offer an alternative. If reaming is inevitable due to the type of fracture, the indication for reamed femoral nailing should be carefully evaluated. Further clinical studies appear justified.



## NOTES

**TITLE:** EARLY EXCHANGE IM NAILING OF DISTAL FEMORAL  
FRACTURES WITH ASSOCIATED VASCULAR INJURY  
**AUTHOR(S):** INITIALLY STABILIZED WITH EXTERNAL FIXATION  
W.Iannacone, M.D.,W.DeLong,Jr.,M.D.,C.Born,M.D.  
**INSTITUTION:** R.Dalsey,M.D.,R.Taffet,M.D.  
Cooper Hospital/University Medical Center  
**PRESENTER:** Robert Taffet, M.D.  
William Iannacone, M.D.,Ph.D.  
**SENIOR SPONSOR:**  
**CITY, STATE:** Camden, New Jersey 08103

Fractures of the distal femur with vascular injury requiring repair are uncommon injuries. These injuries are frequently open and may be severely contaminated. The primary goal of treatment is rapid restoration of perfusion to the dysvascular limb and skeletal stabilization. Treatment options for extra-articular fractures of the distal femur with accompanying vascular injury include immediate external fixation followed by vascular repair, or vascular shunting followed by internal fixation and subsequent definitive vascular repair. Initial treatment with external fixation has the advantage of rapid simple fracture stabilization allowing easy access for vascular repair and wound care. The disadvantages of external fixation treatment include pin tract problems, pin loosening, quadriceps scarring, and joint stiffness. Delayed exchange of an external fixator to an intramedullary (IM) nail has been associated with a significantly increased infection rate in the tibia. The reported interval between the removal of the external fixator and IM nailing averaged over two months. Early primary exchange of external fixator to IM nail has not been reported for the tibia or femur. The advantages of early primary exchange would include reduction of external fixator complications and shorter hospitalization by alleviating the need for interval traction.

Over a twenty month period from 12/91 through 7/93 five patients presented to a Level I Trauma Center with six fractures of the distal femur associated with arteriography proven vascular injury. Four fractures were open, three secondary to gunshot wounds and one secondary to blunt trauma. Initial treatment consisted of uniplanar external fixation with wound and fracture debridement as necessary followed by definitive vascular repair.

Primary exchange IM nailing was then performed an average of twelve days (range 3 to 20 days) following initial treatment. Three fractures were treated with a retrograde supracondylar IM nail, three with a non-reamed antegrade IM nail. One patient required bone grafting for bone loss sustained at the time of the original injury.

All fractures demonstrated bony union without evidence of infection at an average follow-up of 10 months (range 3 to 23 months). There were no problems related to the vascular repair. We are cautiously optimistic that this treatment sequence will prove to be a safe, efficient management protocol for these difficult injuries.

## NOTES

**TITLE:** THE ILIZAROV METHOD FOR COMPLEX FRACTURE  
NONUNIONS  
**AUTHOR(S):** DiPasquale D, Ochsner MG, Champion HR  
**INSTITUTION:** Washington Hospital Center  
**PRESENTER:** Doreen DiPasquale, MD  
**SENIOR SPONSOR:** M. Gage Ochsner, MD  
**CITY, STATE:** Washington, DC

**Introduction:** Fracture complications of infection and nonunion continue to challenge orthopedic trauma surgeons. Traditional surgical management of these complications results in a successful outcome in only seventy percent of these patients. The Ilizarov method of managing fracture nonunions has been reported to be more effective than traditional methods, in Europe, with successful outcomes in at least ninety percent of cases. We decided to evaluate the efficacy of the Ilizarov method for managing orthopedic trauma patients with nonunions of lower extremity fractures.

**Methods:** Patients were selected for the Ilizarov Method based on the presence of a nonunion extremity fracture and: 1) treatment failure with traditional methods, 2) significant bone loss, 3) severe infection. Principles of management include surgical debridement, stabilization with a small wire external fixator, and bone regeneration for defects. During treatment, function is stressed, patients are required to perform intense physical therapy and return to activities of normal life are mandatory.

**Results:** Since March of 1991, seventeen patients have been treated with the Ilizarov for complex nonunions. Thirteen nonunions were secondary to infection, eight of which were a result of Grade III open fractures and five were associated with hardware and multiple orthopaedic operations. The four nonunions not associated with infection were due to malreduction or mechanical failure. Fractures involved the upper or lower extremity in 3 and 14 patients respectively. Ten of the 17 patients (60%) had failed traditional treatment for fracture nonunion. Time needed to achieve union (3-12 months, mean=6 months) depended upon the extent of resected infection and bone regeneration required. A united fracture was achieved in 16/17 (94%) patients, all of whom have returned to work with a functional extremity. In nine patients, the only other recourse was amputation.

**Conclusions:** Our results indicate that the Ilizarov method is superior to traditional techniques of managing fracture nonunions and allows early return to a productive lifestyle for trauma patients with this complication.

## NOTES

**TITLE:** THE UNRELIABILITY OF INITIAL CHEST RADIOGRAPHS AND CT SCANS IN EVALUATING DIAPHRAGMATIC RUPTURE.  
**AUTHOR(S):** Marc J Shapiro, MD, Elizabeth Heilberg, MD,  
**INSTITUTION:** Rodney M Durham, MD, William B Luchtefeld, RN, MSN, Department of Surgery/Division of Trauma Surgery and Department of Radiology, St. Louis University Health Science Center, St. Louis, Missouri. Senior sponsor: Frederick Moore, MD, Denver, Colorado  
**PRESENTER:**  
**SENIOR SPONSOR:**  
**CITY, STATE:**

The diagnosis of blunt traumatic diaphragmatic rupture continues to elude surgeons and radiologists. No "gold standard" for early and reliable diagnosis exists. Over the past four years, seventeen patients with blunt diaphragmatic rupture were identified. Ten patients, all involved in motor vehicle accidents, had both chest x-ray and CT scan prior to going to the operating room and serves as the basis of this report. The average age was 32.6 years with 8 (80%) males and 8 (80%) unbelted automobile occupants. The average injury severity score was 31.9 (range 11-42) and no patient died. Only one patient had the diagnosis made (by digital thoracostomy) while they were on the ventilator, although 6 patients were intubated sometime prior to the diagnosis and going to the operating room. ( $p \leq .05$  when compared to no preop intubation). Evaluation of the initial chest x-ray was diagnostic with the nasogastric tube and/or stomach bubble in the left chest in three cases (not intubated), suggestive in two cases (elevated hemidiaphragm) and not suggestive in five cases. The three diagnostic CT scans were on patients with diagnostic chest x-rays. Chest x-ray and CT scan interpretations did not change when reviewed by an outside radiologist. The diagnosis was made in the other patients as follows: operatively (2), digital thoracotomy (1), and delayed presentation on chest x-ray (all recently extubated) (3). Positive pressure ventilation significantly impedes diagnosis as it prevents upward displacement of the hemidiaphragm. Caution should be exercised when utilizing CT scanning and chest x-ray for diagnosing diaphragmatic rupture.

## NOTES

**TITLE:** ROLE OF PANCREATOGASTROSTOMY FOLLOWING  
PANCREATODUODENECTOMY FOR TRAUMA

**AUTHOR(S):** R. Delcore, M.D., J. Stauffer, M.D.,  
J.H. Thomas, M.D., G.E. Pierce, M.D.

**INSTITUTION:** University of Kansas Medical Center

**PRESENTER:** R. Delcore, M.D.

**SENIOR SPONSOR:** G.E. Pierce, M.D.

**CITY, STATE:** Kansas City, Kansas

Pancreatoduodenectomy is rarely indicated for trauma and less than 160 cases have been reported. Although recent reports have demonstrated a sharp decline in the morbidity and mortality associated with this operation in trauma patients, the pancreatic anastomosis continues to be the major cause of complications following pancreatoduodenectomy. This study was undertaken in order to evaluate the role of pancreatogastrostomy as an alternate method of restoring pancreato-intestinal continuity following severe pancreatic injuries that require either pancreatoduodenectomy or pancreatic reconstruction.

Since 1975, eighty-five consecutive patients have undergone pancreatogastrostomy following pancreatoduodenectomy for the treatment of neoplastic disease at our institution. No pancreatic anastomotic leaks or other complications related to the pancreatogastrostomy have occurred. In addition, five patients with a mean age of 26.4 years (range 20-32 years) suffered severe penetrating (n=3) or blunt (n=2) traumatic injuries that required pancreatoduodenectomy followed by pancreatogastrostomy (n=4) or pancreatogastrostomy alone (n=1). The mean trauma score for these five patients was 12 (range 9-15) and other injured organs included inferior vena cava (n=1), portal vein (n=1), superior mesenteric vein (n=2), superior mesenteric artery (n=1), right lobe of the liver (n=2), left lobe of the liver (n=1), gallbladder (n=1), common bile duct (n=3), left diaphragm (n=2), duodenum (n=3), jejunum (n=4), small bowel mesentery (n=2), spleen (n=1), and colon (n=1). All five patients had soft, previously normal pancreatic glands without induration or ductal dilatation. The mean duration of operation was 6.4 hours (range 5-7 hrs), mean blood loss was 7,200 cc (range 1,000-17,500 cc), mean transfusion requirements were 13.8 units of blood (range 2-32 units), mean hospital stay was 37 days (range 11-90 days). Two patients developed right upper quadrant abscesses that required re-operation. There were no pancreatic anastomotic leaks or other complications related to the pancreatogastrostomy. All five patients are alive and well and have not developed endocrine or exocrine pancreatic insufficiency after a mean follow-up of 41 months (range 6-103 months).

Our overall experience with pancreatogastrostomy confirms that it is a safe method of handling the pancreatic remnant following pancreatoduodenectomy. Furthermore, the results of this study suggest that pancreatogastrostomy may have several technical advantages when handling soft, previously normal pancreatic glands and, therefore, may be preferable to pancreatojejunostomy as a drainage procedure following pancreatoduodenectomy in trauma patients.



## NOTES

**TITLE:** NON-OPERATIVE MANAGEMENT OF BLUNT  
HEPATIC INJURIES: SAFE AT ANY GRADE?  
**AUTHOR(S):** HF Sherman, MD, BA Savage, RN,  
BA Latenser, MD, CE McAuley, MD,  
**INSTITUTION:** JR Varcelotti, MD, et al  
The Mercy Hospital of Pittsburgh  
**PRESENTER:** Harold F. Sherman, MD  
**SENIOR SPONSOR:** Harold F. Sherman, MD  
**CITY, STATE:** Pittsburgh, Pennsylvania

Non-operative management (NOM) of blunt hepatic injuries (BHI) has become more widely accepted. A prospective protocol was undertaken in which no patient was excluded from NOM solely on the basis of the CT grade of BHI. All patients with BHI diagnosed by CT scan between July 1990 and June 1993 were considered for NOM. Patients were excluded only if they manifested hypotension which could not be promptly corrected, the presence or suspicion of any other injury requiring laparotomy, or would be unavailable for continued monitoring. Admission CT scans were interpreted by the attending trauma surgeon and later graded (AAST system) by an attending radiologist blinded to clinical events. All patients underwent close hemodynamic monitoring and frequent examination. Patient progress was followed by serial determination of liver enzymes and hematocrit and by serial CT scans.

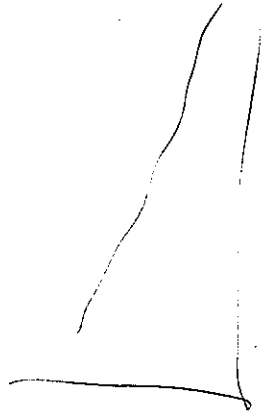
Continuous variables were analyzed by t-test and linear and stepwise regression, categorical variables by chi square.

During the study period 51 patients were treated for BHI. Of these, 28 underwent NOM (Group 1). The remaining 23 (Group 2) had other indications for laparotomy. The groups were statistically similar in age, sex, and injury severity score (ISS).

There were no deaths, hepatic complications, or delayed laparotomies for any reason in the NOM group (Group 1). The groups did not differ with regard to ICU or total hospital stay when analyzed as independent variables or by linear regression with control for BHI grade and ISS. Transfusion requirements (TR) were not significantly different either independently or when controlled for BHI grade and ISS. Trauma scores were significantly lower for Group 2 ( $p=.004$ ). For both groups, length of ICU stay was predicted by TR but not by BHI grade or ISS.

NOM of BHI is a safe, effective, and efficient technique applicable to all hemodynamically stable patients who lack other indications for laparotomy.

NOTES



**TITLE:** IS TRIPLE CONTRAST CT SCANNING USEFUL IN THE SELECTIVE MANAGEMENT OF STAB WOUNDS TO THE BACK

**AUTHOR(S):** E McAllister, MD; M Perez, MD;

**INSTITUTION:** S M Olson, RN; M Camps, BS; R Kramer, BS; MH Albrink, MD; AS Rosemurgy, MD

**PRESENTER:** University of South Florida

**SENIOR SPONSOR:** Earl W McAllister, MD  
Alexander S Rosemurgy, MD

**CITY, STATE:** Tampa, FL

**OBJECTIVE:** Patients with retroperitoneal injuries due to stab wounds to the back may present with few symptoms or signs. For these patients, mandatory exploration results in a high non-therapeutic celiotomy rate while expectant management carries fear of missed injury. In an attempt to limit the number of non-therapeutic celiotomies and improve expectant management, we devised a protocol to prospectively manage stab wounds to the back. **METHODS:** Through protocol, all back stab wounds in hemodynamically stable adults were locally explored. All patients with fascial penetration underwent triple contrast (oral, rectal, IV) CT scans. Patients did not undergo operative exploration if their CT scans were negative or if the CT scans documented isolated findings not necessitating operative exploration, such as simple splenic or liver injuries. This report details our experience with selective management of hemodynamically stable patients with stab wounds to the back which penetrated the fascia of the superficial musculature. **RESULTS:** 53 patients experienced stab wounds to the back penetrating the fascia of the superficial musculature and were hemodynamically stable. These 53 patients, per protocol, underwent triple contrast CT scans. The time to complete the triple contrast CT ranged from 3 to 6 hours (average 3.5 hrs) at a cost of \$1050.00/scan. In 51 (96%), the CT scans were either negative (in 31) or showed injuries not requiring operative exploration (in 20), including soft tissue hematomas, retroperitoneal hematomas, perinephric hematomas, or superficial liver injuries. These 51 patients did well with non-operative management. Two CT scans documented significant injury (pneumoperitoneum in one clinically developing peritonitis and a large retroperitoneal hematoma in another) and led to operative exploration and therapeutic celiotomy. No non-therapeutic celiotomies were associated with this protocol and in no patients did selective management fail to detect a notable injury. The average cost of detecting injuries requiring operative exploration by this test was \$27,300.00. **CONCLUSIONS:** Patients with stab wounds to the back can be selectively managed safely. Most patients with fascial penetration avoided celiotomy. The few patients that underwent operative exploration did so appropriately. In no patients did selective management fail to detect a notable injury. Triple contrast CT scanning is able to detect occult injuries due to stab wounds to the back. However, those scans are obtained at considerable cost and rarely alter clinical care.

## NOTES

**TITLE:** DO PREHOSPITAL TRAUMA CENTER TRIAGE CRITERIA  
IDENTIFY MAJOR TRAUMA VICTIMS

**AUTHOR(S):** T. Esposito, MD, P. Offner, MD, G. Jurkovich, MD, J. Griffith, MA, R. Maier, MD.

**INSTITUTION:** Harborview Injury Prevention and Research Ctr. and the Washington State Dept. of Health, Olympia, WA.

**PRESENTER:** T. Esposito, MD

**SENIOR SPONSOR:** G. Jurkovich, MD

**CITY, STATE:** Seattle, WA

**OBJECTIVE:** To evaluate prehospital triage criteria as indicators of a major trauma victim (MTV).

**METHODS:** Anatomic, physiologic and mechanism of injury prehospital trauma center triage criteria were evaluated in a state without a trauma system or trauma center designation. The subjective criterion of provider "gut feeling" was also employed. Injured patients treated by EMS personnel state wide during one year were prospectively entered into the study if at least one triage criterion was met. Mortality and yield of MTV's were determined for each criterion applied singularly and in combination with one or more others. MTV was defined as having a retrospectively calculated ISS  $\geq$  16.

**RESULTS:** 5728 patients were entered into the study, 3007 cases exhibited a singular entry criterion.

SINGULAR CRITERION	#CASES	% MTV	% MORTALITY	YIELD
Prolonged prehospital time	33	39	13	} HIGH
*Pedestrian struck > 30 mph	119	35	18	
Physiologic	161	32	11	
*Occupant Death	17	23	19	} INTERMED
Anatomic	386	23	7	
Intrusion	134	23	7	
30" Deformity	174	25	5	
Ejection	281	24	7	} LOW
Provider "gut feeling"	210	15	5	
Fall > 20 ft.	719	13	6	
Rollover	412	12	3	
Comorbid factors	361	11	5	

When applied singularly, triage criteria tended to stratify into high, intermediate and low yield groups. Addition of one or more other criteria to any low or intermediate yield criterion increased the yield of MTV and associated mortality.

**CONCLUSIONS:** A limited set of high yield prehospital criteria are reliable indicators of a MTV. Isolated low and intermediate yield criteria may not be useful for initiating trauma center triage or full activation of hospital trauma teams.

*Physiologic  
ped struck  
occ death*

## NOTES

**TITLE:** FALLS: EPIDEMIOLOGY AND STRATEGIES FOR PREVENTION  
**AUTHOR(S):**  
**INSTITUTION:** A. Mosenthal M.D., D. Livingston M.D., J. Elcavage R.N., S. Merritt P.A., S. Stucker P.A.  
**PRESENTER:** UMDNJ-New Jersey Medical School, Newark, NJ  
**SENIOR SPONSOR:** Presenter: Anne C. Mosenthal, MD  
Sponsor: Frederick A. Moore MD  
**CITY, STATE:** Denver, CO

Traumatic injury secondary to falls is a largely preventable public health problem. To define better prevention strategies, we reviewed the records of 324 patients admitted to our trauma center over the past 30 month period with injuries due to falls. Overall mortality was 31/324 (10%). 281 (87%) falls were accidental. The remaining 43 falls were due to suicide in 11, assault in 25 or house fires in 7. Excluding children, 73 of 280 adults tested positive for alcohol.

54 falls occurred in children under the age of 12; only 1 died. Forty percent of these resulted from falls out of windows and 25% from play. Falls to escape child abuse occurred in 9% of children below 19 years.

Elderly patients (age >62 years) accounted for only 45 (14%) of falls but over 50% (17/31) of the deaths. This mortality occurred despite the fact that the majority of these falls were from relatively low heights. 19 patients fell down less than one flight of stairs and 12 "handy-men" fell from ladders.

Occupational falls occurred in 80 (25%) patients only five of whom tested positive for alcohol. Toxicology was not performed in 44 patients. Of the remaining 36, only 3 were positive. Data on safety equipment was unavailable.

190 falls occurred in adults (ages 20-60) with a 5:1 male to female ratio. 95 (50%) were intoxicated with either alcohol or drugs and 97 (50%) were unemployed.

Prevention strategies need to be targeted to specific groups at risk. The high percentage of childhood falls from windows may be directly related to the lack of window guard legislation in our area. Educational programs should be aimed at the elderly since most of these falls occurred at home during routine tasks but resulted in a high mortality. Further data is needed regarding the availability and use of safety devices in the workplace to prevent occupational falls. A large number of falls in adults were correlated with poor socioeconomic factors (unemployment, alcohol and drug use) which may be resistant to prevention strategies.



## NOTES

**TITLE:** THE RISING COST OF VIOLENCE: SIX YEARS  
EXPERIENCE IN AN URBAN TRAUMA CENTER

**AUTHOR(S):**

**INSTITUTION:** K Joseph, MD, R Smith, MD, R Roberts, MD,  
S Krosner, MD, K Nagy, MD, JA Barrett, MD

**PRESENTER:** Cook County Hospital

**SENIOR SPONSOR:** K Joseph, MD  
HR Champion, MD

**CITY, STATE:** Chicago, Illinois

Purpose: Intentional injury is a major public health problem whose rising costs have been implicated in trauma center closures. The purpose of this study is to characterize the impact of assaults in an urban trauma setting.

Methods: All patients admitted to a large midwestern urban trauma center are entered into a registry. For 1987 - 1992 this was searched for admissions, cause of admission, total charges, surgery, and deaths.

Results: From 1987 to 1992 admissions increased from 3389 to 4415. Assaults rose from 1938 to 2682 and accounted for 90% of the increase in admissions. 721 (70%) were due to gunshot wounds (GSW). In this period assaults increased by 48% but deaths from assaults tripled (59 to 180), indicating that assaults have become more violent. GSW account for an increasing portion of these totals. There were 499 GSW in 1987, 26% of all assaults; by 1992 this had increased to 1220, 43% of all assaults. Deaths from GSW increased 350% (39 to 138) from 1987-92. The likelihood of dying from GSW increased from 7.8% to 11.3%, and GSW alone accounted for 52% of all deaths in 1992. Of patients requiring surgery each year, those accounted for by assault increased from 45% to 72%. Those accounted for by GSW increased from 17% to 40%. In 1992 assaults accounted for 65% of all monies allocated for treatment of trauma patients with 35% going to treat GSW victims. During this period admissions for motor vehicle crashes (MVC) rose 44%, but deaths from MVC rose only 29%. In 1992 MVC accounted for 18% of patients requiring surgery, and 21% of funds.

Conclusion: At a time when trauma centers are seeing an ever increasing number of patients, assaults accounted for the majority of our center's increase. Not only were the assaults more numerous, but their cost was disproportionate to their numbers in terms of deaths and surgical resources. The cost of GSW are rising disproportionately to the increase in assaults. Continued unchecked, the increasing demands of violence may adversely affect access to trauma care by forcing more trauma center closures.

## NOTES

**TITLE:** DECREASED LIMB LOSS WITH AGGRESSIVE  
TREATMENT OF BLUNT POPLITEAL TRAUMA  
**AUTHOR(S):** BB Chang MD, DM Shah MD, RC Darling  
III MD, LW Robinson MD, RP Leather  
**INSTITUTION:** MD, DEM Bock MD.  
Albany Medical College  
**PRESENTER:** Chang BB, MD  
**SENIOR SPONSOR:** Wray RC, MD  
**CITY, STATE:** Albany, NY

Popliteal artery injury is one of the most common forms of civilian blunt arterial injury. In spite of this, limb loss rates of 24-38% are reported in several series. Over a ten-year period, 47 blunt popliteal artery injuries were treated at our institution. The mean age of this group was 26 years (range 5-77 years) and consisted of 40 males and 4 females. Three patients had bilateral injuries at presentation. The mechanism of injury was motor vehicle accident in all cases. The decision to operate on these patients was made on clinical grounds with the aid of segmental pressures, pulse volume recordings, and later in the series, Duplex ultrasound. Angiography was obtained on only 4 patients, all of whom presented with nonocclusive lesions (intimal flaps). Patients were all administered mannitol (25 mg IV bolus, 5 gm/hr IV drip) to decrease reperfusion injury. Excised saphenous vein grafts were used to repair the arterial lesion in all cases. Popliteal vein injuries were repaired with autogenous vein (6 cases) or ePTFE (4 cases) whenever encountered. Distal fasciotomy was performed in 25 cases. One limb was amputated (2.1%). This patient had been transferred 72 hours after the initial injury. Mean time from injury to revascularization was 5.7 hours (range 2.3 - 76 hours). Long-term follow up demonstrated that all 46 intact limbs were ambulatory. Sixteen had minor degrees of disability, 10 had moderate disability and 6 major disability related to the original injury. Limb loss in blunt popliteal trauma may be minimized by rapid autogenous revascularization without preoperative angiography, intravenous mannitol, repair of venous injury, and liberal use of fasciotomy.

## NOTES

**TITLE:** QUALITY OF WELL BEING SCALE CAPTURES  
OUTCOME OF TRAUMA

**AUTHOR(S):** C. Mohme, c.m., D.H. Wittmann, M.D., T.H.  
Cogbill, M.D., P.J. Strutt, R.N., N. Bansal, Ph.D.,  
Charles Aprahamian, M.D.

**INSTITUTION:**

**PRESENTER:** Medical College of Wisconsin, Milwaukee  
C.Mohme, c.m.,

**SENIOR SPONSOR:**

**CITY, STATE:**

Medical advances demand more sophisticated outcome measures than mortality and morbidity to capture the impact of treatment methods on quality of life after trauma. A single index of health status such as the Quality of Well Being Scale (QWB), ranging from 0 (dead) to 1 (optimal well being), and based on a one-on-one interview of approximately 15 minutes, could be practical and more sensitive. Furthermore, mortality is incorporated into this score. QWB has been validated, but not tested in trauma. The purpose of this study was to assess the usefulness of QWB in trauma patients and the impact of various injuries on quality of life and well years (WY) ( $WY = \text{Life Expectancy} \times \text{QWB}$ ).

**METHOD:** Of 5071 trauma admissions from 1990 to 91, 607 stayed 5 days and longer in hospital. 354 met the second study entrance criterion of  $ISS \geq 13$ . The group of penetrating trauma ( $n=121$ ) had to be excluded due to an insufficient number available for follow up interviews. We studied 133 completed interviews of blunt trauma patients ( $n=233$ ) and 29 of non injured volunteers (controls).

**DATA:** Trauma patients had a median age of 40.5 (15-89). 64% were male. Controls were similar. Median ISS was 25.8 (13-75). The median length of stay was 13 d (5-201).

Mean life expectancy (LE) for both groups was identical at 37.9 years; their WY, however, differed (21.5 for trauma and 31.2 for controls) ( $p < 0.05$ ).

Mean QWB was  $0.528 \pm 0.264$  (median = 0.580) for trauma, and  $0.823 \pm 0.074$  (0.822) for controls ( $p < 0.001$ ). QWB and ISS correlated well ( $p = 0.0001$ ), as did QWB and the extremity AIS ( $p < 0.001$ ). There was no significant correlation to any other AIS subscore.

**CONCLUSION:** In this study QWB proved to be a viable tool to measure quality of life following trauma. Only certain AIS scores predict a lower quality of life after trauma. It seems to discriminate best outcome following orthopedic trauma. Quality of life as measured by QWB and WY is significantly reduced after trauma and correlates with ISS.

## NOTES

**TITLE:** A RATIONALE FOR ENTERAL NUTRITIONAL SUPPORT IN SEVERE CLOSED HEAD INJURY

**AUTHOR(S):** A.P. Borzotta, MD, A. Osborne, MS, F. Bledsoe, MS, J. Paxton, RD,

**INSTITUTION:** S. Mardesic, RD, J. Pennings, MD,

**PRESENTER:** B. Papasadero, RN, R. Borzotta, RN Emanuel Hospital & Health Center

**SENIOR SPONSOR:** A.P. Borzotta, MD

**CITY, STATE:** Mark Metzдорff, MD  
Portland, Oregon

Total parenteral nutrition (TPN) is used in severe closed head injury (Glasgow Coma Score  $\leq 8$ ) due to prolonged gastric atony. We postulated that jejunal feeding (ENT) would be equivalent nutritionally, potentially reduce infectious morbidity and be more cost effective. We prospectively randomized 57 patients to begin TPN or ENT within 72 hours of admission, using isocaloric/isonitrogenous prescriptions later tailored to individual patient needs using regular indirect calorimetry measurements. TPN patients began gastric feeding  $10.2 \pm 4.8$  days, needing  $3.1 \pm 2.1$  days for transition. Infectious and feeding morbidity was monitored.

	\$ Ave/day Cost/charge	ISS	LOS (days)	MREE/kCal delivered				Infection	
				1wk	2wk	3wk	4wk	Pulm	other
ENT (n=27)	<u>33.49</u> 111.84	32.5 $\pm 10.1$	39.8 $\pm 23.2$	<u>2383</u> 2641	<u>2609</u> 2881	<u>2467</u> 2863	<u>2379</u> 3078	23 (82%)	1.3 per
TPN (n=21)	<u>53.30</u> 300.15	34.1 $\pm 9.3$	36.9 $\pm 14.0$	<u>2410</u> 2484	<u>2543</u> 2948	<u>2450</u> 2887	<u>2384</u> 2612	15 (71%)	1.6 per

Ten day nitrogen balance, weekly UUN, albumin, and transferrin levels were not different. 16 of 21 TPN patients required a gastrostomy prior to discharge. ENT did not significantly lessen the incidence of pneumonia or other infections, many of which developed within five days of admission. An accelerated catabolic state persists for 4 to 5 weeks. For the average LOS, enteral costs and charges were \$818 and \$7360 less, respectively, compared to TPN. Nutritional support in severe CHI is needed for a prolonged period; enteral sources are nutritionally effective and cost-effective.



## NOTES

**TITLE:** EFFECTS OF NITRIC OXIDE SYNTHASE INHIBITION ON SPLANCHNIC PERFUSION IN SEPTIC SHOCK  
**AUTHOR(S):** P.J. Offner, M.D., F.M. Robertson, M.D.  
**INSTITUTION:** Madigan Army Medical Center  
**PRESENTER:** Patrick J. Offner, M.D., M.P.H.  
**SENIOR SPONSOR:** Gregory Jurkovich, M.D.  
**CITY, STATE:** Tacoma, Washington

Nitric Oxide (NO) is a physiologic regulator of vascular tone in animals and humans. NO production is increased in septic shock and may be responsible for microcirculatory dysfunction. Therefore, NO synthesis inhibition is a potentially useful therapeutic modality in septic shock. Concerns have been raised about deleterious effects on splanchnic perfusion. We used gastrointestinal tonometry to investigate the effects of NO synthesis inhibition with N-nitro-L-arginine methyl ester (NAME) on splanchnic mucosal perfusion in a porcine model of septic shock. Anesthetized, instrumented swine were randomly divided into three equal groups. Controls received normal saline resuscitation (NSR) at 1 cc/kg/min beginning at T<sub>0</sub>. The lipopolysaccharide group (LPS) received NSR and *E. coli* LPS, 200 mcg/kg over 20 minutes at T<sub>0</sub>. The NAME group received NSR and LPS at T<sub>0</sub>, plus a continuous infusion of NAME (50 mcg/kg/min) starting at one hour (T<sub>1</sub>). Hemodynamic data and gastric/ileal intramucosal pH (pHi) were measured hourly for four hours beginning at T<sub>0</sub>. Data were analyzed using MANOVA with repeated measures. Pertinent results at T<sub>1</sub> and T<sub>4</sub> are shown below:

	Control (n=6)		LPS (n=6)		NAME (n=6)	
	T <sub>1</sub>	T <sub>4</sub>	T <sub>1</sub>	T <sub>4</sub>	T <sub>1</sub>	T <sub>4</sub>
MAP	+4.5(2.9)	+1.4(3.5)	-14(2.4)*	-19(6)*	-23(2.3)*	-10(10)*
SVRI	-0.7(5.6)	+3.6(8.6)	-37(5.7)*	-22(5.4)*	-42(3.7)*	+27(20)*
Arterial pHi	-0.7(0.3)	-1(0.1)	-1.2(0.1)	-2.1(.1)*	-1.6(0.1)	-2.7(.1)*
Ileal pHi	+0.4(0.2)	0(0.2)	+0.4(0.1)	-0.9(0.3)	+0.3(0.1)	-1.2(0.2)
Gastric pHi	-0.5(0.3)	-0.3(0.7)	-0.6(0.3)	-3.4(1.1)	-1.1(0.6)	-3.6(0.8)
Percent Baseline (+/- SEM) *p<0.05 compared to control						

NO synthesis inhibition by NAME resulted in significant improvement in mean arterial blood pressure and systemic vascular resistance; however, there was no improvement in splanchnic perfusion as measured by gastric and ileal pHi. In conclusion, NO synthesis inhibition had no effects on splanchnic perfusion, deleterious or otherwise, and should not limit its potential use in septic shock.

## NOTES

**TITLE:**

ECONOMIC IMPACT AND CLINICAL PREDICTORS OF  
SUCCESSFUL NON-OPERATIVE TREATMENT OF ADULT  
SPLENIC INJURY

**AUTHOR(S):**

J.P.Sutyak, M.D., L.F.D'Amelio, M.D.,  
W.Chiu, M.D., J.Amorosa, M.D.,

**INSTITUTION:**

J.Thomasseau, L.P.N., J.S.Hammond, M.D.

**PRESENTER:**

UMDNJ - Robert Wood Johnson Medical School  
Departments of Surgery and Radiology

**SENIOR SPONSOR:**

John P. Sutyak, M.D.  
Steven E. Ross, M.D.

**CITY, STATE:**

New Brunswick, New Jersey

**Purpose:** Non-operative (NO) management of adult splenic injury (SI) is an emerging option. The economic impact of NO of has not been analyzed. This study reviews demographic & outcome variables in adult SI relative to pt selection & cost.

**Methods:** Records of pts >14 yo with confirmed SI admitted to a Level I Trauma Center from 1/91 through 4/93 were reviewed. Abd CT's had 2 attending radiologist blinded review. Professional & hospital charges & payments were obtained. 10 pts expired in <48h from overwhelming head or multisystem injury (mean ISS 45.1). None from missed intra-abd injury. Data shown are for pts surviving >48h. SI was seen in 3.5% of all trauma pts. Data analysis: 1 way ANOVA.

**Results:** 54 pts survived >48h: 18 patients had initial NO. One (5.3%) crossover to splenectomy (SE) occurred. 36 pts went directly to OR; 16 had splenic salvage (SS) (2 non-bleeding lesions, 14 splenorrhaphy). No successful NO pt had an ED BP<100, GCS<14, or RTS<12. CT injury grade matched OR grade in 3 of 10 cases, underestimated injury in 5, & overestimated in 2. Radiologists disagreed on SI grade in 6 of 27 scans. There was no statistical difference between successful NO, SS & SE for ER BP & pulse, & OR min. Fees & reimbursements (RE) in U.S. dollars.

	NO	SS	SE	p NO/SE	p NO/SS	p SE/SS
ISS	14.0±7	20.4±8	28.8±8	<.001	.093	.014
AIS Abd	2.3±.5	3.0±.5	3.9±.3	<.001	<.001	<.001
RTS	12 (all)	11.4±1	10.6±2	.004	NS	NS
Tot PRBC	0.6±2u	2.6±4u	9.7±7u	<.001	NS	.001
Surg Fee	717 ±475	3823 ±1734	5236 ±3135	<.001	.002	.188
Surg RE	517 ±383	2052 ±1972	3816 ±3185	<.001	.186	.090
Rad Fee	2235 ±1814	1243 ±920	4201 ±2917	NS	NS	.046
Rad RE	1601 ±1399	943 ±857	3639 ±2876	NS	NS	.055
Anes Fee	151 ±465	1561 ±501	1590 ±465	<.001	<.001	NS
Anes RE	151 ±465	1216 ±855	1086 ±744	<.001	<.001	NS
Hosp	15,152	27,218	58,804	.002	NS	.034
Charge	±14,971	±19,778	±49,291			

**Conclusions:** NO of SI is safe & cost-effective in low ISS & AIS. CT scan can over/underestimate SI magnitude & has inter-observer variability. Surg reimbursement for cognitive skills involved in safe, economical NO management is minimal & accounts for only 3.9 % of costs. Future health care policy must recognize & reimburse the cognitive aspects of trauma care.

## NOTES

**TITLE:** PREVENTION OF VENOUS THROMBOEMBOLISM  
IN TRAUMA PATIENTS  
**AUTHOR(S):** M.M. Knudson, M.D., F.R. Lewis, M.D.,  
A. Clinton, R.N., K. Atkinson, R.V.T., J. Megerman,  
Ph.D.  
**INSTITUTION:** University of California, San Francisco  
**PRESENTER:** M.M. Knudson, M.D.  
**SENIOR SPONSOR:**  
**CITY, STATE:** San Francisco, California

Trauma patients are at risk for thromboembolic complications, but effective methods of prophylaxis have not been established for this heterogeneous population. This study was designed to identify significant risk factors, and to evaluate two methods of prophylaxis for deep venous thrombosis (DVT) and pulmonary embolism (PE) in trauma patients. Four hundred trauma patients who underwent laparotomy, thoracotomy, or had major fractures or neurotrauma, and who underwent initial duplex venous imaging within 24 hours of admission were included in this prospective trial. They were assigned to one of 3 groups, depending upon their injuries, and then randomized, within each group, to a treatment mode - Group I: sequential gradient pneumatic leg compression (SCD), low-dose subcutaneous heparin (H), or control (C); Group II: H or C; Group III: SCD or C. Additional venous exams to test for DVT were performed weekly. Results: 251 enrolled patients were available for at least one additional scan after admission. Of these, 15 (6%) developed leg DVT during their hospitalization and 2 additional patients developed PE (one fatal). The risk factors associated with the development of DVT included: a history of prior DVT ( $p < 0.001$ ), immobilization  $> 3$  days ( $p < 0.05$ ), age 30 years or older ( $p < 0.05$ ), and the need for multiple transfusions ( $p < 0.05$ ). Results approached statistical significance in the group (III) of patients with neurotrauma who cannot receive heparin, with SCD being effective in preventing DVT (0/26 vs. 5/30,  $p = 0.057$ ). Conclusion: We recommend the use of SCD in neurotrauma patients. Since neither H or SCD appears to offer protection in the other groups of trauma patients, those with the risk factors listed above should at least undergo serial duplex exams so that DVT can be diagnosed and treated, and PE prevented.

## NOTES

**TITLE:** PRACTICE GUIDELINES FOR EVALUATION OF THE ABDOMEN IN BLUNT TRAUMA VICTIMS; STEP ONE, IDENTIFYING CLINICAL RISK FACTORS

**AUTHOR(S):** B.M. Cushing, M.D.

**INSTITUTION:** National Study Center for Trauma & EMS, Shock Trauma, Univ. of Maryland

**PRESENTER:** B.M. Cushing, M.D.

**SENIOR SPONSOR:** J.A. Morris, M.D.

**CITY, STATE:** Baltimore, MD

Practice Guidelines are being developed to reduce health care costs, practice variation and liability exposure. Guidelines for evaluation of the abdomen in blunt trauma victims (BTV) will be forthcoming because the technology used to evaluate the abdomen is expensive and the population "at risk" is large given the "occult" nature of AI and the "high index of suspicion" approach forwarded by ATLS and other trauma care standards. The first step towards guideline development and the objective of this study is to define those clinical factors significantly associated with increased or decreased risk of AI.

**Methods:** 24 anatomic & physiologic factors available to the clinician at the time he/she decides whether or not to evaluate the abdomen were analyzed for association with AI in BTV's admitted from the scene to a trauma center over a 7 yr period.

**Results:** The population of 9462 BTV's had a mean ISS of 15, a mean age of 33 and a mortality of 6%. AI was present in 7.9% (753/9462). The incidence of AI for a given factor is presented below for those factors significantly associated ( $p < 0.001$ ).

Factor	Percent with AI (# w/factor & AI / # w/factor)
Diaphragmatic rupture	78.8 (52/66)
Admission systolic BP <90	39.2 (176/449)
Hemo-pneumo thorax	33.6 (232/691)
Pulmonary contusion or laceration	31.7 (140/442)
Lower rib fracture(s) (7-12)	29.6 (169/572)
Gross hematuria or dipstick 3+	27.7 (391/1413)
Pelvic fracture	25.6 (185/735)
Admission Ph $\leq$ 7.33	21.8 (364/1667)
Hip fracture	18.7 (62/331)
Admission GCS 3-12	17.3 (248/1431)
Mid-shaft femur fracture	15.9 (107/675)
Abdominal wall contusion/laceration	15.3 (141/924)
Upper rib fracture(s) (1-6)	15.1 (62/41)
Lumbar spinal column fracture	15.0 (38/254)
Admission HCO <sub>3</sub> $\leq$ 21	11.3 (570/5033)
Cervical spinal cord deficit	2.5 (5/201)

Note that cervical spinal cord injury is negatively associated with AI and compared to the general BTV population, carries only 1/3 the risk of AI.

**Conclusions:** Numerous factors are associated with increased risk of AI and should be considered in guideline development. The risk of AI in cervical spinal cord injury victims is low and should prompt re-assessment of routine abdominal evaluation in these patients.



## NOTES

**TITLE:** ANTITHROMBIN III AND TRAUMA PATIENTS:  
FACTORS THAT DETERMINE LOW LEVELS

**AUTHOR(S):** R.S. Miller, M.D., D.A. Weatherford, M.D.,  
M. Stein, M.D.

**INSTITUTION:** Greenville Memorial Hospital

**PRESENTER:**

**SENIOR SPONSOR:** R.S. Miller, M.D.  
Edmund Rutherford

**CITY, STATE:** Greenville, South Carolina

Objective: To determine the frequency of low antithrombin III levels in trauma patients and their association with selected clinical variables.

Design/Setting/Participants: Prospective (cohort) study of 50 consecutive adult trauma patients and 5 controls in a tertiary care center. Antithrombin III levels were obtained as soon after admission as possible and every other day thereafter.

Main Outcome Measure: Antithrombin III (dependent), ISS, base deficit, operative intervention, blood/blood products, shock, hypoxia, subcutaneous heparin, sequential compression devices (independent variables).

Results: 160 antithrombin III levels were obtained on 50 patients (17 had only one study, 33 had multiple studies). 28/50 (56%) patients had at least one low antithrombin III level (<80%) whereas 15 concurrently drawn control levels (3 levels each in 5 volunteers) were all  $\geq$ 90%.

Low antithrombin III levels were more common in patients who:

- A) Had a base deficit worse than -4 [12/12 (100%) vs 42%,  
p=0.001]
- B) Required blood transfusion [10/11 (91%) vs 46%, p=0.02]
- C) Had an ISS>15 [15/18 (83%) vs 41%, p=0.008]
- D) Required operative intervention [16/21 (76%) vs 41%,  
p=0.03]

All other variables were not statistically significant although all six patients with shock had low levels versus 50% of those not in shock.

Conclusion: Over one-half of adult trauma patients had low antithrombin III levels at some time during hospitalization, and these patients were clearly more severely injured. Further studies are required to determine if these patients are more susceptible to thromboembolic phenomena.

## NOTES

**TITLE:** BLUNT CAROTID ARTERY INJURIES --  
**AUTHOR(S):** MULTICENTER REVIEW  
T. H. Cogbill, M.D., et. al.  
**INSTITUTION:**  
**PRESENTER:** 9 Western Trauma Association member institutions  
Thomas H. Cogbill, M.D.  
**SENIOR SPONSOR:**  
**CITY, STATE:** La Crosse, Wisconsin

The relative infrequency of blunt carotid artery trauma prompted a multicenter review to determine the spectrum of injuries, optimal treatment strategies, and neurologic outcome. During a 6-year period 52 carotid artery injuries due to blunt trauma in 42 patients were treated at 9 institutions. There were 10 bilateral injuries. Injury mechanisms were diverse but involved motor vehicles in 35(83%) patients. Nine (21%) patients presented in shock. In 11(26%) patients, significant neurologic deficits developed more than 24 hours after a normal admission neurologic examination. The diagnosis was confirmed by angiography in 38/42 (90%) patients. Documented injuries included dissection alone in 17(33%) arteries, dissection with associated pseudoaneurysm in 6 (11%), complete arterial thrombosis in 16(30%), pseudoaneurysm alone in 5(10%), frank arterial disruption in 5(10%), and carotid-cavernous fistula in 3(6%). Arterial dissection was managed nonoperatively in 15/17(88%) cases, the majority with systemic anticoagulation. Arterial thrombosis was managed with supportive treatment alone in 10/16 (63%) arteries; most associated with fixed, dense neurologic deficits. Pseudoaneurysm repair was performed in 6/11 (55%) injuries. Carotid-cavernous fistulas were treated in all 3 instances with balloon occlusion.

Overall mortality was 12/42 (29%). Ten deaths were related to the carotid artery injury. Good, functional neurologic outcome was achieved in 18/42 (43%) patients. Results, listed by type of arterial injury, were as follows:

	<u>Mortality</u>	<u>Good Neurologic Outcome</u>
Dissection	3/23 (13%)	14/23 (61%)
Thrombosis	6/16 (38%)	5/16 (31%)
Pseudoaneurysm	1/11 (9%)	7/11 (64%)
Disruption	5/5 (100%)	0/5 (0%)
Carotid-cavernous fistula	0/3 (0%)	3/3 (100%)

**Conclusions:** 1) Blunt carotid artery injuries are uncommon and diverse. 2) Neurologic symptoms may develop in a delayed fashion; prior clinical suspicion is essential. 3) Arterial dissection without arterial thrombosis may be effectively managed by anticoagulation. 4) Pseudoaneurysms in accessible anatomic locations can be repaired with good results. 5) Carotid-cavernous fistulas are effectively treated with balloon occlusion. 6) Injuries with complete arterial thrombosis are associated with high mortality and poor neurologic outcome based upon the initial degree of neurologic impairment. The optimal method of treatment for this subgroup of injuries awaits prospective multicenter investigation.

## NOTES

**TITLE:** THE USE OF INFERIOR VENA CAVA FILTERS IN THE TRAUMA PATIENT  
**AUTHOR(S):** S.K. Matous M.D., J.M. Castle M.D., J.C. Puyana M.D.  
**INSTITUTION:** University of Massachusetts Medical Center  
**PRESENTER:** S.K. Matous M.D.  
**SENIOR SPONSOR:** Stephen M. Cohn M.D.  
**CITY, STATE:** Worcester Massachusetts 01655

Pulmonary embolism remains a grave complication in the multiply injured trauma patient. Paradoxically, these patients have the greatest risk of thrombotic complications and are often poor candidates for standard DVT prophylaxis and DVT screening. Furthermore, the nature of their injuries precludes anticoagulation therapy when DVT or PE are identified. Inferior vena cava (IVC) filters offer an alternative approach in this high risk group of patients. **Objective:** To examine the pattern of utilization of IVC filters in a level one trauma center. **Methods:** Prospectively collected data from a level one trauma center registry from March 1989 to February 1993 (5280 patients) was reviewed. Associated injuries, indications for filter placement, and complications of IVC filter use were analyzed. **Results:** IVC filters were placed in 79 patients (1.4%). Common associated injuries were lower extremity fractures 40/79 (51%), intracerebral hemorrhage 32/79 (40%), pelvic fractures 25/79 (31%), and abdominal organ laceration/contusion 18/79 (23%). The mean ISS was  $25 \pm 11.8$  (std). Fifty-two patients (66%) received filters for prophylaxis because they were unable to have routine DVT prophylaxis or routine DVT surveillance.

IVC filters were inserted in 26 patients after a DVT was identified, 2 of these patients also had a PE. One patient had the filter placed because of PE of unknown source. In these 27 patients, the IVC filters were placed because of a contraindication to anticoagulation (20/27), complication of anticoagulation (4/27), or a failure of anticoagulation therapy (3/27). No significant complications referable to the IVC filter or its placement were encountered. No PE was encountered after IVC filter placement. **Conclusion:** In a large series of trauma patients, IVC filters were utilized in 1.4 % of all admissions. IVC filters appear to be a safe and effective method of preventing PE when used in the high risk trauma patient.

## 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 corporate 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 to 100 members. No single specialty shall comprise more than 40% of the total membership of 100.

#### SECTION 2: Qualifications

Active members shall be limited to Doctors of Medicine who are Board Certified in their particular medical specialty. The Board of Directors is hereby given discretionary powers to interpret if foreign physicians who apply for membership have the credentials comparable to Board Certification. Certified members of other (non-M.D.) health care disciplines with a special interest or expertise in trauma may be elected to associate membership with the approval of the Board of Directors and the membership. Associate members shall have all the rights and privileges and must satisfy the same requirements for election to and retention of membership as active members except the right to vote or hold office. For applications to be considered, candidates must submit a completed application with a letter of support (sponsorship) from a member of the Association, submit an abstract for consideration by the Program Chairman, and attend the entire meeting during which their application is being considered. 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) Tender to the Program Chairman for consideration an abstract relating to the diagnosis or management of traumatic conditions within the particular medical specialty of the member at one out of every three consecutive meetings of the Association. An invited active panelist can fulfill this requirement.
- (d) Agree to be responsible for annual membership dues and any assessments as set by the Board of Directors at a special or the annual meeting and to remain current in the payment of same.

At age 55, members in good standing will automatically accept the position of senior membership in the 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, or submit an abstract once every three years, 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 By-Laws of this association.

The Board of Directors may award honorary membership to individuals in recognition of extraordinary contribution to the Western Trauma Association. The qualifications for membership and membership retention itemized in Article II, Section II and Article II, Section III, respectively may be waived under these circumstances. Honorary membership status requires a two-thirds vote of the Board of Directors.

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

#### SECTION 2: Majority

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

#### SECTION 3: Manner of Voting

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

- (1) In person.
- (2) 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.
- (3) By proxy duly executed in writing by the member or his authorized attorney-in-fact. No voting member in attendance at a meeting shall hold or vote more than one duly executed proxy for absent members.

#### SECTION 4: 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, and such other officers as from time to time may be appointed by the Board of Directors. The president, president-elect, vice president, secretary, and treasurer shall be elected at the annual meeting of the members.

#### SECTION 2: Term and Vacancies

The secretary and treasurer shall each hold office for the term of three (3) years. The remaining officers shall be elected at the annual meeting of the members. In the event that an officer cannot fill his term, his successor shall be chosen by the Board of Directors to fill the vacancy for the unexpired term of the office.

#### SECTION 3: Removal

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

#### SECTION 4: Resignation

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

## ARTICLE VIII

### Duties of Officers

#### SECTION 1: President

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

#### SECTION 2: President-elect

The president-elect shall plan and organize the next annual meeting and assume whatever responsibilities the president shall assign to him.

#### SECTION 3: Vice President

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

#### SECTION 4: Secretary

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

#### SECTION 5: Treasurer

The treasurer shall have the following duties:

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

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

#### SECTION 3: Membership Committee

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

#### SECTION 4: Publications Committee

The Publications Committee will consist of a Chairman and a Committee including a General Surgeon, an Orthopedic Surgeon, a Plastic Surgeon, another specialist, and the Chairman of the Program Committee (ex-officio), all appointed by the President. This committee will be responsible for reviewing all manuscripts submitted in association with presentations at the annual meeting and for choosing those which will be submitted to *The Journal of Trauma*. The Chairman will serve as the liaison to *The Journal of Trauma*. Should the Chairman not be an Editorial Consultant to *The Journal of Trauma*, the Chairman will consult with a member of the Editorial Board of *The Journal of Trauma* designated by the President.

## ARTICLE XI

### Conduct and Order of Business

#### SECTION 1: Business Sessions of the Members

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

#### SECTION 2: Order of Business

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

## ARTICLE XII

### Amendments

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



**MEMBERSHIP**





**WESTERN TRAUMA ASSOCIATION  
1993 - 1994  
MEMBERSHIP LISTING**

<b>AMADIO, Peter C.</b> (Bari)	Mayo Clinic 200 First Street, S.W. Rochester, MN 5590	O:507-284-2806 H:507-281-3772 Orthopedics/Hand
<b>AMMONS, Mark A.</b> (Lee Anne)	2005 Franklin Midtown II, Suite 410 Denver, CO 80205	O:303-832-6165 H:303-355-5709 Gen/Thoracic Surgery
<b>* APRAHAMIAN, Charles</b> (Patricia)	8700 W. Wisconsin Ave. Milwaukee, WI 53226	O:414-257-5022 H:414-781-2209 Surgery
<b>BAHNSON, David H.</b> (Peggy)	3 Albert Cree Drive Rutland, VT 05701	O:802-775-2937 H:802-773-4143 Orthopedics
<b>BEAL, Sandra L.</b> (Steve Smith)	655 East 11th Eugene, Oregon 97401	O:503-485-8331 General Surgery
<b>BENJAMIN, James</b> (Laurie)	Univ. Medical Center Room 4318 Tucson, AZ 85724	O:602-626-4024 H:602-795-7015 Orthopedics
<b>BOYD, Allen D., Jr.</b> (Claire)	601 Elmwood Avenue Box 665 Rochester, NY 14642	O:716-275-7938 H:716-264-9489 Orthopedics
<b>BROECKER, Bruce H.</b>	1901 Century Blvd. Atlanta, GA 30345	O:404-320-9179 H:404-325-2297 Urology
<b>BURCH, Jon M.</b> (Rita)	Baylor College of Medicine Houston, TX 77030	O:713-798-3432 H:713-666-3569 Surgery/Vascular
<b>CABANELA, Miguel E.</b> (Rosa)	200 First Street, SW Rochester, MN 55905	O:507-284-2226 H:507-285-1045 Orthopedics
<b>CARTER, Donald R.</b>	8200 E. Belleview #400 Englewood, CO 80111- 2807	O:303-740-7760 H:303-671-0250 Head & Neck Surg
<b>* CARVETH, Stephen</b> (Kay)	6200 Old Cheney Road Lincoln, NE 68516	O:402-489-6553 H:402-423-1768 Thoracic/ Cardiovasc Surg

<b>CHAMPION, Howard R., F.R.C.S. (Maria)</b>	1900 Quincy St.,NW Washington, D.C. 20010	O:202-877-6424 H:202-829-3486 Gen/Trauma Surgery
* <b>CHANG, Frederic C. (Jan)</b>	14809 Willowbend Circle Wichita, KS 67230	O:316-268-0296 H:316-753-0627 General Surgery
<b>CHERRY, Kenneth J. (Robin)</b>	Mayo Clinic 200 First St., S.W. Rochester, MN 55905	O:507-284-2644 H:507-288-3131 Vascular Surgery
<b>COGBILL, Thomas H. (Jan)</b>	1836 South Avenue La Crosse, WI 54601	O:608-782-7300 H:608-788-7808 Gen/Vasc Surgery
<b>COHN, Stephen M. (Kelly)</b>	350 Congress Avenue Suite 3A New Haven, CT 06510	O:203-785-2572 H:203-466-0006 Surgery
* <b>COIL, James A.,Jr. (Sharon)</b>	Conemaugh Valley Mem. Hospital 1086 Franklin Johnstown, PA 15905	O:515-283-6076 H:515-224-4745 General Surgery
<b>DAVIS, James W.</b>	Department of Surgery Valley Medical Center 445 S. Cedar Fresno, CA 93701	O:209-453-4000 H: Gen/Trauma Surg
<b>EBERSOLD, Michael J. (Janet)</b>	Mayo Clinic 200 First Street, S.W. Rochester, MN 55905	O:507-284-3714 H:507-288-5781 Neurosurgery
* <b>EDMONDSON, Robert C. (Ann)</b>	1207 Fairchild Court Woodland, CA 95695	O:916-666-1631 H:916-662-7856 Internal Medicine (Oncology)
<b>EDNEY, James A. (Debbi)</b>	University of Nebraska Medical Center Department of Surgery 600 S. 42nd Street Box 983280 Omaha, NE 68198-3280	O:402-559-7272 H:402-493-0705 General Surgery
<b>ESRIG, Barry C.</b>	50 Bellefontaine Street Suite 403 Pasadena, CA 91105	O:818-793-1135 H:818-355-1883 Thoracic Surgery
<b>FELICIANO, David V.</b>	Dept. Surg, Glenn Bldg. Grady Mem. Hospital 69 Butler Street Atlanta, GA 30303	O:404-616-5456 H:404-875-1648 Gen/Trauma Surg
<b>FERRIS, Bruce G. (Joan)</b>	825 N. Hillside Wichita, KS 67214	O:316-688-7500 H:316-733-1241 Plastic Surgery

<b>FERRIS, Bruce G.</b> (Joan)	825 N. Hillside Wichita, KS 67214	O:316-688-7500 H:316-733-1241 Plastic Surgery
* <b>FISCHER, Ronald P.</b> (Nancy)	5656 Kelley Street 1EC 93 006 Houston, TX 77026	O:713-636-5765 H:713-827-7925 Gen/Trauma Surgery
<b>FRAZEE, Richard C.</b> (Debbie)	2401 S. 31st Street Temple, TX 76508	O:817-774-4976 H:817-939-6009 General Surgery
<b>GALL, Warren</b> (Beth)	345 W. Washington Madison, WI 53703	O:608-252-8473 H:608-276-8605 Thoracic/Cardiovasc Surgery
<b>GENTILELLO, Larry M.</b> (Olivia)	Harborview Medical Center 325 9th Avenue, ZA-16 Seattle, WA 98104	O:206-223-3956 H:206-641-4191 General Surgery
<b>GUSSACK, Gerald S.</b> (Lynn)	1365 Clifton Road Atlanta, GA 30322	O:404-248-5724 H:404-621-9350 Otolaryngology
<b>HALL, John R.</b> (Mary)	Cook County Hospital 700 S. Wood Street Chicago, IL 60612 B-40	O:312-633-8583 H:312-383-5724 Surgery/Peds
<b>HANSEN, Arlen D.</b>	200 First Street, S.W. Rochester, MN 55905	O:507-284-2884 H:507-281-3511 Orthopedic Surgery
<b>HARRISON, Paul B.</b> (Carolyn)	3243 Murdock, 404 Wichita, KS 67208	O:316-685-6222 H:316-686-3075 General Surgery
<b>HAUTY, Michael</b> (Rose)	800 S. W. 13th Street Portland, OR 97205	O:503-221-0161 H:503-294-0754 Surgery
<b>HEBERT, James C.</b> (Mary Ellen)	Dept. of Surgery Fletcher 301 Medical Center Hospital Burlington, VT 05401	O:802-656-5354 H:802-985-3937 Surgery
<b>HELLING, Thomas C.</b> (Linda)	4320 Wornall, #308 Kansas City, MO 64111	O:816-753-7460 H:913-649-6164 General Surgery
<b>HOYT, David B.</b> (Beth)	Division of Trauma H-640-B UCSD Medical Center 225 Dickinson Street San Diego, CA 92103	O:619-294-6400 H:619-272-5893 Surgery
<b>IANNACONE, William</b> (Jane)	Three Cooper Plaza Camden, NJ 08103	O:609-342-3253 H:215-664-4786 Orthopedic Surgery

JURKOVICH, Gregory (Deanne)	Harborview Medical Center 325 9th Avenue, ZA-16 Seattle, WA 98104	O:206-223-5912 H:206-232-2153 Gen/Trauma Surgery
KAPPEL, David A. (Charl)	Professional Bldg. IV Suite 200 Medical Park Wheeling, WV 26003	O:304-242-0590 H:304-277-3018 Plastic Surgery
KEARNEY, Robert E. (Becky)	Harbourside Medical Tower #730 4 Columbia Drive Tampa, FL 33606	O:813-253-6001 H: General Surgery
KING, Brent R. (Rosemary)	Dept. of Emergency Med. Children's Hospital 3300 Henry Ave. Philadelphia, PA 19129	O:215-590-1944 H: Pediatrics
* KLASSEN, Rudolph A. (Frieda)	200 First Street, SW Rochester, MN 55905	O:507-284-3662 H:507-288-4879 Orthopedics
KNUDSON, Mary Margaret (Stephen A. Delateur)	SF General Hospital Ward 3A, 1001 Potrero San Francisco, CA 94110	O:415-821-8820 H:415-948-3419 Gen/Trauma Surgery
LANDERCASPER, Jeffrey (Betty)	1836 South Avenue La Crosse, WI 54601	O:608-782-7300 H:507-895-6222 General Surgery
LANZI, Guy L. (Maureen) (Associate Member)	15 E. Euclid Avenue Haddonfield, NJ 08033	O:609-429-1711 H:609-427-0722 Oral and Maxillofacial Surg.
LAU, Jeffrey M. (Diane)	1329 Lusitana Street Suite 108 Honolulu, HI 96813	O:808-537-1974 H:808-595-7039 Thoracic/Cardio Vascular Surgery
LEWALLEN, David G. (Marti)	200 First Street, SW Rochester, MN 55905	O:507-284-4896 H:507-282-4463 Orthopedics
LINDEN, Christopher H. (Jeanne)	Univ. of Mass. Med. Center 55 Lake Avenue North Worcester, MA 01655	O:508-856-4101 H:508-797-0133 Emerg. Medicine
<i>with him</i> ★ LUCIE, Stephen R. (Sharon)	3804 McGirts Boulevard Jacksonville, FL 32210	O:904-399-3604 H:904-387-3604 Orthopedics



MACKERSIE, Robert C. (Katherine)	Ward 3A, Dept. of Surg. SFGH 1001 Portero Avenue San Francisco, CA 94110	O:415-206-8814 H:415-731-8466 Gen/Trauma Surgery
MCCROSKEY, Brian L. (Betsy)	6910 W. 67th First Street Overland Park, KS 66202	Gen/Vasc. Surgery
MCGILL, John W.	Hennepin County Medical Center Emergency Department 701 Park Avenue, S. Minneapolis, MN 55415	O:612-347-5683 H:612-825-4281 Emergency Medicine
* MCGUIRE, Arthur M. (Peggy)	COL. MC 98th GEN Hospital Unit 27401-Box R APO AE 09105	
MCINTYRE, Kenneth E.	1501 N. Campbell Avenue Tucson, AZ 85724	O:602-626-7747 H:602-299-1539 Vasc/Gen Surgery
MCKINLEY, Richard C. (Cheryl)	P.O. Box 199 Augusta, MO 63332	O:314-781-1317 H: Addiction Medicine
MEHRHOF, Austin I., Jr. (Trudi)	Box 154, MCV Station Richmond, VA 23298	O:804-786-9318 H:804-794-6329 Gen/Plastic Surgery
METHENY, Jeffry	2031 Anderson Rd., St. A Davis, CA 95616	O:916-756-2221 H:916-758-0597 Orthopedics
METZDORFF, Mark T. (Marie-Louise)	2226 NW Pettygrove Street Portland, OR 97210	O:503-226-6321 H:503-243-1088 Gen/Thor Surgery
<i>never contact</i> MILLIKAN, J. Scott (Ann)	P.O. Box 35100 Billings, MT 59107	O:406-256-2500 H:406-656-3982 Thoracic/Cardio Vascular Surgery
MOORE, E. Eugene (Sarah)	Denver General Hospital 777 Bannock Street Denver, CO 80204	O:303-893-7045 H:303-831-4102 Gen/Trauma Surgery
MOORE, Fred (Paula)	Denver General Hospital 777 Bannock Street Denver, CO 80204	O:303-436-6558 H:303-741-1210 Gen/Trauma Surgery
MOORE, John B. (Debbie)	9351 Grant Street Suite 400 Thornton, CO 80229	O:303-452-0059 H:303-424-5352 General Surgery
MORRIS, John A., Jr. (Julia)	S-2304 Medical Center, No. Vanderbilt University Nashville, TN 37232	O:615-322-6580 H:615-292-0483 Gen/Trauma Surgery

<b>MUCHA, Peter, Jr.</b> (Sonja)	RR #9 Bingen Road Bethlehem, PA 18015	O:717-272-6621 H: Gen/Trauma Surgery
* <b>NELSON, Gerald D.</b> (Doris)	825 N. Hillside Street Wichita, KS 67214	O:316-688-7500 H:316-684-1524 Plastic Surgery
* <b>NEVIASER, Robert J.</b> (Anne)	2150 Pennsylvania Ave.,NW Washington, DC 20010	O:202-994-4386 H:301-869-1919 Orthopedics (Hand)
<b>OCHSNER, M. Gage</b> (Judy)	110 Irving Street, NW Washington, DC 20010	O:202-877-6424 H:703-329-0828 Gen/Trauma Surgery
* <b>OLFELT, Paul C.</b> (Helen)	2206 Parkland Lane Minneapolis, MN 55416	O:612-932-5000 H:612-922-1735 Radiology
* <b>OLSEN, William R.</b> (Joan)	3387 Herron Road Frankfort, MI 49635	O: H:616-352-4815 Retired
<b>O'MALLEY, Keith F.</b>	Three Cooper Plaza Suite 411 Camden, NJ 08103	O:609-342-3013 H:609-234-0253 Gen/Trauma Surgery
<b>OSBORNE, Robert W., Jr.</b> (Martha)	1802 S. Yakima, #204 Tacoma, WA 98405	O:206-383-3325 H:206-754-7858 Vascular Surgery
<b>PACHTER, H. Leon</b> (Rena)	530 First Avenue, NY/6C New York City, NY 10016	O:212-340-7302 H:212-679-9633 Gen/Trauma Surgery
<b>PETERSEN, Scott R.</b> (Elizabeth)	St. Joseph's Hospital & Medical Center 350 W. Thomas Road Phoenix, AZ 85013	O:602-285-3157 Surgery
<b>PHILLIPS, Thomas F.</b> (Bonnie)	2787 Harris St. Eureka, CA 95503	O:707-441-8660 Gen/Ortho Surgery
<b>PICKARD, Laurens</b> (Bonnie)	One Baylor Plaza Houston, TX 77030	O:713-798-4599 H:713-669-9722 Gen/Thoracic/Ped Surgery
* <b>PIERCE, George</b> (Carolyn)	University of Kansas Medical Center 39th & Rainbow Boulevard Kansas City, KS 66103	O:913-588-6128 H:913-268-5631 Gen/Thoracic/Vasc Surgery
<b>POLACK, Edward P.</b> (Wendy)	Professional Building,IV Suite 200 Medical Park Wheeling, WV 26003	O:304-242-0590 H:304-233-6132 Plastic Surgery

• RATZER, Erick R. (Jeanne)	Three Cimmaron Drive Littleton, CO 80121	O:303-399-1194 H:303-781-2002 General/Oncology Surgery
REED, R. Lawrence, II (Geraldine)	Box 3501, Dept. of Surg. Duke Univ. Med. Center Durham, NC 27710	O:919-681-5080 H: Gen/Trauma Surgery
ROETTGER, Richard (Sara)	Department of Surgery University of Louisville Louisville, KY 40292	O:502-588-1727 H:502-896-8330 Gen/Trauma Surgery
ROSEMURGY, Alexander (Kathryn)	Department of Surgery 730 Harbourside Tower 4 Columbia Drive Tampa, FL 33606	O:813-259-0898 H:813-932-9167 Gen/Trauma Surgery
ROSENBERGER, Alan (Mary)	9351 Grant Street Suite 400 Thornton, CO 80229	O:303-452-0059 H:303-467-1243 Gen/Thor/Vascular Surgery
ROSS, Steven E. (Carolyn)	3 Cooper Plaza Suite 411 Camden, NJ 08103	O:609-342-3014 H:609-427-4352 Gen/Trauma Surgery
RUTHERFORD, Edmund J. (Eloise)	2100 Pierce Ave., 243 MCS Division of Trauma Nashville, TN 37212	O:615-322-6580 H:615-662-1077 General Surgery Critical Care
• RUTHERFORD, Robert B. (Kay)	Box C-312-4200 East 9th Avenue Denver, CO 80262	O:303-394-8552 H:303-322-3790 Gen/Thor/Vascular Surgery
SAFFLE, Jeffrey R. (Susan)	50 N. Medical Drive #3B-306 Salt Lake City, UT 84132	O:801-581-3595 H:801-582-6603 Gen Surg/Burns
SCALEA, Tom M.	116 Willow Street, #2 Brooklyn, NY 11201	O:718-735-3416 H:718-402-0924 Gen/Trauma Surgery
SCHECTER, William P. (Gisela)	1001 Potrero Avenue Ward 3A San Francisco, CA 94110	O:415-821-8817 H:415-726-1339 Anesthesia/Surgery
• SEIBERT, Charles E. (Mary)	One Cimmaron Drive Littleton, CO 80121	O:303-761-9190 H:303-781-7760 Radiology
SHACKFORD, Steven R. (Ellen)	301 Fletcher House Medical Center Hospital of Vermont Burlington, VT 05401	O:802-656-5354 Gen/Trauma Surgery

<b>SHARP, Kenneth W.</b> (Eileen)	TVC 3662 Vanderbilt University Nashville, TN 37232	O:615-322-0259 H:615-377-1978 Gen/Trauma Surgery
<b>SHERMAN, Harold</b>	Division Multisystem Trauma Mercy Hospital of Pittsburgh 1400 Locust Street Pittsburgh, PA 15219	O:412-232-7786 H:412-683-7744 Gen/Trauma Surgery
<b>SIMONET, William T.</b> (Michele)	6363 France Ave. S. Suite 500 Edina, MN 55435	O:612-925-2535 H:612-926-5693 Orthopedics
<b>STOTHERT, Joseph C.</b> (Jean)	Department of Surgery Suite 3740 601 N. 30th Omaha, NE 68131	O:402-280-4477 H:402-896-9899 General/Trauma Surgery
* <b>STREET, David E.</b> (Karen)	818 N. Emporia, #200 Wichita, KS 67214	O:316-263-0296 H:316-682-2012 General Surgery
<b>SUGERMAN, Harvey J.</b> (Betsy)	Box 519 Medical College Virginia Richmond, VA 23298-0519	O:804-786-0032 H:804-741-2764 General Surgery
* <b>TAWES, Roy L.</b> (Joyce)	117 N. San Mateo Drive San Mateo, CA 94401	O:415-342-4113 H:415-347-4319 Vascular Surgery
* <b>TEAL, Peter V.</b> (Annie)	1232 N. 30th Street Billings, MT 59101	O:406-245-3149 H:406-245-6565 Orthopedics
<b>THOMAS, Herbert, III</b> (Klařma)	799 E. Hampden Suite 400 Englewood, CO 80110	O:303-789-2663 H:303-694-4586 Orthopedics
<b>TUGGLE, David W.</b> (Judy)	940 NE 13th Street Room #2B204 Oklahoma City, OK 73126	O:405-271-5922 H:405-271-5922 Pediatric Surgery
* <b>VOLZ, Robert G.</b> (Anne)	P.O. Box 2298 Breckenridge, CO 80424	O:303-453-7780 Orthopedics
<b>WALD, Steven L.</b> (Linda)	University Health Center One South Prospect Street Burlington, VT 05401	O:802-656-8226 H:802-985-2582 Neurosurgery
* <b>WALDRON, John F.</b> (Helen)	104 Medical Office Bldg. 2545 Chicago Avenue S. Minneapolis, MN 55404	O: H: Pediatric Surgery

<b>WEBSTER, Dwight A.</b> (Constance)	<b>550 Harrison Court</b> Syracuse, NY 13202	<b>O:315-742-2015</b> <b>H:315-446-1802</b> Orthopedics
<b>WHITLEY, Ronald</b>	<b>1401 Johnston-Willis Dr.</b> Richmond, VA 23235	<b>O:804-320-2900</b> <b>H:804-598-2195</b> General Surgery
<b>* WILSON, Robert F.</b> (Jacqueline)	<b>376 Wattles Road</b> Bloomfield Hills, MI 48103	<b>O:313-745-3485</b> <b>H:313-644-1091</b> Gen/Thoracic/CV Surgery
<b>WRAY, R. Chris</b> (Rockeye)	<b>601 Elmwood Avenue</b> Box 661 Rochester, NY 14642	<b>O:716-275-5818</b> <b>H:716-385-3454</b> Plastic Surgery
<b>YAUN, Hansen</b>	<b>550 Harrison Center</b> Syracuse, NY 13202	<b>O:315-473-4472</b> <b>H:315-446-6921</b> Orthopedics

**\* Senior Members**

## GEOGRAPHICAL ROSTER

### Arizona

#### Phoenix

Petersen, Scott R.

#### Tucson

Benjamin, James  
McIntyre, Kenneth E.

### California

#### Davis

Metheny, Jeffrey

#### Eureka

Phillips, Thomas F.

#### Fresno

Davis, James W.

#### Pasadena

Esrig, Barry C.

#### San Diego

Hoyt, David B.  
Mackersie, Robert C.

#### San Francisco

Knudson, Mary Margaret  
Schechter, William P.

#### San Mateo

Tawes, Roy L.

#### Woodland

Edmondson, Robert C.  
Yamuchi, Hiroshi

### Colorado

#### Breckenridge

Volz, Robert G.

#### Denver

Ammons, Peter C.  
Burch, Jon M.  
Moore, E. Eugene  
Moore, Fred  
Rutherford, Robert B.  
Thomas, Herbert, III

#### Englewood

Carter, Donald R.

#### Littleton

Ratzer, Erick R.  
Seibert, Charles E.

#### Thornton

Moore, John B.  
Rosenberger, Alan

### Connecticut

#### New Haven

Cohn, Stephen M.

### District of Columbia

Champion, Howard R.  
Neviaser, Robert J.  
Ochsner, M. Gage

### Florida

#### Jacksonville

Lucie, Stephen R.

#### Tampa

Rosemurgy, Alexander S.  
Kearney, Robert

### Georgia

#### Atlanta

Broecker, Bruce H.  
Feticiano, David V.  
Gussack, Gerald S.

### Hawaii

#### Honolulu

Lau, Jeffrey M.

### Illinois

#### Chicago

Hall, John R.

### Kansas

#### Kansas City

Pierce, George

#### Overland Park

McCroskey, Brian L.

#### Wichita

Chang, Frederic C.  
Ferris, Bruce C.  
Harrison, Paul B.  
Nelson, Gerald D.  
Street, David E.

### Kentucky

#### Louisville

Roettger, Richard

### Massachusetts

#### Worcester

Linden, Christopher H.

### Michigan

#### Bloomfield Hills

Wilson, Robert F.

**Frankfort**

Olsen, William E.

**Minnesota**

**Edina**

Simonet, William T.

**Minneapolis**

McGill, John W.

Olfelt, Paul C.

Waldron, John F.

**Rochester**

Amadio, Peter C.

Cabanela, Miguel E.

Cherry, Kenneth J.

Ebersold, Michael J.

Hanssen, Arlen D.

Klassen, Rudolph A.

Lewallen, David G..

Lindscheid, Ronald L.

**Missouri**

**Augusta**

McKinley, C. Richard

**Kansas City**

Helling, Thomas

**Montana**

**Billings**

Milfikan, J. Scott

Teal, Peter V.

**Nebraska**

**Lincoln**

Carveth, Stephen

**Omaha**

Edney, James A.

Stohtert, Joseph

**New Jersey**

**Camden**

Iannacone, William M.

O'Malley, Keith F.

Ross, Steven E.

**Haddonfield**

Lanzi, Guy L.

**New York**

**Brooklyn**

Scalea, Tom M.

**New York City**

Pachter, H. Leon

**Rochester**

Wray, R. Chris

**Syracuse**

Palmer, Andrew K.

Webster, Dwight, A.

Yaun, Hansen

**North Carolina**

**Durham**

Reed, R. Lawrence, III

**Oklahoma**

**Oklahoma City**

Tuggle, David W.

**Oregon**

**Eugene**

Beal, Sandra L.

**Portland**

Hauty, Michael

Metzdorf, Mark T.

**Pennsylvania**

**Hershey**

Mucha, Peter Jr.

**Johnstown**

Coil, James A. Jr.

**Pittsburgh**

Sherman, Harold

**Tennessee**

**Nashville**

Morris, John A., Jr.

Rutherford, Edmund

Sharp, Kenneth W.

**Texas**

**Houston**

Fischer, Ronald P.

Pickard, Laurens

**Temple**

Frazee, Richard C.

**Utah**

**Salt Lake City**

Saffle, Jeffrey R.

**Vermont**

**Burlington**

Hebert, James C.

Shackford, Steven R.

**Rutland**

Bahnson, David H.

**Virginia**

**Richmond**

Mehrhof, Austin I., Jr.  
Sugerman, Harvey J.  
Whitley, Ronald

**Washington**

**Seattle**

Gentilello, Larry M.  
Jurkovich, Gregory

**Tacoma**

Osborne, Robert W., Jr.

**West Virginia**

**Wheeling**

Kappel, David A.  
Polack, Edward P.

**Wisconsin**

**LaCrosse**

Cogbill, Thomas H.  
LanderCASPER, Jeffrey

**Madison**

Gall, Warren

**Milwaukee**

Aprahamian, Charles

**Germany**

McGuire, Arthur M.



WESTERN TRAUMA ASSOCIATION  
TWENTY-FOURTH ANNUAL MEETING

CHANGE OF ADDRESS FORM

NAME \_\_\_\_\_

SPOUSE  
NAME \_\_\_\_\_

MAILING  
ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

OFFICE PHONE \_\_\_\_\_ HOME PHONE \_\_\_\_\_

SPECIALTY \_\_\_\_\_

Return form to:

Herbert Thomas, M.D.  
Secretary, WTA  
8015 W. Alameda #210  
Denver, CO 80223

video program @ reception  $\leq$  for High  
? swimming party

tags

VASTAR  
DANKWET  
iCn'C } + forum

extracurricular activities

breakfast - Name tags (spouses) for conversation, etc

WTA Banner(s)

see re: extracurricular activities -

if Yellowstone trip same day as Bridge Bowl  
emphasize wives/kid going & husbands - chance to meet, interact

Turner ? sponsor Jack Horner

met Recd. Att. Gen. re: Gun Control

request for abstracts/Early Career announcement - criteria for  
doing needs to go with it.

reception  
argument - separate bar for kids ✓

with Milliken - 'local' resource

jury lottery



