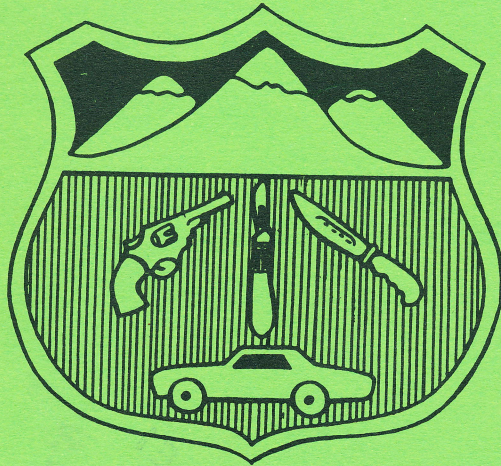


# WESTERN TRAUMA ASSOCIATION

## 20th ANNUAL MEETING



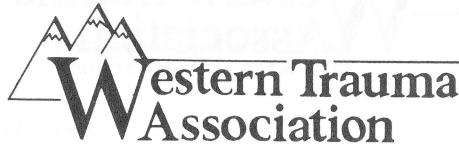
February 25 - March 2, 1990

Crested Butte, Colorado

**The Western Trauma Association  
Gratefully Acknowledges**

**Auto Suture  
Decknatel  
Merck Sharp & Dohme  
Richards Medical  
Synthes USA  
Zimmer - Ross**

**Who Have Graciously Contributed  
to the Printing of the Program**



1989 - 1990

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# Western Trauma Association

October 1989

Western Trauma Association Tentative Schedule

Sunday, February 25, 1990

4:00 - 7:00 P.M. Registration and Welcoming Reception

Monday, February 26, 1990

6:30 - 7:00 A.M. Breakfast  
 7:00 - 9:00 A.M. First Scientific Session  
 4:00 - 6:00 P.M. Second Scientific Session  
 6:00 P.M. Board of Directors Meeting

Tuesday, February 27, 1990

6:30 - 7:00 A.M. Breakfast  
 7:00 - 9:00 A.M. Third Scientific Session  
 4:00 - 5:30 P.M. Fourth Scientific Session  
 5:30 - 6:00 P.M. Presidential Address - Stephen W. Carveth, M.D. (wives incl.)  
 6:00 - 8:00 P.M. Western Trauma Association Business Meeting

Wednesday, February 28, 1990

6:30 - 7:00 A.M. Breakfast  
 7:00 - 9:00 A.M. Fifth Scientific Session  
 10:00 A.M. NASTAR Race (families incl.)  
 12:00 NOON Picnic and Picture  
 4:00 - 5:30 P.M. Panel Discussion  
 5:30 - 6:00 P.M. "Medical Marriages" by John and Debbie Moore  
 (Wives included)

Thursday, March 1, 1990

6:30 - 7:00 A.M. Breakfast  
 7:00 - 9:00 A.M. Sixth Scientific Session  
 4:00 - 6:00 P.M. Special Guest Presentation - Bob Stuplich (families incl.)  
 "Archeology on the Russian - Turkey Border"  
 "Honeymoon on Mount Ararat"  
 6:30 P.M. Reception/Cash Bar  
 8:00 P.M. Annual Banquet  
 NASTAR Awards  
 Introduction of New Members  
 9:00 - 12:00 Midnight Band - Dancing

Friday, March 2, 1990

6:30 - 7:00 A.M. Breakfast  
 7:00 - 9:00 A.M. Eighth Scientific Session  
 4:00 - 6:00 P.M. Ninth Scientific Session  
 6:00 P.M. Adjournment

Spouse's Breakfast Monday thru Friday 8:00 - 9:00 A.M. Grand Cafe

WESTERN TRAUMA ASSOCIATION  
TWENTIETH ANNUAL MEETING  
CRESTED BUTTE, COLORADO

Monday, February 26, 1990

- 7:00 AM Welcome from President Stephen W. Carveth, MD  
7:05 AM Program introduction by Steven R. Shackford, MD

Time	Title	Presenter
Moderator: Steven R. Shackford, MD		
7:10 AM	Early tracheostomy vs late tracheostomy in the multiply injured patient	Dr. I. Lesnik
7:30 AM	Continuous arterio-venous rewarming	Dr. L. Gentilello
7:50 AM	Predictors of mortality in geriatric trauma	Dr. A. Morris
8:20 AM	Invasive candidosis in severely injured adults	Dr. A. Murphy
8:40 AM	Hypoxic events in the surgical intensive care unit - A rational approach	Dr. F. Moore

Moderator: Peter V. Teal, MD

4:00 PM	Rigid nailing of the tibia- Biomechanics of the nail insertion site	Dr. D. Sobba
4:15 PM	Ankle mortice stability in Weber C ankle fractures: Indications for transmalleolar fixation	Dr. J. Solari
4:30 PM	Resection of partial physeal arrest	Dr. R. Klassen
4:45 PM	Improved outcome with early fixation of unstable pelvic fractures	Dr. B. Latenser
5:00 PM	Management of large soft tissue defects following close range shotgun injury	Dr. S. Hoekstra
5:15 PM	Topic Review: Soft tissue infections	Dr. G. Jurkovich

Tuesday, February 27, 1990

Time	Title	Presentor
Moderator:	J. Scott Millikan, MD	
7:00 AM	Torn thoracic aorta: Evolution of a repair technique	Dr. B. McCroskey
7:20 AM	The management of flail chest injury	Dr. M. Freedland
7:40 AM	Blunt carotid dissection: 4 year experience in a trauma system	Dr. J. Davis
8:00 AM	Conservative management of infected post traumatic hemothorax	Dr. A. Mansour
8:20 AM	Parasternal and transmediastinal gunshot wounds: Grady Memorial Hospital clinical study	Dr. M. Stout
Moderator:	John A. Morris, Jr., MD	
4:00 PM	Topic Review: ARDS: Current update on management	Dr. H. Sugerman
4:45 PM	Increased morbidity with abnormal pulmonary albumin flux in septic adult respiratory distress syndrome	Dr. H. Sugerman
5:00 PM	Bronchial blood flow and eicosanoid blockade	Dr. J. Stothert
5:30 PM	Presidential Address - Stephen W. Carveth, MD (wives included)	

Wednesday, February 28, 1990

Time	Title	Presenter
Moderator: James Benjamin, MD		
7:00 AM	C1-C2 posterior arthrodesis for odontoid nonunion	Dr. M Cabenela
7:20 AM	Use of xenon-enhanced computed tomography as an indicator of clinical outcome in neurologic injuries	Dr. T Johnson
7:40 AM	Dynamic computerized tomography of the occiput-atlas-axis complex in trauma patients with odontoid lateral mass asymmetry	Dr. W Iannacone
8:00 AM	Balloon catheter tamponade in cardiovascular wounds	Dr. D Feliciano
8:30 AM	Intracranial injury in mid-face fractures	Dr. K. Brandt
10:00AM	NASTAR Race (families included)	
Moderator: Thomas F. Phillips, MD		
4:00 PM	Panel Discussion: Management of the mangled extremity	Dr. F. Phillips
5:30 PM	"Medical Marriages" by John and Debbie Moore (wives included)	

Thursday, March 1, 1990

Time	Title	Presentor
Moderator:	Peter A. Mucha, Jr., MD	
7:00 AM	The Morbidity and financial impact of colostomy closure in the trauma patient	Dr. J. Hoballah
7:20 AM	Esophageal perforations	Dr. C. Bailey
7:40 AM	Duodenal trauma: A multicenter review	Dr. T. Cogbill
8:00 AM	Nonoperative management of blunt liver injuries: The need for continued surveillance	Dr. M. Knudson
8:20 AM	Complications in evaluating abdominal trauma: Diagnostic peritoneal lavage vs CT scan	Dr. J. Davis
8:40 AM	Emergency center ultrasonography in the evaluation of hemoperitoneum: A prospective study	Dr. A. Kimura
4:00 PM	Special guest presentation - Bob Stuplich "Archeology on the Russian - Turkey Border" "Honeymoon on Mount Ararat" (families included)	



Friday, March 2, 1990

Time	Title	Presentor
Moderator:	Thomas H. Cogbill, MD	
7:00 AM	Restablishment of dental occlusion following mandibular fractures: The importance of interdental fixation	Dr. G. Lanzi
7:20 AM	Multipiece tire rim injuries	Dr. A. Sussman
7:40 AM	The effect of alcohol in isolated splenic injury	Dr. W Rappaport
8:00 AM	Firearms, alcohol, protective devices and the public device for funding trauma care.	Dr. R Mackersie
8:30 AM	Impact of the seat belt law on traffic injuries in Hawaii	Dr. W. Limm
Moderator:	William E. Olson, MD	
4:00 PM	Penetrating iliac vascular injuries	Dr R Richardson
4:15 PM	The asymptomatic patient with suspected myocardial contusion: Is hospital admission really necessary?	Dr. M. Foil
4:30 PM	Is proximity an indication for mandatory angiography in penetrating extremity injuries	Dr. N. Smeidra
4:45 PM	Topic Review: Blood and fluid resuscitation	Dr. S Shackford
5:30 PM	Hypertonic saline alters plasma clotting times and platelet aggregation	Dr. R. Reed
5:45 PM	Massive transfusion: Outcome in 144 trauma patients	Dr. J. Wudel

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: EARLY TRACHEOSTOMY VS LATE TRACHEOSTOMY IN THE MULTIPLY  
 (ALL CAPITALS) INJURED PATIENT  
 Authors: I. Lesnik, M.D., W. Rappaport, M.D.  
 Institution: University Medical Center  
 Presenter: I. Lesnik Member            Guest x Resident             
 Senior Sponsoring Member: Dr. Jim Benjamin  
 Time: 10 minutes  
 Special Audiovisual Requirements:           

ABSTRACT

Multiply injured patients frequently require prolonged mechanical respiratory support. Such support is not without its own morbidity and mortality which is noted to frequently increase with length of time requiring mechanical ventilation. It has been the clinical impression at our institution that early tracheostomy results in earlier weaning and decreased incidence of nosocomial pneumonias as compared to late tracheostomy. The purpose of our study was to retrospectively investigate the effect of early tracheostomy (ET) vs late tracheostomy (LT) in trauma patients and the resultant effect on the incidence of nosocomial pneumonias and weaning from mechanical ventilation. From 1980 to 1989, 111 tracheostomies were performed on trauma patients. Five early deaths (4.5%) occurred in this population leaving 106 (95.5%) patients who were studied. Patients were divided into two groups. Group I comprised 37 patients who underwent tracheostomy 4 days after injury (ET) and Group II consisted of 69 patients who underwent tracheostomy four days after injury (LT). There was no difference between the two groups in age (range 15 to 86). Glasgow Coma Score (GCS) (range 3 to 15), Injury Severity Score (ISS) (range 9 to 43) or the presence of thoracic injuries. The decision whether to perform early tracheostomy was based on the trauma surgeons preference. Six of 37 (19%) in group I had evidence of nosocomial pneumonia versus 41 of 69 (59%) in group II ( $p < 0.001$ ). Early weaning defined as ventilatory support  $< 7$  days occurred with greater frequency in group I than group II ( $p < 0.01$ ). In addition, total time of mechanical ventilation was 5.6 days (range 2-17) in group I and 20.6 days (range 6-65) in group II ( $P < 0.001$ ). Nonlethal complications associated with tracheostomy occurred in 3 (2.7%) patients. From the above findings we conclude that early tracheostomy results in a reduction in hospital acquired pneumonias, weaning time and total time of ventilatory support with little operative morbidity.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE (ALL CAPITALS): CONTINUOUS ARTERIO-VEINUS REWARMING

Authors : L.M. Gentilello, M.D., V. Cortes, M.D., G.A. Gomez, M.D.

Institution : University of Miami School of Medicine

Presenter : L.M. Gentilello Member          Guest X Resident         

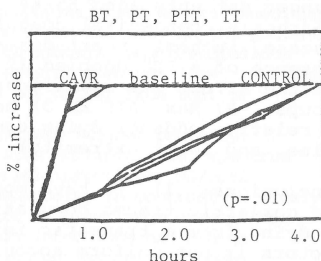
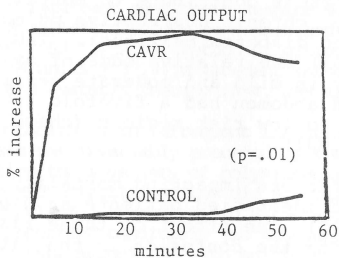
Senior Sponsoring Member:         

Time :          10 minutes

Special Audiovisual Requirements:         

ABSTRACT

Hypothermia is an ominous complication in critically injured patients. We developed a new method of reversing the pathophysiologic effects of hypothermia using a method of extra-corporeal rewarming which does not require heparin or pump assistance. Hypothermia to 29.5C was induced in eight anesthetized dogs, and thermistors placed in the pulmonary artery, liver, bladder, esophagus, rectum, muscle, and skin. Four control animals were rewarmed with a fluid circulating blanket set at 41C configured as an abdomino-thoracic wrap. Four experimental animals were rewarmed using a counter-current fluid warmer (Level 1 Fluid Warmer) which was modified by bending it 90 degrees, thereby placing the heat exchange element in a horizontal position at bed height. Arterial and venous femoral lines were connected to the inflow and outflow side of the heat exchanger, forming an A-V fistula which used arterial pressure to drive blood continuously through the interposed fluid warmer (CAVR). Bleeding time (BT), coagulation profile (PT, PTT, TT), and cardiac output (CO) were measured during rewarming to 35C. Temperature rose significantly faster with CAVR at all sites ( $p=.007$ ). Average time to rewarming was 45 minutes with CAVR vs. 4 hours and 45 minutes with external rewarming. Haptoglobin, platelet, fibrinogen and fibrin split product levels were unaffected by CAVR.



These results represent the fastest reversal of hypothermia and associated coagulopathy and cardiac depression yet reported using methods not requiring heparin or pump assistance. The application of CAVR in post-traumatic and environmentally induced hypothermia warrants further investigation.

## 1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: PREDICTORS OF MORTALITY IN GERIATRIC TRAUMA  
 (ALL CAPITALS)  
 Authors: John A. Morris, Jr., M.D., Ellen J. MacKenzie, Ph.D.  
 Institution: Vanderbilt University School of Medicine  
 Presenter: John A. Morris, Jr. MD Member X Guest Resident  
 Senior Sponsoring Member: \_\_\_\_\_  
 Time: \_\_\_\_\_ 10 minutes  
 Special Audiovisual Requirements: \_\_\_\_\_

## ABSTRACT

Data on factors influencing mortality in geriatric trauma are sparse and contradictory. To develop a model for health policy decisions we examined all trauma admissions aged 55 and older to acute care hospitals in the state of California in the year 1983. Logistic regression was used to define the relative importance of the following factors: age, injury severity (determined using a mapping from ICD-9 CM codes to AIS scores), presence of preexisting conditions (PEC), and anatomic region of maximal injury (RI Max).

Results: The study group (N=69,480) had a mortality of 2.6% and represented 34.3% of all trauma admissions (N=202,641). The most important predictor of mortality was injury severity, although the effect of severity on mortality was not linear. An ISS of 25 or more was associated with a 50% mortality independent of age, PEC's or RI-MAX. In contrast, mortality for those with an ISS less than 25 was only 2%. For these individuals, the influence of age, PEC's, and RI-MAX were significant risk factors over and above ISS. Patients aged 80 and above had a fourfold increased risk of dying compared to younger patients aged 55-64. Five PEC's contribute to mortality (cirrhosis, congenital coagulopathy, chronic obstructive pulmonary disease, ischemic heart disease, and diabetes mellitus). The presence of a PEC doubled ( $P < 0.001$ ) the relative odds of dying, but the effect was significant only in mild and moderate severity groups. RI Max (AIS  $\geq$  3) head and abdomen had a fivefold increase in relative odds of dying compared to low risk regions (chest, face, spine, and lower extremity) ( $P < 0.001$ ).

Conclusions: 1) We have modeled factors impacting mortality in the geriatric trauma population and identified patients at high risk of dying from a traumatic injury. 2) The effect of these risk factors is not uniform accounting for the confusion in the literature. 3) In light of the rapidly growing elderly population, these findings have implications for health care policy, resource allocation, triage, quality assurance, and reimbursement.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: Invasive Candidosis in Severely Injured Adults.  
 (ALL CAPITALS)  
 Authors: Christopher Murphy M.D., Thomas Drost M.D., Michael H.  
 Institution: Albrink M.D., and Alexander Rosemurgy M.D.  
 Presenter: C. Murphy M.D Member Guest Resident x  
 Senior Sponsoring Member: Alexander Rosemurgy M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: \_\_\_\_\_

ABSTRACT

This study was undertaken to determine the incidence of invasive candida infections in trauma patients, to identify common factors in trauma patients that developed invasive candidosis and to assess morbidity and mortality associated with candida infections.

Thirty-three (.7%) of 4818 trauma patients developed invasive candidosis requiring IV antifungal therapy between January 1987 and July 1989. The average age was 37.7 years  $\pm$ 17.9. All patients were significantly traumatized: average Injury Severity Score of 26.1  $\pm$  11.1; average transfusion of 18 units  $\pm$ 3.0; blood; average hospital stay 63.6 days (range 14-149). Prior to developing candidosis, all patients had documented bacterial infections: 23 pneumonia, 13 bacteremia, 11 wound/peritoneal, 7 UTI, 9 venous catheter, 3 sinusitis. These infections were generally polymicrobial treated with multiple broad spectrum antibiotics (an average of 5.4 antibiotics for 17.2 days.) Twenty-eight (85%) of 33 patients received enteral feedings for an average of 11 days ( $\pm$ 1.5) prior to developing candidosis and 24 (73%) received NG/oral Nystatin for an average of 7.6 days ( $\pm$ .9) prior to developing candidosis. Candidosis was diagnosed by a positive candida antigen titer ( $>$ 1:4) in 12 patients, positive titer plus source in 12, multiple sources in 5 and a single source in 4 (Foley UTI). All patients with candidosis were treated with intravenous Amphotericin B. Cumulative dose of Amphotericin B was 157.3 mg  $\pm$  31.3mg given over 10 days  $\pm$  1.1. One patient developed recurrent candidosis despite NG/oral prophylaxis and enteral feedings. Six patients (18%) died due to sepsis and multiple organ failure. In the patients that died, ISS (27 $\pm$ 1.8), method of diagnosis of candidosis, and transfusions (N=6,  $\bar{x}$ =30 units  $\pm$  37.9), antecedent infections, enteral feedings (N=4,  $\bar{x}$ =10 days  $\pm$  2.9), and nystatin therapy (N=4,  $\bar{x}$ =6 days) did not differ from that of survivors.

Candidosis is an infrequent infection in severely injured patients. Candidosis was invariably preceded by treatment with multiple broad spectrum antibiotics for a variety of polymicrobial bacterial infections. NG/oral nystatin and enteral feedings did not prevent candidosis, in contrast to widely accepted beliefs. Amphotericin B therapy was safe despite large cumulative doses. Recurrent candidosis was unusual. Candida infections had a high mortality rate associated with multiple blood transfusions and prolonged hospitalization. Candidosis represents a symptom of markedly impaired host response but is amenable to prompt, aggressive treatment.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: HYPOXIC EVENTS IN THE SURGICAL INTENSIVE CARE UNIT -  
 (ALL CAPITALS) A RATIONAL APPROACH  
 Authors: FA Moore, M.D., JB Haenel, R.R.T., E.E. Moore, M.D., CM Abernathy, M.D.  
 Institution: Denver General Hospital  
 Presenter: F.A. Moore, M.D. Member  Guest  Resident   
 Senior Sponsoring Member: \_\_\_\_\_  
 Time: \_\_\_\_\_ 10 minutes  
 Special Audiovisual Requirements: 2 SLIDE (DUAL) PROJECTORS

ABSTRACT

To insure early identification and appropriate intervention, an oxygen monitoring protocol with a diagnostic algorithm was established in October 1987. A three month surveillance audit ending March 1989 prospectively documented 100 consecutive hypoxic events in 51 of 241 (21%) SICU patients. There were 34 (67%) males, ages ranged from 18 to 85 years (mean = 50 yrs). Forty-six episodes occurred during mechanical ventilation, 15 during weaning, while 39 were in nonintubated patients. Identification was as follows:

Monitor	Events	Desaturation Range	Mean
Pulse Oximetry (SpO <sub>2</sub> )	59	6-55%	17%
Arterial Blood Gas (PaO <sub>2</sub> )	24	20-238 torr	51 torr
Venous O <sub>2</sub> Saturation (SvO <sub>2</sub> )	15	10-48%	22%
Transcutaneous O <sub>2</sub> (PtcO <sub>2</sub> )	2	24-35 torr	29 torr

Initial evaluation including hand ventilation, airway inspection, physical exam, ventilator check and review of recent interventions identified the probable cause in 61 events. Urgent chest roentgenograms (CXR) were obtained in 46, 31 (67%) were diagnostic. Of 12 electrocardiograms, three were abnormal and one revealed an acute myocardial infarction (AMI). The 12 patients with clinical suspicion of pulmonary embolism had negative workups. Hypoxia was caused by mechanical ventilation/artificial airway in 42, recent interventions in 21, onset of a new pulmonary process in 19, progression of underlying disease in 11 and remained unknown in seven. Two adverse outcomes were directly related to hypoxia: one anoxic encephalopathy and one AMI. In conclusion acute hypoxia is a frequent potential morbid SICU event. Advances in continuous oxygen monitoring permit early identification and thereby may limit adverse outcomes, but should not prompt an expensive diagnostic workup. A thorough bedside evaluation and a CXR will be diagnostic in over ninety percent of hypoxic events.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: Rigid Nailing of the Tibia - Biomechanics of the Nail Insertion Site  
(ALL CAPITALS)  
Authors: David J. Sobba M.D., James B. Carr M.D., Lance Bear B.S.  
Institution: Univ. of Missouri K.C. - Truman Medical Center  
Presenter: Member Guest Resident XX  
Senior Sponsoring Member: James A. Edney M.D.  
Time: 10 minutes  
Special Audiovisual Requirements: dual projectors and screens

ABSTRACT

The use of a proximal "universal" insertion site for rigid IM nailing of the tibia was evaluated in a biomechanical study and in a retrospective clinical study. The purpose of the study was to investigate the bursting strain patterns in the proximal tibia fracture fragment during nailing and to retrospectively evaluate a clinical series using the "universal" site.

Eight matched pairs of cadaver tibias were instrumented with strain gauges and nailed, four pairs with a Lottes and four with a Grosse-Kempf nail. The "universal" site and the recommended standard site were used in one of each pair. The "universal" site was located in the midline at the anterior edge of the tibial plateau. Bursting strain was calculated for each proximal tibia fracture fragment. In the clinical series twenty-seven fractured tibias underwent rigid IM nailing with the use of the "universal" site. These were evaluated for technical complications, alignment, and knee symptoms at follow up.

The results of the biomechanical study showed a much larger bursting strain generated when using the standard insertion site in the Lottes group and a small difference when using a reamed Grosse-Kempf nail. No significant technical complications were encountered. Alignment was satisfactory in 23/24 tibias, and three patients had knee symptoms related to the insertion site. Three patients were lost to follow-up.

The results of this study support the use of the proximal "universal" insertion for all rigid IM nailing of the tibia as it provides a single site for all rigid IM nailing, closely approximates the biomechanically correct site, and generates less bursting strain during nailing. The clinical application of this site should produce less fracture comminution during nailing with less resultant technical complications.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: ANKLE MORTICE STABILITY IN WEBER C ANKLE FRACTURES:  
 (ALL CAPITALS) INDICATIONS FOR TRANSMALLEOLAR FIXATION  
 Authors: JOHN SOLARI, JAMES BENJAMIN, JOHN WILSON, RUSSELL LEE  
 Institution: UNIVERSITY OF ARIZONA HEALTH SCIENCES CENTER  
 Presenter: JOHN SOLARI Member Guest Resident xx  
 Senior Sponsoring Member: JAMES BENJAMIN, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: \_\_\_\_\_

ABSTRACT

Weber Type C ankle fractures were reproduced in 12 cadaver lower extremities which were disarticulated at the knee and mounted in a frame for biomechanical testing. We sequentially osteotomized the medial malleolus, released the syndesmotic ligaments, and osteotomized the fibula 4cm above the mortice. A 24 inch/lb external rotation torque was applied to the ankle at each stage and the rotational stability of the ankle was documented. Fluoroscopic controlled AP and mortice radiographs were also obtained at each stage. The fracture was then sequentially repaired in reverse order and again tested for rotational stability.

The maximum external rotation in the intact ankle averaged 7.7°. Creation of a Weber C injury allowed 31.8° of rotation, a 311% increase from baseline. Plate osteosynthesis of the lateral malleolus alone improved stability by 32% and addition of a syndesmotic screw improved the mortice stability to 51% of that seen in the intact ankle. Fixation of the medial malleolus alone reconstituted 57% of the ankle's stability. Medial and lateral osteosynthesis reconstituted 73% of the baseline stability and the addition of a syndesmotic screw improved stability to 101%.

Our results would indicate that fixation of the medial complex dictates the need for transmalleolar fixation. If the deltoid ligament is disrupted or the medial malleolus can not be repaired, a lateral plate restores only a third of the ankle's stability, and a syndesmotic screw significantly offers a significant improvement. If repair of the medial complex is possible, transmalleolar fixation does not appear as crucial and its benefits may not outweigh the potential risks.



**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

**Deadline:** November 1, 1989

**TITLE:** RESECTION OF PARTIAL PHYSEAL ARREST  
**(ALL CAPITALS)**  
**Authors:** R. A. Klassen, M.D. and H. A. Peterson, M.D.  
**Institution:** Mayo Clinic  
**Presenter:** R. A. Klassen Member  Guest  Resident   
**Senior Sponsoring Member:** R. A. Klassen, M.D.  
**Time:** 10 minutes  
**Special Audiovisual Requirements:** Double carousels.

**ABSTRACT**

Physeal injury can cause partial or complete premature growth arrest of the physis and associated long bone deformity. The purpose of the study was to evaluate the long-term results of long bone growth following physeal bar resection.

This is a prospective study of 121 patients treated from 1968 to 1986 who underwent physeal bar resection. History of injury, age at onset, treatment, physical exam, and roentgenograms (AP and lateral, scanograms, tomograms, and bone age) were noted. Epidemiology, morphology of the lesion, and treatment results were assessed. The lesions were classified as to type I-IV, location, and bone involved. The size of the lesion and projected growth was determined. Indication for treatment was projected growth of 2 cm or more and less than 50 percent involvement of the physeal area. Associated procedures required to gain appropriate alignment and length, included osteotomies, epiphysiodesis, and bone lengthening, were noted. The lesions were resected with a burr under radiographic control. The defects were then filled with cranioplast, marker pins were inserted, and growth was monitored until maturity. Additional procedures were performed as necessary. One hundred and twenty-one lesions were resected: distal femur, 46; proximal tibia, 20; distal tibia, 39; distal fibula, 1; toe, 1; proximal humerus, 2; distal radius, 8; distal ulna, 3; and acetabulum, 1. Etiology was trauma, 80 percent; infection, 10 percent; tumor, 5 percent; iatrogenic, 3 percent; radiation, 2 percent; and burns, 1 percent. Forty-three patients with 56 lesions were followed to maturity. Forty percent were male and 13 percent female. Sixteen required no further treatment. Forty required additional treatment: osteotomies, 22; epiphysiodesis, 20; and lengthening, 8. Thirteen complications were noted: 9 recurrences, 2 infections, and 2 fractures.

Results: Bone growth occurred in the affected bone as compared to the normal side as this follows: femur, 76.8 percent; proximal tibia, 87 percent; distal tibia, 86.8 percent; for an overall aggregate of 84 percent. It was also noted that growth frequently could be stimulated at the unaffected physis.

Conclusion: Lesions are resectable and bone growth is to be expected in 84 percent of cases. Physeal growth contribution is variable. The age of the patient was not related to the results. Multiple procedures were often required to equalize the limb and physeal bar resection is useful in many cases.

## 1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE (ALL CAPITALS): IMPROVED OUTCOME WITH EARLY FIXATION OF SKELETALLY  
PELVIC FRACTURES

Authors : B.A. Latenser, M.D., J. Batdorf, M.D., L.M. Gentilello, M.D.

Institution : University of Nevada School of Medicine

Presenter : B.A. Latenser, M.D. Member \_\_\_\_\_ Guest \_\_\_\_\_ Resident X

Senior Sponsoring Member: R.P. Fischer, M.D.

Time : 10 minutes

Special Audiovisual Requirements: \_\_\_\_\_

## ABSTRACT

Massive hemorrhage and delayed septic complications are significant causes of morbidity and mortality in patients with skeletally unstable pelvic fractures. In order to determine the efficacy of early pelvic stabilization (defined as internal or external fixation within eight hours of hospital admission), 37 consecutive patients with unstable pelvic fractures were divided into two groups: Group 1 (July 1981 to December 1984; n=18), when early fixation was not routinely used and Group 2 (January 1985 to March 1988; n=19), when early pelvic stabilization was performed unless contraindicated by the patients clinical status.

Both groups were well matched for baseline demographics, including age, sex, injury severity score, mechanism of injury, pelvic fracture type, and associated injuries. Outcome variables measured included duration of hospital stay, long-term disability, incidence of complications, transfusion requirement, and mortality rate. Significantly more patients in Group 2 underwent early pelvic fixation (p=.05). There was a 37.8% decrease in median hospital stay for Group 2 patients, which was highly significant (p=.004). Of group 1 patients, 60% were confined to a wheelchair or bed for at least six months versus 15.7% in Group 2 (p=.001). In Group 1, 45% of patients required discharge to a rehabilitation facility, versus 26.4% of patients in Group 2. Group 1 had more complications, 1.4 per patient versus 1.0 per patient in Group 2. Patients in Group 2 taken directly to surgery from the Emergency Department averaged 27.2% fewer units of blood transfused than patients in either group whose surgery was delayed. Survival was better in Group 2, 100% vs. 83.3% (p=.06).

In conclusion, early fixation of unstable pelvic fractures significantly decreases duration of hospital stay and long-term disability, and may result in less complications, decreased transfusion requirement, and better survival.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

**TITLE:** MANAGEMENT OF LARGE SOFT TISSUE DEFECTS FOLLOWING CLOSE  
(ALL CAPITALS) RANGE SHOTGUN INJURY  
**Authors:** Hoekstra SD, Bender JS, Levison MA  
**Institution:** Detroit Receiving Hospital and Wayne State University  
**Presenter:** Hoekstra SD Member Guest Resident X  
**Senior Sponsoring Member:** Robert F. Wilson  
**Time:** 10 minutes  
**Special Audiovisual Requirements:**

ABSTRACT

Large soft tissue defects following close range shotgun blasts remain a major technical challenge to the trauma surgeon. During the period 1980-1988, 43 patients survived greater than 48 hours following this injury and were managed in our center. The location of their soft tissue defects were: abdomen/chest 20; extremity 20; and head/neck 3.

All patients underwent immediate surgical exploration and wide debridement of all devitalized tissue along with repair of associated injuries. Sixteen had associated visceral injury, 11 had associated long bone injury, and 11 had associated major vascular injury. Fourteen patients were admitted in shock (SBP <90 torr). An average of 4.7 units (range, 0-30) of blood were required during resuscitation and initial operation. Broad-spectrum antibiotics were administered to all patients. Patients underwent daily or every other day dressing changes, debridement, and irrigation in the operating room. Three patients whose abdominal wall defects could not be initially closed had temporary placement of Owen's cloth to prevent evisceration. Overall, 2 patients had eventual delayed primary closure, 7 had closure with split thickness skin grafts, 9 had closure with myocutaneous flaps and 23 closed by secondary intent. Only 6 patients developed sepsis postoperatively and all patients survived.

**Conclusion:** Mandatory frequent operative dressing change, debridement and irrigation minimizes sepsis following close range shotgun blasts and should be the treatment of choice for this devastating injury.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: TORN THORACIC AORTA: EVOLUTION OF A REPAIR TECHNIQUE  
(ALL CAPITALS)  
Authors: BL McCROSKEY, EE MOORE, FA MOORE, CM ABERNATHY  
Institution: DENVER GENERAL HOSPITAL, UNIV. OF COLORADO HEALTH SCIENCES CTR  
Presenter: BL McCROSKEY Member x Guest \_\_\_\_\_ Resident \_\_\_\_\_  
Senior Sponsoring Member: BL McCROSKEY  
Time: 10 Min. 10 minutes  
Special Audiovisual Requirements: Double Slide Projector

ABSTRACT

TORN THORACIC AORTA: EVOLUTION OF A REPAIR TECHNIQUE

BL McCROSKEY, EE MOORE, FA MOORE, CM ABERNATHY  
DENVER GENERAL HOSPITAL, UNIVERSITY OF COLORADO HEALTH SCIENCES CENTER

Successful repair of the torn descending thoracic aorta continues to be a major challenge confronting trauma surgeons. The infrequency of these injuries and their early lethality preclude any one Trauma center from having a large experience. Controversy regarding their repair has focused on maneuvers to protect against spinal cord ischemia. Encouraged by the application of the intraluminal graft for dissecting aneurysms and by the report of Metzdorff and Esrig at the 16th Annual Meeting of the WTA describing its use for traumatic aortic repair, we began using this graft routinely at our institution in 1986. Due to dissatisfaction with this technique we subsequently relied on a centrifugal blood pump with partial left heart bypass for spinal cord protection. This report reveals our recent experience with thoracic aorta repairs, describing the two techniques and comparing their results.

Twelve patients underwent repair of a torn thoracic aorta over a three year period ending in Oct. 1989. Ten patients were male and 2 were female with a mean age of 30; all injuries were due to blunt motor vehicular deceleration. Two patients had "clamp and sew" technique, 4 patients had graft repair performed using an intraluminal graft (Meadox), and the more recent 6 patients underwent partial left atrial-femoral bypass using the Biomedicus centrifugal pump. Concomitant solid organ and soft tissue injuries were common, but patients groups were comparable in Revised Trauma Score and Injury Severity Score. Of the intraluminal graft patients, 1 developed spinal cord ischemia and 2 others developed sustained hypertension due to a "pseudo-coarctation" syndrome. Insertion of the intraluminal shunt was difficult to accomplish in the normal sized aorta of young injured patients, and had to be abandoned in one patient. In contrast, partial bypass was successful in all patients for whom it was employed, and resulted in no adverse effect or neurologic morbidity. In addition, partial bypass was instrumental in controlling left ventricular afterload during aortic cross clamping particularly in patients having sustained cardiac contusion. Five out of 6 patients received heparin during bypass repair; a concomitant head injury was felt to contraindicate anticoagulation in 1 patient.

Based on this experience we have abandoned use of the intraluminal graft for repair of the torn thoracic aorta; instead we strongly recommend conventional repair combined with routine partial left atrial-femoral bypass.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: THE MANAGEMENT OF FLAIL CHEST INJURY  
 (ALL CAPITALS)  
 Authors: Michael A. Freedland, M.D., Robert F. Wilson, M.D., Jeffrey Bender, M.D.  
 Institution: Wayne State University, Detroit Receiving Hospital  
 Presenter: M.A. Freedland Member Guest Resident X  
 Senior Sponsoring Member: Robert F. Wilson, M.D., FACS  
 Time: 10 minutes  
 Special Audiovisual Requirements: N/A

ABSTRACT

The records of 57 consecutive patients with flail chest were reviewed to determine factors affecting morbidity and mortality. The patients were divided into three groups. Group I (n = 20) had flail chest as an isolated injury; Group II (n=16) had flail chest plus extremity fractures; and Group III (n = 21) had flail chest plus major organ injury involving head, chest, or abdomen. Intubation was performed in 36 patients for clinical evidence of inadequate ventilation.

Group	N	Deaths	Intubated	*Pneumonia	*Days in Hospital
1	20	0	5 (25%)	0	9 ± 4
2	16	0	10 (63%)	8 (50%)	30 ± 22
3	21	10 (48%)	21 (100%)	17 (100%)	50 ± 48
TOTAL	57	10 (18%)	36 (51%)	25 (51%)	29 ± 34

\*Four early deaths not included.

All mortalities were in Group III. Four of these patients died within 72 hours of admission from massive bleeding or head injuries. Two patients died at 6 and 8 days from cardiac injuries. Four patients died between days 30 and 197 from pulmonary sepsis.

Of 55 patients in whom the amount of pulmonary contusion could be quantified, 11 (20%) had no apparent contusion, 13 (23%) had minimal contusion, 15 (27%) had moderate contusions and 16 (29%) had severe contusions. Of the 31 patients who had moderate to severe contusions, 24 (77%) required ventilatory support and 18 (58%) developed pneumonia. In 24 patients with no or minimal contusions, the incidence of ventilatory support (46%) and pneumonia (25%) were significantly lower at  $p < 0.05$ .

Group 2 patients with concurrent fractures versus Group I (isolated flails) had a significant increase in need for intubation (63% vs 24%) at  $P < 0.03$ , incidence of pneumonia (50% vs 0%) at  $P < 0.001$  and length of stay ( $30 \pm 22$  vs  $9 \pm 4$ ) at  $P < 0.01$ .

In this series, the primary determinant of morbidity, length of stay and mortality was the presence and extent of associated injuries. Patients with isolated flail chest did well with minimal morbidity. Mortalities occurred only in patients with major associated injuries. Finally, patients with flail and concurrent fractures have significant morbidity and increased hospital stay.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: BLUNT CAROTID DISSECTION: 4 YEAR EXPERIENCE TN  
 (ALL CAPITALS) A TRAUMA SYSTEM  
 Authors: JW Davis, DB Hoyt, TO Field, SR Shackford, RC Mackersie, T Holbrook  
 Institution: UCSD Medical Center  
 Presenter: James W. Davis Member \_\_\_\_\_ Guest \_\_\_\_\_ Resident \_\_\_\_\_  
 Senior Sponsoring Member: RC Mackersie  
 Time: XX 10 minutes  
 Special Audiovisual Requirements: None

ABSTRACT

Traumatic blunt carotid dissection (BCD) is a rare and potentially lethal injury. We reviewed the experience of 6 trauma centers to determine if specific features might lead to earlier diagnosis and treatment.

From 1/85 - 3/89, 11,148 patients were admitted after blunt trauma. Twelve patients (0.11%) were identified with blunt dissection of the internal carotid artery, 2 had bilateral injuries. One patient was assaulted, 9 were injured in motor vehicle crashes, and 1 each in ski and bicycle crashes. All had associated injuries: head injuries (92%), rib fractures (42%), pelvic fractures (33%), facial or skull fractures (17% each), cervical spine fractures (17%) and lumbar spine fractures (17%).

All patients underwent angiography to confirm the diagnosis, 5 because of neurologic deterioration. Ultrasonography of the carotid arteries was obtained in 5 patients; 2 were non-diagnostic, 2 revealed internal carotid occlusion, and 1 demonstrated intimal flaps.

To assess the association of head injury, facial and skull fractures and other injuries with the occurrence of BCD, a case-control analysis was performed. Controls were selected from blunt trauma patients and frequency matched for injury severity score, age and sex.

INJURY	BCD(+) (N=12)	BCD(-) (N=2953)	ODDS RATIO	P VALUE
Head inj	46%	44%	1.2	NS
Cspine Fx	8%	3%	2.8	NS
Head inj/Facial Fx	31%	13%	3.1	0.05
Head inj/Cspine Fx	8%	6%	1.3	NS
Head/Face/Cspine*	92%	68%	5.6	0.06
Head/Face/Cspine* + Extrem	54%	30%	2.8	0.06

\* Head injury or Facial fracture or C-spine fracture

BCD is rare, occurring in 1 in 1000 blunt trauma patients. Deceleration type injuries are the predominant cause of BCD. Any combination of head injury, facial fracture and C-spine fracture should increase the index of suspicion for this diagnosis and patients with neurologic deterioration and normal or unchanged CT findings require consideration for urgent angiography to diagnose BCD. Angiography remains the diagnostic test of choice as non-invasive scanning was not reliable in this study.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: CONSERVATIVE MANAGEMENT OF INFECTED POST TRAUMATIC  
(ALL CAPITALS) HEMOTHORAX  
Authors: M.A. Mansour, M.D., J. Moulton, M.D., J.B. Moore, M.D.  
Institution: St. Anthony Hospital and University of Colorado  
Presenter: Ash Mansour, M.D. Member Guest Resident X  
Senior Sponsoring Member: John B. Moore, M.D.  
Time: 10 minutes 10 minutes  
Special Audiovisual Requirements: None

ABSTRACT

Closed chest tube drainage of infected post-traumatic hemothorax may fail if the tube is not optimally placed within the loculations or if the fluid is clotted. Standard management after chest tube failure includes open surgical drainage or decortication. The authors discuss an alternative method involving radiologically-guided catheter placement and transcatheter instillation of urokinase to promote clot lysis and lung re-expansion.

Six patients with infected post-traumatic hemothorax were treated using this method. Two of the hemothoraces were due to gunshot wounds, 4 were iatrogenic due to presumed intercostal vessel laceration (2 following subphrenic abscess drainage, 2 following transcostal catheter placement). The collections averaged 3 days old prior to initial drainage (range 0-11 days). Four patients initially underwent surgical thoracostomy tube placement, all underwent radiologically-guided placement of single-lumen drainage catheters managed with suction and saline irrigation. This therapy had failed to completely drain the collections over an average of 11 days (range 1-17 days). Urokinase (1000 units/ml) was instilled into the pleural space in 80- to 150-ml aliquots, left in place for 1-2 hours, then aspirated. After 1-2 hours, then aspirated. After 1-2 hours of suction the procedure was repeated. All 6 collections were completely drained after an average of 5.3 instillation with an average of lytic therapy being 36 hours (range 12-75 hours). The catheters were removed 1-2 days following completion of urokinase therapy. There were no complications.

We conclude that the use of image-guided catheter placement and intrapleural instillation of urokinase offers a safe, effective, and cost-effective alternative in the treatment of infected post-traumatic hemothorax.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: PARASTERNAL AND TRANSMEDIASTINAL GUNSHOT WOUNDS:  
(ALL CAPITALS) GRADY MEMORIAL HOSPITAL CLINICAL STUDY  
Authors: Mark J. Stout, MD, Barry M. Renz, MD, Roger T. Sherman, MD  
Institution: Emory University Department of Surgery  
Presenter: Dr. Stout Member          Guest          Resident X  
Senior Sponsoring Member: David V. Feliciano, MD  
Time: 10 minutes 10 minutes  
Special Audiovisual Requirements: None

ABSTRACT

Parasternal and transmediastinal gunshot wounds are dramatic and frequently lethal injuries. Management is selective and rapidly determined by the initial clinical course as shall be described.

Thirty-four such patients presented acutely during a 16 month period. The diagnosis of parasternal entrance or transmediastinal trajectory was established by clinical or radiographic means. Twenty-six (76%) were hypotensive or had no blood pressure on presentation, of which 16 required an emergent thoracic operation, including 4 emergency department thoracotomies (EDT). Two patients were clearly dead on arrival (DOA) and EDT was not performed. The remaining 16 patients, hemodynamically stable on presentation or following initial resuscitation, immediately underwent diagnostic studies to evaluate the mediastinal structures at risk. This protocol included aortography, esophagography or intra-operative esophagoscopy, bronchoscopy, and pericardial window or echocardiography as indicated.

Six cardiac, 5 aortic and great vessel, 3 pulmonary artery, 3 esophageal, 1 tracheal, and 6 spinal cord injuries were encountered. Thirteen of the 16 patients (81%) diagnostically evaluated were determined to have no significant thoracic injury, and were therefore managed expectantly with no subsequent morbidity related to a missed diagnosis. Ten patients died (29% mortality), including the 4 who underwent EDT and the 2 DOA.

Operative intervention dictated by hemodynamic instability or diagnostic studies is appropriate for gunshot wounds which traverse the mediastinum. Mandatory mediastinal exploration for all patients is not optimal since exposure of all potentially injured structures is difficult and in over one-third no significant injury is present.



1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: INCREASED MORBIDITY WITH ABNORMAL PULMONARY ALBUMIN

(ALL CAPITALS) FLUX IN SEPTIC ADULT RESPIRATORY DISTRESS SYNDROME

Authors: H. Sugerman, K. Byrne, J. Tatum, D. Henry

Institution: Medical College of Virginia

Presenter: H. Sugerman Member  Guest  Resident

Senior Sponsoring Member: \_\_\_\_\_

Time: \_\_\_\_\_ 10 minutes

Special Audiovisual Requirements: \_\_\_\_\_

ABSTRACT

Damage to the pulmonary capillary membrane can be detected by a rising lung:heart radioactivity ratio or slope index (SI). Thirty-two control individuals, 19 patients with CHF and 30 patients with a diagnosis of sepsis (fever, leukocytosis and infection source) and ARF [intubation, mechanical ventilation, (A-a)O<sub>2</sub> > 200 torr without PEEP and PAOP  $\leq$  18 mmHg] underwent comparative scintigraphic studies. An abnormal SI,  $\geq 0.86 \times 10^{-3} \text{ min}^{-1}$ , was 2 S.D. > control mean.

Results: Smoking history, sex or age did not affect SI. There was no significant difference between SI ( $\times 10^{-3} \text{ min}^{-1}$ ) in the control ( $0.14 \pm 0.4$ ) and CHF ( $0.25 \pm 0.8$ ) groups when only patients with PAOP  $\leq$  30 mmHg were included. Three of 6 patients with PAOP > 30 mmHg had an abnormal SI. The septic ARF patients had a higher ( $p < 0.001$ ) SI ( $0.89 \pm 0.5$ ) than either the control or CHF (PAOP  $\leq$  30 mmHg) groups. In the septic ARF group, 15 patients had a normal and 15 an abnormal SI. There were no differences in PaO<sub>2</sub>, (A-a)O<sub>2</sub>, PEEP, mortality or time to death between septic ARF patients with normal or abnormal SI's. Using a censoring mechanism for the patients who died, time-to-response analysis in surviving patients were significantly longer in the patients with an abnormal SI than a normal SI for duration of mechanical ventilation (34 vs 10 days, respectively,  $p < 0.01$ ), intensive care unit stay (63 vs 11 days, respectively,  $p < 0.005$ ) and length of hospital stay (110 days vs 41 days, respectively,  $p < 0.005$ ).

In conclusion, computerized single isotope pulmonary gamma scintigraphy in septic patients with ARF was associated with a greater flux of albumin than control patients or those with cardiogenic pulmonary edema with a PAOP  $\leq$  30 mmHg. Septic patients with an abnormal scintigraphic scan required a much more prolonged duration of mechanical ventilation, stay in the ICU and hospitalization than septic patients without an abnormal scan. Blood gas exchange was not significantly different between these two groups of septic patients, suggesting that there are additional causes for ventilation/perfusion abnormalities and ARF than an increased pulmonary capillary permeability.

**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

**Deadline:** November 1, 1989

**TITLE:** BRONCHIAL BLOOD FLOW AND EICOSANOID BLOCKADE  
**(ALL CAPITALS)**  
**Authors:** J.C. Stothert, G. Ghaanador, L. Traber, D. Traber  
**Institution:** University of Texas Medical Branch at Galveston  
**Presenter:** Member  Guest  Resident   
**Senior Sponsoring Member:** David Feliciano, M.D.  
**Time:** 10 minutes  
**Special Audiovisual Requirements:** None

**ABSTRACT**

The systemic circulation to the lung is thought to be an important microvascular exchange region which may contribute significantly to pulmonary edema resulting from inhalation injury. We have evaluated bronchial arterial flow after an injury caused by aspiration of 2.5 ml/kg of 0.1 N hydrochloric acid and blockade of thromboxane synthetase (TxI) or cyclooxygenase (CyI) in a sheep model with chronic lung lymph fistulae. All animals were anesthetized during airway acid aspiration and were then followed for 48 hours in the awake state with free access to food and water. Bronchial artery blood flow was measured by chronically implanted ultrasonic flow probes around the main bronchial artery (ml/min). Lymph flow is expressed in ml/hr. Statistical significance utilizing ANOVA where \* = p 0.05 as compared to 0 time.

<b>Bronchial Artery Flow:</b>						
Hour		0	0.5	6	24	48
Control	n=5	10	64*	36*	35*	34*
TxI	n=5	14	67*	39*	50*	37*
CyI	n=3	13	16	9	17	34*
<b>Pulmonary Lymph Flow:</b>						
Hour		0	0.5	6	24	48
Control	n=5	8.4	24.4*	29.8*	26.6*	13.4
TxI	n=5	6.7	20.3*	28.4*	25.9*	22.3*
CyI	n=3	4.6	15.0*	28.2*	31.8*	42.0*

**Conclusion:** Thromboxane synthetase inhibition results in minimal changes in bronchial artery flow and lymph flow. Cyclooxygenase inhibition, results in marked diminution in arterial blood flow response with a consequent increase in lymph flow especially at 48 hours when compared to control acid aspiration. These data suggest that an eicosanoid vasodilator (probably prostacyclin) has marked influence on the response to direct airway injury utilizing acid. These data further suggest that inhibition of the vasodilator response worsens injury.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: C1-C2 POSTERIOR ARTHRODESIS FOR ODONTOID NONUNION  
 (ALL CAPITALS)  
 Authors: M. E. Cabanela, M.D. and A. D. Hanssen, M.D.  
 Institution: Mayo Clinic, Rochester, MN 55905  
 Presenter: Cabanela Member  Guest  Resident   
 Senior Sponsoring Member: \_\_\_\_\_  
 Time: Ten minutes 10 minutes  
 Special Audiovisual Requirements: Two carousel projectors

ABSTRACT

The study reports the results of C1-C2 posterior arthrodesis in 21 patients with established nonunion of a Type II dens fracture. All procedures were performed by one surgeon between February 1976 through May 1987 at the Mayo Clinic. There were 11 male and 10 female patients with an average age of 43 years. All patients were followed until bony union was verified by flexion-extension radiographs and trabecular union. Average follow-up was 36 months. Eighteen patients had primary bony union of the fusion mass at 11.5 weeks (range 8-16 weeks) and were immobilized with a halo thoracic device for an average of seven weeks followed by a Philadelphia collar for nine weeks. Sixteen had a modified Brooks-Jenkins wedge compression arthrodesis while the remaining two had a Gallie arthrodesis. All eighteen patients had autogenous iliac bone grafting. Three patients had problems with bony union which were felt to be related to alterations in the surgical technique or the postoperative immobilization. All three patients had a Brooks-Jenkins arthrodesis. One patient who was immobilized with a four-poster brace had delayed union of the fusion, but was solid at seven months. A second patient immobilized with a Philadelphia collar developed a nonunion which required re-arthrodesis at 12 months. Postoperative immobilization with a halo thoracic device resulted in successful fusion after reoperation. The third patient with arthrodesis failure had allograft rather than autogenous graft and was successfully reoperated 11 months after the initial procedure.

Conclusion: Posterior C1-C2 fusion for an established nonunion Type II dens fracture was always successful with autogenous bone grafting and postoperative halo-thoracic immobilization. All bony union problems encountered in this series were associated with the use of postoperative immobilization other than a halo thoracic device or the use of allograft bone.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: USE OF XENON-ENHANCED COMPUTED TOMOGRAPHY AS AN INDICATOR OF  
 (ALL CAPITALS) CLINICAL OUTCOME IN NEUROLOGIC INJURIES  
 Authors: Johnson TJ, Edney JA, McConnell JR  
 Institution: University of Nebraska Medical Center  
 Presenter: Johnson TJ Member            Guest            Resident x  
 Senior Sponsoring Member: Edney JA  
 Time:            10 minutes  
 Special Audiovisual Requirements: None

ABSTRACT

Utilizing current imaging techniques, the prediction of clinical outcome in the head-injured patient can be a time consuming and unreliable process. Artifacts and drug-induced changes may make accurate interpretation of the electroencephalogram (EEG) impossible. Since radioisotope brain scans are a lengthy procedure, they are often logistically impractical in the severely injured patient. This study was undertaken to determine if Xenon-enhanced computed tomography (Xe-CT) has any advantages as an alternative indicator of clinical outcome in the head-injured patient.

Five patients with severe head and neck trauma were assessed both by routine CT and concomitant Xe-CT. The rate of cerebral blood flow (CBF) per 100 gm of cortical tissue was compared to clinical outcome.

CASES	Xe-CT CBF (cc/100 gm/min) N=20-40	CLINICAL OUTCOME
1	Global flows normal Range 25-47	Survived
2	Focal right parietal region <10 Remainder global flow 39-57	Motor deficit left hand
3	Global flow <10 Range 1.4-2.3	Death
4	Global flow <10 Range 1.5-3.0	Death
5	Global <10 Range right cortex 1.9-9.1 Range left cortex 4.6 frontal 38.0 occipital	Death

All head and neck trauma patients undergo routine head CT. Xe-CT scanning adds an additional 15 minutes. In our institution the use of Xe-CT in place of an isotope brain flow scan saves the patient \$535.

We found Xe-CT scanning to be of predictive value in determining clinical outcome in our preliminary study of patients with severe head and neck trauma. Xe-CT is more cost effective and logistically easier to perform than isotope brain flow scans and are not subject to the artifactual changes associated with EEG. This study indicates that Xe-CT may be the study of choice to determine CBF in head and neck trauma patients. Further study of the role of Xe-CT estimation of in head and neck trauma is necessary.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: DYNAMIC COMPUTERIZED TOMOGRAPHY OF THE OCCIPUT-ATLAS-AXIS  
(ALL CAPITALS) COMPLEX IN TRAUMA PATIENTS WITH ODONTOID LATERAL MASS ASYMMETRY  
Authors: Iannacone, W.M., DeLong, W.G., Born, C.T., Bednar, J.M., Ross, S.E.  
Institution: University of Medicine & Dentistry of NJ-Robert Wood Johnson Med. School  
Presenter: Member \_\_\_\_\_ Guest X Resident \_\_\_\_\_  
Senior Sponsoring Member: \_\_\_\_\_ Steven E. Ross, M.D.  
Time: 10 minutes  
Special Audiovisual Requirements: \_\_\_\_\_

ABSTRACT

Asymmetry of the interspace between the odontoid and the lateral masses of the axis is occasionally noted on open mouth anterior-posterior radiographs taken for routine cervical spine evaluation following trauma. Some patients presenting with this radiographic finding are asymptomatic while others may have cervical pain, paraspinous tenderness and fixed deformity or limited range of motion. The most common cause of this finding is improper head positioning. The clinical significance of this finding has been addressed in the literature and many authors have suggested that persistent asymmetry of the odontoid-lateral mass interspace (OLMI) on properly aligned open mouth radiographs may represent atlanto-axial rotatory subluxation or fixation.

The purpose of this study was to prospectively determine the significance of this finding utilizing dynamic CT scanning. Dynamic CT scanning involves obtaining axial 4 mm thick scans through the occiput, atlas, and axis with the head in neutral position, followed by scanning through the same levels with the head voluntarily rotated by the patient 15° to 30° to the left, then 15° to 30° to the right. The relative rotation of the occiput (C0), the atlas (C1), and the axis (C2) is then determined utilizing anatomic landmarks for reference.

From July 1987 to May 1989, 25 patients, aged 11 to 74 years, presented to our Level I Trauma Center with odontoid lateral mass asymmetry of 2 to 5 mm on properly centered AP open mouth x-rays. All patients had routine cervical spine x-rays taken including an AP, lateral, and open mouth odontoid view. Patients with cervical spine fractures or dislocations and patients with less than 2 mm of odontoid lateral mass asymmetry were excluded from this study. 8 patients had limitation of range of motion, 17 complained of cervical pain, and no patient had fixed clinical rotatory deformity. 9 patients had associated non-cervical spine fractures. From dynamic CT scanning, 19 patients demonstrated relative range of motion of C1 on C2 greater than 5° bilaterally (average 16°). 3 patients demonstrated less than 5° relative motion of C1 on C2 bilaterally, and three patients had less than 5° of relative motion of C1 on C2 with left rotation only. 2 patients with less than 5° relative motion of C1 on C2 had follow-up CT scans within one week which demonstrated symmetric range of motion greater than 5° bilaterally. All patients had minimal (i.e. less than 5° to 10°) limitation of cervical range of motion clinically at the time of hospital discharge.

The finding of an asymmetric odontoid-lateral mass interspace on properly centered open mouth AP roentgenograms in the presence of otherwise normal cervical spine radiographs, in conscious patients without fixed deformity, appears incidental and requires no further evaluation or treatment. Patients presenting with this finding and fixed clinical rotatory deformity should continue to be evaluated with cineradiography or dynamic CT scanning.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: BALLOON CATHETER TAMPONADE IN CARDIOVASCULAR WOUNDS  
 (ALL CAPITALS) David V. Feliciano, MD, Jon M. Burch, MD, Kenneth L. Mattox, MD,  
 Authors: Carmel G. Bitondo, MD, Gwen Fields, MD  
 Institution: Ben Taub General Hospital and Baylor College of Medicine, Houston, TX  
 Presenter: X Member        Guest        Resident         
 Senior Sponsoring Member:         
 Time: X 10 minutes  
 Special Audiovisual Requirements:       

ABSTRACT

Though standard methods of vascular control are adequate in most patients with vascular wounds, there are still patients who require innovative approaches to prevent exsanguination. Balloon catheter tamponade used at operation and often maintained in the postoperative period may be a lifesaving technique.

Operative balloon catheter tamponade was used in eight patients with cardiac or vascular injuries from penetrating wounds at one trauma center between 1980-1988. In one patient with a gunshot wound to the heart, a Foley balloon catheter was used to control hemorrhage from the right superior pulmonary vein as sutures were placed; the balloon catheter was then removed. In the remaining seven patients, either a Fogarty or Foley balloon catheter was passed into a bleeding site through the bullet tract or proximal vessel, inflated with radiologic dye, attached to a three-way stopcock, and left inflated in the postoperative period. The patient was then observed in the intensive care unit for 3-4 days, at which time the balloon catheter was withdrawn. Included in this group were patients with hemorrhage from the following locations: internal carotid artery at the base of the skull (2) or presenting as a ruptured post-traumatic intraoral pseudoaneurysm (1), diffuse hemorrhage from the oropharynx or nasopharynx (2), second portion of vertebral artery (1), and retroperitoneal area of pelvis (1). Six of seven patients survived following removal of the balloon catheter, while one patient with a Fogarty balloon placed in the carotid siphon died from a cerebral infarction. Hemorrhage did not recur after removal of the balloon in any patient, and there were no postoperative complications.

Balloon catheter tamponade is an extremely useful technique for the trauma surgeon. Temporary insertion into large cardiac or vascular wounds will allow for placement of sutures in a dry field. In locations which are relatively "inaccessible" (base of skull, nasopharynx, deep pelvis, etc.), acute hemorrhage can be controlled by leaving the balloon inflated for a 3-4 day period after operation. Deflation of the balloon at that time is safe, and hemorrhage will not recur.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: INTRACRANIAL INJURY IN MID-FACE FRACTURES  
 (ALL CAPITALS)         
 Authors: Brandt, K., Hickerson, W., Burruss, G., White, C. DeLozier, J.  
 Institution: University of Tennessee  
 Presenter: Brandt, K. Member        Guest        Resident X  
 Senior Sponsoring Member: John Morris, M.D.  
 Time:        10 minutes  
 Special Audiovisual Requirements: None

ABSTRACT

The management of facial fractures has been transformed significantly in the last decade. Treatment options have migrated toward urgent internal rigid plate fixation, and away from delayed external or wire fixation. These improvements have shortened the preoperative period, requiring an intensive evaluation at the time of admission for associated injuries.

Our goals in this review were to analyze the incidence and etiology of combined mid-face and intracranial injuries, with particular attention to outcome of early surgical treatment. We reviewed all patients with mid-face fractures (excluding isolated nasal fractures) treated by the authors in our trauma center over a twelve month period (1987-1988). The etiology of these fractures were motor vehicle accident (MVA) 51, assault 32, and a variety of other accidents 11. All patients received a detailed neurological exam and head and facial CT scan. When possible, patients received rigid fixation of their fracture within 24 hours (66). Patients with known intracranial injury and either, open fractures or those urgently anesthetized for another procedure, received intracranial pressure monitoring perioperatively when appropriate.

Of the 94 patients reviewed, 33 had intracranial injury, ranging from concussion to open cranial vault with cerebral loss. All were recognized preoperatively. Overall mortality was 1% (1/94), and was due to neurologic injury. The most common fracture was an isolated zygomatic complex (52). Of the 21 isolated zygomatic complex fractures in the non-MVA groups only 2 (10%) had an associated intracranial injury, whereas the incidence in the MVA group was 12/32 (37%). LeFort and frontal sinus fractures had a high incidence of intracranial injury, but were almost exclusively MVA related. Ultimately, only 10 patients left the hospital neurologically impaired, as defined by motor or sensory loss or seizure disorder. Of these, only 3 (5%) were in the group undergoing surgery within 24 hours, whereas 7 (25%) were in the group receiving delayed surgical intervention.

Our results indicate that the MVA group was at much higher risk for CNS injury. This confirms the need for detailed neurologic evaluation, including CT scan, in all patients in this group. Although the incidence of intracranial injury is much lower, mid-face fractures of other etiologies deserve the same work-up to avoid the potential morbidity of a neglected injury. In this series, patients operated on within 24 hours fared better than the delayed group, possibly due to differences in the severity of other injuries. However, the favorable outcome in the early surgical group is evidence of the safety of urgent intervention with appropriate neurosurgical support.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: THE MORBIDITY AND FINANCIAL IMPACT OF COLOSTOMY CLOSURE IN THE TRAUMA PATIENT (ALL CAPITALS)  
 Authors: JAMAL J. HOBALIAH, MD, H IRON PACHTER, MD, THOMAS A. CORCORAN, BS, et al.  
 Institution: New York University Medical Center  
 Presenter: X Member Guest Resident  
 Senior Sponsoring Member: David Feliciano, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: None  
 ABSTRACT

The complication rate following traumatic colostomy closure has been reported to be infrequent, (5%) prompting some to conclude that the morbidity of this procedure could not be cited as a factor favoring primary repair. This has not been our experience. As such a 10 year (1/79-1/89) retrospective analysis of 87 patients seen at the Bellevue Hospital was undertaken to evaluate the morbidity of traumatic colostomy closure and its financial impact. The mean postoperative hospital stay was 15 days at a cost of \$13,875. There were no deaths and no anastomotic leaks in this series, but a morbidity rate of 24% was significant. Early small bowel obstruction was the most frequent significant complication occurring in 10 patients (11%) and resulting in a prolongation of hospital stay by 7 days at a cost of \$6,500 per patient. Other complications are detailed in the following table:

MORBIDITY OF COLOSTOMY CLOSURE AFTER COLON INJURY

COMPLICATION	# OF PATIENTS 10 (11.5%)	AVERAGE DELAY IN HOSPITALIZATION
EARLY SMALL BOWEL OBS.	8 (9%)	7
SUPERFICIAL WOUND INFECTION	1 (1.3%)	0
INCISIONAL HERNIA	2 (2.3%)	24
TRANSIENT RESPIRATORY FAILURE	1 (1.3%)	-
TOTAL	22 (24%)	0

The morbidity rate of 24% reported herein after colostomy closure for colonic injuries with its significant financial cost should be considered as a significant factor in favoring primary repair whenever feasible.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: ESOPHAGEAL PERFORATIONS (ALL CAPITALS)  
 Authors: Colin Bailey, M.D., Robert F. Wilson, M.D., Jeffrey Bender, M.D.  
 Institution: Wayne State University, Detroit Receiving Hospital  
 Presenter: C. Bailey, MD Member Guest Resident XX  
 Senior Sponsoring Member: Robert F. Wilson, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: N/A  
 ABSTRACT

Of 53 patients with esophageal perforations reviewed from records over the past 13 years, 22 (42%) died. Seven of these perforations were diagnosed at autopsy. The etiology of these perforations (and mortality) were as follows: iatrogenic 24 (10/24, 42%), gunshot wounds 10 (4/10, 40%), blunt 1 (0/1, 0%), spontaneous 15 (7/15, 47%), and foreign body 3 (0/3, 0%). In the iatrogenic group, the perforations were due to 7 dilators, 6 endotracheal tubes, 5 endoscopies, 4 nasogastric tubes, and 2 Sengstaken Blake more tubes. Of 52 chest x-rays, 12 (23%) were normal. The most common findings on chest x-ray were: effusion - 23 (42%), subcutaneous emphysema - 19 (37%), pneumomediastinum - 14 (27%), and pneumothorax - 11 (21%). Of 29 contrast studies, 7 (24%) were falsely-negative. Of 10 flexible endoscopies, 3 (30%) were falsely-negative. When two or more of these diagnostic tests were performed, at least one was always positive. The mortality rates for the different treatments used were:

TREATMENT	ESOPHAGEAL LOCATION	
None (autopsy dx)	Cerv.	Thor
Antibiotics only	1/1	6/6
Chest tubes	1/6	0/1
Penrose Drains	-	5/8
Diversions	0/4	-
Primary Repair	0/1	5/8
Gastric Wrap	1/8	1/2
Celestin tube	-	1/5
TOTAL	3/20	18/31

The mortality rate with thoracic or abdominal esophageal perforations (19/33 = 58%) was significantly higher than with cervical esophageal perforations (3/20 = 15%) ( $\chi^2 = 9.29$ ;  $P < 0.005$ ). The various diagnostic tests were falsely-negative in 23 to 30%. Cervical esophageal tears were handled successfully by almost any technique. The use of a gastric wrap, when possible, seemed to be beneficial for low thoracic or abdominal perforations. This review underscores the fact that a high index of suspicion is needed to diagnose an esophageal perforation and begin early definitive treatment, particularly in the chest and abdomen. A negative chest x-ray, contrast swallow or esophagoscopy should not deter further study and/or direct surgical examination in suspicious cases, particularly in the chest and abdomen.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: BALLOON CATHETER TAMPONADE IN CARDIOVASCULAR WOUNDS  
(ALL CAPITALS) David V. Feliciano, MD, Jon M. Burch, MD, Kenneth L. Mattox, MD,  
Authors: Carmel G. Bitondo, MD, Gwen Fields, MD  
Institution: Ben Taub General Hospital and Baylor College of Medicine, Houston, TX  
Presenter: X Member        Guest        Resident         
Senior Sponsoring Member:         
Time: X        10 minutes  
Special Audiovisual Requirements:       

ABSTRACT

Though standard methods of vascular control are adequate in most patients with vascular wounds, there are still patients who require innovative approaches to prevent exsanguination. Balloon catheter tamponade used at operation and often maintained in the postoperative period may be a lifesaving technique.

Operative balloon catheter tamponade was used in eight patients with cardiac or vascular injuries from penetrating wounds at one trauma center between 1980-1988. In one patient with a gunshot wound to the heart, a Foley balloon catheter was used to control hemorrhage from the right superior pulmonary vein as sutures were placed; the balloon catheter was then removed. In the remaining seven patients, either a Fogarty or Foley balloon catheter was passed into a bleeding site through the bullet tract or proximal vessel, inflated with radiologic dye, attached to a three-way stopcock, and left inflated in the postoperative period. The patient was then observed in the intensive care unit for 3-4 days, at which time the balloon catheter was withdrawn. Included in this group were patients with hemorrhage from the following locations: internal carotid artery at the base of the skull (2) or presenting as a ruptured post-traumatic intraoral pseudoaneurysm (1), diffuse hemorrhage from the oropharynx or nasopharynx (2), second portion of vertebral artery (1), and retroperitoneal area of pelvis (1). Six of seven patients survived following removal of the balloon catheter, while one patient with a Fogarty balloon placed in the carotid siphon died from a cerebral infarction. Hemorrhage did not recur after removal of the balloon in any patient, and there were no postoperative complications.

Balloon catheter tamponade is an extremely useful technique for the trauma surgeon. Temporary insertion into large cardiac or vascular wounds will allow for placement of sutures in a dry field. In locations which are relatively "inaccessible" (base of skull, nasopharynx, deep pelvis, etc.), acute hemorrhage can be controlled by leaving the balloon inflated for a 3-4 day period after operation. Deflation of the balloon at that time is safe, and hemorrhage will not recur.



1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

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 Authors: Brandt, K., Hickerson, W., Burruss, G., White, C. DeLozier, J.  
 Institution: University of Tennessee  
 Presenter: Brandt, K. Member Guest Resident X  
 Senior Sponsoring Member: John Morris, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: None

ABSTRACT

The management of facial fractures has been transformed significantly in the last decade. Treatment options have migrated toward urgent internal rigid plate fixation, and away from delayed external or wire fixation. These improvements have shortened the preoperative period, requiring an intensive evaluation at the time of admission for associated injuries.

Our goals in this review were to analyze the incidence and etiology of combined mid-face and intracranial injuries, with particular attention to outcome of early surgical treatment. We reviewed all patients with mid-face fractures (excluding isolated nasal fractures) treated by the authors in our trauma center over a twelve month period (1987-1988). The etiology of these fractures were motor vehicle accident (MVA) 51, assault 32, and a variety of other accidents 11. All patients received a detailed neurological exam and head and facial CT scan. When possible, patients received rigid fixation of their fracture within 24 hours (66). Patients with known intracranial injury and either, open fractures or those urgently anesthetized for another procedure, received intracranial pressure monitoring perioperatively when appropriate.

Of the 94 patients reviewed, 33 had intracranial injury, ranging from concussion to open cranial vault with cerebral loss. All were recognized preoperatively. Overall mortality was 1% (1/94), and was due to neurologic injury. The most common fracture was an isolated zygomatic complex (52). Of the 21 isolated zygomatic complex fractures in the non-MVA groups only 2 (10%) had an associated intracranial injury, whereas the incidence in the MVA group was 12/32 (37%). LeFort and frontal sinus fractures had a high incidence of intracranial injury, but were almost exclusively MVA related. Ultimately, only 10 patients left the hospital neurologically impaired, as defined by motor or sensory loss or seizure disorder. Of these, only 3 (5%) were in the group undergoing surgery within 24 hours, whereas 7 (25%) were in the group receiving delayed surgical intervention.

Our results indicate that the MVA group was at much higher risk for CNS injury. This confirms the need for detailed neurologic evaluation, including CT scan, in all patients in this group. Although the incidence of intracranial injury is much lower, mid-face fractures of other etiologies deserve the same work-up to avoid the potential morbidity of a neglected injury. In this series, patients operated on within 24 hours fared better than the delayed group, possibly due to differences in the severity of other injuries. However, the favorable outcome in the early surgical group is evidence of the safety of urgent intervention with appropriate neurosurgical support.

**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

**Deadline: November 1, 1989**

**TITLE: THE MORBIDITY AND FINANCIAL IMPACT OF COLOSTOMY CLOSURE IN THE TRAUMA PATIENT (ALL CAPITALS)**

**Authors:** JAMAL J. HOBALLAH, MD, H. LEON PACTER, MD, THOMAS A. CORCORAN, BS, et al.

**Institution:** New York University Medical Center

**Presenter:** X Member Guest Resident

**Senior Sponsoring Member:** David Feliciano, M.D.

**Time:** 10 minutes

**Special Audiovisual Requirements:** None

**ABSTRACT**

The complication rate following traumatic colostomy closure has been reported to be infrequent, (5%) prompting some to conclude that the morbidity of this procedure could not be cited as a factor favoring primary repair. This has not been our experience. As such a 10 year (1/79-1/89) retrospective analysis of 87 patients seen at the Bellevue Hospital was undertaken to evaluate the morbidity of traumatic colostomy closure and its financial impact. The mean postoperative hospital stay was 15 days at a cost of \$13,875. There were no deaths and no anastomotic leaks in this series, but a morbidity rate of 24% was significant. Early small bowel obstruction was the most frequent significant complication occurring in 10 patients (11%) and resulting in a prolongation of hospital stay by 7 days at a cost of \$6,500 per patient. Other complications are detailed in the following table:

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EARLY SMALL BOWEL OBS.	10 (11.5%)	7
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SUBPHRENIC ABSCESS	1 (1.3%)	24
INCISIONAL HERNIA	2 (2.3%)	-
TRANSIENT RESPIRATORY FAILURE	1 (1.3%)	0
<u>TOTAL</u>	<u>22 (24%)</u>	

The morbidity rate of 24% reported herein after colostomy closure for colonic injuries with its significant financial cost should be considered as a significant factor in favoring primary repair whenever feasible.

**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

Deadline: November 1, 1989

**TITLE:** ESOPHAGEAL PERFORATIONS  
**(ALL CAPITALS)**  
**Authors:** Colin Bailey, M.D., Robert F. Wilson, M.D., Jeffrey Bender, M.D.  
**Institution:** Wayne State University, Detroit Receiving Hospital  
**Presenter:** C. Bailey, MD Member Guest Resident XX  
**Senior Sponsoring Member:** Robert F. Wilson, M.D.  
**Time:** 10 minutes  
**Special Audiovisual Requirements:** N/A

**ABSTRACT**

Of 53 patients with esophageal perforations reviewed from records over the past 13 years, 22 (42% died). Seven of these perforations were diagnosed at autopsy. The etiology of these perforations (and mortality) were as follows: iatrogenic 24 (10/24, 42%), gunshot wounds 10 (4/10, 40%), blunt 1 (0/1, 0%), spontaneous 15 (7/15, 47%), and foreign body 3 (0/3, 0%). In the iatrogenic group, the perforations were due to 7 dilatations, 6 endotracheal tubes, 5 endoscopies, 4 nasogastric tubes, and 2 Sengstaken Blakemore tubes.

Of 52 chest x-rays, 12 (23%) were normal. The most common findings on chest x-ray were: effusion - 23 (42%), subcutaneous emphysema - 19 (37%), pneumomediastinum - 14 (27%), and pneumothorax - 11 (21%). Of 29 contrast studies, 7 (24%) were falsely-negative. Of 10 flexible endoscopies, 3 (30%) were falsely-negative. When two or more of these diagnostic tests were performed, at least one was always positive.

The mortality rates for the different treatments used were:

TREATMENT	ESOPHAGEAL LOCATION			
	Cerv.	Thor	Abd.	
None (autopsy dx)	1/1	6/6	-	7/7
Antibiotics only	1/6	0/1	-	1/7
Chest tubes	-	5/8	-	5/8
Penrose Drains	0/4	-	-	0/4
Diversion	0/1	5/8	-	5/9
Primary Repair	1/8	1/2	1/1	3/11
Gastric Wrap	-	1/5	0/1	1/6
Celestin Tube	-	0/1	-	0/1
<b>TOTAL</b>	<b>3/20</b>	<b>18/31</b>	<b>1/2</b>	<b>22/53</b>

The mortality rate with thoracic or abdominal esophageal perforations (19/33 = 58%) was significantly higher than with cervical esophageal perforations (3/20 = 15%) ( $\chi^2 = 9.29$ ;  $P < 0.005$ ). The various diagnostic tests were falsely-negative in 23 to 30%. Cervical esophageal tears were handled successfully by almost any technique. The use of a gastric wrap, when possible, seemed to be beneficial for low thoracic or abdominal perforations.

This review underscores the fact that a high index of suspicion is needed to diagnose an esophageal perforation and begin early definitive treatment, particularly in the chest and abdomen. A negative chest x-ray, contrast swallow or esophagoscopy should not deter further study and/or direct surgical examination in suspicious cases, particularly in the chest and abdomen.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: DUODENAL TRAUMA: A MULTICENTER REVIEW  
(ALL CAPITALS) Sixteen authors from eight WTA member institutions  
Authors: La Crosse, WI; Denver, CO; Houston, TX; San Diego, CA;  
Institution: Seattle, WA; Nashville, TN; Rochester, MN; Camden, NJ  
Presenter: Thomas H. Cogbill Member XX Guest Resident  
Senior Sponsoring Member: Thomas H. Cogbill, M.D.  
Time: XX 10 minutes  
Special Audiovisual Requirements: None

ABSTRACT

The experience of eight trauma centers with duodenal injuries was analyzed to identify trends in management, mortality, and duodenal-related morbidity. A standard anatomic organ injury scale was applied and evaluated. During the 5-year period ending December 1988, 165 duodenal injuries were identified. Patient ages ranged from five to 78 years. There were 38 Class I, 70 Class II, 48 Class III, four Class IV, and four Class V injuries. Injury mechanism was penetrating in 103 (62%) patients and blunt in 62 (38%). No specific duodenal repair was used in 34 (21%) patients. An intramural hematoma was decompressed in three (2%) individuals. Primary repair of the duodenal injury was performed in 117 (71%) patients, including 27 patients also managed with pyloric exclusion and 12 with tube duodenostomy. Duodenal resection with primary anastomosis was used in six (4%) patients and pancreatoduodenectomy was necessary in only five (3%).

Overall mortality was 19%. The cause of death was uncontrolled hemorrhage from severe hepatic or vascular injuries in 22 (13%) patients. In only two (1%) patients could death be attributed to the duodenal injury; each as the result of duodenal repair dehiscence and subsequent sepsis. Duodenal-related morbidity was documented in 26 (16%) patients. These included 21 patients with intra-abdominal abscess, six with duodenal fistula, and four with frank duodenal dehiscence.

Conclusions: 1) A revised organ injury scale for duodenal trauma is suggested. 2) The vast majority of duodenal injuries can be managed by simple repair. 3) Pyloric exclusion is a useful adjunct for more complex injuries. 4) Pancreatoduodenectomy is rarely necessary to treat civilian duodenal trauma. 5) Mortality from duodenal injuries is primarily related to associated vascular and hepatic trauma.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: NONOPERATIVE MANAGEMENT OF BLUNT LIVER INJURIES:  
 (ALL CAPITALS) THE NEED FOR CONTINUED SURVEILLANCE  
 Authors: M.M. Knudson, M.D., R.C. Lim, Jr., M.D., D.D. Oakes, M.D.  
 Institution: University of California, San Francisco, Dept. of Surgery  
 Presenter: M.M. Knudson, MD Member Guest  Resident  
 Senior Sponsoring Member: David Feliciano, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements: None

ABSTRACT

Computed tomographic scanning (CT) after blunt abdominal trauma has allowed nonoperative management of selected patients with liver injuries. This report contains the accumulative experience of the authors in treating 70 patients with such injuries without immediate surgery. 54 adults and 16 children are included, with the major mechanism of injury being motor vehicle accidents. Patients who arrived in hemorrhagic shock or with evidence of peritonitis were not considered candidates for nonoperative management. Liver injuries based on CT diagnosis that were treated expectantly included 52 lacerations, 16 intrahepatic hematomas and 2 subcapsular hematomas. Free intraperitoneal blood in small to moderate amounts was present on CT in 45 patients. Serum hepatocellular enzymes were elevated in 40 of the 44 patients tested, but demonstrated a rapid return toward normal. There were no deaths in this series, no major complications, and no known missed intraabdominal injuries. No patient underwent emergency laparotomy for hemorrhage. However, one patient had a staged laparotomy 4 days after injury to evaluate changes seen on CT. Follow-up CT scans were available for review in one-half of the patients, and were performed at various times post injury (from 1 day to two years). While most injuries appear to heal rapidly, 5% of those patients who were restudied demonstrated residual liver defects persisting longer than four months post-trauma. None of these have developed hematemesis.

Summary: This report on a large series of selected patients with liver injuries demonstrates that initial nonoperative treatment is safe when carefully monitored. Hemorrhage even from major liver lacerations after initial cessation of bleeding rarely occurs. A small number of patients with persistent liver defects however may be at risk for future complications such as hematemesis.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: COMPLICATIONS IN EVALUATING ABDOMINAL TRAUMA:  
(ALL CAPITALS) DIAGNOSTIC PERITONEAL LAVAGE vs. CT SCAN  
Authors: JW Davis, DB Hoyt, RC Mackersie  
Institution: UCSD Medical Center  
Presenter: JW Davis Member            Guest            Resident             
Senior Sponsoring Member: RC Mackersie  
Time: XX 10 minutes  
Special Audiovisual Requirements: None

ABSTRACT

Both diagnostic peritoneal lavage (DPL) and computerized axial tomography (CT) are used in the evaluation of the abdomen after trauma. This study was undertaken to compare the significant complications associated with the use of these two modalities.

The care of 11,027 patients admitted to 6 trauma centers from 6/1/86 to 7/31/88 was reviewed concurrently and retrospectively using data from hospital records and a computerized trauma registry. Autopsies were performed on all patients who died. Significant complications from each diagnostic procedure were evaluated by a multidisciplinary medical audit committee composed of trauma specialists. The committee's findings were reviewed retrospectively to verify their accuracy.

2695 patients underwent DPL and 1152 patients underwent CT scan of the abdomen during resuscitation. There were 18 DPL complications: 6 false negative lavages, 10 visceral perforations and 2 vascular injuries. All but 3 of the perforations required operative repair. There were no deaths associated with DPL complications.

There were 42 complications associated with abdominal CT scan. There were 3 false positive scans and 15 false negative scans (including 6 splenic injuries and 5 small bowel injuries). Seven CT scans were initially misread, leading to delays in diagnosis and treatment of 5 splenic injuries and 2 small bowel injuries. Twelve hemodynamically stable patients were significantly delayed in going to the operating room (>2 hours) because of obtaining a CT scan of the abdomen. Operative treatment of an epidural hematoma was significantly delayed by obtaining an abdominal CT scan and contributed to a preventable death. Five hemodynamically unstable patients were evaluated by abdominal CT scan. All 5 subsequently died; 2 were non-preventable, 2 died from other errors in management. One death was potentially preventable due to the delay to the operating room attributable to the CT scan.

The incidence of complications is low for both modalities. There were no preventable deaths from DPL but there were 2 preventable deaths associated with abdominal CT scan. This study indicates that overall DPL is associated with less preventable mortality and morbidity than CT in the evaluation of abdominal trauma.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: EMERGENCY CENTER ULTRASONOGRAPHY IN THE EVALUATION  
(ALL CAPITALS) OF HEMOPERITONEUM: A PROSPECTIVE STUDY  
Authors: Akio Kimura, MD, Hiroshi Henmi, MD, Yasuhiro Yamamoto, MD  
Institution: Nippon Medical School Tosibumi Ootuka, MD  
Presenter: Akio Kimura, MD Member Guest Resident  
Senior Sponsoring Member: \_\_\_\_\_  
Time: \_\_\_\_\_ 10 minutes  
Special Audiovisual Requirements: \_\_\_\_\_

ABSTRACT

In the United States, diagnostic peritoneal lavage (DPL) has been widely used for evaluation of blunt abdominal trauma. In Japan, ultrasonography (US) is routinely used in the emergency center, and its usefulness has been discussed. In this study we prospectively analyzed the accuracy of US detection of hemoperitoneum in blunt abdominal trauma.

Material and Methods

From March 1989 to mid-October 1989, 236 blunt trauma cases were admitted to our emergency center. Excluding DOA cases, obvious isolated head traumacases and isolated extremity cases, US examination were done for 82 cases. There were ten incomplete records, which were eliminated from this analysis. The 72 cases studied consisted of 59 males and 13 females, having a mean age of 33. The most common mechanism of injury was the motor vehicle accident (61.1%), 52.3% of which were motorcycle accidents. Examination were performed by various physicians ranging from postgraduated year (PGY) 2 to PGY 8. The Hitachi EUB-400 was used as the US machine. Examinations were mostly done just after admission, and were repeated if the initial examination was equivocal or negative but abdominal trauma was still suspected. Initial examinations were done 63.5 minutes after injury on the average, with 61.2% of these performed within 60 minutes. If an anechoic or echo-free space was recognized in Morrison's pouch or Douglas' cul-de-sac, we took it to be positive hemoperitoneum. Bilateral hemothorax, cardiac tamponade, liver, spleen and bilateral kidneys were also checked as routine measures. Most examination were done within 15 minutes, and it took no longer than 5 minutes to evaluate hemoperitoneum.

Results

The sensitivity of US detection of hemoperitoneum was 87.6% and its specificity was 100% (fig 1) In one of the two false negative cases, 5 ml of blood was taped by DPL catheter. However, laparotomy was not indicated. The other case had a history of laparotomy and his heart rate was unstable in spite of rapid fluid infusion. Hemoperitoneum was not demonstrated by US, though it was revealed by CT scan. Laparotomy revealed superior mesenteric venous injury. In 61.5% of the US positive cases hemoperitoneum was detected in the initial examination, with 76.9% of US hemoperitoneum positive cases undergoing laparotomy. A total of 87.5% of the initial US positive cases required laparotomy. No negative nor unnecessary laparotomy was performed in this series.

Discussion

Although the sensitivity of US detection of hemoperitoneum (87.6%) is lower than of DPL (98%), its specificity was almost 100%. Moreover, US offered several advantages over DPL: noninvasive examination, the examination can be repeated, organ specific information can be obtained, and information concerning hemothorax and cardiac tamponade can be derived. In conclusion, we believe that US is a very effective examination method for evaluation of blunt abdominal trauma in the emergency center.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: REESTABLISHMENT OF DENTAL OCCLUSION FOLLOWING MANDIBULAR FRACTURES:  
 (ALL CAPITALS) THE IMPORTANCE OF INTERDENTAL FIXATION  
 Authors: Guy L. Lanzi, D.M.D., Steven E. Ross, M.D.  
 Institution: UMDNJ/Robert Wood Johnson Medical School - Camden, New Jersey  
 Presenter: Member \_\_\_\_\_ Guest X Resident \_\_\_\_\_  
 Senior Sponsoring Member: Steven E. Ross, M.D.  
 Time: \_\_\_\_\_ 10 minutes  
 Special Audiovisual Requirements: slide projector

ABSTRACT

Restoration of dental occlusion and immobilization of the fractures are paramount in the reduction of fractures of the dentate maxilla and mandible. Anatomic alignment of the bones is secondary and, if functional anatomy is re-established form will follow. In order to assess the importance of closed reduction maxillomandibular fixation (CRMMF) alone, and in combination with open reduction and internal fixation (ORIF) of fracture sites, we undertook a retrospective study of multiple trauma patients treated for mandibular fracture during a 42 month period. Treatment with or without CRMMF (+/-ORIF) was determined, and follow-up radiographs reviewed to determine occlusal relationship and function.

Of 73 patients sustaining mandibular fracture, 7 died prior to definitive therapy, and adequate follow-up was unavailable for 9. Results of therapy are summarized in the table. Three patients had stable fractures, not requiring intervention, and 3 patients had non-operative management in the face of severe head injury. 5 patients in the ORIF group had too few teeth to assess occlusion. One additional patient underwent open reduction and external fixation of the mandible with poor results.

THERAPY	NO. PTS.	OCCLUSION ACCEPTABLE	MALOCCLUSION
CRMMF	17	17(100%)	0
CRMMF+ORIF	16	11(69%)	5(31%)
ORIF	17	2(12%)	10(59%)

Mandibular fractures which can be managed by CRMMF alone, have a low incidence of malocclusion. When open reduction is required, concomitant CRMMF is necessary to insure proper bite. ORIF without CRMMF should be reserved for patients with inadequate dentition for interdental fixation, as the risk for malocclusion and the longterm complications thereof is high.



1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: "MULTIPIECE TIRE RIM INJURIES"  
(ALL CAPITALS)  
Authors: Anthony M. Sussman, MD; JS Williams, MD, FACS; CR Boyd, MD, FACS; ED DeLoach, MD, FAC  
Institution: Memorial Medical Center, Inc., Savannah, GA/Medical College of Georgia  
Presenter: Dr. Sussman Member Guest Resident x  
Senior Sponsoring Member: Peter Mucha, Jr., M.D., FACS  
Time: 10 minutes 10 minutes  
Special Audiovisual Requirements: VCR (VHS) and viewing apparatus

ABSTRACT

Multipiece tire rims used on trucks, tractor trailers, campers, and buses can predispose to severe injury as a result of explosion during tire change. Although more than 500 such accidents have been reported to the National Highway Traffic Safety Administration (NHSTA) leading to approximately 100 deaths, no reports exist in the surgical literature as to the nature and the cause of these injuries.

The case records of seven patients hospitalized at Memorial Medical Center, Inc., Savannah, Georgia between August 1981 and August 1989, with injuries secondary to a multipiece tire rim were reviewed and analyzed to determine the nature of the injuries and to assess the cause.

All patients were male; age range 17 to 47 years. Mean trauma score was 13; mean injury severity score was 30; and mean head abbreviated injury score was 3. Four victims required intubation at the scene or in the emergency department for airway control. All seven victims had massive maxillo-facial trauma; six had ocular damage; four had both cranial and intracranial injury; and three had extremity fractures. There were two deaths both due to extensive head injury; three patients suffered significant long term disability; and all survivors required extensive reconstructive surgery.

These accidents result from a flaw inherent in the design of the multipiece tire rim. Under normal circumstances, there is a delicate balance of the rim parts withholding tremendous energy levels. External and internal physical factors during tire change may disrupt this balance causing an explosive separation of the apparatus into the victim. The force is estimated to be 2000 G.

Since many of these accidents are not reported to the NHSTA, the incidence of these injuries may be significantly higher. An alternative tire rim design is available which is not hazardous. Safety devices, design modifications or a law restricting the use of the multipiece tire rim must be considered if these accidents are to be prevented.

**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

**Deadline:** November 1, 1989

**TITLE:** THE EFFECT OF ALCOHOL IN ISOLATED SPLENIC INJURY  
**(ALL CAPITALS)** Dr. William Rappaport, Dr. Ken McIntyre, Dr. Richard Carmona,  
**Authors:** Dr. Charles Stanton  
**Institution:** Arizona Health Science Center  
**Presenter:** Dr. Rappaport Member have Guest x Resident \_\_\_\_\_  
**Senior Sponsoring Member:** \_\_\_\_\_ applied \_\_\_\_\_ Dr. James Benjamin \_\_\_\_\_  
**Time:** \_\_\_\_\_ 10 minutes \_\_\_\_\_  
**Special Audiovisual Requirements:** \_\_\_\_\_

**ABSTRACT**

The effect of alcohol on the trauma patient is controversial, with numerous authors citing no difference in mortality in the acutely intoxicated patient. The purpose of our study was to investigate the effect of alcohol in the patient with isolated splenic injury. From 1980 to 1989, 47 adult patients with splenic trauma as the only major injury were admitted to the Trauma Service. There were 37 males and 10 females with a mean age of 29 years (range 15 to 61). Blunt trauma was responsible for 44 (94 percent) of the injuries. Group 1 consisted of 24 patients with a mean blood alcohol level of 185 mg/dl (range 15 to 380). In Group 2 there were 23 patients without detectable blood alcohol. There was no statistically significant difference between the two groups in age, Abbreviated Injury Severity Score, initial hematocrit, and grade of splenic injury. Hypotension was present in 13 patients (55 percent) in Group 1 versus six patients (26 percent) in Group 2 ( $P < 0.05$ ). Significant abnormalities in clotting studies were present on admission in six patients (25 percent) in the alcohol detected group versus one (4 percent) in the other group ( $P < 0.05$ ). Blood transfusion requirements in the first 24 hours were significantly greater in Group 1 (mean 3.9 units) versus Group 2 (mean 0.5 units) ( $P < 0.001$ ). If alcohol was present, there was much less chance for splenic conservation as 18 patients (75 percent) underwent splenectomy versus 7 patients (26 percent) in the non-alcohol group ( $P < 0.05$ ). There was one death and this occurred in a patient acutely intoxicated who suffered a cerebral infarct. From the above findings we conclude that alcohol has a negative impact on the trauma patients with splenic injury. Hypotension on admission, abnormality in clotting, and transfusion requirements in the first 24 hours are greater in this group compared to a similar patient without alcohol. In addition, when surgery is required in the alcohol intoxicated patient, splenectomy is often necessary versus splenic salvage in the non-alcohol group.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

**Deadline:** November 1, 1989

**TITLE:** FIREARMS, ALCOHOL, PROTECTIVE DEVICES, AND THE PUBLIC BURDEN  
**(ALL CAPITALS)** FOR FUNDING TRAUMA CARE.  
**Authors:** Robert C. Mackersie, MD, James W. Davis, MD, David B. Hoyt, MD.  
**Institution:** UCSD Medical Center Steven R. Shackford, MD  
**Presenter:** Robert Mackersie Member X Guest Resident  
**Senior Sponsoring Member:** Robert C. Mackersie, MD  
**Time:** 10 minutes  
**Special Audiovisual Requirements:**

**ABSTRACT**

The survival of trauma centers may increasingly depend on financial viability. Public agency based trauma reimbursement is limited, and new means of providing funding for trauma care are badly needed. Injury related factors including intoxication, the use of vehicular protective devices, and the use of firearms have been associated with a greater risk of injury, disability, and costs. The extent to which public agencies bear the financial burden for injury associated with high risk behavior is not clear. The purpose of this study was to determine the relationship between private versus public trauma care funding, and the frequency of intoxication, the use of protective devices, and the mechanism of injury.

The trauma registry records of 10,017 adults hospitalized at one of 5 trauma centers in San Diego county over a 55 month period were analyzed. Patients were grouped according to private (HMO/3rd party/etc) or public (medicaid/county/medicare/etc.) health care sponsorship. The incidence or average values for various factors were analyzed for each group:

Incidence or value for:	public funding (n=6290)	private funding (n=3727)
age	31.8 ± 15.3 (NS)	31.9 ± 15.8
ISS	14.2 ± 14.8 (NS)	13.7 ± 13.1
length of stay	7.9 ± 16 (NS)	7.4 ± 11
hosp.charges (thousands)	19.1 ± 43.5 (NS)	19.2 ± 34.7
average BAL (gm%)	.10 ± .12 *	.075 ± .096
BAL >.1	1748/4308 tested (41%)*	738/2542 tested (29%)
MVA's w/o seat belts	1504/1932 known (78%)*	1117/1649 known (68%)
MCA's w/o helmets	449/627 known (72%)*	232/420 known (55%)
penetrating trauma	1488/6290 (24%)*	378/3727 (10%)
gunshot wounds	600/6290 (9.5%)*	161/3727 (4.3%)

\* p < .001 public vrs. private groups

This data demonstrates that trauma patients not providing for their own health insurance were more frequently intoxicated, had higher blood alcohol levels, did not wear protective devices as often, and had a higher incidence of gunshot wounds/penetrating trauma when compared to patients with private health insurance. Failure to establish and enforce adherence to laws which are designed to reduce injury incidence and severity such as mandatory seat belt and helmet laws, gun control, or drunk driving laws are generating enormous trauma care costs which are being borne to a substantial degree by public agencies. Either the establishment of stricter penalties and regulations governing this behavior, or the institution of "user fees" in the form of vehicular licensure and registration taxes, alcohol tax, and firearms tax will be necessary to offset the increased public costs generated by this activity.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: IMPACT OF THE SEAT BELT LAW ON TRAFFIC INJURIES IN  
(ALL CAPITALS) HAWAII  
Authors: Whitney Limm, M.D., Jeffrey Lau, M.D., J. Judson McNamara, M.D.  
Institution: University of Hawaii School of Medicine  
Presenter: W. Limm, M.D. Member \_\_\_\_\_ Guest \_\_\_\_\_ Resident x  
Senior Sponsoring Member: Jeffrey Lau, M.D.  
Time: 10 minutes  
Special Audiovisual Requirements: None

ABSTRACT

Hawaii's seat belt law took effect on December 15, 1985. In an effort to evaluate the impact of this on traffic morbidity and mortality on the island of Oahu, we reviewed the charts of traffic accident victims killed or seriously injured (N=441) in the 6 month period before and after the seat belt law took effect. Following enactment of the law, the number of hospitalized victims decreased from 215 to 168 and the number of fatalities decreased from 40 to 18. The percentage of victims with major neurologic (18% to 10%), thoracic (12% to 9%), abdominal (14% to 9%) and orthopedic (15% to 10%) injuries decreased after the seat belt law. The percentage of victims with at least one major injury decreased from 41% to 27% ( $p < .01$ ). A survey of passenger vehicles showed that seat belt use increased from 34% to 74% after the seat belt law. Among the victims, seat belt use increased from 22% to 54%. We conclude that seat belt use on Oahu more than doubled after the seat belt law and this coincided with a significant reduction in traffic morbidity and mortality.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

**Deadline:** November 1, 1989

**TITLE:** PENETRATING ILIAC VASCULAR INJURIES  
**(ALL CAPITALS)**  
**Authors:** Robert Richardson MD, Jon M Burch MD, Kenneth L Mattox MD  
**Institution:** Baylor College of Medicine  
**Presenter:** R Richardson    Member    Guest x    Resident  
**Senior Sponsoring Member:** Laurens R. Pickard, MD  
**Time:** 10 minutes  
**Special Audiovisual Requirements:** \_\_\_\_\_

**ABSTRACT**

Iliac vascular injuries are a source of significant morbidity and mortality. To define those factors which influence outcome, the records of 233 consecutive patients with these injuries were reviewed.

Isolated injuries (arterial only 29%, or venous only 71%) occurred in 170 patients. The remaining 63 patients had combined arterial and venous injuries. Although the mortality rates for isolated venous and isolated arterial injuries were similar (21% vs 26%), the mortality rate for combined arterial and venous injuries was significantly higher (49%).

The presence of shock, defined as systolic BP <80mmHg, was determined in both the preoperative and intraoperative periods. Normotensive patients and those experiencing transient preoperative shock had a mortality rate of 3%. Patients experiencing preoperative shock which persisted in the operating room (suggesting continuing hemorrhage) had a mortality rate of 66%. Methods of repair of the common and external iliac arteries included lateral suture (35 patients), end to end anastomosis (16 patients), ligation (11 patients), PTFE interposition graft (17 patients), arterial autograft (2 patients), and extra anatomic bypass (5 patients). The simplest methods of repair (lateral suture and ligation) were associated with mortality rates 40% and 82% respectively. In contrast, patients treated by end to end anastomosis and PTFE interposition grafting had mortalities of 25% and 24% respectively. This suggests the severity of injury was more important than technique of vascular repair in determining outcome.

Injuries of the common and external iliac veins were treated with lateral suture (94 patients), ligation (60 patients), end to end (2 patients), and PTFE interposition graft (1 patient). Ligation of the common or external iliac veins (65 patients) was associated with a 46% mortality rate and 20% of the survivors developed acute or chronic edema of the lower extremities.

The overall mortality for the series was 30%, and 87% of the deaths occurred within 3 days of the injury. The better results seen with end to end repair and graft interposition are a reflection of less extensive injuries. Although morbidity from venous ligation may be significant, the high mortality in this group of patients suggests heroic efforts to repair these injuries should not be attempted. Mortality for penetrating iliac vascular injuries is related to both the complexity of the injury and continuing hemorrhage but not necessarily the method of repair.

TYPE INFORMATION AS IT SHOULD APPEAR IN PRINTED PROGRAM

Title: THE ASYMPTOMATIC PATIENT WITH SUSPECTED MYOCARDIAL CONTUSION:  
IS HOSPITAL ADMISSION REALLY NECESSARY?

Author(s): M. Beth Foil, MD, Robert C. Mackersie, MD, Sheldon R. Furst,  
MD, James W. Davis, MD, Melvin S. Swanson, Ph.D., David B.  
City, State: Hoyt, MD, Steven R. Shackford, MD

San Diego, California  
THE ABSTRACT COPY MUST STAY WITHIN THESE BLUE MARGINS

Diagnostic criteria and guidelines for hospital admission for suspected myocardial contusion, (MCC) remain unclear, and many centers continue to admit otherwise uninjured patients with isolated chest wall contusions because of the suspicion of myocardial contusion. The purpose of this study was to examine the clinical sequela of patients admitted with a suspicion of MCC and develop specific criteria for short term observation or immediate discharge following isolated, minor blunt chest wall trauma.

The hospital and trauma registry records of all patients admitted over a 33 month period with suspected MCC were reviewed. Admission EKG, cardiac rhythm, isoenzymes, cardiac related complications, and associated injuries were analyzed for 524 patients.

28 cardiac related complications occurred in 27/524 patients, (4.8%). These complications included 23 dysrhythmias, 3 infarctions and 2 pericardial effusions. 23/27 had abnormal admission EKG's. 1/27 patient developed dysrhythmias 4 hours following admission, and 3/27 patients had normal EKG's, but major associated chest trauma requiring ICU admission.

There were no complications in patients with isolated chest wall contusions, a normal admission EKG, and a normal rhythm at 4 hours. CPK isoenzymes were elevated (> 5%) in 113/479 (23%) There was no relationship between CPK elevations and the development of related cardiac complications.

The importance of blunt myocardial injury is related to the clinically significant complications that arise from it. In this study, all patients with clinically significant cardiac complications associated with blunt chest injury presented with either abnormal EKG's or dysrhythmias within 4 hours of admission, or major associated chest injuries. The complete absence of significant cardiac sequela in patients with isolated chest wall contusion, normal admission and 4 hour EKG, and no other associated major injuries suggests that these patients do not require hospital admission and may be discharged following a short period (4-6 hours) of observation and cardiac monitoring.

1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: IS PROXIMITY AN INDICATION FOR MANDATORY ANGIOGRAPHY IN  
 (ALL CAPITALS) PENETRATING EXTREMITY INJURIES?  
 Authors: Nicholas G. Smedira, M.D., Michael Stevens, M.D., Corito  
 Institution: Tolentino, M.D., Robert C. Lim, M.D., William P. Schecter, M.D.  
 Presenter: Nicholas Smedira Member Guest Resident   
 Senior Sponsoring Member: Thomas Phillips, M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements:

ABSTRACT

We reviewed the records of all patients with penetrating extremity trauma studied by angiography between 1984 and 1987 in order to determine the diagnostic yield of routine angiography in patients whose only indication for angiography was proximity of the injury to a major vessel. We defined spasm, extrinsic compression by presumed hematoma, and small arterial branch extravasation as minor angiographic findings. Major angiographic findings included abrupt vessel cutoff, intimal tear, major vessel extravasation, thrombosis, pseudoaneurysm and arteriovenous fistula (AVF).

152 extremities with 161 injuries were evaluated. The average age was 29 years. The injury was a gunshot wound (GSW) in 103 (68%) and a stab wound in 48 (32%) patients. High velocity gunshot and shotgun wounds made up 6% and 3% of the GSW respectively. 14 (9%) of the patients had a major abnormality on angiogram. 8/14 patients underwent operative repair. No patient with minor angiographic findings had operative repair.

13/14 patients with a positive angiogram and 8/8 patients who had operative repair had abnormal physical findings which indicated angiography and/or exploration. Patients with a GSW and a fracture had a positive angiogram 47% of the time as compared to 12% in those patients without a fracture. In patients with a GSW and a major angiographic finding, a fracture was present 67% of the time. Proximity was the sole indication for angiography in 108 (71%) of the patients. 1 (0.9%) had a major abnormality by our definition (2 small pseudoaneurysms of the anterior humeral circumflex artery). However, this abnormality was felt to be clinically insignificant.

We conclude that patients with low velocity penetrating extremity injuries who have otherwise normal physical and roentgenographic examinations do not require mandatory angiography.

**1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM**

**Deadline:** November 1, 1989

**TITLE:** HYPERTONIC SALINE ALTERS PLASMA CLOTTING TIMES AND PLATELET  
**(ALL CAPITALS)** AGGREGATION  
**Authors:** R.L. Reed, II, M.D., D. Johnston, M.D., Y. Chen, MS, R.P. Fischer, M.D.  
**Institution:** Department of Surgery, University of Texas Medical School, Houston  
**Presenter:** R.L. Reed, II Member Guest  Resident  
**Senior Sponsoring Member:** Ronald P. Fischer, M.D., Ph.D.  
**Time:** 10 10 minutes  
**Special Audiovisual Requirements:** None

**ABSTRACT**

Hypertonic (7.5%) saline (HS) has been advocated as a resuscitation solution for injured and burned patients. Recent animal studies have suggested that HS increases bleeding during uncontrolled hemorrhage while normal (0.9%) saline (NS) does not. One potential mechanism for this effect is through vasodilation provoked by HS. However, any anticoagulant activity exhibited by HS, in the absence of added dextran, could provide another mechanism for the increased hemorrhage. This study was undertaken to determine if HS alone (without dextran) exhibits anticoagulant effects. Normal human assayed reference plasma (ARP) was serially diluted with either HS or normal (0.9%) saline (NS). Prothrombin times (PT) and activated partial thromboplastin times (APTT) were performed using an automated coagulation timer. Normal platelets from healthy donors were similarly diluted. Platelet aggregation profiles (%Ag) were obtained using 5µM ADP as the aggregation stimulator. Sodium concentrations on the prepared dilutions were measured using an ion-selective electrode. Comparisons between group means were performed using Student's t-test with Bonferroni's correction for multiple simultaneous comparisons. Results are expressed as mean ± 1 SEM of 6 duplicate determinations:

<u>%ARP</u>	<u>PT-NS</u>	<u>PT-HS</u>	<u>APTT-NS</u>	<u>APTT-HS</u>	<u>%Ag-NS</u>	<u>%Ag-HS</u>
100	11.1±.1	11.1±.1	31.5±.1	31.5±.1	79.9±1	81.0±1
97½	-----	-----	31.6±.1**	32.7±.2**	-----	-----
95	11.2±.1	11.5±.1	31.6±.1**	35.3±1**	84.6±1	85.5±2
90	11.5±.1*	12.2±.1*	32.1±.3**	42.9±1**	85.6±1*	67.2±7*
75	12.5±.1**	17.8±.1**	34.1±.4**	94.9±2**	86.6±2**	6.2±1**

\*p < 0.01, HS vs. NS; \*\*p < 0.001, HS vs. NS

The 97.5%, 95%, and 90% ARP dilutions were found to correspond to serum sodium levels of 169, 192, and 263 mEq/l, respectively. Statistically significant changes were seen at all concentrations of HS tested for the APTT and at concentrations above 5% HS for the PT and %Ag. High degrees of correlation were observed between the HS concentration with the prolongation in PT ( $R^2 = 0.97$ ,  $p < 0.0001$ ) and with the prolongation in APTT ( $R^2 = 0.98$ ,  $p < 0.0001$ ). Thus, HS exhibits anticoagulant activity. While the prolongations in clotting times do not appear clinically significant, the anticoagulant effect may be more pronounced in the presence of ongoing clotting factor losses. Furthermore, the addition of dextran, commonly added to HS solutions, may compound the anticoagulant effects. These data indicate that a coagulation abnormality, along with changes in microvascular tone, could contribute to the increased blood loss observed in experimental uncontrolled hemorrhage treated with HS resuscitation.



1990 WESTERN TRAUMA ASSOCIATION ABSTRACT FORM

Deadline: November 1, 1989

TITLE: MASSIVE TRANSFUSION: OUTCOME IN 144 TRAUMA PATIENTS  
 (ALL CAPITALS)  
 Authors: James H. Wudel, M.D.; John A. Morris, Jr., M.D.; Sue M. Bass  
 Institution: Vanderbilt University School of Medicine M.  
 Presenter: Member Guest Resident x  
 Senior Sponsoring Member: John A. Morris, Jr., M.D.  
 Time: 10 minutes  
 Special Audiovisual Requirements:

ABSTRACT

Between October 1984 and March 1989, 1657 patients received a total of 12,600 units of blood (uRBC) at our institution. 147 (9%) of these received massive transfusion, defined as 20 or more uRBC's. In order to survey utilization and analyze outcome in patients with massive transfusion, we divided the population into groups based on units RBC's received: 0-1, 2-5, 6-19, 20-25, 26-35, >35. Outcome variables include percent survival(s), mean probability of survival using TRISS ( $\bar{P}_s$ ), mean Injury Severity Score ( $\bar{I}SS$ ), mean hospital charges in dollars ( $\bar{\$}$ ), presence of shock on admission defined as Systolic Blood Pressure less than 90 (% shock), percent complications, and percent of patients with closed head injury (CHI) defined as discharge CHI of 4 or 5 on Abbreviated Injury Scale (AIS).

uRBC	N	%S	$\bar{P}_s$	$\bar{I}SS$	$\bar{\$}$	%Shock	%Cx	%CHI <sup>a</sup>
0-1	4659	96	.96	10	7656	4	20	12
2-5	839	85	.87	20	23295	10	41	32
6-19	522	74	.78	28	42541	16	55	50
20-25	57	51	.75	33	63194	34	65	67
26-35	57	53	.66	36	64564	30	70	70
> 35	33	64	.81	36	103835	39	91	67

We conclude: (1) The survival rate in patients with massive transfusion exceeds 50% justifying the high expenditure of resources; (2) The complication rate climbs steadily as the transfusion requirement increases, suggesting immunosuppression associated with massive transfusion; (3) The presence of closed head injury in the massively transfused patient increases mortality but does not preclude survival; (4) A majority (66%) of the massively transfused group were not in shock upon arrival in our emergency department suggesting, even in a rural environment with long transport times, a high quality EMS can deliver these patients to the trauma center in salvageable (55%) condition.

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1988 - 1989  
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WINTER, John II (Pam)	6020 Yellowstone Rd. Cheyenne, WY 82009	O:307-634-0871 H:307-634-9734 Orthopedics
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YAUN, Hansen	550 Harrison Center Syracuse, NY 13202	O:315-473-4472 H:315-446-6921 Orthopedics

## GEOGRAPHICAL ROSTER

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#### San Francisco

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Tawes, Roy L.

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Edmondson, Robert C.

Ryan, Kevin C.

Yamuchi, Hiroshi

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Ammons, Mark A.

Good, James T. Jr.

McCroskey, Brian L.

Moore, E. Eugene

Moore, Fred

Rutherford, Robert B.

Thomas, Hebert III

#### Englewood

Carter, Donald R.

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Moore, John B.

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#### Wheatridge

Rosenberger, Alan

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Neviaser, Robert J.

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#### Jacksonville

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#### Tampa

Rosemurgy, Alexander S.

Sherman, Harold

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Lau, Jeffrey M.

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Webster, Dwight A.

Yaun, Hansen

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Sharp, Kenneth W.

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Sugerman, Harvey J.

Whitley, Ronald

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#### Tacoma

Osborne, Robert W., Jr.

### WEST VIRGINIA

#### Wheeling

Kappel, David A.

Polack, Edward P.

### WISCONSIN

#### LaCrosse

Cogbill, Thomas H.

Landerscasper, Jeffrey

#### Madison



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Wichita  
Chang, Frederic C.  
Ferris, Bruce C.  
Nelson, Gerald D.  
Street, David E.

**MICHIGAN**

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Olson, William H.  
Bloomfield Hills  
Wilson, Robert F.

**MINNESOTA**

Edina  
Waldron, John F.  
Minneapolis  
Bucknum, Frank M.  
Joseph, Jon W.  
McKinley, Richard C.  
Olfelt, Paul C.  
Seymour, John  
Rochester  
Cabanela, Miguel E.  
Klassen, Rudolph A.  
LeWallen, David G.  
Lindscheid, Ronald L.  
Mucha, Peter A., Jr.

**MISSOURI**

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Helling, Thomas C.

**MONTANA**

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Johnson, James H. Jr.  
Millikan, Scott J.  
Teal, Peter V.

**NEBRASKA**

Lincoln  
Carveth, Stephen  
Griffin, William T.  
Omaha  
Edney, James A.

**NEW JERSEY**

Camden  
O'Malley, Keith F.  
Cherry Hill  
Ross, Steven E.

**WISCONSIN**

LaCrosse  
Cogbill, Thomas H  
Landerscasper, Jeffrey  
Madison  
Gall, Warren

**WYOMING**

Cheyenne  
Winter, John II

**GERMANY**

McGuire, Arthur M.