



The Occurrence of Occult Injuries in Crashes at the William Lehman Injury Research Center

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A CIREN CENTER

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Saving Lives



- Approx. 5-10% of all crash deaths are preventable with early recognition and improved triage
 - Evanco (2002), Best (2001)
- CIREN is uniquely positioned to identify crash injury patterns and improve trauma systems
- *Continued education* of providers is fundamental to system improvement-*survival*
- Future systems will automate crash recognition, localization and prediction of injury

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Education



- Triage strategies to avoid missing patients with *occult* injuries
- Optimized diagnostic and therapeutic in-hospital decision making

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Injuries



- “Occult Injuries” (not easily recognized)
 - internal bleeding without external signs (liver, spleen)
 - heart and aortic injuries (damage without bleeding)
 - “talk and die” brain injuries

Trauma Criteria

	Category 1 (ANY <u>1</u> Meets TTC)	Category 2 (ANY <u>2</u> Meets TTC)
AGE		55 years old
AIRWAY	Assisted / Intubated	Respiratory rate 30
CONSCIOUSNESS	Alter mental status	BMR 5
CIRCULATION	GCS \leq 12 HR > 120 bpm < 90 mmHg.	Heart rate 120 bpm
FRACTURE	2 + long bone fractures	Long bone fracture
CUTANEOUS	2 nd ° or 3 rd ° burns to 15% TBSA	Major degloving injury
	Amputation	Avulsion > 5 inches
MECHANISM OF INJURY		GSW Ejection Steering wheel deformity
OTHER	High index of suspicion	



Nearly 40% of all car crash victims who are brought to the Ryder Trauma Center under "High Suspicion of Injury" require *no further treatment* and are discharged shortly after arrival.

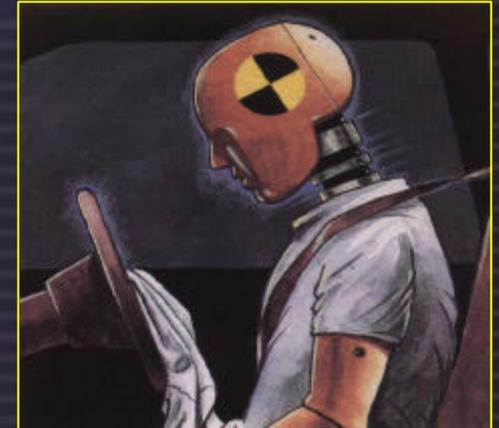
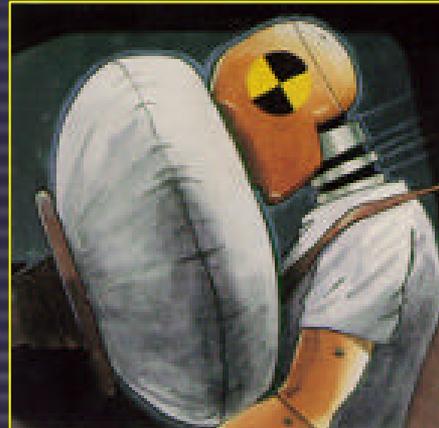


Added Criteria to Improve Triage Decisions

The SCENE Scale
The URGENCY Algorithm

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Look Beyond The Obvious



The S C E N E Scale

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The SCENE Scale

- Proposed by WLIRC in 1993
- Triggered by Unexpected Injuries at Low Delta-V
- Significant Elements
 - Bent Steering Wheel – “Lift & Look”
 - Close-in Occupants
 - Excessive Energy in the Crash
 - Non-Use of Lap Belts
 - Eye-witness Observations On- scene

How An Air Bag Works.



Look Beyond The Obvious.*

While air bags, automatic safety belts and greater use of manual seat belts and child safety seats are saving thousands of lives and preventing hundreds of thousands of injuries each year, injuries can still occur from crash forces. National Highway Traffic Safety Administration research indicates that some people are dying in the United States as the result of internal injuries that are not being diagnosed and treated. The following observations at the crash SCENE, should increase the index of suspicion that internal injuries may have occurred.

S Steering wheel deformation? If air bag and belt, a bent steering wheel could indicate internal injuries.

C Close proximity of driver to the steering wheel? If occupants of small station or large trucks sitting close to the steering wheel are at greater risk of internal injuries.

E Energy of the crash? Severity or time index of vehicle crash indicates high crash forces.

N Non-use of seat belts? Non-use of lap or lap/shoulder belts could result in multiple impacts and greater potentiality of internal injuries.

E Eyewitness report of crash scene? Verbal reports, photos and videotape images of the interior and exterior of the crash vehicle convey the severity of the crash, and include the probability of occupant injuries.

*Observe and photograph critical air bag and/or seat belt deployment scenes. Think the case by indicators of internal injuries.

Call for more Air Bag Facts at 1-800-424-9393 for appropriate details and to request additional literature. Some state vehicle codes and local ordinances may apply.

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Evolution of the SCENE Scale



- Added Low Frequency Events That Increase Injury Risk to Belted Occupants
- Most Significant Events:
 - Multiple impact crashes
 - Narrow object impacts
 - Off-side crash direction
 - Unbelted rear seat occupants

How An Air Bag Works.



It is important to understand that while air bags are a life-saving device, they are not a substitute for seat belts. Air bags are designed to work in conjunction with seat belts to provide the best protection for occupants.

Look Beyond The Obvious.*

While air bags, automatic safety belts and greater use of manual seat belts and child safety seats are saving thousands of lives and preventing hundreds of thousands of injuries each year, injuries can still occur from crash forces. National Highway Traffic Safety Administration research indicates that some people are dying in the United States as the result of internal injuries that are not being observed and treated. The following observations at the crash SCENE should increase the index of suspicion that internal injuries may have occurred.

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N Non-use of seat belt? Non-use of lap or lap/shoulder belts could result in multiple impacts and greater potentiality of internal injuries.

E Evidentiary reports of crash scene? Verbal reports, photos and videotape images of the interior and exterior of the crash vehicle convey the severity of the crash, and indicate the probability of occupant injuries.

*Observations and photographs should be as complete as possible. Verbal reports should be taken. Think the case by indicators of internal injuries.

Call for more Air Bag Facts at 1-800-424-9393 for appropriate details and to request additional literature. Some vehicle safety and air bag facts may vary.

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The URGENCY Algorithm



- Jones and Champion, Journal of Trauma, 1989 – *Damage Greater than 20” is indicator of severe injury - (1 Variable)*
- Malliaris – SAE 970393 “*Relationships Between Crash Casualties and Crash Attributes*”
 - Regression Analysis of NASS/CDS - (17 Variables)

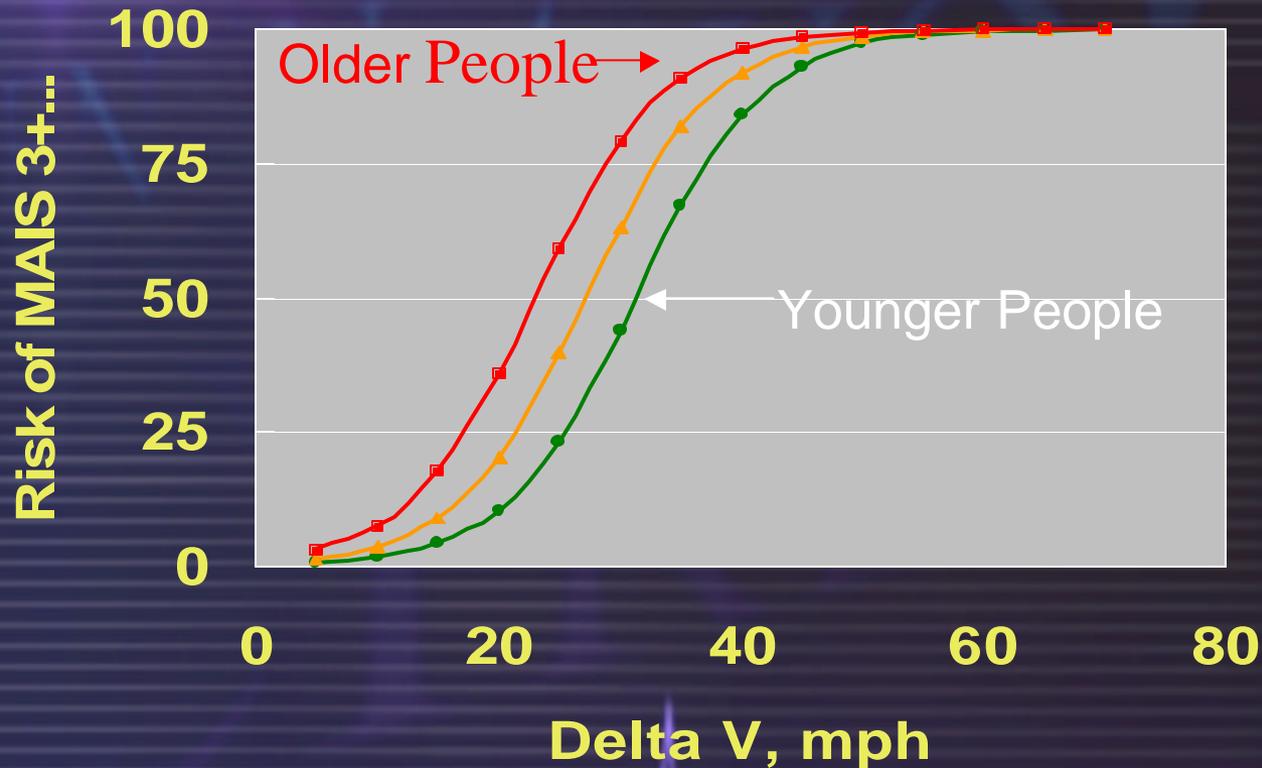
-Basis for the **URGENCY Algorithm**

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Probability of AIS 3+ Injury Frontal Crash (Malliaris)



—●— 25 Yrs Old —▲— 50 Yrs Old —■— 75 Yrs Old

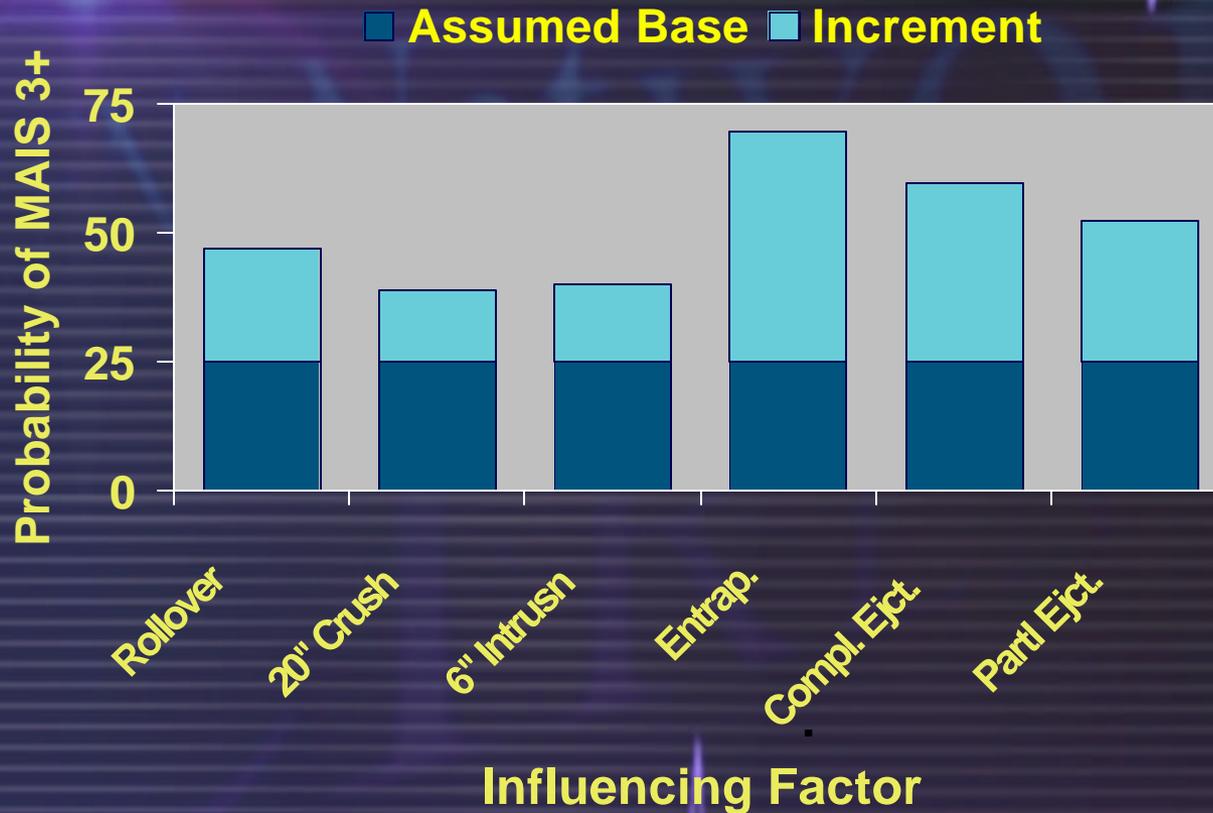


2 Predictors

(Delta V, Age)

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Factors that Increase of MAIS 3+ Probability over Shown Base (Malliaris)



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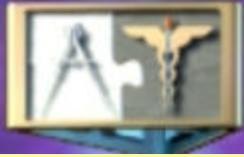
Evolution of the URGENCY Algorithm



- Selected Malliaris Factors Programmed in Excel, Briefing to NHTSA Administrator 3/11/97 (Digges & Champion)
- Available to NHTSA Field Operational Test of ACN Systems (Jun 1997-Aug 2000)
- Provided by NHTSA to Comcare - on Website

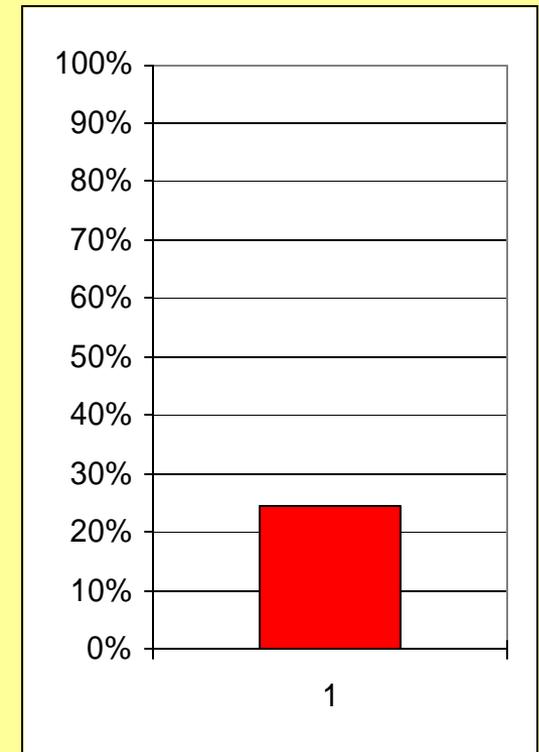
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Original URGENCY (1997)



Projection of the Probability of Casualty

Vehicular Crash Site Data	Value	Data Check
DELTAV, in MPH?	32	
ROLL? (NO=0, YES=1)	0	TRUE
Side Damage, Passenger Compartment? (NO=0, YES=1)	0	TRUE
Rear Damage? (NO=0, YES=1)	0	TRUE
Car Curb Weight, in lbs.? (Default 3200 lbs.)	3200	
Safety Belt Use? (NO=0, YES=1)	1	TRUE
Car Occupant's Age, in years? (Default 30 yr.)	30	
Occupant's Gender? (FEMALE=1, MALE=0)	0	TRUE
Entrapment? (NO=0, YES=1)	0	TRUE
Complete Ejection? (NO=0, YES=1)	0	TRUE



Probability of Severe Injury

25%

URGENCY + SCENE

Added Data (1998)



Vehicular Crash Site Data

Damage to Left Front? (Left Front=1)

Damage to Center Front? (Center Front=1)

Damage to Right Front? (Right Front=1)

Damage Greater Than 15"?(G.T. 15"=1)

Damage Greater Than 20"?(G.T. 20"=1)

Damage Greater Than 30"?(G.T. 30"=1)

Intrusion Greater than 6"?(L.T 6"=0, G.T 6"=1)

Steering Damage G.T. 1"?(L.T 1"=0, G.T 1"=1)

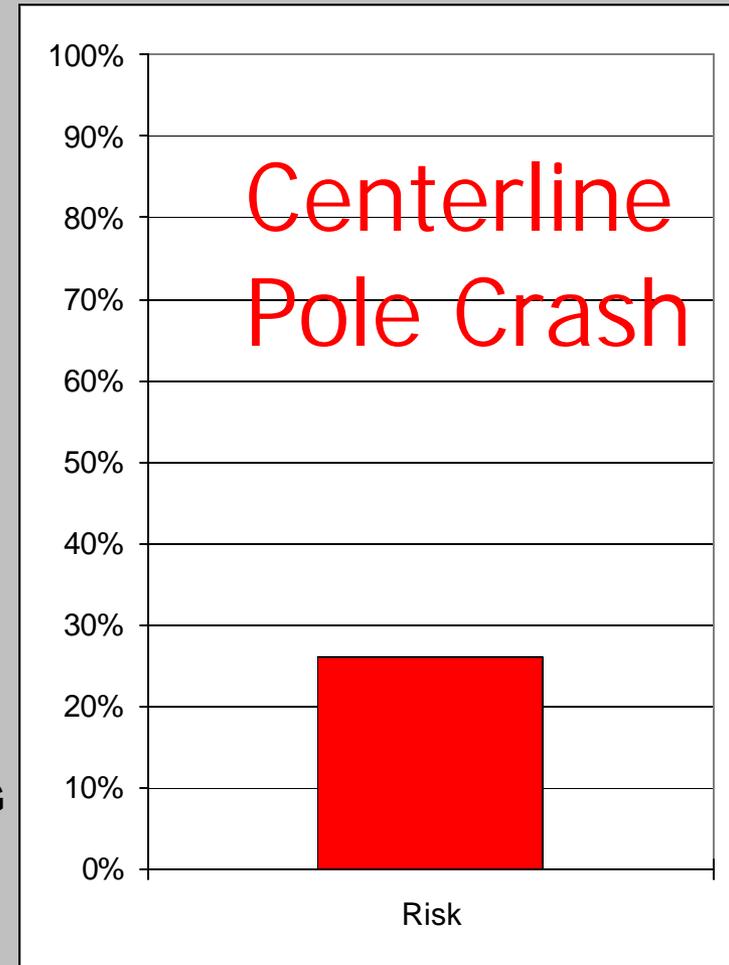
Single Vehicle Crash? (Single Vehicle=1)

Rollover? (Rollover=1)

URGENCY + SCENE (1998)

Vehicular Crash Site Data	Value	Data
Damage to Left Front? (Left Front=1)	0	NO
Damage to Center Front? (Center Front=1)	1	C Front
Damage to Right Front? (Right Front=1)	0	NO
Damage Greater Than 15"?(G.T. 15"=1)	1	G.T.15
Damage Greater Than 20"?(G.T. 20"=1)	1	G.T. 20
Damage Greater Than 30"?(G.T. 30"=1)	0	L.T. 30
Intrusion Greater than 6"?(L.T 6"=0, G.T 6"=1)	0	L.T. 6
Steering Damage G.T. 1"?(L.T 1"=0, G.T 1"=1)	0	L.T. 1
Single Vehicle Crash? (Single Vehicle=1)	1	SINGLE
Rollover? (Rollover=1)	0	NO ROLL
Entrapped or Ejected? (NO=0, YES=1)	0	NO
Driver? (DRIVER=1, PASSENGER=0)	1	DRIVER
Occupant's Gender? (FEMALE=1, MALE=0)	0	MALE
Occupant's Height? (Inches)	0	FALSE
Occupant's Weight? (Pounds)	0	FALSE
Car Occupant's Age, in years? (Default 30 yr.)	16	TRUE
Air Bag Deployed? (NO BAG=0, YES, BAG=1)	0	NO AIR BAG
Safety Belt Use? (NO BELT=0, YES, BELT=1)	1	BELT
Shoulder Belt Without Lap Belt? (NO LAP=1)	0	-

Serious Injury Risk

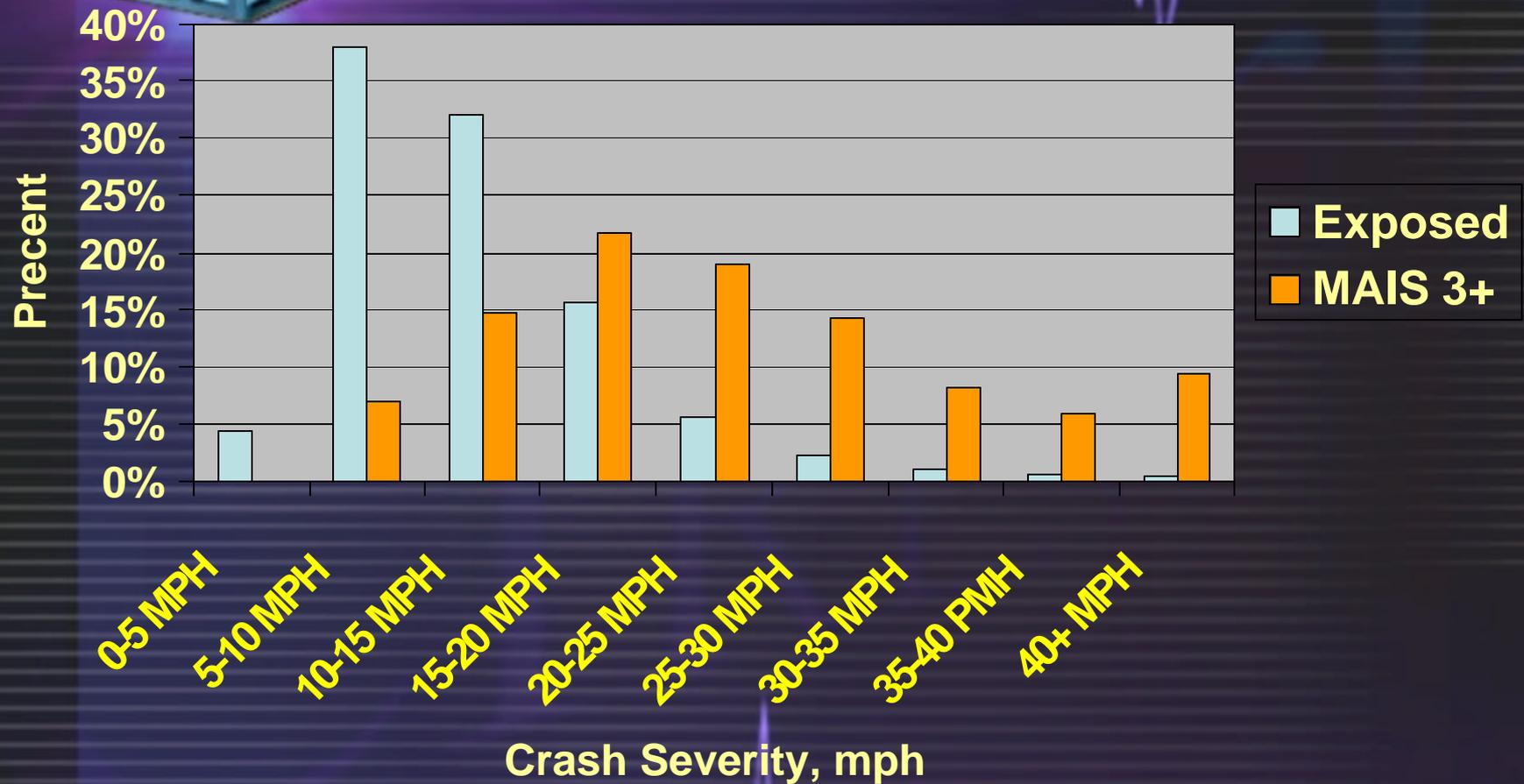


Probability of Severe Injury

26%

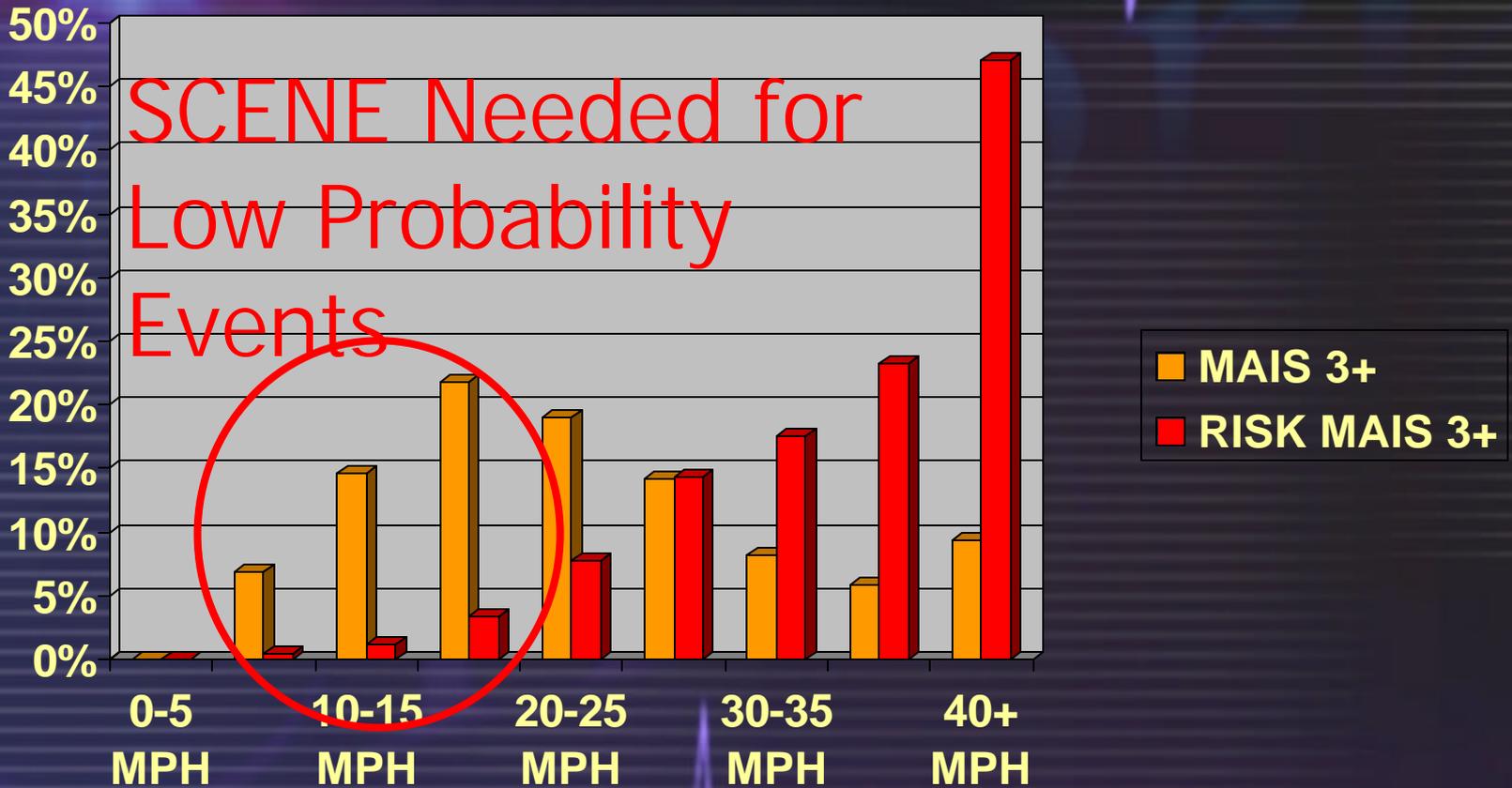
SUSPECT LIVER INJURY

Exposure & Injury vs Crash Severity



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Injuries and Injury Risk vs Crash Severity



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URGENCY and SCENE Scale

SCENE Scale - Predicts specific injuries

based on multidisciplinary analysis of injuries observed in low frequency crashes

URGENCY - Estimates injury risk –

based on statistical analysis of injury frequency in real-world crashes

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2nd Generation URGENCY and SCENE (2002)



- **URGENCY**
 - Separate Crash Modes
 - Include ACN Variables
 - Subdivide Data – Develop and Validate
 - Account for Multiple Injuries
- **SCENE**
 - Continue to Document and Analyze Unexpected Severe Injuries

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Continued Development & Application of the SCENE Scale

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The "Process"

Learning from cases

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Early recognition of crashes with occult injuries

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Can Crash Patterns Leading to
Occult Injuries be recognized early
using the
SCENE Scale?

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Case 1

2-Point Shoulder Belt Related Non-Use of Lap Belt

Occult Liver Injury
-Fatality-

Vehicle to Vehicle Frontal Impact

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Case Subject

44 Y/O Male *Driver*

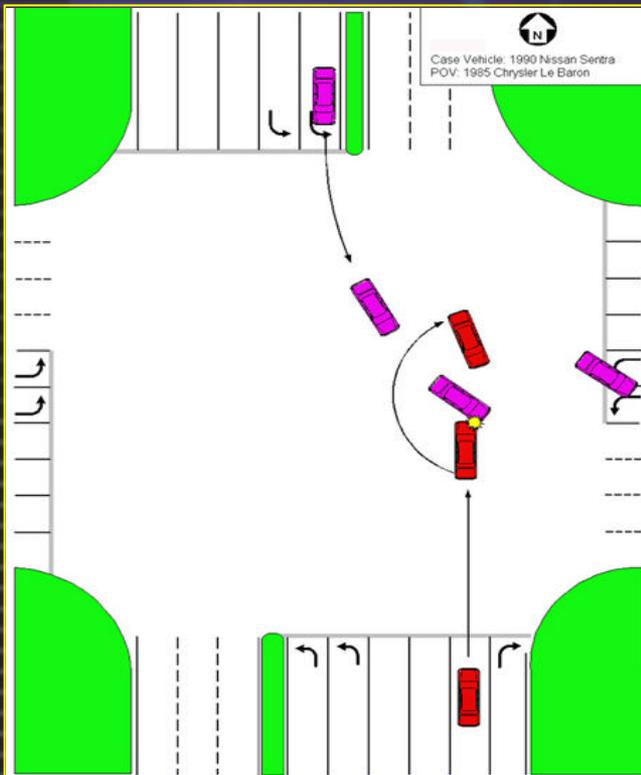


- 180 cm (72")
- 86.8 kg (191 lbs)
- 2-point shoulder belt restrained
 - lap belt not used
- No air bags available

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Expired in hospital ED 13 hrs post crash

Non-Use of Lap Belt *Missed Opportunity*



Crash occurred 01:20am





Case Vehicle

- 1990 Nissan Sentra
- PDOF: 11 O'clock
- Max crush: 55 cm (22")
- dV: 40 km/h (25 mph)

Case Facts



- Stated he was OK at scene
- Taken to Jail (DUI)
- 12 hours post-crash complained of extreme abdominal pain
- 14 hours post crash cardiac arrest –
– *Died* in ER

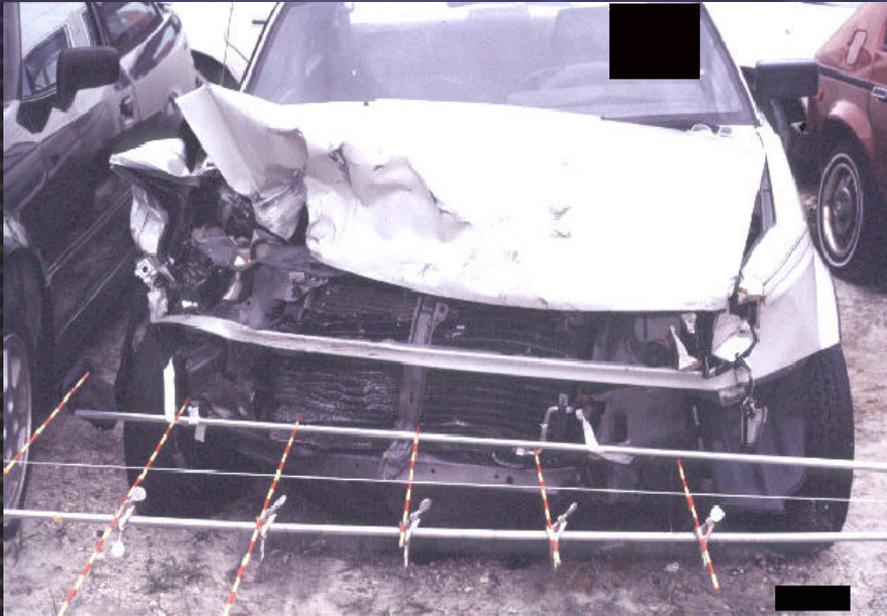
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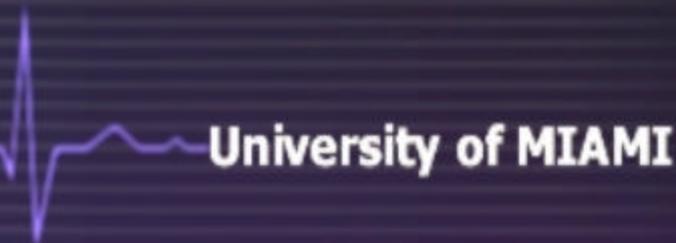
Vehicle Damage

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Max Crush 55 cm (22")



dV: 40 km/h (25 mph)



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Driver Area



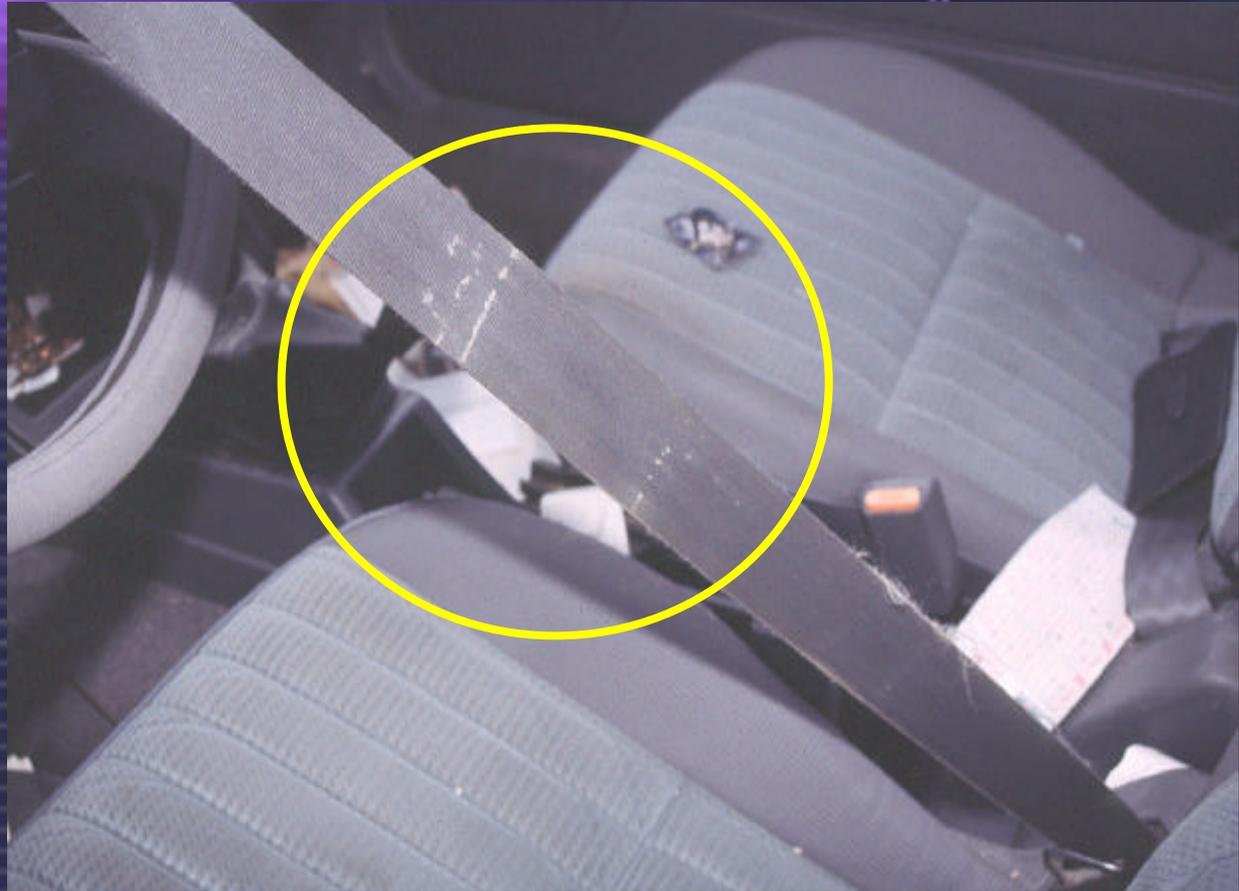
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Right Knee Contact



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Restraint Loading



2-Point shoulder belt

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Principle Other Vehicle



1985 Chrysler Le Baron



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Significant Injury

AIS-4 Right lobe of liver (major laceration)



Injury Mechanism

- AIS 4 – Right lobe of liver (major laceration)
2-Point Shoulder restraint / direct loading

Injury



No Obvious Indication
of Severe Injury But Case
Occupant Sustained a
Liver Laceration
AIS 4



Using SCENE Scale

How An Air Bag Works.



An inflation monitor is connected to the suspension system by the manufacturer of the air bag. The bag inflates either before or around the time the vehicle is involved in a crash.

Look Beyond The Obvious.*

While air bags, automatic safety belts and greater use of manual seat belts and child safety seats are saving thousands of lives and preventing hundreds of thousands of injuries each year, injuries can still occur from crash forces. National Highway Traffic Safety Administration research indicates that some people are dying in the United States as the result of internal injuries that are not being detected and treated. The following observations at the crash SCENE should increase the index of suspicion that internal injuries may have occurred.

S Steering wheel deformation? Lift air bag and look. A bent steering wheel could indicate internal injuries.

C Close proximity of driver to the steering wheel? Occupants of small stature or large girth sitting close to the steering wheel are at greater risk of internal injuries.

E Energy of the crash? Thrust or more inches of vehicle crush indicates high crash forces.

N Non-use of seat belts? Non-use of lap or lap/shoulder belts could result in multiple impacts and greater probability of internal injuries.

E Eyewitness report of crash scene? Verbal reports, photos and sketches maps of the interior and exterior of the crash vehicle convey the severity of the crash, and indicate the probability of worst injuries.

*Steering wheel deformation caused by air bags and passenger protection by air bags and safety belts may have internal injuries. Check the owner for evidence of internal injuries. Call the Auto Safety Hotline at 1-800-424-9093 to report other vehicle safety response information from your vehicle safety and health research on crash injuries.

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National Highway Traffic Safety Administration

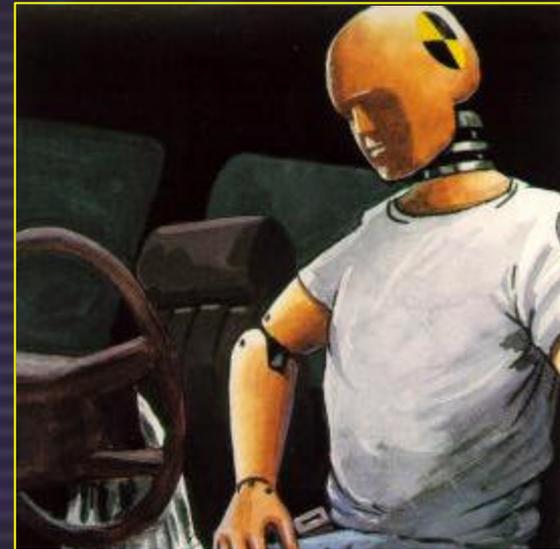
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S C E N E



Non-use of Seatbelts

Non-use of lap or lap/shoulder belts especially during multiple impacts result in greater probability of internal injuries.



2nd Generation URGENCY



- 59.6% Risk of an AIS-3 or Greater Injury
- Increased risk for non-use of lap belt

Poster Woman

2-point Belt - Success



- '93 Mazda Protege
- dV: 15 mph
- PDOF: 1 O'clock
- Max crush: 6.5"
- Vehicle to Vehicle Impact

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Injury Recognized by Mechanism



- 40 Y/O Female driver
- 187 lb. , 6'
- **Shoulder Belt Only**
- No Air Bag deployment
- Injuries
 - AIS-5 Major Liver Laceration
 - AIS-2 Kidney Contusion
- Trauma Criteria

High Suspicion of Injury

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Case 2

Close-in Occupant *Occult Liver Injury* -Survivor-

Single Vehicle Pole Impact

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Case Subject

40 Y/O Female *Driver*



- 163 cm (64")
- 61 kg (135 lbs)
- Lap/Shoulder restrained
- Driver air bag deployed

Initially Brought to ED

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Scene

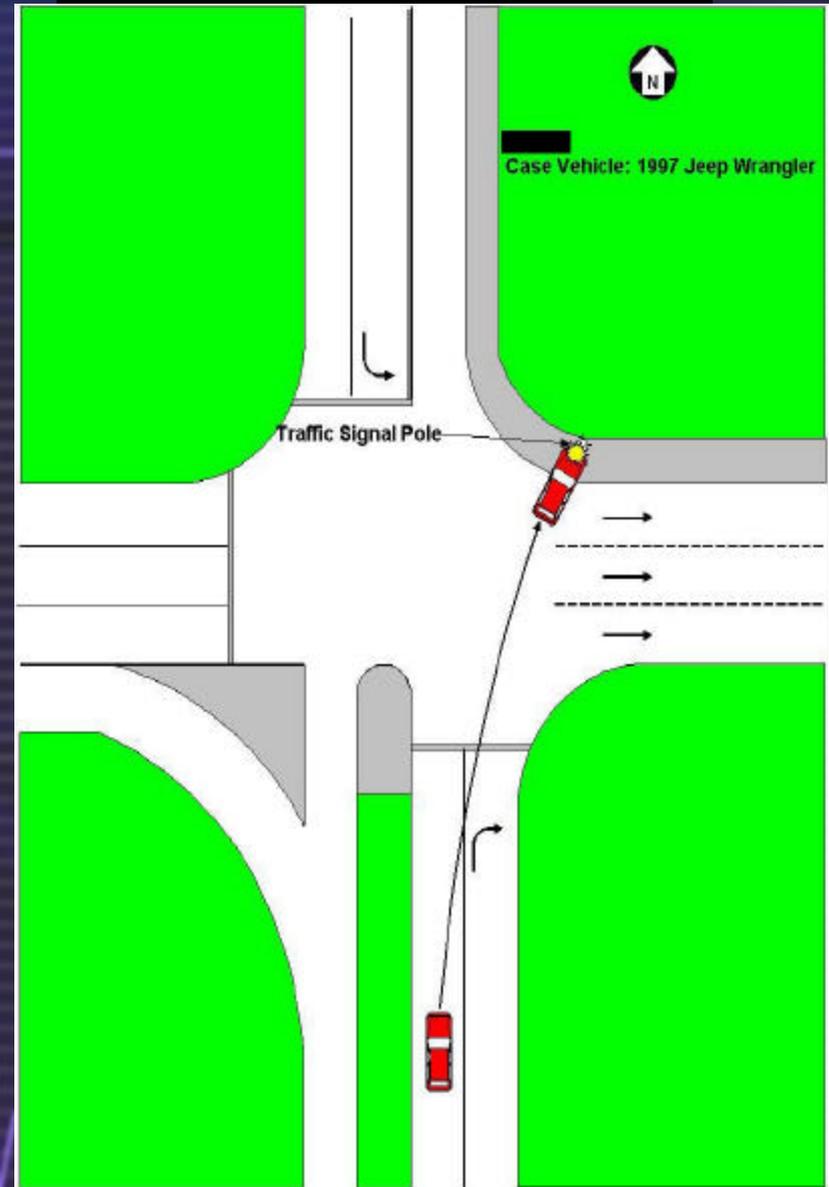
Crash occurred: 09:47am



CV trajectory



Unknown reason for loss of control



Case Vehicle



- 1997 Jeep Wrangler
- PDOF: 12 O'clock
- Max crush: 81 cm (31.9")
- dV: 48 km/h (30 mph-est.)
- Left instrument panel intrusion:
-3 cm (1.2")
- Left toe pan intrusion:
-8 cm (3.1")
- Steering wheel deformation:
-12 cm (4.7")

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Crash Facts

- Crash occurred
-09:47am
- Ground rescue takes driver to hospital ED
-10:37am
- Trauma resus arrival
-10:48am
- Hospital stay
- 4 days

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On Scene



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Vehicle Damage

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Max Crush 81 cm (31.9")

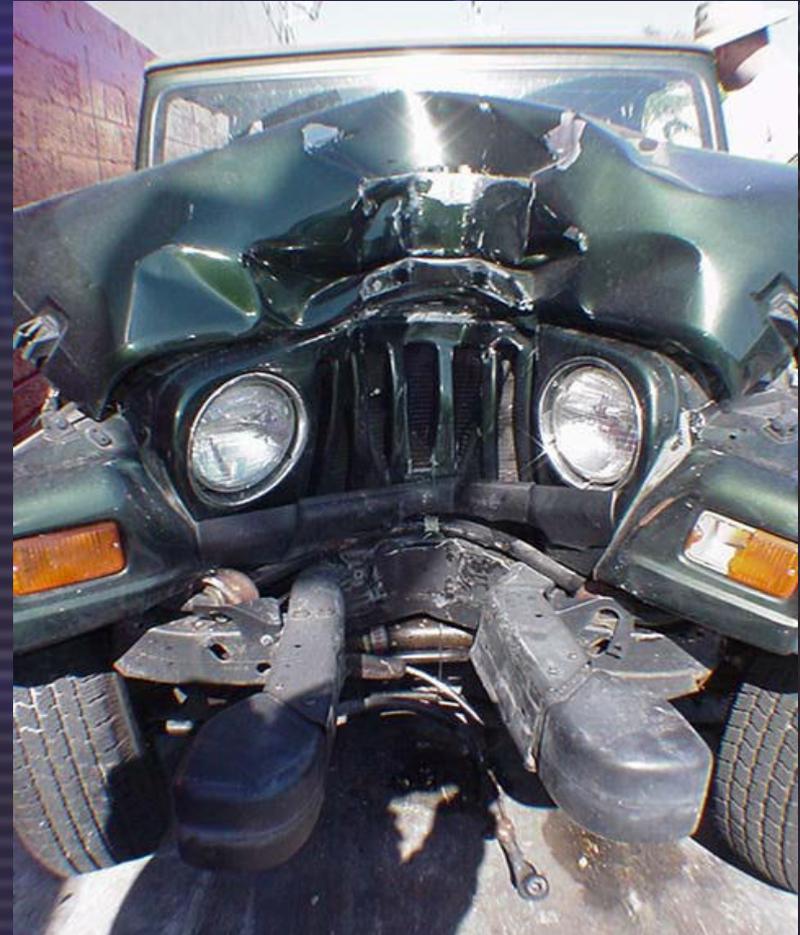


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7/7/2003

dV: 48 km/h (30 mph)

Close Up of Front Damage



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Left Side View



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Steering Wheel Deformation 12 cm (4.7")



Close-in Occupant



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Restraint Loading



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Significant Injuries



- AIS-4 Multiple rib fractures (bilateral 1-3) with hemothorax
- AIS-3 Liver laceration
- AIS-4 Brain hemorrhage
- AIS-3 Brain contusion
- AIS-3 Right lung contusion

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Injury Mechanism



- AIS-4 Multiple rib fractures (bilateral 1-3)

Driver air bag / Direct loading

- AIS-3 Liver laceration

Lap/shoulder restraint / Direct loading

- AIS-4 Brain hemorrhage

Seat back / Direct contact

- AIS-4 Brain contusion

Seat back / Direct contact

- AIS-3 Right lung contusion

Driver air bag / Direct loading

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Injury Mechanism



Bilateral rib fractures 1-3

Driver air bag loading



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Injury Mechanism



Liver laceration

Shoulder restraint loading



Mechanism of Injury



Subarachnoid Hemorrhage

Seat back



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Injury Mechanism



Right parietal swelling

Rebound right side seat frame



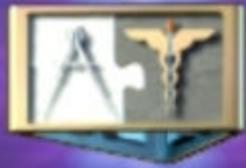
Injury Mechanism



Lap/Shoulder loading

7/7/2003

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Applying SCENE Scale

How An Air Bag Works.



Look Beyond The Obvious.*

While air bags, seat belts, safety belts and proper use of animal seat belts and child safety seats are saving thousands of lives and preventing hundreds of thousands of injuries each year, injuries can still occur from crashes. Research indicates that some people are dying in the United States as the result of internal injuries that are not being detected and treated. The following observations at the crash SCENE should increase the index of suspicion that internal injuries may have occurred.

S Steering wheel deformation? Full air bag and lock. A level steering wheel could indicate internal injuries.

C Close proximity of driver to the steering wheel? Occupants of small vehicles or large girls sitting close to the steering wheel are at greater risk of internal injuries.

E Energy of the crash? Velocity, or force, index of vehicle crash indicates high crash forces.

N Position of seat belts? Position of lap or hip? Shoulder belts could result in multiple impacts and greater probability of internal injuries.

E Evidentiary report of crash scene? Towed reports, photos and interview reports of the interior and exterior of the crash vehicle concern the severity of the crash, and indicate the probability of crash injuries.

*Research and programs promoted by air bags and proper safety belts have been internal injuries. Check the seat for evidence of internal injuries. Call the Auto Injury Hotline at 1-800-424-9093 to get safety advice and to request information on current vehicle safety and medical research in crash injuries.

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National Highway Traffic Safety Administration

S C E N E

Steering Wheel Deformation Close-in Occupant



How An Air Bag Works.



Look Beyond The Obvious.®

While air bags automatically inflate, belts and proper use of restraint are both vital. Air bag safety may be saving thousands of lives and preventing hundreds of thousands of injuries each year. Highway can still cause fatal crashes. National Highway Traffic Safety Administration.

research indicates that some people are dying in the United States as the result of steering wheel deformation. The following observations at the crash site should increase the odds of suspicion that steering wheel was deformed.

S Steering wheel deformation? Look for bag and look. A bent steering wheel could indicate steering suspension.

C Close proximity of driver? Displacement of seat relative to bag could indicate close to steering wheel or at greater risk of steering suspension.

E Energy of the crash? Damage to other interior of vehicle could indicate high crash forces.

N Because of seat belt? Because of lap or hip? Another belt could result in multiple impacts and greater probability of steering suspension.

E Deformation report of crash scene? Initial reports, photos and video images of the scene and evidence of the crash which may increase the severity of the crash and reduce the probability of steering suspension.

Please refer to the NHTSA's 1998 report on the subject of steering wheel deformation. Visit the website at www.nhtsa.gov. Call the new hotline, 1-800-424-9393. For more information, please call 1-800-424-9393. NHTSA's website is www.nhtsa.gov.

U.S. Department of Transportation
National Highway Traffic Safety Administration



First Generation URGENCY



CrashCARE Version 2.2 Crash Study System - Crash Study Data

File Edit Help

Patient ID: Case Number:

Crash Type: Partial Ejection

DeltaV in MPH:

Rollover:

Single Vehicle:

Max. Crush (in.):

Max. Intrusion > 6 in.:

Car Curb Weight, in lbs:

Air Bag + 3Pt Belt:

3Pt Belt:

Car Occupant's Age, in Years:

Occupant's Gender(Female):

Entrapment:

Complete Ejection:

Partial Ejection:

Probability of Severe Injury

ALS Code	Description	Body Region
110402.1	Swelling, NOS to the Posterior Parietal region	External
140612.3	Contusion, NOS to the Anterior Temporal lobe, NOS Anteriorly	Head/Neck
140640.4	Small amount Hemorrhage, NOS to the Anterior Cisterna interpeduncularis	Head/Neck
210402.1	Ecchymosis to the Anterior Skin of upper eyelid Right side	External
410402.1	Contusion, NOS to the Anterior Left Skin of upper trunk	External
441406.3	Contusion, NOS to the Anterior Right Right upper lobe of lung, NOS	Chest
450242.5	w small Hemothorax Fracture, closed, NOS to the Anterior Left Rib cage, NOS Ribs L 1-3 Post., R 1-3 Ant.	Chest
510402.1	Horizontal, Linear Contusion, NOS to the Anterior Left Skin of abdomen, NOS LLQ & LRQ	External
541826.4	Grade 3 Laceration, NOS to the Anterior Right Right lobe of liver, NOS	Abdomen/Pel...
710202.1	Multiple Abrasion, NOS to the Anterior Right Skin of upper extremity, NOS	External
710202.1	Abrasion, NOS to the Anterior Left Skin of upper extremity, NOS	External

Crash Study Data 4:09 PM English User Signed on:

2nd Generation URGENCY



- 72.27% risk of and AIS-3 or greater injury
- Increased risk from impacts with strong narrow fixed objects

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Case 3

Lap/Shoulder Restraint Related Occult Liver Injury

-Left Rear Passenger Fatality-

Vehicle to Vehicle Far Side Impact

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Case Subject
12 Y/O Female
Left Rear Passenger

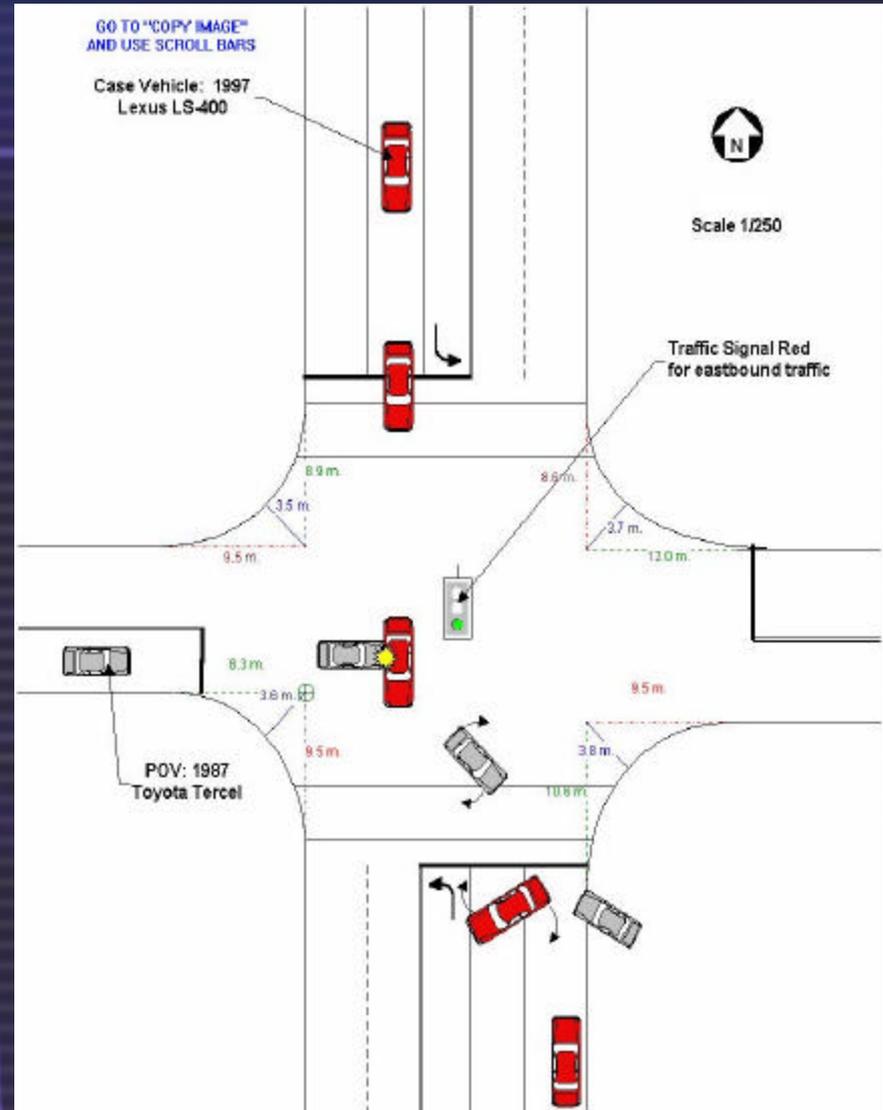
- 165 cm (65")
- 71 kg (156lbs)
- Lap/Shoulder restrained

Occupant does not go to ED

Scene



CV trajectory



Crash occurred: 07:00pm

Case Vehicle



- 1997 Lexus LS 400
- PDOF: 2 O'clock
- Crush measurements N/A
- dV: 24 km/h (15 mph)

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Case Facts



- Crash occurred
-07:00pm
- Vehicle occupied by driver, RF passenger and 2 rear seat passengers
- Right rear passenger taken to local ED, accompanied by her daughter (case subject)
- Case subject complains in ED of stomach pains
- Case subject goes to bathroom, drinks water, gets dizzy and goes into respiratory arrest
- Case subject expires in ED 4 hours post crash
-10:45pm

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Vehicle Damage

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Max Crush Unknown



DV: 24 km/h (15 mph)

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Right Side Damage

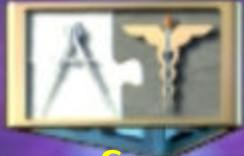


Intrusion unknown

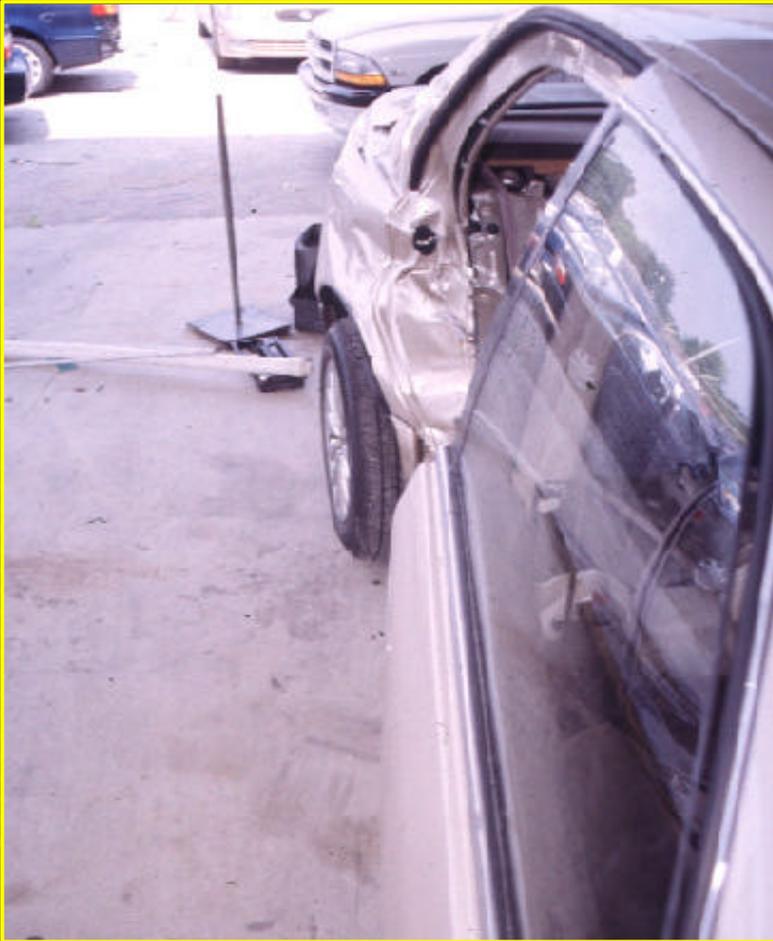
7/7/2003

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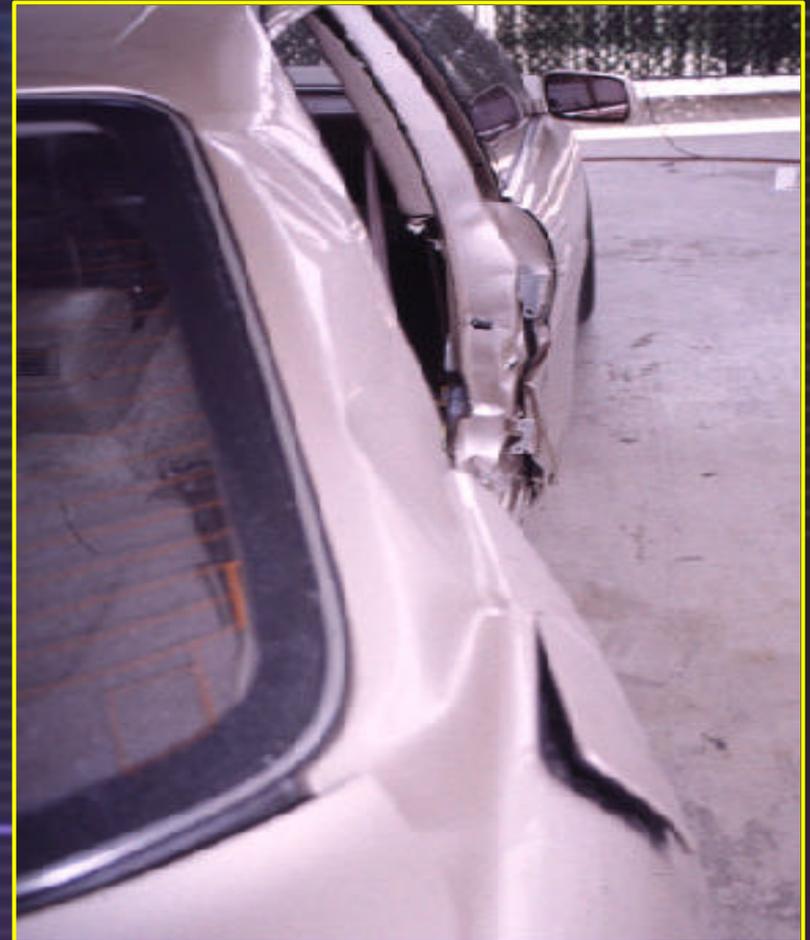
Perpendicular Right Side Damage



View from right front



View from right rear



Left Rear Seat



Exemplar

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Occupant Exemplar



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7/7/2003 5'5" , 156lbs

Restraint Usage



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Principle Other Vehicle

1987 Toyota Tercel

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Significant Injuries

- AIS-5 Right lobe of liver major laceration
- AIS-4 Bilateral lung contusion
- AIS-3 Endocardium contusion
- AIS-2 Left lobe of liver contusion

Injury Mechanisms



AIS 5 – Right lobe of liver major laceration
Lap Shoulder restraint / Direct loading

AIS 4 – Bilateral lung contusion
Lap Shoulder restraint / Compression

AIS 3 – Endocardium contusion
Lap Shoulder restraint / Compression

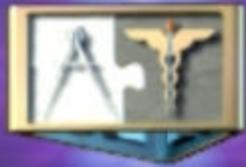
AIS 2 – Left lobe of liver contusion
Lap Shoulder restraint / Direct loading



Lessons Learned

- URGENCY and SCENE currently not applied to rear seat occupants
- Certain far side crashes may be hazardous to belted occupants
- **Need to update our thinking on rear seat occupants!**

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Case 4

Rear Seat Loading *Occult Spleen Injury* -Survivor-

Frontal Narrow Pole Impact

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Case Subject

20 Y/O Female

Right Front Passenger

- 168 cm (66")
- 54 kg (120lbs)
- Lap/Shoulder restrained
- Right front passenger air bag deployed

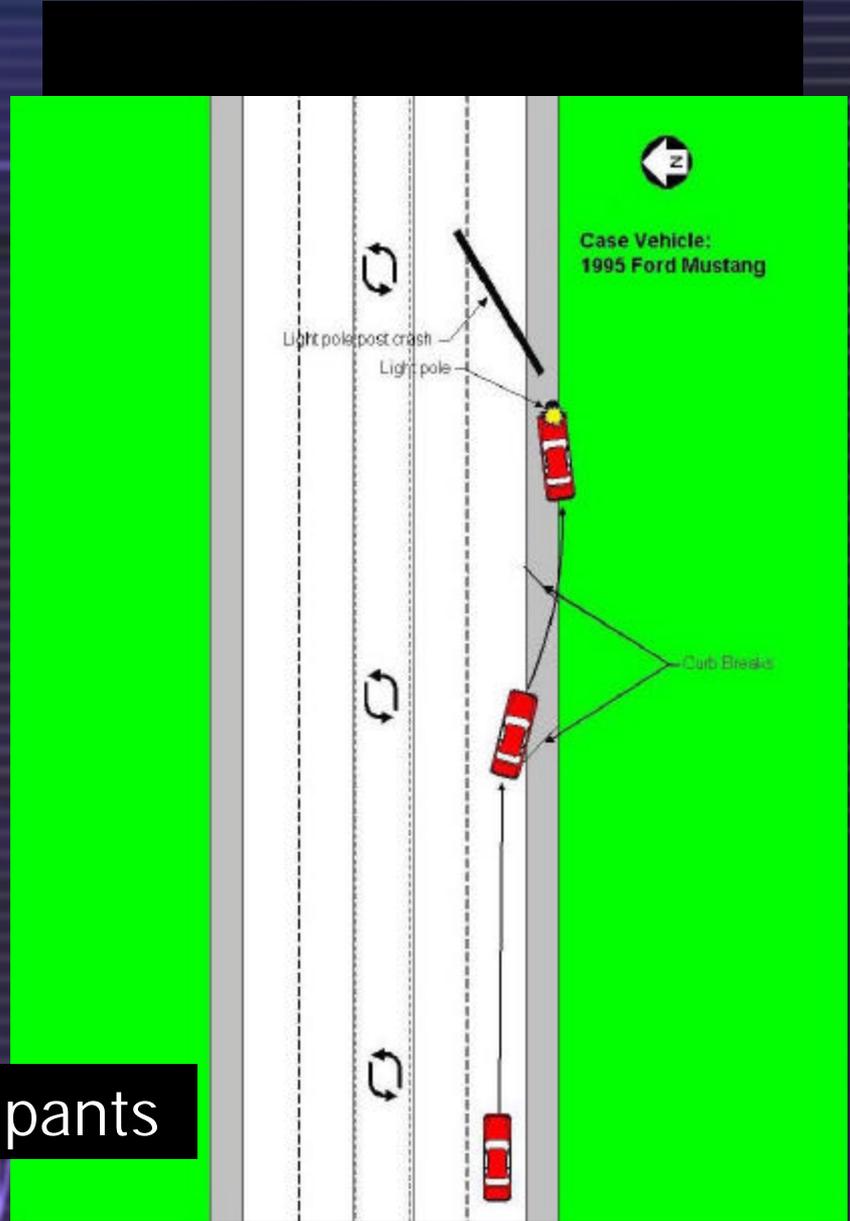
Sharing the rear right seat are two occupants that load the right front seat back during impact

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Scene



CV trajectory



Driver is distracted by vehicle occupants

Case Vehicle



- 1995 Ford Mustang
- PDOF: 12 O'clock
- Max Crush: 62 cm (24.4")
- dV: 40 km/h (25 mph est.)
- No Intrusion

Initially brought to ED

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Crash Facts



- Crash Occurred
 - 03:42am
- Ground rescue takes RF passenger to hospital ED
 - 04:42am
- Trauma resus arrival
 - 06:22am
- Hospital stay
 - 9 days

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Vehicle Damage

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Max Crush 62 cm (24.4")



7/7/2003
DV: 40 km/h (25 mph)

Right Front Passenger Area



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Restraint Usage



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Rear Seat Occupant Loading

Left rear seat was in down position when crash occurred

Right rear seat was occupied by two unrestrained occupants





Significant Injuries

- AIS-3 Spleen laceration
- AIS-3 Left rib fractures with pneumothorax
- AIS-3 Left lung contusion
- AIS-2 Pelvic fracture

Injury Mechanisms



- AIS-3 Spleen laceration
Lap/Shoulder restraint / Compression
- AIS-3 Left rib fractures with pneumothorax
Lap/Shoulder restraint / Direct loading
- AIS-3 Left lung contusion
Lap/Shoulder restraint / Direct loading
- AIS-2 Pelvic fracture
Lap/Shoulder restraint / Direct loading

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Mechanism of Injury



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2nd Generation URGENCY



- 46.86% risk of an AIS-3 or greater injury
- Increased risk from impacts with strong narrow fixed objects and extent of crush
- No factor for unrestrained rear seat occupants

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Using SCENE SCALE

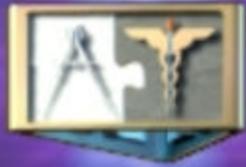


NOTE: Rear Seat Occupant Loading

Predicts specific injuries based on multidisciplinary analysis of injuries observed in low frequency crashes

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Thank you For Recognizing the Importance of Education



- NHTSA – CIREN
 - Live lectures
 - Web-based
 - Under development

How An Air Bag Works.



Look Beyond The Obvious.*

While air bags, in motor safety belts and proper use of manual seat belts, and child safety seats are saving thousands of lives and preventing hundreds of thousands of injuries each year, injuries can still occur from crash forces. National Highway Traffic Safety Administration research indicates that some people are dying in the Critical Status as the result of internal injuries that are not being detected and treated. The following observations at the crash/SCENE should increase the index of suspicion that internal injuries may have occurred.



Steering wheel deformation? Lift air bag and look. A bent steering wheel could indicate internal injuries.



Close proximity of driver to the steering wheel? Occupants of small stature or large girth sitting close to the steering wheel are at greater risk of internal injuries.



Energy of the crash? Twenty or more inches of vehicle crumple indicates high crash forces.



Neck pain or seat belt? Pressure of lap or leg? Shoulder belts could result in multiple impacts and greater probability of internal injuries.



Emergency report of crash scene? Medical reports, photos and television images of the interior and exterior of the crash vehicle convey the severity of the crash, and indicate the probability of occult injuries.

*Research and program provided by all large vehicle safety belts and child restraint seats. Check the seat for evidence of internal injuries. Call the Injury Hotline at 1-800-325-9000 to request safety belts and to request information on motor vehicle safety and medical research resources.


 U.S. Department of Transportation
National Highway Traffic Safety Administration