

Occult Injuries: Two Case Presentations

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and the New Jersey CIREN Team:

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Accident Cause and Analysis
Frank Costanzo, Rob Freeth



**Case Presentation:
Occult Injury (Aortic Arch Disruption)
in a Patient with Obvious Lower
Extremity Injuries**



Frontal motor vehicle crash

- V1 = 1997 Honda Civic (1064 kg)
- V2 = 1992 Ford Taurus (1430 kg)
- Delta V1 = 63.4 kph (39.4 mph)
- Delta V2 = 47.1 kph (29.3 mph)
- PDOF = 350
- CDC = 12FDEW2
- Max crush = 47 cm at C1

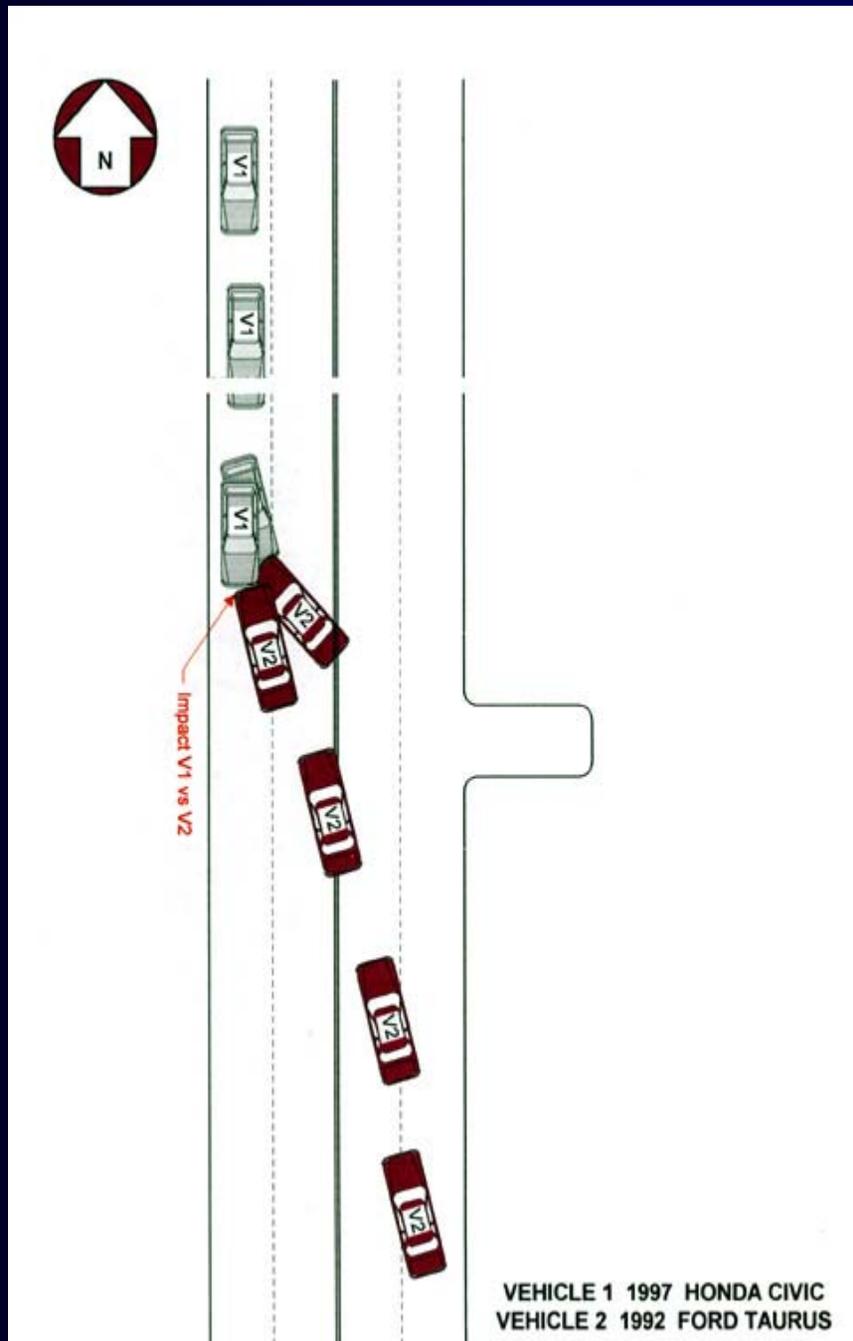


Case Occupant (V1 – 1997 Honda Civic)

- 53 year old male unrestrained driver
- Weight = 90 kg (198 lbs)
- Height = 160 cm (5' 3")
- Airbag deployed

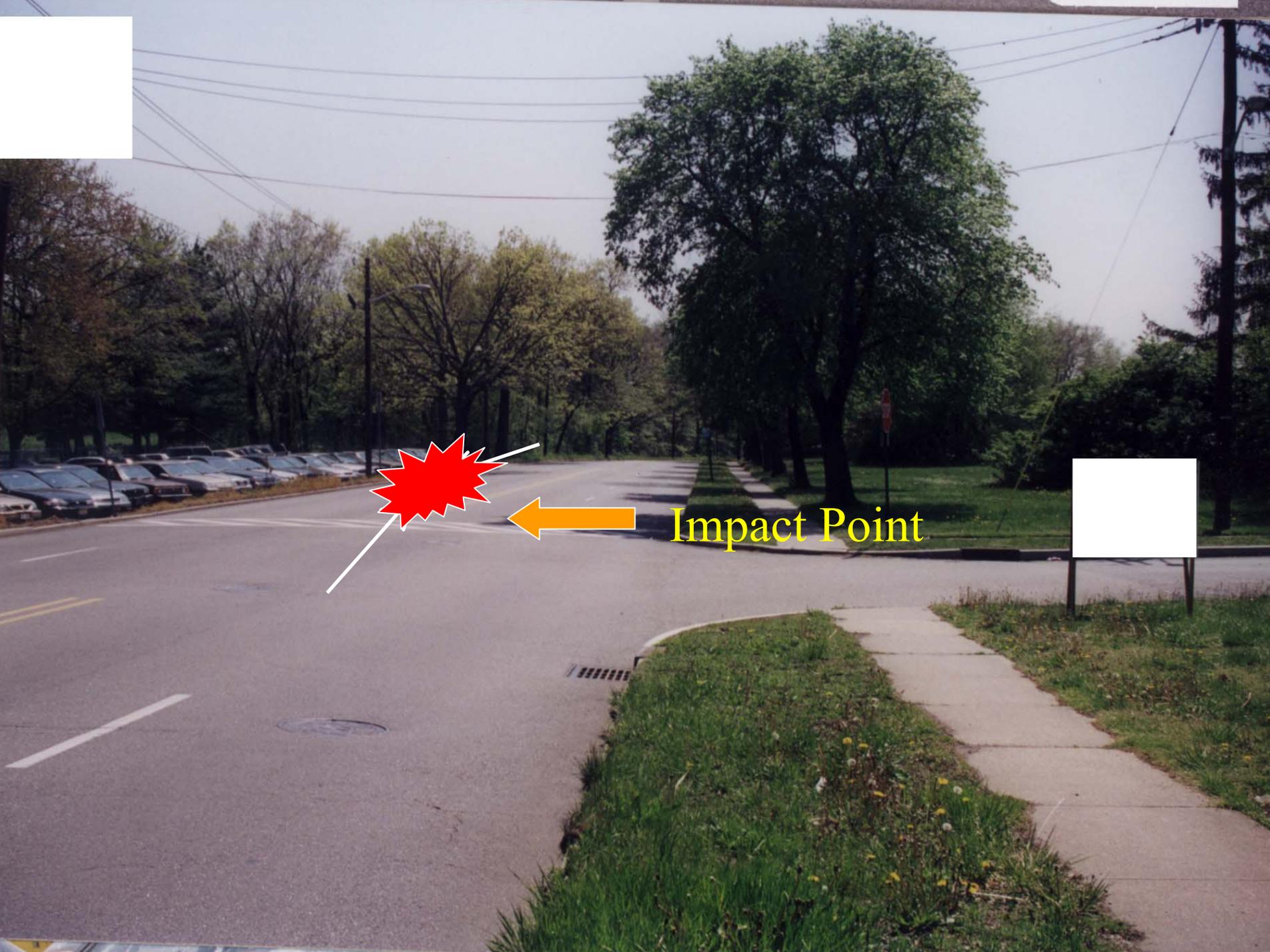


Scene Diagram

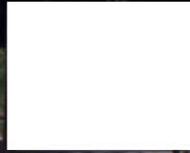




Travel path of vehicles

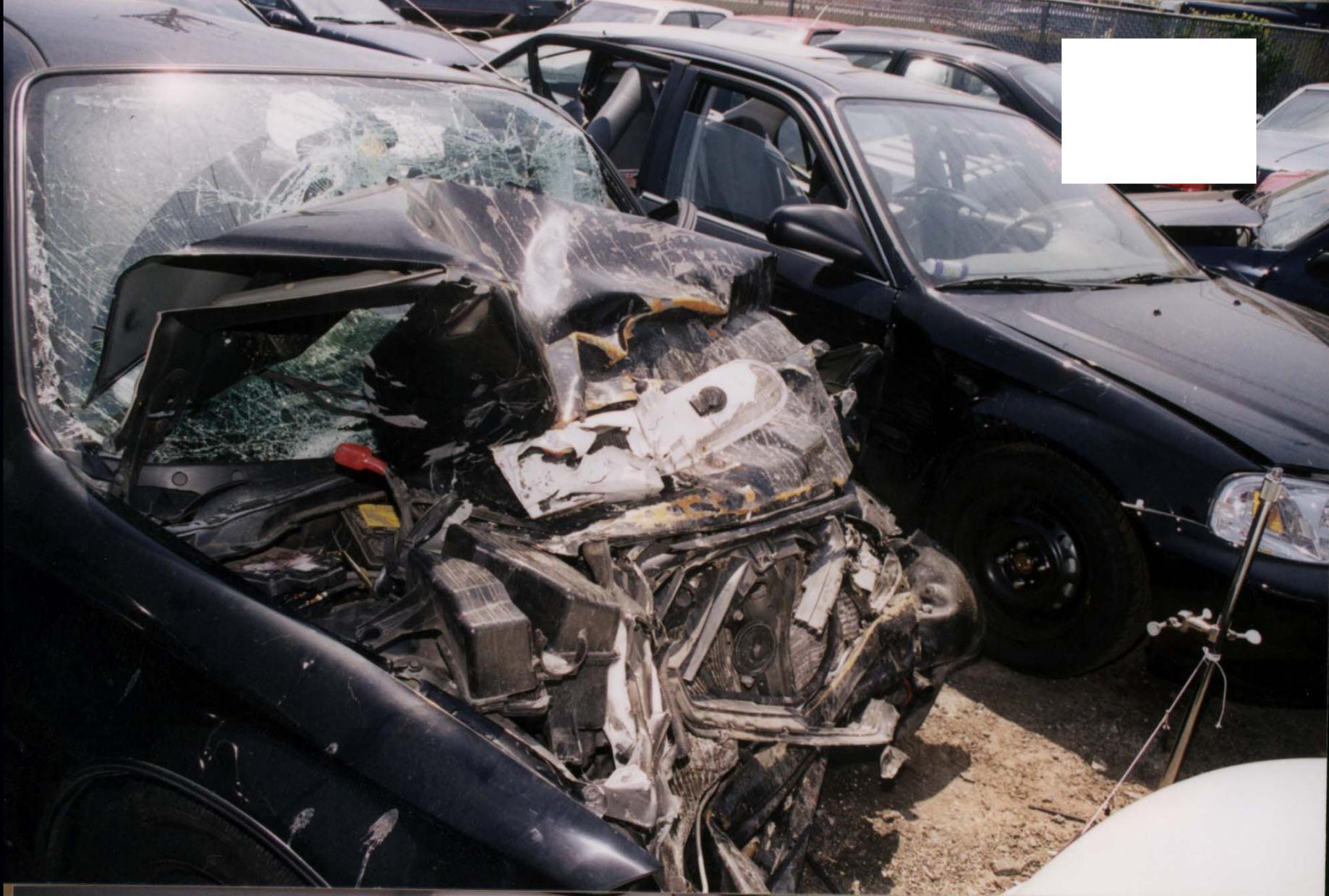


Impact Point



Frontal Damage - 1997 Honda Civic

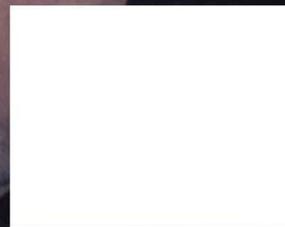




Frontal Intrusion - 1997 Honda Civic



Driver Airbag



View of Driver Seat

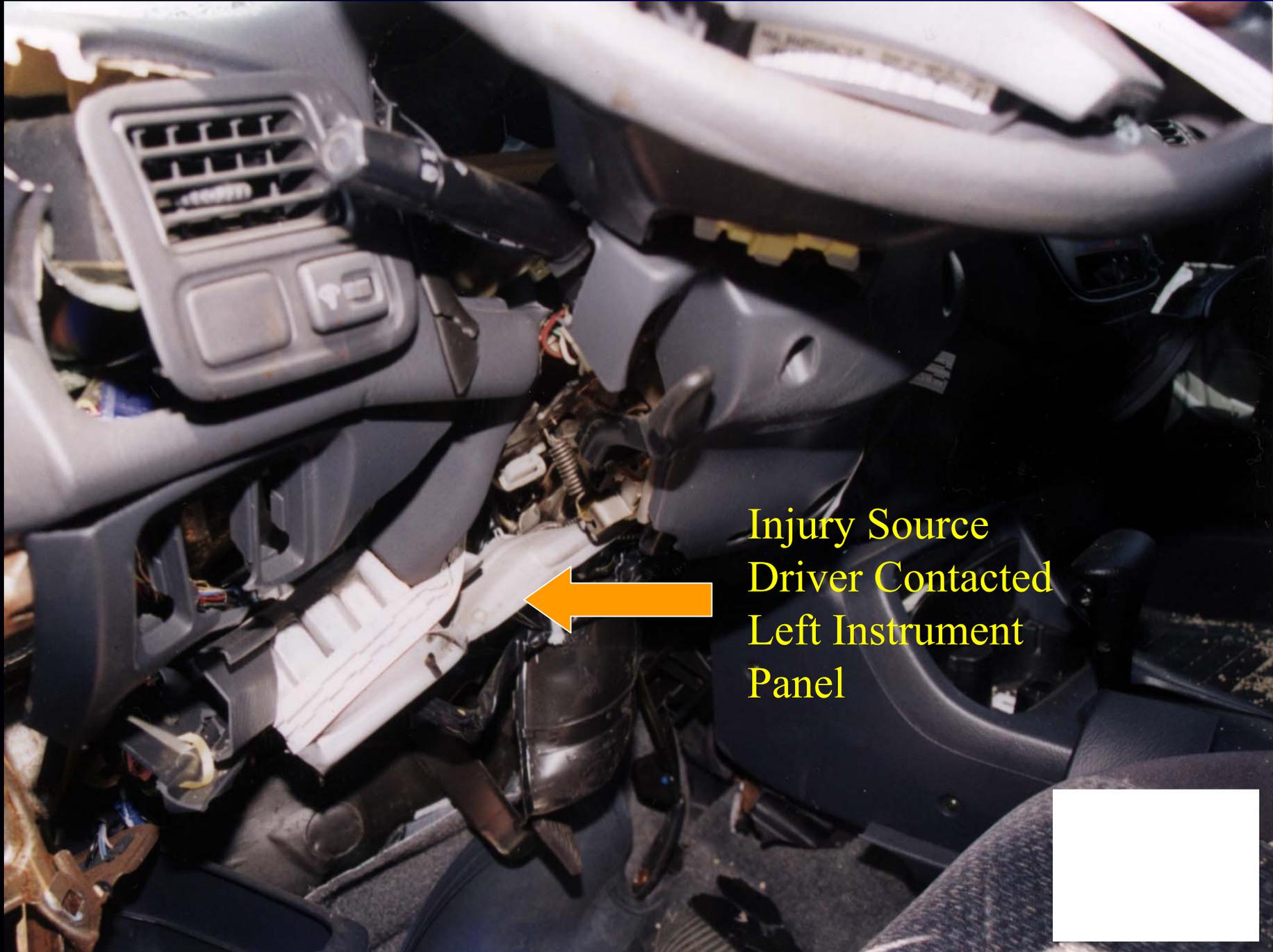




Injury Source
Unrestrained
Driver
Contacted
Steering Wheel

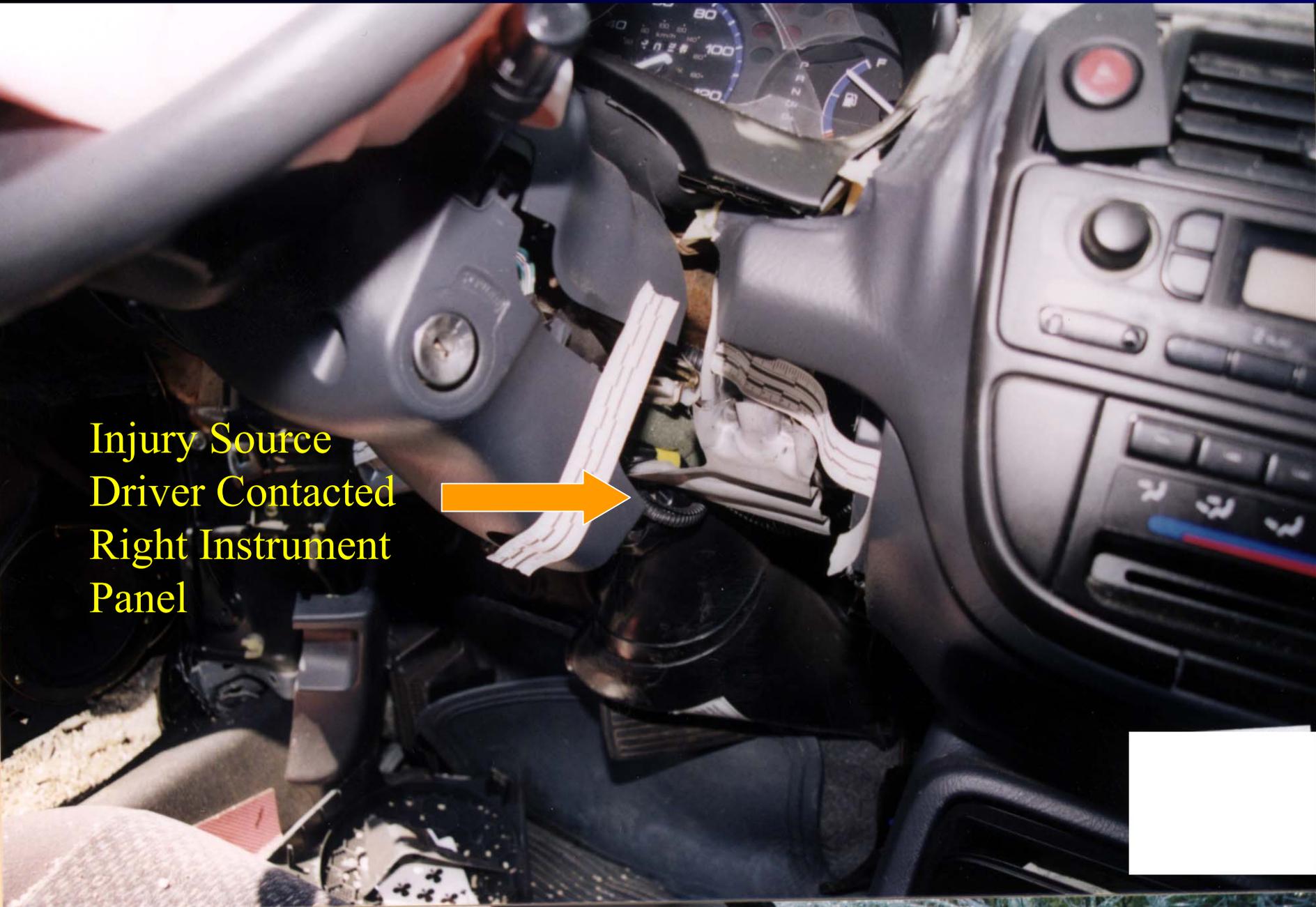
Interior of 1997 Honda Civic

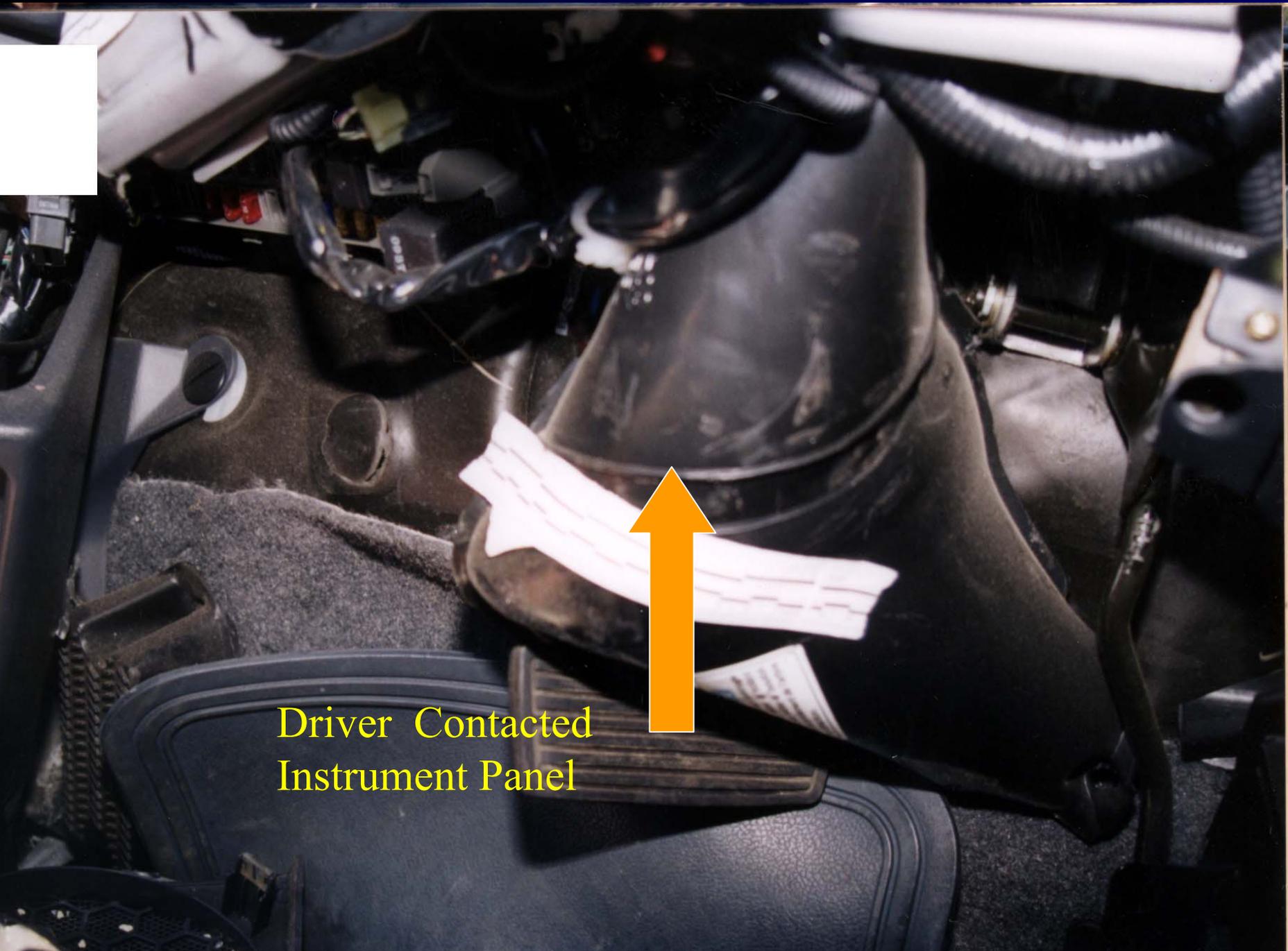




Injury Source
Driver Contacted
Left Instrument
Panel

Injury Source
Driver Contacted
Right Instrument
Panel



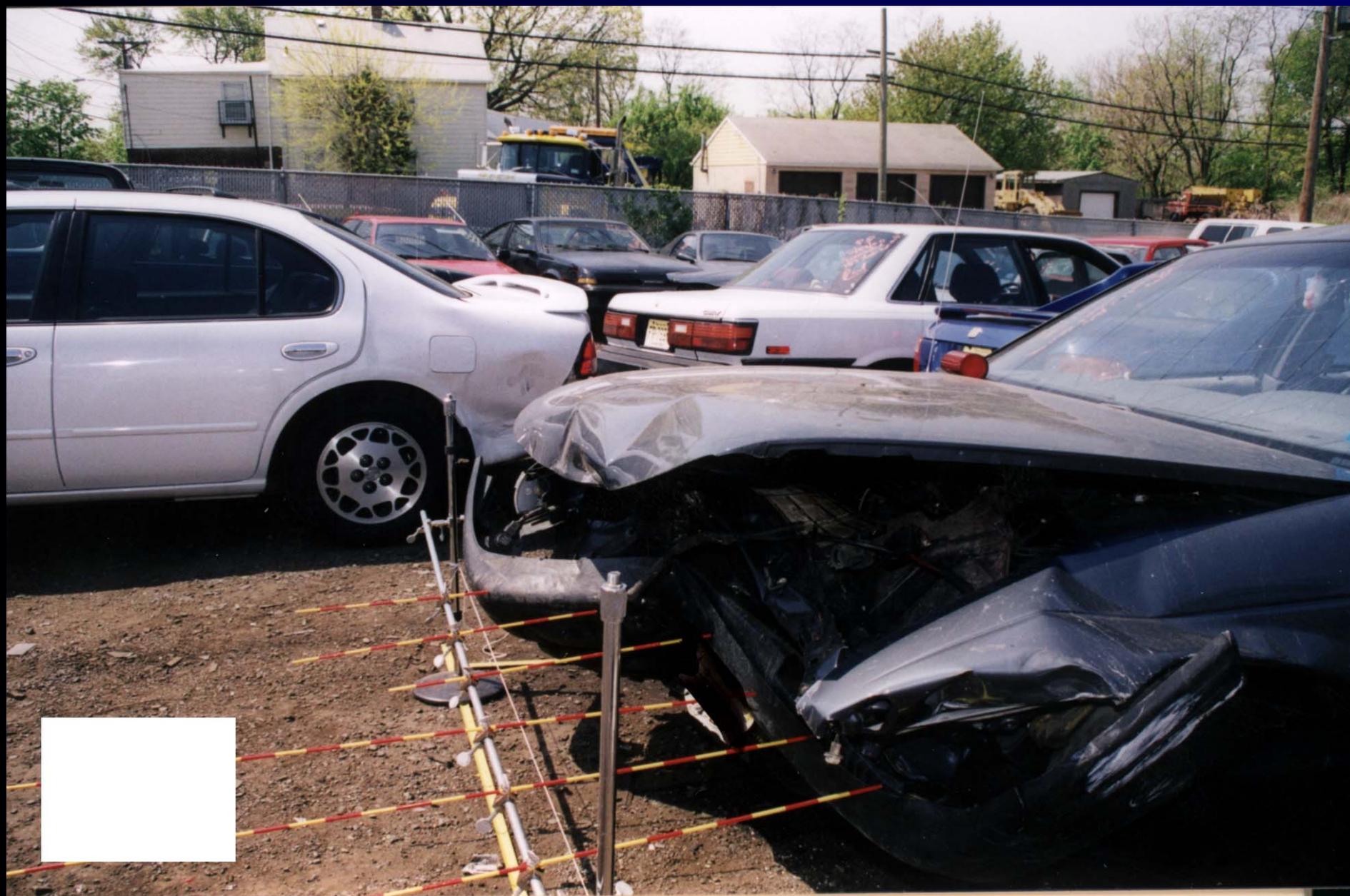


Driver Contacted
Instrument Panel

Front of Vehicle 2 – 1992 Ford Taurus



Front of Vehicle 2 – 1992 Ford Taurus

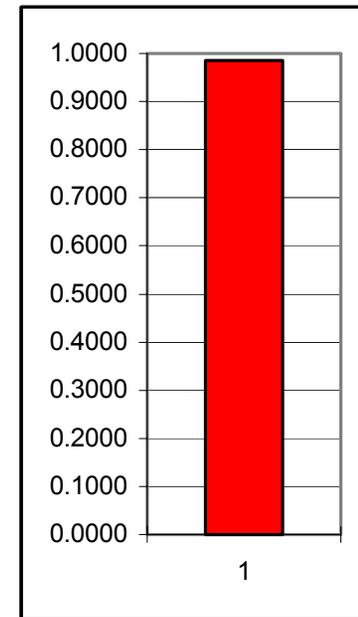


URGENCY Score

Vehicular Crash Site Data

Variable	Data Value	Check
DELTAV, in MPH?	39	
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.)	2341	
Safety Belt Use? (NO=0, YES=1)	0	TRUE
Car Occupant's Age, in years? (Default 30 years)	53	
Occupant's Gender? (FEMALE=1, MALE=0)	0	TRUE
Entrapment? (NO=0, YES=1)	1	TRUE
Complete Ejection? (NO=0, YES=1)	0	TRUE

Projection of the Probability of Casualty



Projection of the Probability of Casualty

0.9859

Urgency Attempts to Predict Injuries



Frontal motor vehicle crash vs Sedan – Case Occupant (V1) Injury List

INJURY	SOURCE
Thoracic aorta laceration (junction of left innominate artery takeoff and aortic arch: pseudoaneurysm)	Steering wheel/airbag
Bilateral rib fractures (left 1, right 2-3)	Steering wheel/airbag
Left pneumothorax, right hemothorax	Steering wheel/airbag
Manubrium sternum comminuted fracture	Steering wheel/airbag
Liver laceration Grade II	Steering wheel
Left open mid-shaft femur fracture, Grade IIIA	Left instrument panel
Left intertrochanteric fracture	Left instrument panel
Right open mid-shaft tib/fib fracture	Brake pedal
Left complex mid-foot fractures	Toe pan

Hospital Course

- Repair of pseudo aneurysm using a vascular graft under cardiac arrest with hypothermia and heparinization
- IM nailing of left femoral fracture, ORIF of intertrochanteric and patellar fractures, insertion of Greenfield IVC filter
- 10 days ICU course was complicated
- discharged after 27 days of hospitalization to a rehab facility for his orthopedic injuries – bilaterally non-weight-bearing



Case Presentation: Occult Injury (Multiple Pelvic Fractures) In a Patient with No Visible Injuries



Frontal (barrier) motor vehicle crash

- V1 = 2000 Ford Expedition SUV (2374 kg)
- Delta V1 = 27 kph (17 mph)
- Principal Direction Of Force (PDOF)= 350
- CDC = 12FDEW2
- Max crush = 35 cm at C1

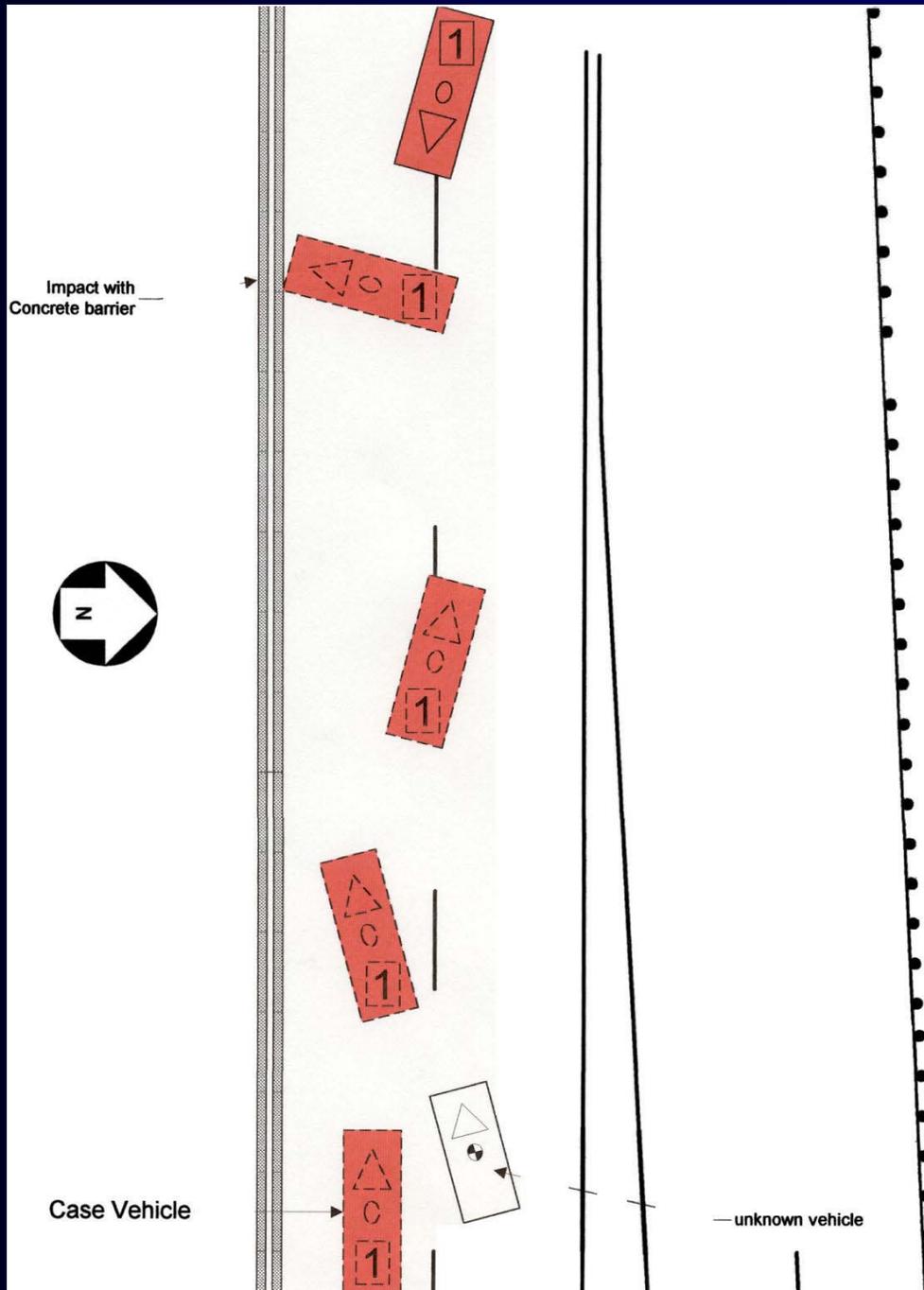


Case Occupant (V1)

- 53 year old male unrestrained driver
- Weight = 79 kg (174 lbs)
- Height = 173 cm (5' 8")
- Airbag deployed



Scene Diagram





Impact Point (Jersey Wall) by 2000 Ford Expedition



Scene Showing Impacted Jersey Wall

Front of 2000 Ford Expedition



Intrusion - 2000 Ford Expedition





2000 Ford Expedition

Seatbelt Shows No
Evidence of Use In
Crash (No stretch
marks on webbing)



Deployed Driver Airbag





Driver's Knee
Contacted Left
Instrument Panel



Contacted Center
Instrument Panel



Contacted Center
Instrument Panel

Contact with Rear View Mirror



Undamaged Door Panel – No Driver Contact

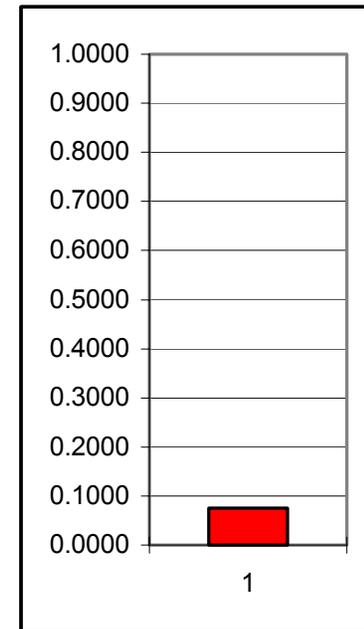


URGENCY Score

Vehicular Crash Site Data

Variable	Data Value	Check
DELTAV, in MPH?	17	
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.)	5223	
Safety Belt Use? (NO=0, YES=1)	0	TRUE
Car Occupant's Age, in years? (Default 30 years)	53	
Occupant's Gender? (FEMALE=1, MALE=0)	0	TRUE
Entrapment? (NO=0, YES=1)	0	TRUE
Complete Ejection? (NO=0, YES=1)	0	TRUE

Projection of the Probability of Casualty



Projection of the Probability of Casualty

0.0749



Urgency Attempts to Predict Injuries



Hospital Course

- Taken to non-trauma center hospital complaining of left hip and neck pain; no evidence that x-rays were taken; not admitted
- 6 days later, brought to Level I trauma center complaining of persistent severe left hip pain since the accident
- Alert with stable vital signs on admission to trauma center with pain and limited contraction of left hip
- Chest x-ray and pelvis films and CT done



Frontal motor vehicle crash vs barrier – Case Occupant (V1) Injury List

INJURY	SOURCE
Left comminuted iliac wing fracture with hematoma	Left instrument panel
Left acetabulum T-type fracture (anterior and posterior column)	Left instrument panel
Left inferior pubic rami fracture	Left instrument panel
Splenic laceration Grade I	Left instrument panel
Left posterior thigh contusion	Left instrument panel



Hospital Course

- hospitalized for 8 days
- underwent ORIF of acetabular and pelvic fractures and Greenfield IVC filter insertion
- discharged home



Outcome

- contacted for follow up at 21 months post-discharge (wife answered all questions and prevented direct contact with patient)
- patient underwent three months of outpatient rehab
- returned to work at primary occupation (teaching) after 7 months of disability
- was not able to return to secondary job doing home improvements, with a consequent reduction in income



53-year-old male unrestrained driver, airbag deployed	53-year-old male unrestrained driver, airbag deployed
Frontal collision with other vehicle	Frontal collision with barrier
Vehicle weight 1064 kg (2341 lbs)	Vehicle weight 2374 kg (5223 lbs)
PDOF=350	PDOF=350
Urgency score = 0.9859 	Urgency score = 0.0749 



Urgency Algorithm Test Outcome

Case I would have been properly triaged to a Level I trauma center based on the **URGENCY** algorithm.



Urgency Algorithm Test Outcome

Case II would not have been identified by the URGENCY algorithm. However, case II would have been elevated from low-risk to mid-risk by the URGENCY algorithm if the mechanism of injury, along with the failure to use the available seat belt restraint, had been taken into account.



In Dr. Siegel's opinion:

“In Case II, the mechanism of injury appears that he struck his left knee against the dashboard forcing the femur into the acetabulum **because he was not restrained by a seat belt**. The only place that a modification in weighting could have occurred that would have brought him from the low-risk category to at least a mid-risk category, insuring his triage to a Level I or II trauma center and a proper radiologic exam, would have been if the weighting for **NOT** wearing a seat belt had had a **positive value sufficient to raise the URGENCY algorithm to a value greater than or equal to 0.11**”.



Thank you for your attention!

