Impact Energy-Delta V Relations and Their Injury Consequences in Sedan v Sedan Compared to Sedan v SUV MVCs

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Accident Cause and Analysis

Frank Costanzo, Rob Freeth

April 3, 2003

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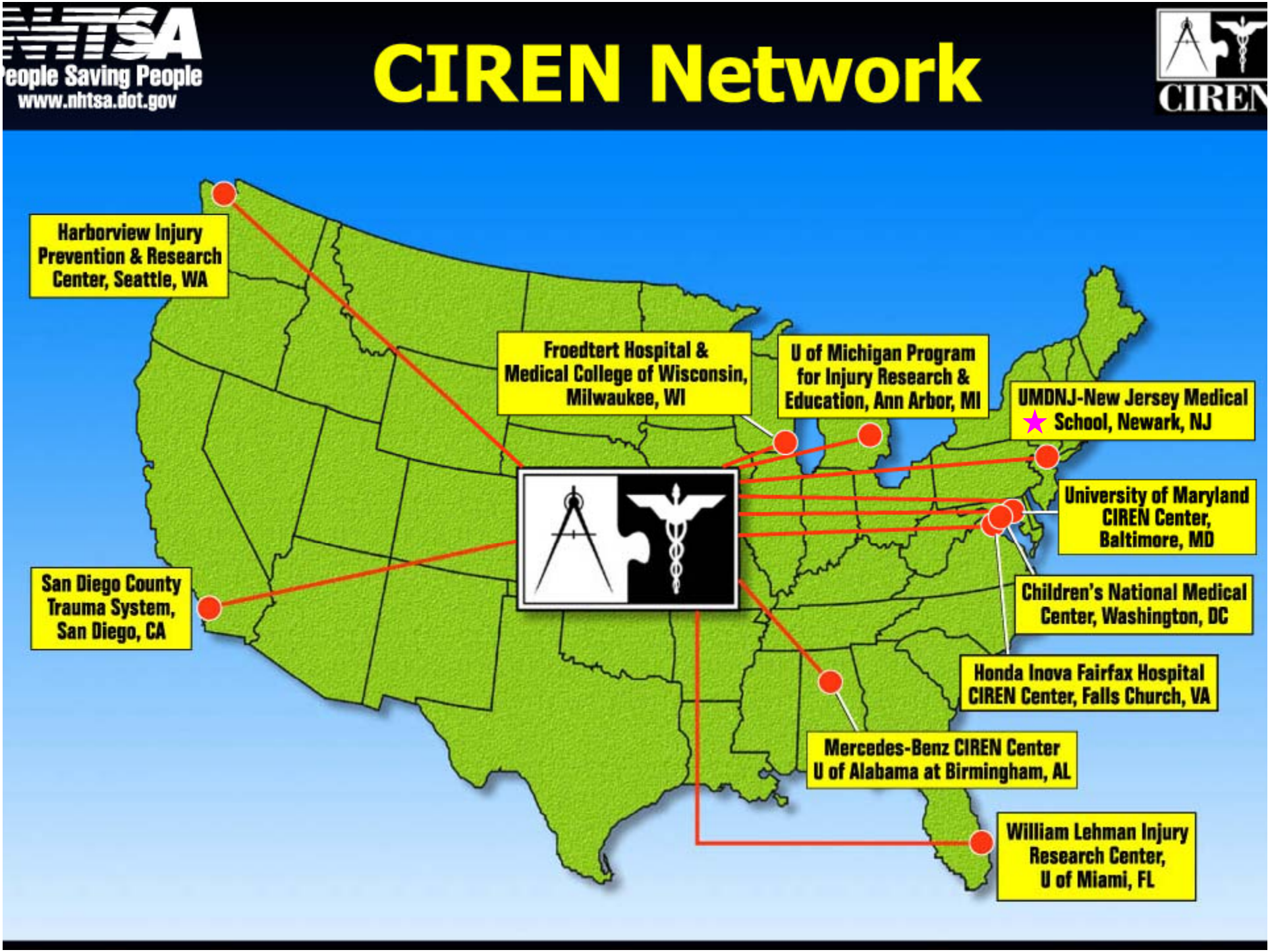
www.nhtsa.dot.gov

CIREN Network

CIREN



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and...

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Materials and Methods

Datasets were downloaded from the CIREN Intranet site and a special dataset was requested through Volpe and provided by Brian Powell at NHTSA.

Downloaded datasets were combined by CIRENID where possible.

Data for “all lateral” and “all frontal” crashes were selected by PDOF alone. These data points, unfiltered, were used to create the “all lateral” and “all frontal” graphs and regressions. Every data record that had ENERGY and DELTA V1 available was used to compute Vehicular Impact Dynamics.

This dataset was filtered to remove rear seat passengers and records in which fatality information was missing. This was used to create the graphs for vehicle dynamics by FATALITY.

Separately, seat belt use, airbag deployment, V1 class and V2 class data was transformed and combined with the downloaded dataset. This dataset was filtered to remove children (<14 years) and rear seat passengers. Then data for lateral and frontal crashes were selected by PDOF alone. These data records were further classified by V2 class, restraint use and fatality to generate the sedan v sedan and sedan v SUVT graphs by Patient Restraint Use.

Patterns of Injury by Sedan v Sedan compared to Sedan v SUVT MVCs:

Next, the injury database was updated with data on V1 class,V2 class and PDOF. Number of discrete cases represented in the database was determined. AIS codes for injuries of interest were determined and transformed into digital data indicating presence or absence of the injury type. The dataset was filtered to remove occupants less than 16 years of age. The injuries were then tabulated and calculated as a “per case” number.

Case Presentation:
Sedan vs SUV
FATALITY

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Near Side Lateral motor vehicle crash

- V1 = 2000 Mazda 626 (1391 kg)
- V2 = 2000 Honda CRV (1455 kg)
- Delta V1 = 55 kph (34 mph)
- Energy = 163692 joules
- PDOF = 280
- CDC = 09LYAW5
- Max crush = 70 cm at C3
- Rollover - 2 quarter turns

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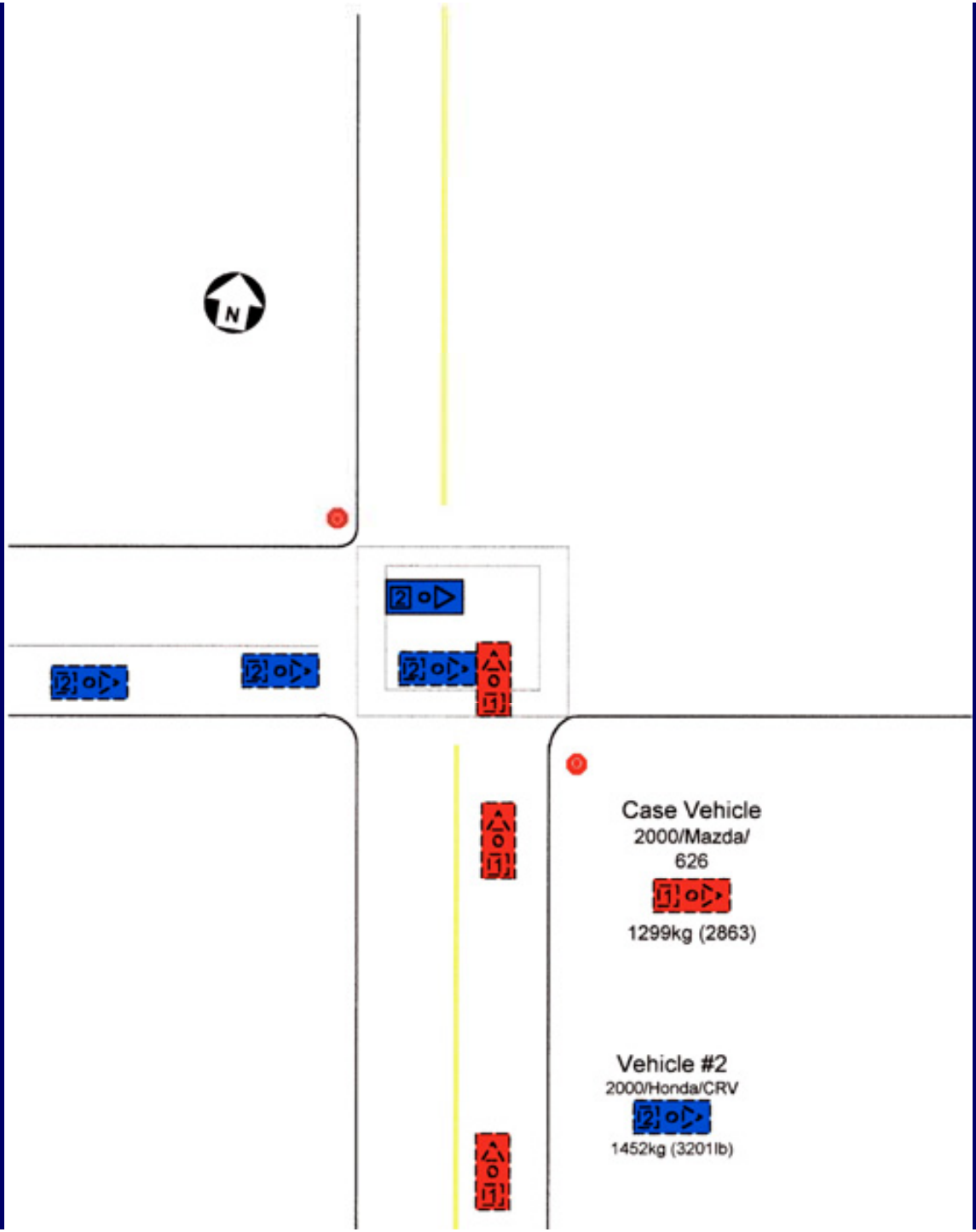
Case Occupant (V1)

- 28 year old male unrestrained driver
- Weight = 83 kg (182 lbs)
- Height = 188 cm (6’ 2”)
- Airbag deployed


N
Case Vehicle
2000/Mazda/
626
1299kg (2863)
Vehicle #2
2000/Honda/CRV
1452kg (3201lb)

Lookback from Impact

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Frontal Damage to Case Vehicle

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Left Side Views of Case Vehicle

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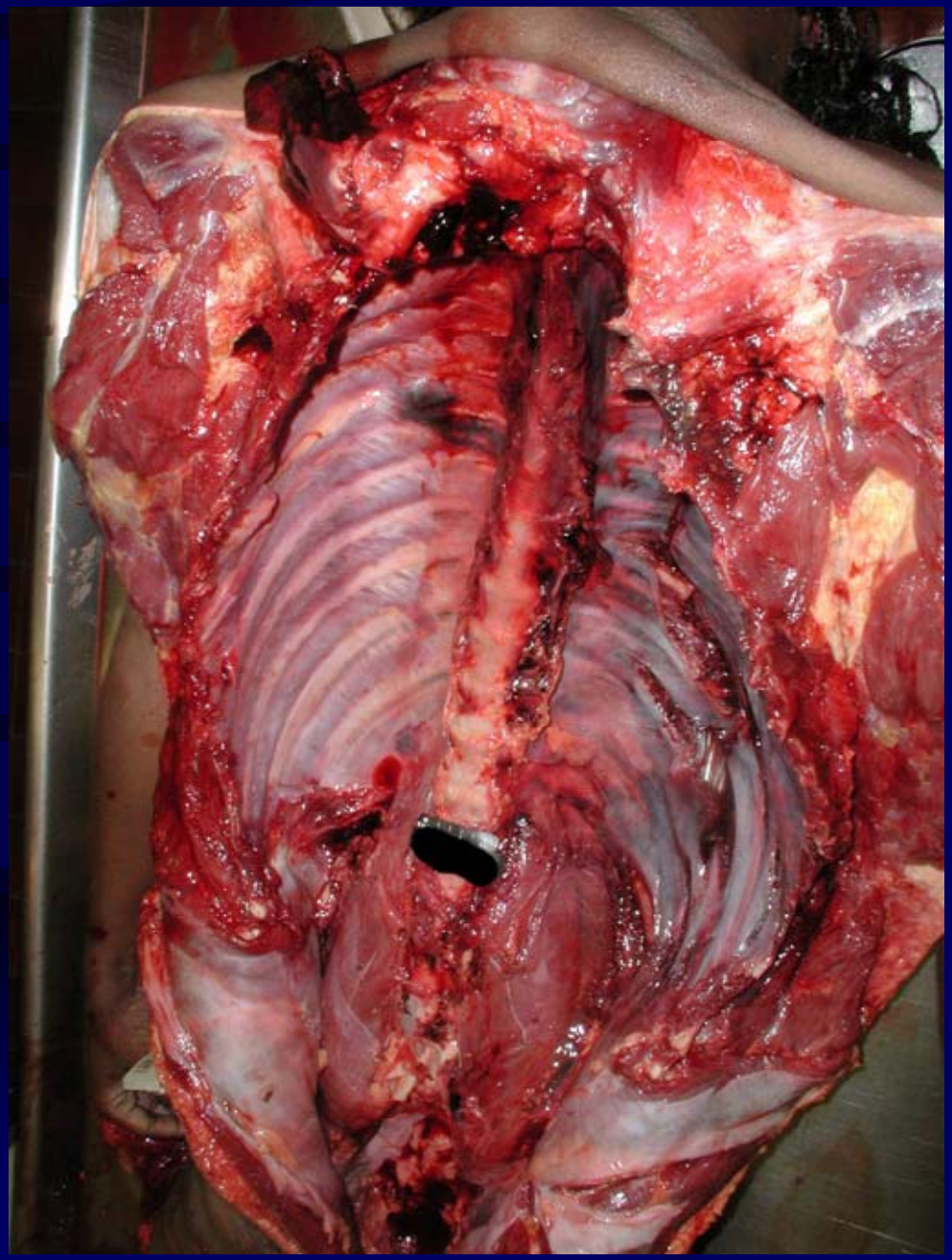

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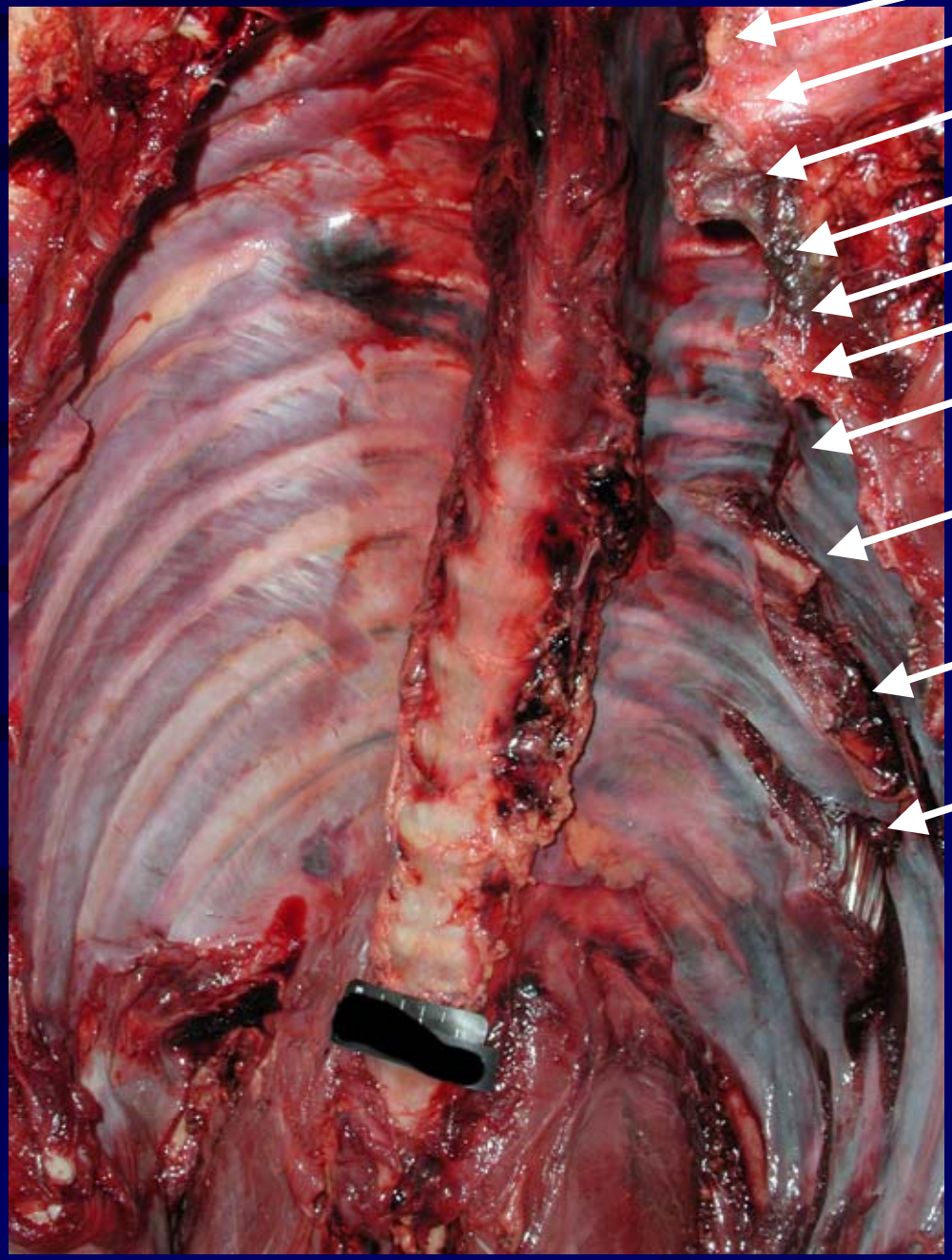

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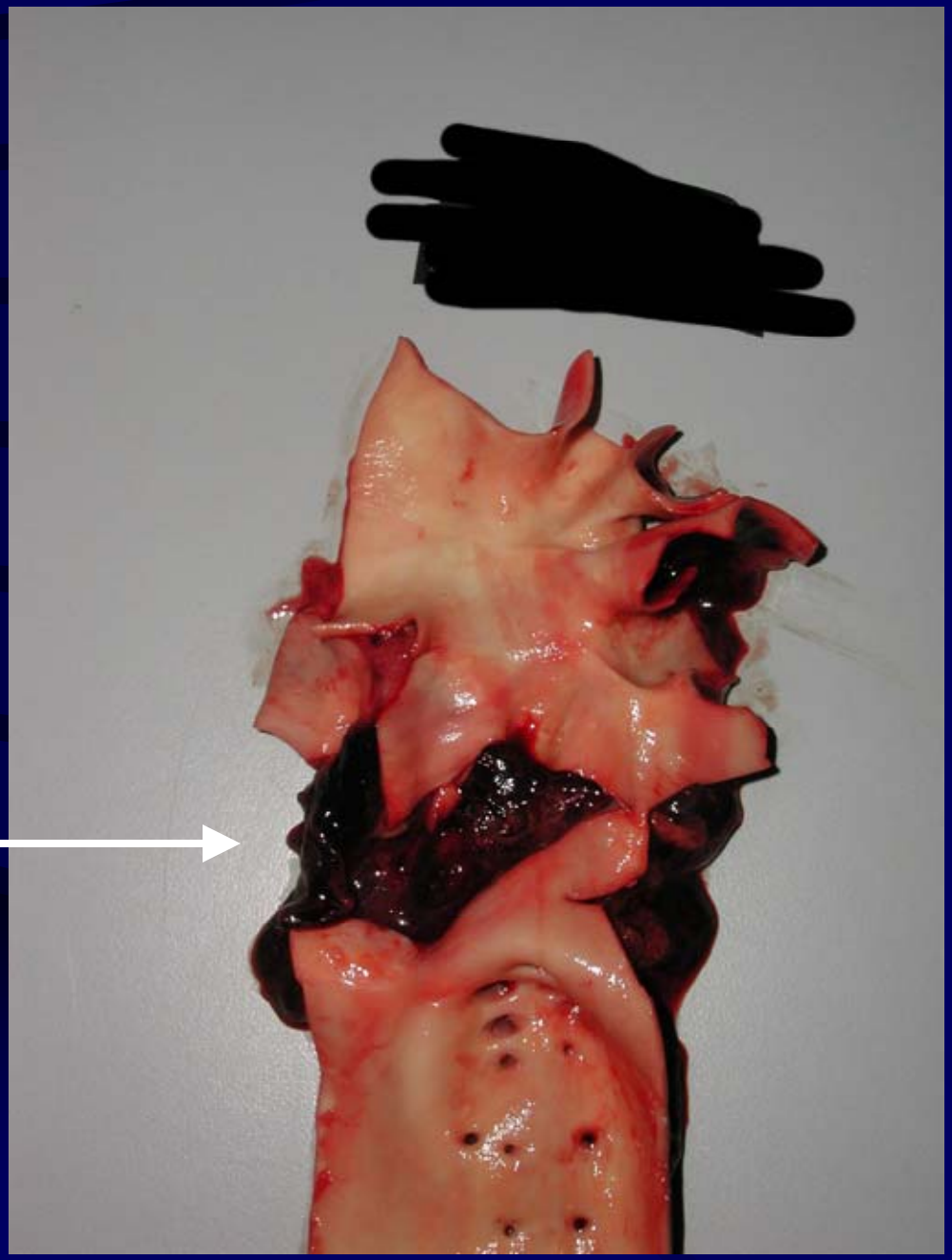

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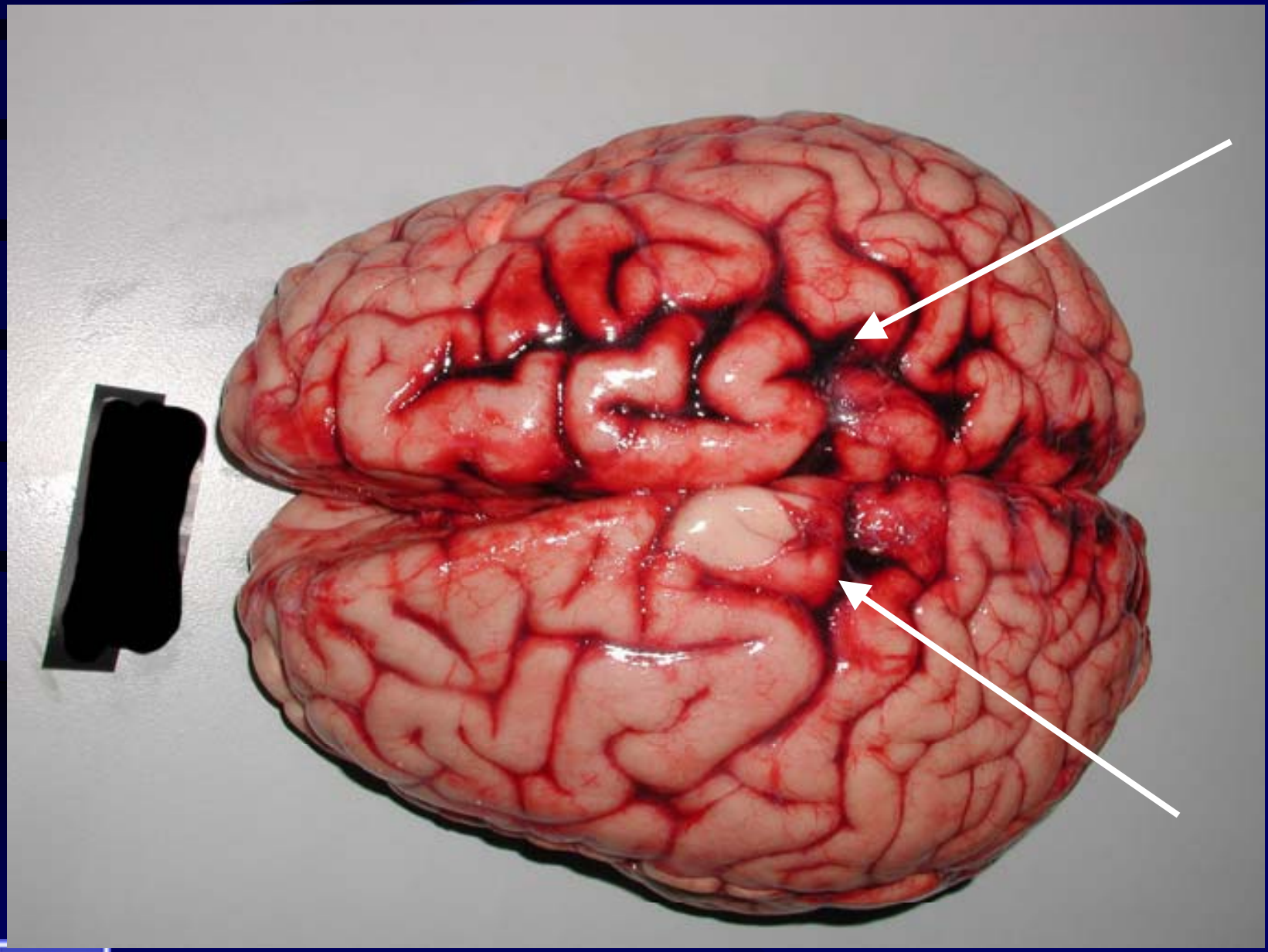

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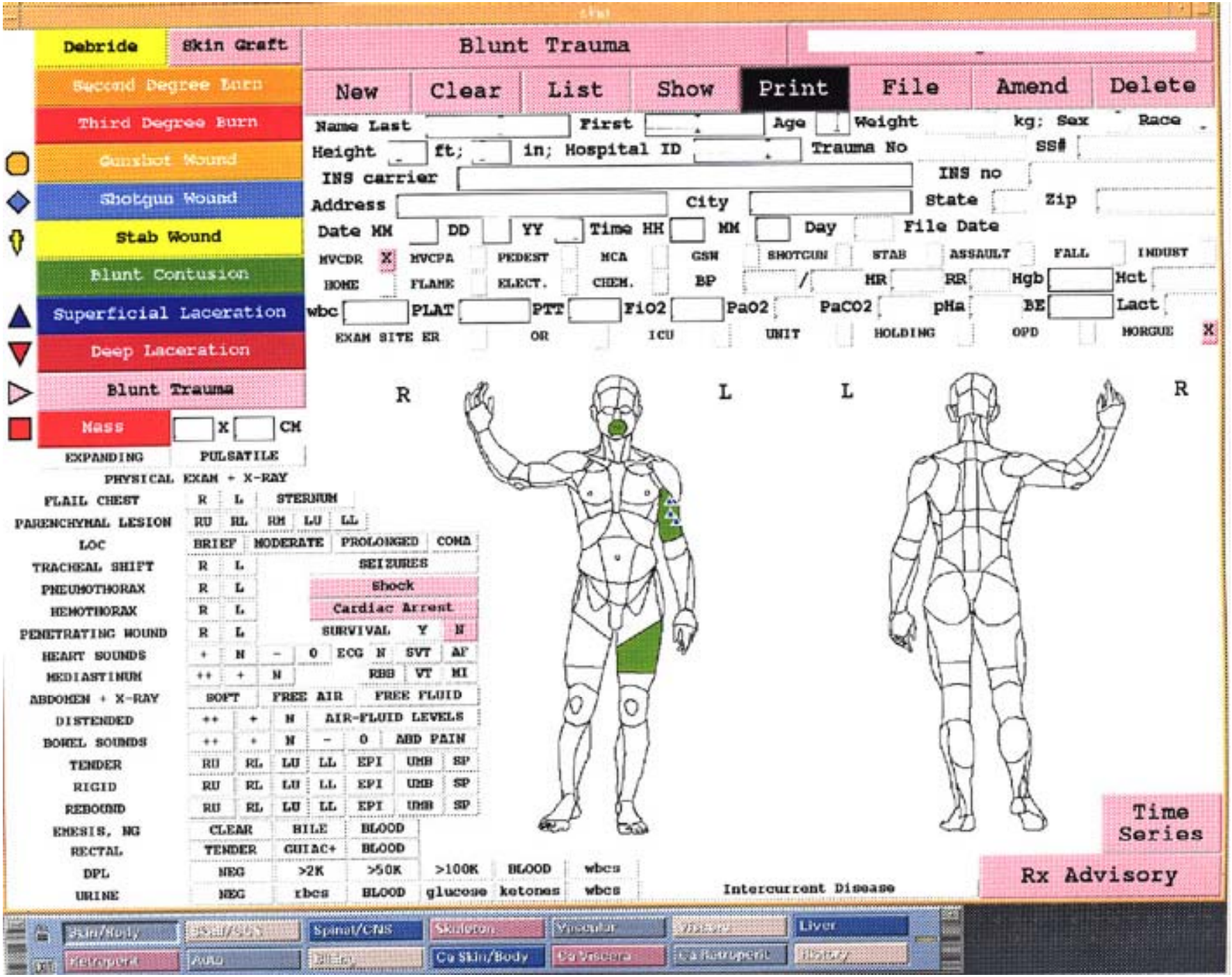
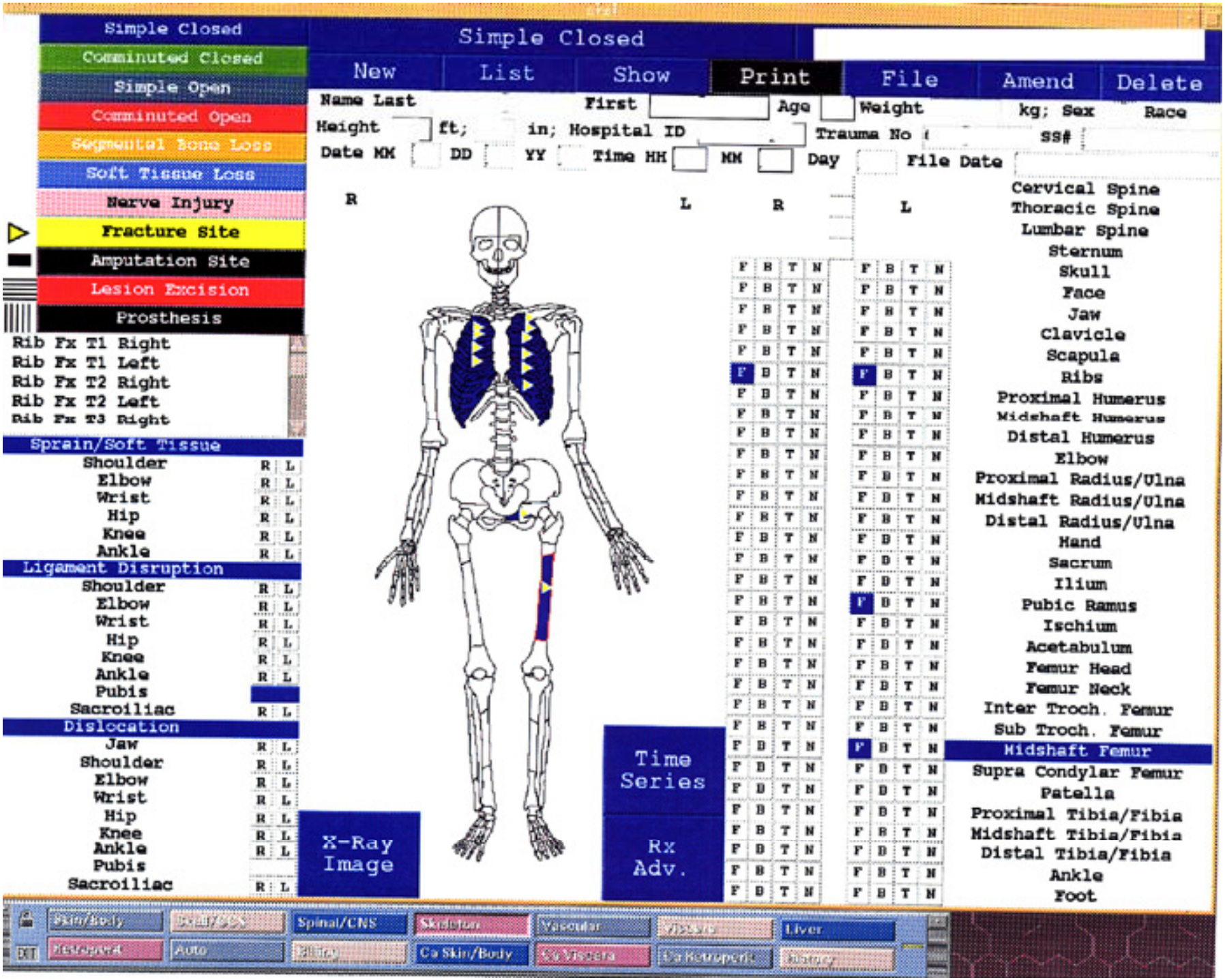
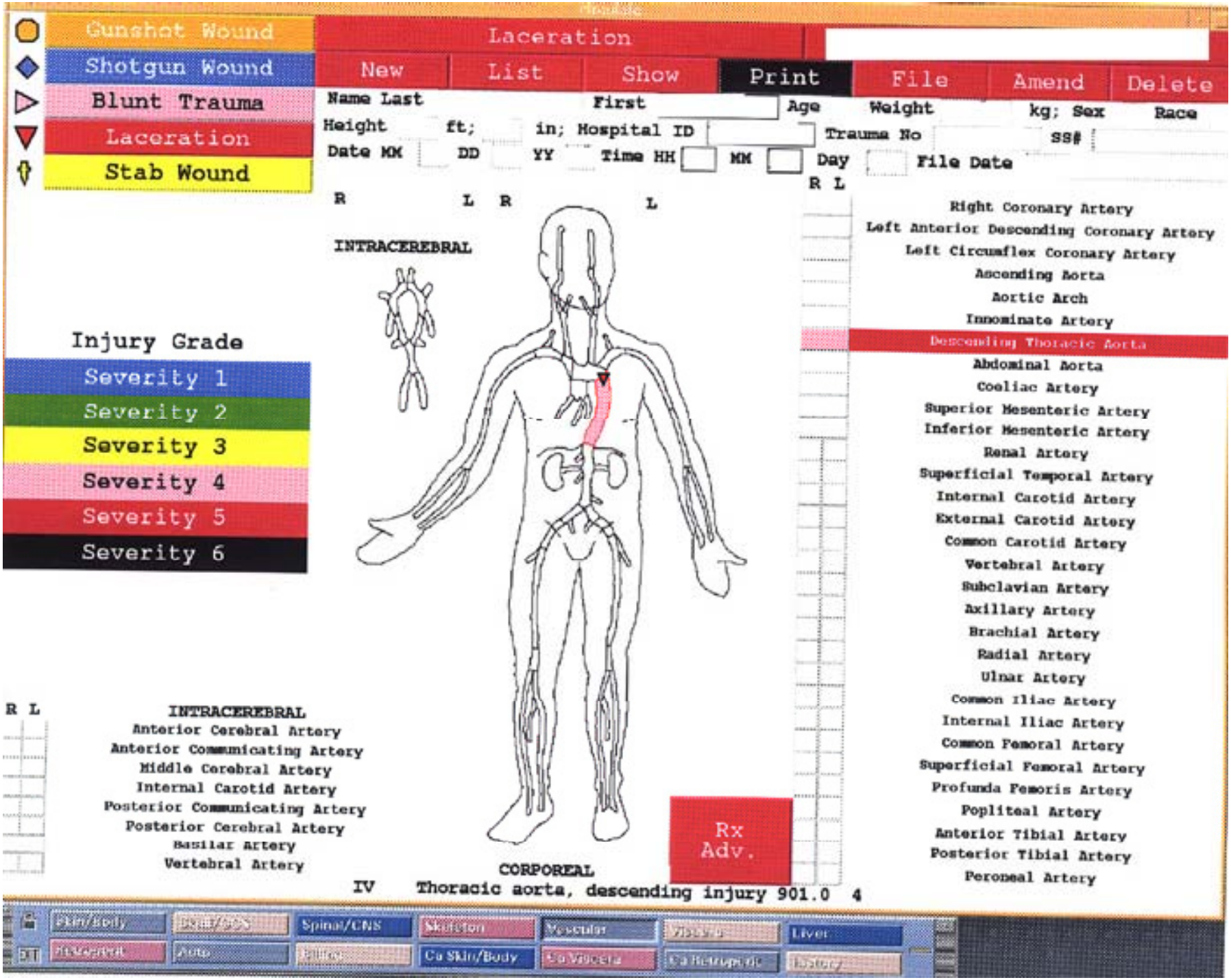
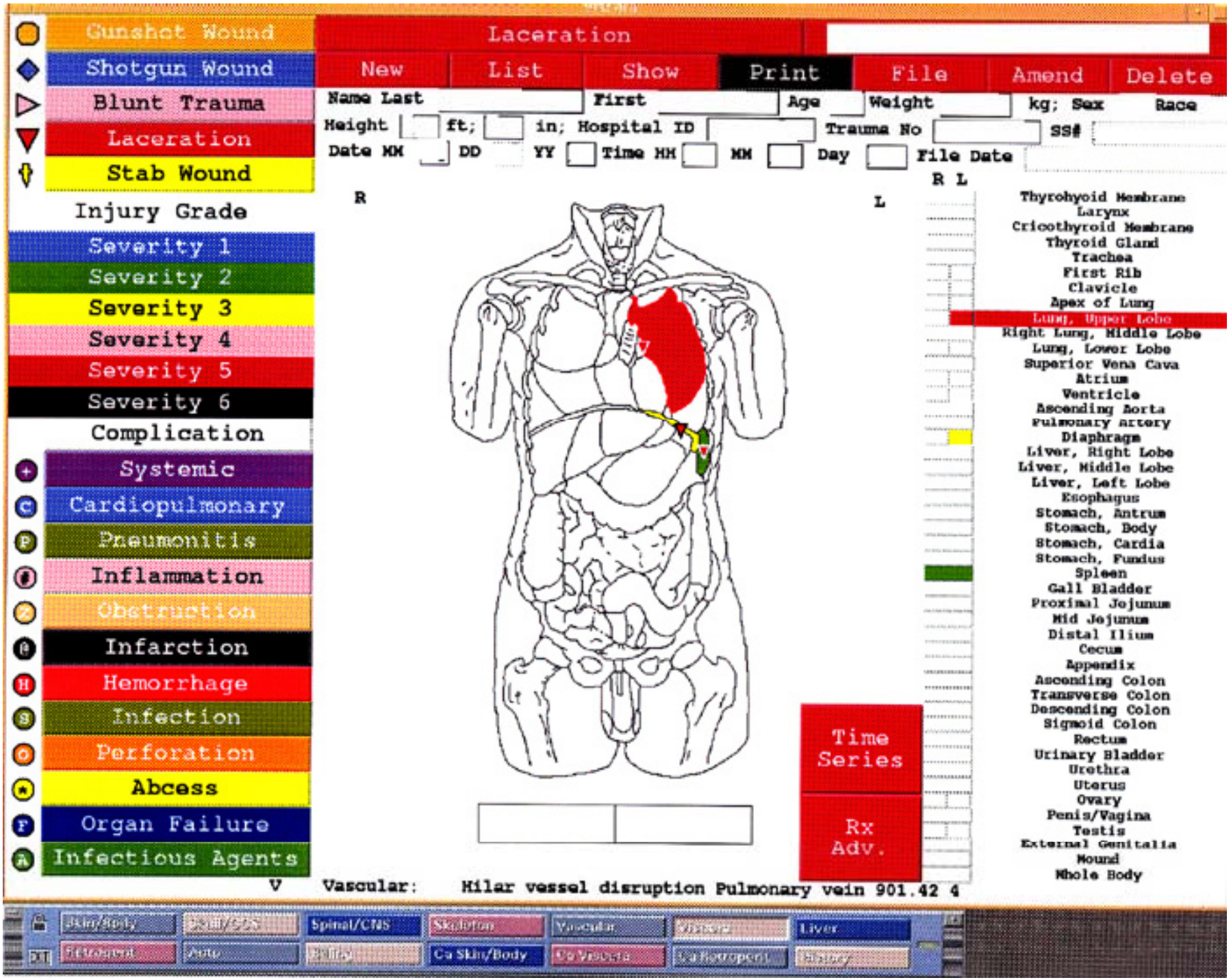
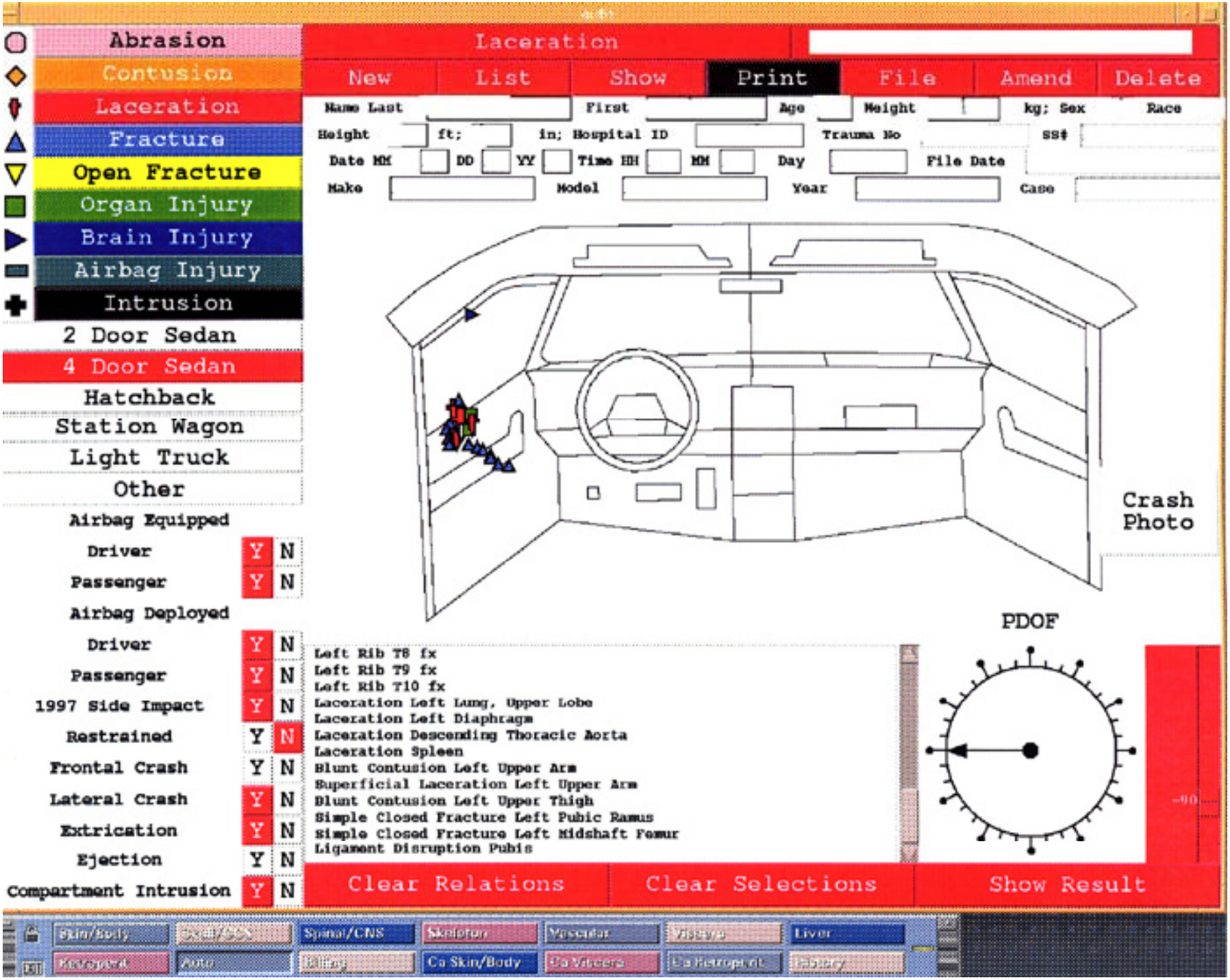

Debride
Skin Graft
Blunt Trauma
Second Degree Burn
Third Degree Burn
Gunshot Wound
Shotgun Wound
Stab Wound
Blunt Contusion
Superficial Laceration
Deep Laceration
Blunt Trauma
Mass
X
CM
EXPANDING
PULSATILE
New
Clear
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
INS carrier
INS no
Address
City
State
Zip
Date MM
DD
YY
Time HH
MM
Day
File Date
MVCDR
MVCPA
PEDEST
MCA
GSW
SHOTGUN
STAB
ASSAULT
FALL
INDUST
HOME
FLAME
ELECT.
CHEM.
BP
HR
RR
Hgb
Hct
wbc
PLAT
PTT
FiO2
PaO2
PaCO2
pHa
BE
Lact
EXAM SITE ER
OR
ICU
UNIT
HOLDING
OPD
MORGUE
R
L
L
R
PHYSICAL EXAM + X-RAY
FLAIL CHEST
STERNUM
PARENCHYMAL LESION
LOC
BRIEF
MODERATE
PROLONGED
COMA
TRACHEAL SHIFT
SEIZURES
PNEUMOTHORAX
Shock
HEMOTHORAX
Cardiac Arrest
PENETRATING WOUND
SURVIVAL
HEART SOUNDS
ECG
SVT
AF
MEDIASTINUM
RBB
VT
MI
ABDOMEN + X-RAY
SOFT
FREE AIR
FREE FLUID
DISTENDED
AIR-FLUID LEVELS
BOWEL SOUNDS
ABD PAIN
TENDER
RIGID
REBOUND
EMESIS, NG
CLEAR
BILE
BLOOD
RECTAL
TENDER
GUIAC+
BLOOD
DPL
NEG
>2K
>50K
>100K
BLOOD
wbcs
URINE
NEG
rbcs
BLOOD
glucose
ketones
wbcs
Intercurrent Disease
Time Series
Rx Advisory
Skin/Body
Spinal/CNS
Skeleton
Vascular
Liver
Retroperit
Co Skin/Body
Co Viscera
Co Retroperit


Simple Closed
Comminuted Closed
Simple Open
Comminuted Open
Segmental Bone Loss
Soft Tissue Loss
Nerve Injury
Fracture Site
Amputation Site
Lesion Excision
Prosthesis
Simple Closed
New
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
Date MM
DD
YY
Time HH
MM
Day
File Date
R
L
R
L
Rib Fx T1 Right
Rib Fx T1 Left
Rib Fx T2 Right
Rib Fx T2 Left
Rib Fx T3 Right
Sprain/Soft Tissue
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Ligament Disruption
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Pubis
Sacroiliac R L
Dislocation
Jaw R L
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Pubis
Sacroiliac R L
X-Ray Image
Time Series
Rx Adv.
Cervical Spine
Thoracic Spine
Lumbar Spine
Sternum
Skull
Face
Jaw
Clavicle
Scapula
Ribs
Proximal Humerus
Midshaft Humerus
Distal Humerus
Elbow
Proximal Radius/Ulna
Midshaft Radius/Ulna
Distal Radius/Ulna
Hand
Sacrum
Ilium
Pubic Ramus
Ischium
Acetabulum
Femur Head
Femur Neck
Inter Troch. Femur
Sub Troch. Femur
Midshaft Femur
Supra Condylar Femur
Patella
Proximal Tibia/Fibia
Midshaft Tibia/Fibia
Distal Tibia/Fibia
Ankle
Foot
Skin/Body
Spinal/CNS
Skeleton
Vascular
Liver
Auto
Ca Skin/Body


Gunshot Wound
Shotgun Wound
Blunt Trauma
Laceration
Stab Wound
Laceration
New
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
Date MM
DD
YY
Time HH
MM
Day
File Date
R L
R L R L
INTRACEREBRAL
Injury Grade
Severity 1
Severity 2
Severity 3
Severity 4
Severity 5
Severity 6
Right Coronary Artery
Left Anterior Descending Coronary Artery
Left Circumflex Coronary Artery
Ascending Aorta
Aortic Arch
Innominate Artery
Descending Thoracic Aorta
Abdominal Aorta
Coeliac Artery
Superior Mesenteric Artery
Inferior Mesenteric Artery
Renal Artery
Superficial Temporal Artery
Internal Carotid Artery
External Carotid Artery
Common Carotid Artery
Vertebral Artery
Subclavian Artery
Axillary Artery
Brachial Artery
Radial Artery
Ulnar Artery
Common Iliac Artery
Internal Iliac Artery
Common Femoral Artery
Superficial Femoral Artery
Profunda Femoris Artery
Popliteal Artery
Anterior Tibial Artery
Posterior Tibial Artery
Peroneal Artery
R L
INTRACEREBRAL
Anterior Cerebral Artery
Anterior Communicating Artery
Middle Cerebral Artery
Internal Carotid Artery
Posterior Communicating Artery
Posterior Cerebral Artery
Basilar Artery
Vertebral Artery
Rx
Adv.
CORPOREAL
IV
Thoracic aorta, descending injury 901.0
4
Skin/Body
Spinal/CNS
Skeleton
Vascular
Liver
Ca Skin/Body


Gunshot Wound
Shotgun Wound
Blunt Trauma
Laceration
Stab Wound
Injury Grade
Severity 1
Severity 2
Severity 3
Severity 4
Severity 5
Severity 6
Complication
Systemic
Cardiopulmonary
Pneumonitis
Inflammation
Obstruction
Infarction
Hemorrhage
Infection
Perforation
Abcess
Organ Failure
Infectious Agents
Laceration
New
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
Date MM
DD
YY
Time HH
MM
Day
File Date
R
L
R L
Thyrohyoid Membrane
Larynx
Cricothyroid Membrane
Thyroid Gland
Trachea
First Rib
Clavicle
Apex of Lung
Lung, Upper Lobe
Right Lung, Middle Lobe
Lung, Lower Lobe
Superior Vena Cava
Atrium
Ventricle
Ascending Aorta
Pulmonary Artery
Diaphragm
Liver, Right Lobe
Liver, Middle Lobe
Liver, Left Lobe
Esophagus
Stomach, Antrum
Stomach, Body
Stomach, Cardia
Stomach, Fundus
Spleen
Gall Bladder
Proximal Jejunum
Mid Jejunum
Distal Ilium
Cecum
Appendix
Ascending Colon
Transverse Colon
Descending Colon
Sigmoid Colon
Rectum
Urinary Bladder
Urethra
Uterus
Ovary
Penis/Vagina
Testis
External Genitalia
Mound
Whole Body
Time Series
Rx Adv.
V
Vascular: Hilar vessel disruption Pulmonary vein 901.42 4
Spinal/CNS
Skeleton
Liver
Auto
Ca Skin/Body


Abrasion
Contusion
Laceration
Fracture
Open Fracture
Organ Injury
Brain Injury
Airbag Injury
Intrusion
2 Door Sedan
4 Door Sedan
Hatchback
Station Wagon
Light Truck
Other
Airbag Equipped
Driver Y N
Passenger Y N
Airbag Deployed
Driver Y N
Passenger Y N
1997 Side Impact Y N
Restrained Y N
Frontal Crash Y N
Lateral Crash Y N
Extrication Y N
Ejection Y N
Compartment Intrusion Y N
Laceration
New List Show Print File Amend Delete
Name Last First Age Weight kg; Sex Race
Height ft; in; Hospital ID Trauma No SS#
Date MM DD YY Time HH MM Day File Date
Make Model Year Case
Crash Photo
PDOF
Left Rib T8 fx
Left Rib T9 fx
Left Rib T10 fx
Laceration Left Lung, Upper Lobe
Laceration Left Diaphragm
Laceration Descending Thoracic Aorta
Laceration Spleen
Blunt Contusion Left Upper Arm
Superficial Laceration Left Upper Arm
Blunt Contusion Left Upper Thigh
Simple Closed Fracture Left Pubic Ramus
Simple Closed Fracture Left Midshaft Femur
Ligament Disruption Pubis
Clear Relations
Clear Selections
Show Result
Skin/Body
Skull/CCS
Spinal/CNS
Skeleton
Vascular
Viscera
Liver
Retroperit
Auto
Biliary
Ca Skin/Body
Ca Viscera
Ca Retroperit
Urinary

Lateral motor vehicle crash vs SUV – Case Occupant (V1) Injury List

INJURY	SOURCE
Transection of aorta, 99%	Door
Bilateral subarachnoid hemorrhage	Unknown
Right mandible fracture	Unknown
Bilateral rib fractures with hemothorax	Unknown
Left parietal pleural rupture	Door
Left pulmonary vein rupture	Door
Laceration of left hemidiaphragm	Door
Spleen laceration, Grade II	Door
Symphysis pubis and superior ramus fx	Armrest
Left femur midshaft fracture	Door
Left upper extremity laceration (minor)	Door
Left thigh contusion	Door

Case Presentation:

Sedan vs Van

SURVIVOR

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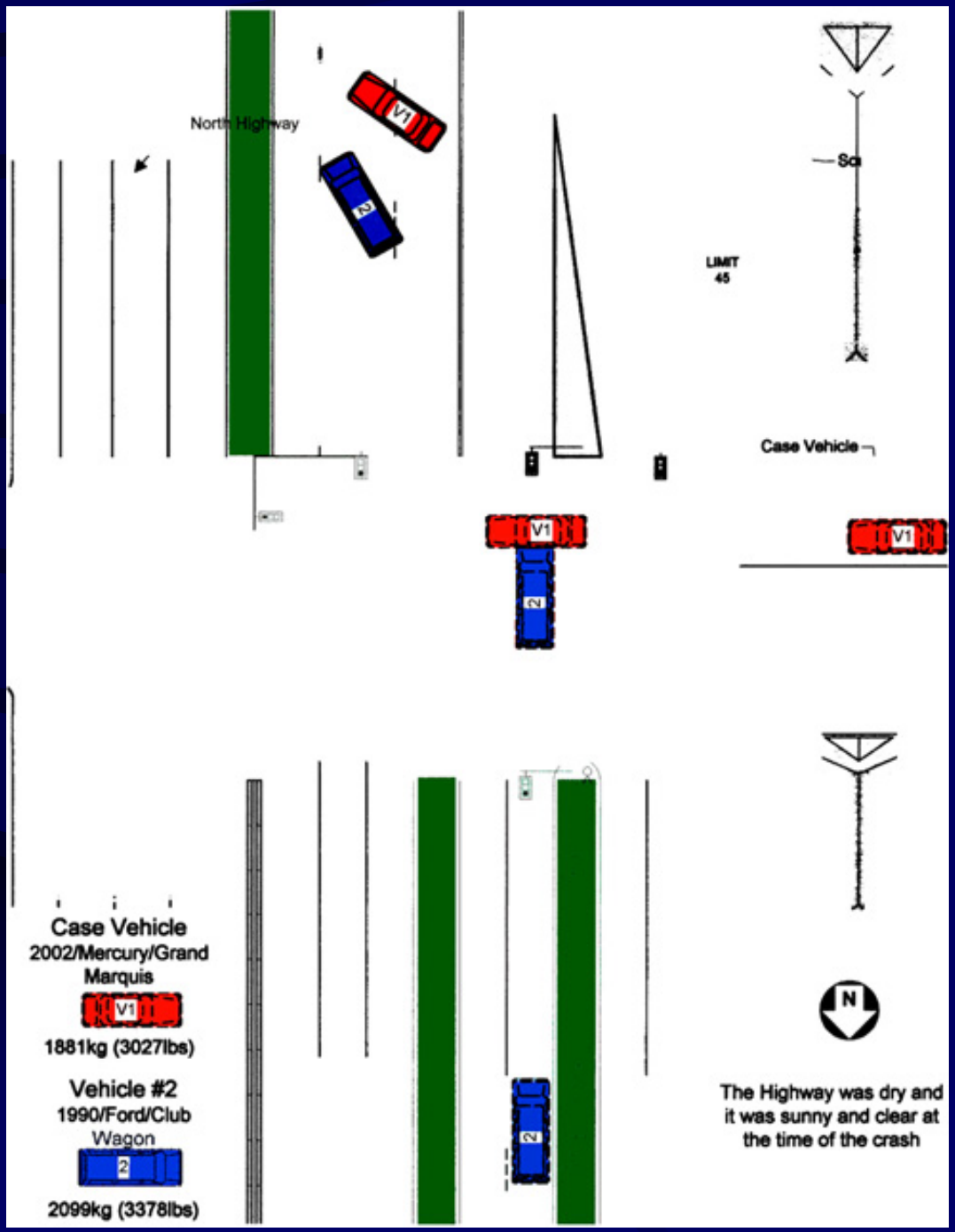
Near Side Lateral motor vehicle crash

- V1 = 2002 Mercury Grand Marquis (1881 kg)
- V2 = 1990 Ford Club Wagon (2099 kg)
- Delta V1 = 27 kph (17 mph)
- Energy = 73260 joules
- PDOF = 290
- CDC = 10LYEW4
- Max crush = 35 cm

Case Occupant (V1)

- 46 year old male restrained driver
- Weight = 86 kg (190 lbs)
- Height = 180 cm (5’ 11”)
- Airbag deployed



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Frontal Damage to Case Vehicle

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Left Side View of Case Vehicle

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Interior Views of Frontal Dash

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Contact Marks

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Door Panel

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Deformed Driver's Seat

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Seat Belt Pretensioners

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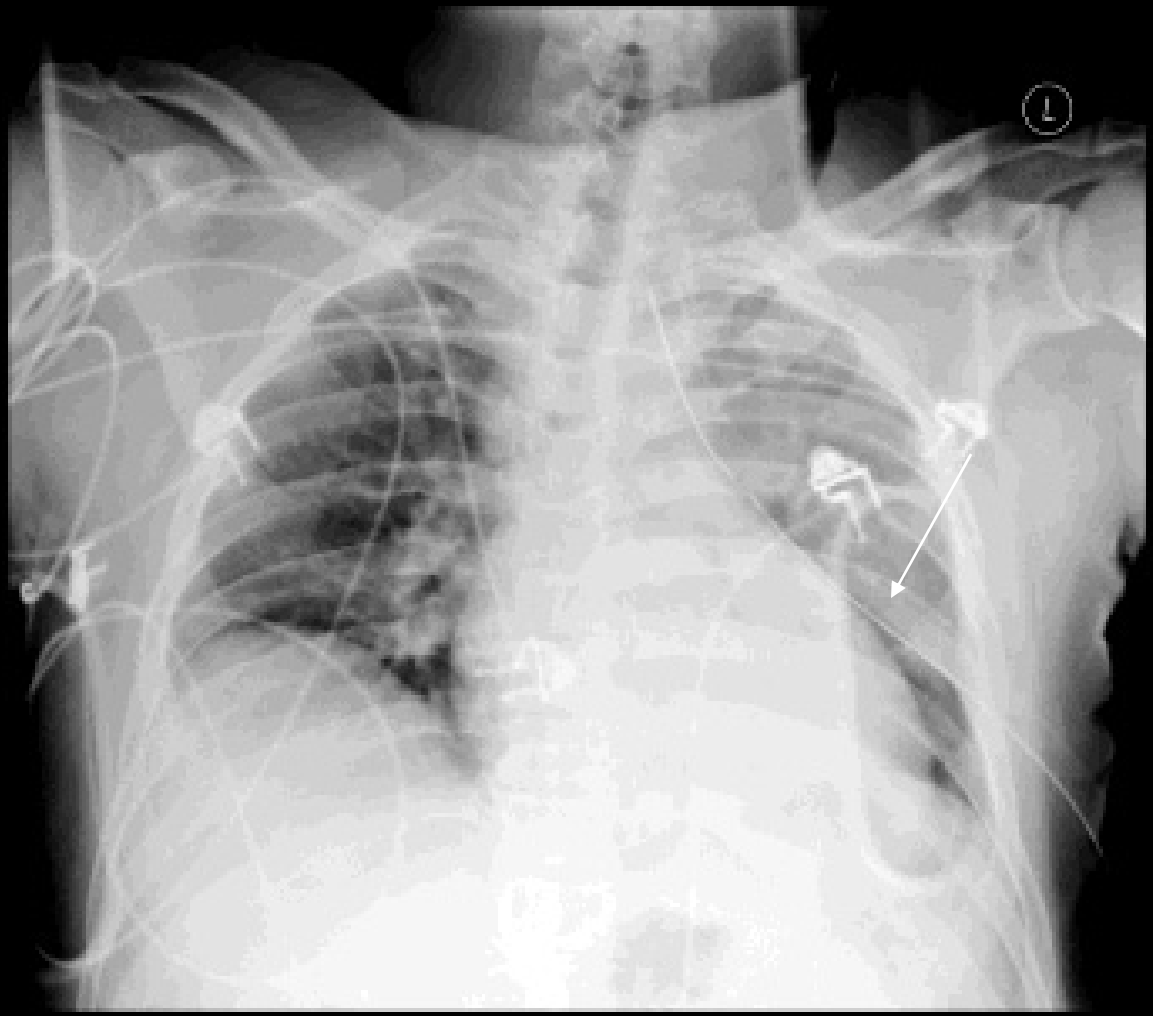
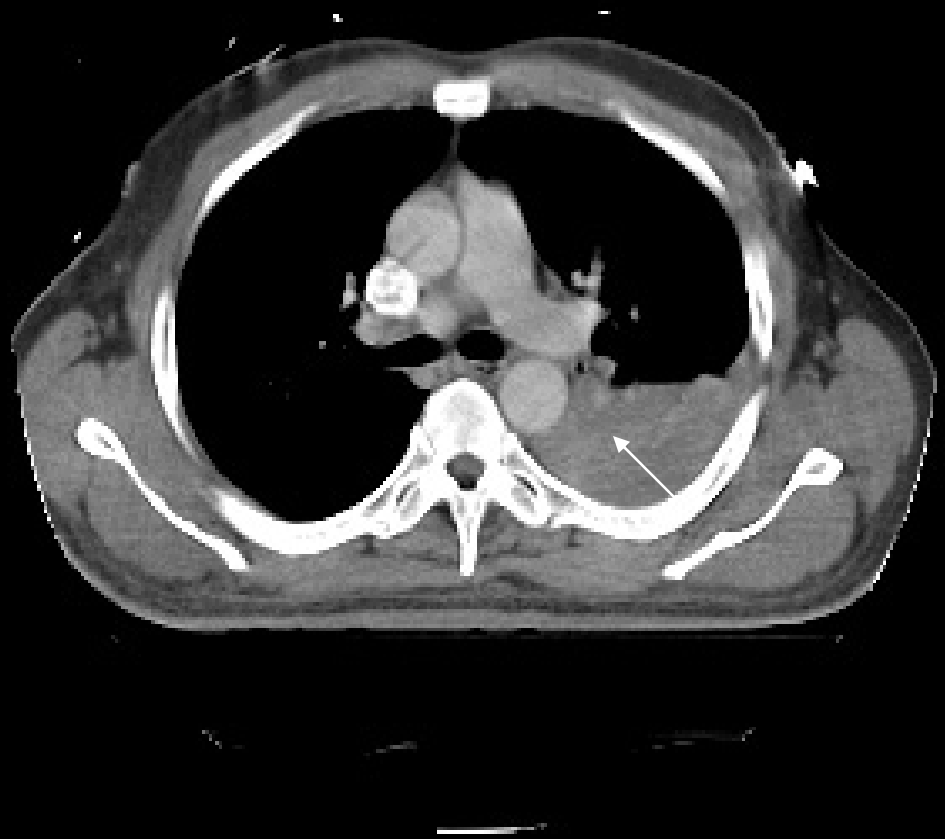
CXR LEFT HEMOTHORAX

R



L

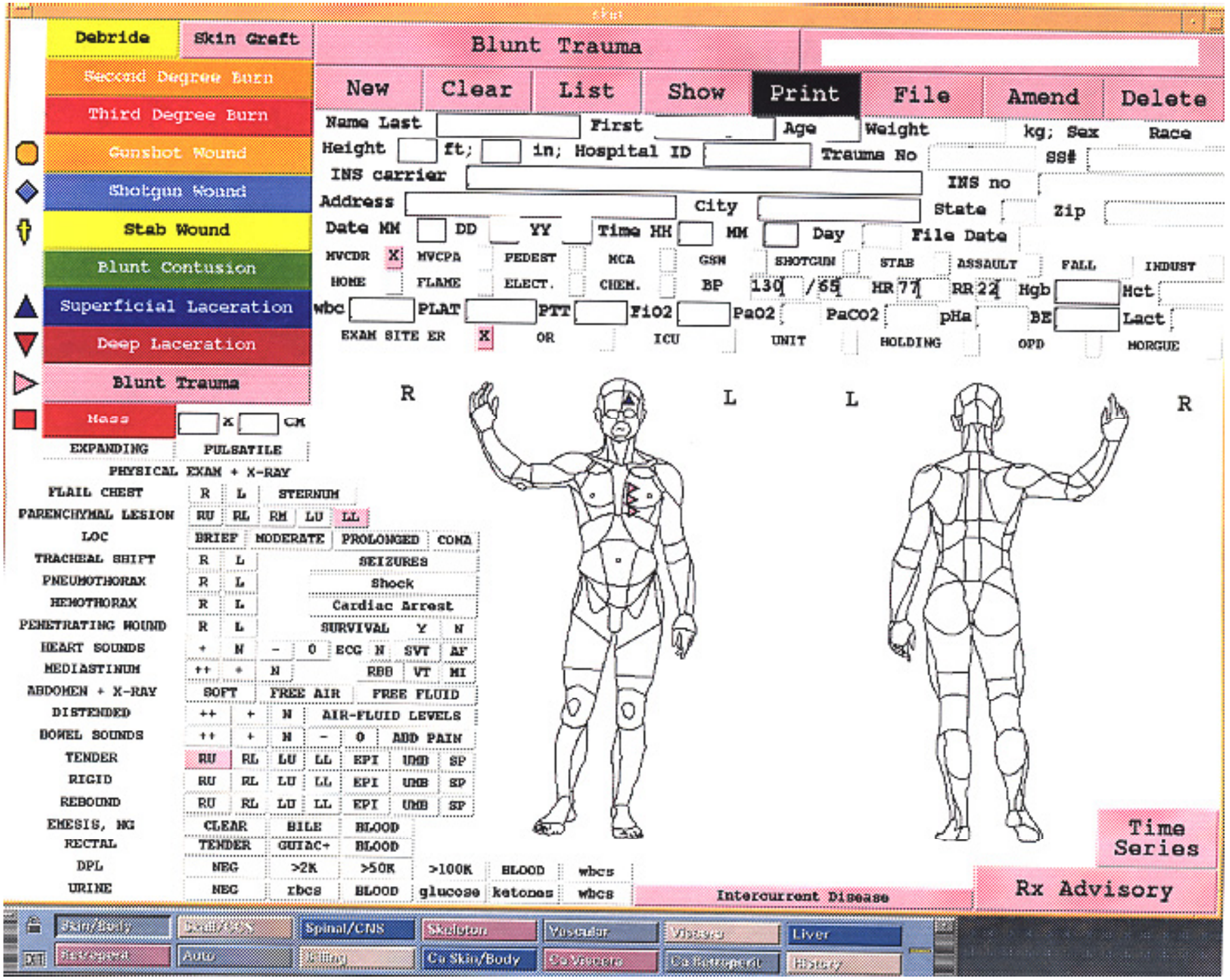
LUNG COLLAPSE

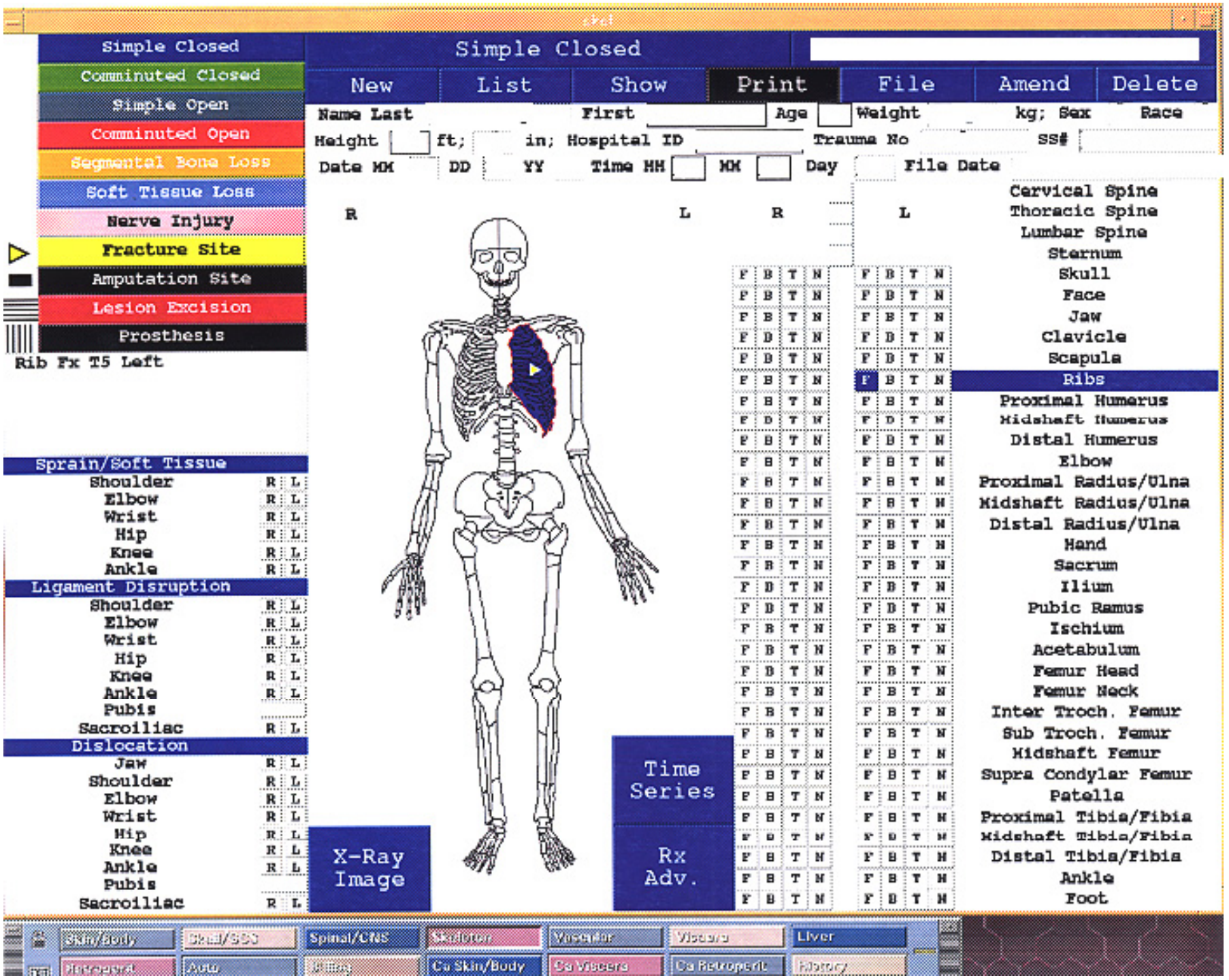


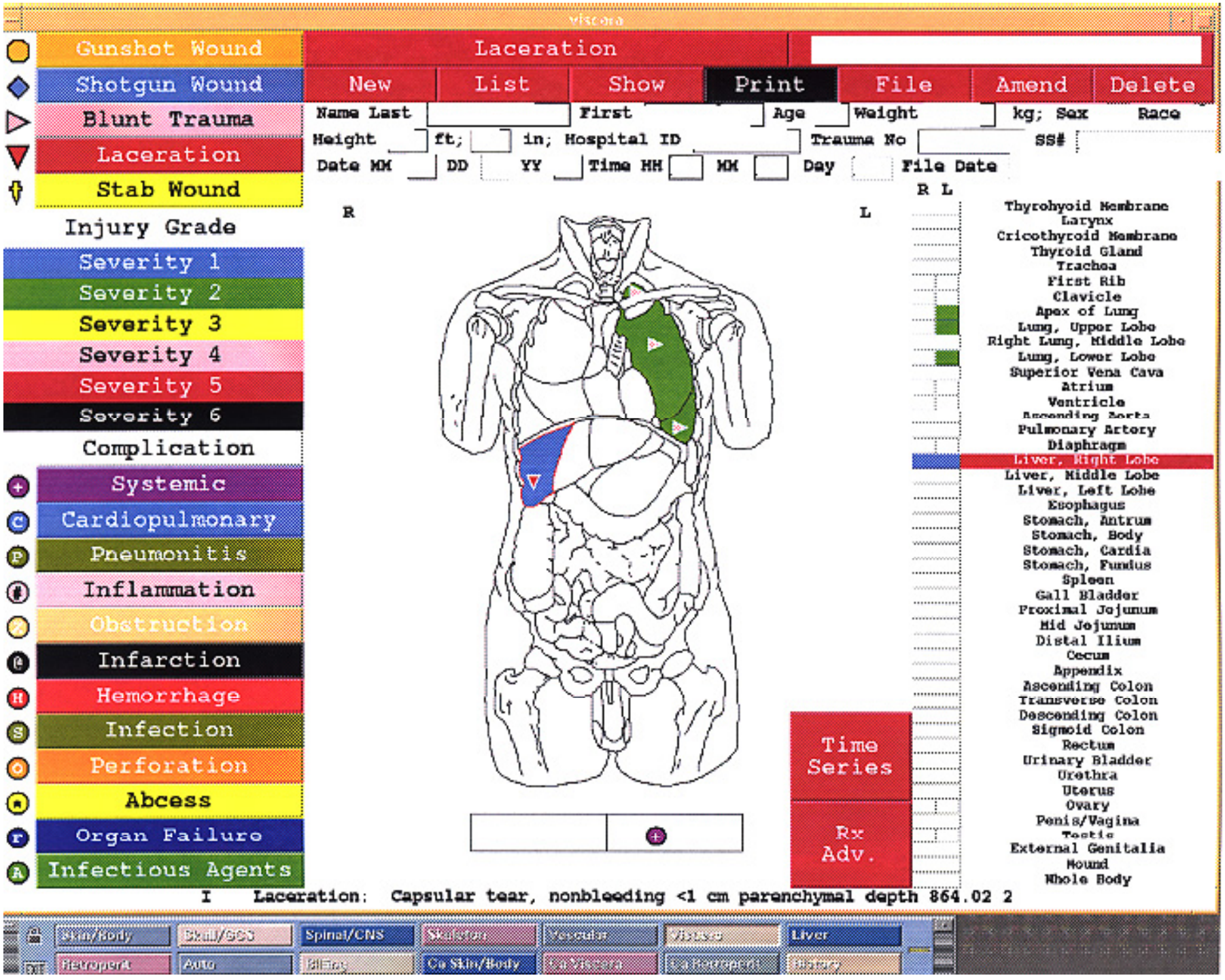
LIVER LAC.

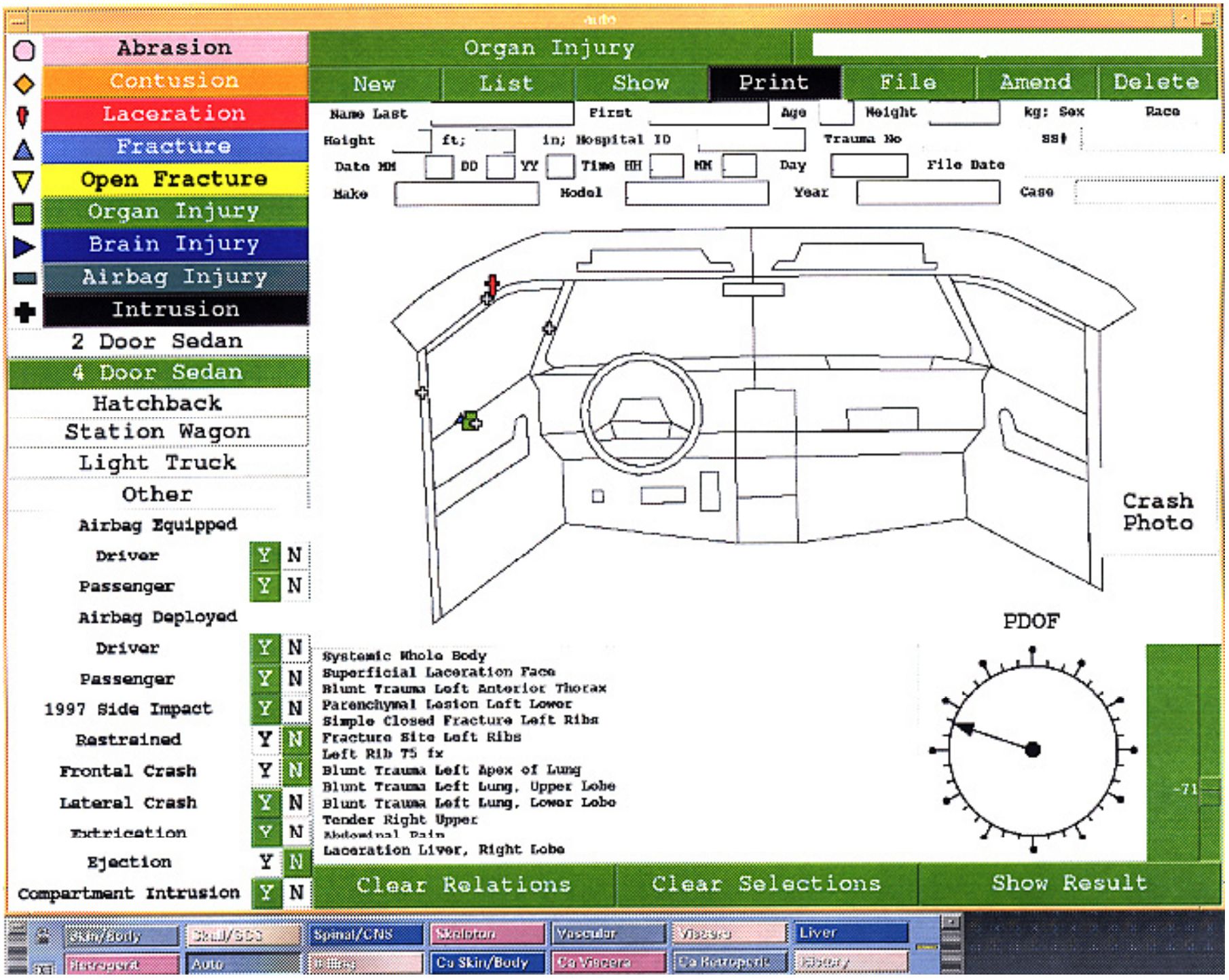
Near Side Lateral motor vehicle crash Sedan vs Van – Case Occupant (V1) Injury List

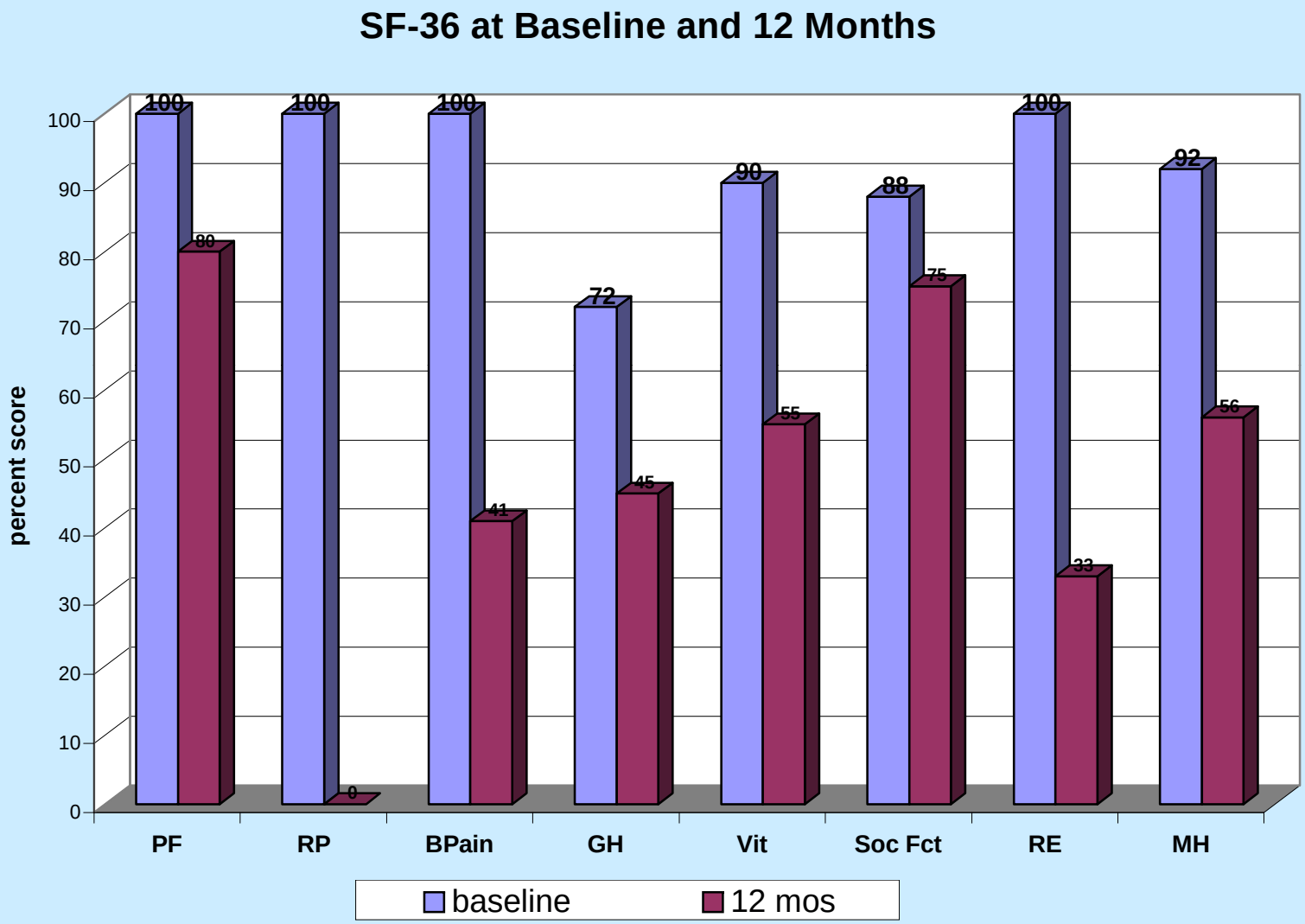
INJURY	SOURCE
Large left hemothorax with 5th rib fracture	Left door panel
Liver laceration, Grade I (right lobe)	Seat belt (?)
Left pneumomediastinum, small	Left door panel
Loss of consciousness <1 hour	Door frame
Small punctate lacerations on left forehead	Door frame


Debride
Skin Graft
Second Degree Burn
Third Degree Burn
Gunshot Wound
Shotgun Wound
Stab Wound
Blunt Contusion
Superficial Laceration
Deep Laceration
Blunt Trauma
Mass
EXPANDING
PULSATILE
Blunt Trauma
New
Clear
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
INS carrier
INS no
Address
City
State
Zip
Date MM
DD
YY
Time HH
MM
Day
File Date
MVCDR
MVCPA
PEDEST
MCA
GSW
SHOTGUN
STAB
ASSAULT
FALL
INDUST
HOME
FLAME
ELECT.
CHEM.
BP 130 /65
HR 77
RR 22
Hgb
Hct
wbc
PLAT
PTT
FiO2
PaO2
PaCO2
pHa
BE
Lact
EXAM SITE ER
OR
ICU
UNIT
HOLDING
OPD
MORGUE
R
L
L
R
PHYSICAL EXAM + X-RAY
FLAIL CHEST
PARENCHYMAL LESION
LOC
TRACHEAL SHIFT
PNEUMOTHORAX
HEMOTHORAX
PENETRATING WOUND
HEART SOUNDS
MEDIASTINUM
ABDOMEN + X-RAY
DISTENDED
BOWEL SOUNDS
TENDER
RIGID
REBOUND
EMESIS, NG
RECTAL
DPL
URINE
STERNUM
BRIEF
MODERATE
PROLONGED
COMA
SEIZURES
Shock
Cardiac Arrest
SURVIVAL
ECG
SOFT
FREE AIR
FREE FLUID
AIR-FLUID LEVELS
ABD PAIN
CLEAR
BILE
BLOOD
TENDER
GUIAC+
NEG
>2K
>50K
>100K
rbcs
glucose
ketones
wbcs
Time Series
Intercurrent Disease
Rx Advisory
Skin/Body
Spinal/CNS
Skeleton
Vascular
Liver
Auto
Billing
Co Skin/Body
Co Vascular
History


Simple Closed
Comminuted Closed
Simple Open
Comminuted Open
Segmental Bone Loss
Soft Tissue Loss
Nerve Injury
Fracture Site
Amputation Site
Lesion Excision
Prosthesis
Rib Fx T5 Left
Simple Closed
New
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in;
Hospital ID
Trauma No
SS#
Date MM
DD
YY
Time HH
MM
Day
File Date
R
L
R
L
Cervical Spine
Thoracic Spine
Lumbar Spine
Sternum
Skull
Face
Jaw
Clavicle
Scapula
Ribs
Proximal Humerus
Midshaft Humerus
Distal Humerus
Elbow
Proximal Radius/Ulna
Midshaft Radius/Ulna
Distal Radius/Ulna
Hand
Sacrum
Ilium
Pubic Ramus
Ischium
Acetabulum
Femur Head
Femur Neck
Inter Troch. Femur
Sub Troch. Femur
Midshaft Femur
Supra Condylar Femur
Patella
Proximal Tibia/Fibia
Midshaft Tibia/Fibia
Distal Tibia/Fibia
Ankle
Foot
Sprain/Soft Tissue
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Ligament Disruption
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Pubis
Sacroiliac R L
Dislocation
Jaw R L
Shoulder R L
Elbow R L
Wrist R L
Hip R L
Knee R L
Ankle R L
Pubis
Sacroiliac R L
X-Ray Image
Time Series
Rx Adv.
Skin/Body
Skull/SCS
Spinal/CNS
Skeleton
Viscera
Viscera
Liver
Ca Skin/Body
Ca Viscera
Ca Retroperit


viscera
Gunshot Wound
Shotgun Wound
Blunt Trauma
Laceration
Stab Wound
Injury Grade
Severity 1
Severity 2
Severity 3
Severity 4
Severity 5
Severity 6
Complication
Systemic
Cardiopulmonary
Pneumonitis
Inflammation
Obstruction
Infarction
Hemorrhage
Infection
Perforation
Abcess
Organ Failure
Infectious Agents
Laceration
New
List
Show
Print
File
Amend
Delete
Name Last
First
Age
Weight
kg; Sex
Race
Height
ft;
in; Hospital ID
Trauma No
SS#
Date MM
DD
YY
Time HH
MM
Day
File Date
R
L
R L
Thyrohyoid Membrane
Larynx
Cricothyroid Membrane
Thyroid Gland
Trachea
First Rib
Clavicle
Apex of Lung
Lung, Upper Lobe
Right Lung, Middle Lobe
Lung, Lower Lobe
Superior Vena Cava
Atrium
Ventricle
Pulmonary Artery
Diaphragm
Liver, Right Lobe
Liver, Middle Lobe
Liver, Left Lobe
Esophagus
Stomach, Antrum
Stomach, Body
Stomach, Cardia
Stomach, Fundus
Spleen
Gall Bladder
Proximal Jejunum
Mid Jejunum
Distal Ilium
Cecum
Appendix
Ascending Colon
Transverse Colon
Descending Colon
Sigmoid Colon
Rectum
Urinary Bladder
Urethra
Uterus
Ovary
Penis/Vagina
External Genitalia
Wound
Whole Body
Time Series
Rx Adv.
I Laceration: Capsular tear, nonbleeding <1 cm parenchymal depth 864.02 2
Skin/Body
Skull/SCS
Spinal/CNS
Liver
Retroperit
Auto
Co Skin/Body


Abrasion
Contusion
Laceration
Fracture
Open Fracture
Organ Injury
Brain Injury
Airbag Injury
Intrusion
2 Door Sedan
4 Door Sedan
Hatchback
Station Wagon
Light Truck
Other
Airbag Equipped
Driver Y N
Passenger Y N
Airbag Deployed
Driver Y N
Passenger Y N
1997 Side Impact Y N
Restrained Y N
Frontal Crash Y N
Lateral Crash Y N
Extrication Y N
Ejection Y N
Compartment Intrusion Y N
Organ Injury
New List Show Print File Amend Delete
Name Last First Age Height kg: Sex Race
Height ft; in; Hospital ID Trauma No SS#
Date MM DD YY Time HH MM Day File Date
Make Model Year Case
Crash Photo
PDOF
Systemic Whole Body
Superficial Laceration Face
Blunt Trauma Left Anterior Thorax
Parenchymal Lesion Left Lower
Simple Closed Fracture Left Ribs
Fracture Site Left Ribs
Left Rib T5 fx
Blunt Trauma Left Apex of Lung
Blunt Trauma Left Lung, Upper Lobe
Blunt Trauma Left Lung, Lower Lobe
Tender Right Upper
Abdominal Pain
Laceration Liver, Right Lobe
-71
Clear Relations
Clear Selections
Show Result
Skin/Body
Spinal/CNS
Skeleton
Vascular
Liver
Auto
Co Skin/Body
Co Viscera


SF-36 at Baseline and 12 Months
percent score
100
90
80
70
60
50
40
30
20
10
0
100
80
100
0
100
41
72
45
90
55
88
75
100
33
92
56
PF
RP
BPain
GH
Vit
Soc Fct
RE
MH
baseline
12 mos

Case Presentation:

Sedan vs SUV

SURVIVOR

Far Side Lateral motor vehicle crash

- V1 = 1994 Cadillac Seville (1709 kg)
- V2 = 2000 Ford Expedition (2317 kg)
- Delta V1 = 36 kph (22.5 mph)
- Energy = 125220 joules
- PDOF = 114
- CDC = 04RYAW4
- Max crush = 52 cm at C4

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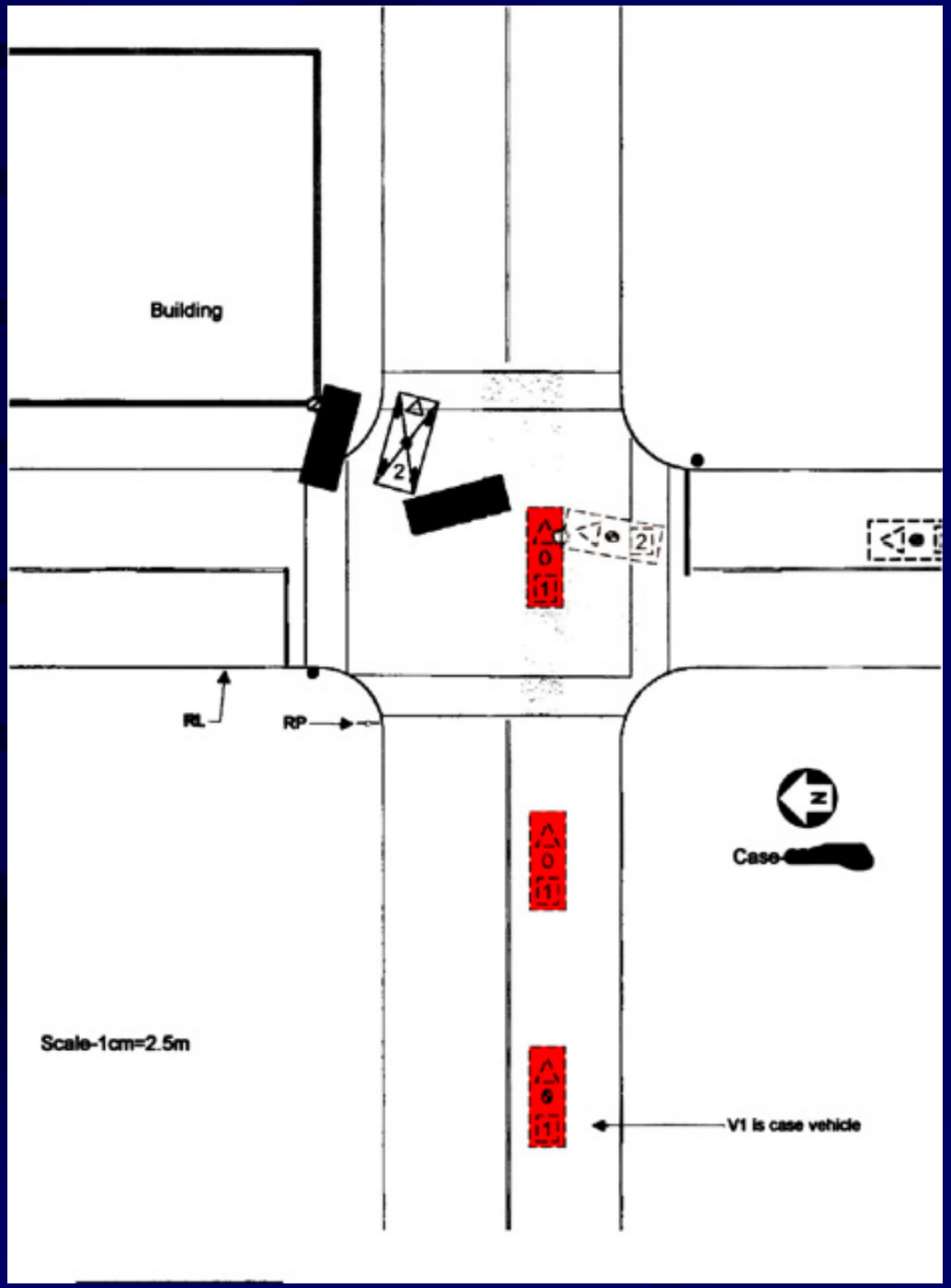
Case Occupant (V1)

- 55 year old male restrained driver
- Weight = 95 kg (210 lbs)
- Height = 165 cm (5’ 5”)
- Airbag deployed



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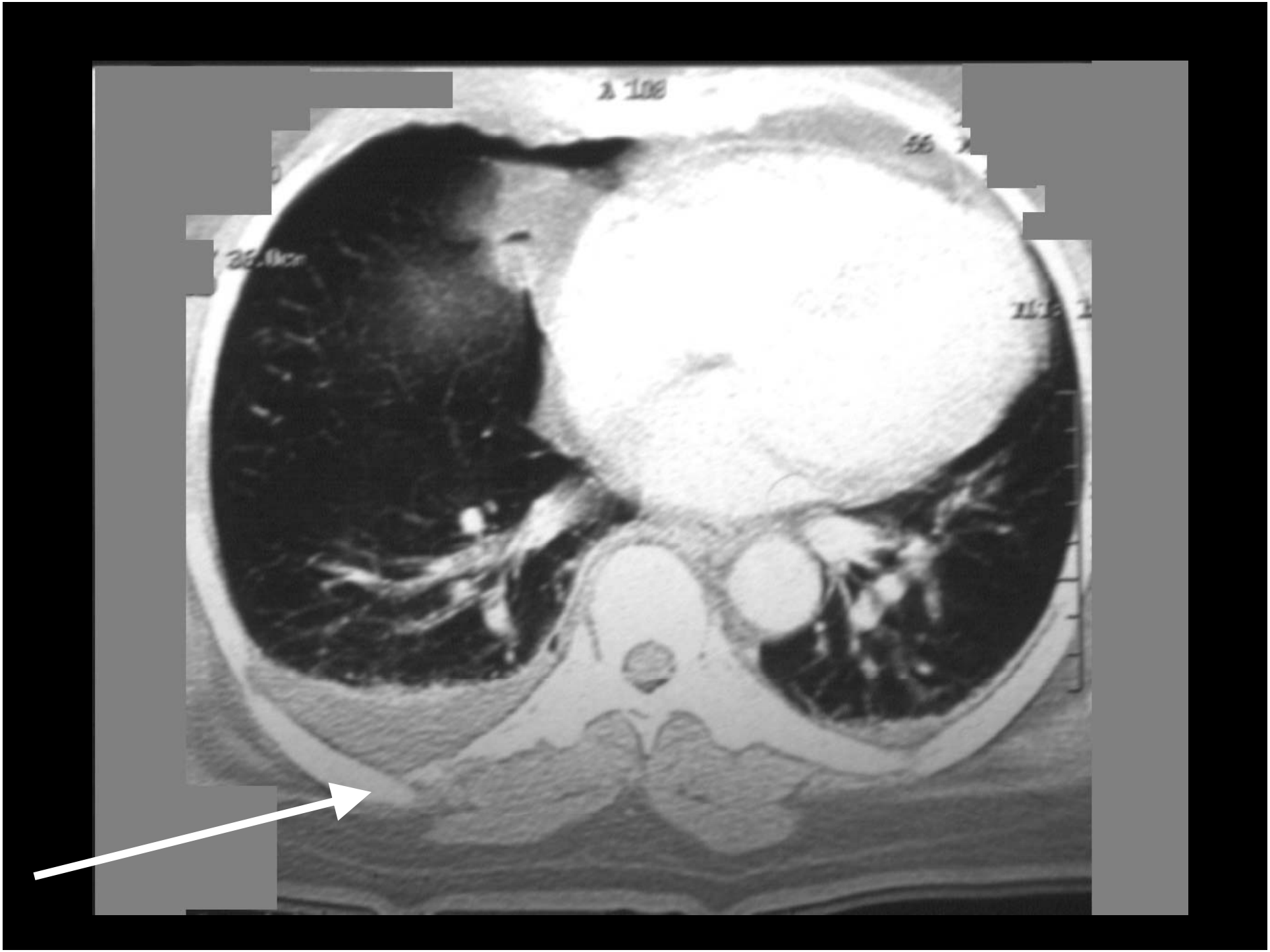
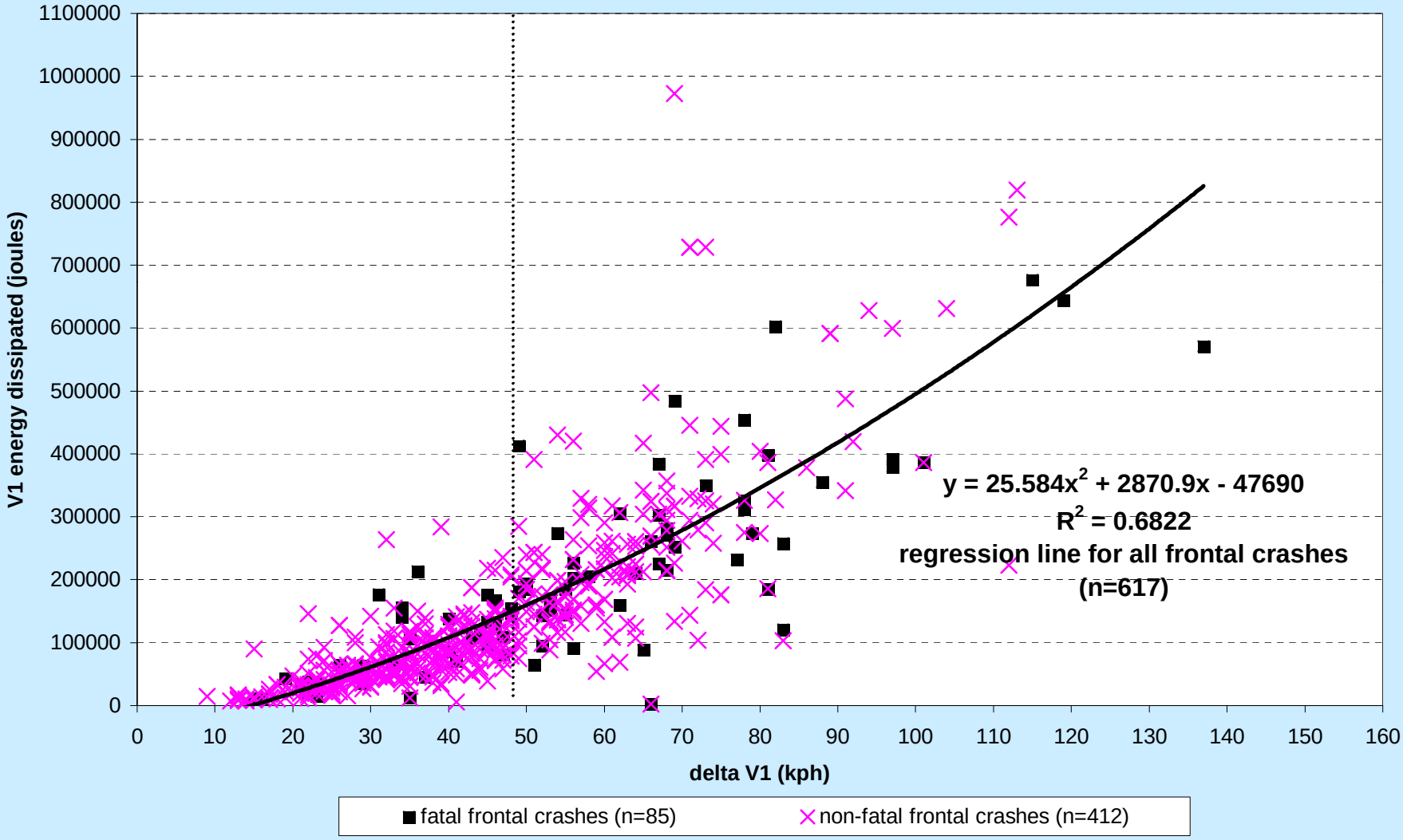


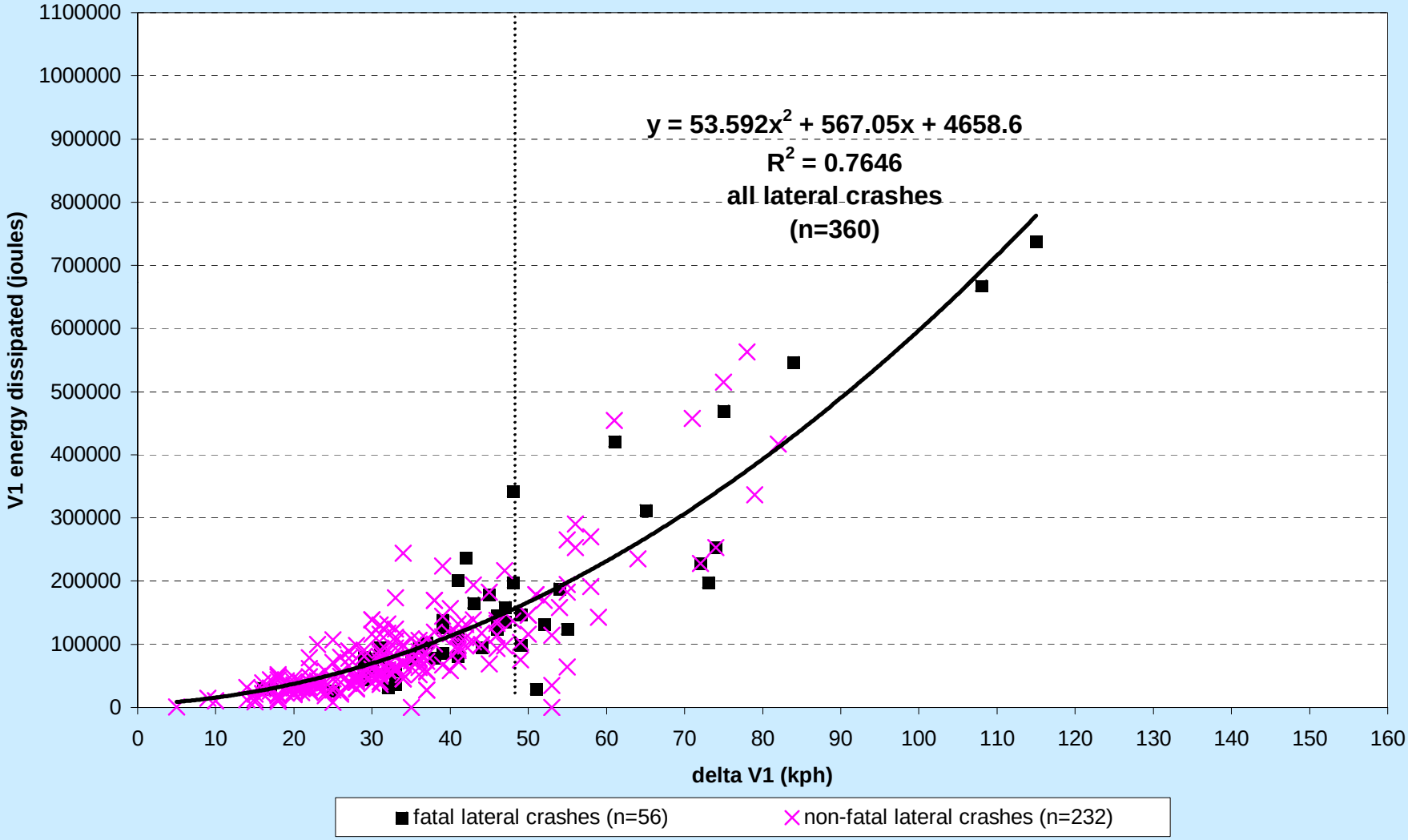
Far Side Lateral motor vehicle crash Sedan vs SUV – Case Occupant (V1) Injury List

INJURY	SOURCE
Right multiple posterior rib fractures	Seat arm rest
Right pulmonary contusion	Seat arm rest
Right subcutaneous emphysema	Seat arm rest
Right kidney laceration	Seat arm rest
Liver laceration, Grade I	Seat arm rest
Right tempero-parietal abrasion	Door panel

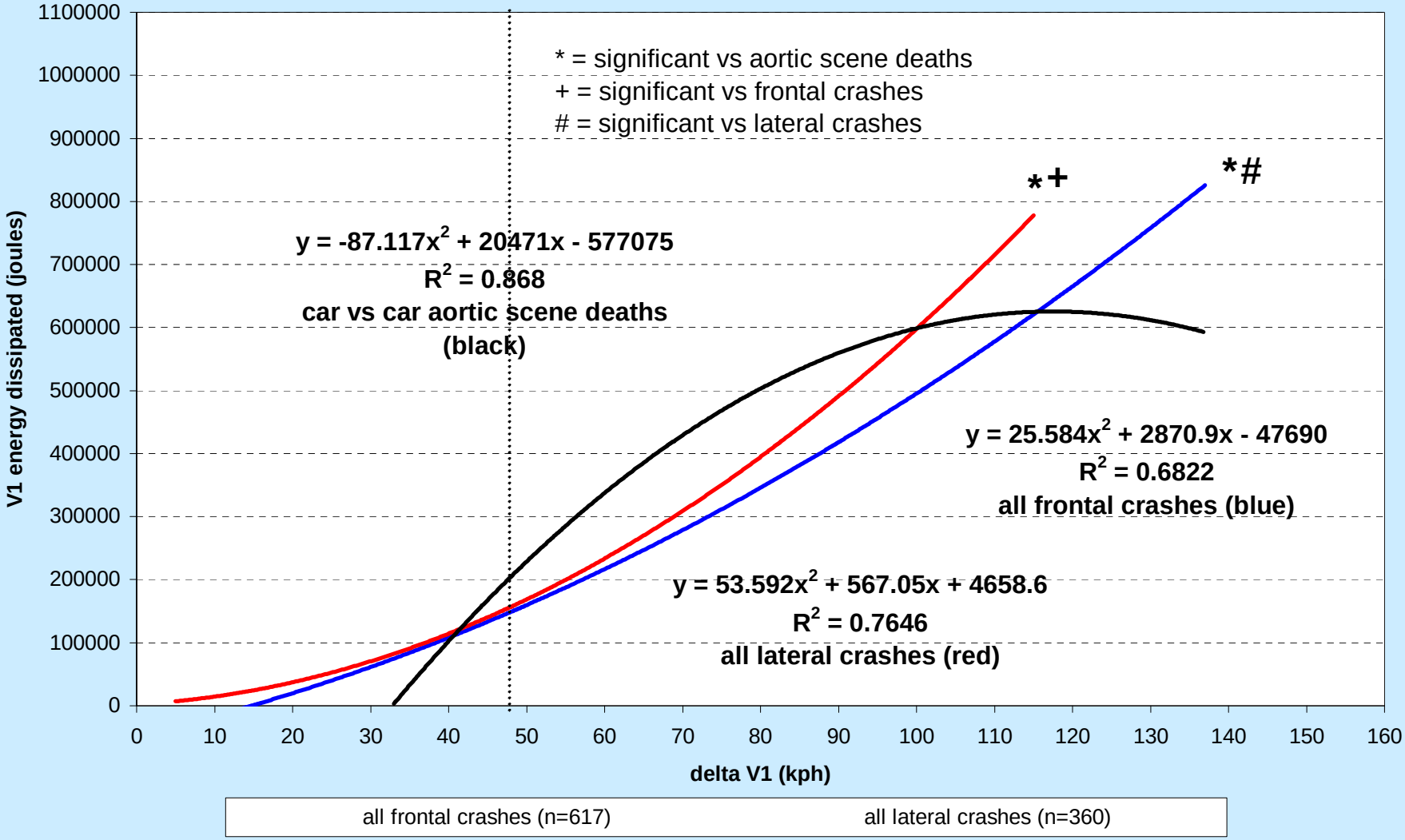
Vehicle Dynamics (V1): fatal vs non-fatal frontal crashes from CIREN data base

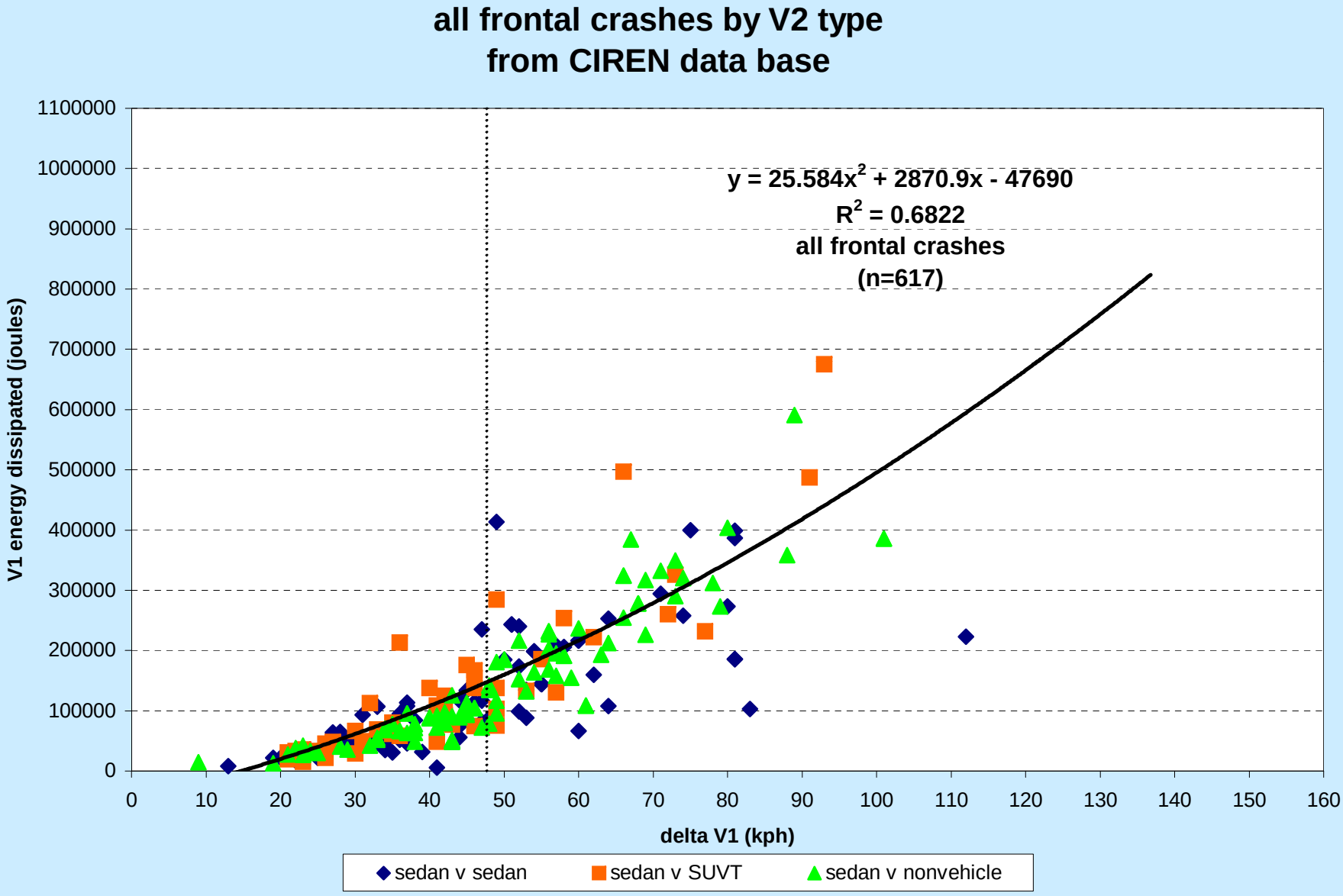


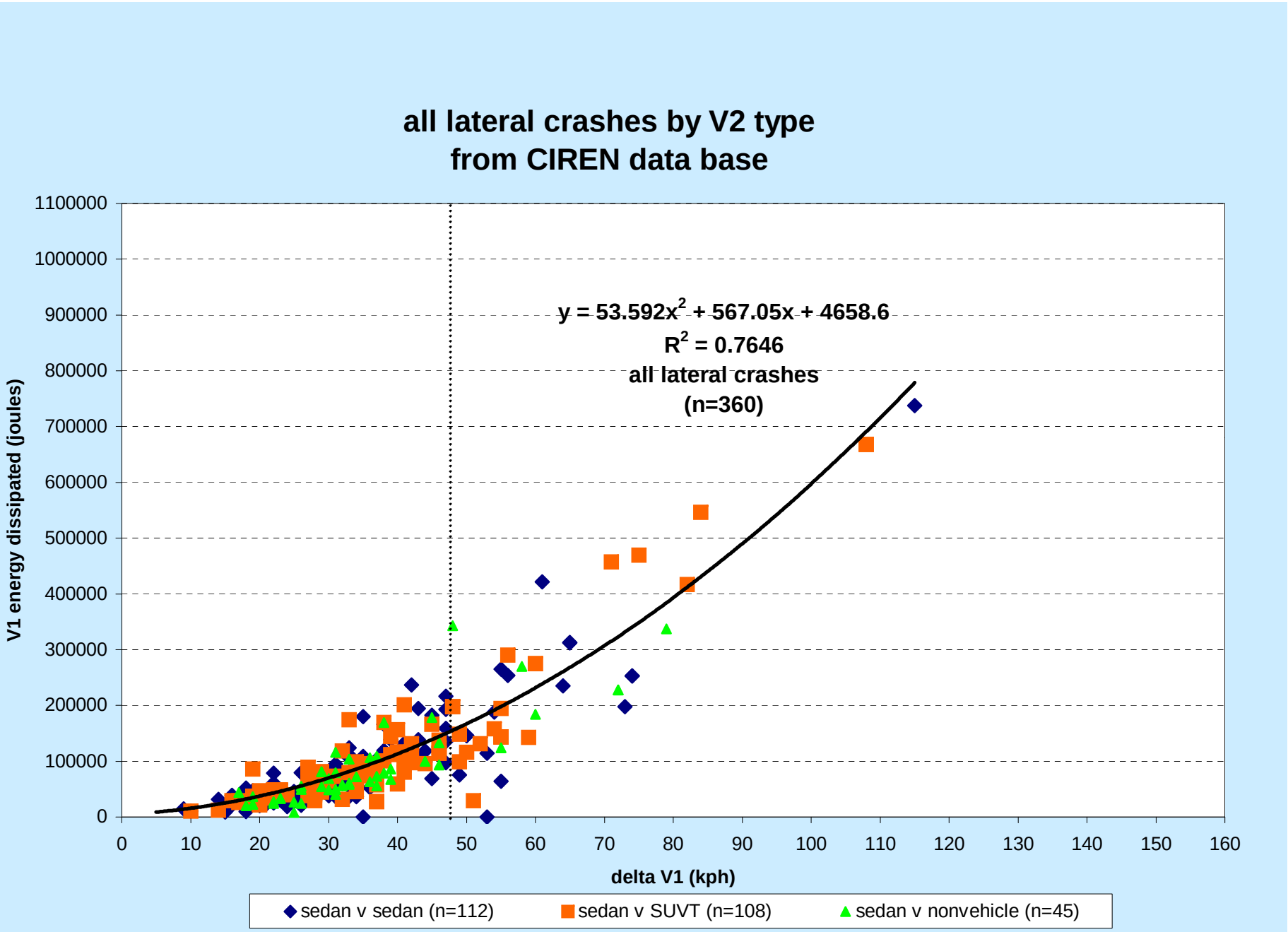
Vehicle Dynamics (V1): fatal vs non-fatal lateral crashes from CIREN data base



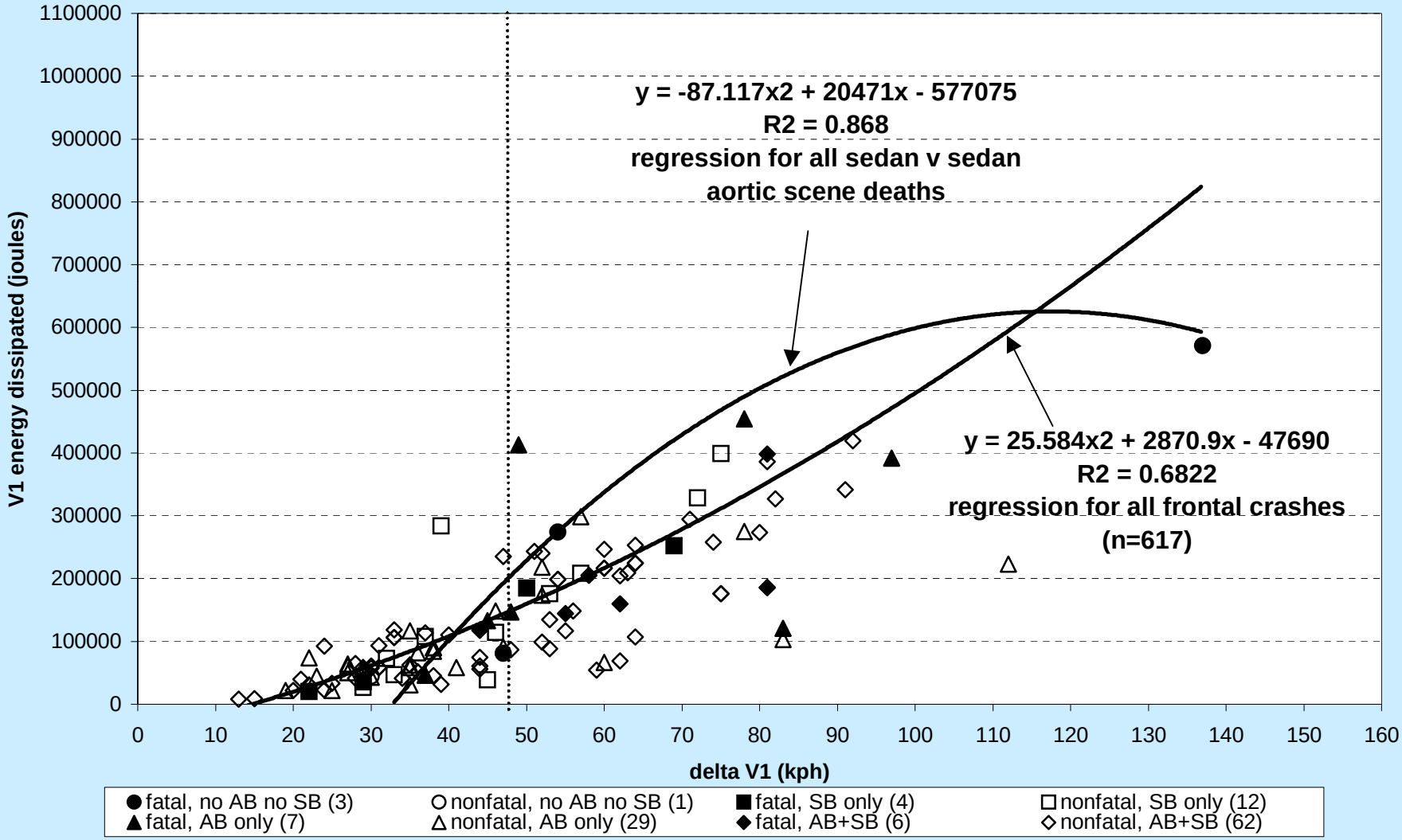
all frontal and lateral crashes from CIREN data base



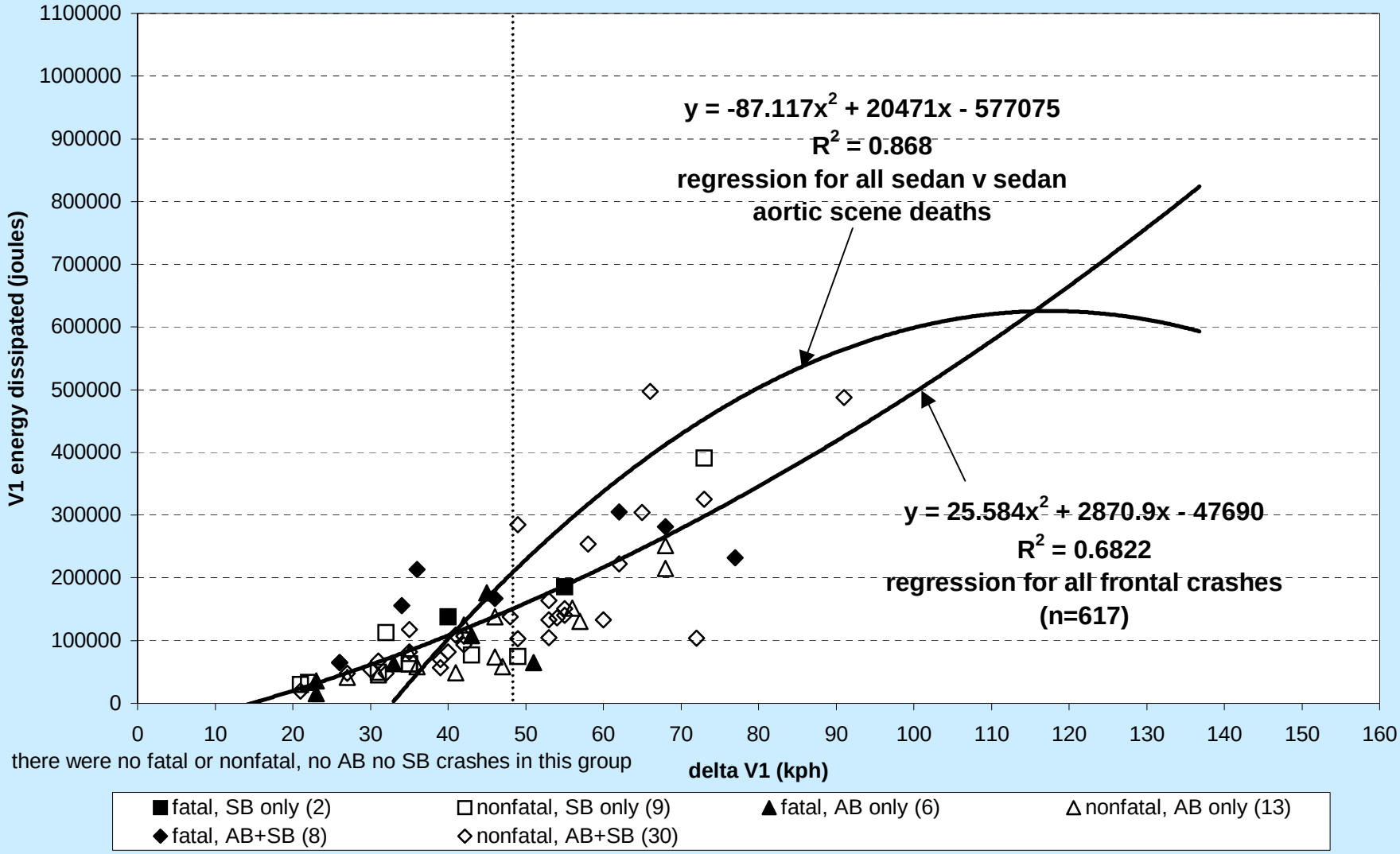

all frontal crashes by V2 type
from CIREN data base
y = 25.584x² + 2870.9x - 47690
R² = 0.6822
all frontal crashes
(n=617)
V1 energy dissipated (joules)
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
delta V1 (kph)
sedan v sedan
sedan v SUVT
sedan v nonvehicle


all lateral crashes by V2 type
from CIREN data base
y = 53.592x2 + 567.05x + 4658.6
R2 = 0.7646
all lateral crashes
(n=360)
V1 energy dissipated (joules)
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
delta V1 (kph)
sedan v sedan (n=112)
sedan v SUVT (n=108)
sedan v nonvehicle (n=45)

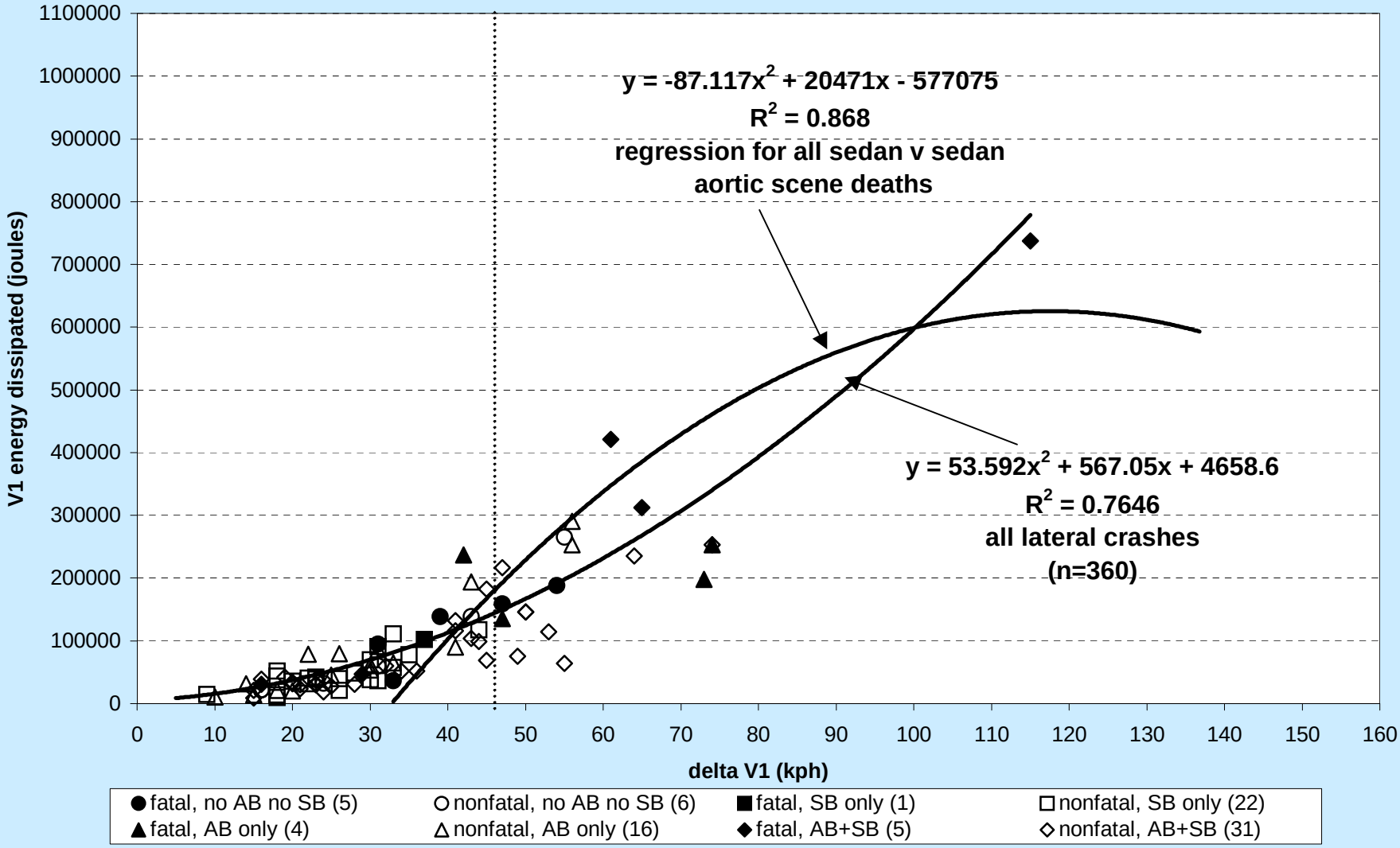
sedan v sedan frontal crashes, driver and front seat passenger only from CIREN data base



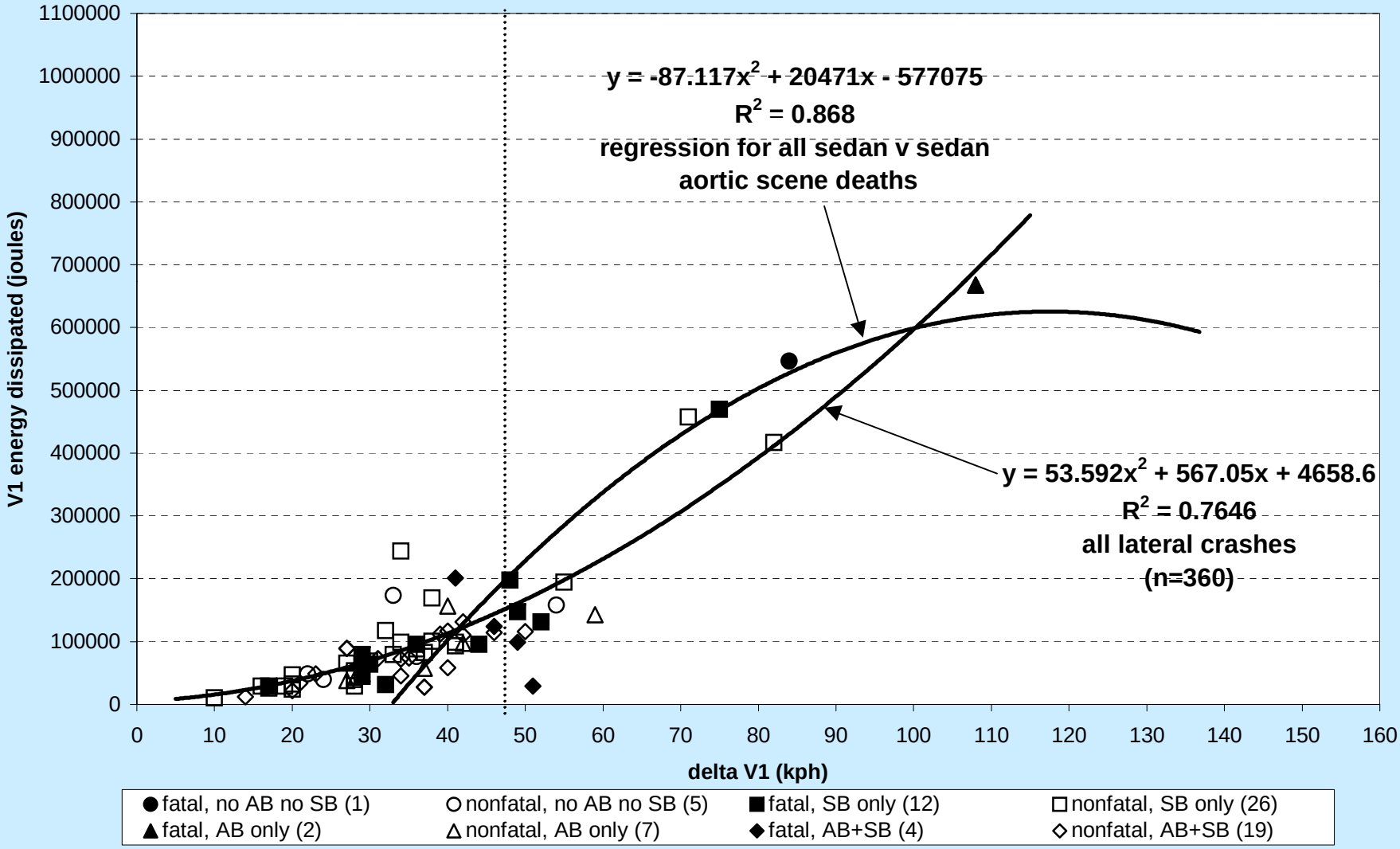
sedan v SUVT frontal crashes, driver and front seat passenger only from CIREN data base



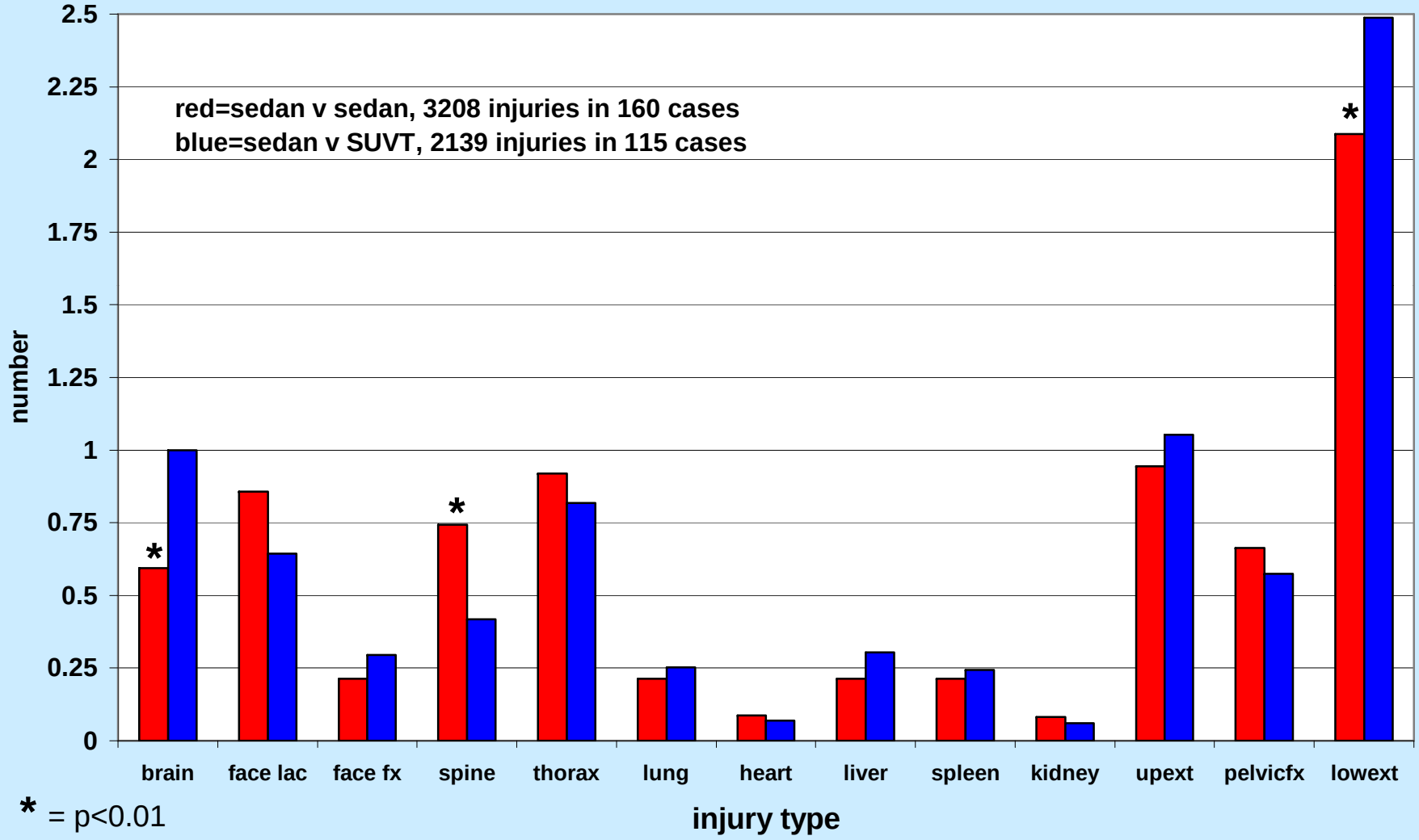
sedan v sedan lateral crashes, driver and front seat passenger only from CIREN data base



sedan v SUVT lateral crashes, driver and front seat passenger only from CIREN data base

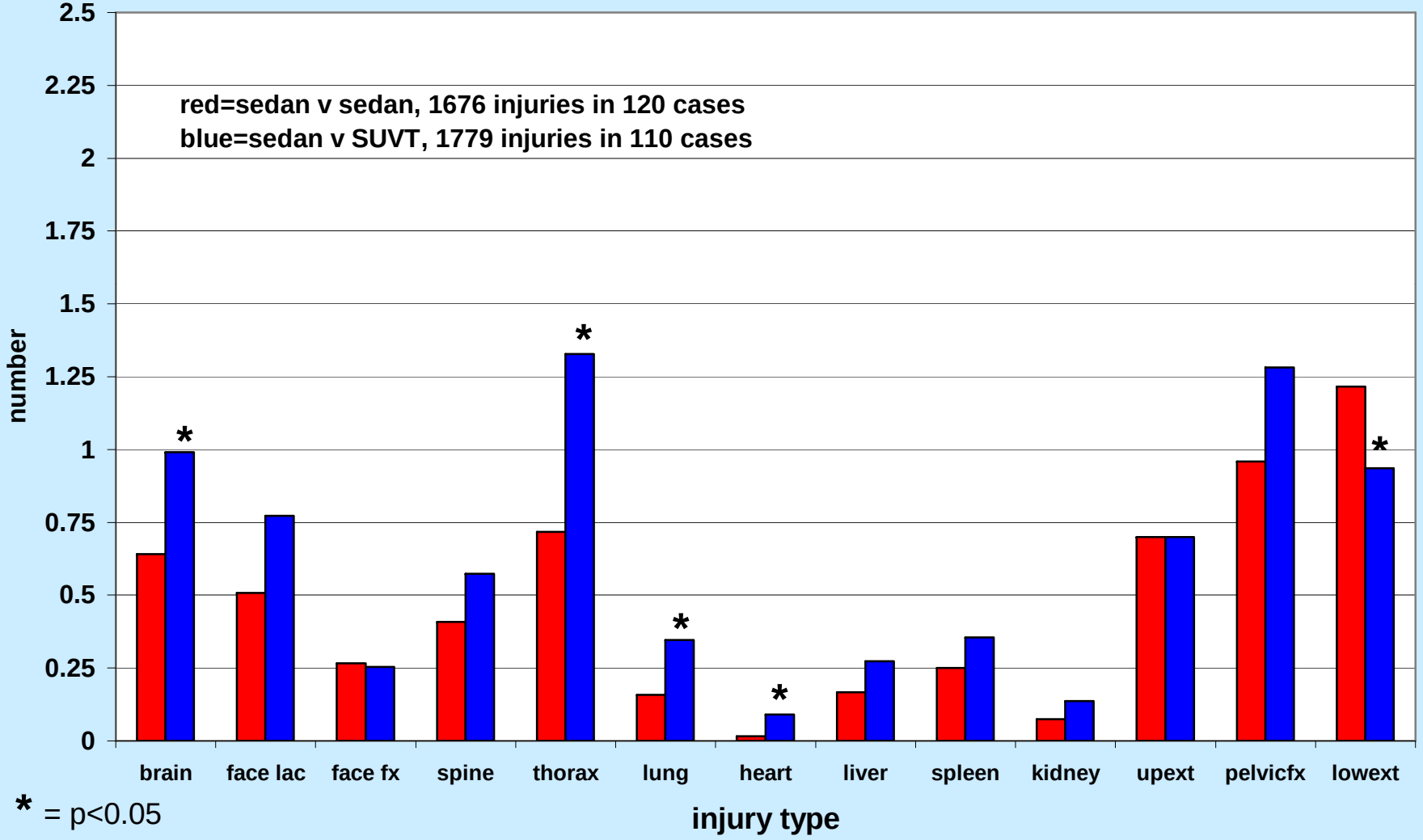


Frontal Crashes: Injuries Per Case by Type



* = p<0.01

Lateral Crashes: Injuries Per Case by Type



* = p<0.05

SUMMARY AND CONCLUSIONS I

VEHICLE DYNAMICS:

REGRESSION ANALYSIS OF THE IMPACT ENERGY DISSIPATED ON V1 AS A FUNCTION OF THE DELTA V1 HAS BEEN DERIVED FROM ALL FRONTAL MVCs (617) AND FROM ALL LATERAL MVCs (360)

PATIENT DATA:

BASED ON PDOF, A TOTALOF 358 CASES OF DRIVERS OR FRONT SEAT PASSENGERS HAVE BEEN EXAMINED FROM THOSE CONTAINED IN THE CIREN DATA BASE, 192 FRONTAL & 166 LATERAL MVCs

CONCLUSIONS II

THE REGRESSION OF IMPACT ENERGY / DELTA V FOR ALL LATERAL CRASHES IS SIGNIFICANTLY DIFFERENT FROM THAT FOR ALL FRONTAL CRASHES BUT BOTH ARE SIGNIFICANTLY DIFFERENT FROM THE REGRESSION FOR AORTIC INJURY SCENE DEATHS

HOWEVER, THE RATE OF INCREASE FOR THE IMPACT ENERGY PER UNIT DELTA V IS GREATER IN THE LATERAL CRASHES THAN IN THE FRONTAL CRASHES ABOVE THE THRESHOLD VALUE OF 48 KPH. THIS SUGGESTS THAT MVC CRASH TESTING SHOULD BE DONE BOTH AT 48 KPH AND ALSO AT A HIGHER LEVEL, 60 KPH FOR LATERAL MVCs AND 70 KPH FOR FRONTAL MVCs

CONCLUSIONS III

BOTH FRONTAL AND LATERAL SEDAN VS SUVT (SUV, VAN & PICKUP TRUCK) MVCs OCCUR OVER THE ENTIRE RANGE OF DELTA Vs EXAMINED

IN FRONTAL MVCs INVOLVING EITHER SEDAN VS SEDAN OR SEDAN VS SUVT MVCs, NONE OF THE 192 PATIENTS EXAMINED WHOSE CRASH OCCURRED ABOVE A DELTA V OF 48 KPH AND WHO WERE COMPLETELY UNRESTRAINED SURVIVED. ALL OF THE SURVIVORS OF CRASHES ABOVE DELTA V 48 KPH HAD SEATBELT, AIRBAG OR BOTH TYPES OF RESTRAINTS IN USE.

OF ALL FRONTAL MVCs ON WHOM DATA WAS AVAILABLE, NO-SB-OR-AB 25% SURVIVED, AB-ONLY 76% SURVIVED, SB-ONLY 78% SURVIVED, SB + AB 85% SURVIVED.

CONCLUSIONS IV

IN LATERAL MVCs INVOLVING EITHER SEDAN VS SEDAN OR SEDAN VS SUVT MVCs, ONLY TWO OF THE 166 PATIENTS EXAMINED WHOSE CRASH OCCURRED ABOVE A DELTA V OF 48 KPH AND WHO WERE COMPLETELY UNRESTRAINED SURVIVED. THE REST OF THE SURVIVORS OF CRASHES ABOVE DELTA V 48 KPH HAD SEATBELT, AIRBAG OR BOTH TYPES OF RESTRAINTS IN USE.

OF ALL LATERAL MVCs ON WHOM DATA WAS AVAILABLE, NO-SB-OR-AB 65% SURVIVED, AB-ONLY 79% SURVIVED, SB-ONLY 79% SURVIVED, SB + AB 85% SURVIVED.

CONCLUSIONS V

PATTERNS OF INJURY IN SEDAN VS SEDAN COMPARED TO SEDAN VS SUVT CRASHES:

FRONTAL MVCs: IN COMPARING THE PATTERN OF INJURIES RESULTING FROM SEDAN VS SEDAN MVCs TO THAT SEEN IN SEDAN VS SUVT CRASHES, IT WAS FOUND THAT DRIVERS OR FRONT SEAT PASSENGERS IN SEDANS STRUCK BY SUVTS HAD A SIGNIFICANTLY GREATER INCIDENCE OF BRAIN AND LOWER EXTREMITY INJURIES, BUT FEWER SPINE INJURIES THAN THOSE IN SEDAN VS SEDAN MVCs.

CONCLUSIONS VI

LATERAL MVCs: IN COMPARING THE PATTERN OF INJURIES RESULTING FROM SEDAN VS SEDAN MVCs TO THAT SEEN IN SEDAN VS SUVT CRASHES, IT WAS FOUND THAT DRIVERS OR FRONT SEAT PASSENGERS IN SEDANS STRUCK BY SUVTS HAD A SIGNIFICANTLY GREATER INCIDENCE OF BRAIN, THORAX, LUNG & CARDIAC INJURIES, BUT FEWER LOWER EXTREMITY INJURIES THAN THOSE IN SEDAN VS SEDAN MVCs.

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HEEDLESS DRIVER GCS 15

IN YOUR FANCY CAR YOU'LL BE SO MELLOW

THAT YOU MAY EVEN PLAY THE CELLO

BUT

IF YOU DRIVE WITHOUT RESTRAINT,

TO SOUND LIKE J. S. BACH YOU AIN'T

RATHER WHEN YOU CRASH

YOU'LL BE LIKE THIS DUMMY I CONFESS,

BECAUSE YOU'LL LOSE YOUR GCS

CRASH DUMMY GCS 3 = ZERO BRAIN