According to Age

The Mercedes-Benz CIREN Center

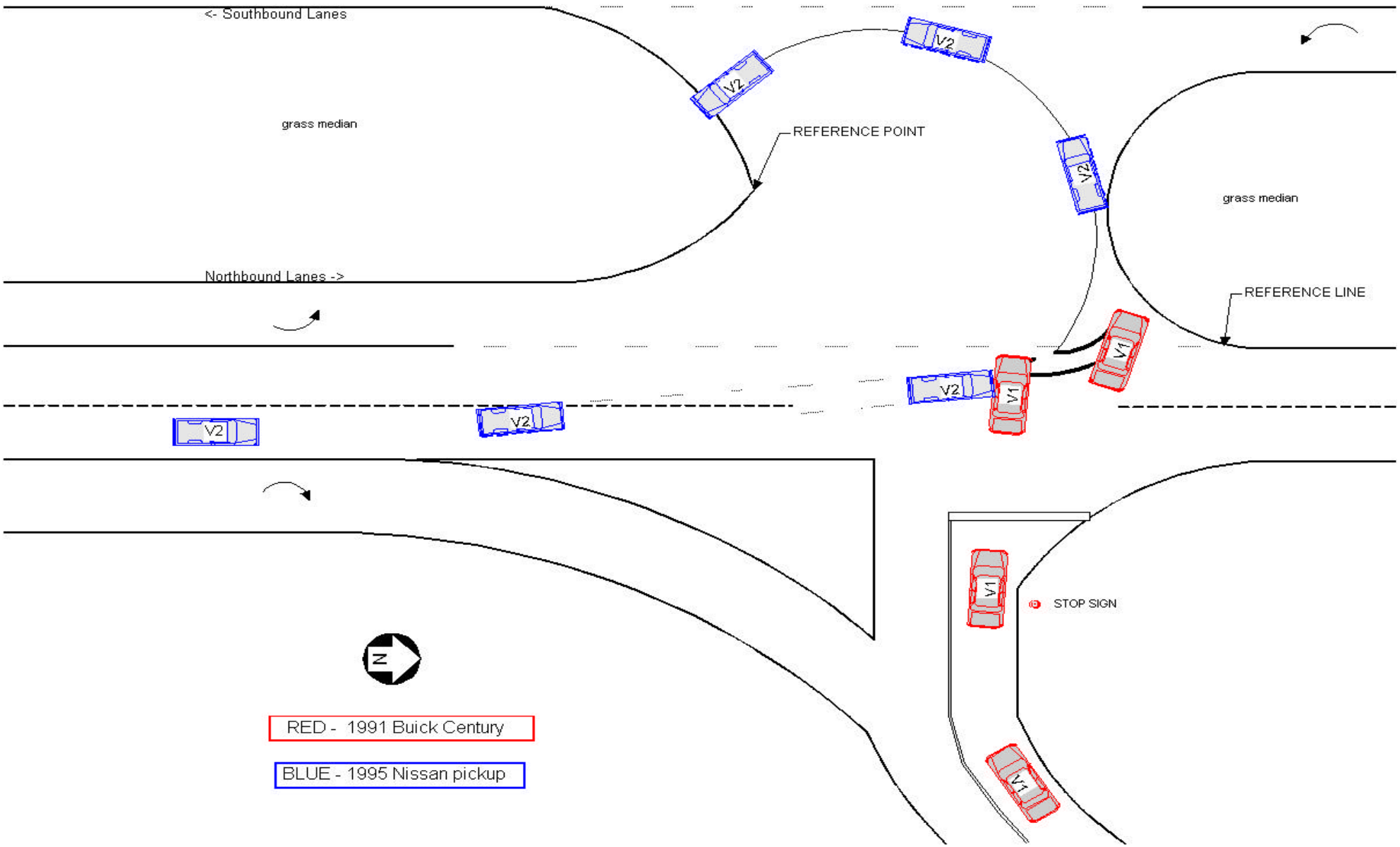
Overview

- Older adults represent fastest growing segment of drivers in the United States
- Older adults have one of the highest crash rates per mile of travel
- Mortality for older adults involved in collisions higher than any other age group

CASE 1

CRASH DATA

CASE OCCUPANT	76 year old female
CASE VEHICLE	1991 Buick Century
OTHER VEHICLE	1995 Nissan pickup
TIME OF CRASH	7:15 a.m. / Daylight
ROAD CONDITIONS	Dry Asphalt / Clear
TRAVEL SPEED	10 mph
AVOIDANCE	Unknown
RESTRAINTS	Lap & Shoulder Belt


<- Southbound Lanes
grass median
REFERENCE POINT
Northbound Lanes ->
grass median
REFERENCE LINE
V2
V1
STOP SIGN
N
RED - 1991 Buick Century
BLUE - 1995 Nissan pickup

CASE VEHICLE PATH

STO

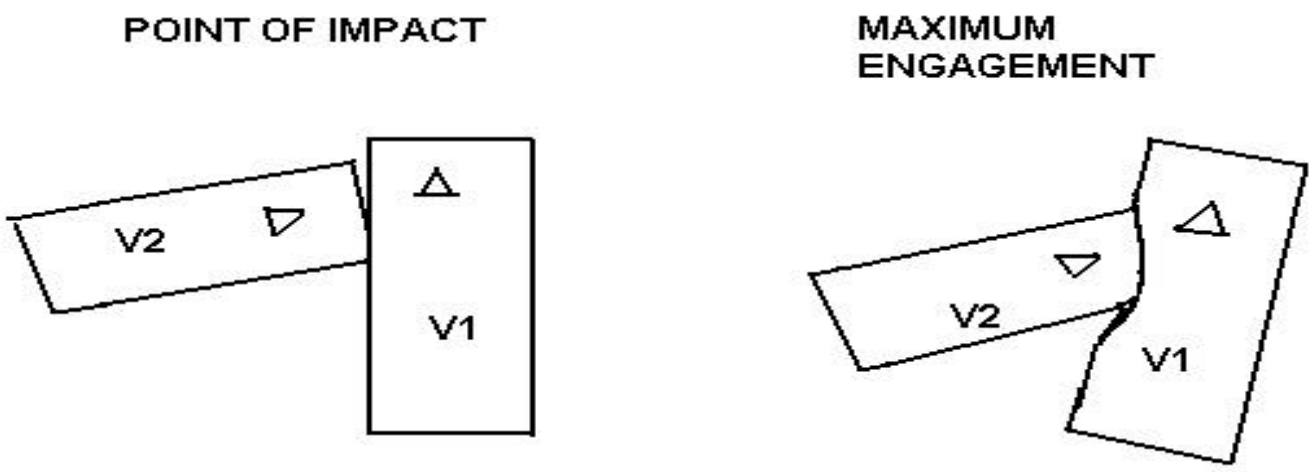
OPPOSING VEHICLE PATH

1991 BUICK CENTURY

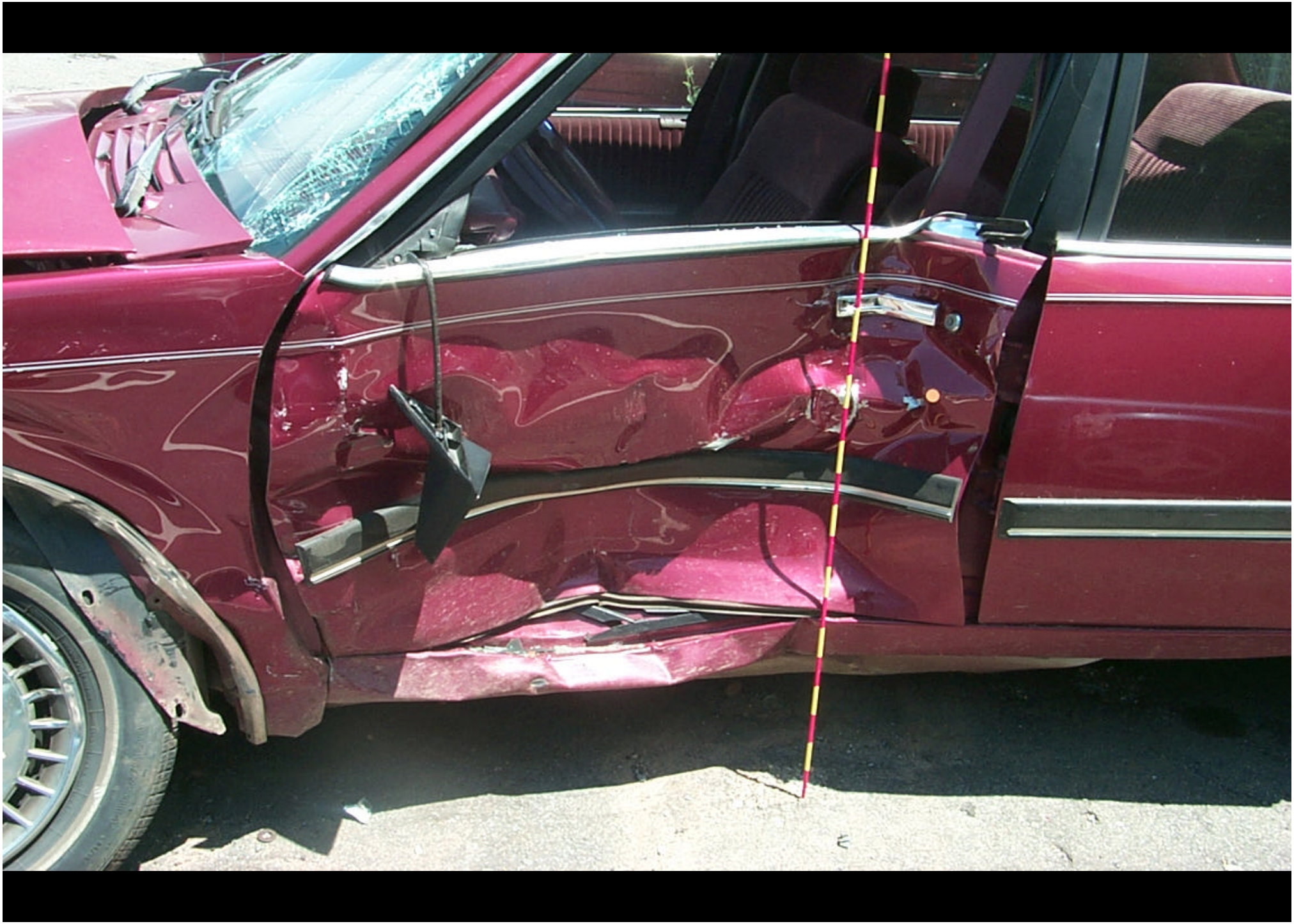
PDOF	-70 degrees
CDC	10LYEW3
DELTA V	15 mph / 24 km

1995 NISSAN PICKUP

PDOF	360 degrees
CDC	12FDEW2
DELTA V	16 mph / 25 km



BUICK



DRIVE RELEASE

INTRUSIONS

Left Door	6 in. / 16 cm.	Lateral
Left Kick Panel	6 in. / 14 cm.	Lateral
Left ‘B’ Pillar	6 in. / 15 cm.	Lateral
Left Seatback	2 in. / 5 cm.	Lateral
Left Seat Cushion	6 in. / 15 cm.	Lateral
Foot Controls	2 in. / 6 cm.	Lateral
Left Sill	6 in. / 16 cm.	Lateral

OCCUPANT CONTACTS

Left Door Panel	Intrusion
Left Front Seatbelt	Stretched
Rearview Mirror	Moved

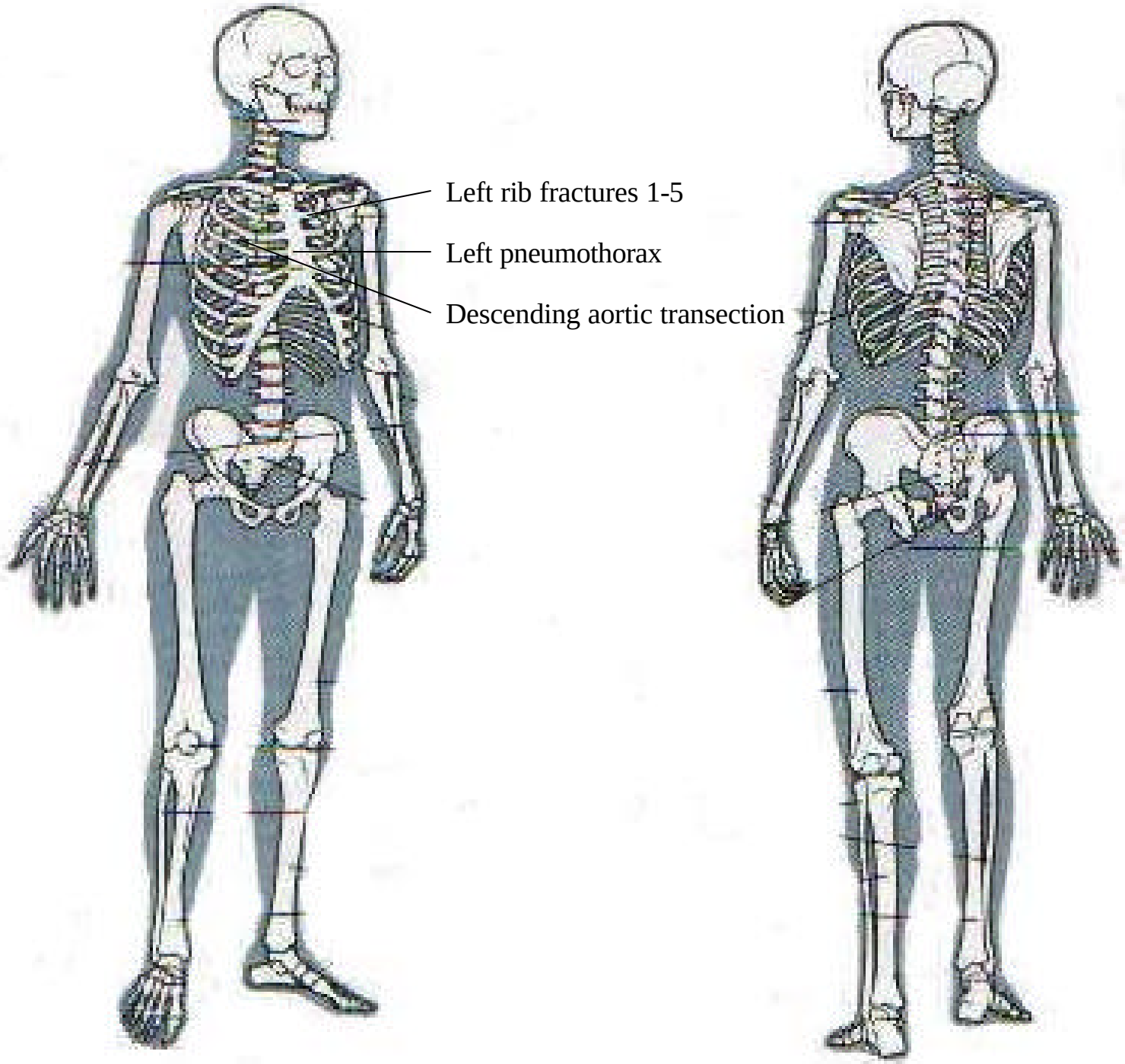
CASE 1 INJURIES

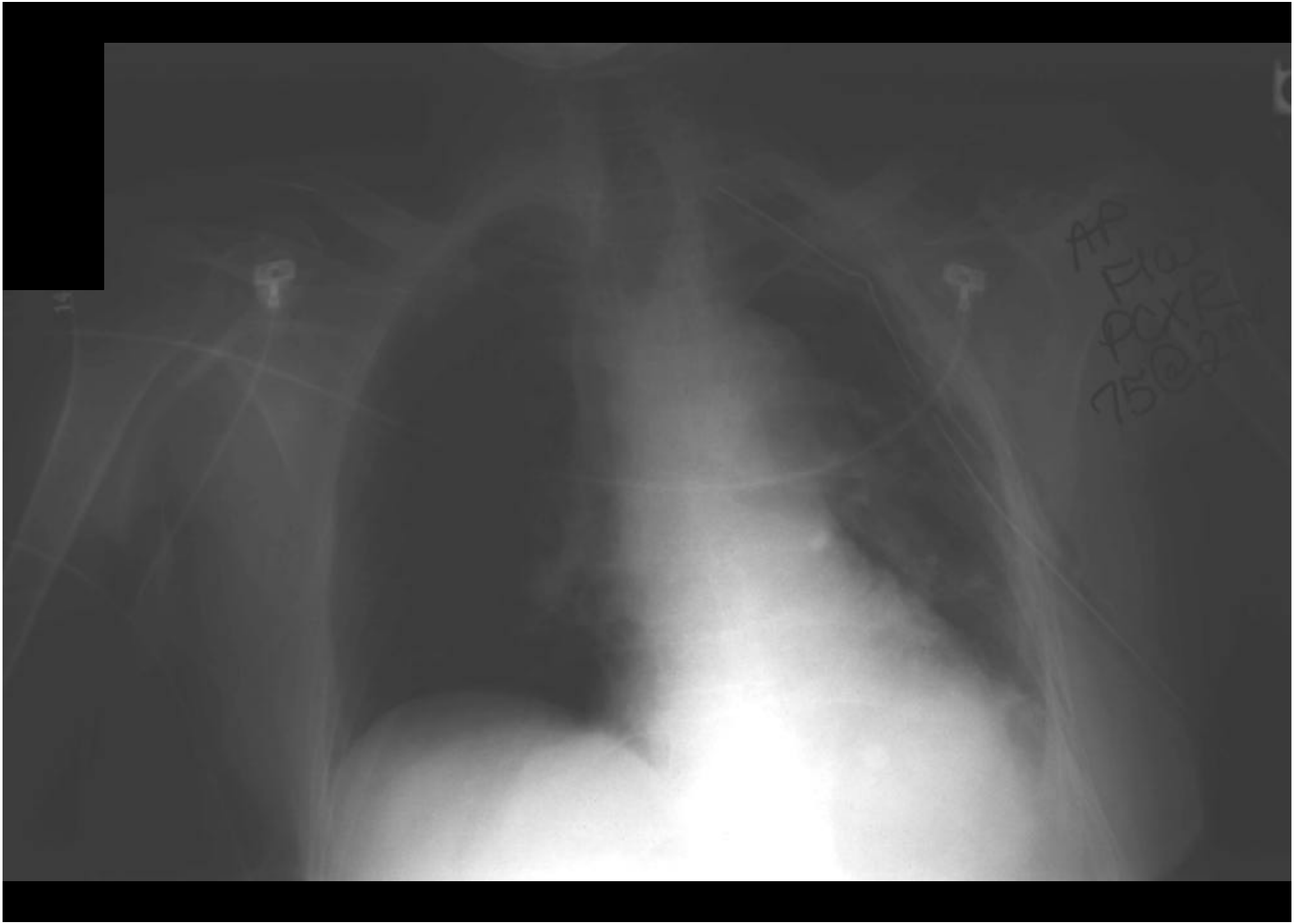
Descending aortic transection

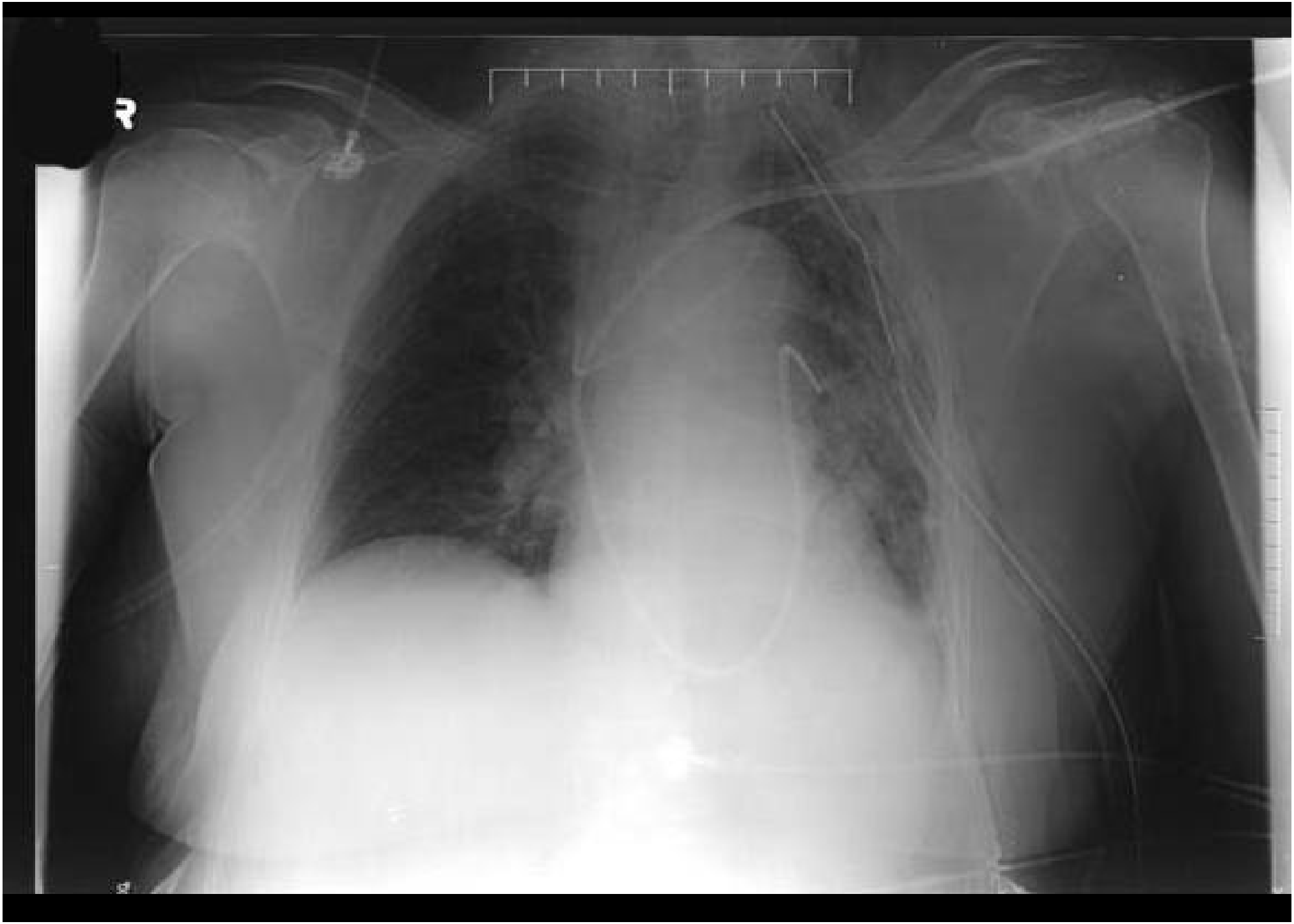
Left rib fractures 1-5

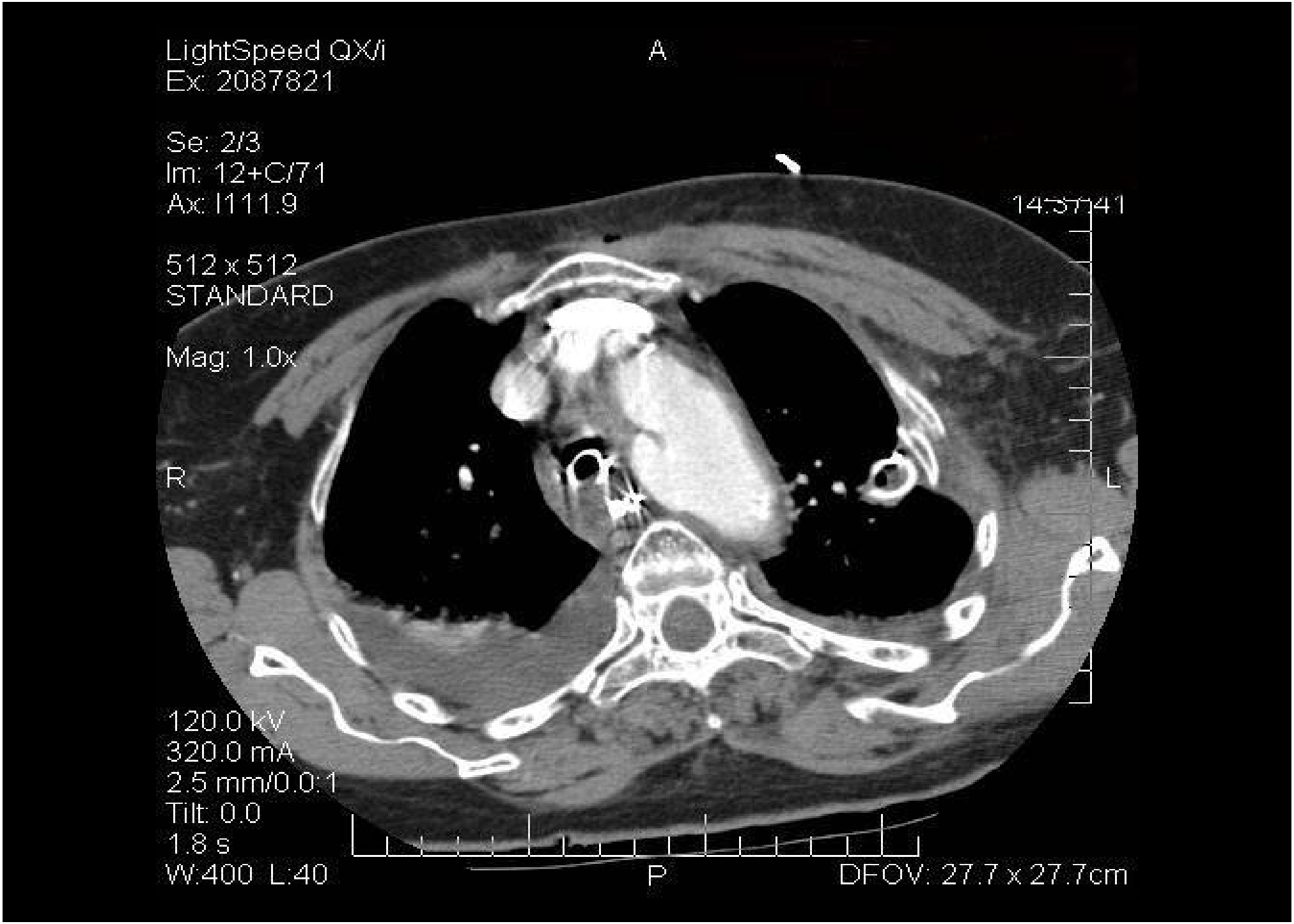
Left pneumothorax

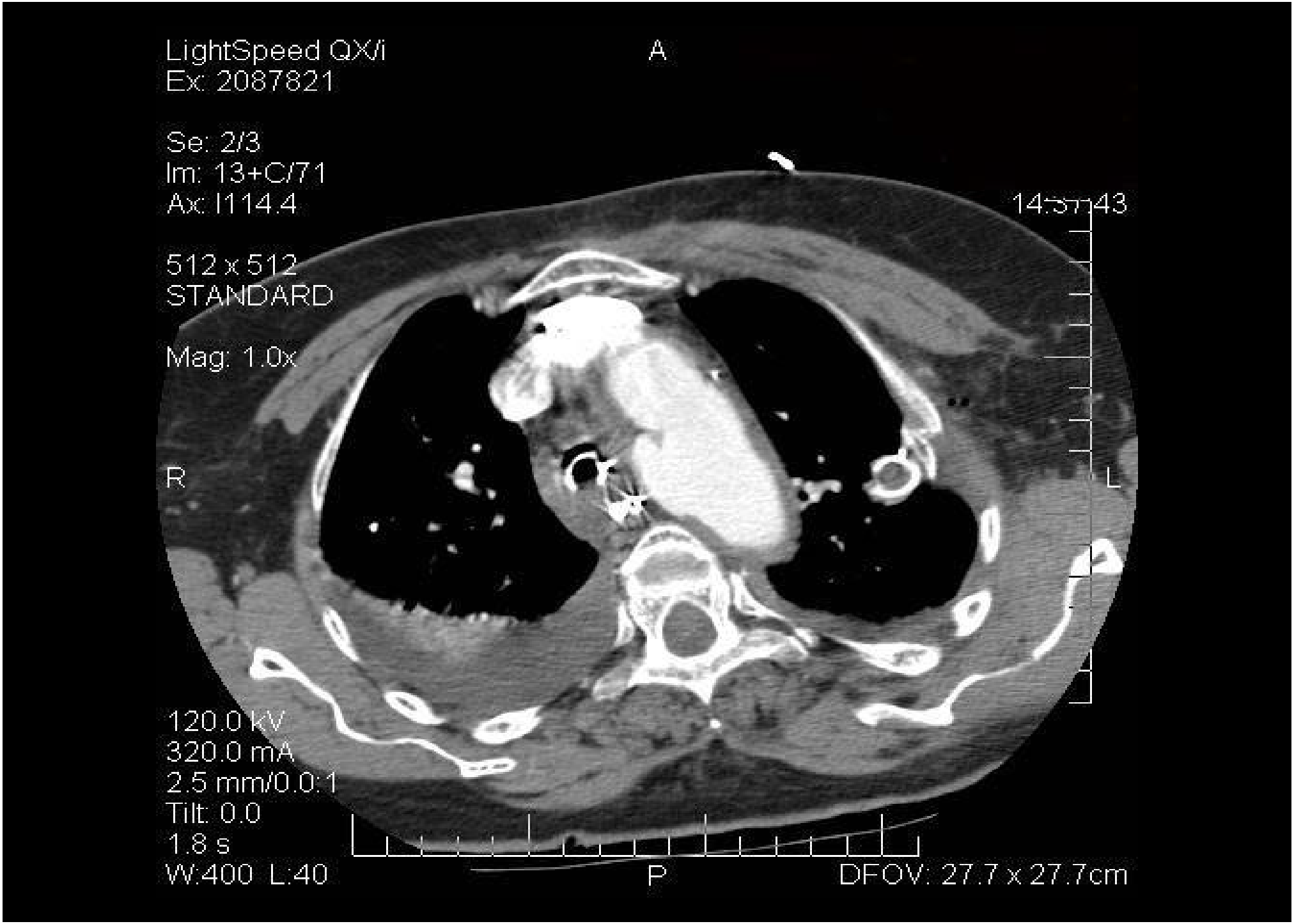
Multiple abrasions

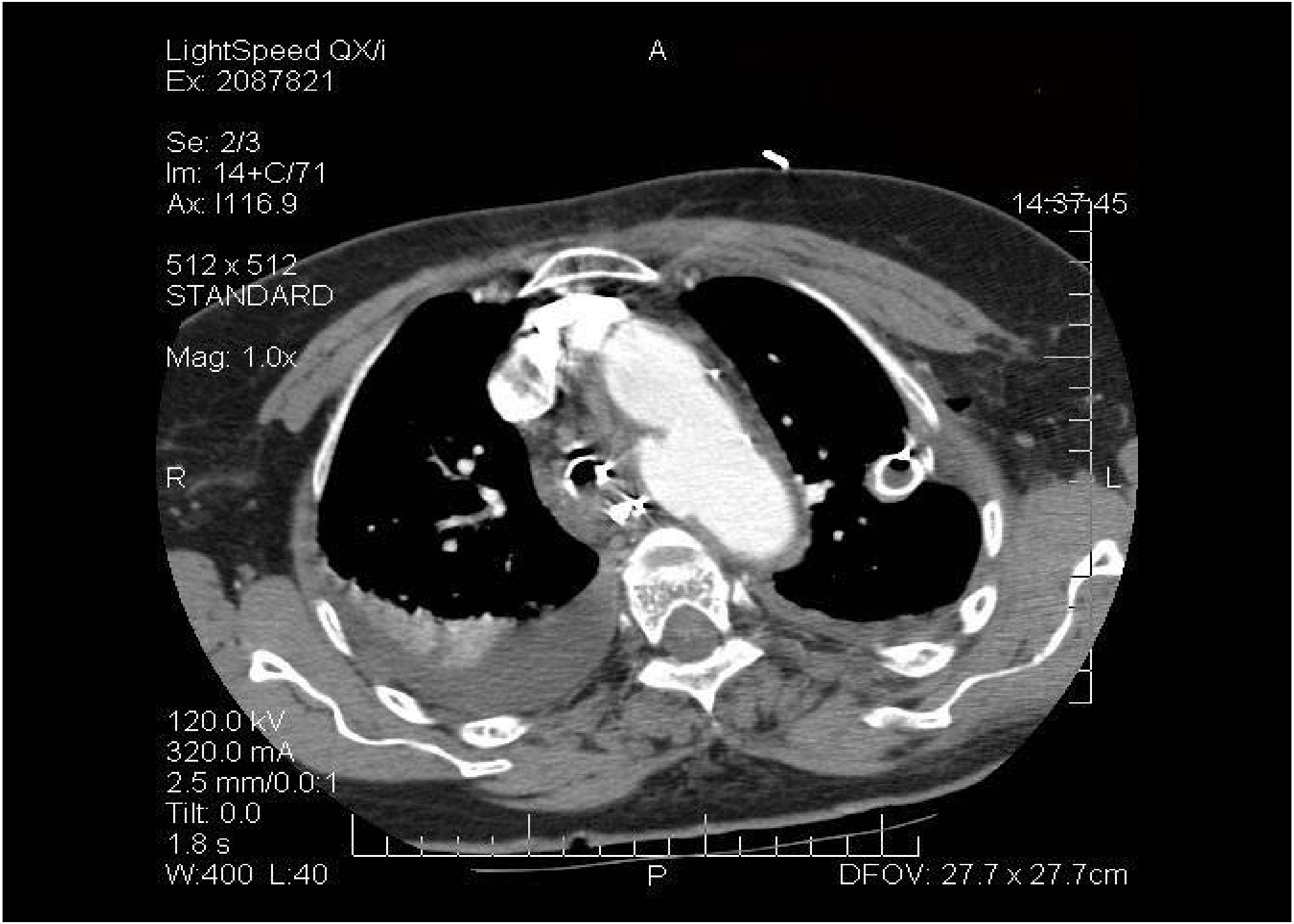

Left rib fractures 1-5
Left pneumothorax
Descending aortic transection

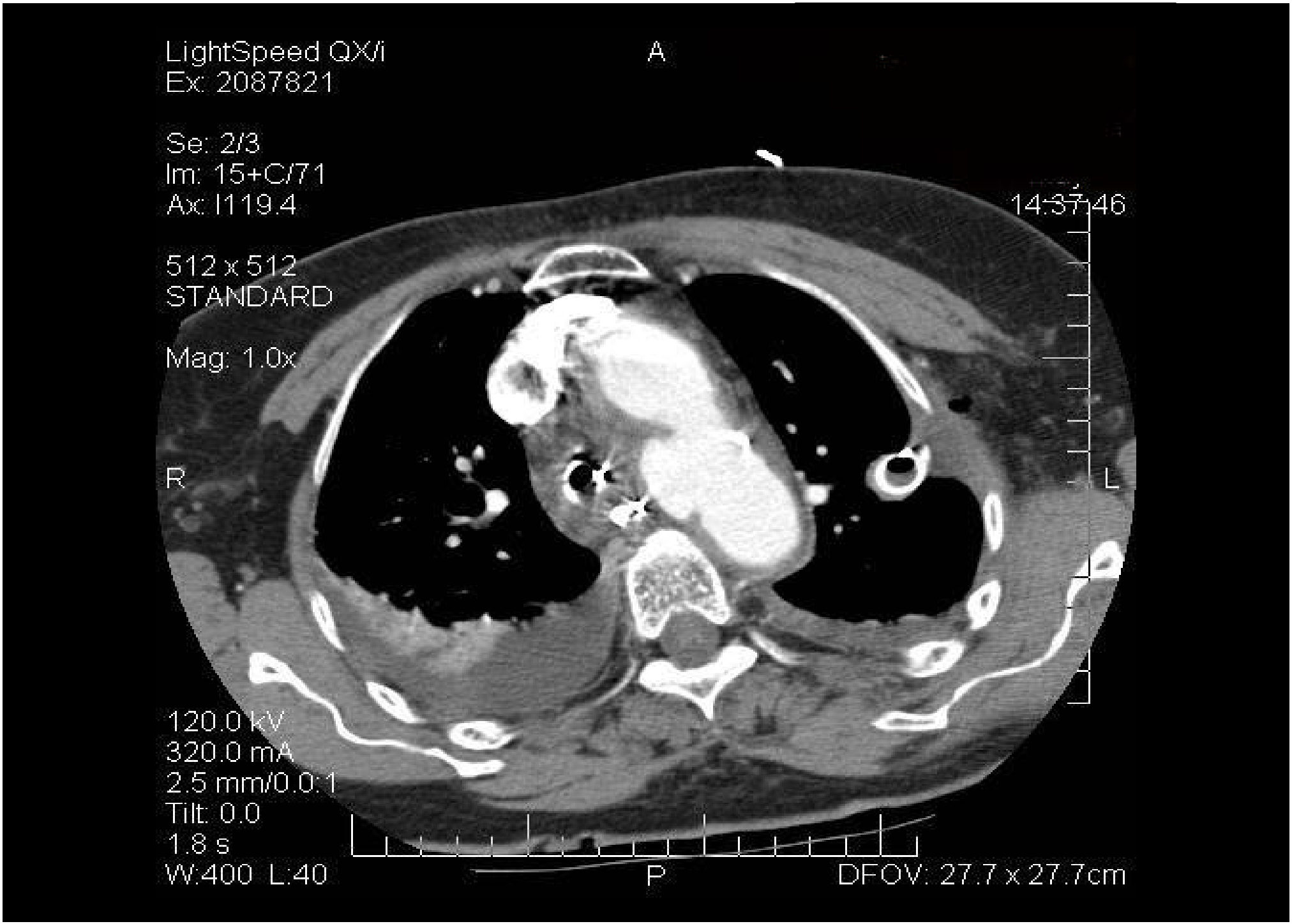

AP
F10
PCXR
75@


R


LightSpeed QX/i
Ex: 2087821
A
Se: 2/3
Im: 12+C/71
Ax: I111.9
512 x 512
STANDARD
Mag: 1.0x
R
L
P
120.0 kV
320.0 mA
2.5 mm/0.0:1
Tilt: 0.0
1.8 s
W:400 L:40
DFOV: 27.7 x 27.7cm


LightSpeed QX/i
Ex: 2087821
A
Se: 2/3
Im: 13+C/71
Ax: I114.4
512 x 512
STANDARD
Mag: 1.0x
R
L
120.0 kV
320.0 mA
2.5 mm/0.0:1
Tilt: 0.0
1.8 s
W:400 L:40
P
DFOV: 27.7 x 27.7cm


LightSpeed QX/i
Ex: 2087821
Se: 2/3
Im: 14+C/71
Ax: I116.9
512 x 512
STANDARD
Mag: 1.0x
A
14:37:45
R
L
120.0 kV
320.0 mA
2.5 mm/0.0:1
Tilt: 0.0
1.8 s
W:400 L:40
P
DFOV: 27.7 x 27.7cm


LightSpeed QX/i
Ex: 2087821
Se: 2/3
Im: 15+C/71
Ax: I119.4
512 x 512
STANDARD
Mag: 1.0x
A
14:37:46
R
L
120.0 kV
320.0 mA
2.5 mm/0.0:1
Tilt: 0.0
1.8 s
W:400 L:40
P
DFOV: 27.7 x 27.7cm

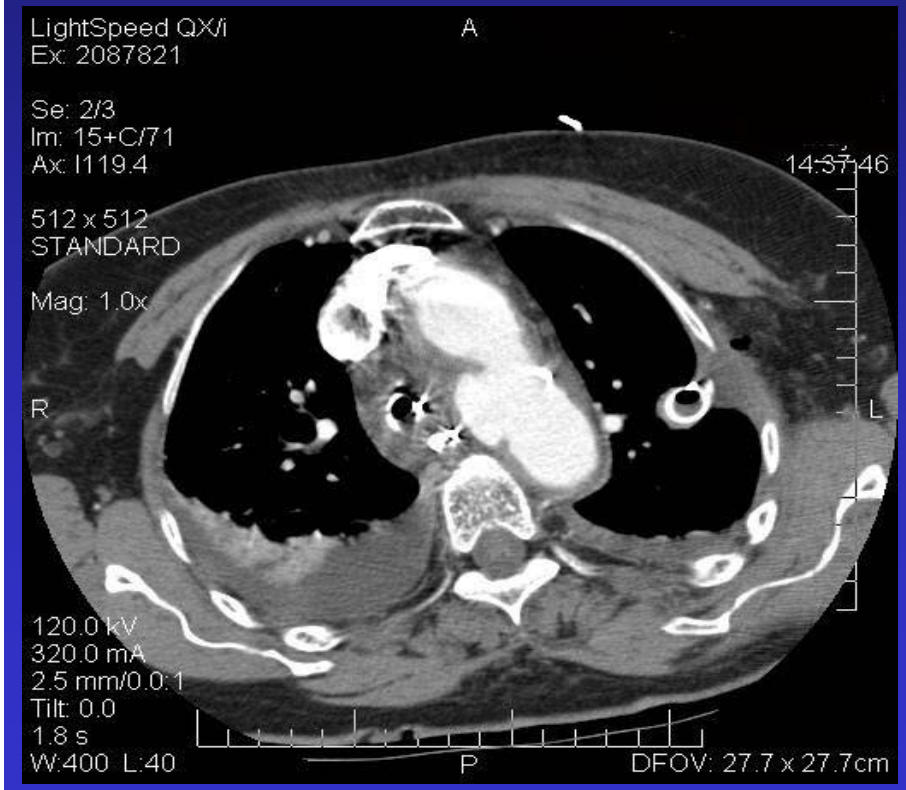
HOSPITAL COURSE

LOS:	51 days (37 days ICU)
Ventilator:	28 days
Complications:	Pneumonia
Disposition:	Inpatient Rehabilitation
	Home

Descending aortic transection

Left 1-5th rib fractures

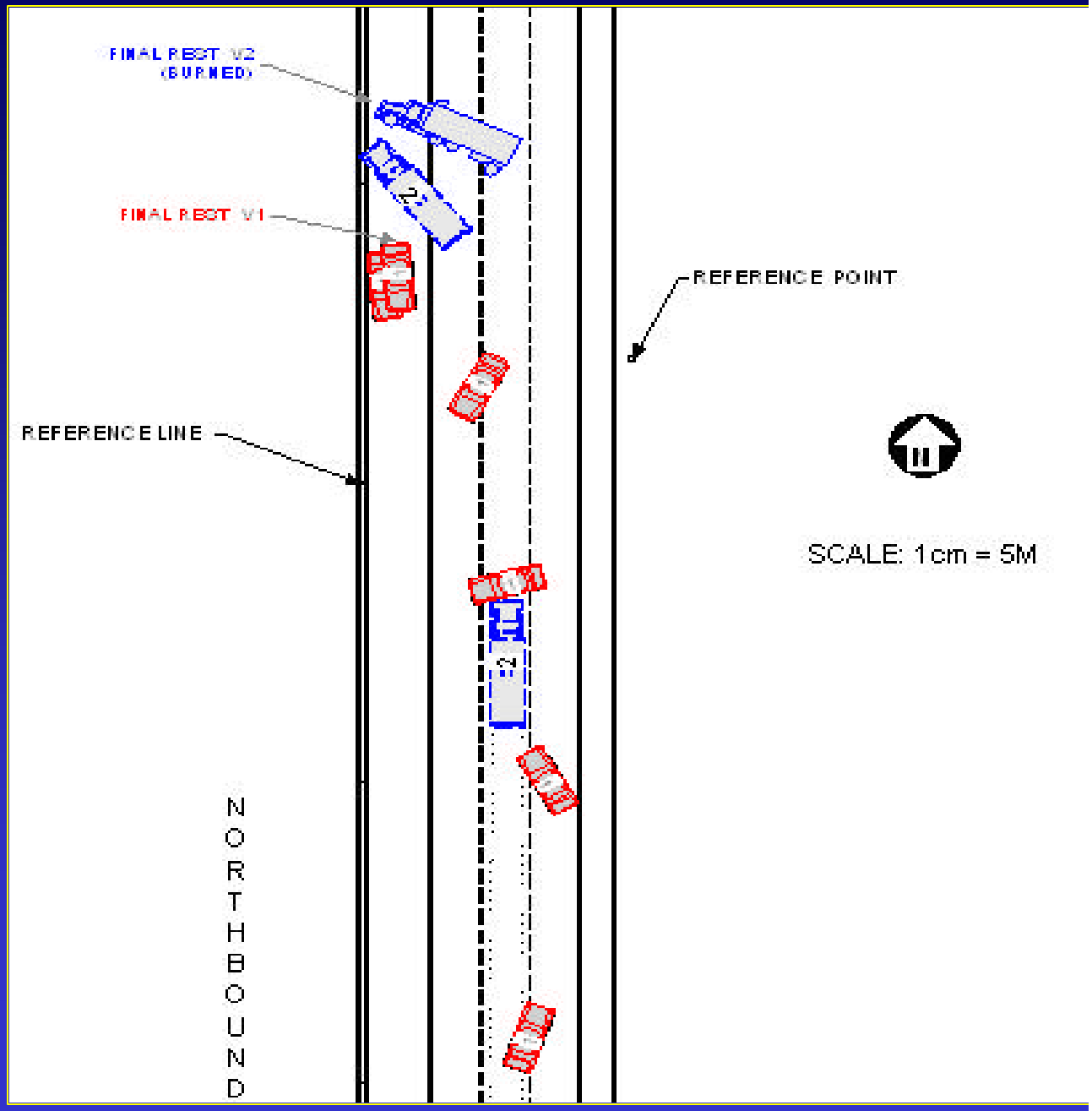
Left Pneumothorax



CASE 2

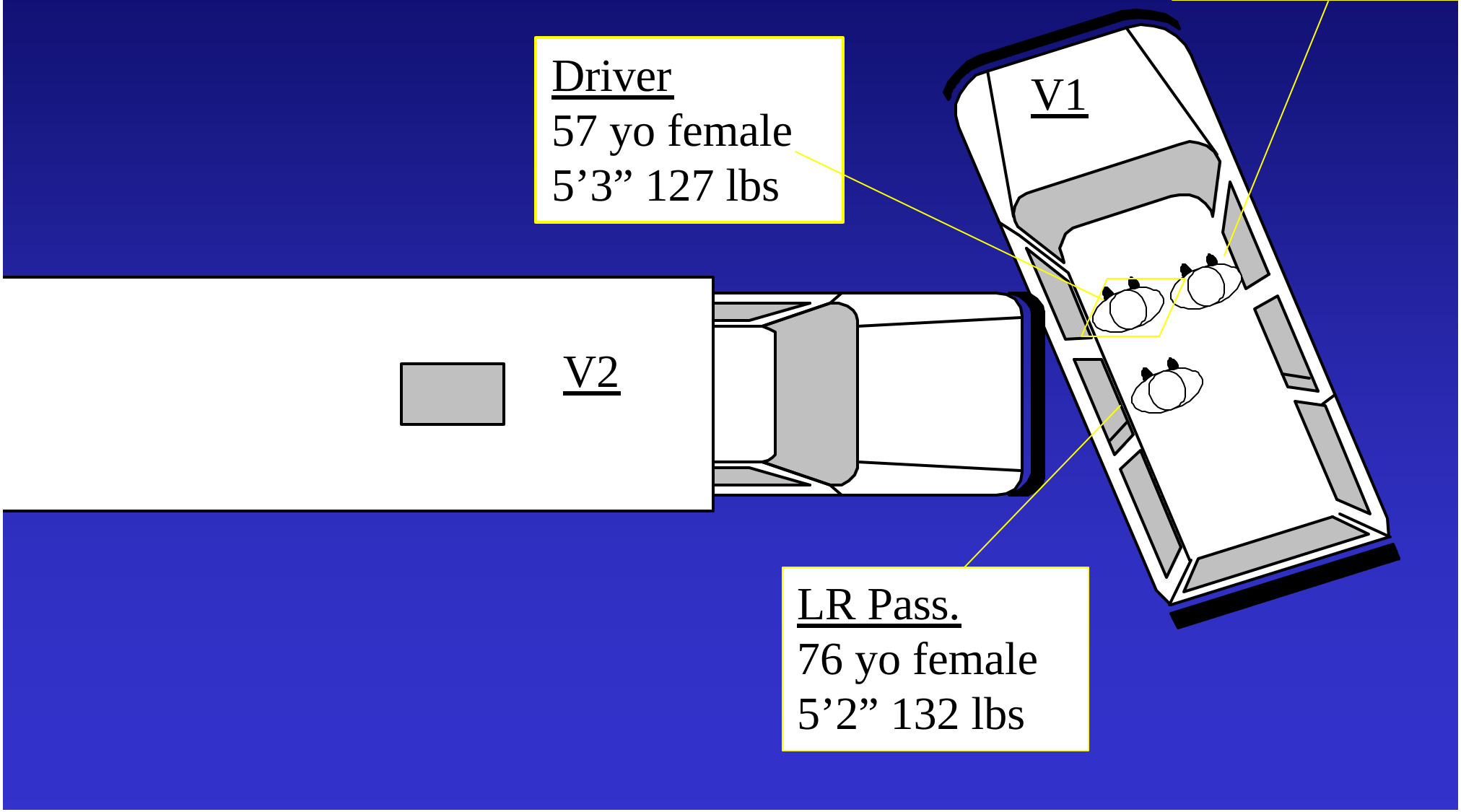
CRASH DATA

CASE OCCUPANT	57 year old female
CASE VEHICLE	1999 Ford Expedition
OTHER VEHICLE	2000 Western Star Truck
TIME OF CRASH	3:00 p.m. / Daylight
ROAD CONDITIONS	Dry Asphalt
SPEED ESTIMATE	113 kmph / 70 mph
AVOIDANCE	Braking & Steering Left
RESTRAINTS	Lap / Shoulder Belt Deployed Airbag


FINAL REST V2
(BURNED)
FINAL REST V1
REFERENCE POINT
REFERENCE LINE
SCALE: 1cm = 5M
NORTHBOUND

CASE VEHICLE PATH

PDOF 290 degrees
CDC 10LZAW3
DELTA V (BE) 25 kmph / 16 mph



EXPEDITION

EXPEDITION

WARNING

Center armrest = 28 cm / 11 in wide, 14 cm / 6 in high

LF Door Armrest Intruded 19 cm / 7 in

WARNING
Wrap a Smile Today!
LDS CINNAMON ROLL
.59 CENTS

INTRUSIONS

LEFT REAR DOOR	28 cm / 11 in	Lateral
LEFT REAR SILL	26 cm / 10 in	Lateral
LEFT FRONT SILL	20 cm / 8 in	Lateral
LEFT FRONT DOOR	19 cm / 7 in	Lateral
LF WINDOW FRAME	19 cm / 7 in	Lateral
LF SEATBACK	14 cm / 6 in	Lateral
LEFT ‘C’ PILLAR	4 cm / 2 in	Lateral

OCCUPANT CONTACTS

LEFT KNEE BOLSTER	Scuffed
LF DOOR ARMREST	Blood
REAR VIEW MIRROR	Displaced
LEFT SUNVISOR	Displaced

CASE 2 INJURIES

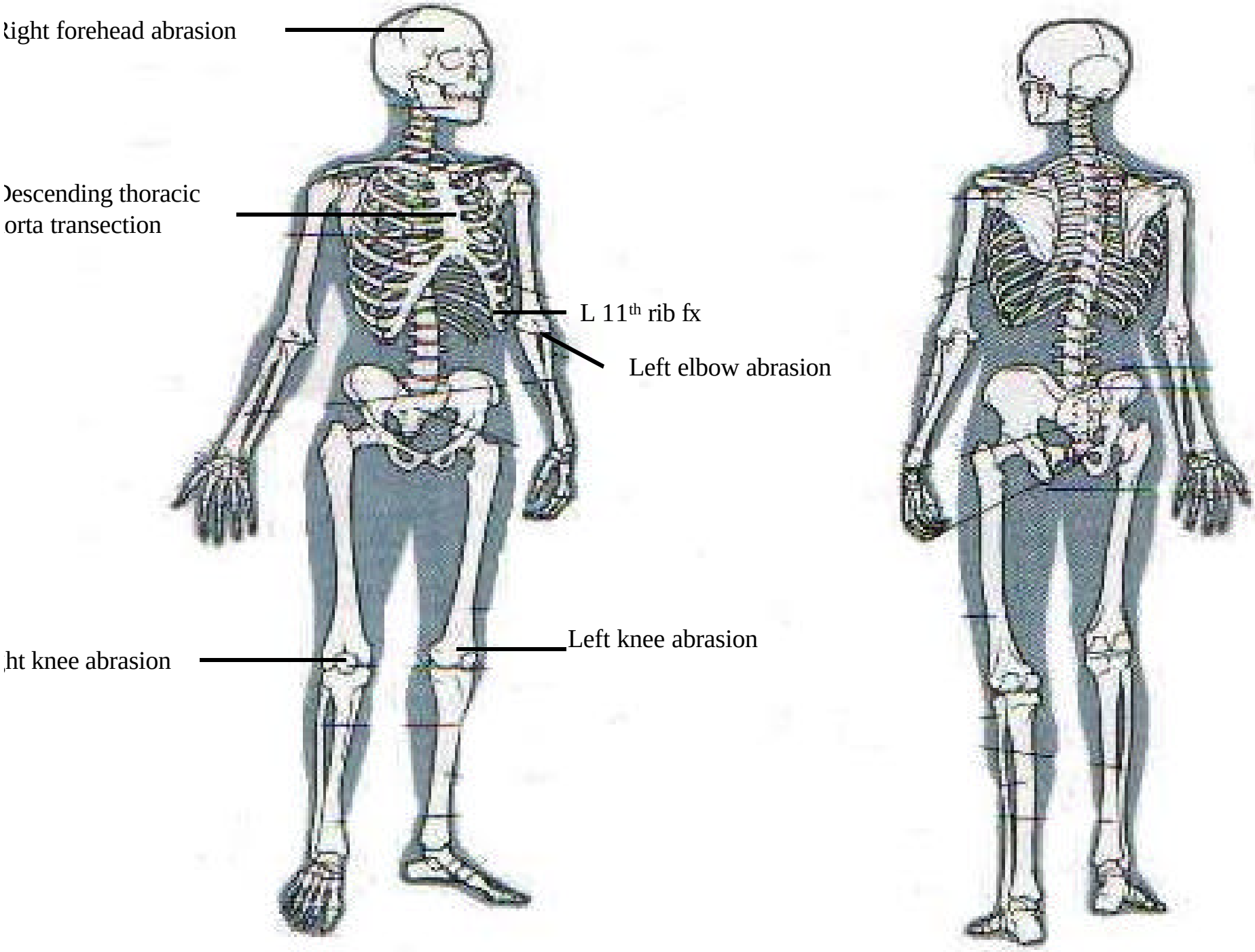
Descending aortic transection

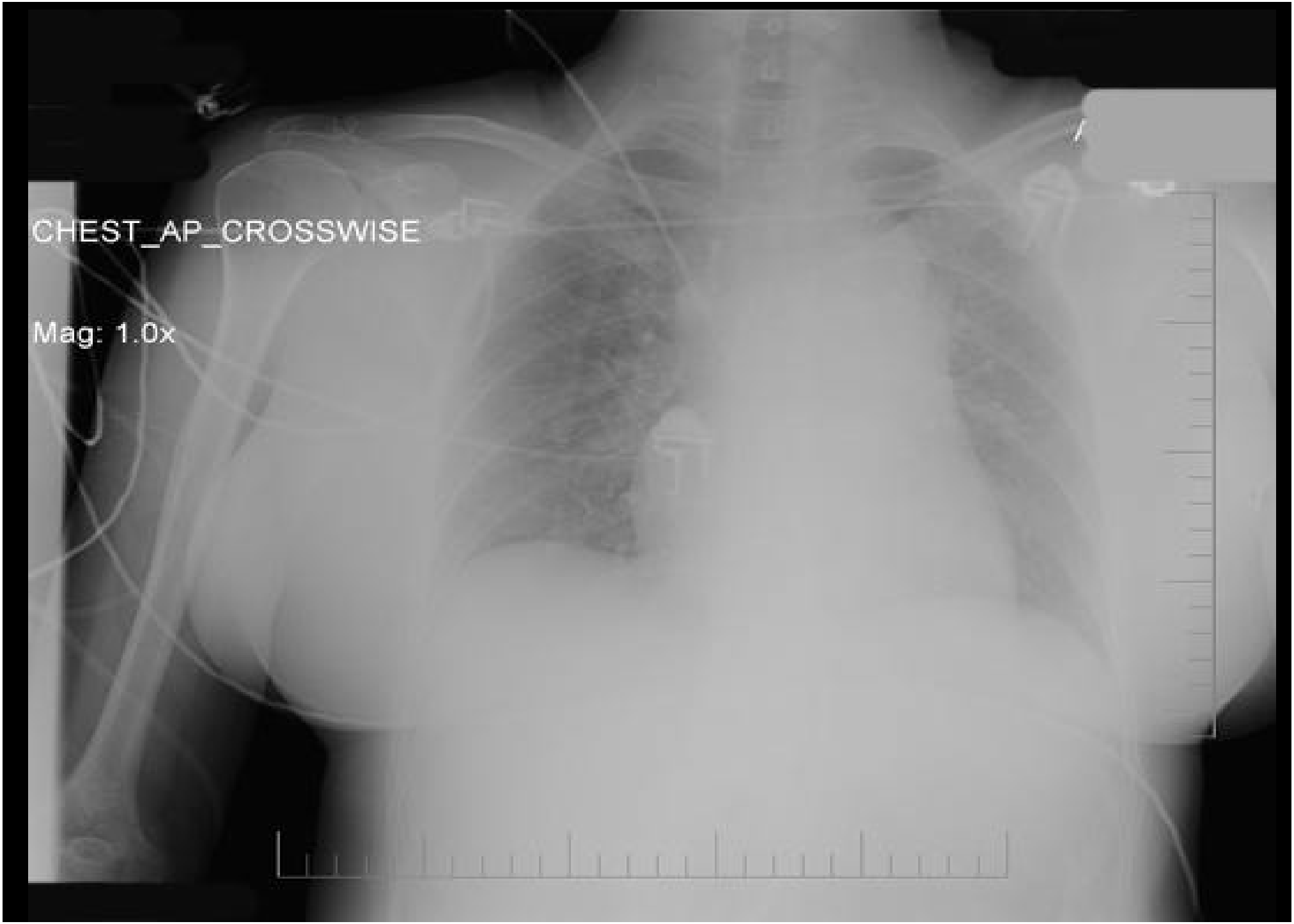
Left 11th rib fracture

Right forehead abrasion

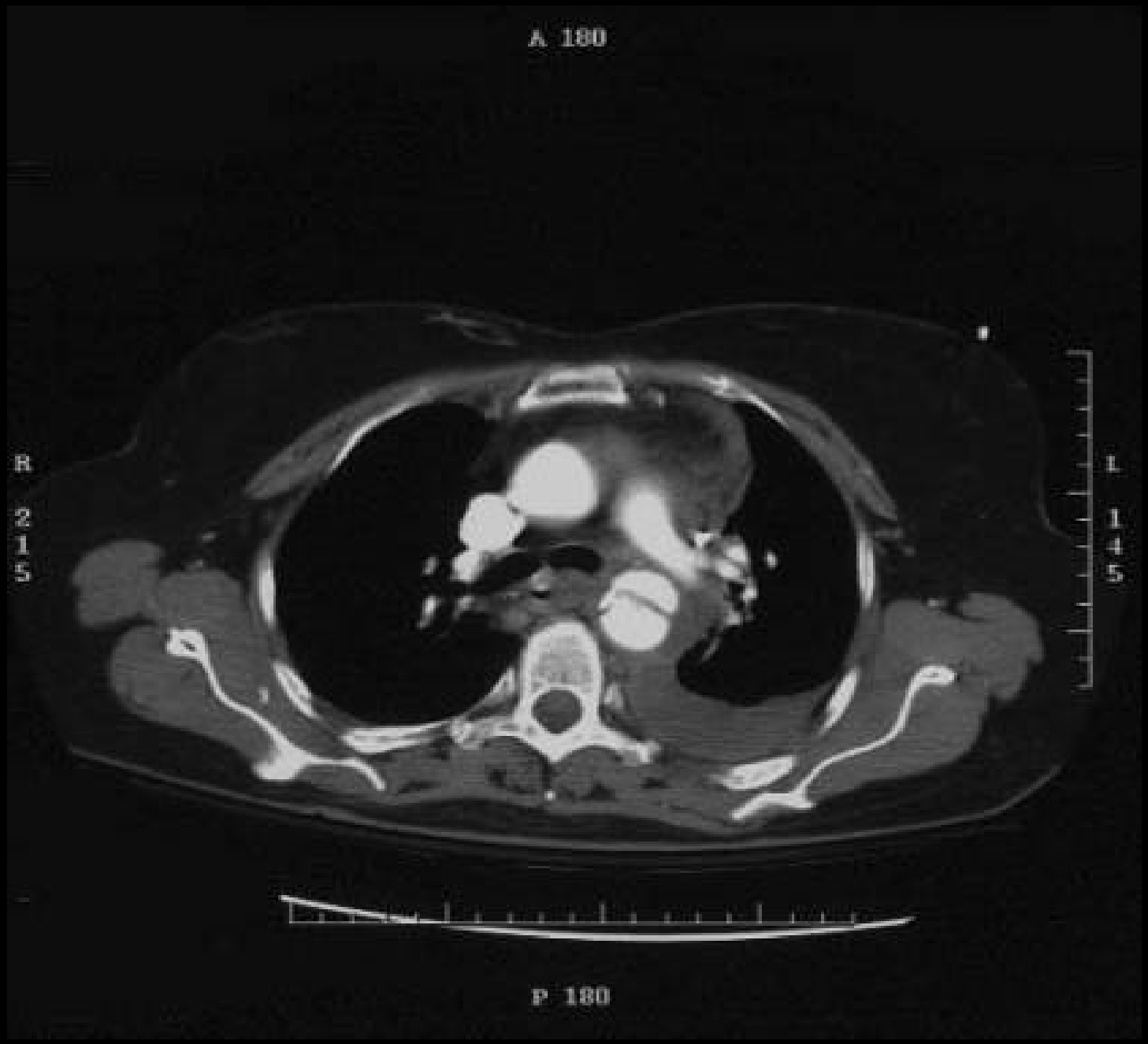
Left elbow abrasion

Bilateral knee abrasions


Right forehead abrasion
Descending thoracic
orta transection
L 11th rib fx
Left elbow abrasion
ht knee abrasion
Left knee abrasion


CHEST_AP_CROSSWISE
Mag: 1.0x

A 165
R
2
0
0
L
1
2
8
P 163


A 180
R
215
L
145
P 180

HOSPITAL COURSE

LOS:	**27 days (14 days ICU)**
Ventilator:	**12 days**
Complications:	**Pneumonia**
Disposition:	**Home**

Case Summary

	Case 1	Case 2
Age	76	57
Near Side Impact	Yes	Yes
Delta-V	15 mph	16 mph
Maximum Intrusion	6 in.	11 in.

According to Age

Gerald McGwin, Jr., M.S., Ph.D.,

Loring W. Rue, III, M.D.

Center for Injury Sciences

University of Alabama at Birmingham

Background

- Blunt injury to thoracic aorta (BAI) is rare and highly lethal injury.
- MVCs represent majority of cases.
- Despite improvements in care, no reduction in BAI mortality demonstrated over time.
- Prevention and more rapid identification of those with injury therefore important.

Background

- Majority of patients with BAI are young or middle aged.
- Rates of BAI currently not known thus those at greatest *risk* also unknown.
- Due to degenerative changes in vascular system elderly may be at greatest risk.

Accident led to Steve Allen's death

Allen

A minor traffic accident was apparently to blame in the October death of comedian and television pioneer **Steve Allen**, according to a just-released coroner's report. Allen, 78, died on Oct. 30 of what seemed to be a heart attack while napping at his son's Los Angeles-area home. A Los Angeles coroner's spokesman said that autopsy results showed that the real cause of death was a ruptured blood vessel, caused by injuries to Allen's chest from a minor traffic accident earlier in the day.

Study Goal

Calculate the incidence of BAI according to age and to evaluate age related differences in mechanism of injury.

Data Source

- National Automotive Sampling System (NASS) 1995-1999.
- Probability sample of all police-reported two-away MVCs in the United States.
- Scene, vehicle, collision, occupant, and medical characteristics collected.

Subject Selection

- All occupants of police-reported MVCs.
- Primary outcome of interest: injury to thoracic aorta (AIS codes 420202.4 through 420218.6).
- Will verify aortic injury information from hospital and/or autopsy records.

Variable Selection

- **Occupant characteristics**
  - Age
  - Seating position
  - Restraint use
- **Collision characteristics**
  - Crash type
  - Delta-V
  - Intrusion

Statistical Analysis

- All statistical analyses conducted using the NASS sampling weights (*SUDAAN v. 7.5.6*).
- KAI incidence calculated according to age using two denominators.
- Among subjects with KAI, occupant and collision

Results

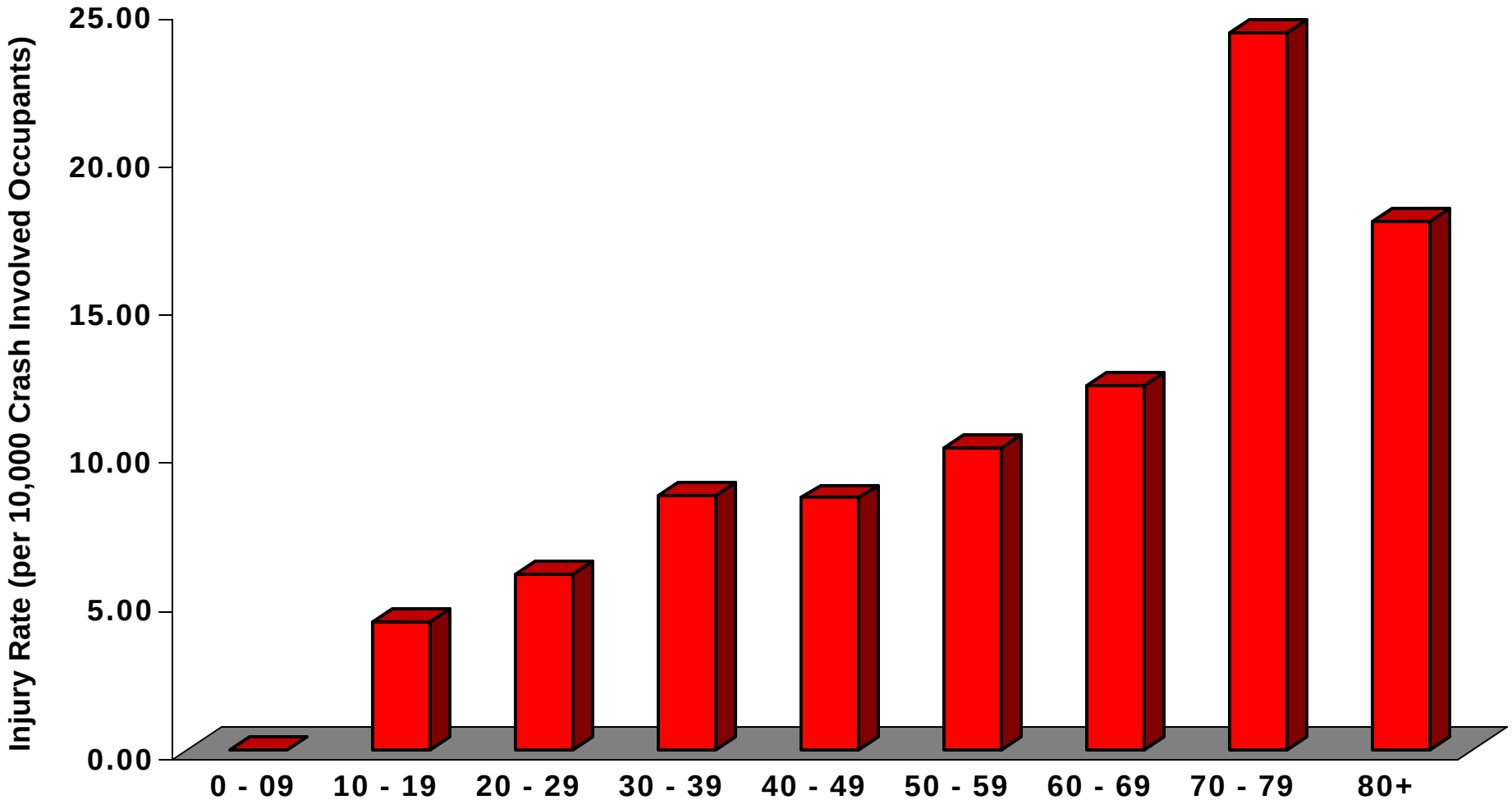
United States, 1995-1999

	Cases of Blunt Aortic Injury	Total Occupants	Injury Rate (per 10,000)
All Occupants	17,711	26,062,622	6.8
Occupants Seen at Health Care Facility	7,920	7,922,187	9.9

Patient Outcomes

	Survive %	Scene Death/Dead on Arrival %	Hospital Death %
Age Category			
0 – 9	0.0	0.0	0.0
10 – 19	7.0	93.1	0.0
20 – 29	20.1	78.1	1.8
30 – 39	16.0	82.4	1.6
40 – 49	12.2	86.9	1.0
50 – 59	4.7	95.3	0.0
60 – 69	11.4	80.5	8.1
70 – 79	4.8	92.1	3.1
80 +	0.0	76.5	23.5
Total	11.9	85.4	2.7

BAI Incidence by Age



Age	10-	20-	30-	40-	50-	60-	70-	80+	
No.	2,532	3,796	3,734	2,435	1,571	1,241	1,827	710	p-value
Driver									
Yes, %	30.6	77.6	88.1	90.1	73.8	66.7	56.0	52.4	<0.0001
Seatbelt Use									
Yes, %	19.4	17.2	21.1	33.7	36.8	58.2	19.4	25.9	<0.0001

Age	10-	20-	30-	40-	50-	60-	70-	80+	
No.	2,532	3,796	3,734	2,435	1,571	1,241	1,827	710	p-value
Airbag Deployment									<0.0001
Deployed	6.8	29.0	25.6	18.4	7.9	15.5	32.4	27.8	
Collision									<0.0001
Frontal	67.9	51.5	66.8	53.3	32.4	41.5	66.2	40.7	
Near Side	9.0	22.9	16.6	22.2	50.9	27.1	24.9	45.6	

Collision Characteristics

Age	10-	20-	30-	40-	50-	60-	70-	80+	
No.	2,532	3,796	3,734	2,435	1,571	1,241	1,827	710	p-value
Max. Intrusion (cm)									<0.0001
3 – 7	0.0	0.0	2.8	0.3	0.8	0.0	8.4	0.0	
8 – 14	0.0	1.6	7.7	0.5	0.0	9.1	11.8	9.6	
15 – 29	43.9	25.9	17.0	8.9	14.9	29.4	7.4	25.9	
30 – 45	31.0	15.3	16.3	29.5	49.0	8.0	41.9	24.6	
46 – 60	21.3	14.4	19.8	9.6	8.2	6.1	11.0	13.7	
61+	3.8	42.8	36.4	51.2	27.0	47.5	19.5	26.3	

Collision Characteristics

Age	10-	20-	30-	40-	50-	60-	70-	80+	
No.	2,532	3,796	3,734	2,435	1,571	1,241	1,827	710	p-value
Delta-V (km/h)									<0.0001
1 – 35	10.8	5.0	26.1	13.9	28.6	15.0	23.9	58.6	
36 – 49	38.1	44.4	31.5	12.3	50.7	33.5	54.8	35.2	
50 – 61	13.6	22.7	21.7	41.6	15.5	19.9	16.0	6.2	
62 – 160	37.6	27.8	20.7	32.2	5.2	31.6	5.2	0.0	

Validity of Results

- **Internal validity**
  - >90% vehicles inspected
  - Medical data from primary sources
  - Consistency of data
  - Misclassification possible; bias unlikely
- **External validity**
  - Generalizability function of sampling

Conclusions

- **Older adults have the highest rate of MVC-related BAI and their injuries tend to occur in less severe collisions.**
- **Atherosclerosis and calcification of the great vessels *may* explain this difference.**
- **A high level of suspicion for BAI among older adults should not be reserved for high-energy collisions only.**