بسم الله الرحمن الرحيم

(قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ العَلِيمُ الحَكِيمُ)

صدق الله العظيم

[سورة البقرة : ٣٢]

Road traffic accident (RTA)

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Road accident statistics

Total world wide death toll of Tsunami 2004

was about 230,000

But the annual worldwide death toll of road accidents is 1,200,000 !!!!

i.e. more than five times the Tsunami toll.

There are four main factors responsible in RTA:

1- The driver: is responsible for nearly 85% of accidents.

2**- The vehicle design:** defects in vehicles e.g. in brakes, tyre, lights, indicative of defective exhaust system of the car.

3- Absence of seat belts, head rest.

4- Environmental factors: include road engineering, the weather, road safety education for pedestrians and traffic law enforcement.

Auto accidents include:

* Injuries to pedestrians.
* Injuries to pedal cyclists.
* Injuries to motorcyclists.
* Injuries to occupants of the vehicle.

* Injuries to Pedestrians :

Usually the pedestrians who are at risk are young children and elderly people.

The site and nature of pedestrian injuries depend on :

The height of pedestrian.

The position of pedestrian in relation to the vehicle when struck either facing the vehicle , his back or his side to the front of the vehicle.

The feet of the pedestrian on the ground whether both fixed or one is raised.

The site of impact in relation to the center of gravity.

The height of the car .

The striking part of the vehicle whether the front or back.

The surface of the road and foot wear of the victim.

Pedestrian injuries:

1- Impact injuries:

a- primary impact injuries: the first part of the body struck by the vehicle.

b- Secondary impact injuries: other parts of the body struck by the vehicle.

2- Secondary injuries:

Injuries caused by the victim's striking other objects such as the ground. These injuries vary from impact abrasions, contusions, lacerations, and fractures, separate or in combination.

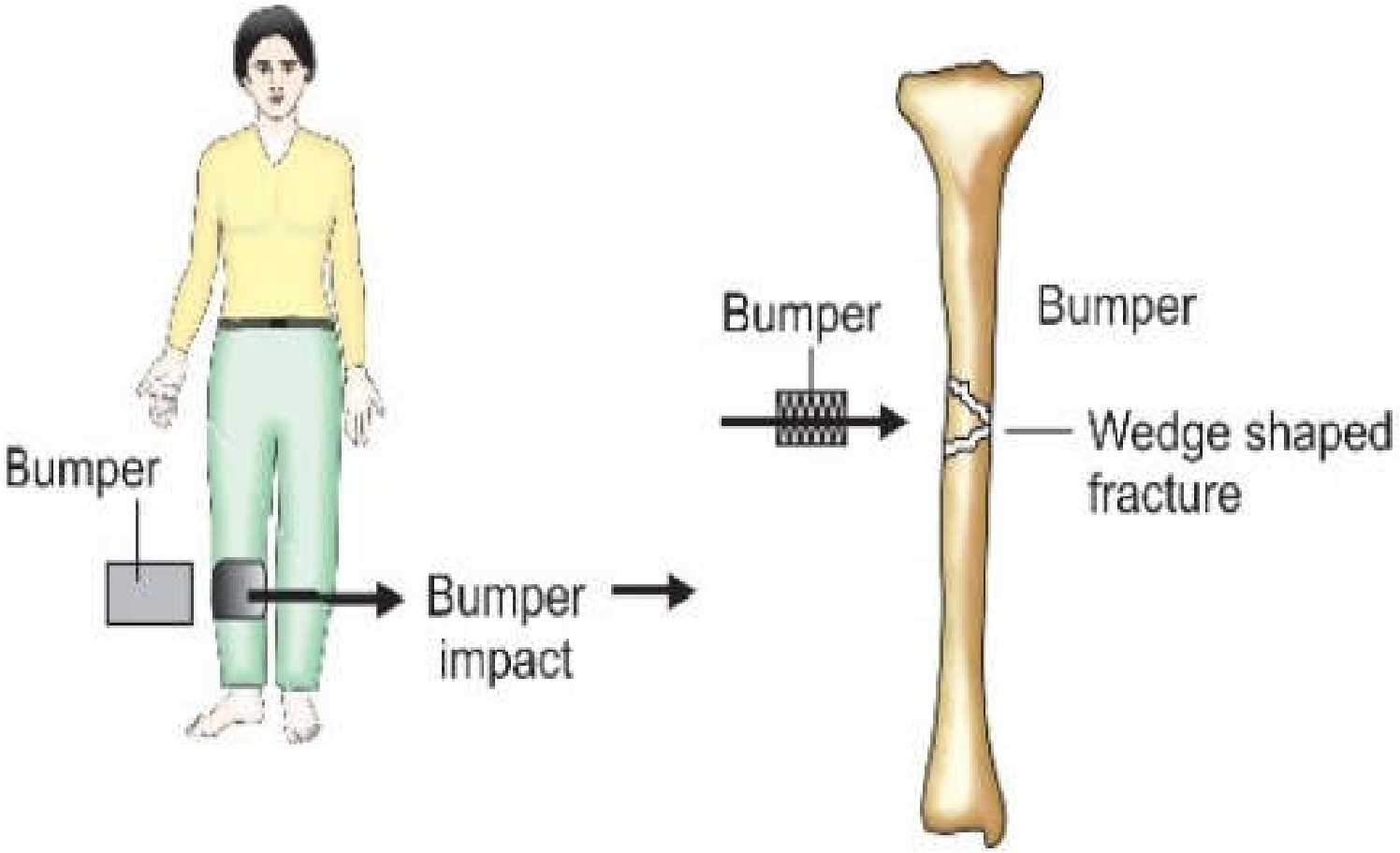
Bumper impact → Primary impact injury

Hood and Windscreen impact → Secondary impact injuries

Ground impact → Secondary injuries

If the front of the vehicle struck the pedestrian from behind:

The primary impact injuries will be on the back of the legs caused by the bumper of the car resulting in soft tissue injury and even compound comminuted fracture of tibia (may be with the fibula) in one or both legs, this is called bumper fracture (the bumper is responsible for femoral fractures in children) .


Bumper
Bumper
impact
Bumper
Bumper
Wedge shaped
fracture

Then the body is thrown backward where the buttocks and back comes in contact with the car causing injuries in the form of bruises even fracture dislocation of thoracic and or lumbar vertebrae, even may be fracture pelvis at high speed as the pedestrian may be moved upward and slides onto the bonnet (hood) and sustains secondary impact injuries of the head and shoulders as they come in contact with the windshield.

Alternatively the body may be thrown forward thus striking the ground and causing secondary injuries in the face, palms and knees.

If the front of the vehicle struck the pedestrian from the side:

The primary impact will be against the lower leg. The side of the knee, thigh, abdomen, chest, and the lateral aspect of the upper limb shows secondary impact injuries. The pedestrian is then pushed forward or to the side with resulting secondary injuries on striking the ground. The injuries affect the head, lateral aspect of the shoulder, and the upper part of thigh, buttocks.

Hood and Windscreen impact → Secondary impact injuries

If the pedestrian facing the front of the vehicle:

He may sustain intra-abdominal injuries and or injuries to the chest wall and thoracic contents. if the impact against the symphysis pubis, it leads to transverse fracture across the pubic rami which may be accompanied by retroperitoneal haemorrhage and shock.

Crush injury:

When the pedestrian struck by a vehicle, he may fall to the ground and run over by the wheels of the vehicle (common in children)

The following injuries may be present:

1- Impact abrasions, bruises, lacerated wounds.

2-chest: fracture rib, pleural tear, lung laceration, heart contusion even rupture of aorta.

3- abdomen: laceration and rupture of liver and spleen, tear of small and large intestine.

4- limbs: abrasions, contusions, lacerated wounds and fractures.

Injuries to pedal cyclists:

The injuries are usually mild but occasionally serious injuries may occur with fracture of bones. This usually due to friction between the skin of the rider and the surface of the road.

Bicycle spoke injury:

This injury occurs when a child falls from a bicycle and forces his feet and leg in between the spokes of the wheel.

Injuries to motor cyclists

The motor cycle may slide or overturn and if at the time of contact with the ground, the gas tank mechanical and explodes, a combination between thermal injuries may occur.

The rider may be ejected leading to severe head injuries. This is why the use of safety helmets is mandatory by law. The injuries suffered by the pedestrians struck by motor cycle do not differ from those occur when they stroke by car.

Injuries to the occupants of the vehicle

In unrestrained driver

On impact the lower half of the body thrust forward thus injuries the knees. The head strikes the wind screen, while the abdomen and chest may impact against the lower edge of the steering wheel.

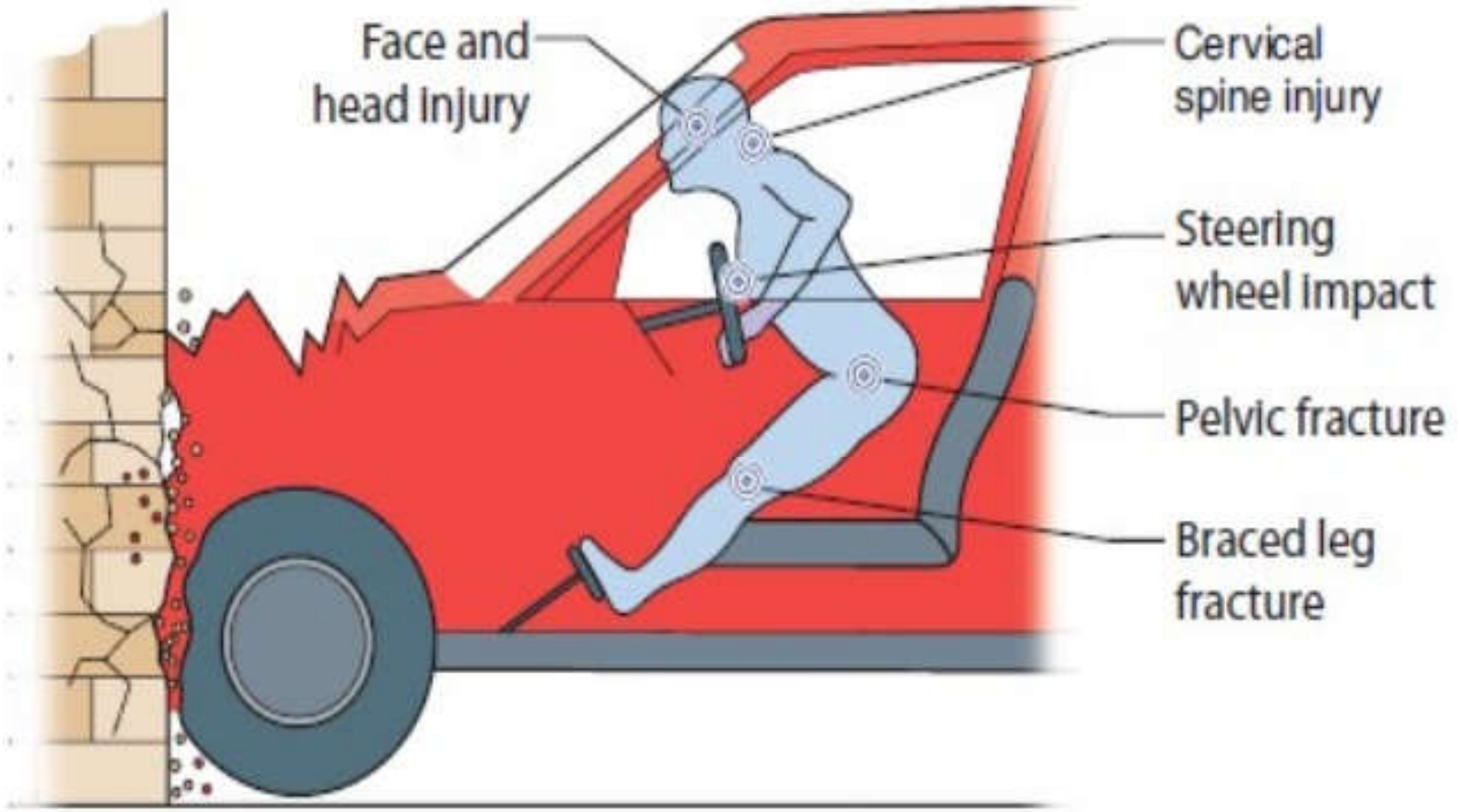


Figure 9.1 Major points of injury to an unrestrained driver of a vehicle in deceleration impact.

The right front seat occupants

As there is no steering wheel, they are commonly thrown through the wind screen if they are unaware that an accident occurred, or they may come in contact with the dash board.

In the back seat occupants

As there are no wind screen or dash board , they may be thrown forward striking the back of the front seat occupants or they may strike the side or top of the vehicle, even they may be ejected from the doors or window . Any type of injury can occur as abrasions, contusions, lacerations, fracture dislocation, tear or rupture of organs.

Injuries in driver and front seat occupant

1- Head & Neck

Head injury:

It is caused by striking the wind screen or its frame. Superficial cuts in the face and neck may occur from the flying glasses. Skull fractures and brain injury in the form of concussion, contusions, and intracranial hemorrhage can occur.

Neck injury:

A type of injury occurs in rear impact called whiplash injury. Where the head is violently extended and then violently flexed. This will leads to severe injuries to the neck which varies from sprains to rupture of the anterior longitudinal ligament even fracture and dislocation of cervical vertebrae, especially at the level of 5^{th} and 6^{th} cervical vertebrae or at the atlanto-occipital joint. The introduction of high back seats to support the neck (antiwhiplash seats)minimize this type of injury.

Whiplash injury:-

2- Chest injuries

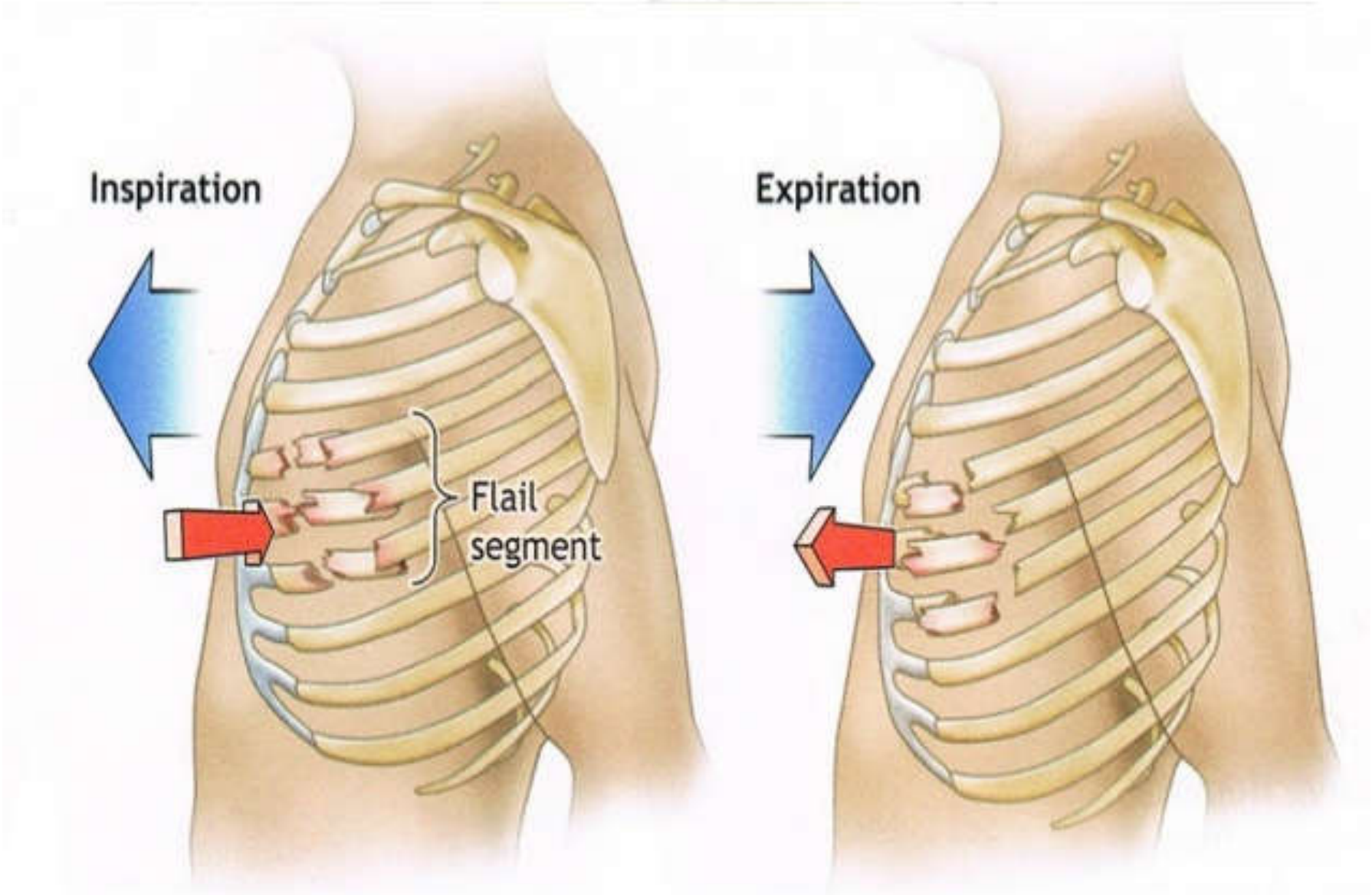
Chest injuries resulting from impact with the steering wheel occurs in the driver. The imprint of the lower rim of the steering wheel can be seen on the chest.

a - Sternum: is fractured or depressed.

b- Rib fracture: may tear in the pleura or laceration of the lung leading to pneumothorax or hemothorax, flail chest.

c- Heart and blood vessels: Contusions in the anterior wall (coup lesions) or in the posterior wall (contre coup lesion), rupture of the heart or large blood vessels. In the front seat occupant no steering wheel is present so chest injuries are less severe.

Flail Chest:-



3- Abdominal injuries

In the form of contusions, lacerations, tear of the liver, spleen , kidney and pancreas, rupture of hollow organs as stomach, intestine, fracture of the pelvis, bladder rupture, and retroperitoneal haematoma.

4-Extremeties

a- Upper limb :

The driver: usually aware that an accident will occur, so he put most of his force on the steering wheel by his hand, thus avoiding full impact of the chest and head against the steering wheel and wind screen. Injuries may be sprains or fractures of the wrist or forearm.

The front occupant seat: if aware of the accident will occur, he put his hands on the dash board and gets similar lesions as the driver.

b- Lower limb:

- The driver:

Knee injuries: due to impact of knee against dash board and its instruments panel.

Leg injuries: If the driver is aware that an accident will occur, he applies brakes, this may lead to fracture of tibia and fibula.

If the femur is adducted..›posterior dislocation of the hip.

If the femur is abducted….›fracture shaft and neck of femur.

Also may be fracture pelvic bone.

The front seat occupant:

May be aware of impending accident and apply brakes so leg injuries similar to those of the driver, also dash board injuries of the knees with fracture femur.

Ejection crash injury

Ejection from a vehicle results in severe and multiple injuries to occupants regardless of there original position in the car. Head, chest and abdomen bear the brunt of impact. Rib fracture occur in 2/3 of patients.

Seat belt injuries

very important in prevention injuries resulting from automobile collisions, particularly those due to ejection of the car occupants. But seat belts themselves may cause major injuries. These injuries vary with the type of seat belt in use.

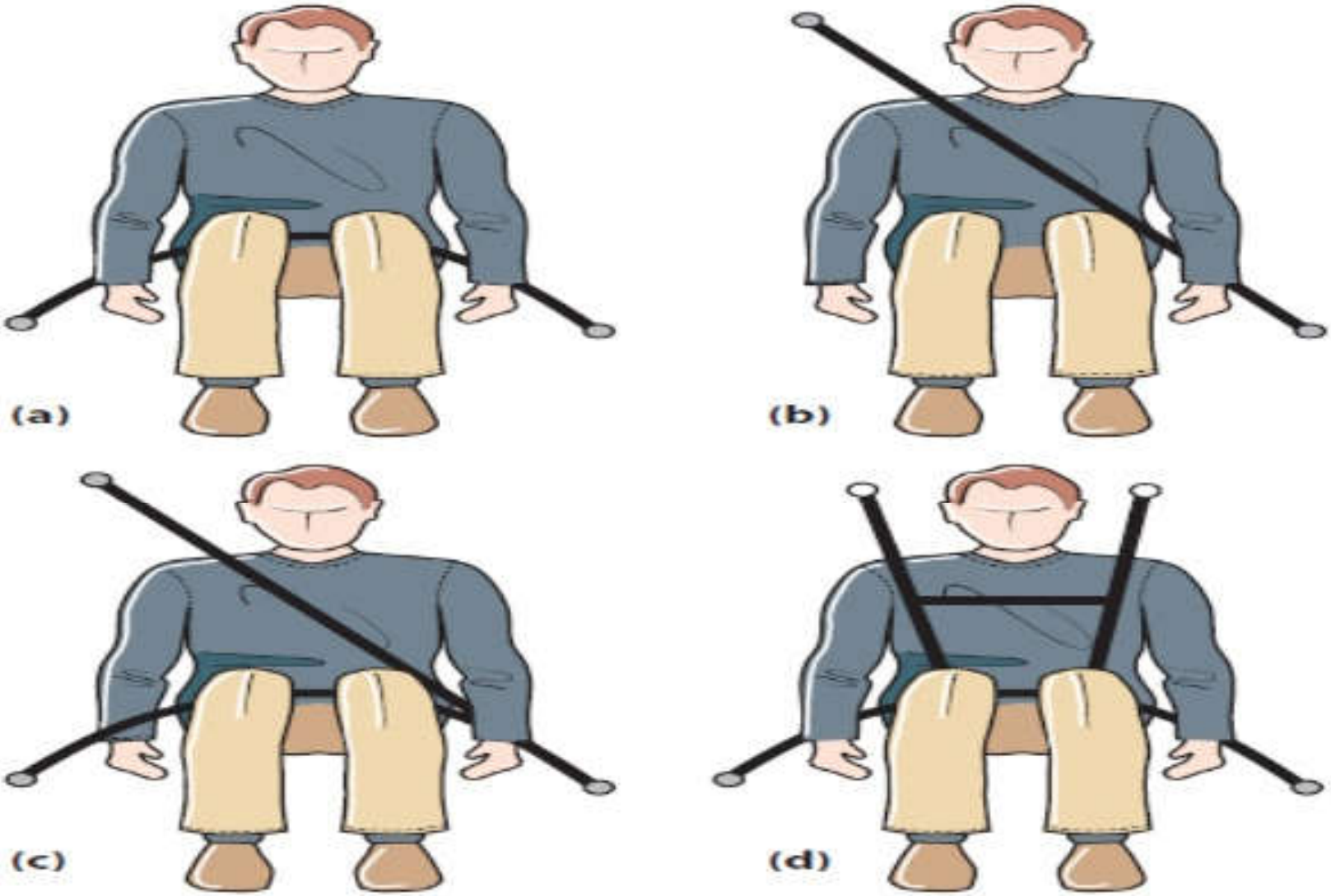


Figure 9.13 Types of seatbelt restraint: (a) simple lap-strap (dangerous to aorta); (b) diagonal only (can slip underneath); (c) diagonal plus lap-strap (usual car type); and (d) shoulder harness (used in aircraft and racing cars).

The Lap belt, for example, may produce injuries to the abdomen (rupture of small intestine, large intestine, mesenteric rupture and vascular injuries) . Pelvic injuries with bladder rupture and lumbar spine injury. Since the Lap belt offers no support to the upper half of the body, head ,neck, and chest injuries due to acute flexion of the body over the Lap occurs.

Medico legal investigation in road accident

1- The pattern of injuries.

2- The role played by a natural disease in the causation and outcome of the accident e.g. cerebrovascular accidents.

3- The accident may be a method for self-destruction e.g. suicide.

4- The accident may be a method for masking a homicide.

5- The role played by alcohol and drugs like barbiturates, tranquilizers, hallucinogens etc.…


Thank You