TRANSPORTATION INJURIES 2

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MOTORCYCLE INJURIES

INJURIES SUSTAINED BY MOTORCYCLIST

Injuries sustained by motorcyclist are much more serious than motor vehicle injuries because;

- Inherent instability of two wheeler compared to for wheelers
- Unprotected and lack of protective gear
- Even small motorcycles can attain high speed
- Their size is relatively so small that they are easily overlooked by larger vehicles
- Their weight is relatively much less than average four wheeled vehicles and they are therefore at a mechanical disadvantage
- The vehicle does not remain upright in an accident
- He is almost always thrown off and subject to very severe impact forces
- Rash and negligent driving.

CAUSES OF MOTORCYCLE ACCIDENTS

- Alcohol and drugs
- Reckless driving
- Environmental factors(pot holes,oil slicks,poor visibility,slippery road)
- Failure of drivers of cars to see the motorcycle
- Loss of control over vehicle may result in crash against stationary object with fatal results
- If driver is reckless and does not see or loses control over the vehicle,he may have his head or limbs amputated by cables or wires stretched across the road(uncommon).

INJURIES TO THE MOTORCYCLIST

When an accident occurs,the injuries are often severe as there is very little crushable material to absorb the impact and the driver and/ passengers are always thrown off.

INJURIES TO THE MOTORCYCLIST

All types of injuries may be present. In a high speed impact of a motor cycle there may be;

- Primary injuries(as a result of initial impact)(mostly open fractures of the tibia and fibula);followed by
- Secondary injuries from striking the ground(mostly fractures of the skull and cervical spine as well as contusions of the brain).

INJURIES TO THE MOTORCYCLIST

- Head and neck injuries ; include skull fractures,contusions and lacerations of the brain,intracranial hemorrhages,ocular and orbital open lesions,facial fractures,cervical fractures and lesions of the spinal cord
- Thoracic injuries ; include fractures of the sternum,clavicle, and ribs;hemopneumothorax;contusions and lacerations of the lungs and heart;and rupture of aorta
- Abdominal injuries include lacerations of the liver,spleen and kidney;rupture of the bowels and urinary bladder;and fracture of the pelvis
- In upper extremity,fractures of radius,ulna,and metacarpals are common

INJURIES TO THE MOTORCYCLIST

- In the lower extremity, open fractures of the tibia and fibula are most often seen;fractures of femur and metatarsals may be present
- Traumatic amputations in both upper and lower extremities may be seen
- Thermal injuries due to hot metal sliding against the street and fire caused by gas tank puncture
- Skid marks(grazes) on the skin due to contact with road gravel are seen.The direction of travel may be easily identified by the presence of skin tags at the rear most(far)end of these scratches.

CAUSE OF DEATH IN MOTOR CYCLE INJURIES

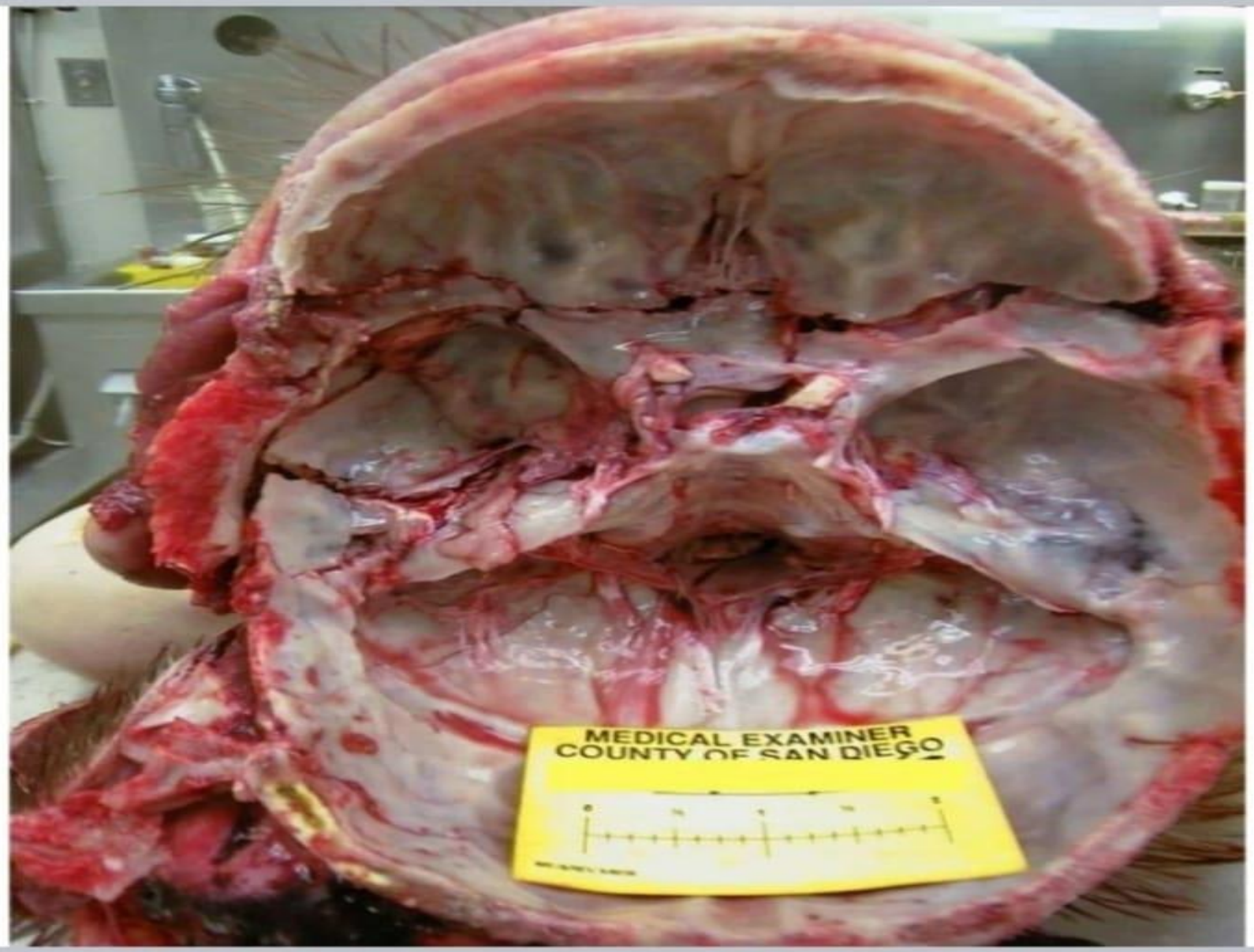
- **A fracture of the skull** with associated **brain injury** is the most common cause
- **Multiple fatal injuries** constitute typical fatal motor cycle accident
- **Submersion** may occur in attempt to cross a frozen lake(not realizing ice is not thick enough to sustain weight of the vehicle and its rider.

USE OF CRASH HELMETS

- This has reduced fatalities at low speeds
- Offer little or no protection at high speeds
- A crash helmet is designed to reduce friction of the head against the ground and make deceleration less drastic by allowing the protected head to skid across the ground rather than to come to an abrupt halt
- A full face helmet is better than an open face helmet as it provides greater protection against facial excoriations and fractures as well as against spinal injuries.

SKULL INJURIES TO THE MOTORCYCLIST

- Fall on the side with side impact to head results in basal fracture of skull especially hinge type(**hinge fracture;motorcyclists fracture/transverse fracture**)
  - Impact on the face causes fracture of facial skeleton
  - Impact on forehead causes **sagittal fracture** of base of the skull
  - Impact on chin causes **mandibular fracture**
  - Impact on crown of head by fall may cause **ring fracture**.
- **Fracture of temporo-parietal** bone due to fall on road resulting in impact on lateral aspect of the skull.



MOPED AND BICYCLE INJURIES

MOPED(MINI-BIKE) INJURIES

- **Primary impact injuries** of the legs;and
- **Secondary injuries** to head,shoulder,and trunk

FATALITY IN MOPED(MINI-BIKE) INJURIES

Where the speed is lower,the usual fatal injury is due to another motor vehicle striking the rider.

INJURY PANORAMA/PATTERN

It is the same as that of motorcycle accidents but a moped is estimated to be **only one-third as dangerous** as a motorcycle.

BICYCLE ACCIDENTS

The majority of fatal bicycle accidents are **collisions between bicycle and a motor vehicle**.

CAUSE OF DEATH IN BICYCLE INJURIES

The most common cause of death is **cranio-cerebral injury**.

TYPES OF BICYCLE INJURIES

When a bicyclist is struck by a motor vehicle,he sustains;

- **Primary impact injuries**(struck by vehicle);and
- **Secondary injuries**(at points of impact with pavement and bicycle)

Whilst being thrown off the bicycle,he may sustain **injuries from** handle bars and other **projecting parts**.

INJURIES TO THE BICYCLIST

- **Head injuries** include dental trauma,fracture of facial bones,contusions of the brain,fractures of skull and cervical spine
- **Trunk injuries** include mainly superficial contusions and excoriations;fractures of ribs,spine and pelvis seen;intra-thoracic and intra-abdominal lesions seldom seen but handle bars may cause rupture of bowels and laceration of liver,spleen or kidney
- **Injury to extremities** include shoulder contusions,clavicular fractures,metacarpal fractures,knee and ankle dislocations and fractures of lower part of tibia and fibula and rarely of femur and metatarsals

INJURIES TO THE BICYCLIST

- An injury peculiar to the bicycle riders,especially children,is the **bicycle spoke injury** which occurs when the child falls from a bicycle and his foot and leg are wedged between the spokes of the wheel.The result is compression or crushing of soft tissues of the leg.The most common site of skin necrosis is at the level of the lateral or medial malleolus.Other common sites are over the Achilles tendon or lateral aspect of the foot.Fractures of the ankle or lower part of the tibia and fibula may be seen.

SPINE AND SPINAL CORD INJURIES

SPINAL CORD INJURIES

The spinal cord is susceptible to;

1) Concussion
2) Compression
3) Pithing; and
4) Laceration

The spinal cord is liable to be damaged also when its vascular supply is interfered with.

CONCUSSION OF THE SPINAL CORD

- This may occur without any evidence of external injury.It may follow a severe blow to the back;a fall from the height;a bullet injury
- It is common form of injury in railway accidents and motor car collisions and is known as Railway spine
- Symptoms may not appear at once but come on after some hours when the patient may develop transient paralysis of the arms, hands,bladder,rectum,lower extremities with or without loss of sexual function
- Complete recovery may occur unless the cord is lacerated.

- Sometimes a momentary dislocation of the cervical spine in the region of C4-C6 may occur causing contusion of the spinal cord followed by a self reduction
- Such an injury may occur from a blow on the brow or chin or when a motor car comes to a sudden stop
- The forward thrust dashes the head against the windscreen of a car(**whiplash injury**) resulting in hyperextension of the head and consequent injury.
- This injury is likely to be missed and paralysis resulting therefrom regarded as hysterical unless the cord in the region is carefully examined
- An autopsy may show an area of hemorrhagic discoloration on the surface or in substance of the cord or subthecal effusions of blood in the case of hemorrhage in the substance of the cord
- The extent of hemorrhage must be demonstrated biserial sections of the cord

- examination of living persons for evidence of loss of sexual function impotency as a result of assault or accident involving the spine may pose a difficult forensic problem

- Blows on the spine not associated with fracture or dislocation may be followed by edema,venous thrombosis and softening of the cord
- Therefore when death is alleged to have been caused by violence and no trace of it is perceptible in other parts of the body it is necessary to inspect the vertebral column for evidence of some mechanical injury or morbid changes in the spine or cord
- This part of medicolegal exam investigation it's too often neglected

- **The spine and the spinal cord should be carefully examined in cases of;**
  - Local injuries
  - Sudden death following trauma without apparent local injury
  - Death from convulsions
  - Battered babies ; and
  - When such an examination is specifically requested by the investigating officer

COMPRESSION OF THE SPINAL CORD

- This is generally due to fracture or dislocation of the spine
- The common sites of fractures,dislocation,subluxations and compression are C4-C6,T3-T6 and T10-L3
- If the level of compression is about the 4^{th} cervical segment,death is seldom long delayed on account of asphyxia resulting from paralysis of respiratory muscles
- Death usually occurs within 24 hours if the three lower cervical vertebrae are injured
- When upper thoracic vertebrae have been fractured death may occur after two to three weeks due to complications of being bed-ridden(bed sources,cystitis,pyelonephritis,etc
- Life may be prolonged for years with partial paralysis of the lower limbs if the lower thoracic or upper lumbar vertebrae have been injured.

PITHING

- This is a process of killing brought about by pushing a small needle in the nape of the neck between the base of the skull and first cervical vertebrae or between the 2nd and the 3rd cervical vertebrae
- The puncture wound in this region proves almost immediately fatal as it injures the medulla and upper cervical cord which contains respiratory and other vital centers
- The wound may be so small(**concealed punctured wound**)that it may be missed at autopsy
- Murder by pithing is not altogether uncommon particularly in cases of female infanticide so it should be kept in mind and carefully look carefully looked for in appropriate circumstances.

LACERATION

- Laceration of the spinal cord without any external injury is not an uncommon method of causing death especially in children
- The neck is twisted and dislocated causing laceration of spinal cord
- This can also happen in wrestling
- Firearms can also cause laceration of the spinal cord even though the missile has not entered the cord
- The damage resulting from near-miss trajectories at higher velocities.

RAILWAY INJURIES

MEDICOLEGAL ASPECTS OF RAILWAY INJURIES

- Railway Injuries may be ;
- **Suicidal** ; or
- **Accidental**

SUICIDAL RAILWAY INJURIES

- A simple decapitation is commonly an indication of suicide and rarely of an accident
- If a person jumps in front of a train the injuries are very severe and although primary impact may be demonstrated usually the primary impact injuries are too extensive to afford any helpful interpretation
- On other occasions a simple decapitation may occur.

ACCIDENTAL RAILWAY INJURIES

- Traumatic amputation of limbs or trunk is commonly an indication of accident or rarely of a person throwing himself in front of a moving
- These injuries are sustained while trying to board fast moving train,walking on the rails or crossing them;while leaning out of the window;during a fall from a train and during collisions.

BOARDING A FAST MOVING TRAIN

- The person may be thrown off with resultant impact injuries and risk of getting crushed between the train and the platform.

RAIL WALKING AND CROSSING

- While walking on the rails,the injuries are usually severe and consist of impact injuries caused by contact with parts of the front of the engine and secondary injuries due to being thrown n and possibly run-over
- While crossing,the primary impact will be on the side and will usually involve the head and shoulders.

LEANING OUT OF A WINDOW

- This will produce almost exclusively head injuries the injured person being found either in the carriage or on the other side of the line.

FALL FROM A TRAIN

- Such injuries are usually in the nature of multiple abrasions with impact injuries due to striking objects
- Shock is usually a prominent feature.

COLLISIONS

- The victim will frequently show characteristic fractures of the leg similar to those found in motor car accidents
- In addition,transmitted force may cause compression fractures of the spine and secondary injury injuries to falling luggage or parcels usually occur.

NATURE OF RAILWAY INJURIES

- It will depend upon the position of the victim when struck on electrified lines electric burns and charring may be found.

EXTENT OF RAILWAY INJURIES

- It will depend upon the duration of contact with the live rail and may include bone.

DIFFICULTIES IN DIAGNOSING OF RAILWAY ACCIDENT DEATHS

- It is not uncommon in India to kill a person and place his body on a railway track and make it appear as a case of suicide or accident
- This aspect needs to be excluded in all cases when a dead body is found on a railway track

- While it may be difficult to give any opinion if the body is decomposed or badly crushed in mutilated it is possible in a number of cases to come to some definite conclusion by considering the following factors;
  - History
  - Scene of crime
  - Injuries
  - Hypostasis
  - Rigor mortis
  - Laboratory examination of viscera

HISTORY

- A careful inquiry should be made if the deceased was depressed had some incurable or chronic disease, if he was associated with drugs or abuse or if he was a member of some criminal gang.

SCENE OF CRIME

- Evidence of extensive blood stains covering a large area may indicate that the person was living at the time of accident.

INJURIES

- The presence of marks of throttling(manual strangulation or stab injuries definitely points to homicide the nature of railway injuries,whether antemortem or postmortem,solves much of the problem
- The age of various injuries as determined by naked eye microscopic examination and enzyme chemistry is also helpful.

HYPOSTASIS

- The incidence,extent and degree of fixation of postmortem lividity is important
- It may provide a valuable clue about the time since death which may be different from the time of the accident.

RIGOR MORTIS

- The presence and extent or the absence of rigor mortis should be noted
- It may offer supplementary evidence about the time since death.

LABORATORY EXAMINATION OF THE VISCERA

- Chemical examination of viscera may provide evidence regarding possibility of poisoning.

AIRCRAFT INJURIES

AIRCRAFT ACCIDENTS

Aircraft injuries result from either;

- **Crash accidents**; or
- **Flight accidents**

- The majority of aircraft accidents are crash accidents occurring while landing or taking off
- Flight accidents are normally very few.

CRASH ACCIDENTS

- The sudden deceleration on crashing is responsible for both the breakup of the aircraft and for most of the injuries to the occupants
- Both while landing or taking off the passengers are usually secured to their seats by lap dash type safety belts
- On crashing the forward momentum of the upper part of the body across the safety belt throws the head onto the back of the seat in front resulting in a fractured skull
- The impact may also be sufficiently severe to cause rupture of the liver spleen kidney and abdominal aorta

- Fire may occur in a fatal crash and complicate deep primary injuries by incineration
- The fire contains a high proportion of carbon monoxide fumes
- If the occupants survive the impact as well as the fire they are likely to be overtaken by carbon monoxide from the fumes before they can escape
- A very great problem in the aircraft crash is that of identification as the bodies are burned and charred or are dismembered and body parts are often co-mingled and scattered over a wide area sometimes inaccessible for days
- The methods used for identification include collection and correlation of specific and non specific relevant data

- **Specific data** collection relates to fingerprints,dental identification and X-ray comparisons
- **Non-specific data** collection that relates to personal property such as documents,jewelry,diary,etc.Body features such as scars,tattoos,operations,vaccinations,hair pattern,implanted devices,etc and visual identification of photographs
- Specially organized teamwork is necessary for this purpose
- DNA typing when in routine use could be most helpful

FLIGHT ACCIDENTS

- Most turbine powered and jet aircraft fly at an altitude between 25,000 and 40,000 feet
- Normally,the cabins are pressurized in such a way that the inside pressure is not allowed to fall below that found at an altitude of 8000 feet so that the effects of anoxia are minimal
- Door or window failure with explosive loss of cabin pressure may occur resulting in immediate loss of life from hypoxia amongst those who have those with heart or lung disease
- If the height is not restored to a reasonably safe altitude between 15,000 to 20,000 feet in at most quarter of an hour even the young and fit would also suffer
- At the same time the rush of air out of the cabin is sufficient to blow a standing or even a seated occupant out with it with consequent injuries which are mostly severe

- The deliberate destruction of commercial aircraft in flight has important medical legal implications
- The main difficulty facing the investigators is to distinguish sabotage from explosive decompression due to structural failure
- In the event of sabotage being known to be the cause of the accident, the responsibility for insurance passes from the all risk insurance to those underwriting war risks
- In these days of advanced technologies,an unexplained disaster in air should be suspected to be due to sabotage until contrary is proved
- The media box of the aircraft would be found scattered over a wide area without any logical pattern in case of mid-air explosions.

THE END