Blunt trauma is the most common cause of traumatic death and disability. The definition of blunt trauma is “the energy exchange between an object and the human body, without intrusion through the skin”.

Over 44,000 people die each year on US highways. The events during blunt trauma start at the vehicle collision and then continue to the body, organ and secondary collisions.

To understand how blunt trauma affects our body we must first understand the kinetics of blunt trauma.

**Inertia:**
- “A body in motion will remain in motion unless acted upon by an outside force”. *Newton*
- “A body at rest will remain at rest unless acted upon by an outside force” *Newton*

**Conservation of Energy:**
- “Energy can neither be created nor destroyed. It is only changed from one form to another”. *Newton*

**Kinetic energy:**
- Energy in motion

\[
KE = \frac{\text{Mass(weight)} \times \text{Velocity(speed)}^2}{2}
\]
- Double weight = Double the energy
- Double speed = Quadruple the energy

*Speed is the greatest determinant*

**Force:** *(Newton’s 2nd law of motion)*
- Emphasizes the importance of rate at which an object changes speed. This can be from acceleration or deceleration.

\[
\text{Force} = \text{Mass} \times \text{Acceleration}
\]
- The force that puts the object in motion must be absorbed before the object will stop.
Physics: There are basically three types of forces in blunt trauma.

- **Shearing:** Occurs when the organ and the organs attachments do not accelerate or decelerate at the same rate of speed. Examples would be the Aortic Arch, spleen or kidneys.
- **Compression:** This would be similar to placing an organ on a table and hitting the organ with a hammer. Every time you strike it cells are crushed and damaged.
- **Overpressure:** This is similar to hitting a closed paper bag with your hand...the bag pops. Bladder, bowel and lungs would be examples of these types of injuries.

There are several types of impact in regards to vehicular crashes.

- **Frontal:** 32% of all crashes are frontal and cause the occupant to go Down and Under...this will cause injuries to the knee, femur and hip as well as chest trauma from the steering wheel. Up and Over will cause bilateral femur fractures, hollow organ rupture and liver lacerations.
- **Lateral:** These crashes happen about 15% of the time, but cause over 22% of all traffic deaths. They cause upper extremity injuries, pelvic and femur fractures. Lateral compression can cause ruptured diaphragm, splenic and aortic injuries.
- **Rotational:** The impact from these crashes can be either a right/left or a front/rear type. These happen about 38% of the time and can be less severe unless the vehicle strikes another object.
- **Rear-end:** 9% of automobile crashes are rear-end type and will cause the occupants seat to propel the occupant forward which then will cause their head to be forced backwards stretching the neck muscles and ligaments. Hyperextension and hyper flexion are also possible.
- **Rollover:** There are multiple points of impact with a rollover that comprise about 6% of crashes. Partial or full ejections from the vehicle are possible and can be greatly decreased by the use of restraints.

When we examine the vehicle we need to examine the crumple zones, deformity of vehicle, intrusion into the occupants space and if the occupant used the vehicle restraints. Greater than 50% of all fatal crashes involve the use of alcohol and can be a factor in regards to injuries as well. Areas of the body that are associated with vehicular mortality are

- Head: 48%
- Internal or the Torso: 37%
- Spinal and Chest Fracture: 8%
- Extremity fracture: 2%
- Other areas: 5%
Several questions need to be asked as you arrive at the scene of the crash. How did the crash occur, what direction and speed were the vehicles traveling in? Was there a difference in the vehicle size and was there a secondary collision involved? Did weather or visibility play a factor, what about the use of alcohol or drugs? Was there a significant skid mark from either vehicle that would clue you into the speed involved? Take a look at the interior of the vehicle. Is there starring of the windshield, dash or steering wheel deformity? Then look at the amount of intrusion into the occupants space.

Now let’s examine some of the other causes of blunt trauma such as Motorcycle crashes. We need to figure out if the crash was from a low or a high speed collision. Was the rider injured from a frontal, angular or did he lay the bike down. The rider is usually ejected from the bike and we then need to consider did the rider strike just the ground or did they strike an object as well. In Illinois, the rider of a motorcycle does not have to wear a helmet. This increases the chance of a head injury by more than 300%.

Pedestrians struck by vehicles will vary based on whether the individual is an adult or a pediatric patient. Adults tend to turn away and run from the impact. Therefore, most of the adult injuries will be from the bumper striking the lower legs first and then the victim will roll up and over the vehicle as they are thrown.

Children on the other hand turn toward the vehicle and tend to have more anterior injuries. They will usually have the triad of injuries with femur and pelvic fractures from the bumper and grill and then head trauma as they strike the ground. They can also be thrown and possibly even run over by the vehicle.

Recreational accidents can also be from various vehicles. The problem with most of these items is they do not have any type of restraint for the rider. Vehicles such as snowmobiles, personal watercraft, wave runners and ATV’s can all cause blunt trauma from the riders being thrown or rolled over.

Another type of blunt trauma is falls. They can be down stairs, from a height and can be to several different surfaces. You have to look at how the person fell and from what height did they fall? What part of their body was impacted? These answers will help us predict what injuries there may be.

We can also have blunt trauma form any form of an explosion or blast. Blast injuries can come from dust, fumes or other explosive compounds that ignite. An explosion happens when there is fuel and an oxidant that combines and instantaneously ignites. This causes a heat and pressure wave that can injure us as well.
When there has been an explosion, there is a pressure wave created and changes in the atmospheric pressure from the movement of the blast wave. You may see associated burns, injuries from projectiles as well as the injuries from the displacement of the victim from the blast itself. Hollow organs are susceptible to rupture from the wave as it passes through the tissues.

Injury patterns will focus on rupture of air or fluid containing organs. There will be a forceful compression and decompression of the chest cavity which can cause the lungs to have destruction of the alveoli and there could be hemorrhage in the lungs. Pulmonary embolism, dyspnea and hemoptysis and pneumothorax are common in blast injuries. In the abdominal cavity there will also be a possibility of the release of bowel contest and disruption of the diaphragm from the force of the organs being pushed into the thorax.

Remember that they can also have hearing loss from the blast and there may have been projectiles as well. Treatment for the penetration of the body from the projectile would be the same as for any other wound or impaled objects. Burns would also be treated as any other burn would, but we must remember that the patient is also a trauma patient from the explosive event and we need to evaluate for injuries beyond the burn.

DCAPBTLS can be an acronym that will help us with any of these types of trauma. Look at the patient and during the exam ask your self if you have any…

- Deformity
- Contusions
- Abrasions
- Penetrations
- Burns
- Tenderness
- Lacerations
- Swelling

Our goal is to do a very rapid and thorough assessment through inspection, palpation and auscultation. The trauma guideline for scene time on any trauma should be less than 10 minutes. We can do our rapid assessment on the scene, and do our detailed assessment on the way to the hospital. Getting the patient to the trauma center as soon as possible is key to their survival.

Ref: Blunt Trauma – Markus Forsythe MD and Vic Vennenkar DO
McHenry Western Lake County EMS  
System Paramedic, EMT-B and PHRN  
Optional Continuing Education  
2019 #2  
Blunt Trauma  

Name: ___________________________________  
Department: ___________________________________  
Date: ___________________________________  

IF YOU ARE NOT A MEMBER OF THE MCHENRY WESTERN LAKE COUNTY EMS SYSTEM, PLEASE INCLUDE YOUR ADDRESS ON EACH OPTIONAL QUIZ TURNED INTO OUR OFFICE. OUR ADDRESS IS: NORTHWESTERN MEDICINE - MCHENRY HOSPITAL EMS, 4201 MEDICAL CENTER DRIVE, MCHENRY, IL 60050. WE WILL FORWARD TO YOUR HOME ADDRESS VERIFICATION OF YOUR CONTINUING EDUCATION HOURS.  

IF YOU ARE A MEMBER OF OUR EMS SYSTEM, YOUR CREDIT WILL BE ADDED TO YOUR IMAGE TREND RECORD. PLEASE REFER TO IMAGE TREND TO SEE YOUR LIST OF CONTINUING EDUCATION CREDITS. ANY QUESTIONS REGARDING THIS CAN BE ADDRESSED TO CINDY TABERT AT 224-654-0160. PLEASE FAX YOUR QUIZ TO CINDY TABERT AT 224-654-0165.
Across

3. In the acronym DCAPBTLS, P stands for.
5. Similar to placing an organ on a table and hitting with a hammer.
7. After a blast or explosion it is very common to have a loss of _____.
10. Illinois does not require the use of this item.
13. Vehicles such as snowmobiles, waverunners and ATV’s.
15. A body in motion will remain in motion unless acted upon by an outside source.
18. In an explosion, hollow organs are susceptible to _____.
19. Emphasizes the importance of rate at which an object changes speed.
22. This type of collision causes 22% of all traffic deaths.
23. Fractures to femurs, pelvis and head are common to what type of pedestrian?
24. This type of energy in motion.

Down

1. In the acronym DCAPBTLS, B stands for.
2. When we have a fall victim, you need to consider the______.
4. >50% of all fatal crashes involve the use of this.
6. An explosion happens when there is fuel and an _____ that combines and instantaneously ignites.
8. Similar to hitting a closed paper bag.
9. Organs and the attachments do not accelerate or decelerate at the same rate of speed.
11. In the acronym DCAPBTLS, D stands for.
12. This type of crash causes an occupant to go down and under.
14. Mass X _______ = Force
16. Right/left or front/back crash type.
17. The force that puts the object in motion must be _______ before the object will stop.
20. When part of the vehicle has been pushed into the occupants space it is called_______.

21. Type of trauma without intrusion through the skin.
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