BLAST RELATED INJURIES





OVERVIEW



- Five Categories of Blast Effects
- Pattern of Injuries
- Wounding Effects of Fragmentation
- Wounding Effects of Overpressure

LEARNING OBJECTIVES



Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives



- Primary
- Secondary
- Tertiary
- Quaternary
- Quinary

Primary

- Impact = Pressure
- MOI = Overpressure
- Injuries = Hollow organs (Lungs and TM)







Secondary

- Impact = Projectiles
- MOI = Debris from blast
- Injuries = Penetrating trauma



- Tertiary
 - Impact = Body vs. hard surface
 - MOI = Structural collapse
 - Injuries = Blunt trauma, crush injuries





- Quaternary Impact
 - Impact = Heat/flames
 - MOI = Burns and toxic injuries
 - Injuries = Burns, asphyxiation





Quinary

- Impact = Additives i.e. radiation (dirty bomb)
- MOI = Contamination
- Injuries = Varies







PATTERN OF INJURIES

Military

- Young and healthy
- Protective gear

Civilian

- Very young or old
- Poor health
- Little protective gear





EFFECTS OF FRAGMENTATION



- Fragments from:
 - Bomb
 - Environment
 - Human Body





EFFECTS OF FRAGMENTATION



Limbs

 Most commonly affected

• Eyes

 Susceptible to secondary and tertiary effects







Physics of Blast Waves

- Stress Waves Injures gas-filled organs (lungs, ears, intestines)
- Sheer Waves Cause tissue to move back and forth





Lung Injuries

- Second most susceptible organ to primary blast injury.
- Most common cause of death associated with the primary blast effect
- Injuries to the lung are

 -possible between 30-40 psi
 -50% possible at 80 psi
 -universally fatal in open-air blasts over 200 psi

- Signs and Symptoms
 - Onset may be immediate or delayed 24-48 hrs
 - Internal hemorrhage
 - Frothy, bloody secretions
 - Hypoxia
- Other injuries might include:
 - Pneumothorax
 - Hemothorax
 - Subcutaneous mediastinal emphysema



Lung Injury Treatment

- Difficult in a tactical setting
- Monitor for dyspnea and frothy sputum
- Provide oxygen as soon as it is available
- Limit IV solutions; avoid fluid overload
- Do not remove impaled objects
- TACEVAC ASAP





Auditory Injury

- Perforated eardrum =most common physical finding
- Can occur at as little as 5-15 psi
- Perforation is considered a marker for primary blast injury
- Absence of a rupture may lower the index of suspicion for primary blast injury (although it doesn't automatically rule out other blast injuries)
- Blast induced deafness causes considerable anxiety; may be permanent or may spontaneously resolve

- Signs and symptoms
 - Hearing loss
 - Bleeding from the ears

Treatment of auditory injury

- Not a priority, but should be addressed within 24 hours
- Most ruptures will heal on their own
- Avoid probing or irrigating
- Administer antibiotic eardrops if the canal is full of contaminated debris
- Be aware that blast induced deafness



Gastrointestinal

- Higher probability with detonations inside a building
- Solid Organs
 - Very rare in open air blasts
 - Reported in underwater blasts







- CNS/Traumatic Brain Injury
 - Common with blast injuries
 - Mild TBI may go undiagnosed, therefore <u>ALL</u>
 <u>PERSONNEL</u> involved in a blast incident should be referred to a medical officer for documentation and evaluation



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