

# Blast Injury

HARRT 2004

## PRIMARY BLAST INJURY

- Unique to HE explosions
- Damage sustained as a direct result of the blast wave
- Air-containing structures are the most susceptible:
  - Lungs
  - G.I. Tract
  - Ears (tympanic membranes)



## PRIMARY BLAST INJURY

- Damage occurs in 3 ways:
  - **Spalling:** Pressure wave moving from an area of high density to one of lower density.
    - Results in turbulence at the interface between the 2 areas and a shattering of tissue at the border.
  - **Implosion:** Compression of pockets of gas within areas of the body causing them to rebound to a greater volume as the wave passes.
  - **Acceleration/Deceleration** of different tissues at different rates and speeds



## PRIMARY BLAST INJURY:PULMONARY BAROTRAUMA

- Most common type of fatal blast injury.
- Generalized alveolar damage due to spalling effect:
  - Hemorrhage
  - Edema
  - Parenchymal/pleural lacerations
  - A-V fistulas
  - Acute Gas Embolism (AGE)
  - ARDS
  - Pulmonary contusions



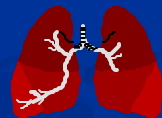
## SECONDARY BLAST INJURY

- Both HE and LE Explosions
- Damage sustained by the impact of debris energized by the blast.
  - Speeds > 1500 mph.
  - One's thumb in another's neck.
- Due to blast winds.
- Both blunt and penetrating trauma.
- Responsible for majority of casualties.
  - e.g. Oklahoma City: wounds due to glass shards.
  - Pipe bombs



## PHYSICAL EXAM

- A,B,Cs
- LUNGS
  - Contusion, pneumothorax
  - Dyspnea
  - Chest pain
  - Hemoptysis
  - Rales, rhonchi
  - Cyanosis
  - Respiratory S&S may occur later.



## PHYSICAL EXAM

### ■ G.I. TRACT

- Principally colon & stomach.
- Occult
- May require repeat exams
- Pain, nausea, vomiting, rectal bleeding, testicular pain.
- Especially in closed-space/underwater blasts
- Leibovici, '99: No such injuries found in open-air bombings in his series.

