warfare injuries

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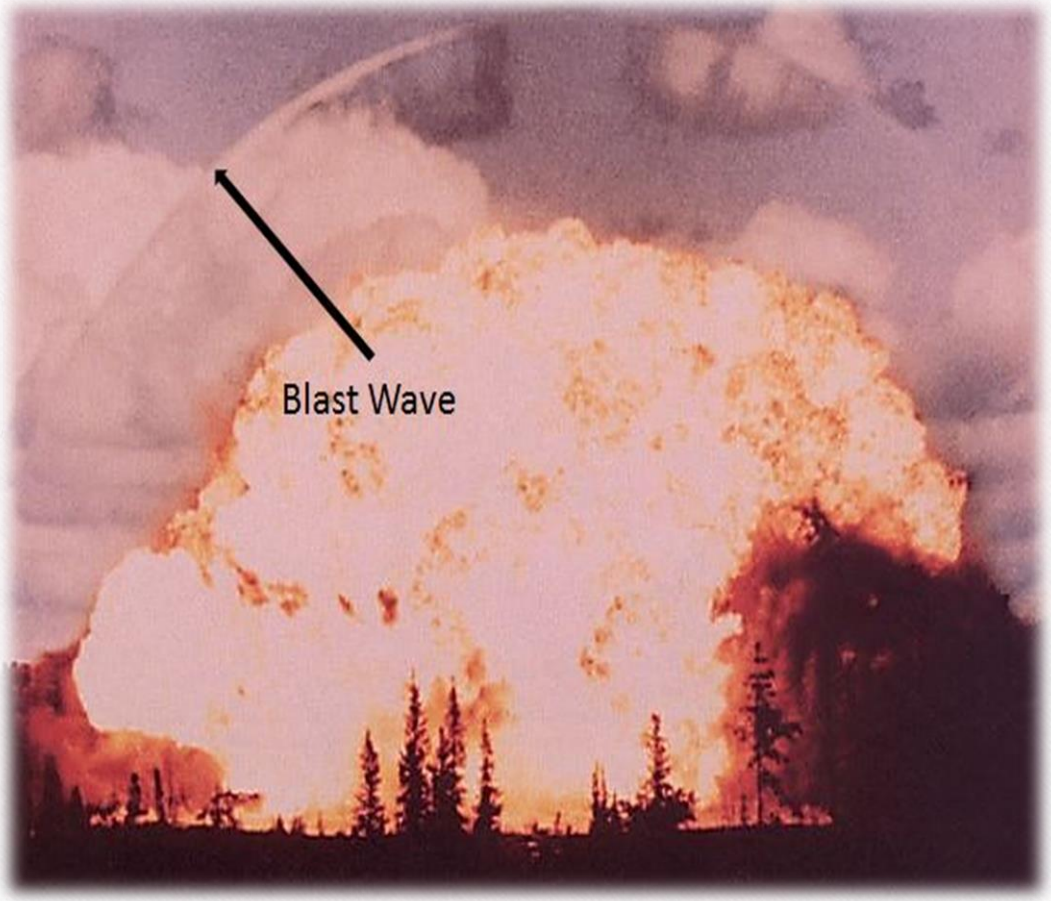
Blast injuries

- Blast injuries may be due to explosions involving domestic gas, industrial sites (eg mines/mills), or bombs. Often several mechanisms co-exist to cause injury.
- Blast injuries result from explosions that have the capability to cause multisystem, life-threatening injuries in single or multiple victims simultaneously.
- The extent and pattern of injuries produced by an explosion are a direct result of several factors, including the amount and composition of the explosive material

Blast wave (primary blast injury)



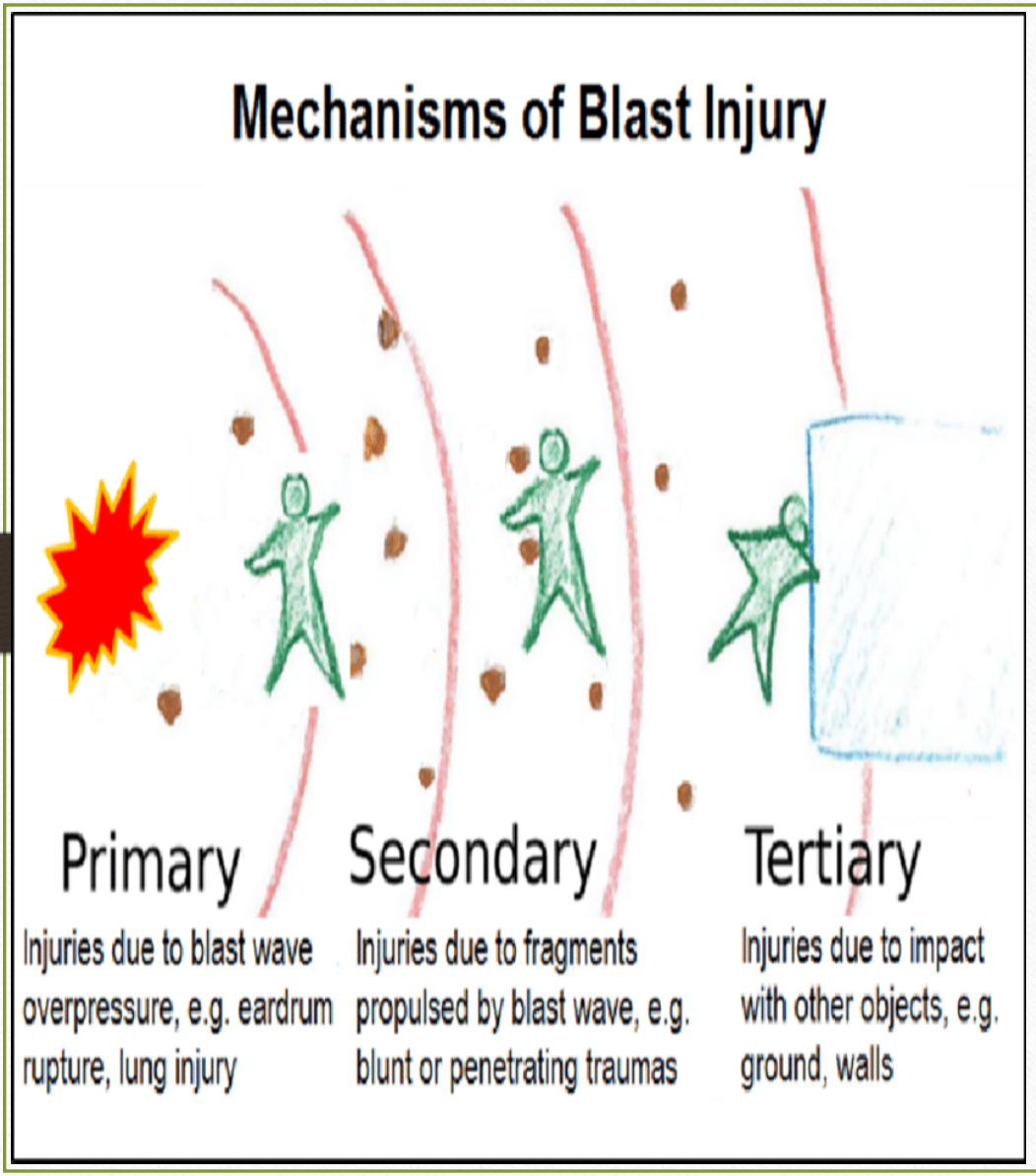
- This is an extremely short-lived pressure wave (lasting a few milliseconds only) which expands outwards from the explosive focus.
- The effects can be dramatically aggravated and reinforced by reflection from solid surfaces, such as buildings.

Blast wave injuries are caused by 3 mechanisms

1. Disruption at air/tissue interfaces (especially lungs and ears, producing blast lung and tympanic membrane rupture, respectively).
2. Shearing injuries at tissue/tissue interfaces causing subserous and submucosal hemorrhage.
3. Implosion of gas-filled organs leading to perforation of the GI tract and cerebral or coronary air embolism

Blast winds

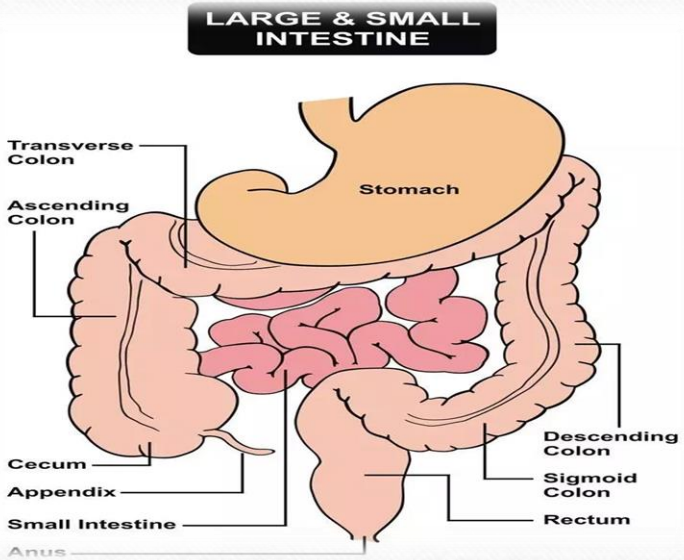
- These are fast moving columns of air that follow the initial blast wave. Their destructive force can be immense, leading to traumatic amputation or even complete dismemberment.
- Blast winds also carry debris (masonry, glass, etc.), which act as secondary missiles causing fragmentation injuries.

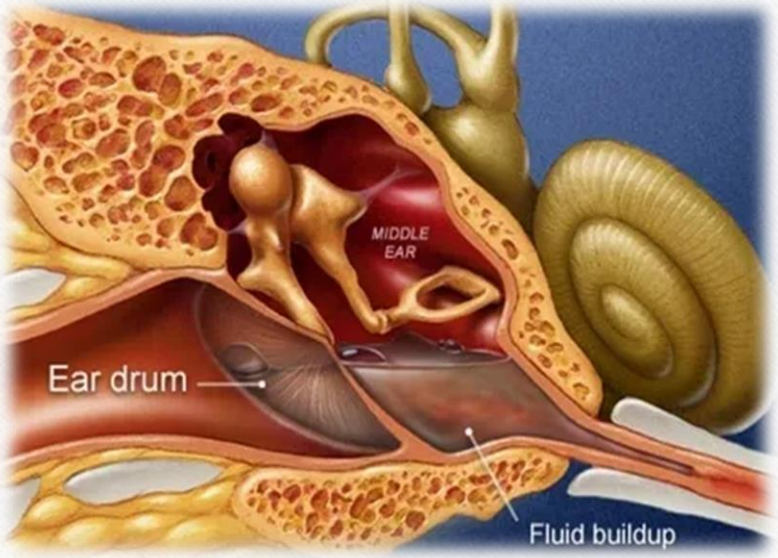


- *Fragmentation injuries :* Objects from a bomb (e.g nails, casing, and bolts) or flying debris (masonry, wood, glass) cause lacerations or penetrating injuries. This is classified as *secondary blast injury* .
- *Flash burns :*These are usually superficial, affecting exposed skin in those close to the explosion. Smoke inhalation may also occur.
- *Tertiary blast: injuries* result from individuals being thrown by the blast wind, often causing severe multiple injuries
- *Psychological:* The psychological effects of blast injury are often severe, comprising acute fear, anxiety, and the potential for chronic sequelae.

Signs and symptoms

- Unique patterns of injury are found in all blast types. The lungs, bowel, and middle ear are most susceptible to primary blast injuries (PBIs).





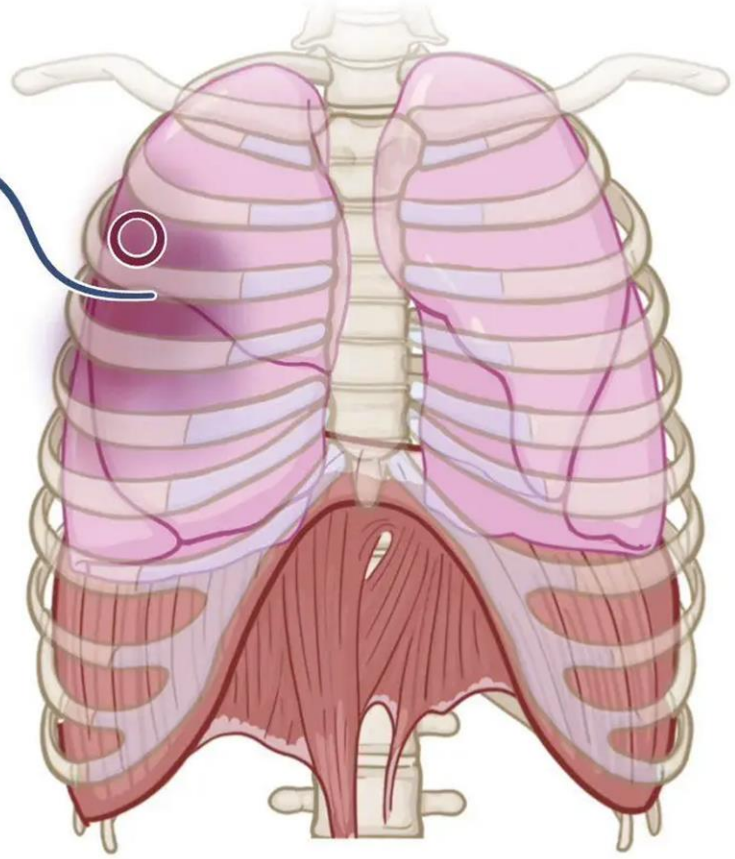
Pulmonary barotrauma

- the most common fatal PBI, may include the following:

1. Pulmonary contusion
2. Systemic air embolism, which most commonly occludes blood vessels in the brain or spinal cord
3. Free radical–associated injuries such as thrombosis, and disseminated intravascular coagulation (DIC)
4. Impaired pulmonary performance lasting hours to days
5. Acute respiratory distress syndrome (ARDS) may be a result of direct lung injury or of shock from other body injuries

PULMONARY CONTUSION

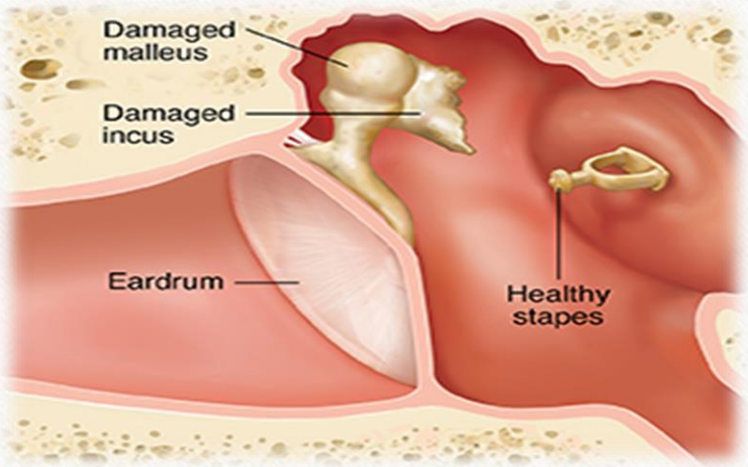
CHEST TRAUMA



INTERSTITIAL HEMORRHAGE
~ INHIBITS GAS EXCHANGE

Acoustic barotrauma consists of the following

1. Tympanic membrane rupture (most common)
2. Hemotympanum without perforation
3. Ossicle fracture or dislocation may occur with very high energy explosions



General aspects of treatment

- The principles of blast injury treatment are identical to those for patients with other causes of major trauma
- Clinical features in blast injuries may be delayed, both in terms of onset and development of clinical signs. This particularly relates to lung and intraabdominal complications; therefore, observe all patients for at least 48hr

The approach to wounds

- Consider and record the following
- *Length* : preferably measure. If not, use the term 'approximately' in the notes.
- *Site and Orientation* : vertical, horizontal or oblique.
- *Contamination* : by dirt or other FBs may be obvious.
- *Infection* : either localized or spreading
- *Neurological injury* : test and record motor and sensory components of relevant nerves.
- *Depth* : wounds not fully penetrating the skin are 'superficial'. Do not try to judge depth of other wounds before exploration.
- *Vascular injury* : check for distal pulses.

classification of wounds and injury

- *Incised wounds* May also be referred to as cuts. Caused by sharp injury (eg knives or broken glass) and characterized by clean-cut edges
- *Lacerations:* Caused by blunt injury ,the skin is torn, resulting in irregular wound edges. Unlike most incised wounds, tissues adjacent to laceration wound edges are also injured by crushing and will exhibit evidence of bruising
- *Puncture wounds :* Most result from injury with sharp objects, although a blunt object with sufficient force will also penetrate the skin
- *Abrasions:* these result from blunt injury applied tangentially

- *Burns*
- *Bruises:* Bruising reflects blunt force (crush) injury to the blood vessels within the tissues, resulting in tender swelling with discoloration: sometimes localized bleeding collects to form a *hematoma.*
- *Scratches:* These may comprise either a 'very superficial incision' or a 'long, thin abrasion'

Wound management

- Thoroughly clean all wounds to decrease risk of infection.
- The standard agent used for wound cleaning is 0.9 % (normal) saline.
- Devitalized or grossly contaminated wound edges usually need to be trimmed back (debrided)

Wound closure

- There are three recognized types of wound closure:
- *Primary closure :* Surgical closure (by whatever physical means) soon after injury.
- *Secondary closure :* No intervention: heals by granulation (secondary intention).
- *Delayed primary closure:* Surgical closure 3–5 days after injury

Wounds not usually suitable for primary closure in the ED i

1. Stab wounds to the trunk and neck.
2. Wounds with associated tendon, joint or neurovascular involvement.
3. Wounds with associated crush injury or significant devitalized tissue/ skin loss.
4. Other heavily contaminated or infected wounds.
5. Most wounds > 12hr old (except clean facial wounds).


Thank you