

# JOINT TRAUMA SYSTEM



## AURAL BLAST INJURY/ACOUSTIC TRAUMA AND HEARING LOSS

### CLINICAL PRACTICE GUIDELINE (CPG) TRAINING

*Joint Trauma System Trauma Care Educational Program*



# DISCLOSURE/DISCLAIMER



- ◆ No financial disclosures
- ◆ The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, the U.S. Army or Air Force Medical Department, the U.S. Army or Air Force Office of the Surgeon General, or the Department of Defense or the U.S. Government.

# PURPOSE



- ◆ These slides are based on the JTS Aural Blast Injury/Acoustic Trauma and Hearing Loss CPG which helps providers identify and treat aural trauma and hearing loss to prevent morbidity and preserve as much function as possible through early intervention.
- ◆ Date of CPG publication: 27 Jul 2018
- ◆ JTS CPGs are evidence-based guidelines developed by subject matter experts in the military and civilian communities. CPGs are compiled from DoD Trauma Registry data, health data abstracted from patient records and after action reports.
- ◆ Information contained in this presentation is only a guideline and not a substitute for clinical judgment.

# AGENDA



1. Background
2. Summary
3. Aural Blast Injury Facts
4. Temporal Bone Fractures
5. Symptoms
6. Treatment
8. Absolute Indications for Ear, Nose & Throat (ENT) Referral
9. References
10. Performance Improvement (PI) Monitoring
11. Appendices
12. Contributors

# BACKGROUND



- ◆ Approximately 2% of total force develops permanent injury annually.
- ◆ Service members exposed to hazardous noise, greater than 140dB, are at high risk for acoustic trauma and hearing loss.
- ◆ Service members exposed to blasts are at risk for both aural and acoustic trauma.

# SUMMARY



- ◆ Blasts are noise hazards in addition to other blast effects.
- ◆ The tympanic membrane (TM) is the most sensitive organ to primary blast effects, but all components can be affected resulting in conductive hearing loss.
  - ◆ Risk of injury is determined by proximity to source of blast.
  - ◆ Ear can also be subject to secondary, tertiary, and quaternary blast effects.



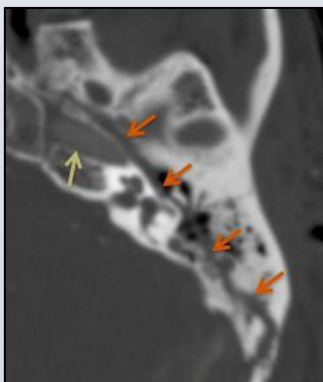
# AURAL BLAST INJURY FACTS

- ◆ The ossicular chain can also be injured by blast effect.
  - ◆ Fracture or disarticulation
  - ◆ Healing of tympanic membrane can stiffen the ossicular chain.
  - ◆ Injury causes conductive hearing loss (CHL) with or without sensorineural hearing loss (SNHL).
- ◆ Vertigo after a blast may be due to traumatic brain injury or inner ear injury.

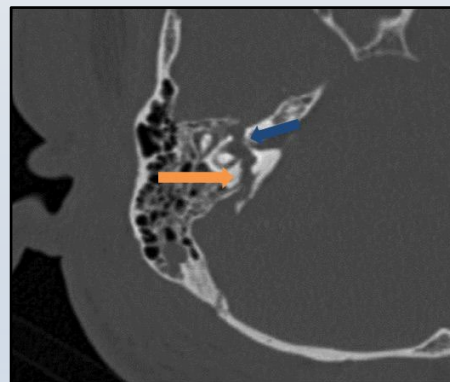


# TEMPORAL BONE FRACTURES

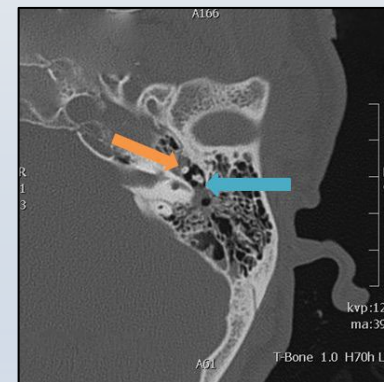
- ◆ Temporal bone fractures can affect ear canal and hearing.
  - ◆ Risk of meningitis with CSF leak
  - ◆ Facial nerve injury possible with temporal bone fractures
    - ◇ Full evaluation of facial nerve function
    - ◇ Referral for expert consultation (otolaryngologist/ENT) for possible intervention if evidence of injury



Temporal bone fracture



Temporal bone fracture - cochlea



Temporal bone fracture - separation of malleus & incus



# SYMPTOMS



## ◆ Symptoms of noise injury

- ◆ Hearing Loss
- ◆ Acute Tinnitus
- ◆ Aural Fullness
- ◆ Recruitment (ear pain with loud noise)
- ◆ Troubles localizing sounds
- ◆ Difficulty hearing in a noisy background
- ◆ Vertigo



Hemotympanum

◆ Patients with symptoms should be directed to self-report for evaluation and treatment as soon as practicable

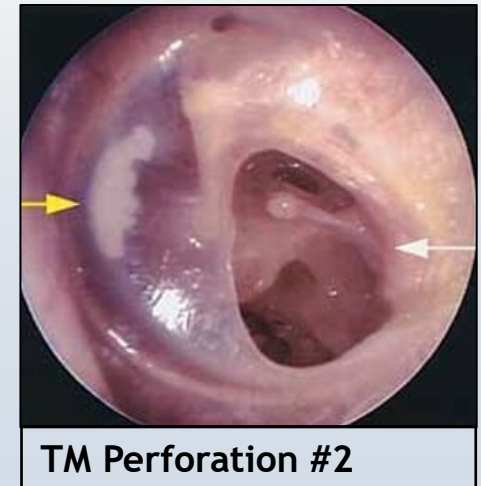
# SYMPTOMS



Patients exposed to blast should have focused assessment of hearing function and evaluation of the ear

◆ Signs of TM perforation include:

- ◆ Symptoms of SNHL
- ◆ Bloody ear discharge
- ◆ Signs of conductive hearing loss (CHL)



# TREATMENT



- ◇ If debris in the external auditory canal or middle ear, treat with a fluoroquinolone and steroid containing antibiotic (i.e. ciprofloxacin/dexamethasone drops).
  - ◆ Do not irrigate canal.
  - ◆ Instruct patient to maintain strict dry ear precautions until TM perforation healed/repaired.
  - ◆ Most heal within 8 weeks.
- ◇ If concerned for temporal bone fracture, broad spectrum antibiotic prophylaxis and expert consultation is recommended.

# TREATMENT



- ◆ Vertigo may be due to vestibular trauma.
  - ◆ Patients should undergo Dix-Hallpike test and canalith repositioning if positive.
- ◆ Hearing loss greater than 72 hrs warrants hearing test/audiogram.
  - ◆ Restrict from further noise exposure until complete evaluation.
  - ◆ Patient with threshold shift greater than 25 dB in three consecutive frequencies should be considered for steroid therapy.
  - ◆ Patients should be evaluated by an ENT.

# ENT REFERRAL



## Absolute Indications for ENT Referral

- ◆ Temporal bone fracture
- ◆ Hearing loss (HL) > 72 hrs or duty limiting HL
- ◆ TM perforation not resolved after 8 weeks; refractory drainage or significant SNHL
- ◆ Vertigo not resolved within 7 days
- ◆ Clear ear drainage
- ◆ Persistent discolored ear drainage after 3 days of topical antibiotic/steroid combination
- ◆ Facial nerve paralysis
- ◆ On audiogram:
  - ◆ Pure tone threshold average across 500, 1000, and 2000 Hz > 30 dB or any hearing threshold > 35 dB
  - ◆ Any hearing threshold greater than 45 dB at 3000 Hz or 55 dB at 4000 Hz

# ENT REFERRAL



## Relative Indications for ENT Referral

- ◆ Debris in the external auditory canal that does not clear with topical drops
- ◆ Inability to visualize the TM despite treatment with topical drops
- ◆ Persistent dizziness
- ◆ Patient with significant communication problems regardless of the hearing test results
- ◆ Tinnitus that interferes with patient duty performance

# PI MONITORING



## ◆ Intent (Expected Outcomes)

- ◆ All patients with signs or symptoms of acoustic trauma receive hearing screening at concussion care centers.
- ◆ All patients at risk for TM injury are assessed when initially evaluated at each MTF in the continuum.

## ◆ Performance/Adherence Metrics

- ◆ The patient is assessed by otoscopy and audiometry for symptoms of acoustic trauma.
- ◆ The patient was assessed for TM injury during the initial evaluation at each MTF.

## ◆ Data Source

- ◆ Patient Record
- ◆ Department of Defense Trauma Registry

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# APPENDICES



- ◆ **Appendix A: Dix-Hallpike Test**
- ◆ **Appendix B: Epley Maneuver**
- ◆ **Appendix C: Additional Information Regarding Off-label Uses in CPGs**

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