Joint Trauma System

Unexploded Ordnance (UXO) Management

Clinical Practice Guideline (CPG) Training

Joint Trauma System Trauma Care Educational Program

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Purpose

- These slides are based on the JTS Unexploded Ordnance Management CPG which provides details on the procedures to safely remove unexploded ordnance from combat patients, both loose and impaled, to minimize the risks to providers and the medical treatment facility while ensuring the best outcome for the patient.
- Date of CPG publication: 14 Mar 2017
- 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.

Summary

- Rare but persistent problem in combat casualties; there have been at least 7 cases since 2005.
- All patients require an initial inspection to find and remove all weapons and ammunition prior to entry to a transport vehicle or treatment facility.
- Ordnance should be removed expediently in an isolated ancillary surgical site with the minimum required personnel.
- Military ordnance retained by patients can be a risk to all individuals and equipment along the continuity of care.
  - Military ordnance for purposes of this CPG includes items such as bullets, grenades, flares and explosives.
  - Can be “loose” – stored in patient’s gear or pockets.
  - Can be “impaled” – penetrating into the patient body.

Background

- Propelled explosive devices are the most likely to impale. Examples: mortars, rocket propelled grenades, 40 mm projectiles.
- Consist of:
  - Propulsion system
  - Trigger mechanism
  - Main explosive charge
- Should be assumed inadvertent event occurred to cause item to not explode.
- All retained ordnance should be considered armed.

Background

Trigger mechanism is often on the tip of the main explosive charge.

- Can be set off by pressure or possibly light, electricity or thermal energy.
- Simply reorienting the patient and exposing trigger to sunlight or using cautery may trigger device in some instances.

Portable rocket launcher.
Photo by Sgt. Richard Jones. Defense Visual Information Distribution Service

Evaluation

- Inspect all patients to find and remove all weapons and ammunition prior to entry into a transport vehicle or treatment facility.
  - Give identified items to the patient's unit representatives or the area Explosive Ordnance Disposal (EOD) team.
  - Place items in a safe location (i.e. UXO pit) if no other options.
- When impaled UXO is identified on initial trauma evaluation, all non-essential personnel must go to a safe location and higher command notified.
  - Always be prepared for this regardless of where you are in the continuum of care, it may be missed earlier.

Evaluation

- Casualties with suspected or confirmed impaled UXO should only be moved or evacuated if absolutely necessary.
  - Surgical or diagnostic capabilities should be moved to the patient location.
  - If movement required, keep patient positioned in the same position they were found in to prevent motion from triggering device.
  - If using rotary wing vehicle, consult with aircrew to ground the patient to the helicopter to avoid static discharge triggering device.

UXO Removal

- Safe removal requires coordination between local security, base command element and EOD personnel.
  - Base security/command team
    - Patient location cordoned off to predesignated location.
    - Keep non-treating personnel out of blast radius.
    - Command team at medical treatment facility (MTF) accepting patient should be notified if a patient with known UXO being transferred.
  - EOD personnel
    - Advise and assist in construction of UXO barricade for location of removal and storage of device.
    - Be readily available.
    - Evaluate and provide input on type, triggering mechanism, and likelihood of discharge of ordnance present.
    - Possibly assist in surgery.

UXO Removal

- During triage at every level of care, the triaging officer must always inspect soldiers for UXO.
  - If possible, triage should be done outside the main treatment facility.
  - Metal detector wand can be used with little risk.
  - Comfort care can be provided if the patient is moved to a safe distance.

Outside UXO treatment area.

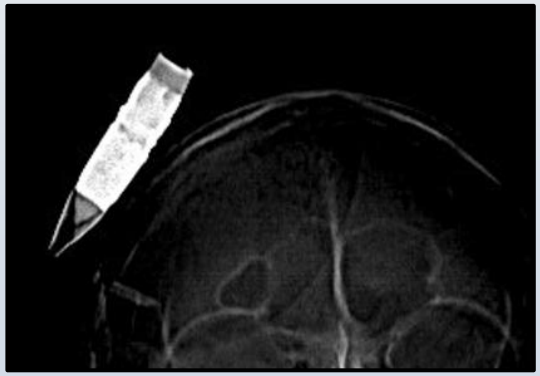
Inside UXO treatment area

UXO Removal

- Removal should be done at an ancillary surgical site when time and casualty flow permit.
  - Established outside the main surgical facility with adequate lighting and operative equipment readily available.
  - Area must be level and have ample space for all patient movement, portable x-ray, explosive barriers and required field operating tables.
  - Do not remove UXO in a contained bunker
  - Establish area during initial MTF setup – well before patient arrives.
- Once UXO is removed, patient can be moved from segregated locations to main MTF.

Imaging

- Plain radiographs are generally considered safe, but do not reorient patient to obtain films. Prevent motion that can trigger device.
- Computed tomography and ultrasound effects on UXO are undocumented. Avoid these modalities at this time.



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Equipment Requirements

Surgical instruments and adjuncts

- Use of electrocautery, mechanical blood warmers, monitors, blood pressure gauges, infusers or pumps should be minimized.
- Non-powered saw and drill options should be used.
- No combustible agents in vicinity of patient.
- UXO surgery equipment and supplies should be prepared and identified when treatment facility established.

Operating Personnel

- Unnecessary people should be removed from the vicinity of the UXO.
  - All equipment should be laid out prior to operation to eliminate an OR technician when possible.
  - A surgical assistant should be used only when necessary.
  - Required personnel should be designated when treatment facility established and practice.
- Personnel should wear gown and glove over ballistic protective equipment or EOD bomb helmet and suit.

Anesthesia

Anesthetic considerations

- Use general anesthesia. If UXO is retained in an extremity, then a peripheral nerve block is appropriate.
- Limit the use of supplemental oxygen. Place oxygen tank behind a barrier to limit combustible sources.
- If possible, place the anesthesiologist away from the patient, but close enough to view monitoring equipment.

Surgical Intervention

- Surgical strategy and priorities
- Remove the ordnance by the most expedient means possible.
  - May require en-bloc resection or amputation of the limb.
  - Ordnance should be exposed to a degree that will allow removal of the object in the same orientation as it lies in the body.
- Avoid twisting or pushing forward UXO.
- Avoid contacting the UXO with hands or surgical equipment.

Surgical Intervention

- Stabilize limb if in an extremity.
- Limit damage control for other injuries to procedures to save life and limb.
- Once UXO removed, gently hand off to UXO personnel or place in explosive containment device.
  - If placed in device, move patient to safer location.
  - Patient can be moved from segregated locations to main MTF.

Special Situations

- Finding UXO in the MTF operating room
  - Follow core principles as possible: minimize staff, reduce equipment that can trigger, limit patient movement.
  - Notify facility leadership and EOD.
  - Pause operation if patient stable and have protective care brought to team.
  - Biological and chemical impaled UXO
- A command decision on how to proceed is needed.
  - If decision made to provide full care, individuals should be fully protected including all appropriate biological-chemical gear (including gloves) and ballistic gear over it.
  - UXO should be immediately handed over to EOD and the patient and medical staff decontaminated before moving into the MTF.

Special Situations

Impaled UXO in deceased patients

- Screen deceased individuals using a metal detecting wand or x-ray.
- Take same precautions to secure the UXO in deceased individuals as you take with a live patients.

Unexploded ordnance patient.
Photo by Airman 1st Class Gwendalyn Smith. Courtesy of Defense Visual Information Distribution Service.

PI Monitoring

- Population of Interest

  All patients with retained ordnance

- Intent (Expected Outcomes)
  - EOD consult documented for patients in population of interest.
  - Treatment occurred outside of ER/OR.
- Performance/Adherence Metrics
  - Number and percentage of patients in population of interest with EOD consult documented.
  - Number and percentage of patients in population of interest who are evaluated and treated outside of emergency room/operating room.
- Data Source
  - Patient Record
  - DoD Trauma Registry

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Appendices

- **Appendix A:** Table of UXO Practices
- **Appendix B:** UXO Personal Protection Equipment
- **Appendix C:** Additional Information Regarding Off-label Uses in CPGs

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