Unexploded Ordnance (UXO) Management

Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series
Purpose

This CPG 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.

Presentation is based on the JTS Unexploded Ordnance (UXO) Management CPG, 14 Mar 2017 (ID: 41). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.
Agenda

1. Summary
2. Background
3. Evaluation
4. UXO Removal
5. Imaging
6. Equipment Requirements
7. Operating Personnel
8. Anesthesia
9. Surgical Intervention
10. Special Situations
11. Performance Improvement (PI) Monitoring
12. References
13. Appendices
14. Contributors
Summary

- All patients require an initial inspection in order 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.

Unexploded ordnance patient.
Background

- Rare but persistent problem in combat casualties.
  - At least 7 cases since 2005

- 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.
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.
Trigger mechanism often on 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.
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.
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.
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 provide assistance in surgery.
UXO Removal (2)

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 surgical treatment area.

Inside UXO treatment area.
UXO Removal (3)

- 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 not documented. Avoid these modalities at this time.

Courtesy of 455th Air Expeditionary Wing Public Affairs, Defense Visual Information Distribution Service
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

- People not absolutely necessary 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 (continued)

- 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.
PI Monitoring

Intent (Expected Outcomes)

- EOD expertise is essential for aiding in the safe removal of the UXO.
- It is essential to protect medical personnel and the surgical facility from damage that could render the MTF mission non-capable.

Performance/Adherence Measures

- EOD was contacted early in the management of the case.
- The procedure was carried out in an ancillary surgical site away from the MTF.

Data Source

- Patient Record
- Department of Defense Trauma Registry (DoDTR)
References


8. COL Louis N Finelli, DO, U.S Army, Deputy Armed Forces Medical Examiner-Personnel communication in ref to loose and impaled UXO in deceased patients arriving back in the US for processing. (June2015).


Appendices

- **Appendix A**: Table of Unexploded Ordnance (UXO) Practices
- **Appendix B**: UXO Personal Protection Equipment
- **Appendix C**: Additional Information Regarding Off-Label Uses in CPGs
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