Amputation: Evaluation and Treatment
Agenda

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Contributors

- LtCol Wade Gordon, MC, USAF
- CDR Luke Balsamo, MC, USN
- LtCol Max Talbot, RCMS, CF
- LCDR Charles Osier, MC, USN
- LTC Anthony Johnson, MC, USA
- John Shero, MHA
- LTC Benjamin Potter, MC, USA
- CAPT Zsolt Stockinger, MC, USN

Slides: Maj Andrew Hall, MC, USAF

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This CPG provides evidence–based guidelines for amputation of extremities in combat casualties.
Summary

- Amputation may be required as a damage-control procedure in a massively injured patient.
- Intact or ability to restore perfusion can delay decision to amputate.
Key Principles of CPG

- Summary
- Background
- Decision Criteria
- Evaluation
- Precautions
- Amputation Expectations

- Amputation Prep
- Amputation
- Post Operative Management
- PI Monitoring
- References
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Amputation Terminology

- **Traumatic Amputation**: Immediate extremity amputation caused by the wounding mechanism.

- **Primary Amputation**: Performed by a surgical team after evaluation of the mangled extremity and deciding not to pursue limb salvage.

- **Secondary Amputation**: Amputation occurs after an initial attempt at limb salvage.
  - Early: Within 90 days
  - Late: After 90 days

Background

Primary amputation performed at Role 2
Evaluation

- Evaluation of extremity begins with thorough inspection of the wound and perfusion and control of active hemorrhage.
  - May require surgical wound extension to inspect all levels of tissue.
  - Doppler and diagnostic arteriography are adjuncts to evaluation of perfusion.
- Gross decontamination and meticulous sharp debridement of non-viable tissue for all war wounds (see *War Wounds CPG*)
When deciding to amputate, timing hinges on vascularity of the injured extremity. Consider the following:

- Determine if intact or potential to restore perfusion by vascular repair or shunt.
- If perfusion can be restored, decision to amputate for nerve or bone loss can be deferred until later.
- Amputation may be necessary as a damage control procedure in a massively injured patient due to the amount of time required to restore perfusion.
Ipsilateral fractures should be stabilized and should not impact your decision to amputate.

Scoring systems to predict amputation need are not widely accepted or validated in the combat trauma population.
Primary and early secondary amputations are most commonly performed for:
- Vascular injury
- Nerve injury not amenable to repair or functional extremity
- Extensive loss or contamination of soft tissue

Late secondary amputations are generally performed due to patient preference or major complications.

Prolonged damage control procedures for other injuries and patient instability resulted in prolonged ischemia of lower extremity necessitating early secondary amputation.
Thorough inspection of all levels of tissue of the wound are required.

- Extent of the zone of injury dependent on mechanism, treatments, and contamination load.
- Tissue damage is often beyond that which is apparent on initial visual inspection.

Control any active hemorrhage, debride non-viable tissue, and thoroughly irrigate wounds.
Precautions

- Accept atypical skin and tissue flaps as long as the tissue is viable.
- Do not perform primary closure of traumatic amputations.
  - All war wounds should be left open and re-evaluated with serial irrigation and debridement.
- Avoid open circular or guillotine amputations.
  - They sacrifice viable soft tissue and relegate the casualty to more proximal revisions.
  - Have not been shown to be significantly faster than length-preserving procedures.
Current consensus regarding extremity amputation following battle-injury is to:

- Preserve limb length and vascularity.
- Facilitate adequate wound drainage.
- Achieve eventual coverage and closure of the amputation wound.

Atypical length and tissue flaps after amputation of battle-injury to lower extremity. Wound is left open to facilitate wound drainage.
Amputation

- If amputation is required, appropriate vascular structures should be ligated proximal to the bone resection, but distal enough to allow healing.
  - Separate vascular structures from nerves prior to ligation.

- Amputations should be performed at the most distal level which provides viable bone and soft tissue for later closure.
  - If near proximal joint (e.g., knee, elbow) preservation of bone length without soft tissue coverage advised to provide later options for reconstruction.
  - Re-evaluate amputation site within the first 24 hours.

Slightly atypical soft tissue flaps with NPWT to facilitate drainage after irrigation and debridement.
Post-Operative Management

- Place soft dry dressings around the amputation site and extremity.
  - Circumferential wraps with gauze rolls and ace wraps in figure of eight fashion.
  - Avoid excessive compression.

- Place in splint or bivalve cast to prevent joint contracture and provide soft tissue support.
  - Make sure there is simple access for wound inspections.

- If short skin flaps, skin traction to prevent soft tissue traction is an option.

- Avoid placement of pillows under knees to prevent contractures.
Negative pressure wound therapy using reticulated open cell foam can be useful after complete wound debridement and hemostasis achieved.

- Can be left in place for 24 to 48 hours.
- Care to avoid occlusion and leak of seal is essential.
- May macerate healthy tissue, obliterate soft tissue planes, and has a potential role in heterotopic ossification.
- Problems include: bulky for transport; occlusion of tubing or leak; maceration of healthy tissue; and obliteration of soft tissue planes.
Post-Operative Management

- Coordinate all dressing changes and repeat debridement with evacuation schedule and plan to perform them in operating room.
  - OR provides access to equipment for unexpected issues.
  - OR provides anesthetic for patient comfort.
Intent (Expected Outcomes)

- All amputation wounds are appropriately dressed but NOT primarily closed in theater

Performance/Adherence Measures

- All amputation wounds are dressed but not closed in theater

Data Source

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


2. Pollak AN. Use of Negative Pressure Wound Therapy with Reticulated Open Cell Foam for Lower Extremity Trauma. J Orthop Trauma 2008:


Appendix A: Additional Information Regarding Off-Label Uses in CPGs