

# Management of the Mangled Extremity

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DEFINITION/CAUSES/ DECISIONS	MANAGEMENT IN THE EMERGENCY CENTER	MANAGEMENT IN THE OPERATING ROOM	AMPUTATION VS. SALVAGE
<p><b>DEFINITION</b></p> <p>High-energy transfer or crush resulting in some combination of injuries to artery, bone, tendon, nerve, and/or soft tissue</p> <p><b>CAUSES</b></p> <ul style="list-style-type: none"> <li>• Motorcycle or motor vehicle crash</li> <li>• Auto-pedestrian crash</li> <li>• Crush injury</li> <li>• Farm/industrial injury</li> <li>• Fall from height</li> <li>• Close range shotgun wound</li> </ul> <p><b>DECISIONS FOR THE TRAUMA TEAM</b></p> <ul style="list-style-type: none"> <li>• If patient's life is in danger from injuries, immediate amputation must be considered</li> <li>• If patient can be stabilized, should salvage of the mangled limb be attempted?</li> <li>• If salvage is decided, what is the appropriate sequence of repairs?</li> <li>• If salvage fails, when should delayed amputation be performed?</li> </ul>	<ul style="list-style-type: none"> <li>• Primary survey—assess ABCs</li> <li>• Only the attending surgeon or senior resident should remove field dressing and confirm that mangled extremity is present</li> <li>• Control bleeding from the injured extremity               <ul style="list-style-type: none"> <li>—Pressure dressing</li> <li>—Proximal tourniquet</li> <li>—Proximal pressure point</li> </ul> </li> <li>• Reapply dressing</li> <li>• Decide on need for diagnostic evaluation of other injuries using FAST (ultrasound of pericardium/abdomen or CT of head/thorax/abdomen)</li> <li>• Administer appropriate intravenous broad-spectrum antibiotics and tetanus prophylaxis</li> <li>• If no other injuries, move patient to operating room for continued resuscitation and further evaluation of the mangled extremity</li> </ul>	<ul style="list-style-type: none"> <li>• Continue resuscitation if patient is hypotensive</li> <li>• Assess sensation in hand or foot before patient is intubated</li> <li>• X-ray the mangled extremity</li> <li>• Determine if arterial flow to hand or foot is intact               <ul style="list-style-type: none"> <li>—Physical examination</li> <li>—Doppler pulse device</li> <li>—Percutaneous arteriogram by surgeon</li> </ul> </li> <li>• If there is no arterial flow and salvage is still a consideration, insert intraluminal shunts into injured artery and vein</li> <li>• Classify bony/soft tissue injury               <ul style="list-style-type: none"> <li>—Gustilo I: &lt;1 cm wound over Fx</li> <li>—Gustilo II: &gt;1 cm wound over Fx</li> <li>—Gustilo III:                   <ul style="list-style-type: none"> <li>A—Extensive soft tissue injury</li> <li>B—Periosteal stripping</li> <li>C—Arterial injury needing repair</li> </ul> </li> </ul> </li> <li>• Visualize major nerves to hand or foot in open extremity</li> <li>• Classification or scoring system for mangled extremity may be applied now</li> </ul>	<p><b>CRITERIA FOR IMMEDIATE AMPUTATION</b></p> <ul style="list-style-type: none"> <li>• Shredded muscle and transected nerves beyond elbow or knee, especially posterior tibial nerve in lower extremity</li> <li>• Crushed or mangled extremity with &gt;6 hours arterial occlusion upon arrival</li> <li>• Associated mangling or severe injury to ipsilateral hand or foot</li> <li>• Severe associated polytrauma with persistent hypothermia, acidosis, or coagulopathy (“life over limb”)</li> </ul> <p><b>OUTCOME OF ATTEMPTS AT SALVAGE</b></p> <ul style="list-style-type: none"> <li>• 5–7 operative procedures</li> <li>• 30%–50% usefully employed if salvage is successful</li> <li>• Eventual amputation rate of 30% if Gustilo IIIC fracture at time of injury</li> </ul> <p><small>This publication is designed to offer information suitable for use by an appropriately trained physician. The information provided is not intended to be comprehensive or to offer a defined standard of care. The user agrees to release and indemnify the American College of Surgeons from claims arising from use of the publication.</small></p>