

# Overview of Arterial Tourniquets

## Minnesota Statewide Trauma System

# Before You Begin...

The information that follows is intended to provide a general overview of arterial tourniquet use. Hospitals should follow the manufacturer's instructions for the type of tourniquet purchased and adopt a their own guideline for tourniquet use.



# Background

- Recent research has demonstrated the efficacy of arterial tourniquets as a method to control hemorrhage in a limb wound.
- Hemorrhage from a limb is a manageable condition.
- Minnesota ambulance services are required to carry arterial tourniquets.
- By July 1, 2014 Minnesota's level 3 and 4 trauma hospitals must stock a commercially-manufactured arterial tourniquet in the emergency department.



# Key Points

- An arterial tourniquet is indicated when bleeding from a limb injury cannot be controlled with direct pressure or when maintaining direct pressure is not practical.
- Tourniquets prevent blood loss in an injured limb by compressing the tissue around arteries that then collapse the lumina of the arteries.
- Improvised tourniquets fail much more frequently than commercially-manufactured tourniquets.
- Apply tourniquets early! Survivability is much better when the tourniquet is applied *before* rather than *after* the onset of shock (90% vs. 10%).<sup>1</sup>

<sup>1</sup> John F. Kragh, J., Thomas J. Walters, P., David G. Baer, P., Fox, C. J., Charles E. Wade, P., Jose Salinas, P., et al. (2009). Survival With Emergency Tourniquet Use to Stop Bleeding in Major Limb Trauma. *Annals of Surgery*, 1-7.



# Indications

- Bleeding from a limb that is uncontrolled with direct pressure. For example:
  - Mangled limb
  - Arterial laceration
  - Uncontrolled bleeding from dialysis shunt
- Bleeding from a limb when direct pressure is not practical (e.g., multiple casualties, awkward or precarious positioning, insufficient staff in the presence of competing priorities)



# Examples of Commercially-Manufactured Tourniquets



**C-A-Tourniquet<sup>®</sup>**

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# Examples of Commercially-Manufactured Tourniquets



SOF Tactical Tourniquet



# Examples of Commercially-Manufactured Tourniquets



**MAT Tourniquet**





# Procedure

1. Verify that direct pressure is ineffective or impractical. Do not remove pressure dressings.
2. Apply the tourniquet proximal to the site of hemorrhage. Do not place over a joint.
3. Cinch the strap down, removing excess slack.
4. Tighten the tourniquet by turning the windlass, twisting the ratcheting device, or inflating the bladder until the bleeding slows substantially or stops.
5. Write the time of application on the tourniquet and in the patient's chart.
6. Ensure that the tourniquet remains visible to all care providers. Do not cover it up.
7. If transferring the patient, ensure that transferring service personnel and the receiving facility are aware that the tourniquet has been applied.

If bleeding is not controlled, a second tourniquet can be applied proximal to the first.



# Removal

- If the tourniquet is being used to control bleeding from an amputated limb, do not remove; transfer with tourniquet in place.
- After life threats have been addressed, circulatory resuscitation has been achieved and the patient has been stabilized, the tourniquet may be assessed for removal.
  1. Ensure that a pressure dressing is in place.
  2. Loosen the tourniquet slightly and evaluate for continued bleeding.
  3. If significant bleeding recurs, re-tighten; if not, continue to incrementally loosen and re-evaluate until all tension has been released from the tourniquet.



# Considerations

- Apply the tourniquet above and as close to the wound as possible to minimize the amount of tissue affected by the reduced blood flow.
- The lower arms and lower legs have two bones. Tourniquets can't compress the tissue between the bones so application **ABOVE** the knee and elbow is more effective. However, if bleeding from a distal limb can be controlled with a distally-placed tourniquet, risk for extensive tissue loss will be reduced.
- In the setting of an amputation, oozing of blood from the bone marrow will continue despite tourniquet use.



# Considerations

- Tourniquets can remain in place for up to two hours with little risk of distal tissue damage, and for more than four hours with moderate risk of tissue damage. Since the application of a tourniquet creates a time-sensitive situation, immediately arrange for the patient's definitive care.
- Once applied, do not release unless an effective pressure dressing is in place and the tourniquet is no longer required to control the bleeding.
- A crush injury or compartment syndrome can result from a properly placed tourniquet.



# Considerations

- Do not place IVs distal to the tourniquet site.
- The tourniquet will be painful, particularly after 15 minutes when ischemia in the distal tissues develops.
- Poorly constructed and counterfeit tourniquets have been associated with high failure rates. Procure from a reputable distributor.
- Tourniquets with smooth, uniform material are less likely to damage underlying tissues than are tourniquets with sharp edges or wire reinforcement.



# Don't forget the patient!

- Manage body temperature
- Manage shock with IV fluids and blood
- Manage pain
- Arrange for immediate definitive management



# Resources

- Overview of Arterial Tourniquets
  - <http://hqmeded.com/arterial-tourniquets/> (8:54; Hennepin County Medical Center)
- Tourniquet use, junctional hemorrhage control and wound packing
  - <https://www.youtube.com/watch?v=0Ca2t7nRF5o> (20:00; Hennepin County Medical Center EMS)
- Wisconsin Southeast Regional Trauma Advisory Council Training Materials
  - [http://www.sertacwi.org/Tourniquet\\_Training.html](http://www.sertacwi.org/Tourniquet_Training.html)
- C-A-Tourniquet—Combat Tourniquet Application
  - <http://combattourniquet.com/videos/buddy-aid-leg-application/> (1:40; Composite Resources)
  - <https://www.youtube.com/watch?v=7ncAxc5-Nn4> (0:59; North American Rescue )
- SOF Tactical Tourniquet
  - <https://www.youtube.com/watch?v=7NbHImVQ4us> (4:56; Tactical Medical Solutions)
- MAT Tourniquet
  - <https://www.youtube.com/watch?v=sKVt4EJ2hSI> (5:23; Pyng Medical)

