

HEMORRHAGE CONTROL FOR THE EMS PROVIDER

Connecticut EMS Advisory Board
Education and Training Committee
January 2018

Program Goals

Provide participants with current information regarding bleeding control

- Application of pressure dressings
- Wound packing techniques
- Use of tourniquets

Objectives

This program will enable participants to:

- Discuss current techniques for hemorrhage control
- Demonstrate how to apply a pressure dressing

Objectives (Con't)

- Discuss the components of a mechanical tourniquet
- Demonstrate how to apply a mechanical tourniquet
- Demonstrate how to pack a wound

Objectives (Con't)

- Discuss alternatives for commercially available hemorrhage control supplies
- Review the State protocol (6.17) for tourniquet application

Disclosure

- This program references several commonly available products for controlling hemorrhage.
- Students should be familiar with the hemorrhage control products approved for use by their medical control.
- Use of a specific product in this program should not be construed as an endorsement of that particular product.

Types of External Hemorrhage

Bleeding can be categorized in two ways:

1. Minor bleeding that is easily controlled
2. Bleeding that is potentially life-threatening and not easily controlled

Hemorrhage Control

- Uncontrolled extremity hemorrhage is a cause of preventable death.
- A femoral artery and/or vein disruption can lead to the loss of one's complete blood volume within 3 minutes. (TECC, 2017)

Hemorrhage Control

Components of Bleeding Control

- Direct Pressure
- Wound Packing
- Pressure Dressing
- Tourniquet Application

Personal Safety

- As with the provision of any medical care, appropriate measures should be taken to reduce provider exposure to blood.
- Appropriate PPE for the care of injured persons includes that which is necessary to adequately isolate the provider from direct contact with blood.
- Minimum PPE includes gloves and eye protection. Additional protective items may be necessary as the situation dictates.

Direct Pressure

- Use your hand or fingers
 - Use two hands, if at all possible
- Effective most of the time for external bleeding
 - Direct pressure can stop even major arterial bleeding
- To be effective, apply pressure with the victim on a firm surface to provide support
- Don't release pressure to check the wound

(Bleeding Control Basic, ACS 2017)

WOUND PACKING

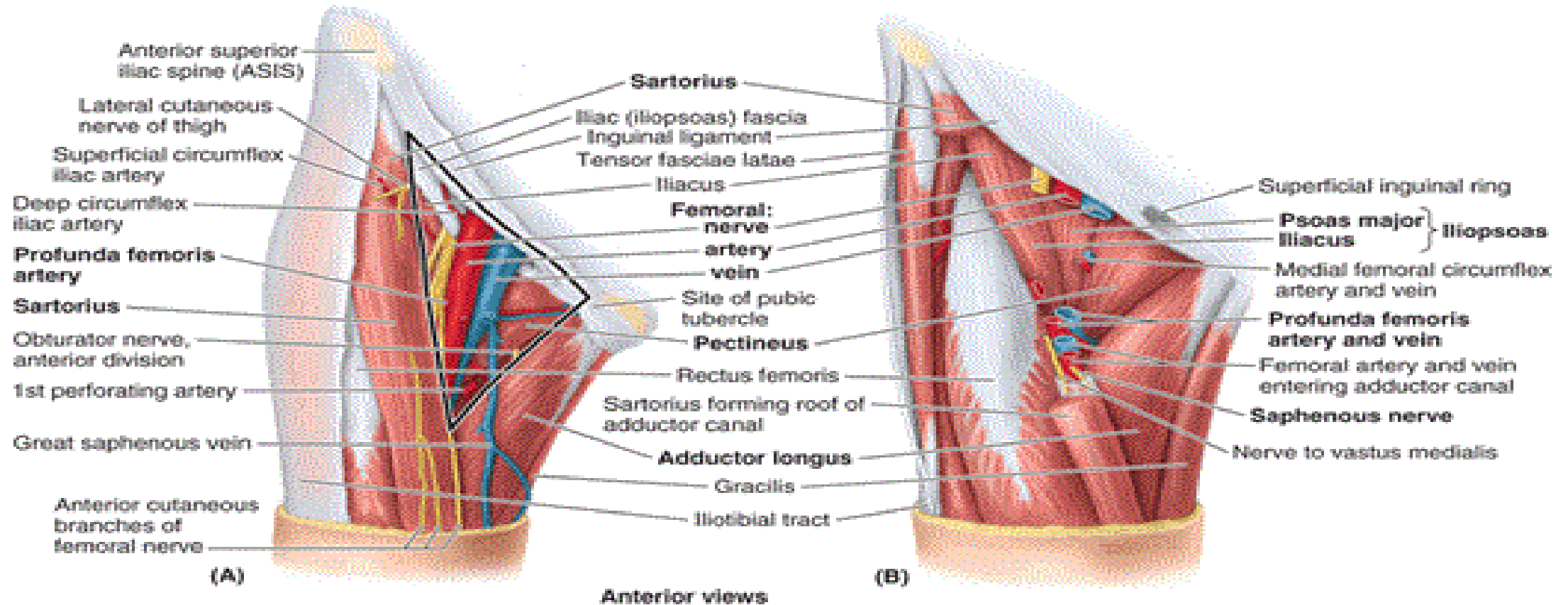
Wound Packing

Some wounds are not amenable to tourniquets or pressure dressings alone

Filling the wound cavity aids in creating pressure on bleeding vessels

Critical Vascular Area

Femoral Triangle



Critical Vascular Area

Anterior Triangle of the Neck

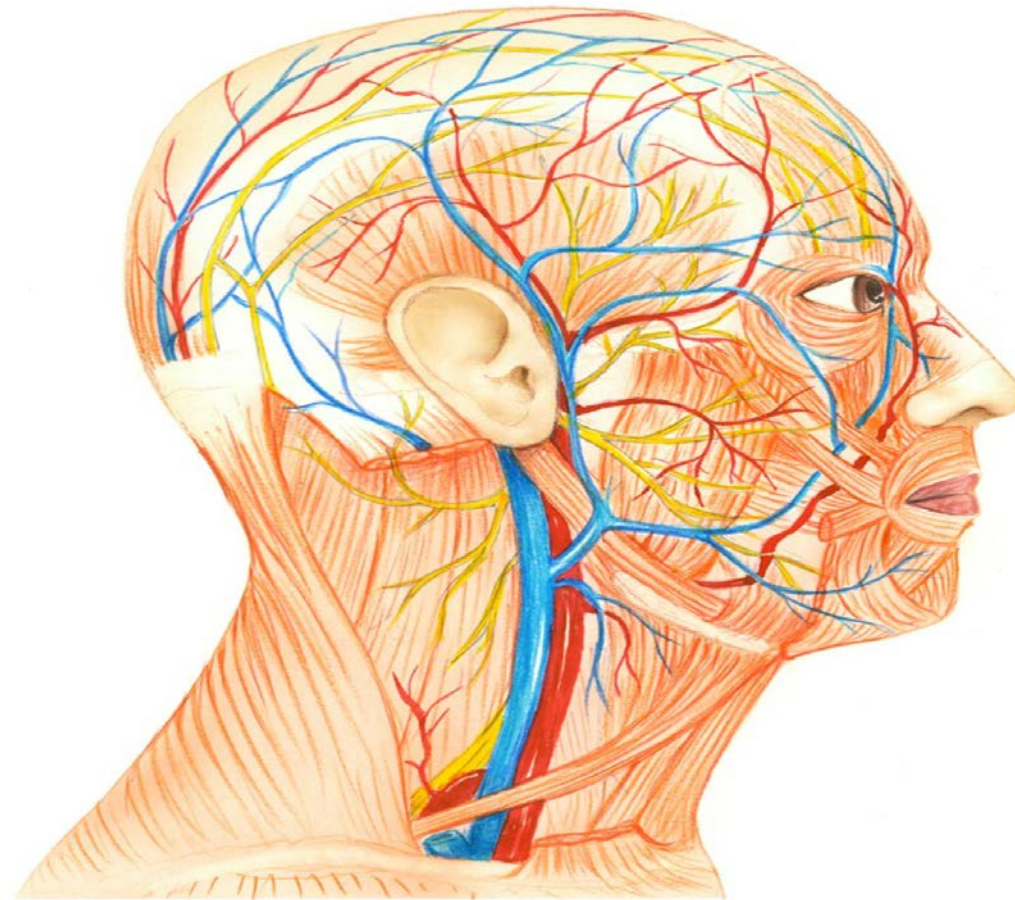


Image: C-TECC, Smith et al. 2017

Wound Packing



Gauze



Placing gauze into a wound creates pressure against bleeding vessels and encourages clotting. Hemostatic dressings are preferred but any sterile gauze can be used for wound packing.



Wound Packing

When considering wound packing:

Do not pack wounds of the abdomen and chest or open skull fractures

- Only for use on limbs, neck, shoulders, hips and groin.
- Use hemostatic products for wound packing if available and in accordance with manufacturers recommendations.
- Pack wound and hold direct pressure according to the manufacturer's recommendation.

Hemostatic Agents

Chemical impregnated gauze incorporating chemicals designed to promote rapid blood coagulation.

Hemostatic agents can establish hemostasis by means of different mechanisms:

- concentrating coagulation factors
- adhesion to the tissues
- delivering procoagulant factors to the hemorrhage site.

(Khoshmohabat, Paydar, Kazemi, & Dalfardi, 2016)

Celox Products

Various forms

- Celox Rapid (30-45 sec)
- Celox Trauma Gauze
- Celox powder



QuikClot Gauze

Standard surgical gauze impregnated with Kaolin

- Promotes coagulation through coagulation cascade



Chitogauze



Chitosan based impregnated gauze



Wound Packing Procedure

Expose Wound and Identify Bleeding

- Open Clothing around the wound.
- Remove excess pooled blood from the wound while preserving any clots already formed in the wound.
- Locate the source of the most active bleeding.



Photo: J. Beaulieu

Wound Packing Procedure

Pack Wound Completely

- Pack gauze tightly into wound and directly onto the source of bleeding.
- More than one gauze may be required.



Photo: J. Beaulieu

Wound Packing Procedure

Pack Wound Completely

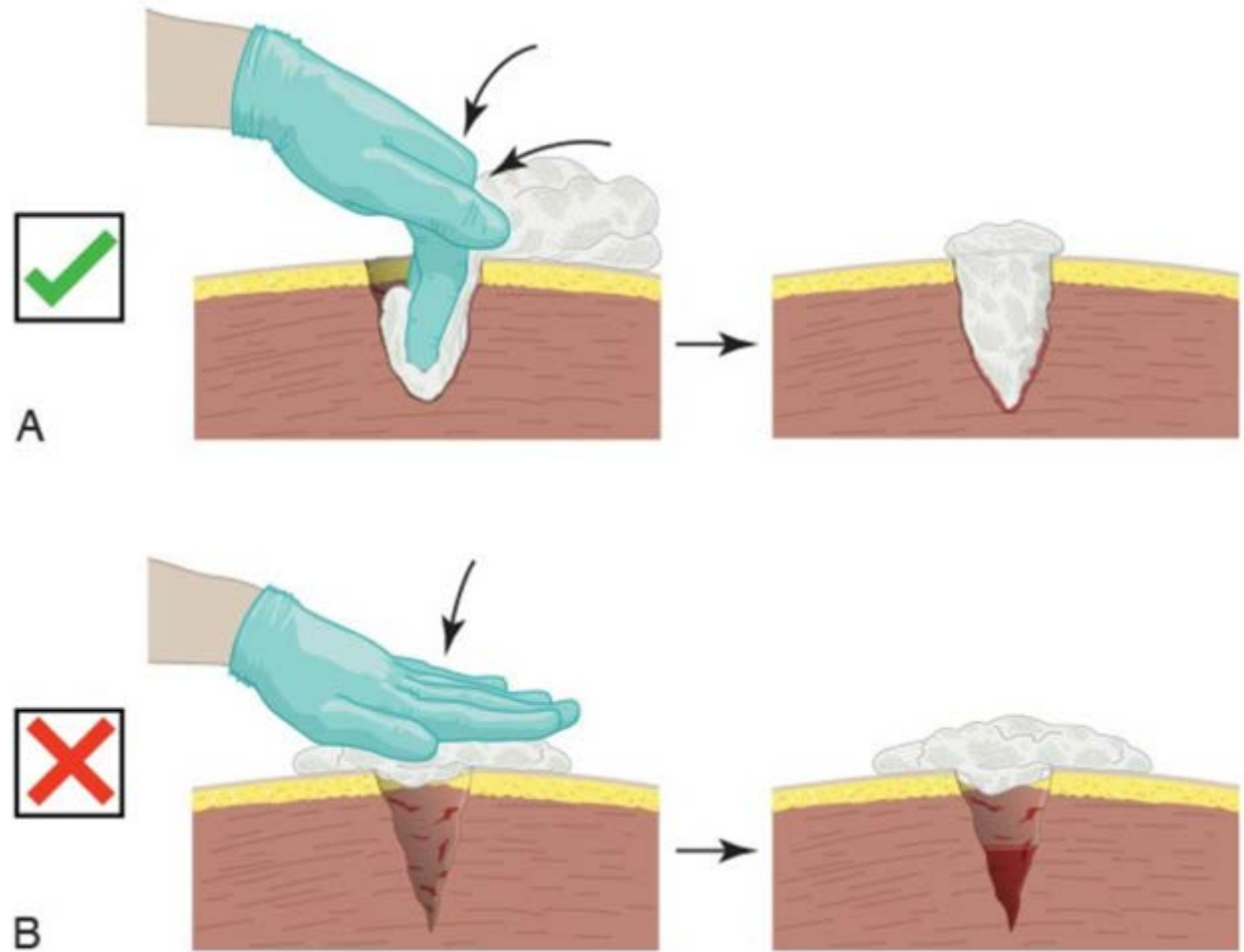
- Use one gloved hand to feed gauze and the other to maintain pressure and hold gauze in place
- Use gloved fingers to maintain pressure and hold gauze. Proper technique will allow for continuous pressure.
- Be cautious of sharp fracture edges and foreign bodies when packing wounds!



Photo: J. Beaulieu

Wound Packing Procedure

**Pack Wound
Completely**



Wound Packing Procedure

Apply Direct Pressure

- Apply and hold continuous direct pressure.
- The time to hold pressure will be longer when not using hemostatic gauze.
- Reassess bleeding while holding continuous direct pressure.



Photo: J. Beaulieu

Wound Packing Procedure

Bandage over Gauze

- Apply a pressure dressing to provide ongoing pressure and secure the wound packing in place.



Photo: J. Beaulieu

Wound Packing Procedure

Transport and Monitor

- Do not remove the bandage or gauze
- If practical – attach gauze wrapper to pressure dressing so that the next care provider is aware gauze is in place in wound.



Photo: J. Beaulieu

Time to practice - Hands-on Session

- Put it all together (wound pack and pressure dressing)

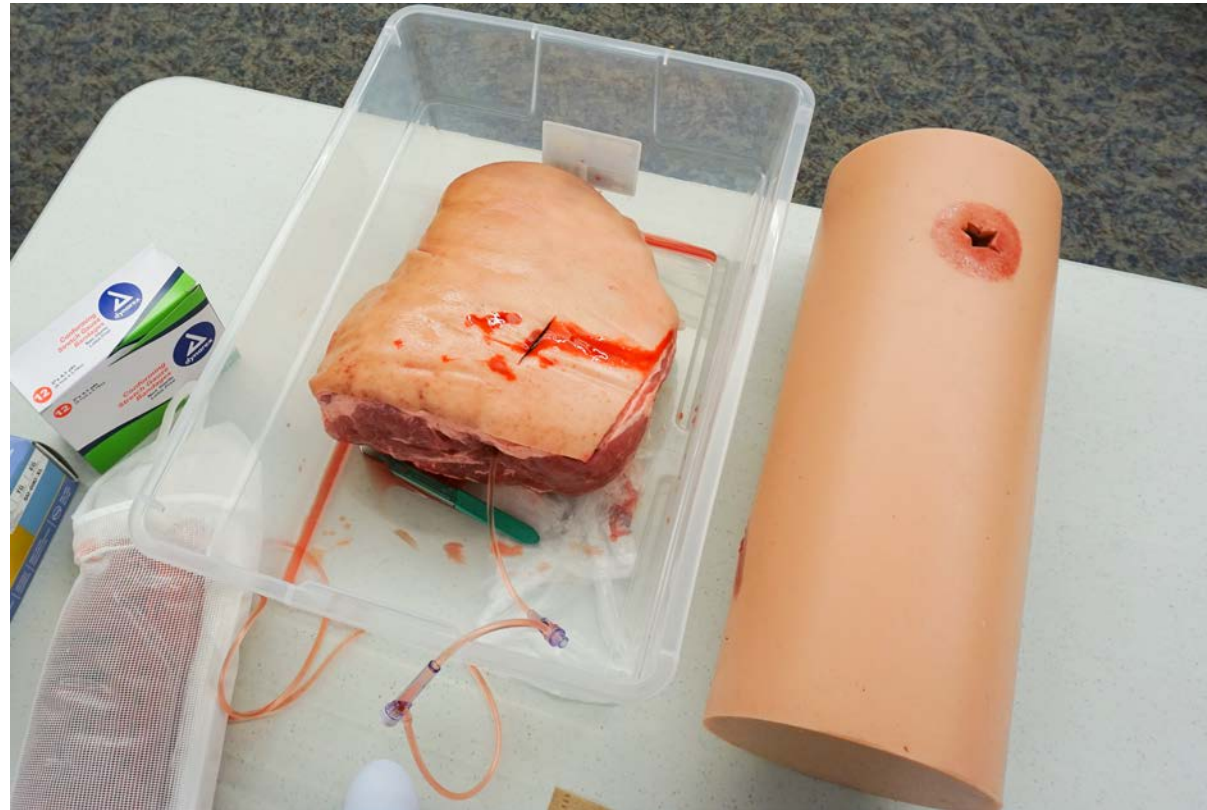


Photo: J. Beaulieu

PRESSURE DRESSINGS

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Pressure Dressings - Indications

- Limb and torso wounds with significant bleeding
- Head wounds with significant bleeding
- As an adjunct to wound packing

Pressure Dressings – Basic Principles

- Apply pressure dressings securely enough to do the job the first time. A loosely applied pressure dressing may waste time and blood.
- Most commercial pressure dressings have a method to concentrate pressure in a specific area. This should be placed directly over the wound.

Pressure Dressings – Basic Principles

- Do not loosen a pressure dressing to check bleeding.
- If bleeding continues after applying a pressure dressing:
 - If on an extremity, apply a tourniquet
 - Apply additional pressure
 - Apply an additional pressure dressing

Pressure Dressings – Application Tips

- Wrap the bandage to cover the entire dressing.
- The bandage should not bunch or become rope-like when wrapped.
- Additional directed pressure to the wound can be created by adding a half or full spin to the bandage over the wound or pressure device.

Improvised Pressure Dressings

Consider how any of the following readily-available items could be combined to create an improvised pressure dressing:

- Small/Med trauma pad
- Large trauma dressing
- Bulky roller bandage (example: Kerlix)
- Elastic bandage such as an Ace™ bandage – 4” or 6” wide
- 1” or 2” tape
- BP Cuff (plus 2 hemostats if available)
- SWAT-T™ / elastic tourniquet

OTHERS??

Pressure Dressing Example – Distal Extremity Amputation

Application:

- Cover wound with a large trauma pad or similar dressing material.
- Place a roll of Kerlix or roller gauze over the wound.
- Bind the roller gauze to the limb with an elastic bandage.
- Continue to unroll, stretch and wrap the entire elastic bandage.
- Secure the bandage with clips or tape.

Improvised Pressure Dressing



Secure the bandage.

Although clips are shown here, using tape is preferred in most cases.

Commercial Pressure Dressings

Most commercial pressure dressings have common features:

- Bulky, sterile dressing that absorbs a large quantity of blood
- Wide elastic bandage
- Device to concentrate pressure to a small area
- Securing mechanism

Commercial Pressure Dressing - Application

In all cases, read the manufacturers instructions and be familiar with the dressings available to you. In general:

- Place the sterile dressing directly over the wound.
- Unroll a few inches of the bandage, pull it tight, then wrap around the limb.
- Integrate the bandage with the pressure mechanism and secure as per the manufacturers instructions.

Pressure Dressing Example - Israeli Bandage



Anchor the bandage with the barrette.

Pressure Dressing Example - H-Bandage



Secure the bandage with the barrette.

Pressure Dressing Example - Oleas Modular Bandage



Secure with the
Velcro and
barrette.

Pressure Dressing – Practical Application

Please practice on your partner...

- Apply an improvised bandage to the arm or leg.
- Practice with the pressure dressing you will most likely use with your agency.

TOURNIQUET USE

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Tourniquet Use

Tourniquets should be applied rapidly if extremity bleeding cannot be controlled with direct pressure, or if effective direct pressure is not possible.

Tourniquet Use – Junctional Tourniquets

- **Junctional tourniquets** are in a different category and are not addressed in this program
 - Control bleeding by compressing vessels in areas other than extremities.
 - Newer to the market
 - \$\$\$\$



Tourniquet Application do's / don'ts

- Commercial tourniquets should be applied per manufacture guidelines
- Ideally, tourniquets should be placed 2"-3" above the site of the injury.
- An acceptable alternative is to place the tourniquet as high as possible on the extremity ("Go High or Die")

Tourniquet Application do' s/don' ts

- If bleeding won't stop with one tourniquet, apply a second tourniquet above the first one.
- If an additional tourniquet is required and there is no room above the tourniquet, put the second tourniquet below and as close to the first one as possible.

Tourniquet Application do's/don'ts

- Do not place a tourniquet over a joint. If the joint is the 2” - 3” above the bleed, place the tourniquet above the joint.
- Placing the tourniquet in direct contact with the skin is preferred.
- Tourniquets can be placed over clothes but avoid placement over pockets containing any items.

Types of Tourniquets

There are several variations of tourniquets on the market.

Mechanical tourniquets have 3 basic components:

- A wide strap
- A mechanical tightening mechanism
- A method for securing the tightening mechanism

Elastic tourniquets may be an acceptable alternative

Tourniquet Selection

Tourniquets should be chosen by the EMS service in cooperation and consultation with medical control

Tourniquet Examples

Combat Action Tourniquet (C-A-T)



Special Operations Forces Tactical Tourniquet - (SOF[®]TT)



Tourniquet Examples

SAM XT



Improvised Tourniquets



Photo: J. Hundley

Improvised Tourniquets – CAUTION!

- Improvised tourniquets can be considered when a commercial tourniquet is not immediately available.
- Improvised tourniquets are **more likely to fail** than commercial tourniquets
- They should **only** be used when a commercial tourniquet is not available.

Improvised Tourniquets - Items Needed

- An appropriate length of material, at least 1" wide.
2"-3" width is preferred.
- A rigid item to serve as a windlass (should resist bending or breaking such as a metal bar, trauma shears, large stick) strong enough to tighten the tourniquet.
- Additional material to secure the windlass once the tourniquet is tightened.

Improvised Tourniquets



Wrap the constricting material around the limb and secure with an appropriate knot.



Constrict the limb by twisting the material with a rigid item such as a ring cutter, shears or a carabiner.



Prevent the improvised windlass from loosening by securing it with additional material.

Improvised Tourniquets



Ring cutter as a windlass



Carabiner as a windlass



Shears as a windlass

6.17

Tourniquet Application

EMT/ ADVANCED EMT / PARAMEDIC STANDING ORDERS

A tourniquet is a commercial device used to control a life threatening hemorrhage on an injured extremity to prevent exsanguination.

INDICATIONS:

Life threatening extremity hemorrhage that cannot be controlled by other means. Serious or life threatening extremity hemorrhage in the face of operational considerations that prevent the use of less aggressive hemorrhage control techniques.

PROCEDURE:

1. If hemorrhage is not severe, attempt to control the hemorrhage with direct pressure, bandaging.
2. With a commercial tourniquet:
 - Place tourniquet proximal to wound on the affected extremity.
 - Tighten per manufacturer instructions until hemorrhage stops and distal pulses are extinguished.
 - If initial tourniquet fails to stop bleeding, ensure proper deployment of first tourniquet, and consider placement of a second tourniquet just proximal to first.
 - Document time of tourniquet application and communicate this clearly with receiving facility.
 - Do not cover tourniquet.
 - Dress wounds per standard wound care and consider use of hemostatic bandage.
 - Reassess for re-bleeding frequently, especially after any patient movement.
 - Proper tourniquet placement often causes significant pain. Consider pain management, see [Pain Protocol 2.16](#).
 - Do not remove or loosen tourniquet once hemostasis achieved.

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Protocols v2017.2



In the absence of a commercial tourniquet (preferred), an improvised device e.g., cravat with windlass, blood pressure cuff could be used. The device must be a minimum of 2 inches wide, otherwise it can cut through the skin.

PEARLS:

- Do not apply tourniquets over clothing or joints. If wound is just distal to a joint, the tourniquet should be placed just proximal to joint.
- Delay in placement of a tourniquet for life threatening hemorrhage significantly increases mortality. Do not wait for hemodynamic compromise to apply a tourniquet.
- Transport patients directly to a Level I or Level II trauma center if feasible and provide earliest possible notification/trauma alert.
- Damage to the limb from tourniquet application is unlikely if removed in several hours.

Demonstration of Tourniquet Application

- CAT

- SOFTT

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