

Chapter 6

Hemorrhage Control

The hemorrhage that take[s] place when a main artery is divided is usually so rapid and so copious that the wounded man dies before help can reach him.

— Colonel H. M. Gray, 1919

Stop the Bleeding!

- Hemorrhage is the leading cause of preventable death on the battlefield.
 - 90% of combat fatalities occur forward of a medical treatment facility.
 - 75% of combat fatalities have nonsurvivable injury and 25% have potentially survivable injury. Of those with potentially survivable wounds, 90% die from hemorrhage.
 - Although bleeding is a main cause of death, the vast majority of wounds do not have life-threatening bleeding.

UNDER FIRE

- Get the patient out of the line of fire — prevent further injury.
- Control obvious external bleeding once out from under fire.
- If you must remain under fire, stop external bleeding with use of a tourniquet.
- **Do not endanger the casualty or yourself with unnecessary treatment.**
- Stay engaged in the firefight if necessary.

KEEP YOUR HEAD DOWN

Sites of Hemorrhage

- External.
 - Extremity injury (most common cause of massive external blood loss in combat), scalp, and torso wounds.
 - Usually associated with an open fracture or amputation.

- Internal.
 - Chest, abdomen, pelvis, and closed extremity fractures.
 - High mortality if the casualty is not expeditiously transported and salvage surgical procedures performed.
 - Controlled (hypotensive) resuscitation should be implemented. (See below; also see Chapter 7, Shock, Resuscitation, and Vascular Access.)

Internal Torso Bleeding Requires Surgical Control

Treatment—First Responder

- External hemorrhage from extremity wounds.
 - **Direct pressure** at the site of injury is the most effective and preferred method of hemorrhage control.
 - ◆ If direct pressure fails to stop the hemorrhage, it signifies deep, massive, or arterial injury, and will require surgery or advanced hemostatic agents.
 - ◆ Hold pressure for at least 5 minutes before looking to see if it is effective.
 - ◆ Impaled foreign bodies should not be removed because profuse bleeding may occur.

Pitfall: A Bandage Does Not Equal Direct Pressure!

- A bandage may wick blood from the wound without stopping the bleeding.
- A bandage hides ongoing bleeding.
- Hemostatic bandages are available on the battlefield to assist in stopping bleeding. (See current TCCC [Tactical Combat Casualty Care] Guidelines.)

- ◆ **Elevation** of the extremity will decrease most bleeding.
- ◆ **Point compression of the proximal artery.**
 - ◇ May help slow bleeding while attempting to gain better control at the wound site.
 - ◇ May require compression at the pressure point for up to 20 minutes to provide hemostasis.
 - ◇ Table 6-1 shows the recognized pressure points.
- ◆ No blind clamping.

Table 6-1. Recognized Pressure Points

Bleeding Site	Hand	Forearm	Arm	Leg	Thigh
Artery	Radial/ulnar	Brachial	Axillary	Popliteal	Femoral
Pressure point	Wrist	Inner upper arm	Axilla	Behind knee	Below groin crease

- ◆ A **tourniquet** should be applied if previous techniques fail.
 - ◇ Use a tourniquet early, rather than allow ongoing blood loss.
 - ◇ Rapid method to secure hemorrhage control.
 - ◇ Does not require constant attention; allows first responder to care for others—extends resources.
 - ◇ Tourniquets should not be removed until the hemorrhage can be reliably controlled by advanced hemostatic agents or until arrival at surgery.

Tourniquet May Be the First Choice in Combat

- ◇ Tourniquet placement on the forearm or leg may not compress the vessels, which lie between the double long bones. Tourniquets on the upper extremity should be placed on the upper arm. If bleeding from the lower extremity is not controlled by a tourniquet on the leg, it should be moved to the thigh, where the vessel may be more easily compressed.
- ◆ A second tourniquet may need to be added to provide better hemostatic control.

Pitfalls of the Tourniquet

Risk–benefit Decision: Do not avoid use of a tourniquet in order to save a limb and then lose a life!

- ◆ **Clamping vessels:** If there is continued bleeding and a damaged vessel can be readily identified, a hemostat may be used to clamp the visualized vessel.

- ◆ **Limb splints** will decrease bleeding associated with fractures and soft-tissue injury by aligning, stabilizing, and returning the limb to length.
- ◆ **Scalp bleeding:** Can be significant due to the rich vasculature of the scalp.
 - ◇ Responds to direct pressure.
 - ◇ But difficult to apply and maintain direct pressure.
 - ◇ Compression dressings must be applied if you cannot provide ongoing direct pressure.
 - ◇ Requires circumferential head application.
 - ◇ Vertical mattress suture closure sometimes is necessary to control bleeding scalp edges.
 - ◇ A readily identified bleeding vessel can be clamped, but the wound should generally not be explored.
 - ◇ Avoid pushing fragments into the brain when applying pressure, but control hemorrhage even at the expense of exposed brain.
 - ◇ Protection of exposed brain with nonadherent gauze or plastic can minimize injury.
- ◆ **Internal bleeding.**
 - ◇ Blood loss into the abdomen or chest cannot be controlled in the field and requires immediate evacuation for salvage or definitive surgery.
 - ◇ Stabilization of pelvic fracture with a pelvic binder or wrapping the pelvis tightly with a wide strap (such as a folded sheet) may reduce pelvic bleeding.
 - ◇ Open torso injuries: If direct pressure does not stop the hemorrhage, consider inserting a tamponade with a balloon (Foley) catheter into the wound. Then, with the balloon inflated, pull back to compress the bleeding site.

Dressings, Bandages, Hemostatic Agents, and Controlled Hypotension

Dressings promote hemostasis, protect wounds from mechanical injury and contamination, immobilize tissues, and provide physical and psychological support to the patient.

- **Application of dressings and bandages.**
 - Control all bleeding.

- Assess neurological status and circulation of extremity before and after applying a dressing or bandage.
- Immobilize suspected fractures.
- Keep dressing as clean as possible.
- Dressings should cover the entire wound.
- Bandages should cover the entire dressing.
- Avoid skin-to-skin contact.
- Leave fingers and toes exposed.
- **Reinforcement.**
 - ◆ If at all possible, **DO NOT** remove the first dressing.
 - ◆ If the dressing becomes thoroughly saturated, reevaluate the wound for a source of bleeding amenable to direct pressure and consider advanced hemostatic agents or a proximal tourniquet. Blood loss into the dressing can be estimated.
- Coagulopathy: Blood loss, massive fluid resuscitation, and a drop in body temperature may lead to an inability to form clots.
 - ◆ Keep patient warm (above 34°C).
 - ◆ Use warm fluids.
 - ◆ Use crystalloid fluids sparingly.
 - ◆ Transfuse with component therapy or fresh whole blood in accordance with current Clinical Practice Guidelines (CPGs).
- Hemostatic agents: New products and bandages are available in several forms:
 - ◆ Dressings: Impregnated with hemostatic agents.
 - ◆ Injectables.
 - ◇ Intravenous: Augment clotting cascade of body.
 - ◇ Intracavitary: Through wounds to control internal bleeding.
 - ◆ Two-component “glues.”
 - ◆ If an advanced hemostatic agent is used after a tourniquet has been placed, the tourniquet may be carefully removed after the agent has achieved hemostasis and the wound observed for hemorrhage. If hemorrhage recurs, return to the tourniquet.
- See current CPGs for a list of hemostatic agents.

Hemostatic Agents

- Currently, TCCC (Tactical Combat Casualty Care) recommends Combat Gauze. See current TCCC guidelines.
- If standard measures, such as pressure dressings, do not control bleeding, it is recommended that a tourniquet be used and that the first agent be Combat Gauze.
- If the bleeding is external and not at a site where a tourniquet can be applied, Combat Gauze can be used if conventional pressure dressings fail.
- This product is to be used only on external sources of hemorrhage.
- Blood and clot should be wiped out of the wound prior to application.
- Remember, pressure must be applied for 3–5 minutes at the bleeding site, after application of a hemostatic dressing.

Field Hemostatic Dressings—Considerations

- Do not use on minor injuries.
 - Use on internal wounds is not yet recommended.
 - Must apply pressure to the bleeding site after application.
 - Effectiveness is limited if Combat Gauze is not in contact with the bleeding source in a deep wound.
- **Controlled Resuscitation** (Permissive Hypotension).
- ◆ Resuscitation is a method of hemorrhage control. The needs of organ perfusion must be carefully balanced against the risk of increased bleeding as blood pressure rises. Excessive fluid resuscitation may increase bleeding and rebleeding. Prior to definitive hemorrhage control, a lower than normal blood pressure may be acceptable. Small volumes of resuscitation fluid are still required in those casualties with decreased mentation due to hypotension (ie, decreased or absent radial pulse).

Reference

Gray HMW. *The Early Treatment of War Wounds*. London, UK: Henry Frowde Hodder & Stroughton/Oxford University Press; 1919.

For Clinical Practice Guidelines, go to
http://usaisr.amedd.army.mil/clinical_practice_guidelines.html

