

ARTERY DAMAGE—A CATASTROPHIC INJURY

Ellen Burns, RN, lead a practicum for treating severe bleeding injuries at the CVHC February 10, 2019 Hike Leaders Safety Meeting. The following are the key points as seen through the eyes of a hiker in attendance:

The Problem

If someone damages an artery, they are at risk of dying from blood loss in a matter of minutes. Blood will be everywhere, perhaps spurting.

Regardless of the cause, you must act quickly and decisively. We'll assume that you've done the first aid basics, like having someone call 911, checked the accident scene for dangerous circumstances, communicated with the victim, and briefly inspected the individual for other issues.

The Solutions

There are only 2 treatment options for a bleeding artery and you should exhaust the first one, applying pressure, before resorting to the second, which is applying a tourniquet.

A tourniquet can only be used on a limb--an arm or a leg--and it puts that limb at high risk for amputation. Losing a limb is better than losing a life, but it's best to be absolutely convinced that continuous, intense pressure won't stop the bleeding before applying a tourniquet.

Tourniquets cannot be applied to damaged arteries in the neck or groin, therefore you must use pressure on those areas. So, become confident that you know that you know how to apply the needed intense pressure to a bleeding artery without giving it much thought should the need arise.

The Basics of Applying Pressure

The basics are very simple: apply intense, targeted pressure to the bleeding artery. If you have both the position and the intensity correct, the bleeding should almost completely stop, almost immediately.

If there is more than a little oozing, double the pressure you are applying—it takes a lot.

If there still isn't a significant slowing in blood loss with the big pressure increase, slightly decrease the pressure so you can slide your hand around a little bit in search of a more effective contact point. Again, you expect to see a dramatic decrease in the blood flow when you apply enough pressure on the correct spot. Keep testing slightly different locations over the wound area in search of that dramatic decrease in bleeding from the intense pressure.

Duration of Pressure

The pressure must be extreme and most likely will need to be applied until the artery is repaired surgically. Unlike a nose bleed or general tissue damage, an artery is under too much pressure from the pumping of the heart for an effective clot to form. You may need to press a

knee or an elbow into the wound to sustain enough weight on the artery to stop the flow. And you may need to switch with other people, if available, to continue providing effective treatment, which may require hours. Intense, continuous pressure must be applied until rescue crews can relieve you of the victim's care.

How to Apply Pressure

You may need to experiment with how best to apply pressure. It will depend on where the wound is and your access to it. You will need to be in a powerful position from which you can sustain your effort. Be creative: consider using flat fingers, a 'corner' of a heel of your hand, the top surface of a fist, a knee, or an elbow. The strength from pulling, by reaching across the victim, may be the best approach in some circumstances. First, find the contact location that stops the bleeding quickly, then consider other positions that are more sustainable for you.

Covering the Wound

Now that you have a sense of how to create effective pressure, let's look at what to do immediately before applying pressure.

Apply fabric of some sort to the open wound. Sterile gauze is ideal, clotting factor infused gauze from a trauma kit is even better, BUT a bandana or clothing will suffice. My handiest option, a small stash of paper towels in my pack pocket, is at the bottom of the list of preferred options: paper fibers can become embedded in the drying or clotting blood and can be difficult to remove without escalating the bleeding.

You can add bulky layers of fabric or other absorbent materials to soak up the blood, but that is a cosmetic issue, not a functional issue. The bare-bones approach is a fabric layer, sterile or not, to keep unhelpful material from becoming embedded in the wound, plus massive pressure applied to the right spot. You can add additional layers of gauze or fabric but do not pull off the original base layer, which will disrupt clot formation.

Unlike with nosebleeds, no peeking is allowed with an arterial wound. You do NOT periodically uncover the wound to see how things are going. Instead, check around the *edges* of the compressed area to hopefully see that the bleeding or oozing has stopped or substantially slowed. Initially, you'll need to keep reassessing the wound to establish if the amount of pressure you are using is effective and in the best place. If the bleeding can be stopped with pressure and you apply enough to the right spot, the bleeding should almost immediately stop.

Applying a Tourniquet—The Last Resort

If you cannot control the bleeding with pressure, do apply a tourniquet, but it is the option of last resort. Use something like a belt, wrap it around the limb 2" above the wound and *between* the wound and the heart. Slip a sturdy, stick-like-object, between the skin and the belt. Folded hiking poles are a great option. Make sure the skin is protected and won't be pinched by the stick. Then twist the stick to tighten the belt until the bleeding stops. When you have enough pressure on the artery with the belt, the blood flow will dramatically diminish, hopefully

stopping altogether. It may still ooze a bit, like when applying pressure. A tourniquet will be very painful for the victim, but that degree of compression is what is required to save their life—you must stop the bleeding.

Once the bleeding has stopped, the challenge is to secure the stick in place. That's easiest to do if you adjust the stick so it is parallel to the limb. Then use duct tape, straps, or fabric strips to hold the stick in place.

The limb will be painful and look horrible, likely turning blue. That's why a tourniquet is the intervention of last resort. Under no circumstances will you remove the tourniquet because the bleeding will resume. Like with applying pressure, tourniquet use is continued until medical professionals take-over the victim's care. Unlike a tourniquet, applying pressure to the artery doesn't cut-off the entire blood supply to the limb.

Niceties

Ellen Burns, RN commented at the workshop that "there will be blood everywhere." With that in mind I personally will:

..hope to cover my own skin by putting on a jacket and perhaps throwing an extra shirt over my own legs while retrieving my first aid supplies from my pack.

..pack 2 pairs of non-latex (PVC, vinyl or nitrile) household gloves instead of the more compact and often recommended examination gloves.

A pair of medium-sized kitchen gloves will be for me; a pair of large-sized gloves will be for a helper. Such gloves are bulkier and heavier to carry but will survive friction damage in my pack, will provide a larger and more substantial barrier to blood borne diseases like HIV, and could be welcome in a wet or cold weather survival situation.

When stopping arterial bleeding, one does not need the superior sensitivity in their hands that nitrile gloves provide. Plastic bags can be used to protect you from contamination if gloves aren't available. Also use plastic bags to dispose of blood contaminated items to limit the exposure of the helpers at the scene to the victim's blood.

A nicety for the victim will be using my foam sit mat under their body region receiving the intense compression. Even in the indoor workshop setting, I had extremely painful skin pinching around my knee when the necessary amount of pressure was applied to my hypothetical leg wound. Out on the trail, it's highly likely that the victim will be lying in a mix of rocks and rough plant material.

Once the wound situation has stabilized, make the victim as comfortable as possible, including any points where their skin is contacting the ground. Consider covering the person to keep them warm. Avoid giving the injured person food or water, which will complicate matters at surgery, unless essential.

Hopefully, you won't be managing an injury like this alone. A good job for an extra person on the scene is to be the scribe. Notes can be taken on paper or written on the victim's skin with a pen or marker. The minimum information would be the time that the wound was discovered and the time a tourniquet was applied. Commit the time to memory if it can't be recorded. Note other time-line details as they arise and is possible. Other useful information for SARS and the hospital staff would be the victim's name, age, contact information, other medical issues, and medications.

Summary

Keep yourself safe by surveying the scene for potential hazards, minimizing the exposure of your skin to the victim's blood, and recruiting help from others.

Save the life of the person with an arterial wound by quickly applying intense and continuous pressure directly to the wound. Only if it is impossible to completely stop the bleeding with pressure, resort to stopping the blood flow from a limb with a tourniquet. Either treatment choice is kept in place until medical professionals assume responsibility for the victim's care.