

3.1 Topic “Bleeding and hemorrhage control”

1. **General information. Causes and signs of external bleeding. Critical external bleeding**
2. **Techniques of bleeding control: pressure bandage, extremity elevation, buccellation (wound packing), Israeli bandage, digital pressure, maximum limb flexion in the joint.**
3. **Tourniquets: indications, types, application technique.**
4. **Internal bleeding: causes and sings. first aid for internal bleeding.**

1. GENERAL INFORMATION. CAUSES AND SIGNS OF EXTERNAL BLEEDING

Bleeding is the loss of blood.

Bleeding is the loss of blood from the circulatory system. Causes can range from small cuts and abrasions to deep cuts and amputations. Injuries to the body can also result in internal bleeding, which can range from minor (seen as superficial bruising) to massive bleeds.

Bleeding may be:

- Inside the body when blood leaks from blood vessels or organs
- Outside the body when blood flows through a natural opening (such as the vagina, mouth, or rectum)
- Outside the body when blood moves through a break in the skin

There are six sites of bleeding in the injured patient:

1. Head
2. Intra-Thoracic
3. Intra-abdominal
4. Pelvic
5. Long bones
6. Externally

WOUNDS:

- Wound is caused when any tissue (Skin, Muscle, Bone, etc.) is torn or cut by an injury.
- **DEPTH** of the wound is more important than AREA.

TYPES OF WOUND:

- Open wound
- Closed wound

OPEN WOUND:

- Incised wound
- Lacerated wound
- Punctured wound
- Graze or Abrasion
- Gun shot wound
- Avulsion Amputation

CLOSED WOUND:

- Contused wound

Sources of Bleeding

1. Arterial bleeding Arterial bleeding is rapid and profuse. As the blood is under pressure from the heart it will spurt from the wound with each contraction of the heart which makes clotting difficult.

2. Venous bleeding Blood flows from the wound at a steady rate as the blood is not under as much pressure. This is dark red blood and clots more easily.

3. Capillary bleeding Blood oozes from the wound. It is very simple to control as the blood pressure in capillaries is very low. Clotting occurs easily with this type of bleeding, as the blood flow is extremely slow.

- **Arterial** - Rapid, profuse and pulsating - Bright red in color
- **Venous** - Steady flow, nonpulsating - Dark red or maroon in color
- **Capillary** - Slow and oozing - Often clots spontaneously, not dangerous

BLEEDING:

- BLEEDING RESULTS DUE TO RUPTURE OF BLOOD VESSELS.

TYPES OF BLEEDING:

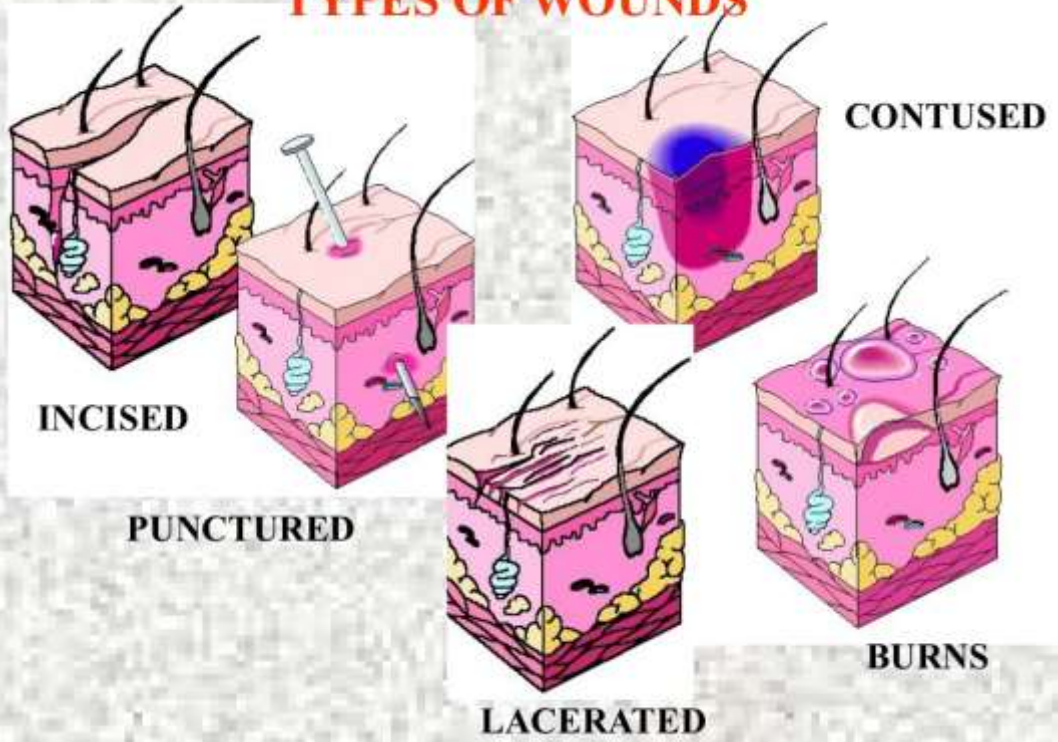
- External bleeding
- Internal bleeding

Varieties of bleeding:

Arterial bleeding:

- BLOOD COMES FROM AN ARTERY.
- BLOOD IS BRIGHT RED IN COLOUR.
- BLOOD COMES IN JETS & IT CORRESPONDS TO HEART BEAT.
- BLOOD LOSS IS RAPID & PROFUSE & CAN CAUSE DEATH QUICKLY.

TYPES OF WOUNDS



External Bleeding



Core Skills

8

- Types of External Bleeding
- Lacerations



• Abrasions



• Puncture wounds



• Amputations



• Avulsions



MANAGEMENT:

- Stop bleeding.
- Handle gently.
- Wash your hands thoroughly.
- Remove any foreign body, if possible.
- Do not remove embedded objects.
- Don't disturb blood clots.
- Place clean dressing & bandage firmly.
- Shift to hospital.

Signs and symptoms of life-threatening external bleeding

- Blood that gushes or spurts from a wound
- Blood that does not clot after efforts to control it
- Faintness
- Pale skin colour
- Nausea
- Vomiting

2. MANAGEMENT: EXTERNAL BLEEDING CAN BE CONTROLLED BY:

- Direct pressure.
- Elevation.
- Indirect pressure on pressure points.
- Splinting.
- Inflatable splinting.
- Blood pressure cuff.
- Tourniquet.

DIRECT PRESSURE:

CAN BE APPLIED BY:

- First aider`s hand
- Dressing & First aider`s hand
- Pressure dressing
- Pressure to be applied for 10 to 30 minutes.
- After control, apply firm bandage
- **NEVER REMOVE EXISTING BANDAGE** IF BLEEDING RECURS. APPLY ANOTHER OVER IT.

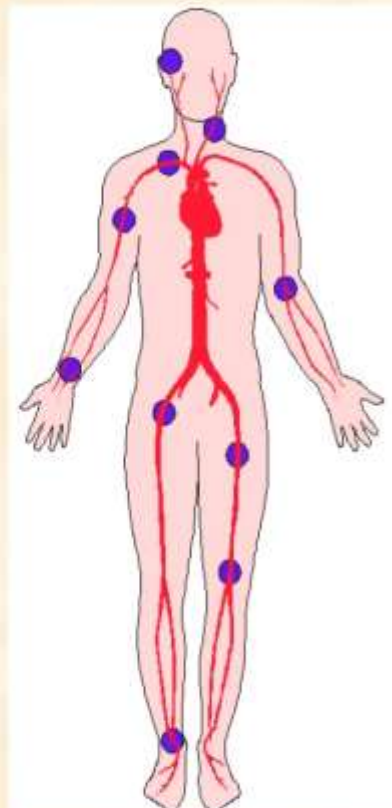
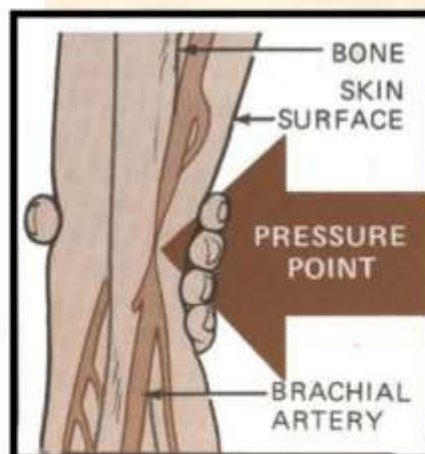
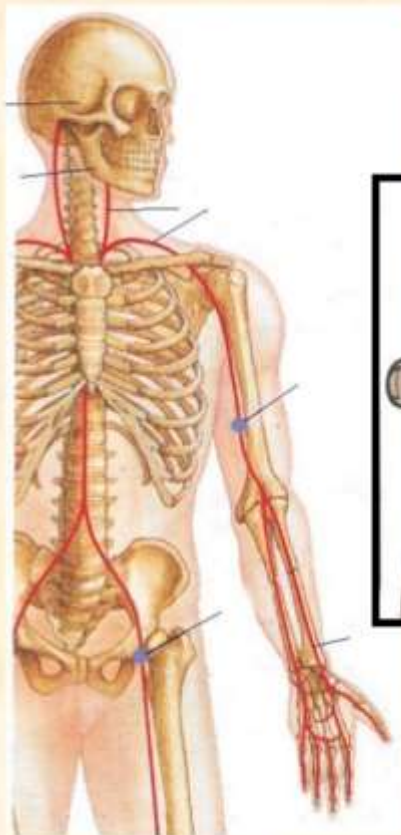
ELEVATION:

- Gravity helps to lower blood pressure & bleeding is slowed.
- **NOT** to be used in cases of fractures & spinal injuries.

PRESSURE POINTS:

- Pressure point is a site where main artery lies near the surface of the body, directly over a bone.
 - Pulsation can be felt in these areas.
 - There are 22 pressure points(11 on each side).
 - Of these 11 are used to control profuse bleeding.
- Brachial artery - for bleeding from upper limb.
 - Femoral artery - for bleeding from lower limb.
 - Carotid artery - for bleeding from neck.
 - Temporal artery - for bleeding from scalp.
 - Facial artery - for bleeding from face.
 - Sub clavian artery - for bleeding from chest wall & armpit

PRESSURE POINTS





APPLICATION OF INDIRECT PRESSURE



Apply **DIGITAL PRESSURE**, if needed.

If an artery is damaged, you can use your finger, thumb, hand, or knee to apply pressure to the artery at a pressure point above the wound. The pressure compresses the artery against the bone, thus reducing blood flow or stopping the blood flow entirely. Since it is difficult to maintain sufficient pressure on the artery and more than one blood vessel is usually involved in the injury, the pressure point method is used only until a pressure dressing can be applied.

Figure 2-10 shows the location of common pressure points. A pulse can always be felt at a pressure point.

a. To control arterial bleeding of the upper part of the upper arm, apply pressure to the subclavian artery (figure 2-10 D).

b. To control arterial bleeding of the lower part of the upper arm or at the elbow, apply pressure to the brachial artery (figure 2-10 E).

c. To control arterial bleeding of the forearm, apply pressure to the lower part of the brachial artery (figure 2-10 F) or to the ulnar or radial artery.

d. To control arterial bleeding of the wrist or hand, apply pressure to the ulnar or radial artery (figure 2-10 G).

e. To control arterial bleeding of the thigh, apply pressure to the femoral artery (figures 2-10 H and I).

f. To control arterial bleeding of the lower leg, apply pressure to the popliteal artery (figure 2-10 J).

g. To control arterial bleeding of the foot, apply pressure to the anterior or posterior tibial artery

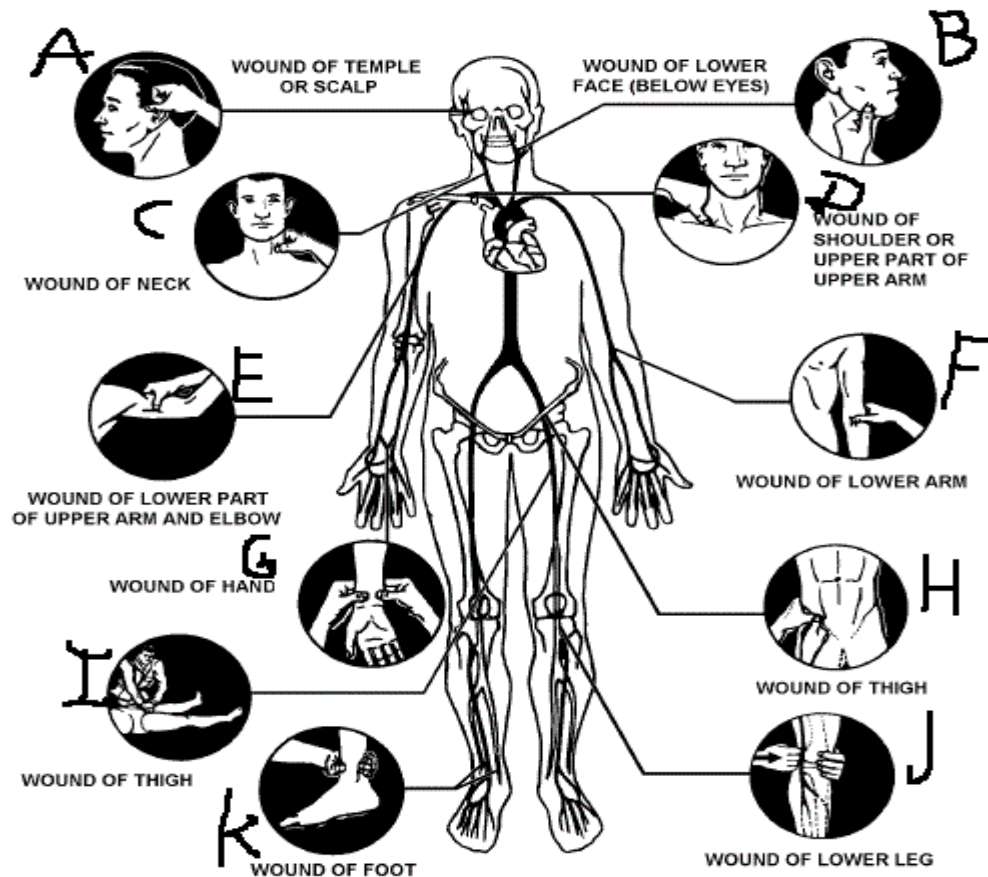


Figure 2-10. Locations of pressure points.

NOTE:

- Pressure point technique is used only after direct pressure & elevation fails to control bleeding.
- Relax the muscles of that area, which will help in applying pressure better.
- Continue pressure till bleeding is controlled or till medical help arrives.
- Release pressure once in 15 minutes and reapply.
- **Splinting**
- **Inflatable splints**
- **Blood pressure cuff**
- **Tourniquet** : applied as a last resort, as in cases of amputation, etc.

MINOR BLEEDING:

- Controlled by elevation & direct pressure.

MAJOR BLEEDING:

- **EXTERNAL BLEEDING:**
- Bring sides of wound together & press firmly.
- Position the patient in a comfortable position. • elevate the injured part if possible.
- If direct pressure fails, apply pressure on pressure point for 10 to 15 minutes.
- Apply clean pad, larger than the wound & press firmly, till bleeding is controlled.
- If bleeding continues, do not remove soaked pad, but apply more pads.

- Bandage firmly.
- Treat shock.
- Shift to hospital as a priority.

THE EMERGENCY BANDAGE



Trauma / Wound Compression Dressing

The Emergency Bandage is the first major innovation
of its kind in over 50 years!

- ♥ NSN # 6510-01-460-0849 - FCP-01 - 4"
- ♥ NSN # 6510-01-492-2275 - FCP-02 - 6"
- ♥ NSN # 6510-01-515-7528 - FCP-05 - 6" +mobile pad



1 Place pad on wound & wrap the elastic bandage around limb or body part

2 Insert elastic bandage into pressure bar

3 Tighten elastic bandage



4 Pull back – forcing pressure bar down onto pad

5 Wrap elastic bandage tightly over pressure bar and wrap over all edges of pad

6 Secure hooking ends of closure bar into elastic bandage



www.kitpro



www.kitpro.co





Splints

- Immobilization of the injured extremity is one of the best ways to stop bleeding
- Broken bone fragments may lacerate blood vessels
- Muscular activity will increase rate of blood flow

3. Tourniquets

- Early use of a tourniquet in the setting of forceful arterial bleeding, such as an amputation, may be life- saving

STOP THE BLEEDING!

Use a commercial tourniquet, such as the Combat Application Tourniquet, if available. If not available, then use..

- Cravat
- Belt
- Rope
- Strap from LBE
- Any available material

Combat Application Tourniquet WINDLASS SELF ADHERING BAND WINDLASS STRAP ▪ The C-A-T was selected as the primary tourniquet for every soldier.

Combat Application Tourniquet

- The C-A-T was selected as the primary tourniquet for every soldier.



Step 1 Place the wounded extremity through the loop of the Self-adhering Band

C-A-T Step 1



Step 2 Place tourniquet above the injury site

C-A-T Step 2



**Place tourniquet
above the injury
site**

Step 3 Pull the free- running end of the Self-adhering Band tight and securely fasten it back on itself.

C-A-T Step 3



**Pull the free-
running end of the
Self-adhering
Band tight and
securely fasten it
back on itself.**

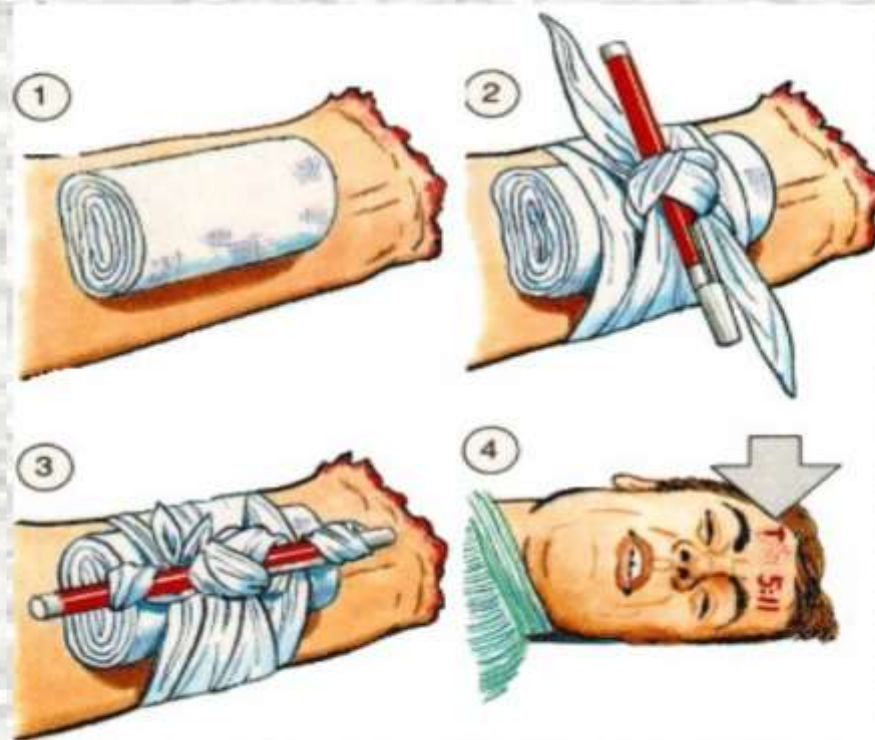
Hemorrhage Control



COMBAT MEDIC ADVANCED SKILLS TRAINING (CMAST)

Improvised Tourniquet

Improvised Tourniquet

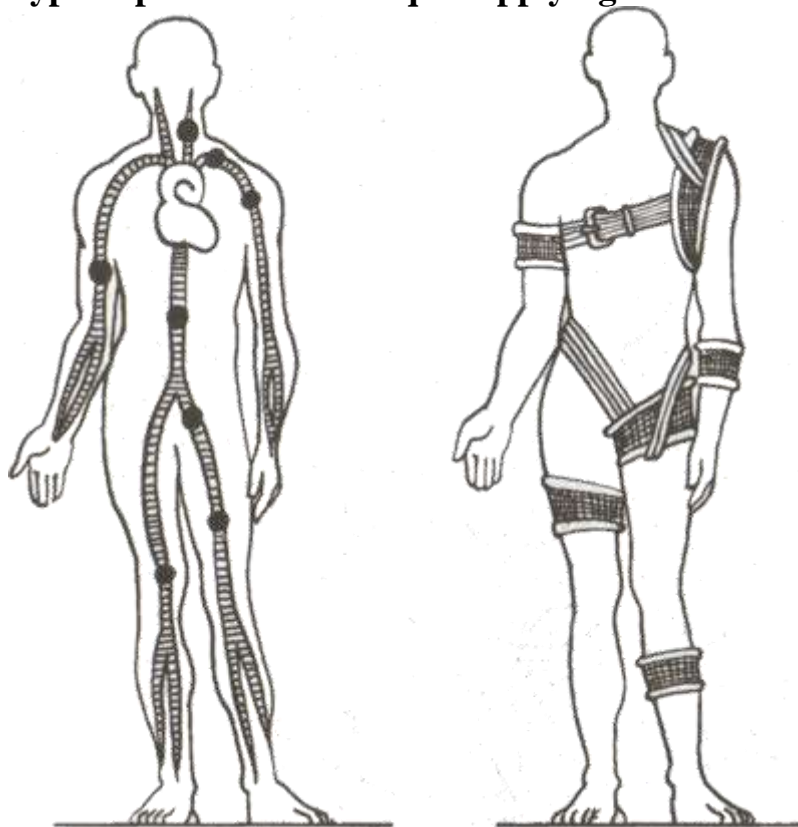


Tourniquet Application • Place tourniquet between the heart and wound • Wrap tourniquet around extremity • Tighten UNTIL BLEEDING STOPS

Apply the tourniquet between the heart and injury. Place your tourniquet around the injured limb, between the open wound and the heart (or proximal to the wound) — the purpose is to cut off the strong blood flow within arteries leaving the heart, not the more superficial veins returning blood back to the heart. More specifically, place your tourniquet about 2-4 inches away from the edge of the wound. Don't place it directly over the wound because the arteries upstream from the injury will still drain into and out from the open wound.

- For wounds that are just below a joint (such as the elbow or knee), place your tourniquet just above and as close to the joint as you can.
- Your tourniquet should have some padding underneath it to prevent skin damage, so use the victim's clothing (pant leg or shirt sleeve) to place under it if you can.
- If your tourniquet is long enough, wrap it around the injured limb numerous times, keeping it as flat as possible. You want the tourniquet to stop blood flow in the arteries, but not cut into and damage any soft tissues while doing so

Typical places for tourniquet applying



HEMOSTATICS: GAUZE BASED, CHEMICAL AGENTS. INDICATIONS FOR ITS' APPLICATION

Haemostatics are applications designed to stem blood-flow through the accelerated promotion of clotting. As with all treatments it is important to understand their roles, applications and the differences between them.

Considerations

- Haemostatics are not the first line treatment for serious bleeds. Always start with direct pressure before considering haemostatics.
- They are used with direct pressure – not instead of.
- Every haemostatic agent (brand and type) is different and familiarisation training should be sought.
- They are applied to the source of the bleed – the damaged blood vessel – not somewhere near it.

- The packaging should be retained and handed-over to the EMS with the instruction that it goes with them to hospital to enable their wound to be managed effectively. Do not assume the hospital will know how to deal with the haemostatic you have applied.

Application

In simple terms Haemostatic agents work in a variety of ways to stem the flow of blood but their use, as with all advanced interventions, requires training and understanding.

The primary treatment for all serious bleeds is direct pressure; all haemostatics are designed to be used with direct pressure at the site of the bleed – directly onto the bleeding artery, deep within the wound if necessary. They are not a ‘magic powder’ that can be casually applied somewhere near the wound and left to work.

Most brands are available as either a loose, granular powder, impregnated onto a bandage or retained inside a porous bag. Loose powders present issue when trying to apply them accurately into the wound site and can be blown around by the wind.

Powders cannot be applied against gravity – for example packing a wound underneath a casualty – nor can they be applied against very fast flowing blood. Haemostatic bandages, gauzes and ‘sponges’ are often easier and more practical to apply. These dressings are also easier to remove and clean in theatre, once the casualty gets to hospital.

Finally, Haemostatic agents should never be allowed to enter:

- The eyes
- The airway
- The chest
- Head injuries with exposed brain tissue or meninges

TYPES OF HAEMOSTATIC AGENTS

Factor concentrators

These agents work through rapid absorption of the water content of blood concentrating the cellular and protein components of the blood encouraging clot formation.

One of the most common ‘myths’ you will hear of Haemostatics is that they cause burns. One particular brand *Quikclot* used Zeolite, an inert volcanic mineral which rapidly absorbs water but creates an exothermic reaction. *Quikclot’s* 2nd generation products had been seen to generate heat up to 42oC.

Mucoadhesive agents

These agents create a strong adherence to tissues and physically seal bleeding wounds. Three common products –Celox, SAM Chito Hemcon - all use chitosan, a naturally occurring, bio-compatible polysaccharide derived from shellfish, and work in this fashion.

Celox Gauze and Chito-SAM

Both Celox Gauze and Chito-SAM are fibrous bandages coated in chitosan powder. This is easier to handle and apply than granules and is also easier to clean in theatre, usually with normal saline. Chitosan is naturally broken down by the body’s natural enzymes unlike Kaolin or other minerals used in haemostatics which will remain in the body indefinitely unless removed.

As haemostatic bandages need to be packed into the wound, the user is limited by the length of their finger; the *Celox Applicator* is a unique design which allows the chitosan to be applied into deep wounds making it ideal for gunshot and penetrating wounds.



Celox Gauze
Chito-SAM



Celox Applicator
HemCon

HemCon products are also chitosan-based haemostatic and works on the same adhesive principle as *Celox*. *Hemcon* is a mucoadhesive pad which is intended to seal the wound (like a puncture repair) but, being a fairly stiff and brittle pad, it is not efficient as efficient at dealing with deeper wounds. Hemcon pads have been known to break apart during use (12). Recently *Hemcon* have introduced *Hemocon Chitoflex* which is a coated bandage similar to *Celox* and *Chito-SAM* which can be packed into the wound.

HemCon® Bandage (4" x 4")



Procoagulant supplementors

A third class of agents function by delivering procoagulant factors to the bleeding wound.

Current 3rd and 4th Generation *Quikclot* utilise Kaolin, a white aluminosilicate nano-particulate which has been shown to accelerate the body's natural coagulation cascade.

3rd Generation products are dispensed in a 'tea bag' like sachet which is applied directly to the wound. This removes the problems associated with handling loose granules and enables a large area to be covered, deep wounds to be filled and direct pressure to be effectively applied. This method of application also facilitates the quick and easy removal of the product in theatre. Conversely, this method is not ideal for treating small, deep puncture wounds or incisions.

4th Generation *Quikclot Combat Gauze* is fibrous gauze impregnated with Kaolin. The bandage is packed deep inside the wounds as with other haemostatic bandages.



Quikclot Combat Gauze



Quikclot ACE 'Sponge'

But...what about just normal gauze?

Comparisons of Quikclot Combat Gauze, Celox and Kerlix (a standard, unmediated, gauze bandage) *that standard gauze was faster to pack with no difference in haemostatic success or blood loss*

Haemostatics should not be left in place for more than 24 hours. If the casualty cannot be evacuated to definitive care within this time, their use is not appropriate. This might limit their use in extremely remote environments.

A casualty with a catastrophic haemorrhage is very poorly. Evidence suggest that this may account for 50% of trauma related fatalities, more to the point, these fatalities typically occur within one hour of the causing incident. Whilst the haemostatic should not be left for more than 24 hours, can you evacuate your casualty to definitive care within one hour?

Let's not be precious about brand but considers a gauze style haemostatic for ease of use. There *may* be merit in a chitosan based haemostatic over Combat Gauze for the critically ill casualty. If you do not have a haemostatic dressing *any sterile gauze will do* to pack the wound if a) direct pressure is not effective and b) a tourniquet is not appropriate. Communicate your treatment in your initial call for help – the use of a haemostatic has made your casualty time-critical.

Some people will die. Not because of you, your actions or which brand of haemostatic you were or were not using. That's why it is called "Catastrophic" bleeding.

4. INTERNAL BLEEDING: CAUSES AND SIGNS. FIRST AID FOR INTERNAL BLEEDING.

Internal bleeding occurs when there is a rupture of either an artery, vein or capillaries within the body.

Internal bleeding may be caused by the following conditions:

1. Trauma - damage to a blood vessel that can't easily be repaired by the body's internal mechanisms;
2. Chronic disease – high blood pressure, aortic aneurism, liver cirrhosis, not enough clotting factors (hemophilia A, B, etc.) in the blood to make the repair;
3. Medications - that are taken to prevent abnormal clotting (Aspirin, Warfarin, Heparin, etc.);
4. Other causes – ectopic pregnancy, pregnancy miscarriage, etc.

If there is an injury, internal bleeding must be suspected. At the same time, the most common reason of severe internal bleeding is an injury. Damaged internal organs commonly lead to the bleeding that is concealed. It can result in severe blood loss with resultant shock (hypoperfusion) and subsequent death.

Internal bleeding can be visible or concealed.

Visible where the bleeding can be seen. Blood is exiting from:

- Ears - bright, sticky blood or blood mixed with clear fluid
- Lungs - frothy, bright red blood coughed up by the person
- Stomach - coffee color, bright or dark red vomit
- Bowel or intestines - bright red or dark/tarry blood (as the blood is partially digested)
- Anus or vagina - usually red blood mixed with mucus
- Urinary tract - dark, red colored or pink tinged urine
- Under the skin (bruising) - dark/purple due to the blood under the skin and not exposed to air

Concealed - no direct evidence of obvious bleeding. Bleeding is contained within the body:

- Head (intracranial hemorrhage)
- Thorax (hemothorax, cardiac tamponade, bleeding due to large vessels' rupture – aorta, superior and inferior vena cava, and their major branches)
- Abdomen (hemoperitoneum due to liver, spleen damage)
- Pelvis (pelvic fractures)
- Around large bones (fractures)

Suspicion and severity of internal bleeding should be based on the mechanism of injury and clinical signs and symptoms.

Relationship to mechanism of injury:

1. **Blunt trauma** - This kind of trauma happens when a body part collides with something else, usually at high speed. **Blood** vessels inside the body are torn or crushed either by shear forces or a blunt object.
 - a. Falls from over 3 meters
 - b. Motorcycle crashes
 - c. Pedestrian impacts
 - d. Automobile collisions

e. Blast injuries
f. Look for evidence of contusions, abrasions, deformity, impact marks, and swelling.

2. **Penetrating trauma** - This happens when a foreign object penetrates the body, tearing a hole in one or more [blood](#) vessels

1. gunshot wounds,
2. stabbings,
3. falling onto a sharp object.

Internal bleeding damages the body both from the loss of blood and from the pressure the misplaced blood puts on other organs and tissues. At first the casualty may not present with any symptoms, although if an organ is bleeding usually this is often painful. This pain may be overlooked by the assessor or the casualty as they may be distracted with other injuries or issues. Also the injured person may not be able to express pain if they are drowsy, confused or (sounds obvious but) unconscious. So please be aware when helping an injured person that visible signs and symptoms, or even lack of them does not necessarily mean they are in the clear of a more serious injury or condition. Eventually, bleeding internally usually becomes apparent with possible signs and symptoms such as blood being vomited up or ears leaking fluid (see below for more possibilities). There are also more vague signs that develop such as generalized pain or tight, rigid abdominal muscles.

It is important to remember that an injured person may be bleeding internally even if you can't see any blood.

Clinical **signs and symptoms** of internal bleeding:

- Bleeding usually causes pain and the area of the body affected is usually the site of the person's complaint. Blood that leaks outside of a blood vessel is very irritating and causes an inflammatory response. There will be pain, tenderness, swelling or discoloration of soft tissues of suspected site of injury;

- Bleeding from an orthopedic injury, usually of the forearm or shin, may cause gradual increase of the pressure within the muscle compartments causing blood supply to the affected area to be compromised. This can lead to intense pain, tingling, numbness, and decreased motion. Fractures of long bones (humerus, femur) will cause deformation (extension of the extremity's diameter), swelling of a damaged limb

- Blood that irritates the diaphragm may cause [pain in the chest](#) or pain that radiates to the shoulder, and it's going to be rigid, breathing problems can appear.

- Blood in the peritoneum causes intense pain that is sometimes difficult to localize especially if blood is spilling everywhere. The abdomen is going to be tender, rigid, and/or distended.

- Black [tarry stools](#) may indicate bleeding in the stomach or small intestine. (Please note that while a black bowel movement should be concerning, it may also be seen in patients taking iron [supplements](#), Pepto Bismol, or other medications and dietary products).

- Blood from a body orifice (mouth, nose, ears, [anus](#), vagina, or urethra) may be a symptom of internal bleeding

- Bleeding from the kidney or bladder may not be recognized until the patient needs to urinate and then the blood is apparent.

- Orthostatic hypotension (becoming dizzy when attempting to stand) can occur in patients with internal bleeding.
 - Late signs and symptoms of hypovolemic shock (hypoperfusion) are
 - a. Anxiety, restlessness, combativeness or altered mental status
 - b. Weakness, faintness or dizziness
 - c. Thirst
 - d. Shallow rapid breathing
 - e. Rapid weak pulse
 - f. Pale, cool, clammy skin
 - g. Capillary refill greater than 2 seconds - infant and child patients only
 - h. Dropping blood pressure (late sign)
 - i. Dilated pupils that are sluggish to respond
 - j. Nausea and vomiting

Steps to caring for patient with internal bleeding

1. Follow standard precautions: look for danger, personal protection, look for response.
2. Maintain the airway with cervical immobilization.
3. Administer high-flow oxygen and provide artificial ventilation as necessary.
4. Control all obvious external bleeding.
5. Apply a splint to an extremity where internal bleeding is suspected.
6. Monitor and record vital signs at least every 5 minutes.
7. Give the patient nothing by mouth.
8. Elevate the legs 15-30 cm (6" to 12") in nontrauma patients.
9. Keep the patient warm.
10. Provide immediate transport for patients with signs and symptoms of shock. Report changes in condition to hospital personnel.