



A close-up photograph of a person's arm, showing a significant bruise on the forearm. The skin is discolored with shades of purple, red, and yellow. The person is wearing a red garment, likely a uniform. The background is dark and out of focus.

Trauma Management

Cause And Effect Of Officer Response Options

By Richard Kay

In a violent confrontation, there is a high possibility that using force to control a resistive subject may cause physical trauma. Whilst the aim is harm minimisation, this may be unavoidable under the circumstances. Response options are chosen by evaluating control versus injury, where the need to gain control is weighed against the possibility of causing (or sustaining) injury.

The aim here is to outline common types of blunt force trauma and relate these to possible causes resulting from a use of force via officer response to a resistive subject. It should be viewed in conjunction with lawful principles of situation assessment, force evaluation and duty of care. An aspect of duty of care includes providing aftercare to injured people and, as such, officers should maintain competency in first aid procedures in addition to use of force procedures.

Blunt force trauma relates to physical trauma caused to a body part, either by impact, injury or physical attack; specifically, the precursory trauma from which there is further development of more specific types of trauma, such as contusions, abrasions, lacerations and/or bone fracturing.

A **wound** is a type of physical trauma where the skin is torn, cut or punctured (*open*), or where blunt force trauma causes a contusion (*closed*). In pathology, it specifically refers to a sharp injury which damages the dermis of the skin.

Before any medical/paramedical evaluation, a wound is considered as minor when it is superficial ('flesh wound'), it is away from natural orifices, there is only minor bleeding or it was not caused by a tool or an animal. Any other wound should be considered as severe. If there is any doubt, a wound should be considered as severe. This does not necessarily mean it endangers life, but should at least be seen by a physician. In the case of severe open wounds, there is a risk of blood loss (which could lead to shock) and an increased chance of infection due to bacteria entering a wound that is exposed to air. Due to the risk of infection, wounds should be kept clean and closed if possible until professional help is available. Depending on their severity, closed wounds can be just as dangerous as open wounds. An injury to the brain such as a contusion is an extremely dire closed wound and requires emergency medical attention.

Bleeding (*haemorrhage*) is the loss of blood from the circulatory system. Bleeding can occur internally, where blood leaks from blood vessels inside the body, or externally, either through a natural opening such as the mouth or rectum, or through a break in the skin.

Desanguination is a massive blood loss, whilst complete loss of blood is referred to as *exsanguination*. Loss of 10–15 percent of total blood volume can be endured without clinical sequelae in a healthy person (blood donation

typically takes 8–10 percent) of the donor’s blood volume). Bleeding generally becomes dangerous, or even fatal, when it causes *hypovolemia* (low blood volume) or *hypotension* (low blood pressure). In these scenarios, various mechanisms come into play to maintain the body’s homeostasis.

Bleeding is broken down into four classes:

- *Class 1* involves loss of up to 15 percent of blood volume. There is typically no change in vital signs. Volume resuscitation is not typically required.
- *Class 2* involves loss of 15–30 percent of total blood volume. A patient is often tachycardic (rapid heartbeat) with a narrowing of the difference between the systolic and diastolic blood pressures. The body attempts to compensate with peripheral vasoconstriction. Skin may start to look pale and be cool to the touch. The patient might start acting differently. Volume resuscitation is all that is typically required. Blood transfusion is not typically required.
- *Class 3* involves loss of 30–40 percent of circulating blood volume. The patient’s blood pressure drops, the heart rate increases, peripheral perfusion (such as capillary refill) worsens, and the mental status worsens. Fluid resuscitation and blood transfusion are usually necessary.
- *Class 4* involves loss of more than 40 percent of circulating blood volume. The limit of the body’s compensation is reached and aggressive resuscitation is required to prevent death.

Individuals in excellent physical and cardiovascular shape may have more effective compensatory mechanisms before experiencing cardiovascular collapse. These patients may look deceptively stable, with minimal derangements in vital signs, while having poor peripheral perfusion (shock).

Traumatic bleeding is caused by some types of injury, including the following wounds:

- *Abrasion* (graze) – caused by transverse action of a foreign object against the skin; it usually does not penetrate below the epidermis.
- *Excoriation* – caused by mechanical destruction of the skin, although it usually has an underlying medical cause (in common with abrasion).
- *Laceration* – irregular wound caused by blunt

impact to soft tissue overlying hard tissue or tearing.

- *Incision* – a clean ‘surgical’ wound, caused by a sharp object such as a knife.
- *Puncture wound* – caused by an object, such as a knife, penetrating the skin and underlying layers.
- *Contusion* (bruise) – caused by a blunt trauma damaging tissue under the surface of the skin.
- *Gunshot wounds* – caused by a projectile weapon; this may include two external wounds (entry/exit) and a contiguous wound between them.

The pattern of injury, evaluation and treatment will vary with the mechanism of the injury. Blunt trauma causes injury via a shock effect, delivering energy over an area. Wounds are often not straight, and unbroken skin may hide significant injury. Penetrating trauma follows the course of the injurious device. As the energy is applied in a more focused fashion, it requires less energy to cause significant injury. Any body organ, including bones and the brain, can be injured and bleed. Bleeding may not be readily apparent; internal organs such as the liver, kidney and spleen may bleed into the abdominal cavity. The only apparent signs may come with blood loss. Bleeding from a bodily orifice, such as the rectum, nose or ears, may signal internal bleeding, but cannot be relied upon.

A **bruise** (also called a contusion) is a kind of injury to tissue in which the capillaries are damaged, allowing blood to seep into the surrounding tissue. It is usually caused by blunt impact. Bruises often induce pain, but are not normally dangerous. Sometimes, bruises can lead to other more life-threatening forms of haematoma, or can be associated with serious injuries, including fractures and internal bleeding. Minor bruises are easily recognised by their characteristic blue or purple colour in the days following the injury. The extent of bruising depends on many factors. The state of the tissue when injured (contracted versus relaxed muscles) can make a large difference, as can the effect of being crushed against underlying bone. People also vary in the sturdiness of their capillaries – some people bruise more easily than others. Colours are a way to determine the severity of a bruise – minor (light blue/light purple), somewhat severe (light-purple/blue),

severe (yellow), very severe (dark purple/black).

An **abrasion** is superficial damage to the skin, generally not deeper than the epidermis. It is more superficial than an excoriation, although it can give mild bleeding. Mild abrasions, also known as grazes, do not scar, but deep abrasions may lead to the development of scar tissue. Most commonly, abrasion injuries occur when exposed skin comes into moving contact with a rough surface, causing trauma to the upper layers of the epidermis.

A **fracture** is a bone break and is classified as closed or open and simple or multi-fragmentary:

- *Closed* fractures are those in which the skin is intact, while open (compound) fractures involve wounds with the fracture that may expose bone to contamination and carry an elevated risk of infection.
- *Simple* fractures occur along one line, splitting the bone into two pieces, while multi-fragmentary fractures involve the bone splitting into multiple pieces. A simple, closed fracture is much easier to treat than an open, contaminated fracture.

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Other types of fracture are:

- *Complete* – bone fragments separate completely
- *Incomplete* – bone fragments are still partially joined
- *Linear* – parallel to the bone’s long axis
- *Transverse* – at a right angle to the bone’s long axis
- *Oblique* – diagonal to a bone’s long axis
- *Compression* – usually occurs in the vertebrae

- *Spiral* – at least one part of the bone has been twisted
- *Comminuted* – causing many fragments
- *Compacted* – caused when bone fragments are driven into each other
- *Open* – the bone reaches the skin
- *Bug* – the bone is in place, but the fracture has the appearance of a crushed insect.

A **dislocation** is where a bone has been displaced from its normal position at a joint. Some joints (shoulder, finger) are more likely than others to dislocate under a sudden, severe force. As a general rule, a dislocation injury should be managed as a fracture.

A **sprain** is an injury which occurs to ligaments caused by a sudden overstretching. The ligament is usually only stretched, but if it is completely torn, a longer period of immobilisation and surgical repair may be necessary. Although some signs and symptoms can be used to assess the severity of a sprain, the most definitive method is with the use of Magnetic Resonance Imaging (MRI).

Sprains are graded in four degrees:

- 1st – only a minor tear or stretch of a ligament
- 2nd – a tear of a ligament, which is usually followed by pain or swelling
- 3rd – a complete rupture
- 4th – actually breaks the ligament, along with some small bones if severe enough.

A **strain** is an injury to a muscle in which the fibres tear as a result of overstretching. Strains are also colloquially known as pulled muscles. Typical symptoms of a strain include localised pain, stiffness, inflammation and bruising around the strain. Whiplash is a specific type of strain and sprain injury to the neck and upper back. The seriousness of a whiplash injury can never be underestimated, no matter how insignificant it seems to be.

Cold compression therapy will stop the pain and swelling while the injury starts to heal itself. Controlling the inflammation is critical to the healing process and icing further restricts fluid leaking into the injured area as well as controlling pain. Cold compression therapy wraps are a useful way to combine icing and compression to stop swelling and pain.

Penetrating trauma is an injury that occurs primarily by an object piercing the skin or entering a tissue of the body. The severity of the injury is determined largely by the velocity of the object that enters the body. High-velocity objects are usually projectiles such as bullets from high-powered rifles. Bullets from handguns and shotguns are classed as medium-velocity projectiles. Low-velocity items, such as knives, are usually propelled by a person's hand and usually do damage only to the area that is directly contacted by the object.

In addition to causing damage to the tissues

they contact, medium- and high-velocity projectiles cause a *cavitation* injury: as the object enters the body, it creates a pressure wave which forces tissue out of the way, creating a cavity that can be much larger than the object itself. The tissues soon move back into place, eliminating the cavity, but the cavitation frequently does considerable damage first. Cavitation can be especially damaging when it affects delicate tissues such as the brain, as occurs in penetrating head trauma.

Officers who learn force response options should also have a comprehensive understanding of the consequences of using these strategies in an operational environment. The provision of aftercare to a subject is an important aspect with regard to showing the officer was acting in a professional capacity and not out of malice. Officers should learn to view first aid in relation to their actions, and in turn assist in justifying their operational choices.

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Common Trauma and Use Of Force Causes		
Trauma	Cause	Treatment
Bruise	strike, control hold, grapple, takedown, handcuff, baton	RICE
Abrasion	takedown, grapple, restraint and detain	Pressure bandage
Bleeding	strike, takedown, handcuff, baton	PIM, rest
Fracture	strike, control hold, baton	Immobilise, treat bleeding and shock
Sprain	control hold, handcuff, grapple	RICE
Strain	control hold, handcuff, grapple	RICE
Penetrating	edged or ballistic weapon	PIM, treat shock

RICE – rest, ice, compression, elevation; PIM – pressure immobilisation