

Gunfighter Anatomy: How to Stop a Man

There are two ways to stop a man. The first, most effective and most difficult to accomplish is disruption of the central nervous system (CNS). The second, least effective and easiest to accomplish is to render a man unconscious as a result of Hypovolemia (blood loss).

Arguably, there is a third method of stopping a man from causing harm. This is to cause damage to the musculoskeletal system in such a way as to inhibit his ability to move. This may leave a perp unable to move from his position, but may also leave him able to operate a firearm. Shots to the pelvic girdle and/or the vertebral column will accomplish this.

Disruption of the Central Nervous System (CNS)

The cerebral cortex, what we think of as ‘the brain’, is involved in conscious initiation of voluntary movement of the body and limbs. The cortex has two hemispheres, left and right, which can operate independently of one another. Each hemisphere controls the muscles of the body on the opposite side – for example the right hemisphere controls the muscles of the left side of the body. Both hemispheres receive information from the body and send information to the body through a structure at the top of the brainstem known as the diencephalon. Damage to one hemisphere of the cortex may *potentially* impede motor function for one side of the body, but the opposite side of the body will be unaffected. Significant damage to the diencephalon will eliminate all voluntary motor function.

Interruption of this voluntary movement pathway will *immediately* eliminate one’s ability to make voluntary movements and thus will *immediately* remove a threat. The pathway for voluntary motor commands to the body is as follows:

Cortex → diencephalon → brainstem → spinal cord → muscles of the body/limbs

The brainstem controls autonomic functions of the body – functions, such as breathing, which sustain life. Within the brainstem also reside axons to the body/limbs (for motor functions) and axons coming from the body (sensation) thus damage to the brainstem may interrupt both voluntary movement and autonomic functions such as breathing. The Pathway for autonomic commands to the body is as follows:

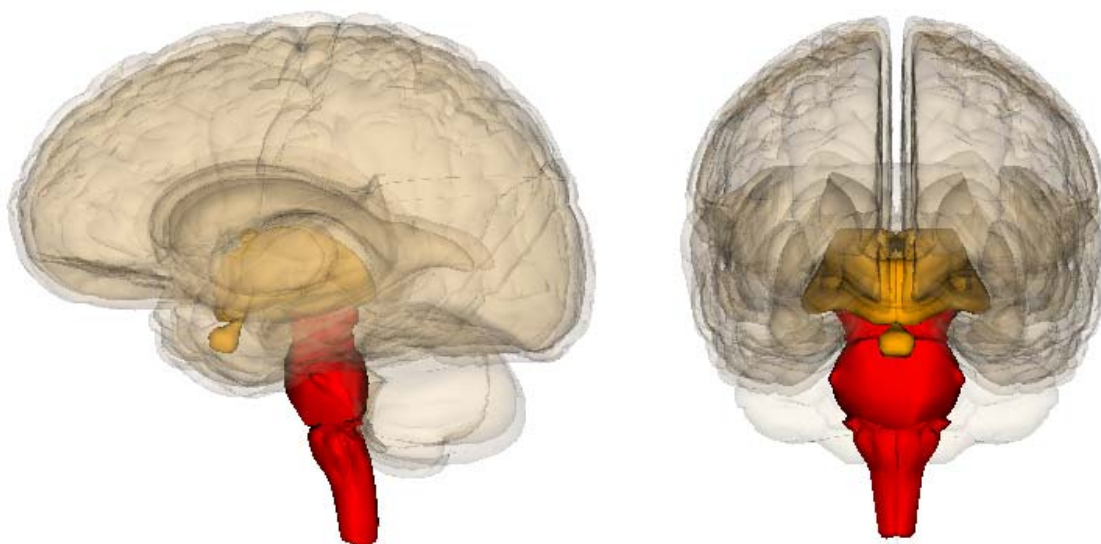
Brainstem → spinal cord → blood vessels, heart, lungs, GI tract, etc

The spinal cord carries information to and from the body to the brain. Severing the cord will cut off information to and from the areas supplied below the cut. The legs are supplied by nerves which enter the cord in the lumbar region. The arms are supplied by nerves which enter the cord in the cervical

region (T1 and above). Thus severing the cord above the base of the neck (just above the jugular notch) will leave a person without the use of their arms or legs.

Conclusions:

- A low velocity (pistol) shot to the head which strikes the cortex may leave the target with the capacity to cause harm.
- Disruption of the brain's ability to communicate with the body can be accomplished through destruction of the diencephalon, brainstem and or spinal cord within the cervical region.
- Destruction of the brainstem will result in immediate death.
- Severing the spinal cord above the base of the neck will ensure complete loss of motor function to the limbs.
- Severing the cord below the base of the neck may leave the arms functional and thus still leave a threat on the field. Note: without the ability to move the trunk the arms will be of less use
- Note: High velocity projectiles penetrating the cranial vault will create an overpressure of the cranium and have an effective result regardless of shot placement within the cranium -think JFK.



Above: the Brainstem (red) and Diencephalon (yellow)

Unconsciousness as a result of Hypovolemia (blood loss)

The brain is a hungry organ and as such it receives approximately 20% of the cardiac output. The Carotid Arteries supply 90% of the blood flow to the brain. A complete disruption of carotid arterial blood flow to the brain will result in unconsciousness within 5-10 seconds. Thus a drop in blood pressure significant enough to reduce blood flow to the brain will result in unconsciousness no quicker than within 5-10 seconds.

Blood leaves the heart and enters the arteries at the junction of the left ventricle and the Aorta. Cardiac output from the left ventricle into the Aorta is 5 Liters per minute on average. The average person has 5 Liters of blood in their body thus the average person could bleed out in one minute if the Aorta were completely dissected.

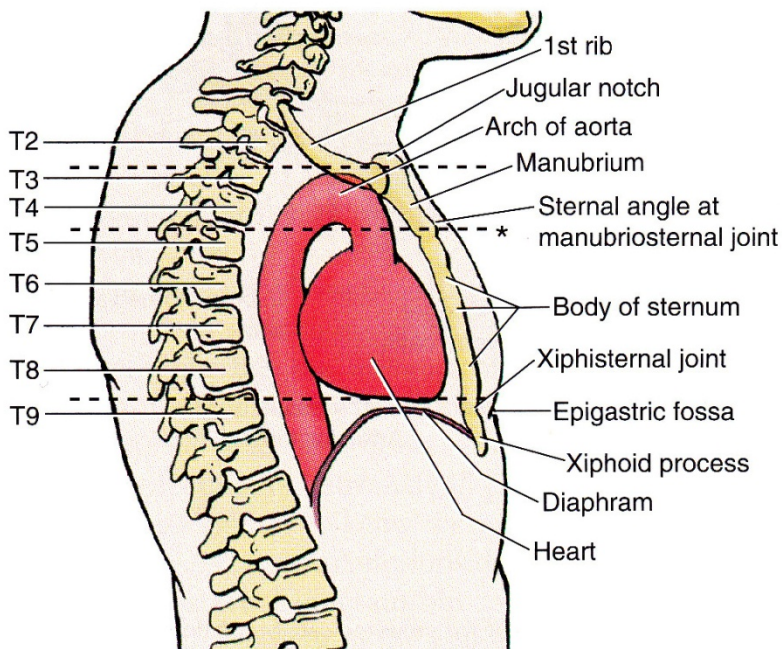
Loss of consciousness will likely occur when 40% of blood volume is lost (approximately 2 liters). Thus loss of consciousness, at best, may occur within 24 seconds of complete perforation of the Aorta near its beginning at the left ventricle, where its velocity is greatest.

Blood flow at the left ventricle/arch of Aorta has the highest velocity of all blood vessels in the body. Blood flow throughout the rest of the vessels of the body is reduced relative to the aorta, so it follows that multiple perforations to multiple arteries would be required to achieve a high rate of blood loss.

Conclusions:

- A complete disruption of blood flow to the brain will not immediately stop a man.
- Even a shot to the heart which results in complete stoppage of blood flow may give a man 5-10 seconds to continue to act.
- Tissue damage in other parts of the body resulting in hemorrhage may take several minutes before blood loss is enough such that the assailant falls unconscious from Hypovolemic shock.
- Even multiple perforations of multiple arteries will likely give an assailant enough time to kill you, your family and your dog before losing consciousness.

Right: a lateral view of the thorax.
Note the position of the Arch of
Aorta behind the Manubrium



Discussion

Loss of consciousness and/or bleeding out from a wound(s) can occur quickly, but in a gunfight seconds are the difference between life and death. A man who is in the process of bleeding out from any number of arterial perforations could very well kill you and later collapse and die himself. The only certain way of immediately stopping a man is to cut off his cortex's ability to communicate with his body. This is done by placing shots on the diencephalon, brainstem and/or spinal cord above the base of the neck.

Unfortunately, these targets are very small. Add movement, return fire and adrenaline and it would be very difficult to hit one and thus it is unrealistic to expect to do so.

The targets which will *quickly* incapacitate a target are also small, but are also in close proximity to other choice targets such as the lungs. Taken as a whole the more rounds you can put on target, the more likely you are to strike the brainstem/spinal cord or perforate highly vascular organs, thus the more likely you will be to create a drop in blood pressure significant enough to result in the target losing consciousness and thus incapacitating, if not killing the target.