

"Odd Job's Gunshot Thread"

Brandon Bertolli
bbertolli@yahoo.com

Introduction:

Brandon Bertolli is a Radiographer whose research interests include the radiographical imaging and documentation of the various bullet configurations (jacketed hollowpoint, full metal jacket, wadcutter and so forth), as they appear in a gunshot victims body, in the interest of furthering the state-of-the-art in the medical treatment of ballistic injuries. What follows is a verbatim copy of a posting that he made to an Internet discussion board, discussing the implications of firearm marksmanship (and aiming points) and how the bullet penetrates the body of a human attacker.

This information was originally made to the Internet firearms discussion forum, www.thefiringline.com, under the handle 'Odd Job'¹. It is presented here as a convenience for visitors to www.BrassFetcher.com, because I feel it is a fine discussion of the shooters end of terminal ballistics – where does the bullet go and where should it be aimed? It is well known that the most critical factor in handgun stopping power is shot placement. Only after a good shot is made, does the benefit of expanding bullets and penetration come into play.

The text has had minor formatting applied, but all that follows is the work of Mr. Bertolli and is copyrighted to him.

Discussion:

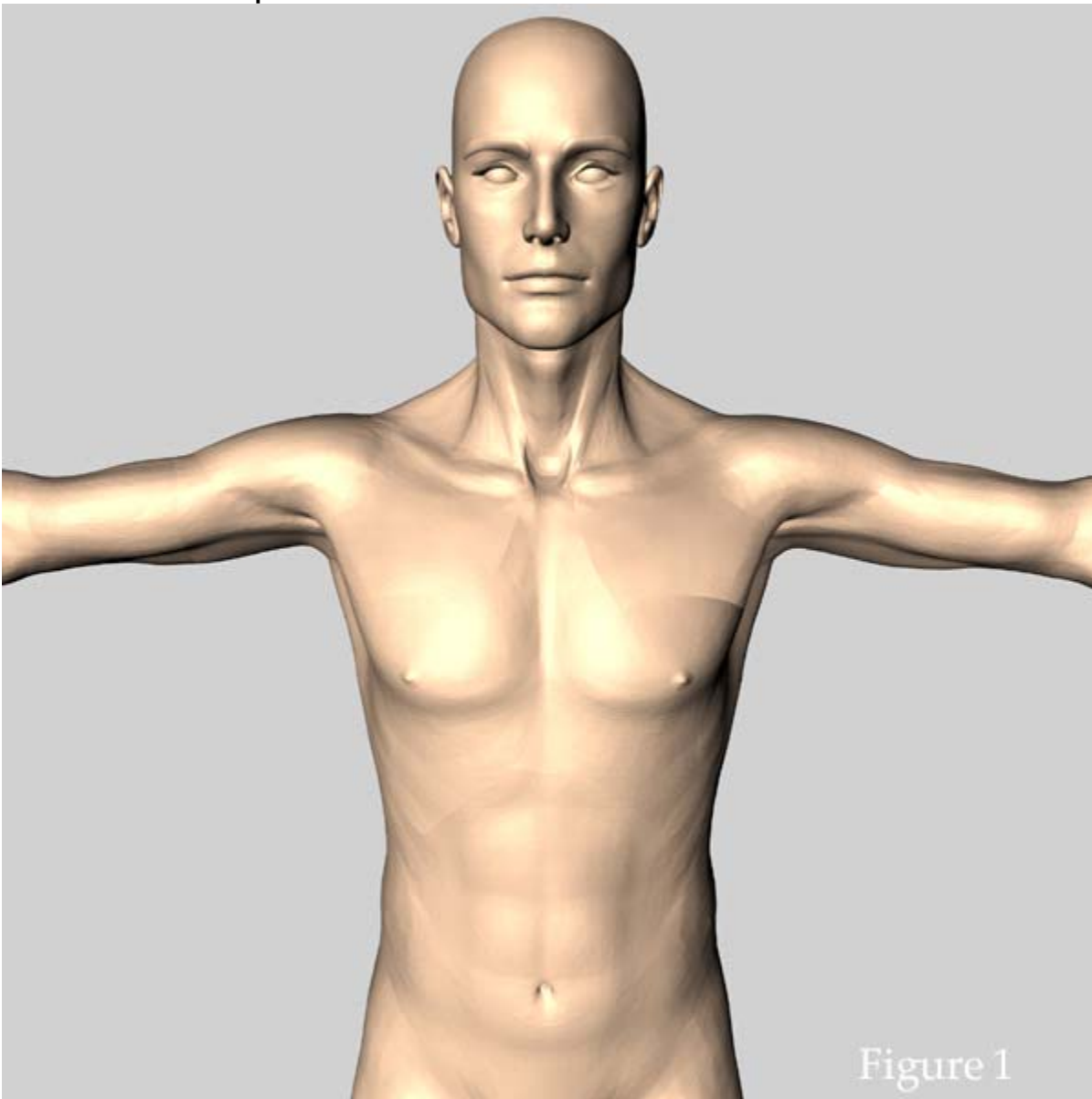
After various threads along the lines of "This guy was hit x times with y ammo of z calibre and he still didn't die" I have decided to tell you all what my perspective is on gunshot wounds and shot placement. To begin with let's go over what we are told by all the experts as regards neutralising a threat by means of gunfire:

- 1) It is accepted that there are certain 'critical' organs and structures within the human body which, if significantly damaged, will lead to the neutralisation of that individual's ability to pose a threat.
- 2) It is also accepted that if we intend to damage those structures we must deliver a projectile that has the ability to penetrate deeply enough into the target to reach and damage those critical organs and structures.
- 3) Lastly we must have some exterior landmark to aim at, which will correspond to the position of the critical organ that we are aiming to damage.

<http://www.thefiringline.com/forums/showthread.php?t=214744&highlight=odd+job+gunshot>¹

And these three points are very difficult to satisfy in real-world shootings because of the variables involved.

To illustrate this, let us pretend that every bad guy we ever encounter will always stand with his arms out sideways (as in Figure 1) and that there is a critical rectangular plate of known dimensions within his chest (as in Figure 2, 3 and 4). Let us also pretend that any bullet that can pass through that plate so that it damages any two parallel surfaces of the plate, will result in an instant incapacitation of that man.



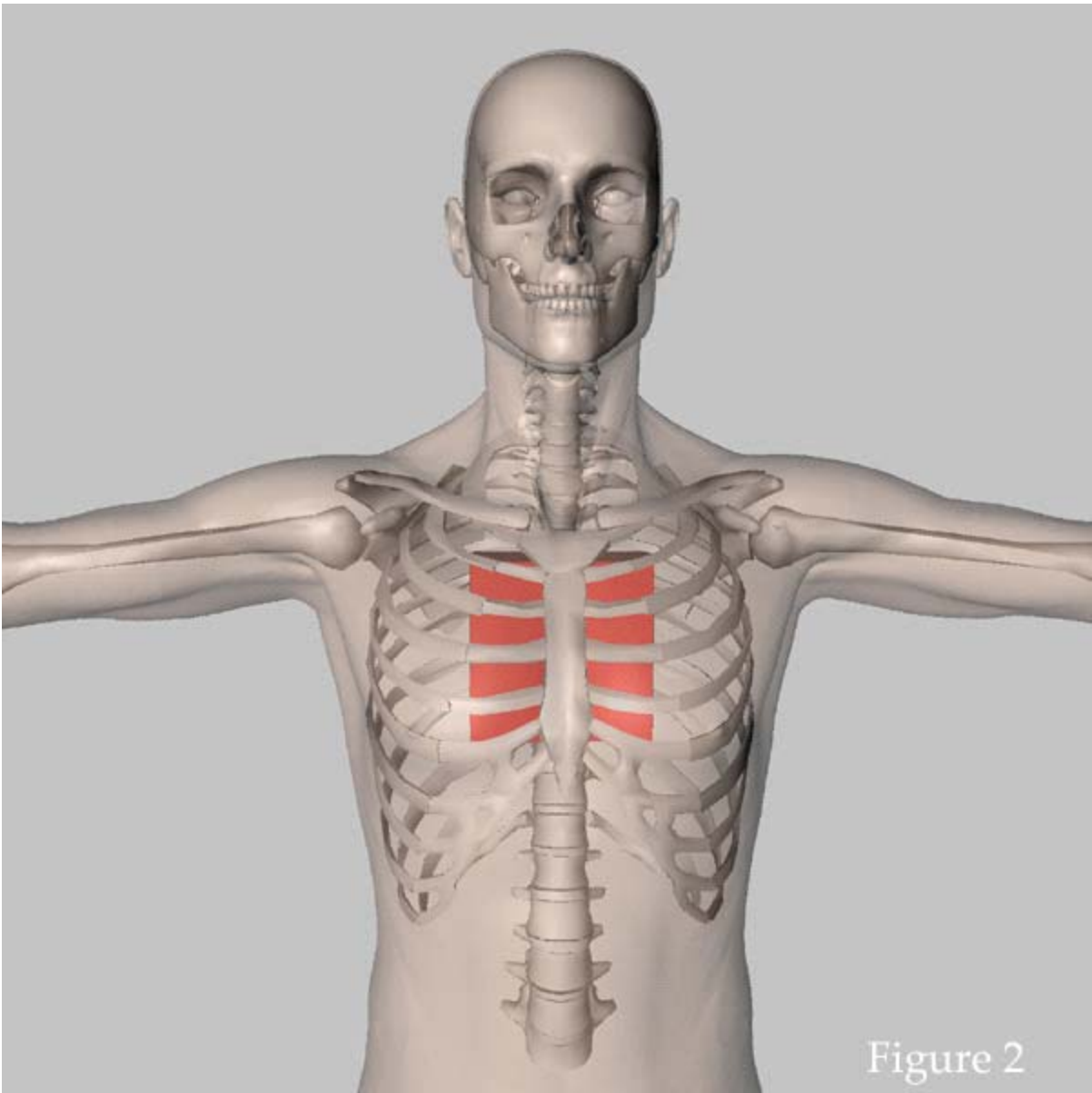


Figure 2

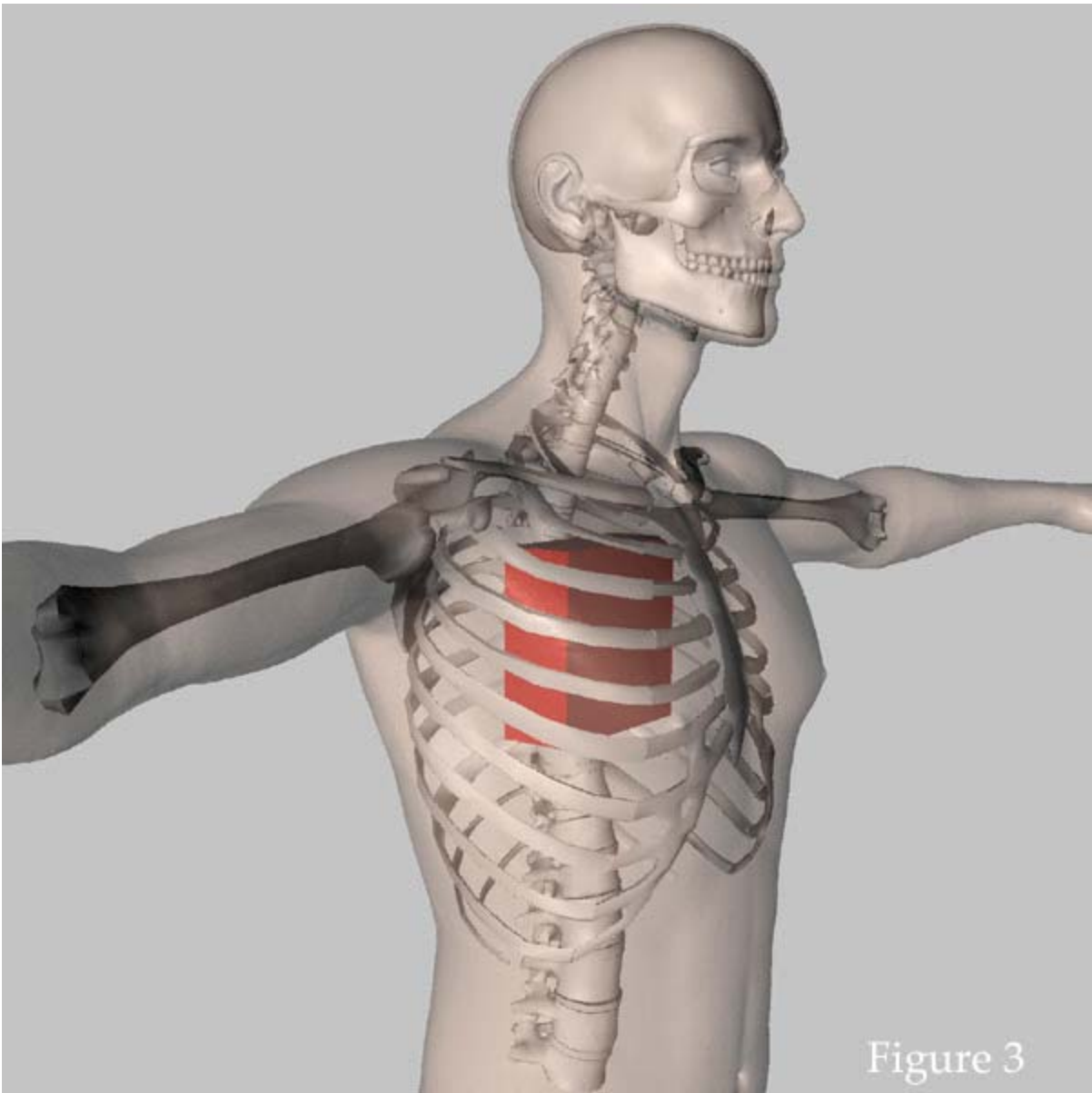
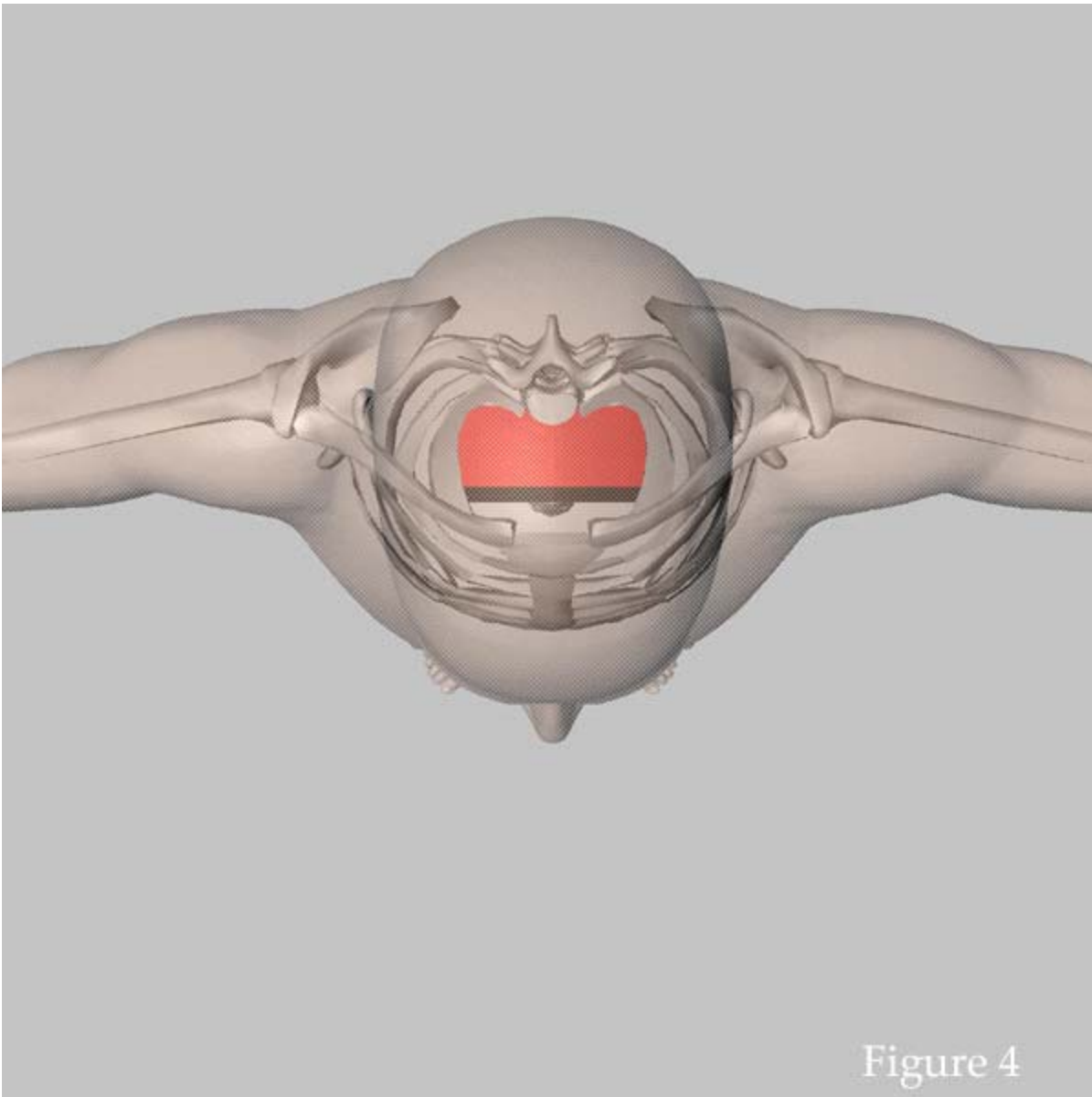


Figure 3



If that is the case, then an ideal shot will be in the center of the chest, through the sternum and through the plate, as indicated by the red line trajectories in Figure 5 and 6:

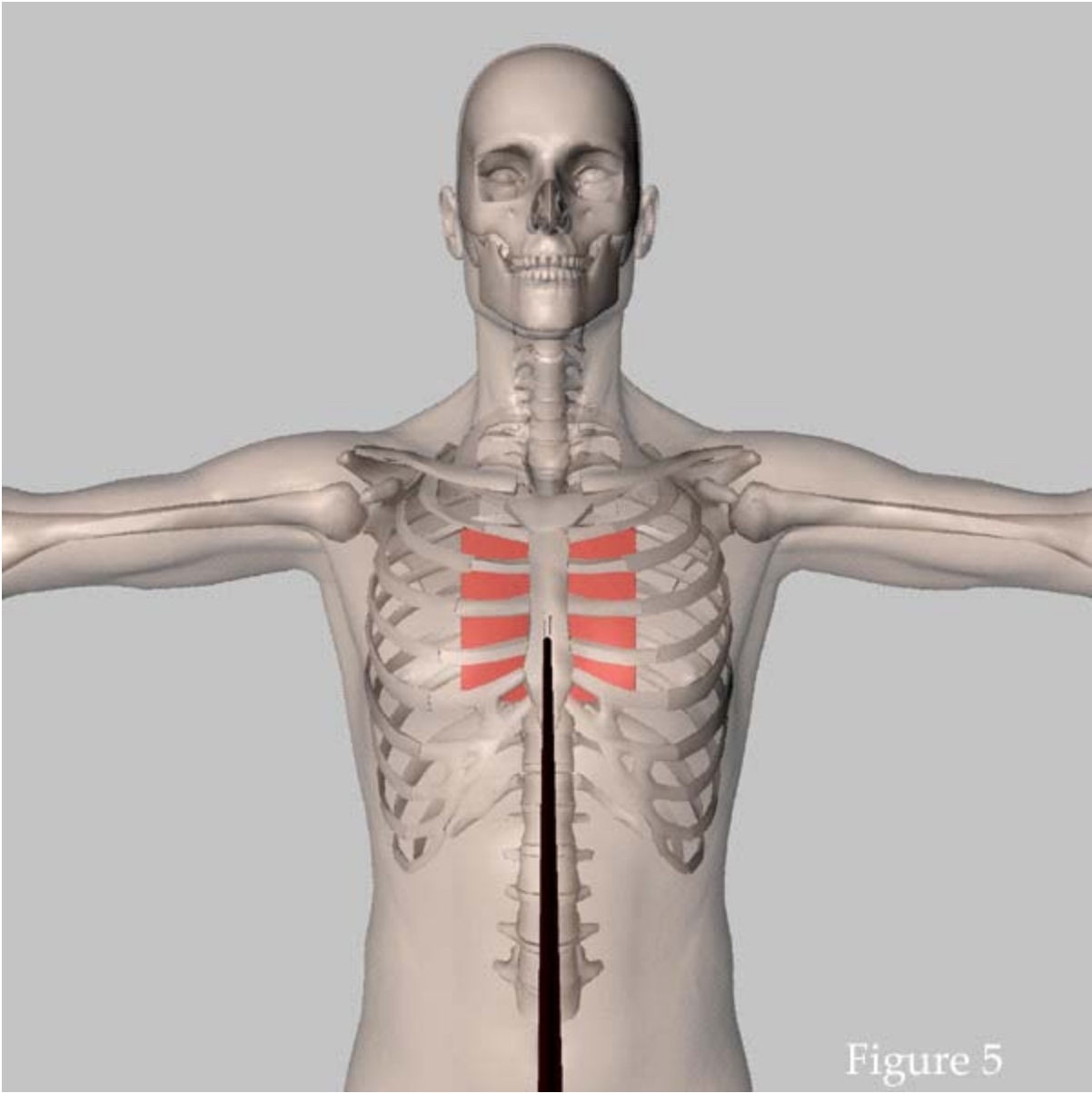
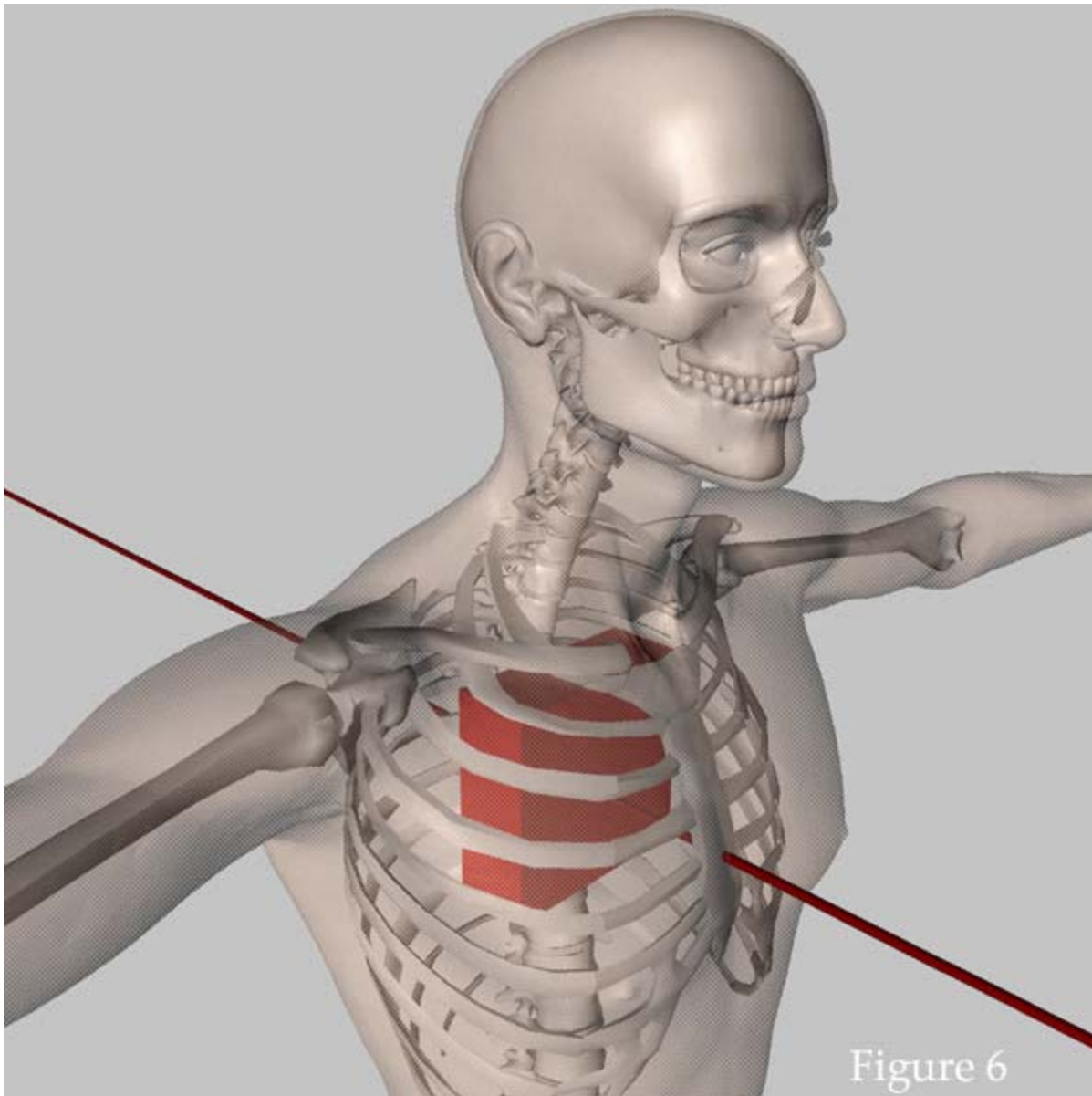
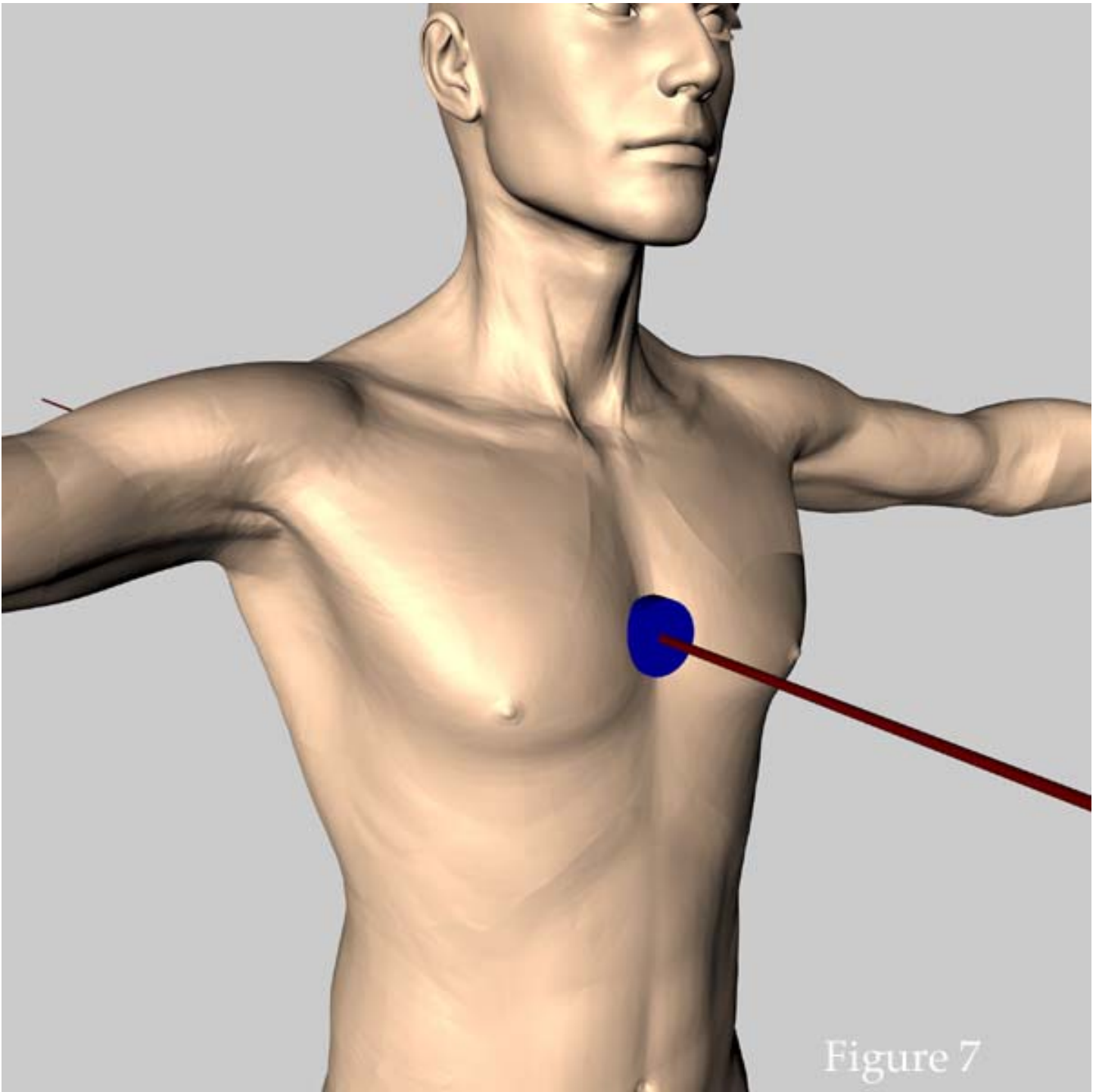


Figure 5



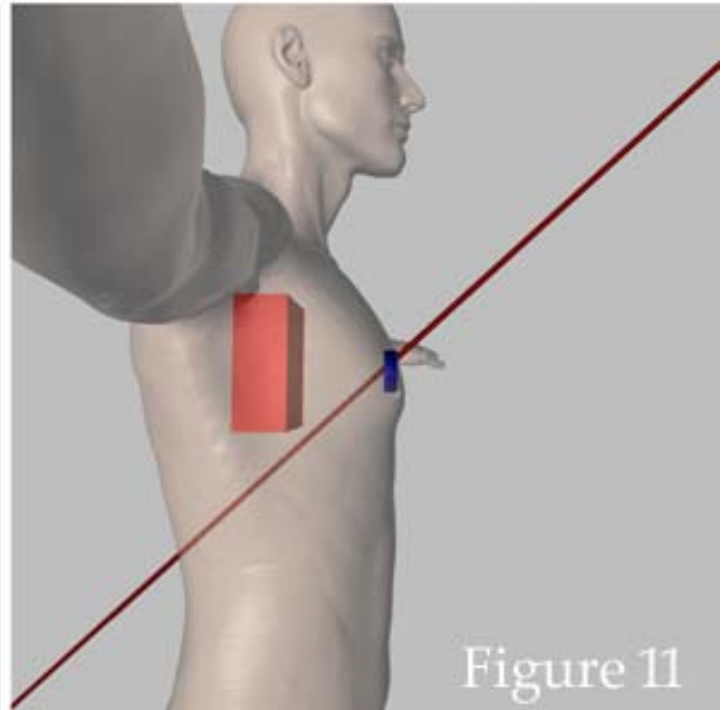
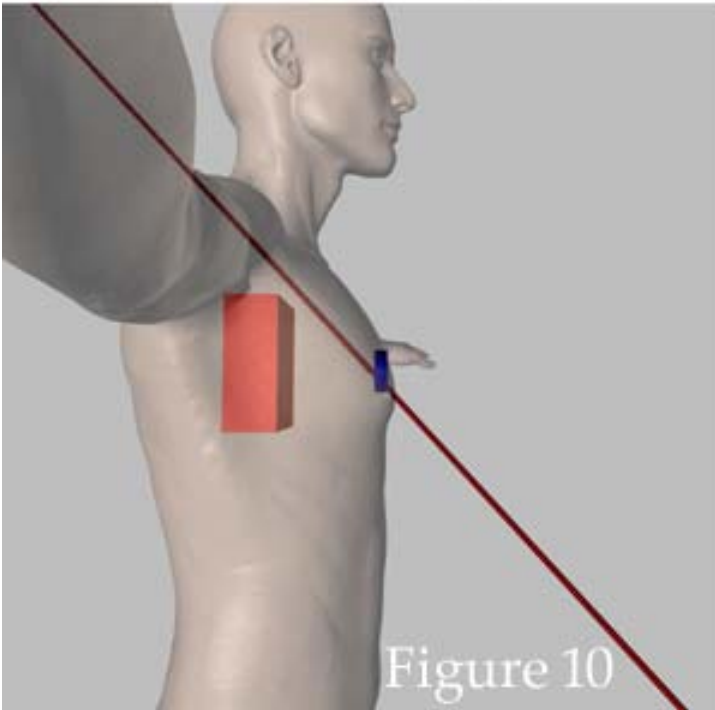
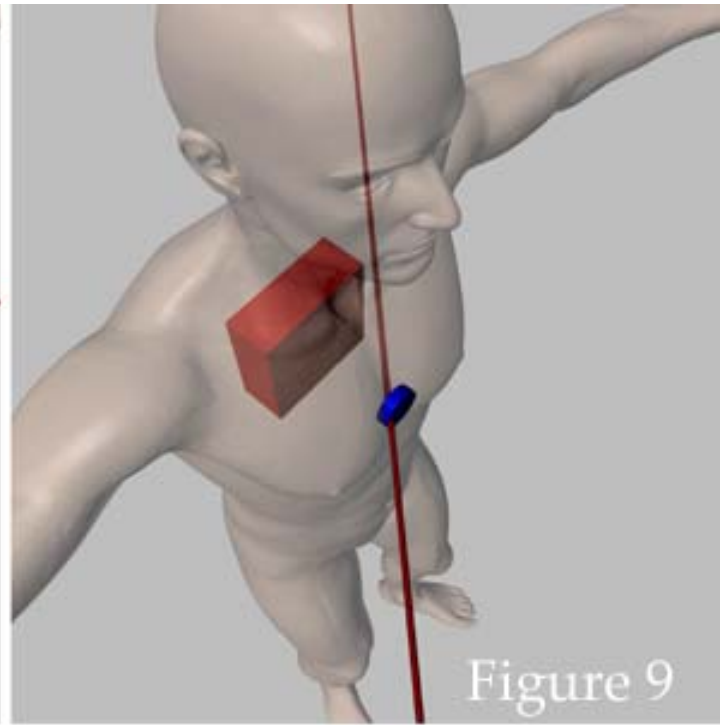
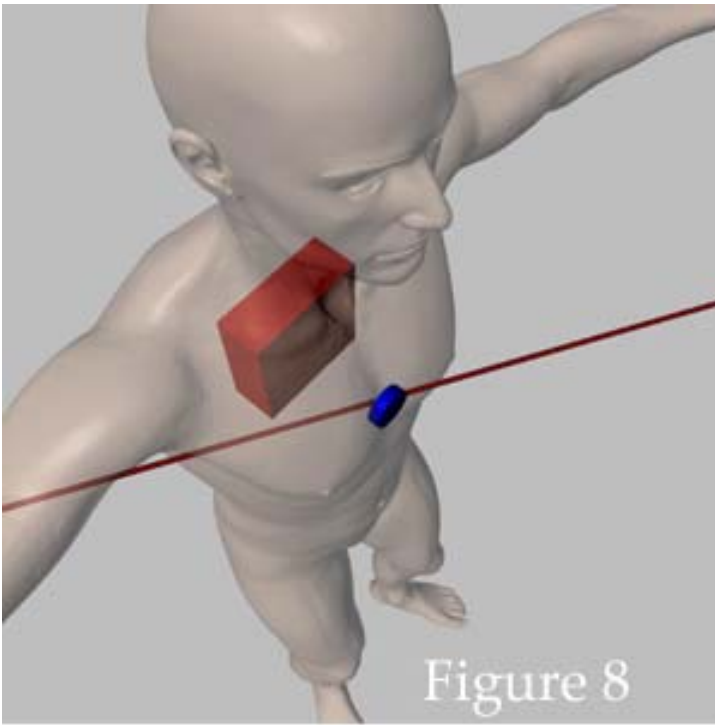
Of course, we cannot aim directly at that plate at the time of the shooting because we do not have X-ray vision, so we choose an overlying surface landmark instead. If we retain the red trajectory in Figure 6 but this time only mark where it enters the skin, we can make a blue aiming point on the man's chest as in Figure 7:



This blue circle seems to be the ideal aiming point if we want to hit that critical red area within the chest. Okay, so let's assume for now that everybody here can satisfy the following requirements:

- 1) Hit that blue circle ALL the time, 100% accuracy.
- 2) Deliver a projectile that cannot be deflected, fragmented or otherwise impeded by the target's tissues. In other words, this will be a projectile that travels in a straight line like a laser beam, no matter what it hits.
- 3) The projectile has sufficient energy to penetrate the man's chest and perforate the critical red area.

Even if the above points could be satisfied, we would still have variables to do with the position of the shooter relative to the position of the target. There are numerous combinations of these positions whereby even if the above three points are satisfied, the projectile fails to even touch the red critical area. Examples can be seen in Figures 8 to 11:



Note that in the above trajectories the blue circle has been hit but not the red area within the chest. Now we must add another variable: the fact that the bad guy doesn't want to stand there with his arms out sideways showing you his chest so you can pick a spot to hit. Have a look at these poses and try to imagine where that blue circle is in all of them. In those cases where you automatically dismiss the blue circle as a valid aiming point, try to work out where you would aim to hit the red area within the target:



This is why we get told to aim for center of mass (COM). The reason being that we are likely to hit something of some 'value' even if we don't hit the 'magic red area.' So therefore in the following figures, the COM would be where I have shaded them:



Figure 15



Note the problem of the target's profile and build. A fat guy or a big-busted woman when standing sideways may appear to be offering quite a large COM, but in reality the critical area available to be struck is less than would be available if they stood facing the shooter. This is how you get COM hits that 'go right through the target' but do not have the required effect, and that's when we get blame put on the weapon/calibre/ammunition type. You only have to spend some time in the emergency room of a large trauma center to see perforating gunshot injuries that have failed to kill or even seriously injure the victim.

Note also that so far we have not even touched on the subject of projectile deflection or fragmentation within the clothing or tissues of the target. A projectile that may have been traveling straight towards the critical area as in Figure 7, may not reach the critical area if it is deflected by the sternum or an anterior rib end. Another thing to remember is that there is no such thing as a nice geometric 'red critical area' as I have drawn here. That was just a convenient way for me to demonstrate the trajectory variables involved. There are substantial variables in the size and position of vital structures such as the heart and great vessels within a person's chest. Further surface variables exist such as muscle content, fat, clothes, bone mineralisation etc. This means that you cannot guarantee that a bad guy will go down even if you are fortunate or skilled enough to place that shot exactly where you intend it to go. Even head shots are not a guarantee to instantly incapacitate somebody.