INTERPRETING & INVESTIGATING GUN SHOT INJURIES

Course Summary
As injuries due to firearms are common in most areas of the United States, skill in the interpretation of these injuries is vitally important for the practitioner of death and injury investigation.

This course will examine the forensic importance of gun shot injuries and will lead the investigator through proper identification and interpretation of gun shot injuries.

What is a "firearm"

A firearm may be generally defined as an assembly of a barrel and action from which a projectile is propelled through the deflagration (rapid burning) of a propellant (gunpowder).

Investigation of Firearm Injuries

All firearm injuries resulting in death will fall into the manner of homicide, suicide, or accident, all will come under the jurisdiction of a medical examiner or coroner, and the local Law Enforcement.

Injuries not resulting in death will remain the jurisdiction of the local Law Enforcement. However, you may still wish to consult a medical death investigator for injury and other assistance.

It is not uncommon for a person to survive a firearm wound, eventually succumbing to remote complications of the wound weeks, months, or even years later. However, such a case remains of medicolegal interest if it can be shown to be directly or indirectly related to the initial wound.

Scene Investigation
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The position and location of the firearm should be carefully noted, if present, and if the firearm loaded, is a round chambered, are fired rounds in the cylinder, is the weapon loaded is of primary importance.

Any projectile found beneath the decedent, stuck to clothing, or other areas should be photographed and recovered at that time to prevent the possibility of loss during transport.

Forensic Scene Investigation

If firearm primer residue sampling is desired, it may be collected at the scene, or the hands may be covered by paper (not plastic) bags before transport to prevent evidentiary loss during transport.

The presence of bullet strikes on the walls of a room should be noted, as these can serve as reference points for later reconstruction of the position of a shooter when combined with a trajectory through the body.

Medicolegal examination of firearm wounds may allow for determination of several aspects of these injuries.

Aspects of Firearm Wounds

Range of Fire

Type of Weapon

Trajectory

Extent of Injuries

Wound Types

Penetrating

An injury in which an object enters the body or structure and does not pass through (bullet still inside body)

Perforating

An injury in which an object enters the body and passes all the way through (bullet at scene or in clothing)

Range of fire, or muzzle to target distance, may be divided into

Contact (Close)

Intermediate

Distance

0 - 12 inches

3 - 5 Feet

< 5 Feet
Determination of range of fire is based on the characteristics of a firearm wound, features of the wound that have been imparted by material coming from the muzzle of the firearm other than the bullet, or from features due to direct interactions between the target and the firearm itself.

Material from the firearm muzzle may take the form of soot, hot gas, gunpowder particles, or other material.

Contact Wound BB Gun
Why Range Info is Important

The range of fire has obvious relevance to such issues as whether a wound is self-inflicted or inflicted by another person, the truth of stated explanations of shooting events, and the validity of self-defense arguments.

Range of fire determination will answer two fundamental questions.

 Fundamental Questions

Who Shot Who?

Could it have happened that way?
Type of Weapon Information From Wounds

The general type of weapon may sometimes be determined by the characteristics of a wound, and by the recovery of the projectile causing a wound, with appropriate analysis.

In other cases, only general characteristics such as the likely type or brand of the firearm may be determined, but these features are still useful. The importance and necessity of recovering retained projectiles should be understood, considering the potential wealth of information that may be gleaned from their examination.

Trajectory of a Projectile

Noun:
the path followed by a projectile flying or an object moving under the action of given forces.

Trajectory of Projectile

The trajectory, or direction, of a projectile through the body, may be approximated, but it must be kept in mind that this does not necessarily equate to the trajectory of the bullet through space.

Because the bodies of the victim and shooter are not static and may move about in 3 dimensions during a shooting event.

Trajectory Info Caution

Occasionally the pathway of a bullet through the body may give some indication of the actual position of the body when shot.

For example, a bullet may exit one part of the body (such as an arm) only to reenter the torso or other body part. This may be suggested by the characteristics of the wounds, as well as the juxtaposition of the 2 wounds on certain positions of the body parts, which can be demonstrated at the time of autopsy.

The trajectory or "path" of a bullet needs to be determined if possible, using:

- Lasers
- Rods
- String
WOUND INTERPRETATION

The wound on a body can tell a story

Wound Interpretation

Various types of firearms may produce wounds that have characteristics reflective of the type of weapon inflicting the injury. However, many characteristics of firearm wounds are similar across a range of weapons.

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Abrasion Ring

An abrasion ring, formed when the force of the gases entering below the skin blow the skin surface back against the muzzle of the gun, is seen here in this ...
Abrasion ring with muzzle imprint
The abrasion ring, and a very clear muzzle imprint, are seen in this contact range gunshot wound.

Smoke and Soot GSR
Residues on the skin from the smoke and soot produced from burnt gun powder.

Stippling and Tattooing
Caused from burnt unburnt powder filling the skin and marking or staining skin.

Entrance v. Exit
NEVER - Assume you know an entrance from an exit. Some characteristic are common. However, many factors can change wound types.

- You can suspect, but always let the Pathologist say for sure. It is bad reporting and embarrassing for you to call an entrance wound an exit.
- Might change the entire investigation...

Entrance v. Exit
Bullets can do odd things when entering or exiting a body
- More than one entrance for one bullet
- Deflection Entrance (ricochet)
- Skin may seal over
- Oblong / Sideways entry
- Fragment Exit

Entrance Wounds
Firearm entrance wounds are typically round to oval, with smooth edges and a zone of epidermal (skin) abrasion surrounding the wound edges.

This abrasion is caused by the rubbing or scraping of surrounding skin surfaces by the bullet as it indents the skin before perforating it. If the bullet strikes perpendicular to the skin, the abrasion will be of uniform width around the wound.
Percussion Injuries

Percussion injuries from gun shot wounds are caused by the expansion of the skull or enclosed spaces of the body due to the introduction of gas pressure.

This may cause some entrance wounds to appear as exits if the skin is grossly lacerated.

Exit Wounds

Exit wounds are usually irregular, have no abrasion rim, and do not display soot deposition or stippling.

They may have a stellate configuration, or, particularly in the event of a low velocity exit wound, have a slit-like configuration. These can be deceptively sharp appearing and can mimic a stab wound.

See the following images.
Exit Wound With Tearing

Exit Wound

Fragmented Exit

9mm Exit

Skull & Bone Beveling

In the case of head injuries, the best form of identifying an exit wound from an entrance is looking at the beveling of the skull in the bullet path.

This can also be used in some instances for other areas of the body as well where bone is involved, i.e., ribs, sternum, clavicle, or many other large flat bones.

Internal beveling is where the inner surface of the skull is more eroded than the outer surface, producing a 'cone' shape in the direction of the bullet path — see next slide example.

Beveling of Flat Bones:

Internal beveling

External beveling
Documenting Injury

Document Injuries at the scene
Documenting Injury

Document Injuries at the scene
Use Forensic Body Exam Chart

Pathologist wants to know what you saw

Let's Look at Scene Investigation

Scene Basics
- Photography of Scene
- Blood Spatter Evidence
- Collection of trace evidence prior to moving body
- Bag hands or not Why?
- Witness statements
- DO NOT shortcut these scenes — an injury may be a death later.... You only get one chance and the first chance.
Blood Spatter

Blood Spatter will give the investigator an indication of the direction and velocity the blood struck a surface. This can be important when reconstructing a crime scene or verifying a witness statement.

NOTE: Often times fine mist blood will exit the body upon impact by the bullet. This mist can be deposited on the shooter during a close-range shooting.

Collect all witness clothing—

Angle of impact

Decreasing angles of impact of single falling blood droplets.

Actual Case – 90 degree Drop

Blood Spatter

Blood Spatter

Health Care
University of Missouri Health System
Gun Shot Residue

The major primer elements are:
> Lead (Pb),
> Barium (Ba), or
> Antimony (Sb).

Usually, all three are present.

Gun Shot Residue - GSR

Firing a weapon produces combustion of both the primer and powder of the cartridge. The residue of the combustion products, called gunshot residue, can consist of both burned and unburned primer or powder components, and can be used to detect a fired cartridge.

Gunshot residue may be found on the skin or clothing of the person who fired the gun, on an entrance wound of a victim, or on other target materials at the scene.

Why GSR Info. is Important

Not so much as who fired the weapon, although can certainly help in determining this.

More importantly it will determine who was in a close proximally when a gun was fired.

If husband say he was not home, yet he has GSR on hands or clothing......we call this a clue!

GSR collection and clothing should be taken from all present, reporting, or who otherwise could be involved.
Why GSR Info. is Important

When a gun is fired smoke and residue escape from the cylinder and barrel. Anyone or anything in close proximally may have GSR present.

Testing (seizing) not only clothing but furniture or other items that may have been in close range.

Victim found in bedroom – you think it may have occurred in living room (small drop of blood) testing the area around the blood may reveal GSR. Might change manner of death.

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Summary

Range of fire is important

Never assume entrance v exit

Using trajectory to determine facts

Proper scene investigation a must

Questions and Discussion