Gunshot Wounds and Violent Assaults
Forensic Aspects for the Trauma Specialist

28th Annual David Miller Trauma Symposium

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Our primary crime scene is often moved and out of our control

EMS – Ambulance
Trauma Center – Emergency Room
Our primary crime scene is often examined without an eye towards forensic evidence.
If the Trauma Specialist is familiar with forensic evidence could an approach be taken that documents or preserves evidence without impacting patient care?
What evidence may be on the body?

Biological
  blood… semen… saliva… urine
Trace
  hairs… fibers… gunshot residue… glass… soil
Touch DNA
  where was the body handled?
Wound and its morphology
  single edge… double edge… pattern injury… gsw
Other Factors

Wound appearance: pre-intervention
Wound appearance: post-intervention
Blood flow patterns on clothing/skin
Blood spatter patterns on clothing skin
Initial blood draw: pristine toxicology
Drugs
Alcohol
Why is this important?

The physical health of the victim is always of paramount concern.

The mental health of the victim cannot be allowed to take a back seat – eventually closure or moving past the incident is aided with successful criminal or civil prosecution of the perpetrator.

Additionally, successful prosecution and incarceration removes serial offenders from impacting the same or different victims.
Wound Appearance: Post Intervention
Our Challenge from the Forensic Side
Entrance injury photographic overlaid on model
Circular pattern on skin in association with entrance wound
Axis between possible circular pattern injury and entry wound demonstrated
Possible pattern injury from recoil guide
UNDERSTANDING FIREARMS AND BALLISTICS

Ruining every cop show you ever watched or murder mystery you ever read
Getting the Terminology Right!
Handguns - Pistols

Revolver

Semi-Automatic
Magazine
Cartridge Cases

Casings
Shotshells

Shells
Headstamp

Headstomp
Ballistics

Internal - within the weapon
External - outside of the weapon
Terminal - within the target structure
(your area of specialty)
INTERNAL BALLISTICS
Extractor

1

2

3

Ejector

Firing Pin & Breech Face
Primers

Unfired primer--no microscopic marks

Fired primer with firing pin and breech face marks
Rifling
Projectiles

Unfired bullet, smooth sides

Fired bullet
- rifling impressions and unique microscopic striae
Terminal Ballistics

WEAPONS DYNAMICS & WOUND DYNAMICS
ENTRANCE WOUNDS
Circular or Elliptical Entrance Wound

- Abrasion collar or ring
- Discolored circle around the entrance wound
- May overlap bullet wipe
- Caused by the abrasion of skin by the bullet as it pushes through entrance
- Perpendicular (symmetrical), or tangential (wider on one side)
Star shaped entrance wound, common with pressed contact over bone.
DISTANCE FROM TARGET
Contact Wound

- Margin Abrasion
- Heat Effect
- Soot in Wound Track
- Possible complete or partial muzzle impression
- Possible Cherry Red discoloration
Close Distance

• Margin Abrasion
• Soot
  – Gray or black, dense carbon
  – Product of burning gun powder
  – May be accompanied by stippling
  – Can be washed off easily
Intermediate Distance

• Margin Abrasion
• Stippling
  – Small punctate lesions surrounding a wound from burning and unburned powder
• Live victims--reddish brown vital reaction
• Dead victims--gray or yellow, since no vital reaction
  – Cannot be washed off
  – Pattern size increases with distance
Powder Shapes

• Manufacturers use different powder shape and size to control rate of burn and pressure peak
Gun Powder

Disc

Rod/Disc

Sheet

 Flake
Bullets & The Bullet Effect on the Body
Mass v Energy
Cartridge Size Comparison

.50 caliber sniper round
7.62mm x 51mm NATO Round
5.56 x 45mm NATO Round
9mm x 18mm Police Round
.22 caliber Pistol Round
Quarter
Round Nose
Hollow Points
Expanding Hollowpoint
Another day....
Another Gimmick
Wound Track

• Permanent Cavity
  – Tissue directly damaged by the projectiles passage
  – May be larger in diameter than the projectile based upon destabilization/tumbling

• Temporary Cavity
  – Expansion of high energy wave through the tissue surrounding the permanent cavity.
  – The size of the temporary cavity is directly proportional to the amount of energy transferred from the projectile to the surrounding tissue
Permanent Cavity
Temporary Cavity
Temporary Cavity
Temporary Cavity
Graze Wounds
Graze Wound

- Bullet strikes at a shallow angle
- Produces an elongated area of abrasion
- Without actual perforation or tearing of the skin
Graze
Wounds

Tear
Abrasion
Dog Balls
A Ninja, A Rifle, And a Water Tower
Attack!
Testicles
Graze Wounds
Forensic Simulation

(No Dogs were injured in this simulation though the human fell on his hind quarters pretty hard)