Medico legal aspects of firearm wounds

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Firearm weapons

- To interpret wounds basic knowledge of weapon and ammunition is necessary

- High muzzle velocity ...above the speed of sound in air i.e. > 1100 feet/second
- Low muzzle velocity ...below the speed of sound in air i.e. < 1100 feet/second

Parts of weapon

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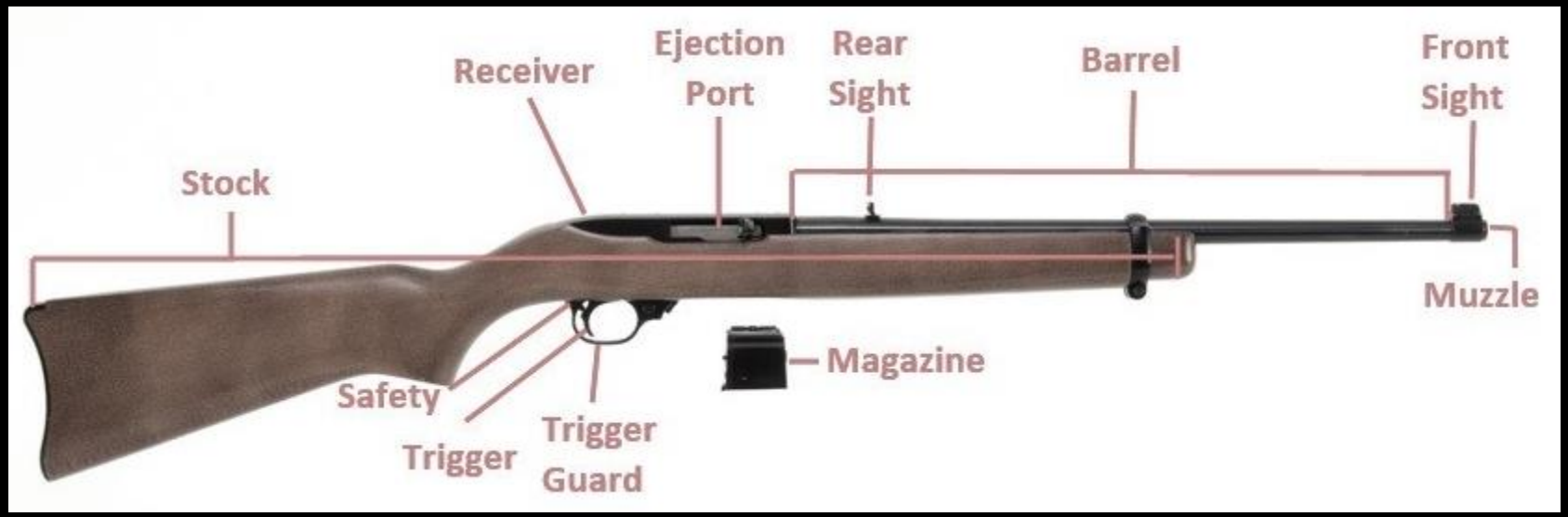
ref:https://www.unodc.org/images/e4j/Firearms/module_02_figure_15.jpg



Ref:https://www.unodc.org/e4j/en/firearms/module-2/key-issues/firearms-parts-and-components.html

Identification

- **Class characteristics: primary markings**
  - **Bullet**
    - **Size**
    - **Material**
    - **Land And Grooves**
  - **Cartridge**
    - **Cartridge Case**
    - **Magazine Marks**
    - **Chamber Marks**
    - **EXTRACTOR OR EJECTOR MARKS**
    - **FIRING PIN MARKS**
- **Individual characteristics: secondary markings**
  - **Due to variation in minor detailing**
  - **Due to fouling that hardens**
  - **Due to servicing**
  - **Wear & tear**
    - **FINGERPRINTING**

types

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rifling

- Rifled firearm weapon

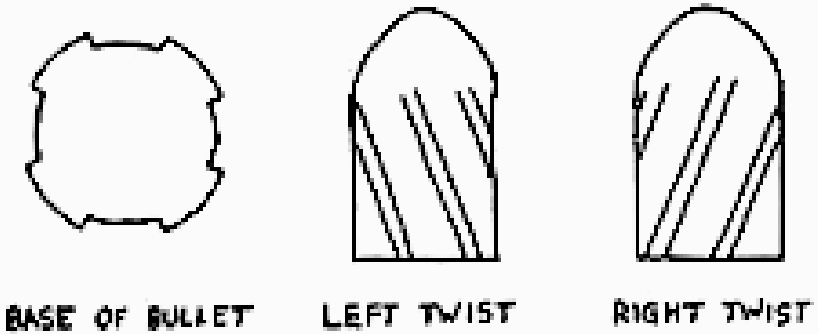
  Inner side of barrel has lands and grooves, spirally arranged and parallel to each other, on its long axis

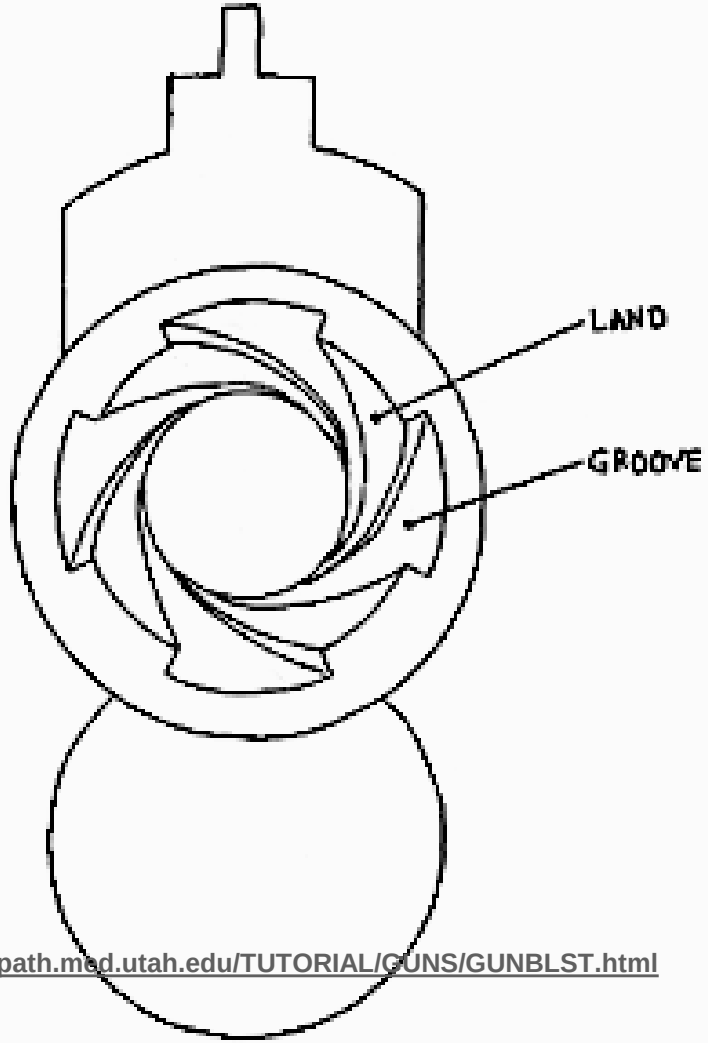
  - Spinning movement
  - Increased penetration
  - Less wobbling
  - stadiness

OR

- Smoothbore firearm weapon

- Rifled
  - Hand gun
  - Rifle [length of barrel =/>16”]
- Shot gun[non rifled]





Ref:
https://webpath.med.utah.edu/TUTORIAL/GUNS/GUNBLST.html

Ref:: https://en.wikipedia.org/wiki/Rifling

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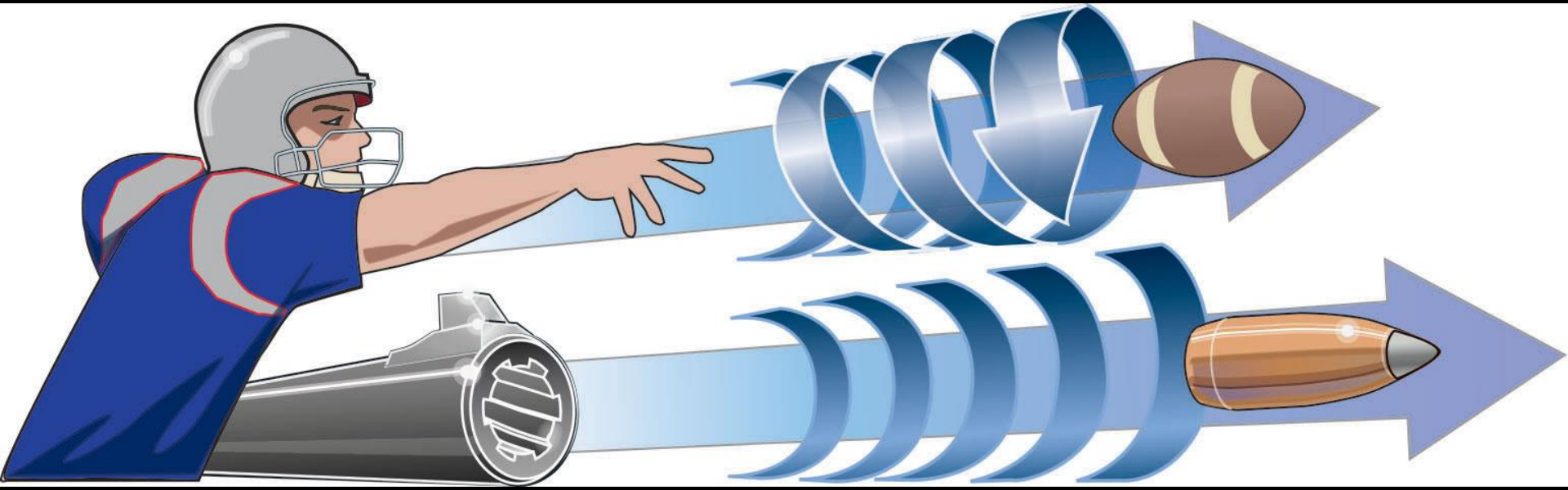
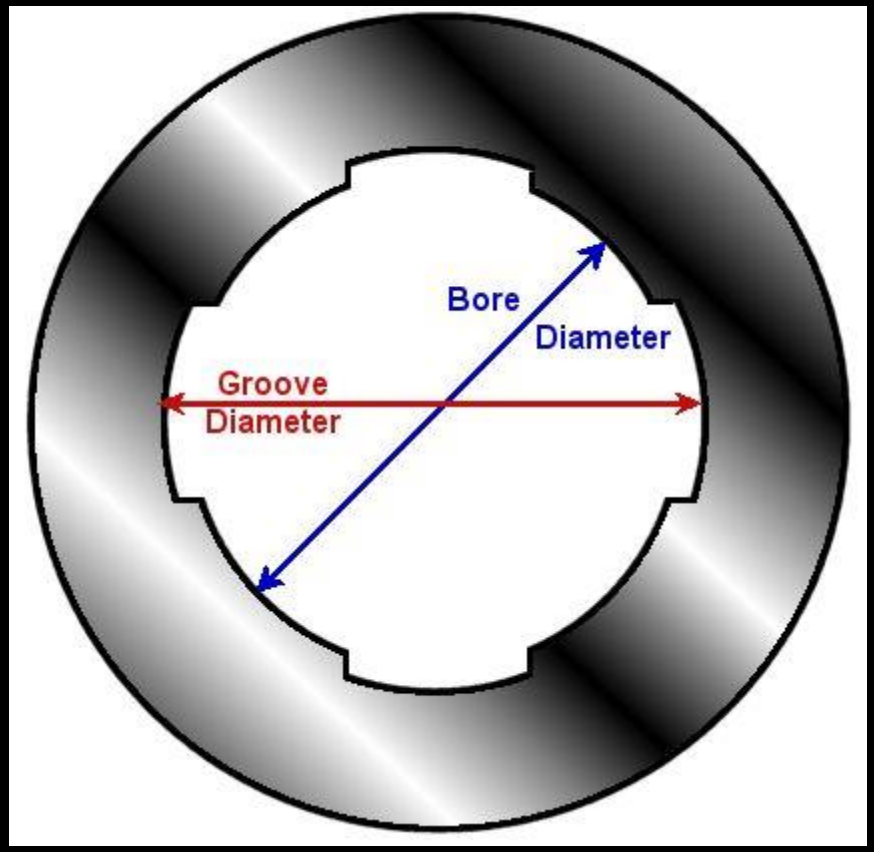
Spining of bullet in rifled type
No spining in smooth bored



Ref:https://www.hunter-ed.com/alaska/studyGuide/Rifling-in-the-Rifle-or-Handgun-Bore/201001_86553/

Caliber and Bore or Gauge



Bore diameter - This is the diameter of the barrel without considering the depth of the grooves/ number of equal sized balls made of one pound of lead, each of diameter of barrel.

Groove diameter - This is the diameter of the barrel also considering the depth of the groove.

Cartridge

Ammunition of rifled firearm weapon

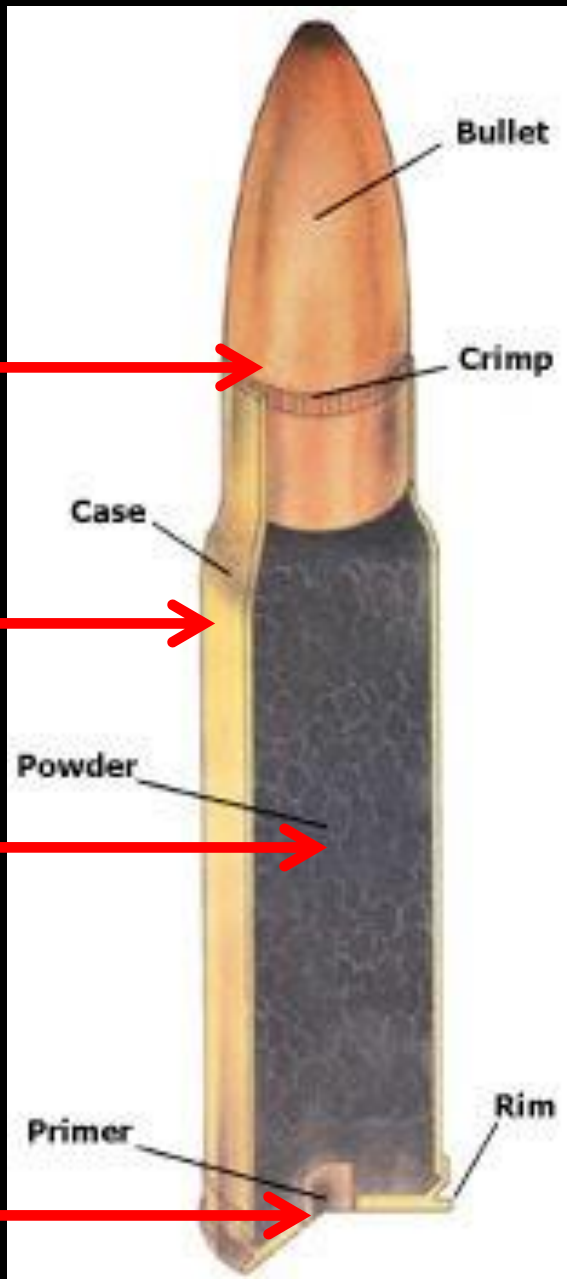
- Consists of

✓ Bullet or projectile

✓ A cartridge case

✓ Propellant

✓ A primer



Cartridge case

- Made of brass ..70% copper + 30% zinc
- Shapes.. Straight, bottleneck or tapered
- Rimmed, semi rimmed, rimless, rebated or belted according to shape of base
- ***To expand and seal the chamber when fired :*** Brass is tempered to the correct hardness so it springs back to its original dimensions to facilitate its easy extract [neither soft or hard]

primers

- Rim fire ...*low velocity*
- Center fire ... *High velocity*

  [1] Boxer [2] Berdan
- Pin fire
- Mercury fulminate , potassium chlorate
- Lead styphnate , Antimony sulphide , barium nitrates

propellant

- Black powder
  1. Sulfur[density and ignitable],
  2. charcoal[fuel] ,
  3. K nitrates[oxidizer] 44%
- Single base smokeless...nitrocellulose
- Double base smokeless [ball powder]... nitrocellulose + nitroglycerine
- Triple base smokeless... nitrocellulose + nitroglycerine + nitroguanidine
- Pyrodex : synthetic black powder

Weight of propellant is adjusted to get required velocity

Powder granules : Ball, flake, disc or cylindrical

Diameter can be controlled with increase surface area

bullets

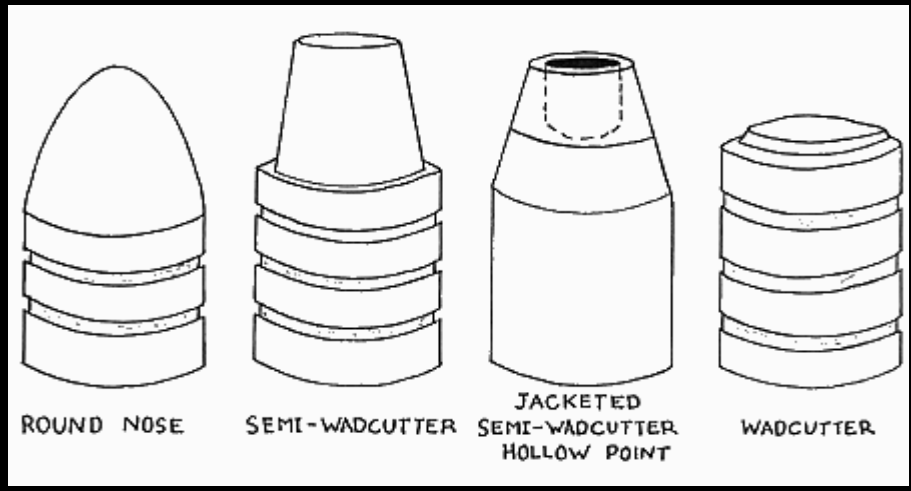
- [1] Non jacketed .. Revolver, .22 caliber rim fire Made of lead [antimony/tin/both]
- High velocity may melt lead → so jacket is added
- [2] Jacketed automatic pistol , high velocity weapons .[center fire]
- [3] Partially jacketed.. Semi jacketed soft point and semi jacketed hollow point, silver tip, bronze tip
- Exit wound up to 100 yards in jacketd

Bullets ..

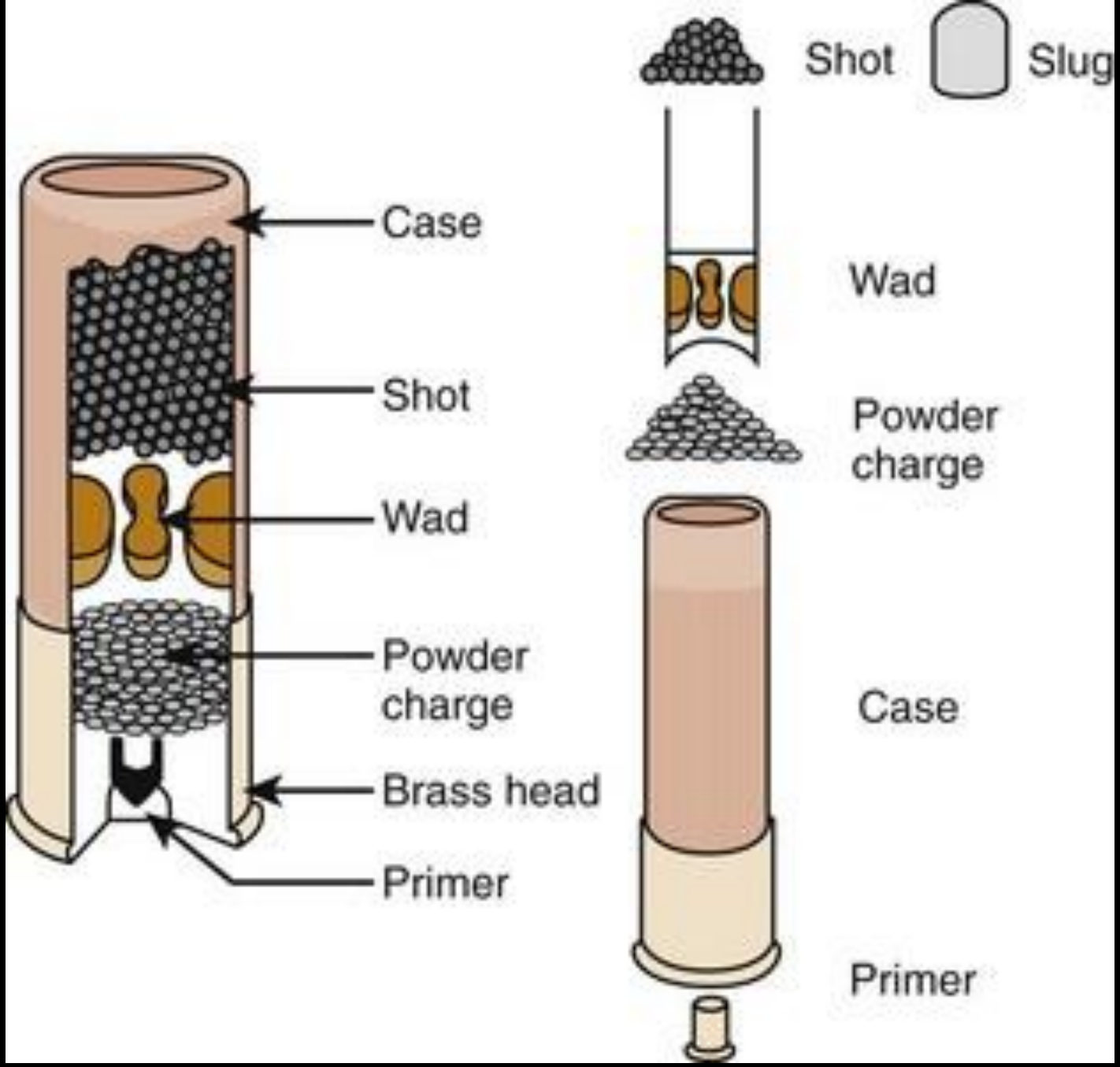
continue

- Configuration of lead bullet

1) Round nose.. Semi blunt, conical with flat base
2) Semiwadcutter... Truncated cone with flat tip[shorten by cutting tip]
3) Hollow point... Semiwadcutter alike but cavity in nose
4) Wadcutter ...cylindrical



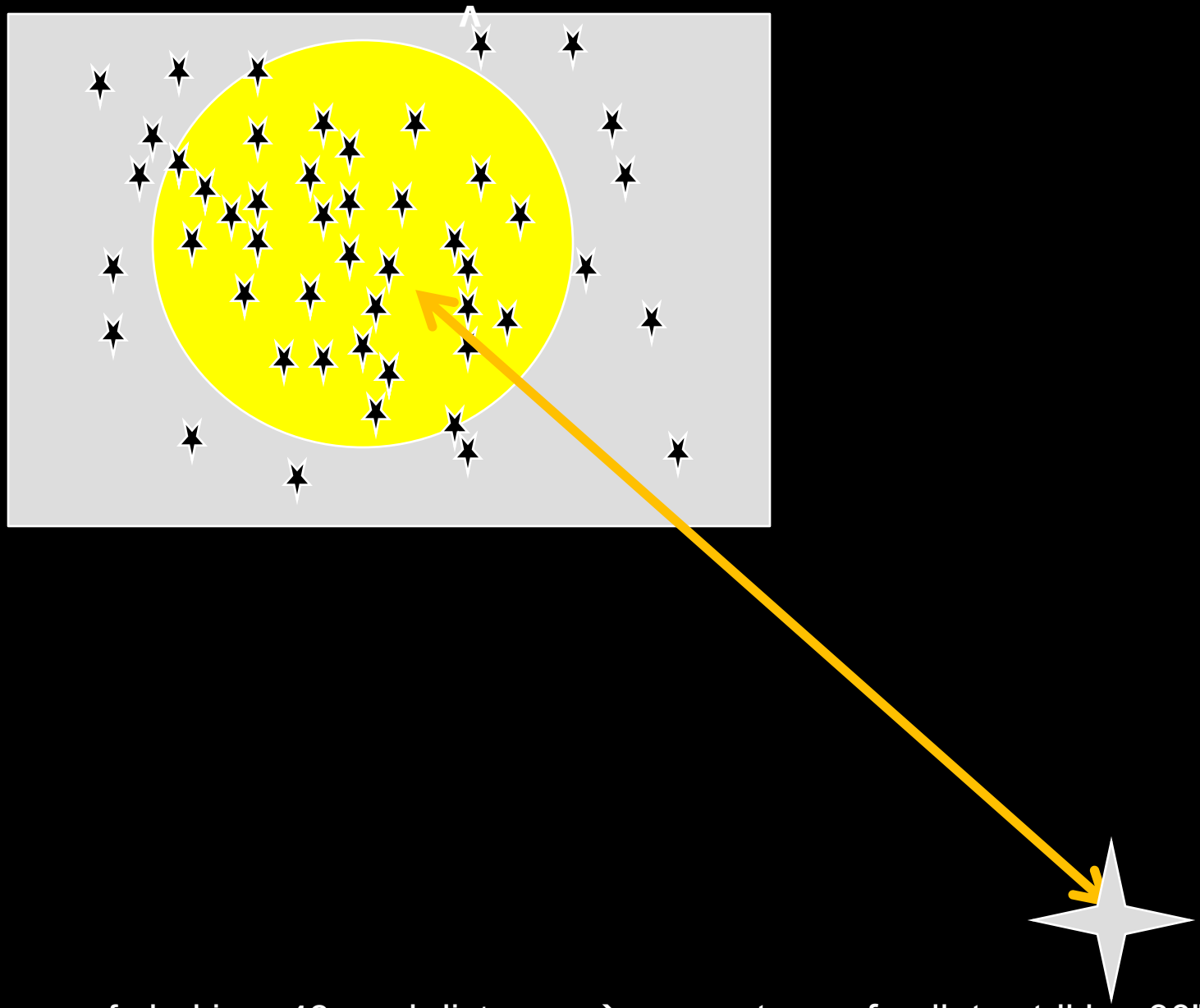
Picture ref:https://webpath.med.utah.edu/TUTORIAL/GUNS/GUNBLST.html



https://clinicalgate.com/hunting-and-fishing-injuries/

Pellets

- Types: as per hardness :Soft shot, chilled/hard shot[antimony], plated shot [copper/nickle]
- As per size of pellet
  - Bird shot : 11 diiferent sizes
    - 12 to BB [.05 to .18 in]
  - Buck shots: 7 different sizes
    - 4 to 000 [.24 to .36 in]
- Choke : Degree
    - Skeet: 30-35 degree
    - Cylinder bore: 35-45
    - Improved:45-55
    - Modified:55-65
    - Full choke: more than 65
      - Win: interchangeable 3 collars of different diameter
      - Poly: sleeve that can be adjusted for required diameter
  - Slug : for killing wild animals : single shot



Degree of choking: 40 yard distance → percentage of pellets striking 30” circle

Mechanism

mechanical energy → thermal energy

- Bullet emerges out accompanied by

i. *Flame [& muzzle flash]*
ii. *Gas*
iii. *Soot [in revolver from cylinder gap also]*
iv. *Powder .. [burnt , burning and unburned]*
v. *Primer residue*
vi. *Metallic particles striped from bullet*
vii. *Vaporized metal from bullet and cartridge case*

Burning of powder depends on

Burning rate of powder is controlled by progressive burning and depends on

- ✓ Surface area of gun powder granules
- ✓ Bullet weight
- ✓ Barrel length