MECHANICAL INJURIES
Definition - damages as the result of mechanical impact of mechanical objects: 3 ways
Division - non-specific
- specific – WOUNDS
Characteristics of objects: point, sharp-edge, flat surface, projectilev(impact of sharp and blunt force)

NON-SPECIFIC (BLUNT FORCE INJURIES)
ABRASION (Excoriatio cutis)
There is removal of superficial epithelial layer of the skin by friction against a rough surface, or destruction of the superficial layers by compression.
Dating: 1. Lymph
2. scab formation (2-30 h)
3. epithelial regeneration (30-72 h)
4. subepithelial granulation (5-8 d), 5. regression (about 12 days)
Direction of violence impact
Postmortem abrasions, dry changes during the life
EROSIONS - Forensic-medicine importance!

BLEEDING (Haemorrhagia)
H. per rhexin / H. per diapedesin
*In body cavity → external/internal exsanguination*
*Bruise (Haematoma cutis)*
*Contusion (Contusio)*
*Ecchymosis /Petechiae*

Livor mortis
Forensic-medicine importance! - evolution of color due to degradation of the hemoglobin

Ruptura
Lesion of internal organs – large mechanical force applied over a large body surface
Danger for the life; sometimes regardless of injury

| PERFORATION (Perforatio) | and | PENETRATION (Penetratio) |
|---|---|---|
| Opening of cavernous organ and communication with environment traumatic / non-traumatic | | opening of body cavity |

Fractura
Types: - complete/incomplete (Infractio, a detached part of bone – Abris f.)
- closed/opened
- duplex/multiplex
- direct: penetrating, focal, crush, bumper /indirect: traction, angulation, rotational, vertical
Compression
Pathological

Healing; Forensic-medicine importance!

DISLOCATION (Luxatio) and Distorsio
separation of the bone ends without rupture
with rupture of joint capsule
Types: partial, opened, habitual (predisposition)
Genesis: indirect

SEPARATION and CRUSHING
(Detractio, Amputatio) (Conquassatio, Destructio)
mechanical disconnection smashing of particular parts

**SPECIFIC – BLUNT FORCE**

CONTUSION WOUND
*Mechanism* - blows by blunt objects (edge or plane surface)
*Types:* - vertical : edge – linear shape
- plane – stellate shape
- at an angle: edge or plane – irregular shape, larger damages

Occur exclusively by crushing= VULNUS CONTUSUM (contusion wound) – most often the bone is under the skin
Occur with combination of crushing and tearing = VULNUS LACEROCONTUSUM (lacero-contusion wound)
- sudden strain of skin = VULNUS LACERUM (laceration wound)
- traumatic skin ripping = AVULSIO, DECOLLEMENT

<u>always</u>: BRIDGES
Part of the body → types of injury
Forensic-medicine importance!

**SPECIFIC – SHARP FORCE**

INCISED WOUND /CUT = VULNUS SCISSUM
*Mmechanism* - produced by sharp-edged weapons or instruments that are pressed into and drawn along the surface of the skin
*Shape* - the edges: tend to separate (depend on whether it is parallel or not with Langer's line)
- clean-cut straight edges; single slash more than one wound ("wrinkle wounds")
- beginning / end; defense / hesitated

CHOP WOUND = VULNUS SECATUM
Combination of cutting (effect of sharp edge) and crushing (effect of the blow force and heaviness of the instrument)

STAB WOUND = VULNUS PUNCTUM seu ICTUM
*Mechanism* - produced by pointed instruments that penetrate into body in direction of its longer axis

*appearance:* - linear, oval or triangular = point and edge
- round = point
- typical / atypical

Size and shape depends on nature of object, force and direction, movement
Identification of instrument
Differences among incised and stab wounds
Combination: incised-stab wounds

THERAPEUTIC/DIAGNOSTIC WOUNDS
Produced by medical personnel during treatment
Thoracotomy and laparotomy incisions, insertion of tubes

**SPECIFIC**

GUNSHOT WOUND = VULNUS SCLOPETARIUM
*Mechanism* - produced by projectiles fired from hand fire-arms (short or long muzzle)
Weapons: small arms – revolvers, pistols, rifles, shotguns, submachine and machine guns
Ammunition: cartridge = cartridge case, primer compound, gunpowder (smokeless), bullet (projectile). For shotguns - shotgun shells with shotgun pellets
Caliber = diameter of the bore of a weapon (or diameter of the bullet),
Primer – explosive material, detonated by the firing pin; function: to ignite the propellant within the cartridge.
*Division:*

- Entry wound - shape depends on: range of fire
  types of weapon and ammunition
  ballistic characteristics of ammunition
  types of tissue (firmness, elastic)
  influence of gunpowder, fume and fire (the longest distance, ½, ¼)

  a) g. w. from DISTANCE – effects of projectile, bullet hole, concentric abrasion ring, canal
  b) g.w. from NEAR CONTACT / INTERMEDIATE RANGE - effects of gun powder (tattooing), soot and searing
  c) g.w. From CONTACT - effects of gases expanded (skin is overstretched,
  of tissue ballooned backward against the muzzle), muzzle imprint, all inside the wound canal

- Exit wound - as a general: larger and more irregularly shaped, averted skin margins, no abrasion collar (depends on velocity); “shored” wound

FACTORS INVOLVED IN WOUNDING
The wounding capability of a bullet depends upon the amount of kinetic energy the bullet possesses when it strikes the target: $KE = wv^2 / 2g$
w = weight or mass of the bullet

v = the velocity of the bullet
g = gravitational acceleration

- possibilities - entry-exit, entry, graze wound (when a bullet strikes the skin at a shallow angle and passes across the skin almost parallel to the skin surface, abrading the skin without penetrating the body), tangential wound ( penetrates into subcutaneous tissue lacerating it)

Shotguns - dispersion of peripheral projectiles

BALISTIC

Science of shot and firing: internal – in the weapon
external – bullet in the space
wound – entry and pass through the body

Hydrodynamic theory - Transfer of KE→ max. lateral movement of *temporary (cylindrical) cavity* along the track (2-4 msek.) → elastic E transfers into KE→ pulsation → calm (lost of KE – transfer into heat energy). Result – tissue damage: wound track (*permanent cavity*); zone of devitalisation (traumatic necrosis; zone of molecular shake (extravasations)

HYDRAULIC EXPLOSIVE ACTIVITY

Pass through organs such lungs and the hollow ones – extremely largely damages (the content of organ brought to high pressure – explosion)

EXPLOSIVE WOUND = VULNUS EXPLOSIVUM

Bombs, mines, fragments

Mechanical + physical injuries

BITE WOUND = VULNUS MORSUM

*Mechanism* - produced by effects of human and animals teeth

*Shape* - rush abrasions associated with bruising (and lacerations); composed of pair of curved lines

From human - most often on exposed parts of the body; self-inflicted or by other person

*F*rom animals: on exposed or covered parts (alive and dead persons)

BITE = morsus (no lost of continuation of skin)

Differential diagnostic

Human vs. Animal bite

| | *Human* | *Dog* | *Cat* |
|---|---|---|---|
| *Shape:* | *oval/elliptic* | *"V" shape* | *pin point* |
| *Depth:* | *superficial* | *deep* | |
| *Injury:* | *abrasion, bruise* | *laceration* | *scratches* |
| *Number:* | *single* | *multiple* | |

ORIGIN OF INJURIES

SELF-INFLICTED INJURIES

Number of characteristics (not diagnostic):
- on area accessible to dominant hand
- superficial or minor
- regular or similar in style and shape
- multiple

- parallel or grouped together
- on selected sites
- tentative injuries
- scars from previous attempts
- probability of psychiatric history or personality disorder

DEFENSE INJURIES - Typically seen in defending against attack:
- blunt object → exposed surface of arms in attempt to protect head, neck
- sharp object → cut wound of palm in attempt to grab blade