

Forensic medicine

Accidental injuries , Strangulation , Drowning and burns

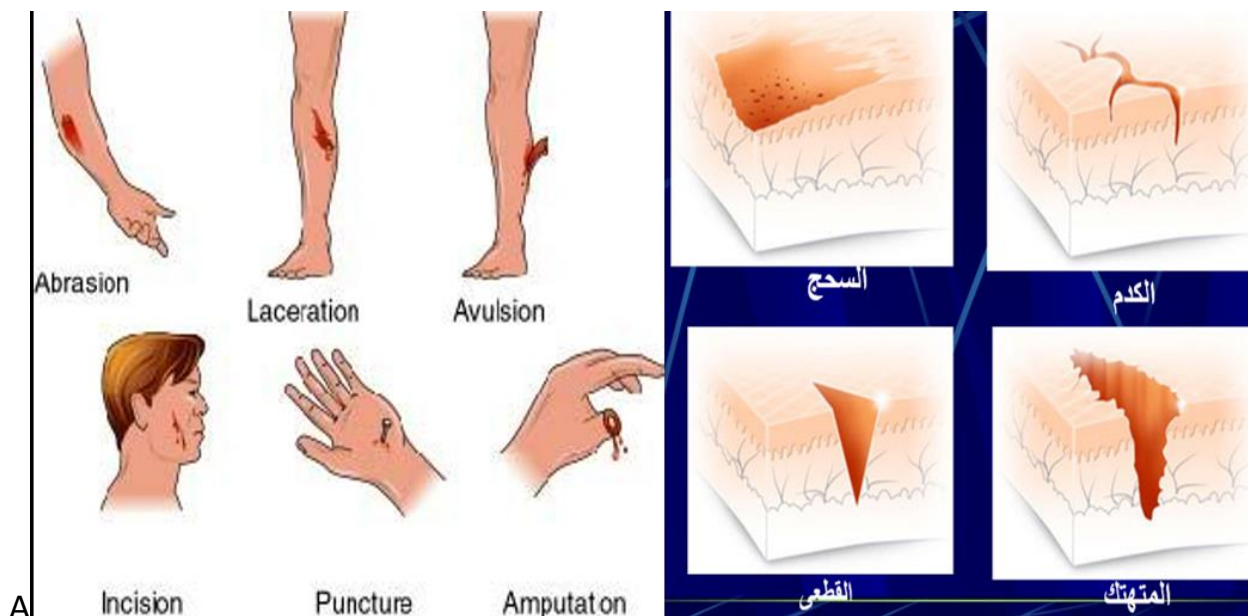
Accidental injuries : It can be defined as affections leaving marks on skin or deeper parts of the cadaver , resulting from physical , chemical or other factors and it may or may not resulted from criminal action .

Accidental injuries include a wide spectrum of affections , the mostly occurring are Traumatic skin injuries and Burns .

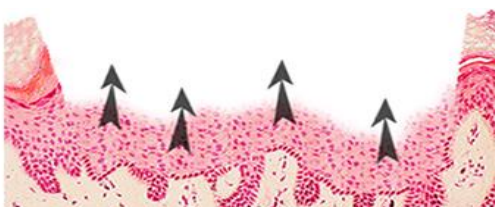
Traumatic skin injuries includes :

1-Blunt force injuries (Abrasions , contusions and Laceration) .

2-Sharp force injuries (Amputation , Slashes , Puncture or penetrating stab wounds , and laceration) .



Abrasions : Abrasions are medically defined as a break in the continuity of skin resulting from physical friction with rough irregular surface leading to lose of few layers of epidermis with maintenance of the underlying epidermal and dermal layers intact .



Avulsion : is a state when a flap of skin at the edge of the superficial wound is torn and reflected to outside or the abrasion with three dimensions .

Forensic significance of abrasion :

1-The shape of abrasion may indicate the causative object ..ex crescent shape – human nails , a head and tail shape – rough straightly moved object .

The shape may indicate the direction of the passage of the force .

2-The position of the abrasion may indicate type of criminal action and the resistance of the victim .

3-The color of the abrasion indicates the time of its occurrence . as following :

a-Covered with moist blood until 24 hours .

b-Clotted not completely dried blood 24-48 hours .

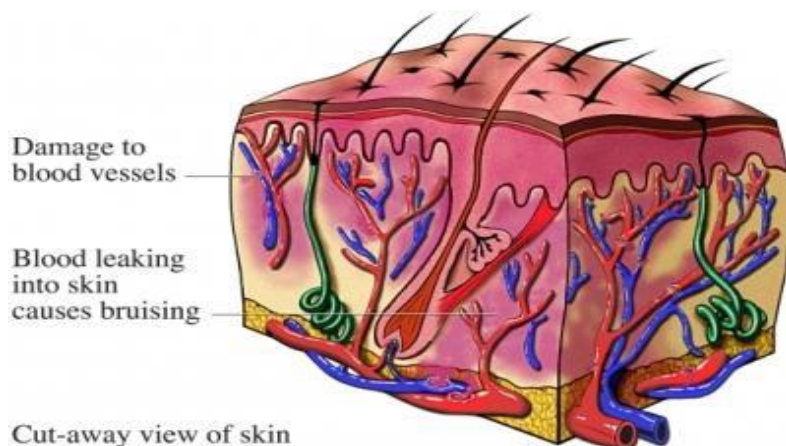
c-Firmly attached brown crust 2-3 days .

d-The crust falls with in 5-6 days .

e-The pink skin return to normal color with in 15 days .

4-Abrasion may contain some component from the rough surface that induced it .. ex : Gravel from street , Iron oxide from rusty metals , Wood fractions from wood objects .

Contusions : contusions can be defined as an injury causing rupture of capillaries in an intact unbroken skin resulted from hitting with blunt object (traumatic force) , the seepage of blood under the skin will change the color and causing swelling to the affected area .



Forensic significance of contusions :

1-its shape may indicate the causative object . ex .. stick , hummer , teeth .

2-The color of the contusion or bruise indicates its age .

Table 1

Determining the Age of a Bruise by Its Color

Color of Bruise	Age of Bruise
Red (swollen, tender)	0-2 Days
Blue, purple	2-5 Days
Green	5-7 Days
Yellow	7-10 Days
Brown	10-14 Days
No further evidence of bruising	2-4 Weeks

Changing color of the bruise occur as following (The cause of color change) :

1-Red after trauma due to seepage of red oxygenated blood to the tissue .

2-Blue with in 2-3 days because turning of oxyhemoglobin to carboxyhemoglobin.

3-Green with in 5-7 days because turning of hemoglobin to bilirubin .

4-Yellow with in 8-10 days because turning of bilirubin to biliveridin .

5-The skin retunes to normal color with in 12-15 days because engulfment of biliveridin by macrophages .

It is usually hard to differentiate accidental bruises from criminal bruises with considering the following differences :

Table 7. Characteristics Suggestive Of Accidental vs. Non-Accidental Bruises.

Characteristic	Accidental	Non-accidental
General appearance	Irregular, non-uniform	Regular, uniform
Geometric shape or pattern	No recognizable shape (object or pattern)	Distinct pattern or shape (may be recognizable object)
Specific location	Non-protected "exposed" bony prominences (forehead, shins, knees, chin, elbows)	Protected non-exposed areas (chest, neck, axilla, ear pinnae, buttocks, genitalia, oral mucosa, inner aspects of arm, back of hands, inner thighs, small of back, back of knees)
General location	Peripheral distribution (lower extremity, arms, forehead)	More central (trunk)
Severity	Less severe	More severe, more extensive
Number/age	Few in number	Multiple, various ages
Unilateral/bilateral	Usually unilateral (e.g., a child who falls usually lands on one side, producing unilateral bruises)	Bilateral, symmetric (e.g., bilateral orbital contusions)
Suspicious location	—	Buttocks, thighs, genitalia, lower back, ear; gagging injuries (corners of mouth/lips); force-feeding injuries (inside mouth/palate); strangulation/restraining injuries (neck, ankles, wrists)
Symmetry/circumference	Asymmetric; unilateral, not circumferential	Circumferential, symmetric; bilateral
Typical patterns	Not recognizable pattern/object	Strangulation: circumferential linear marks on neck; Tied down: circumferential linear marks on wrists/ankles; Grabbed/shaken by ears or upper arms: circular bruises from adult fingers on pinna or upper arm; Toilet-training punishment: bruises in genitalia, thighs, buttocks; Tears of frenulum, mouth laceration: forced feeding; To protect face: bruises on volar surface of forearms

Laceration or Lacerative wound : Can be defined as a tearing in skin or other tissues with a possibility to lose tissue at wound area , the edge of wound are irregular and can be resulted from sharp or blunt objects or friction with rough surfaces , It is usually contaminated .

Forensic significance of Laceration :

1-It is hard to know the shape of the causative object .

2-It is hard to determine the time of occurrence with in few hours from appearance .

3-The laceration may contain some components indicate the nature of causative object ex....Animal Clowes , gravel , sand , wood fragments , iron oxide .

4-If the laceration observed on a cadaver a decision should be made about it relevance with death .. especially if its infected (Inflamed) .

Strangulation and hanging :

Strangulation is the process of applying mechanical pressure on throat or neck obstructing the upper respiratory passages and resulting in comma and death by cerebral hypoxia , It is a violent action appears in short fall hanging and it is the style of killing of some predators .

Forensic significance of strangulation :

1-The marks on the the throat representing the caustive force object ex.. Rope , Fingers , Wire , towel .. etc .

2-Cyanosis in head , tongue , neck and shoulders indicates Hypoxic death .

3-Petecheal and ecchymotic hemorrhages can be obsearved on eye sclera with buldging of eye globs to out side .

The frequency of killing animals by strangulation is less than humans but it is recorded .

Hanging : hanging is suspension of a person or animal from the atlanto-occipital joint or head-neck junction with a rope made loop and knot , then leaving the living body freely suspended , the weight of the body will cause strangulation or breaks the vertebral column and tears spinal cord to death .

Hanging can be divided to 2 types :

1-Short drop hanging : in this process the base supporting the body will be removed leaving the suspended body strangled by the influence of gravity and pressure of the rope loop around the neck occluding trachea , both carotides and both jugulars ..killing the individual by cerebral hypoxia within 10-20 minutes .

2- Long drop hanging : Can be considered as the official method for execution in most of world countries , This depending upon dropping the suspended body freely for 1.2-1.8 meters before the rope being tensed and the loop will break the junction between 2nd-3rd or between 4th-5th cervical vertebrae and tears up the spinal cord causing immediate paralysis ,coma and death (from 0-2 minutes) .

Cranial , epidural and spinal cord hemorrhage and ocular bleeding may accompany the long drop hanging .

Drowning :

Drowning is complete blocking to respiratory performance because the respiratory alveoli are filled and occupied by water or other fluid causing hypoxia , cardiac arrest and death .

*At drowning the victim tries to cough out or swallow water making it inhale larger amount of water .

* As an involuntary response laryngospasm occur to prevent entrance of water to lungs .

* The stomach and esophagus will be filled with water .

According to these informations , Drowning can be divided to tow types :

1-Dry drowning : there is absence or very little water in the victims lungs , the death in this type actually happens because of cerebral hypoxia and heart arrest because of laryngospasm , the upper respiratory tract and digestive system are filled with water .

2-Moist drowning : characterized by lungs filled with fluid indicating the victim is awake at the moment of the death under water .

Burns :

The burns are types of injuries to skin and other tissues , Its cause may be thermal , electrical , radiational , chemical or mechanical , the burns can be superficial include the outer skin layers (**first degree burn**) when the burn reach deeper it is called (**second degree burn**) , when the burn include all skin layers (**third degree burn**) , when the burn include muscles , bones and internal organs (**fourth degree burn**) .

Type ^[10]	Layers involved	Appearance	Texture	Sensation	Healing Time	Prognosis	Example
Superficial (First degree)	Epidermis ^[5]	Red without blisters ^[10]	Dry	Painful ^[10]	5-10 days ^{[10][11]}	Heals well; ^[10] Repeated sunburns increase the risk of skin cancer later in life ^[12]	
Superficial partial thickness (Second degree)	Extends into superficial (papillary) dermis ^[10]	Redness with clear blister. Blanching with pressure. ^[10]	Moist ^[10]	Very painful ^[10]	less than 2-3 weeks ^{[8][10]}	Local infection/cellulitis but no scarring typically ^[8]	
Deep partial thickness (Second degree)	Extends into deep (reticular) dermis ^[10]	Yellow or white. Less blanching. May be blistering. ^[10]	Fairly dry ^[8]	Pressure and discomfort ^[8]	3-8 weeks ^[10]	Scarring, contractures (may require excision and skin grafting) ^[8]	
Full thickness (Third degree)	Extends through entire dermis ^[10]	Stiff and white/brown ^[10] No blanching ^[8]	Leathery ^[10]	Painless ^[10]	Prolonged (months) and incomplete ^[10]	Scarring, contractures, amputation (early excision recommended) ^[8]	
Fourth degree	Extends through entire skin, and into underlying fat, muscle and bone ^[10]	Black; charred with eschar	Dry	Painless	Requires excision ^[10]	Amputation, significant functional impairment and, in some cases, death. ^[10]	

The burns can be accidental or criminal .

Forensic significance of burns :

1-Burns can be used as an abuse applications (non accidental burns) .

2-Chemicals and corrosive substances can be used as weapons or in criminal actions .

3-Some thermal burns may indicate the shape of the causative object .

4-**Electrical burns** characterized by presence of an **entrance burn** and **exit burn** , the exit burn usually noticed at point of contact with floor .

5-Electrical burns may be noticed it electrically stunned cadaver , the death may achieved by heart block because of electrical current .

6-Lighting strike is a type of electrical burn leaving a tree shape burn marks .