



Forensic Perspective of Injuries with Particular Focus on Incised Wounds

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ABSTRACT

Background: Any portion of the body that has sustained damage due to mechanical force is referred to as an injury or wound. Weapon use, blunt force, and sharp force can all cause mechanical injuries. In many nations, the most common method of homicide is the use of sharp objects, particularly knives. One of a forensic pathologist's main responsibilities in the realm of forensics is wound examination. By identifying prospective criminal suspects and tracking the origin and progression of violent occurrences, wound assessment supports criminal investigations.

Aim: The current review provides a view on wounds/injuries, their classifications, incised wounds, how to differentiate them from lacerations, and the importance of wound examination in the field of forensics.

Conclusion: In summary, researchers have classified wounds/injuries according to many factors, and they frequently emphasize the significance of wound examination in the field of forensics.

Keywords: Wounds; Injuries; Classification of Injuries; Incised Wound; Forensic.

INTRODUCTION

With some exceptions, the terms "hurt," "injury," and "wound" all indicate almost the same thing. They often refer to any physical hurt brought on by the use of force or damage to any portion of the body. While hurt refers to physical suffering, illness, or infirmity, injury also includes any harm to one's mind, reputation, or property [1].

Definition of wound

In the field of medicine, a wound is defined as a disruption in the skin's and/or mucous membranes' anatomical integrity, regardless of whether the underlying tissues have sustained damage. In forensics, a wound occurs when any organ or tissue sustains damage, regardless of whether the skin or mucous membrane remains intact [1].

Mechanism of wound formation

A wound is created when the force applied to the body is greater than the tissue's capacity to adjust or resist the force. The amount of kinetic energy

transferred from the relative movement of the weapon and/or the body determines the type of tissue injury [2].

Classification of wounds/injuries

There are numerous methods to categorize wounds, including causes, appearance, depth of damage, severity, type of injury, and time of infliction.

According to causative factors:

Injuries could be divided into [3] (Figure 1):

1. Mechanical or physical injuries (produced by physical violence), this category is subdivided into two types [4]:
 - Blunt force trauma: Blunt trauma can result from an object with a blunt surface striking the body, from a body striking a blunt surface, or from a combination of the two. Blunt force trauma is the term used to describe any lesions that are not produced by sharp instruments. Blunt force trauma to the skin and subcutis results in three frequent lesion types: abrasions, contusions, and lacerations [5].

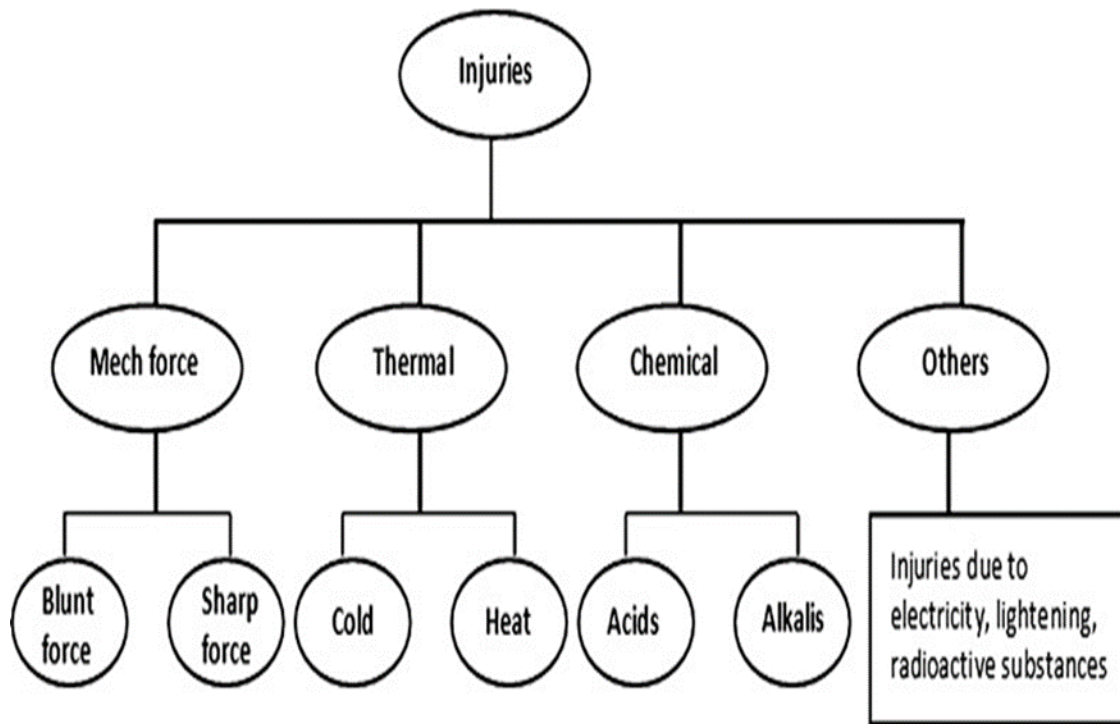


Figure (1): Classification of injuries based on causative factors [11].

- Sharp force trauma: Sharp items or instruments can create stab, chopping, or incised wounds that result in sharp force trauma. Except for nations where it is easy to obtain firearms, sharp force trauma—mostly the use of knives—is the most common form of homicide and a frequent cause of morbidity observed in emergency rooms in many countries [6].

2. Thermal injuries

- Due to application of heat: The application of dry heat, which causes flame burns, or moist heat, which causes scalds, can result in thermal burns [7].

- Due to the application of cold: There are three main forms of typical cold injuries: 1) nonfreezing tissue injuries, like a trench or cold immersion foot; 2) freezing injuries, such as frostbite; or 3) accidental or systemic hypothermia [8].

3. Chemical injuries

Chemical injuries fall into two categories: alkali and acid damage. Alkali burns are more common and typically result in more serious injuries because alkali compounds are widely used in commercial and residential cleaning procedures [9].

4. Miscellaneous injuries:

Injuries like those caused by radiation from exposure to X-rays, UV radiation, radioactive materials, electrical shocks, and lightning strikes [10,11].

According to their appearance (medico-legally):

Injuries could be categorized based on how they seem into [12]:

1. Contusions or bruises:

A contusion or bruise is an extravascular collection of blood in the tissue, such as the skin's dermis, subcutaneous tissue, and deeper tissues, caused by a blood vessel rupturing from blunt force trauma while the surrounding tissue stays intact, preventing blood from escaping the area. A lesion is referred to be a bruise when it is visible from the outside and as a contusion when it is not. The size of bruises can vary, ranging from a petechial hemorrhage the size of a pinhead to a purpura 2 to 5 mm in size, an ecchymosis larger than 5 mm, and a haematoma causing regional swelling [1].

2. Abrasions:

An abrasion is described as a skin injury where the epidermis is destroyed by compression or scraped off by friction against a rough surface, leaving just a localized loss of epidermis with little to no extension to the dermis. Based on the angle of impact with the skin, abrasions can be classified as scrape (or brush), impact (or crush), and pattern abrasions when the morphology of the wound identifies the object that caused the lesion [5].

3. Lacerations:

A laceration is a rip or rupture in the soft tissues that usually happens as a result of blunt force trauma that affects the whole thickness of the skin. It is characterized by bruising, skin tagging, and uneven wound edges [13].

4. Incisions:

These are cuts caused by sharp objects like glass, razor blades, and knives. The surface of the tissue, which is typically the skin, is where the cutting edge tangentially moves. Often, an incised wound is longer than it is deep. It could be fatal, especially in areas where critical structures are found, such as the neck and other body parts with significant superficial blood vessels and nerves [14].

5. Puncture or stab wounds:

When a sharp, pointy object pierces deep into the body, it causes injuries like this one. Its width is less than its depth. Broken glass, knives, scissors, and other sharp items are frequently the cause of it [15].

6. Gunshot injury:

Projectiles fired from a barrel as a result of gunpowder burning are to blame for these wounds. The kind of firearm used, the distance traveled, and the direction of firing all affect how severe the wounds are. Two sorts of wounds can result from gunshot wounds, depending on the direction traveled by the projectile. These wounds are classified as entry wounds and exit wounds, with entry wounds being more regular and smaller than exit wounds. Exit wounds, on the other hand, are bigger and more erratic. They display soft tissue, and the edges have an outward bevel [16].

According to the depth of damage

Depending on how much harm has been done, injuries could be divided into [17]:

1. Superficial: not extending beyond the subcutaneous tissue.

2. Deep: reaching beyond the subcutaneous tissue.

According to the legal point of view:

Legally speaking, injuries can be divided into two categories: minor wounds and severe wounds, which may or may not be fatal [3].

According to the nature of injuries:

Based on how they were caused, injuries might be categorized as homicidal, suicidal, accidental, defense wounds, and self-inflicted wounds [3].

I. According to the time of infliction:

A wound can be caused either after death (postmortem), that is, following cardiac and respiratory stop, or during life (antemortem), when the respiratory and cardiovascular systems are still functioning. Lifetime trauma triggers vital responses that do not occur in postmortem wounds [18].

Incised wound (cut/slash)

Sharp cutting instruments, usually bladed weapons like knives and razors, are the source of incised wounds; however, clean-cut incised injuries can also be caused by anything with a cutting edge, including shattered glass, the edges of tin cans, and sharp instruments like chisels. The entire thickness of the skin is affected by the injuries. An incision's typical characteristics include clean, straight, non-bruised, non-grazed, and non-inverted edges [2,15].

Characteristics of the incised wound

The margins of incised wounds are sharp with well-trimmed edges that are nearly always everted. However, they may be inverted if a small layer of muscle fibers is linked to the skin, as in the scrotum (due to the dartos muscle's connection to the skin). The width is greater than the weapon's edge because of the retraction of the split tissues. It is longer than it is wide and deep and commonly spindle-shaped due to greater retraction of the edges in the center. It is usually deeper at the beginning, except for suicidal cutthroat injuries, which generally have hesitation cuts at the beginning. This is referred to as the wound's head. The end of the incision, also referred to as the wound's tail, is where it gradually gets shallower. The direction of the force used can then be inferred from the depth of the incised wound with tailing [3] (Figure 2)



Figure 2: Homicidal slashed wounds caused by a knife; the length is greater than the depth, unlike stab wounds.

The long tails are due to the knife rising from the skin, thus indicating the direction of the slash [15]

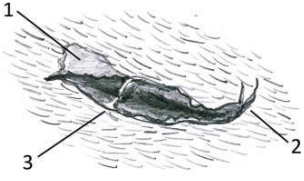
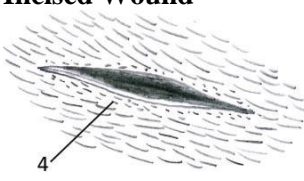
Incised wounds versus lacerations

It is important to distinguish between lacerations and incised wounds resulting from sharp-force trauma. Lacerations can be caused by blunt force hits that compress and tear the skin, or sometimes by shearing force. Usually, lacerations happen where the underlying bone is prominent, such as along the orbital edge. It is sometimes difficult to distinguish between an incised wound and a laceration after treatment, suture, or gluing, which is why thorough documentation is essential before treatment. The primary difference that allows one to differentiate between lacerations and incised wounds is the distinct, clean edges of an incised wound. Lacerations may have macroscopically clean and distinct edges, but not under magnification.

Lacerations typically include uneven or macerated edges, leftover skin bridging (especially at the ends), and other blunt impact injury characteristics such as edema, redness, and bruising [5,19] (Table 1)

Having the appropriate identification is necessary to prevent confusion. A significant amount of time could be lost in court debating whether the lesion the surgeon described as a "cut" was a laceration or another kind of injury, particularly an incised wound. This conclusion might be true in a certain process. The grounds upon which the blunt force trauma mechanism is predicated based on the particular injury may not be sustained if the "cut" is not a laceration. Attending surgeons must therefore either clarify the type of damage or identify the characteristics they observe. The term "cut" should not be used to describe any damage that causes tissue discontinuity [14].

Table (1): Morphological criteria for distinguishing blunt-force lacerations and incised wounds [5]

Criteria	Laceration 	Incised Wound 
Margins	Irregular	Regular
Associated lesion	Abrasion (1) or contusion frequently present	None
Extremities	Possibly divergent (“swallow tails”) (2)	In line with the axis of the lesion
Tissue bridges	Frequently present (3)	Absent
Hair	Crushed or intact	Cut (4)

Examination of injury

The field of forensics places great attention on wound examination. Establishing a thorough and systemic wound evaluation procedure is essential. [20].

While describing injuries, medical professionals must be precise. They also need to document their observations in clinical sheets and, when needed, use body diagrams. Following conventional medical standards is essential to accurately evaluating and documenting an injury. These procedures include getting a detailed history from the patient (or accuser, complainant, or person under suspicion) and doing a thorough physical examination. Digitally taken photographs are becoming a common way to

document injuries, but handling the acquired photos needs standards and procedures in place, and the patient needs to provide appropriate consent [21].

When dealing with situations involving several traumas by different offenders, forensic pathologists must determine the chronology and time of injuries because the severity of an injury usually determines the severity of punishment. The two most important factors in violent death instances are (1) whether the injury occurred during the victim's lifetime or the postmortem phase, and (2) how long the victim lived after the trauma was sustained [22].

Assessing a wound age is determining how long a subject has lived following an injury. In forensic

pathology, determining the age of a wound can be difficult, but in legal proceedings, it is crucial since it can aid in the reconstruction of crime scenes, help apprehend suspects, and affect the verdict [23].

Following the infliction of a wound, a sequence of vital responses takes place to facilitate the healing process (such as hemorrhage, infiltration of inflammatory cells, and granulation tissue production). The healing process is characterized by changes in the wounds' color and union of the wound edges, which roughly correspond to the time interval elapsed between the wound's occurrence and the medical examination [1].

With the development of medical research and medical devices, wound examination should be updated and improved, even though macroscopic and histological examinations are routinely carried out during forensic autopsies. Therefore, it is ideal for forensic practitioners to employ contemporary diagnostic tools and procedures [20].

CONCLUSION

Researchers have highlighted that classification of injury types is crucial to proper forensic interpretation. Wound examination is a fundamental issue in forensic medicine, and the significance of wound age determination has been frequently emphasized by researchers. Wound assessment should be enhanced and updated in conjunction with advancements in medical technology and medical equipment.

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