

# MEDICO-LEGAL IMPORTANCE OF THE CORRECT INTERPRETATION OF TRAUMATIC SKIN INJURIES

*Traumatic skin injuries are becoming more common in South Africa as violence increases.*

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The definition of a skin wound or injury is related to the type of damage to the skin caused by the application of mechanical force. In South Africa with its high rate of violence, doctors are exposed daily to the effect of the application of mechanical forces to the body. The manner in which these injuries occur could be homicide/assault, suicide or accident. Although doctors are not expected to comment on the manner of death, accurate description and, in certain instances, measurement of these wounds are essential in medico-legal proceedings as a consequence of these injuries. In cases of assault the injuries should also be clearly documented on the J88.

## CLASSIFICATION OF TRAUMATIC SKIN INJURIES (TABLE I)

Table I. Classification of traumatic skin injuries

Sharp force injuries	Blunt force injuries
<ul style="list-style-type: none"> <li>• Incised wounds</li> <li>• Stab wounds</li> <li>• Chop wounds</li> <li>• Diagnostic/therapeutic wounds</li> </ul>	<ul style="list-style-type: none"> <li>• Lacerations</li> <li>• Bruising/contusion</li> <li>• Abrasions</li> </ul>

## Blunt force

### Lacerations

A laceration is caused by a blunt object stretching and eventually tearing the skin. Underlying structures such as nerves and blood vessels may also be torn, usually at the site of maximum impact, rarely at the ends of the laceration. Considering the mechanism of injury, abrasions and bruises often surround the borders of a laceration.

When the skin is compressed by a blunt object against a firm base, such as the underlying bone of the skull, the skin may be very cleanly spliced, making it indistinguishable from an incised wound. The term 'laceration' is often indiscriminately used by doctors to describe wounds caused by blunt trauma, as well as incision or stab wounds. There is, however, a clear distinction between the mechanisms of injury. This might be of relevance in a medico-legal case where it could be important to identify the object causing a fatal injury, and often leads to conflicting testimony by the state expert witnesses in subsequent trials.

### Special types of lacerations

- **Splitting of the skin.** The skin is caught between two relatively hard objects, for example the skull and a metal pipe. If the object strikes the skin in the same direction as

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Langer's lines in an action similar to that of a guillotine, the skin will split open quite cleanly, mimicking an incised wound.

- **Stretch tears.** When a heavy, blunt object passes over the body, it causes extreme stretching and tearing of the skin. This is commonly found in motor vehicle accidents where a tyre has passed over a body. These lacerations are usually found in the inguinal or lower abdominal area.
- **Decollement.** The subcutaneous tissue is lacerated, but there is no open injury of the skin. A cavity forms in the deep subcutaneous tissue and is filled with blood and fluid.
- **Hook lacerations.** A protruding object hooks the skin and tears it. The lesion may be linear or angled.
- **Patterned lacerations,** e.g. blows to the head using a hammer, which can leave an impression of the weapon.

### **Bruising/contusion**

Blunt trauma applied to a particular area causes stretching and subsequent rupture of capillary blood vessels in the underlying soft tissue, resulting in

a bruise or contusion. The collection of a large amount of blood in the area of bruising is called a haematoma. Superficial bruises are usually easily visible, but deep bruises, scalp bruises and bruises in dark-skinned individuals may be more difficult to detect and may only become visible on incision into the affected area – this should be confirmed at autopsy.

### *Factors influencing the prominence of bruising*

The size and the severity of a bruise are not always indicative of the amount of force applied. Bruising might even be absent under certain circumstances. Certain factors influence the prominence or severity of a bruise. A bruise is generally larger than the object that caused it. It is important to keep the following factors in mind when asked to comment on the amount of the force used and the type of object used to cause certain injuries:

- **Age.** Children and the elderly bruise more easily than young, fit and muscular individuals. Children have loose delicate skin, while in the elderly there is a loss of supporting subcutaneous tissue.
- **Gender.** Women, especially if they are obese, generally bruise more easily than men.
- **General condition of health.** Underlying bleeding diatheses, for example in alcoholics with liver cirrhosis.
- **The anatomical structure of tissue.** The absence of a visible bruise on the skin does not indicate the absence of blunt force having been applied to a specific area. Bruising of the anterior abdominal wall, for example, might be absent despite severe underlying injuries to the intra-abdominal structures. The reason for this is the lack of underlying supporting structures to the loose and elastic anterior abdominal wall.

### *Ageing of bruises*

Use colour changes within bruises as criteria to determine the age of a bruise with extreme caution. Initially, bruises might appear dark blue, purple

or crimson, but as haemoglobin within the bruise is broken down, the colour gradually changes to violet, green, dark yellow and pale yellow, until it finally disappears. These colour changes can develop over a time period ranging from hours, days or months and it is best to describe bruises as recent or old and not to try to limit the age of the bruise to a specific time period. If there are numerous bruises of differing colours on the body, an opinion may be expressed that they were inflicted at different times. This may be of vital importance in non-accidental injury syndrome in children and domestic violence in women.

### *Special types of bruises*

- **Impression bruises** could be used to identify the object with which the injury was caused, for example the buckle of a belt, motor vehicle tyre or seat belt.
- **Peri-orbital haematoma ('black' eye or raccoon eye)** is caused by bruising of and around the eyelid due to direct trauma to the eye, or indirectly from gravitation in a scalp bruise, or due to a fracture of the base of the skull.
- **Tamline bruises** are caused by trauma inflicted by a linear or longitudinal object that consists of 2 parallel bruise lines as a result of tearing of the capillaries in this area, and a central, unaffected area.
- **Bite marks.** Bruises caused by teeth can be used to identify an assailant. Sharp, irregular or broken teeth may even cause underlying superficial lacerations or imprint abrasions on the skin. Bite marks should always be carefully photographed and, if possible, the help of a forensic odontologist should be obtained in an effort to identify the assailant. The skin over a bite can be swabbed for potential depositor DNA.
- **Self-defence bruises** are typically found on the back of the hands and fingers, medial aspect of the forearms and elbows.
- **Iatrogenic bruises** can be caused by therapeutic or diagnostic procedures such as drip sites,

over the sternum when testing for consciousness in comatose patients and also by resuscitative efforts.

- **Self-inflicted bruises**, e.g. in cases of alcohol intoxication.



Fig. 1. A typical tramline bruise

**Abrasions**

Abrasions are traumatic injuries to the superficial layers of the skin and are caused by a rough object scraping over the surface of the skin or by a person moving into contact with a blunt surface. Foreign material found on the abraded skin surface such as paint flakes, clothing fibres or gravel could be used to identify the object causing the abrasion, and should be collected as trace evidence (see article by Vellema in February CME, p. 64).

*Special types of abrasion*

- **Scratches** are linear abrasions caused by the movement of a sharp object, such as fingernails, over the surface of the skin.
- **Imprint or impression abrasions.** As in the case of imprint bruises, these abrasions reflect the shape or pattern of the object causing the injury. This is not a true reflection of the size of the object, owing to the elasticity of the skin, but is more useful than the pattern of an imprint contusion.
- **Friction abrasion.** This special type of abrasion is caused by a localised force passing over the skin, e.g. abrasions caused by a ligature or whipping.
- **Tangential abrasions or brush burns** are caused when a body is dragged over a rough surface, as in the case of pedestrians involved in motor vehicle accidents.

**Sharp force**

**Incised wounds**

Incised wounds are characterised by being longer on the surface of the body than they are deep, and are usually caused by a swiping action rather than by a stabbing thrust. In some situations an incised wound may very closely resemble a laceration, but since the mechanism of injury is different, it is vital for the distinction to be made (Table II).

to penetrate the skin. The sharper the tip, the less force is needed for skin penetration. The sharpness of the cutting edge is not that important.

In court, doctors are commonly asked to estimate the degree of force that was applied in creating the wound/injury of the patient/deceased. Only a subjective opinion can be given based on experience, but certain generalisations can be made:

- A considerable amount of force is

Table II. Differentiation between incised wounds and lacerations

Incised wounds	Lacerations
<ul style="list-style-type: none"> <li>• Smooth edges</li> <li>• Edges usually free of injury</li> <li>• Clean division of skin and subcutaneous tissue</li> <li>• Usually no foreign material in wound</li> <li>• No loss of hair around wound edges</li> <li>• Linear injuries to underlying skull in scalp wounds</li> </ul>	<ul style="list-style-type: none"> <li>• Irregular edges</li> <li>• Injury to edges, e.g. abrasions/</li> <li>• Bridging tissue strands, especially at extremities of the wound</li> <li>• Foreign material in wound</li> <li>• Scalp: intact hairs cross the injury, or hair may be torn at ends of the laceration</li> <li>• Sometimes fractures related to blunt force trauma</li> </ul>

**Stab wounds**

Stab wounds are caused by sharp force injuries which cause the wounds to be deeper than they are long. These injuries can be caused by knives, scissors, shears, screwdrivers and many other sharp objects. The sharpness of the tip of the instrument is the most important factor when evaluating the amount of force needed

necessary to penetrate bone, and to a lesser degree cartilage.

- The most resistance is offered by the skin and clothing but once the skin has been breached the instrument usually penetrates soft tissue very easily, unless it is hampered by bone.
- Wound depth is a poor indicator of the force that has been applied.



Fig. 2. One end of the stab wound has a 'fish tail' appearance due to the stretching of the skin over the broad blunt edge of a single-edged blade. Also note the puncture wounds around the defect caused by suturing of the wound.

When interpreting the size of a skin wound, certain facts need to be considered. Owing to the elasticity of skin, stab wounds tend to gape open. This causes the wound to appear shorter than its actual length, and can lead to confusion when the width of the knife's blade is compared with the measured (shortened) length of the wound. The appearance of the wound may also be helpful in identifying the purported weapon. Theoretically, a distinction could be made between a blade with a single sharp end or one with 2 sharp edges by evaluating the cut ends of the skin wound. However, this is not always possible, owing to a variety of factors such as postmortem

drying of the wound or abrasions caused by the handle of the knife. If the direction of the knife is changed when it is removed from the body, an extra incision could be caused, giving the skin wound a spur-like appearance.



Fig. 3. The direction of the knife has been changed upon removal from the body and extra incision is visible, giving the skin wound a spur-like appearance.

In South Africa, medico-legal practitioners are not required to state the manner of death (i.e. homicide/suicide/accident/natural causes). One can, however, assist the court in making these decisions, by evaluating the injury patterns:

- **Defence wounds** are found in cases of assault. These are commonly situated on the outer (ulnar) aspect of the forearms and hands, as the victim tries to protect his/her person. Incised wounds may also be present on the palmar aspects of the hand, if the person tried to grab the weapon. When wounds are in areas that are patently inaccessible to the victim, suicide or attempted suicide can be ruled out.
- **Suicide injuries** are usually found in certain well-described sites, i.e. the wrists, throat and over the heart. Multiple injuries in one site are often present, with numerous preliminary cuts surrounding the fatal lesion.
- In **accidental** deaths, the history and circumstances, corroborated with the clinical findings, usually point to the manner of death.

### Chop wounds

These wounds are caused by heavy instruments with sharp edges, such as axes and machetes. Although most chop wounds have an incised appearance, tearing characteristics may also be present in the skin wound, with an underlying fracture or deep groove in the bone.

### Diagnostic/therapeutic wounds

Examples include surgical incisions that might have the appearance of stab wounds, including incisions for insertion of intercostal drains, 'cutdowns' for deep veins and tracheostomy incisions. As these wounds may be mistaken for primary traumatic injuries, therapeutic apparatus should not be removed when a body is sent for a medico-legal autopsy. Accurate descriptions should also be made of the primary wounds and wounds caused by subsequent surgical interventions in the referral letter to the medico-legal laboratory.

## IN A NUTSHELL

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A laceration is caused by a blunt object stretching and eventually tearing the skin. Underlying structures such as nerves and blood vessels may also be torn, usually at the site of maximum impact, rarely at the ends of the laceration.

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Abrasions are traumatic injuries to the superficial layers of the skin and are caused by a rough object scraping over the surface of the skin or by a person moving into contact with a blunt surface.

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Examples of diagnostic or therapeutic wounds include surgical incisions that might have the appearance of stab wounds, including incisions for insertion of intercostal drains, 'cutdowns' for deep veins and tracheostomy incisions.