

In pursuit of justice blunt and sharp injuries

Doctors attending patients who have sustained physical injury from an assault will often have to give evidence in court. They must, therefore, understand the basic forensic principles relating to wounds.

JULIAN STELLA

MB BS, FACEM

CLIVE COOKE

MB BS, BMed Sci, FRCPA

Dr Stella is Staff Specialist in Emergency Medicine, Geelong Hospital, Geelong, Vic, and formerly Senior Registrar in Emergency Medicine, Fremantle Hospital, Fremantle WA. Dr Cooke is Chief Forensic Pathologist and Director of Forensic Services, Western Australia Centre for Pathology and Medical Research (PathCentre), Nedlands, WA.

In 1998 among the adult population in Australia there were 618,300 reported victims of assault and an additional 30,100 female victims of sexual assault.¹ In the same year there were 284 murders and 382 attempted murders.² Many cases of assault, sexual assault, and child and elder abuse go unreported. Many doctors, including GPs, will be involved in the care of patients who have been assaulted and in the legal interpretation of the injuries resulting from these episodes.

It is important to be careful and precise in documenting all aspects of injuries, including the type, site, size, shape, depth, and structures involved. Photographs of injuries are an invaluable adjunct to the written record. Care must also be exercised in the interpretation of any alleged explanation of injuries by patients, especially in the preparation of police reports and the presentation of evidence given in a court of law.

Assessing the type of mechanical injury

Excluding gunshot injuries (which are not discussed in this article), there are two main types of mechanical injury: blunt force injury

and sharp force injury. Mechanical injuries should be described accurately and classified into the specific subtype (see below). Important information on the type of weapon used, the force used and the spatial relationship of the assailant and victim can be garnered from these basic data.

Of particular forensic importance are injuries with a pattern (such as that of a weapon) and those contaminated with trace evidence (that is, when two objects touch there is transfer of material – trace evidence – from one to the other). Such injuries may provide an indication of the weapon used. It is a forensic axiom that the most trivial injuries often hold the most useful information; minor injuries should, therefore, be included in this assessment.

Blunt force injuries

Blunt force injuries comprise bruises, abrasions and lacerations.

Bruises

Bruises are sites of bleeding into the tissue caused by a blunt force impact where the surface is not

IN SUMMARY

- Many GPs will be involved in both the care of patients who have been assaulted and in the legal interpretation of injuries resulting from these episodes.
- GPs should have an understanding of the basic forensic principles relating to wounds.
- An accurate description of the injury and classification of its type can provide valuable clues to the type of weapon used, the force used and the spatial relationship of the assailant and victim.
- Injuries with a pattern or those that are contaminated with trace evidence are particularly useful forensically.
- The main types of mechanical injuries include blunt force injuries (bruises, abrasions and lacerations) and sharp force injuries (incisions and penetrating wounds).

broken. Of all injuries, bruises are the most likely to have a pattern that is useful forensically. An example is tram track-like linear bruising resulting from an impact with a rounded profile weapon, such as a cane, stick or baseball bat (Figure 1).

Additionally, the distribution of bruises may suggest a particular type of assault. Examples include 'restraint'-type bruising of the upper arms or forearms (from being held), bruising of the inner thighs from forceful sexual assault and round (fingerpad) bruises to the neck from manual strangulation.

There are several difficulties, however, with the assessment of bruises. First, assessment of the age of bruises is not accurate. A recent article suggested that all that can be assumed is that any yellowing suggests that a bruise is more than 18 hours old.³ Second, a bruise may develop at an ectopic location (that is, distant to the site of impact). An example of this is periorbital bruising that develops after an impact to the back of the head.

Abrasions

Abrasions result from the loss or crushing of the outer layer of skin due to an impact with a rough, blunt surface. The impact may be tangential, giving 'gliding'-type abrasions, or perpendicular, giving 'imprint' abrasions (Figure 2).

Like bruises, abrasions may have a forensically useful pattern that reproduces that of a weapon. Likewise, there may be trace evidence, such as paint, dirt or wood particles, that adheres to the surface of the abrasion. Sometimes the direction of impact is important. This can be assessed in gliding-type abrasions where linear striae of the base of the abrasion lead to skin tags (which are raised by the sliding force) at the distal margin of the abrasion. Unlike ectopic bruises, the site of an abrasion always indicates the site of impact.

Lacerations

Lacerations are tearing or splitting of tissues that occur when a blunt force impact stretches or crushes the tissue beyond its elastic limits. They need to be distinguished from incised wounds (caused by a sharp force – see below) since the mechanism of the injury is very different. This distinction must be made properly to avoid a misleading line of police investigation.

Lacerations have three readily recognisable



Figure 1 (left). Bruise of the left buttock with pattern reproducing that of an alleged weapon.



Figure 2 (below). Paired imprint-type abrasions of the right wrist, consistent with injuries of restraint (handcuffs).

distinguishing features, as listed below:

- they have irregular and ragged margins
- there is bruising and abrasion of the adjacent skin (due to the crushing impact)
- the base of a laceration is often traversed by tissue 'bridges' (nerve trunks and blood vessels).

Typically, lacerations occur over a bony prominence, such as the eyebrow, cheek or scalp (Figure 3); they are unusual where there is no underlying bone.

continued



Figure 3. Lacerations of the scalp. Any trace evidence is typically in the depths of these injuries.



Figure 4. Incised wounds of the right wrist, typical of self-harm 'hesitation'-type injuries.



Figure 5. A penetrating injury near the top of the spine. A squared-off area is seen at one of the ends, typical of a 'hilt abrasion'.

Consultants' comments

In two generations the teaching of forensic medicine in Australian medical schools has declined from a formal and examinable course to, at best, a short series of lectures with or without a practical autopsy demonstration. Even this scant effort is usually but an appendage to another course, such as pathology or medicine. Consequently, the awareness and knowledge of forensic medicine in the medical community has declined to a critically low level where the 'expert' medical testimony may well mislead the courts, causing justice to miscarry. All practising doctors, no matter what their field, require a basic knowledge of forensic medicine.

This article serves to highlight one important aspect in the interpretation of wounds, with which virtually any doctor may be expected to deal.

Professor John M.N. Hilton

Associate Professor and Director
NSW Institute of Forensic Medicine
Sydney, NSW

I well remember nearly 20 years ago being subpoenaed to give evidence at the Coroner's Court in the case of a young Vietnamese youth. He had been fatally stabbed beneath the fifth left intercostal space, causing a myocardial penetrating injury. Unfortunately, I had neglected to notice a similar posterior thoracic injury and was somewhat embarrassed when the photographic evidence was produced in court.

The lesson I learned was always to examine the victim thoroughly so as not to be misled by what appears to be the primary lesion of sufficient force to cause the fatal event.

Dr John Dearin

General Practitioner
Lithgow, NSW

Again, patterns and trace evidence should be sought. There are some distinctive shapes to lacerations that may be useful. For example, a hammerhead often gives circular or crescent shaped lacerations, while a rounded stick may result in Y-shaped lacerations. Any trace evidence is usually in the depth of the wound, often revealed only by careful inspection before medical intervention.

Sharp force injuries

Sharp force injuries comprise incised wounds and penetrating (stab) wounds.

Incised wounds

Incisions occur when a sharp edged instrument is drawn over the tissue surface. In contrast to penetrating injuries (see below), incisions are longer on the surface than they are deep. Two classical types of incised injuries are:

- 'hesitation'-type incisions, in which exploratory cuts are made before the decisive injury and which are seen on the marginal skin around the main injury; these are typically seen on the front of the wrists (Figure 4)
- 'defence'-type incisions, sustained when a victim is attempting to ward

off a knife-wielding assailant; these are typically seen on the fingers, hands and forearms of an upright victim and the legs of a recumbent victim.

Incised wounds otherwise do not usually have a discernable pattern for medicolegal purposes, nor do they often contain trace evidence.

Penetrating wounds

Penetrating (stab) wounds result when a sharp instrument, such as a knife, penetrates the tissue. By definition, penetrating injuries extend deeper into the tissue than they are long on the surface.

Again, there may be patterns to these injuries and trace evidence that are useful forensically. The external and internal characteristics of the injury may enable the description of a knife blade. For example, the length of the wound to the skin may approximate the width of the blade, and the ends of the wound (sharp or

blunt) may suggest a single or double cutting edge to the blade. The depth of the wound track into the body may also give an idea of the length of the blade. The best indicator of this comes from the wound track length of an injury that externally has a so-called 'hilt abrasion' – a small abrasion (sometimes a bruise) that results from impact with the hilt of the knife (Figure 5). The presence of a hilt injury indicates that the full length of the knife blade has entered the body. In the absence of this injury it is impossible to be certain how much of the blade has been inserted, and so the wound depth is an underestimate of the length of the blade.

Trace material, such as the broken tip of the knife blade, may be found at the end of the wound track; this may be seen clearly on initial radiological films of the patient, and once retrieved should enable objective physical matching with a suspect knife blade.

Summary

Injuries may have a pattern or trace evidence that is useful forensically and, if recognised, will improve the administration of justice. GPs who attend victims of physical assault should look carefully for these features and ensure that they document thoroughly all their findings. **MT**

References

1. Australian Bureau of Statistics. Year book Australia 2000 (1301.0). 82nd edition. Commonwealth of Australia: Canberra, 2000: 303-304.
2. Australian Bureau of Statistics. Year book Australia 2000 (1301.0). 82nd edition. Commonwealth of Australia: Canberra, 2000: 310-311.
3. Langlois NEI, Gresham GA. The ageing of bruises: a review and study of the colour changes with time. *Forensic Sci Int* 1991; 50: 227-238.