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1. Learning Outcomes

After studying this module, you shall be able to know-

- What is contusion (bruise)
- Factors affecting appearance of bruise
- Types and ageing of bruise
- Difference between antemortem and postmortem bruises
- Difference between hypostasis and bruise
- Difference between true bruise and artificial bruise
- Medico-legal importance of bruise

2. Introduction

A contusion or bruise is an effusion of blood into the tissues due to rupture of the blood vessels (veins, arterioles, vessels). Bruise is two dimensional injury and is always measured in terms of length and breadth. The weapon of offence is mainly blunt force like stone, club, stick, hammer etc.

Salient features:

1) Bruise is always situated in the dermis, subcutaneous tissues and fat layers.
2) Bruise is caused by blunt force impact.
3) The color of the bruise, when fresh is bright red with slight pale area in the centre as a result of extravasation. Further discussions on color changes of bruise in relation to age of bruise are described in the later parts of this chapter.
4) Usually, in bruise there is no destruction of the superficial layers of the epidermis unlike abrasion. However, bruise may occur along with laceration or abrasion. A bruise along with abrasion is termed as abraded-contusion. If the contusion is more prominent than abrasion, then it is termed as contused-abrasion.

5) Size- Usually if the size of the hemorrhage is 0.1 to 2mm then it is termed as petechial hemorrhage, if it is 2 to 5mm, then as ecchymosis. Bruise is more than 05mm in size.

6) Bruise is associated with underlying hematoma as there is extravasation of the blood. A bruise may be associated with swelling of the area due to accumulation of blood from the underlying ruptured blood vessels and may form a fluctuant mass.

7) The shape of the bruise may not always correspond to the offending weapon as a result of swelling of the tissues. However, if death occurs immediately, then the oozing of blood stops and shape may be similar to that of weapon.

8) The margins of the bruise are not sharply defined and usually blurred.

9) Generally, the greater the force of violence used, the more extensive will be the bruise.

10) The differential diagnosis of bruise is with Mongolian spot, commonly over the lumbo sacral region. These spots are prevalent among the Asians, Polynesians, Native Americans and East Africans. The color is almost always blue and can be misdiagnosed in a child as evidence of child abuse. Usually, Mongolian spot disappears either 3 to5 years after birth or by puberty.

3. Factors modifying appearance of bruise

1) Condition and type of tissue

Bruise appears fast if the tissue is vascular and loose, such as face, vulva, scrotum as a slight degree of violence may cause a large bruise, as there is sufficient space for the blood to accumulate. If the tissues are firmly supported, containing thick fibrous tissues and thick dermis, such as abdomen, back, palms, soles and scalp, a moderate blow will produce relatively small bruise. In a good muscle tone, like in boxers or athletes, bruising is less. Resilient areas like buttock and abdomen shows less bruising. Over bony prominences, bruising is less marked, as the underlying bone acts as an anvil with the skin between the bone and the weapon. Chronic alcoholics bruise easily.

2) Age

People of extremes of ages like children and geriatric age group bruises easily because of softer tissue and loose, delicate skin in the former and loss of subcutaneous tissues and cardio vascular changes in the latter.

3) Sex

In women, because the tissues are more delicate and sub cutaneous fat is more, they bruise easily than men. The same principle applies to obese people, who bruise easily than thin built people.

4) Color of the skin

Bruising is more clearly seen in fair skinned people due to obvious reasons than dark skinned, where the bruising is better felt than seen. This always needs comparison with the opposite identical half of the body. Color photographs do not depict the true color of the bruise and if used in the court of law, one must use a "color scale" for comparison.

5) Effect of embalming

Bruises become more prominent in embalmed bodies because of the following facts:

a) The embalming fluid forms a dark pigment complex with the blood,

b) By forcing the additional blood into the damaged area

c) Increased transparency of the overlying skin.

6) Natural disease

Bruising occurs easily in areas where vessels are having atherosclerotic changes. In persons suffering from purpura, leukemia, scurvy, vitamin K deficiency, hemophilia, prothrombin deficiency and phosphorus poisoning, bruising appears very prominently following minor trauma.

7) Gravity shifting of the blood

Sometimes, bruising doesn't appear at the site of the impact. Sometimes two are at entirely different locations. A deep bruise due to some crushing injury, especially over the bony prominences, may take a long time to be visible and may not even appear over the actual point of impact. The blood may trickle down through the facial planes due to the effect of gravity and also because the loose areolar tissue is unable to hold the extravasated blood in the same plane and may appear where the tissues are superficial (ectopic bruising or percolated bruising or migratory contusion). Hemorrhages around the soft tissues of the eye and eyelids are known as spectacle hematoma or black eye. This is caused due to various reasons like:

a) A direct blow over the eye.

b) Blunt impact over the forehead, where the extravasated blood underneath the site of impact trickles down and settles around the eye and eyelids.

c) Fracture of the floor of anterior fossa of the skull. A basal fracture is manifested as bruise behind the ear which is termed as Battle's sign.

Similarly, due to effect of gravity, in fracture jaw, bruise may appear in the neck, or fracture pelvis, bruise may appear in the thigh or a blow over upper thigh, bruise may appear around the knee, a kick on the calf muscle; bruise may appear around the ankle.

4. Types of Bruising

Patterned Bruising:

A patterned bruise is the type of contusion, which reflects the size and shape of the weapon of offence over the point of impact. The medico legal importance of such bruise is more as they reflect an idea of the possible weapon of offence. Some examples of patterned bruise are mentioned here:

a) Railway track bruise or tram line bruise: They are caused when elongated pliable objects like a bamboo stick or an iron rod or policeman's cane etc struck the body. The bruise then appears as two parallel lines at the point of impact, with an undamaged zone in between (like a railway line). The mechanism behind this injury is that, when the weapon struck the skin, it pushes the skin downwards causing rupture of the underlying marginal blood vessels. While, on the contrary, the centre of the weapon compresses the skin underneath, and causes little or no damage to the blood vessels due to absence of any bony prominences. When the momentary impact is released, the oozing of blood form the marginal vessels gives rise to the shape of two parallel lines running.

b) A whip will produce similar type of bruise, but as the weapon is flexible, tramline bruise may be found all over the body, encircling the trunk.

c) In vehicular accidents, patterned bruises of tire, car radiator, head light of car etc. are found.

d) Muzzle impression over the skin in contact wounds.

e) Texture of clothing specially if it's is tight, sometimes may leave pattern bruise

f) Bruises from straps, belts, chains leave the pattern behind.

g) In many injuries, along with pattern bruise, pattern abrasions may also be present as in ligature marks of hanging.

Delayed Bruising:

Sometimes, a deep bruise may take hours and days to appear unlike superficial bruises and deeper extravasations of blood may not even appear as bruise. In order to rule out any deep bruise, therefore, examination of the victim should be done at least 48 hours after the first examination. Occasionally, the injuries may be produced before death, but bruise may manifest after death due to further escape of the extravasated blood from the ruptured blood vessels due to gravitation. These bruises are termed as Come-Out Bruise. Thus, in these cases a difference of opinion in between two observers may occur who examined the person at two different times (ante and post mortem).

Deep Tissue and Organ Contusion:

All the organs can be contused and deep contusions are mainly demonstrated during autopsy as the blood is drained from the blood vessels and postmortem autolytic changes goes on. Contusions on vital centres of brain can be fatal and a minor contusion in the respiratory centre or any such area can be life threatening. Contusions may also be associated with rupture of the solid viscera leading to hemorrhagic shock and death.

5. Age of Bruise

A contusion heals by destruction and removal of the extravasated blood, the underlying mechanism being disintegration of the red cells by hemolysis, where the hemoglobin is broken down into its byproducts by the action of enzymes. Factors affecting the color of contusion include:

a) Depth of the bleeding

b) Environmental lighting

c) Overlying skin color

d) Amount of bleeding

Determination of age of bruise is medico legally significant for ascertaining the age of the injury.

Initially: Red in color (Due to oxy hemoglobin.)

Few hours to 03 days: Blue in color (Due to hemoglobin.)

4th Day: Bluish black in color. (Due to hemosiderin.)

5th to 6th Day: Greenish in color. (Due to hematoidin)

7th to 12th Day: Yellow in color. (Due to bilirubin)

2nd week: Returns to normal.

Exceptions: In sub conjunctival bruising, color changes are not seen. They heal straight away from red to yellow.

ANTE MORTEM BRUISING AND POSTMORTEM BRUISING:

Postmortem bruises are the ones which appear after the death. It may be delayed bruise, or the pressure of the putrefactive gases which further displace the blood out of the already damaged blood vessels causing postmortem bruise or due to any postmortem injury (a body may be rolled down the hill after death or while shifting the dead body by rough handling) or due to influence of gravity, bruise may appear late after death as well.

Difference between ante mortem bruise and postmortem bruise are summarized below.

SL. No.	Trait	Antemortem bruise	Post-mortem bruise
1	Time of formation	During life	After death (within few hours or later)
2	Swelling around the areas.	Present	Absent

3	Damage to epithelium	Present	Absent
4	Extravasations of blood	More	Less
5	Site	Anywhere over the body	Over the bony prominences
6	Tissues underneath	Blood infiltrates the tissues and stains it. Tissue stain resists washing.	Tissue stains do not resist washing
7	Histological examination	Inflammatory reaction present	Absent
8	Color change	Seen	Never seen
9	Histochemical examination	Appearance of various enzymes	Not see.

6. Difference between Hypostasis and Bruise

Postmortem hypostasis and bruise needs to be differentiated. The points of differentiation are summarized below.

Trait	Hypostasis	Bruise
Cause	Due to distension of vessels with blood in it after death	Due to extravasations of blood from the ruptured blood vessel.
Site	Occurs over the dependent parts of the body.	Occurs at the site of impact and can be anywhere over the body.
Appearance	There is no associated swelling of the involved area	The area of impact shows swelling

Epidermis	No associated abrasion	Associated abrasion may be present.
Color	Uniformly bluish purple	Color changes seen depending upon the age of injury.
Incision	On giving incision, the blood is seen in the surrounding area which can be easily washed away	The extravasated blood cannot be washed away.
Effect of pressure	Deep pressure over the area will cause blanching of the hypostasis	No such phenomenon is seen

7. Artificial bruises

Artificial bruises or false bruises or fake bruises are reproduced over the body mainly for the purpose of malingering. They are produced by rubbing of irritant substances on the skin. They are mainly produced to bring false charge of assault against an enemy or for malingering purpose in order to take medical leave.

The substances which are used for the said purpose are juices of *Calotropis gigantean, Plumbago rosea, semecarpus anacardium* (marking nut). Sometimes, unusual agents like Dithranol have also been used. The differentiating features between a true and artificial bruise are summarized below.

Difference between True bruise and Artificial bruise

Trait	True bruise	Artificial bruise
Cause	Blunt force	Juice of Irritants.
Site	Anywhere on the body.	Exposed and accessible parts.
Color	Typical color changes	Dark brown in color and no such color change.

Shape	Round or oval in shape and may mimic the weapon of offence.	Irregular in shape
Margins	Not well defined and are diffuse	Well defined, regular and covered with vesicles.
Redness and inflammation	Seen at the site.	Seen in the surrounding skin due to the irritants.
Contents	Extravasated blood.	Acid serum.
Itching	Absent	Present.
Vesicles.	Found around the area and also at the fingertips due to itching.	Absent
Chemical test	Positive for the concerned chemical present	Negative.

8. Demonstration of bruise at the autopsy table

At the autopsy table, sometimes bruises may be difficult to demonstrate or may be obscured by patches of postmortem lividity or by the dark color of the skin. Scalp contusions are demonstrated by reflecting the scalp after making an incision. Bruising of the neck are demonstrated by reflecting the skin and exposing the underlying structures and the inner aspect of the skin. In the subcutaneous tissues wherever confusion arises, bruise can be demonstrated by giving parallel incision through the skin. Deep bruises are demonstrated by giving deep incisions into the muscle. Examination of whole body under UV light makes the bruise visible, which can be missed by naked eyes.

9. Medico-Legal Importance

1. The age of the injury can be determined by the color changes.
2. In patterned abrasion, the weapons of offence are identified.
3. The degree of violence determined by their size.
4. Character and manner of injury may be known by the distribution pattern. eg, bruises of different size at different age distributed all over the body of a child indicates child abuse. In manual strangulation, bruises of the finger tips are left around the neck. Bruising over the shoulder beds indicates pinning on the ground by the assailant. In sexual assault cases, bruising may be found in the inner aspects of thigh etc.
5. Manner of production: Most commonly, bruising are accidental in nature and are produced mainly on the forehead, elbow joint, knee joint or any such bony prominences. In homicidal injuries, they can be found in any portion of the body due to blunt force impacts. Self-inflicted bruise are very rare but may be found in hysteria or mentally ill person as a result of repeated banging of the head for causing self-pain.
6. Bruises are medico legally less valuable than abrasion. It is sometimes difficult to point out the exact site of impact as ectopic bruises appear away from the site of impact. The direction of force also cannot be deduced from bruise. The age estimation of injury is sometimes difficult as bruise may be difficult to visualize in dark skinned people or may be masked by post mortem lividity.
7. Six penny bruises: These are penny or discoid shaped bruises usually of about 1 to 2 cm in diameter and in a group of three to five caused by the pressure of fingertip. They are commonly found bilaterally over the lateral part of the chest in child abuse cases, also in inner part of thigh or abdomen in sexual assault cases and in throttling found bilaterally over the lateral aspect of the neck.

COMPLICATIONS:

1. A contusion may contain 20 to 30 ml of blood and even death of a person may occur due to multiple contusions where 1/3rd of blood loss occurred due to internal hemorrhage and shock.
2. Infection may set in into the pooled blood which may serve as a good site for bacterial growth.
3. Gangrene may set in due to death of the tissues.
4. Rarely, due to sudden compression of the subcutaneous tissues, death may occur due to fat embolism.

10. Summary

- A contusion or bruise is an effusion of blood into the tissues due to rupture of the blood vessels (veins, arterioles, vessels).
- Bruise appears fast if the tissue is vascular and loose, such as face, vulva, scrotum as a slight degree of violence may cause a large bruise, as there is sufficient space for the blood to accumulate.
- A patterned bruise is the type of contusion, which reflects the size and shape of the weapon of offence over the point of impact.
- Occasionally, the injuries may be produced before death, but bruise may manifest after death due to further escape of the extravasated blood from the ruptured blood vessels due to gravitation. These bruises are termed as Come-Out Bruise.
- Artificial bruises or false bruises or Fake bruises are reproduced over the body mainly for the purpose of malingering.