INJURIES AND THEIR MANAGEMENT
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An injury is damage to the body caused by external forces, which may be physical or chemical.

1) Incisions
2) Types of wounds and their closure
3) Practical management of the severely injured
4) Procedure in the operation theatre
5) Foreign bodies in tissues
The object of a good surgical incision is to give adequate exposure of the part operated on. The scar should be as inconspicuous as possible. Incision should not cut important nerves and vessels. It should not be made across skin creases and across the flexor crease of a joint.

- **Langer’s lines**
  These are lines along which collagen and elastic fibers of the skin are distributed. Incisions made parallel to these lines tend to leave minimum scar.
(2) TYPES OF WOUNDS

I. Contusions
II. Abrasions
III. Incised wounds
IV. Penetrating wounds
V. Lacerated wounds
VI. Crushed and devitalized wounds
VII. Avulsion injuries
I. CONTUSIONS

• A contusion or bruise is due to blunt injury. There is bleeding into the tissues and therefore discoloration of the skin.

• A localized collection of blood in the tissues is called a haematoma. A haematoma needs either aspiration or evacuation by open drainage to prevent infection.

• A simple bruise requires no special management. It takes a variable time for the color to become normal, sometimes months.
II. ABRASIONS

• Here the surface of the skin in rubbed off. Most abrasions heal by epithelialisation. Some may be deep. Abrasions may be soiled with dirt and sand particles. Abrasions need thorough cleaning to avoid permanent ‘tattooing’ of the skin.
III. INCISED WOUNDS

• Incised wounds are caused by sharp objects like knife or glass. They are relatively clean. These wounds are explored and then closed by primary suture.

• If exploration is done within six hours of injury, damaged tendons, nerves and blood vessels can be repaired at the time of primary surgery.
IV. PENETRATING WOUNDS

- Penetrating injuries are made by long instruments like spears, screwdrivers or iron rods. The external wound may appear innocent but important structures may be damaged. They need exploration.
V. LACERATED WOUNDS

- Lacerated injuries are caused by instruments with rough edges. They are also common after road traffic accidents. These wounds are dirty and contaminated. Risk of infection is high. Lacerated wounds are managed by meticulous removal of dirt, dead tissues and organic matter such as clothing. Saline irrigation of the raw area is done. Margins of the wound are excised prior to closure. Complicated repair of tendons and nerves should be avoided at initial surgery because of the risk of infection. This can be done 4 to 6 weeks later, when good superficial cover can be assured. So, lacerated wounds are treated by *wound excision and primary suture*. 

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VI. CRUSHED AND DEVITALIZED WOUNDS

- Crush injuries are caused mostly by industrial accidents, severe road traffic accidents and war injuries. The extent of devitalized tissue depends on the severity of the crushing force, duration and velocity of the impact. There is likely to be release of myoglobin into the circulation following a severe crush injury. This is likely to block the renal glomeruli causing acute renal failure.
VI. CRUSHED AND DEVITALIZED WOUNDS

Continued

Problems with these wounds are:

• It is difficult to differentiate viable tissue from non viable tissue.
• If these wounds are closed primarily, the inflammatory edema and therefore tissue tension will rise to dangerously high levels resulting in ischemia and death of tissues which were previously viable. Dead muscle forms ideal environment for development of infections like gas gangrene.
• The wound may be heavily contaminated with bacteria.
VI. CRUSHED AND DEVITALIZED WOUNDS

Continued

• They are treated by wound excision. All contamination including in driven organic matter like cloth is removed. Necrotic muscle is excised. Tension under the deep fascia is relieved by long fasciotomy incision. After saline irrigation, the wound is left open and dressing is done.

• The wound is re-examined after 4-6 days. If all remaining tissue is viable and edema has subsided sufficiently to allow the wound to be sutured without tension, delayed primary suture is done. If there is doubt, suture must be avoided.
VII. AVULSION INJURIES

- They are also called traction injuries or degloving injuries. They occur when hands or limbs are trapped in moving machinery such as rollers. The danger of these injuries is the risk of devascularization and skin necrosis. They are managed by identification of the devitalized skin, remove it, de-fat and then reapply as a full thickness skin graft. Avulsion injuries of hands or feet may require immediate flap cover using a one stage microvascular tissue transfer of skin and/or muscle.
WOUNDS WITH SKIN LOSS

• Skin cover is important as a barrier for infection. Healing of tendon and bone injuries can take place only in the presence of intact skin. Further, longer the exposed tissue remains raw, greater will be the scarring, deformity and disability. In all wounds with skin loss therefore, skin loss should be repaired as soon as practicable.
WOUNDS WITH SKIN LOSS

Continued

• Clean wound with skin loss – **Primary skin grafting.**

• Lacerated wounds with skin loss – **Wound excision and primary grafting.**

• Crushed and devitalized wounds with skin loss – **Wound excision and delayed primary grafting or occasionally secondary grafting.**
SECONDARY SUTURE

- Secondary suture is done at a late stage, after control of infection. The skin is freed at the edge of a granulating wound and sutured.
COMPARTMENT SYNDROME

- Injury to tissues within a closed fascial compartment leads to bleeding, exudates and swelling of these tissues, leading to increased interstitial pressure. As the interstitial pressure rises above capillary perfusion pressure, the blood supply to viable tissues is reduced, resulting in further ischemic tissue injury and swelling. This cycle is repeated, causing a worsening compartment syndrome with muscle and nerve ischemia leading to muscle and skin necrosis, and loss of the limb. This cycle can be arrested by early recognition and decompression by fasciotomy. Sometimes a crushed limb is rescued a few days after the accident. Here, it is possible that the muscles are dead and there is no chance of recovery. Fasciotomy must be avoided in these patients and a decision must be made for primary amputation to save life.
(3) PRACTICAL MANAGEMENT OF THE SEVERELY INJURED

- Remove casualty from the danger zone to avoid further injury.
- Airway. Ensure adequate airway by removing blood and debris from the mouth and throat using suction. The victim is placed in head down, lateral position. Oropharyngeal airway and intubation may be necessary.
- Stop haemorrhage by using a padded dressing to give local pressure. A tourniquet can be life saving in traumatic amputation of a limb.
- Secure IV line. Use a wide bore cannula. Adequate tissue perfusion is achieved by infusion of crystalloids like Ringer lactate first, followed by plasma expanders like gelatin solution (Haemaccel/ Dextran 70). Blood loss will require blood transfusion.
- Oxygen inhalation.
- Splints are applied for fractures to relieve pain and prevent further damage to soft tissues.
- Intra pleural and intra pericardial tension must be relieved by suitable drainage.
- A Ryle’s tube is passed to relieve intra gastric tension.
(4) **PROCEDURE IN THE OPERATION THEATRE**

- Dirty and contaminated wounds are cleaned with sterile saline and dilute antiseptic solutions like Cetavlon or Povidone Iodine. Identify all damaged layers. Badly damaged skin must be excised. It may be necessary to extend the wound to obtain good view of the underlying tissue. Damaged muscle must be excised until it bleeds and contracts when cut. Each structure must be repaired individually by appropriate technique. There are precise suture techniques for nerves, tendons and blood vessels. Muscles are apposed in layers using interrupted catgut sutures. In extensive injuries, deep fascia must be freely incised to evacuate haematoma and prevent compartment syndrome. Otherwise, fascia must be united using interrupted absorbable sutures.
(4) PROCEDURE IN THE OPERATION THEATRE

Continued

- It is important to prevent blood or other fluid from forming a collection in the wound, as it leads to separation of the tissues and formation of a nidus for infection. It is better to insert a corrugated or suction drain, which can be removed later.

- Fine monofilament sutures are used for skin. Subcuticular sutures leave no stitch marks. Wounds of abdomen, chest and head need to be explored. Splints must be applied to immobilize fractures and to rest the soft tissues.
ANTIBIOTICS

• Antibiotics are required in extensive wounds with much tissue damage.

• Tetanus and Gas Gangrene prophylaxis may also be necessary.
FOREIGN BODIES IN TISSUES

- It is common to see foreign bodies lodged in soft tissues. Radiographs must be taken in two planes with a metal skin marker to facilitate location of the foreign body.

- X-ray image intensifier with TV display screen is essential.
• **Domestic needles.** Unless a small fragment is lodged too deeply, it is advisable to remove them. Powerful magnets may help retrieval of domestic needles.

• **Sewing machine needles.** They occasionally transfix the terminal phalanx and nail and then break. The finger should be forcibly pressed on a hard surface, so that the fragment retraces its path and then removed with forceps.
Continued

• *Fish hooks*. Fish hooks which possess barbs are removed by pushing the hook onwards in such a direction as to make it emerge through the skin at the nearest point. The barb is then nipped off and the hook withdrawn.
(5) FOREIGN BODIES IN TISSUES

Continued

• **Gravel.** Gravel is frequently driven into the subcutaneous tissue of face, hands or knees. Ugly scars (‘tattoo marks’) result if their removal is incomplete. Meticulous removal must be done, therefore, using a nail brush.

• **Glass splinters.** Most glass is radio-opaque. Every wound caused by glass must be radiographed. All glass pieces must be removed.
ABRASIONS
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DOG BITE
LACERATED INJURY
AVULSION INJURY
MOULDING MACHINE INJURY
MOULDING MACHINE INJURY
HEALING BY SECONDARY INTENTION
FOREIGN BODIES
FOREIGN BODIES