First Aid and Accident Prevention

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2021

SPECIFIC INJURIES

Learning objectives

Upon completion of this chapter, the learner should be able to:

- Identify different causes of eye injuries
- Discuss emergency management of eye injuries
- Discuss first aid methods for head, chest and abdominal injuries
- Define the burn
- Identify different classification of burn
- Discuss emergency management of burn according its classification
- Discuss different methods of lifting and moving of causality

SPECIFIC INJURIES…

General Principles

- A bandage should be snug (not too loose and tight).
- Leave the person's fingertips and toes exposed.
- Watch for swelling, change of color and coldness of the tips of fingers or toes
- Loosen bandages immediately if the victim complains of numbness or tingling sensation.
- Never apply a tight circular bandaged about a person's neck because it may cause strangulation.

❑ Head Injuries

- Injury to the head involves trauma to scalp, skull and brain.
- It may be only a minor bump on the skull or a serious brain injury.
- The brain is a soft and delicate organ. A hard blow to the head can injure the brain or spinal cord even when there are no visible signs of trauma to the scalp or face.

- That’s why all head injuries are considered serious and should be assessed by the nearest hospital ED.

Head Injuries...

Common causes of head injury are:

- Accidents at home, work, outdoors, or while playing sports
- Falls
- Physical assault
- Traffic accidents

Head Injuries...

Symptoms of a head injury

- **Altered consciousness** –lose consciousness for short or longer periods or may be conscious again, but confused or drowsy. They may even have a brief seizure.
- **Skull deformities** – compressions
- **Clear fluid from the ears or nose** – a skull fracture, especially a fracture to the base of the skull
- **Black eyes and bruised skin behind the ears** –rupture blood vessels around the eyes and ears.
- **Vision changes** – the pupils of the eyes may be dilated (enlarged) and double or blurred vision.
- **Nausea and vomiting –** indication of serious head injury

Head Injuries...

First Aid Measures for Head Injury

- In cases where there is a serious head injury, always call an ambulance.

When the injured person is conscious,

- Encourage the injured person to minimize any movement of their head or neck.
- Control any significant blood loss from scalp injuries with direct pressure and a dressing.
- While examining the wound, avoid disturbing blood clots forming in the hair.
- Reassure the person and try to keep them calm.

Head Injuries...

When the injured person is unconscious,

- The person should not be moved unless they are in immediate danger.
- unnecessary movement may cause the spinal injuries.
- if the head is injured, the neck may be injured too.
- Protect the from any potential dangers at the scene.
- Monitor their airway and breathing until the arrival of an ambulance.
- If the person stops breathing or has no pulse, cardiopulmonary resuscitation (CPR) may be required.

Head Injuries...

Get medical help right away if the person:

- Becomes very sleepy
- Behaves abnormally
- Develops a severe headache or stiff neck
- Has pupils (the dark central part of the eye) of unequal sizes
- Is unable to move an arm or leg
- Loses consciousness, even briefly
- Vomits more than once

Head Injuries...

Steps for first aid care

- Check the person's ABC. If necessary, begin rescue breathing and CPR.
- If the person's breathing and HB are normal but the person is unconscious, treat as if there is a spinal injury.
- Stabilize the head and neck by placing your hands on both sides of the person's head. Keep the head in line with the spine and prevent movement. Wait for medical help.
- Stop any bleeding by firmly pressing a clean cloth on the wound.
- If the injury is serious, be careful not to move the person's head.
- If blood soaks through the cloth, do not remove it.
- Place another cloth over the first one.

Head Injuries...

- If you suspect a skull fracture, do not apply direct pressure to the bleeding site, and do not remove any debris from the wound. Cover the wound with sterile gauze dressing.
- If the person is vomiting, to prevent choking, roll the person's head, neck, and body as one unit onto their side.
  - This still protects the spine.
- Children often vomit once after a head injury.
- Apply ice packs to swollen areas.

Head Injuries...

DO NOT:

- wash a head wound that is deep or bleeding a lot.
- remove any object sticking out of a wound.
- move the person unless absolutely necessary.
- shake the person if he or she seems dazed.
- remove a helmet if you suspect a serious head injury.
- pick up a fallen child with any sign of head injury.
- drink alcohol within 48 hours of a serious head injury.

Head Injuries...

Prevention

Simple steps can help keep you and your child safe:

- Always use safety equipment during activities that could cause a head injury.
  - These include seat belts, bicycle or motorcycle helmets, and hard hats.
- Learn and follow safety recommendations
- Do not drink and drive

❑ Scalp injury

- A wound of scalp, even if small, tends to bleeds profusely ∴ many blood supply.
- A severe wound may be concealed by thick hair and therefore be overlooked.
- Deep scalp wounds may be complicated from fragments of skull fracture or the presence of hair or foreign bodies.

Scalp injury .....

First Aid measures

1. Do not try to clean the scalp wounds of contaminants; to do so may cause serious bleeding and if the skull fractured, can lead to contamination of the brain.
2. Control bleeding by Raise the victim's head and shoulder, if possible; but do not bend the neck, since a fracture may be present.
3. Place the sterile dressing securely on the wound. Excessive pressure should not be used, however, because the bone may be fractured.
4. When bleeding is under control, apply a bandage to hold the dressing in place and to provide continuing pressure.

- Refer the victim.

❑ Skull fracture (#)

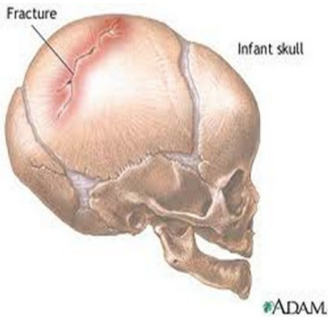
•Skull fracture is breaking in to the continuity of skull due to trauma**.** Skull fractures may occur with head injuries.

•The skull provides good protection for the brain.

•It may be accompanied by concussion or other injury to the brain.

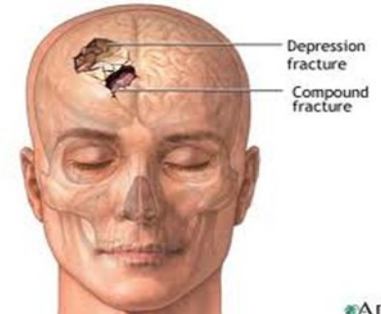
•The brain can be affected directly by damage to the Ns tissue and bleeding.

•This can compress the underlying brain tissue (subdural or epidural hematoma).



Type of Skull Fractures

1. **A simple fracture-** is a break in the bone without damage to the skin.
2. **A linear skull fracture-** is a break in a cranial bone resembling a thin line, without splintering, depression, or distortion of bone.
3. **A depressed skull fracture-** is a break in a cranial bone (or "crushed" portion of skull) with depression of the bone in toward the brain.
4. **A compound fracture-** involves a break in, or loss of, skin and splintering of the bone.



Skull fracture (#)…

Signs and Symptoms

Swelling, bruise, pain and hemorrhage through the nose or in to conjunctiva.

First Aid Measures

- Check the ABC. If necessary, begin rescue breathing and CPR.
- Avoid moving the person unless absolutely necessary.
- If the person must be moved, take care to stabilize the head and neck.
- Place your hands on both sides of the head and under the shoulders.
- Do not allow the head to bend forward or backward, or to twist.

Skull fracture (#)…

- Carefully check the site of injury, but do not probe in or around the site with a foreign object.
- If there is bleeding, apply firm pressure with a clean cloth over a broad area to control blood loss.
- If the person is vomiting, stabilize the head and neck, and carefully turn the victim to the side to prevent choking on vomit.
- If the person is conscious and experiencing any of the previously listed symptoms, transport to the nearest emergency medical facility.

Brain injury….

Brain injuries not only results from scalp injury and open or closed skull fracture but also from illness or tumor.

Signs and Symptoms

- Clear or blood tingled CSF from nose or ear after a skull injury
- Altered level of consciousness
- Partial or complete paralysis of muscle of the extremities.
- Speech disturbance
- Local or generalized convulsion which indicates persistent twitching of muscles.
- Bleeding from nose, mouth or ear canal indicates possible head injury with skull fracture

Brain injury….

- A Pale or flush face
- Pulse although slow and full initially becoming fast and weak.
- Vomiting
- Persistent headache sometimes associated with dizziness
- Unequal site of pupil
- Loss of bowel and bladder control
- Loss of balance

Brain injury….

First Aid Measures

- Obtain medical assistance as quickly as possible. Call for an ambulance equipped with oxygen.
- Keeps the victim lying down.
- Treat shock and if there is no evidence of neck injury and the victim is unconscious, place a small pillow under his shoulders and head.
- Never position the victim so that his head lower than the rest of his body.

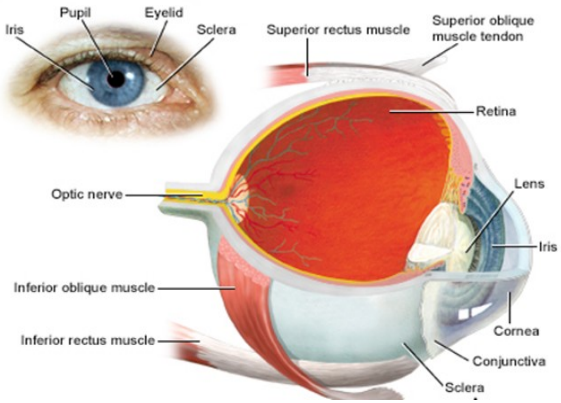
Brain injury….

- Remove the pillow if artificial respiration is to be used.
- Give particular attention to ensuring open air way & artificial respiration when necessary.
- Control hemorrhage

Note:

- Do not give the victim fluids by mouth.
- If scalp wound is present, apply large dressing over the injury and bandage it in place with a full head bandage.
- Record level of consciousness
- Refer

Eye Injuries…



•The eye is the organ for vision. The eye ıe bony orbit of the skull.

•The shape of the eye is maintained by vitreous humor.

- The eye is a delicate structure that is easily damaged by a small foreign body.
- If a foreign body scratches or scars the eye surface, the patient may lose vision in the injured eye.

- A heavy blow may injure soft issues and bone around the eye.
- This can result in pressure on the eyeball and cause blurred or double vision, or even blindness

Foreign body in the eye

•A foreign body is any abnormal substance or object that does not belong to the eye: dust, wood chip, metal shaving, grass clipping, insect or a piece of glass.

•Most foreign bodies are found under the eyelid or on the surface of your eye.

•Foreign objects are often blown or rubbed in to the eye are harmful not only because of irritating effect but also scratching the surface or embedded in to the eye.

Signs and Symptoms eye injury

- Redness
- Pain
- Swelling
- Head ache
- Burning sensation
- Over production of tear
- Sensitive to bright lights

- Scratchy feeling when you blink
- Wounded and presence of foreign objects
- Blurred vision or loss of vision in the affected

Precautions

- Instruct the patient not to rub the eye
- Wash hand thoroughly before examining the victim's eye

- Do not try to remove objects using match stick, tooth picks or other instruments

- Refer the victim for removal if objects are embedded or thought to be embedded

Eye Injuries…

First aid measures and Emergency cares

Method 1: Removal of foreign body from the surface of the eyeball or inner surface of eye lid by gently wiping.

Procedure

1. Pull down the lower eye lid to determine for the presence of the foreign object lies on the inner surface
2. If the object lies on the inner surface, lift out it gently with the corner of clean hand kerchief or tissue paper. Never use dry cotton around the eye.
3. If objects are not located on the lower eye ; it may present under the upper eye lid, so while the victim looking down ward grasp the eye lash of the upper lid gently and then Pull the upper eye lid forward and down over the lower eye lid – tear may dislodge it.

3. If the foreign body has not been dislodged, depress the Victim's upper eye lid with match stick or similar objects placed horizontally on the top of the cartilage and Evert the lid, by pulling upward on the lashes against the match stick.

4. Lift off the foreign object with the corner of a clean handkerchief and replace the lid by pulling downward gently on the lashes.

5. Flush the eye with water

6.If the object is still not removed and is suspected to be embedded, apply dressing and refer the victim

Method 2: Removal of foreign body from the surface of the eyeball or inner surface of eye lid by gently wash object out with water or normal saline.

1. Place patient in a supine position and tilt patient's head slightly to the side to be irrigated.
2. Ensure that an irrigator tip is 1 to 1.5 inches away from the patient’s eye.
3. Allow water to flow from inner to outer canthus using your thumb and forefinger to keep eye open

Eye Injuries…

4. If the foreign body is not easily removed, bandage both eyes and transport the patient to the nearest the medical treatment facility.

5. If there is pain in the eye or loss of vision, refer the patient to the nearest hospital.

NB: Do not put pressure on the eyeball.

Do not irrigate an stabbed object

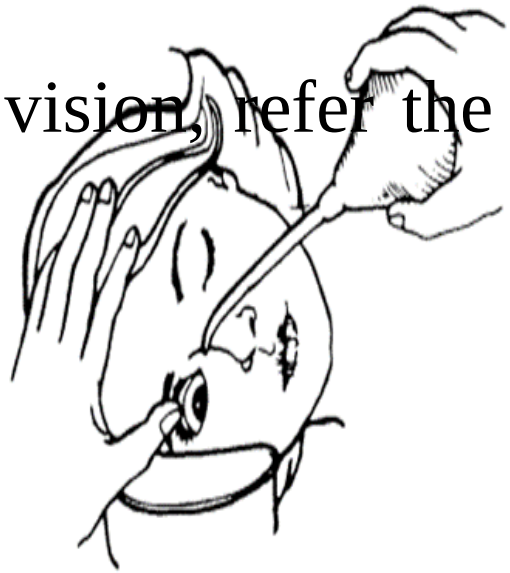


Fig.43. Technique of eye irrigation

Injuries to eye lid

First aid measures for injury to the eyelid

- Carefully wash the eyelid. If the cut is bleeding, apply gentle pressure with a clean, dry cloth until the bleeding stops.
- Cover with a clean dressing.
- Place a cold compress on the dressing to reduce pain and swelling.
- Seek medical help right away. Do not delay

Object Stuck or Embedded in the Eye

First aid measures and Emergency cares

- Calm and reassure the person
- Leave the object in place. Do not apply any pressure to it.
- Wash your hands with soap and water.
- Bandage both eyes. Covering both eyes helps prevent eye movement.
- If the object is large, place a paper cup or something similar over the injured eye and tape it in place. This prevents the object from being pressed on, which can injure the eye further.
- If the object is small, bandage both eyes. Get medical help right away. Do not delay.

Chemical in the Eye

First aid measures and Emergency cares

- Flush with cool tap water right away. Turn the person's head so the injured eye is down and to the side. Holding the eyelid open, allow running water from the faucet to flush the eye for 15 minutes.
- If both eyes are affected, or if the chemicals are also on other parts of the body, have the person take a shower.
- If the person is wearing contact lenses, remove the contacts after the flushing. Then flush again.
- Seek medical help right away. Do not delay.

Blunt injury to eye or contusion

- A contusion occurs from direct blow as fist, vehicle accident or explosion.
- The most result is black eye. In serious cases, the structure of the eye may be torn or ruptured.

- Secondary damage may be due to hemorrhage & infection.
- Vision loss and bleeding may recur after several days

First aid measures and Emergency cares

- Gently apply a cold compress to the eye to reduce swelling and help stop bleeding.
- Do not apply pressure to control bleeding.
- If blood is pooling in the eye, cover both eyes with a clean cloth or sterile dressing.
- Seek medical help right away. Do not delay.

Eye Injuries…

DO NOT

- Do not press or rub an injured eye
- Do not attempt to remove a foreign body or any object that appears to be embedded (stuck) in any part of the eye-get medical help right away.
- Do not use cotton swabs, tweezers, or anything else on the eye itself.
- Cotton swabs should only be used on the eyelid.

Eye Injuries…

Seek Emergency Medical care if:

- There appears to be a scratch, cut, or penetrated eyeball
- Any chemical gets into the eye

- The eye is painful and red
- Nausea or headache occur with the eye pain (may be a symptom of glaucoma or stroke)

- There is any change in vision (blurred or double vision)
- There is uncontrollable bleeding

Prevention

- Supervise children carefully. Teach them how to be safe.
- Always wear protective eye gear when:
  - Using power tools, hammers, or other striking tools
  - Working with toxic chemicals
  - Cycling or when in windy and dusty areas
  - Participating in sports with likelihood of getting hit in the eye with a ball, such as indoor racket sports

❑ Nasal injuries

•Injury to the soft tissue of the nose may be with or without fracture.

•Nose bleeds can result from injury or disease (such as high blood pressure which can cause profuse, prolonged and dangerous bleeding, acute febrile illness, and tumor like polyps).

•Nose bleeding may also occur after a cold, a period of strenuous activity or exposure to high altitudes.

•Nose bleeds are generally more annoying than serious.

•Walking, talking, laughing, blowing the nose, or otherwise disturbing clots may cause increase or resumption of bleeding.

First Aid Measures: to stop bleeding & reduce pain, swelling, and bruising

- Keep the victim quiet.
- Place the victim in a sitting position, leaning forward if possible; if that is not possible, place him in a reclining position with head and shoulders raised.

- Apply direct pressure by pinching to the bleeding nose
- Apply cold compress to the victim's nose and face for 10 to 20 minutes, 3 or more times a day.

First Aid Measures…..

- Keep your head elevated, even while you sleep. This will help reduce swelling.
- Do not take NSAIDs, such as ibuprofen or aspirin for the first 48 hours.
- If the bleeding cannot be controlled by the preceding measures, insert small gauze (not absorbent) soaked in adrenaline in to one or both nostrils and apply pressure externally with your thumb and index finger.
- A free end of the pad must extend outside the nostril so that the pad can be removed later.

First Aid Measures…

- Do not smoke-smoking slows healing because it decreases blood supply and delays tissue repair.
- If the bleeding continues, Refer the victim's for medical assistance.

NB: Bleeding from the nose, ear canal or mouth which is indicative of skull fracture. Therefore, the victim should be treated as suspected head injury.

❑ Ear Injuries

•The ear has external, middle, and inner portions. The outer ear is called the pinna and is made of ridged cartilage covered by skin.

•Sound funnels through the pinna into the external auditory canal, a short tube that ends at the eardrum (tympanic membrane).

Causes of Ear Injuries

- A foreign object blocking the ear canal
- Insects
- Diving is another common cause of ear injuries

Ear Injuries

Foreign Objects in the Ear

A foreign object in the ear can cause pain and hearing loss. Usually you know if an object is stuck in your ear, but small children may not be aware of it.

First Aid Measures

- Stay calm and reassure the victim
- Look inside ear with a flashlight
- If you can see the foreign body & victim is cooperative, use tweezers to remove the item.
- If unsuccessful, tilt head with affected ear facing down to use gravity.

Ear Injuries

First Aid care….

- If you can't see the foreign body: Do not try to remove it. Tilt head with affected ear facing down.
- Try washing the object out. Use a bulb ear syringe and warm water to irrigate the object out of the canal, if no ear tubes are in place and suspect perforated eardrum.
- If these methods fail or the person has pain in the ear, reduced hearing or a sensation of something lodged in the ear, seek medical assistance.

Ear Injuries …

Insect in the Ear

•In adults, insects (cockroaches, moths, flies, ants) are the foreign bodies most commonly found in the ear.

First Aid Measures

- If the foreign object is an insect, tilt the person's head so that the ear with the offending insect is upward.
- Try to float the insect out by pouring mineral oil, olive oil or baby oil into the ear. The oil should be warm but not hot.
- As you pour the oil, you can ease the entry of the oil by straightening the ear canal.

Ear Injuries …

- Pull the earlobe gently backward and upward for an adult, backward and downward for a child.

- The insect should suffocate and float out in the oil bath. Don't use oil to remove any object other than an insect.

- Don't use this method for a child if ear tubes are in place or if you think the eardrum may be perforated. Signs of this are pain, bleeding or discharge from the ear.
- If these methods fail seek medical assistance.

Ear Injuries …

Bleeding of the Ear

- Typically, a bleeding ear may indicate a head injury so there are basic first aid steps that should be followed.

First Aid Measures

- Gently place sterile gauze or pad over the ear, not inside the ear!
- Lay the individual to the affected ear is on the ground which will allow blood and fluids to drain outward.
- Always treat the individual as if you are dealing with a serious head injury and do not allow them to fall asleep.
- Be calm and relaxed yet awake.
- Call for an ambulance immediately

Ear Injuries …

- The eardrum serves two important functions in your ear. It senses vibrating sound waves and converts the vibration into nerve impulses that convey the sound to your brain.

- It also protects the middle ear from bacteria as well as water and foreign objects.
- Normally, the middle ear is sterile. But when the eardrum is ruptured, bacteria can get into the middle ear and cause an infection known as otitis media.

Ear Injuries …

A perforated eardrum is a hole or tears in the eardrum.

=>A hole in the eardrum can be caused by:

- A middle ear infection, if pus builds up inside your ear and puts pressure on eardrum

- An injury to the eardrum, such as a severe blow to the ear or poking an object such as a cotton bud deep into the ear
- A sudden loud noise, such as a loud explosion
- Changes in air pressure, such as while flying at high altitude or when diving

Ear Injuries …

Perforated Eardrum….

Signs and symptoms

- Hearing loss and depending on the size of the hole, eardrum can be healed
- Symptoms of a middle ear infection, such as:
- Earache or discomfort
- Discharge of mucus from your ear
- High temperature (fever)
- Ringing or buzzing in your ear (tinnitus) as well.

Ear Injuries …

Perforated Eardrum …

First aid measures

- Put a small gauze or cotton loosely in the outer ear canal for protection
- Do not insert instrument or any kind of liquid in to the ear canal
- If perforation of ear drum associated with skull fracture requires special attention.
- Don't clean the ear
- Don't stop the flow of cerebrospinal fluid from the ear
- Turn the victim on to his injured side (unless there is some reason not to do so) to allow fluid to drain away
- Obtain medical care

Ear Injuries …

Treating a perforated Ear drum

- May normally heal by themselves in a few weeks or months provided that ear is kept dry and there's no infection.

- If pain, use paracetamol or ibuprofen. Never give aspirin to children under 16.
- Antibiotics can reduce the risk of developing an infection

- Don't go swimming, and cover your ears when having a shower.
- Surgery to repair the eardrum if the hole is particularly large or doesn't heal.
- It is known as a myringoplasty.

❑ Chest injuries

It is a wound of the soft tissue of the chest, fracture of the ribs and sternum, and injuries to the organs of chest.

Cause: Gun shot or stabbing injuries

Classification

1. **Open chest wound-** chest wall has been penetrated externally by an object or perforated from within by fractured ribs.
2. **Closed chest wound:** no external sign of injury- but ribs, sternum, lungs, heart may be damaged.

Sign and symptoms

- **Pain:** at injured area aggravated by breathing
- **Difficulty in breathing**
- **Fear and restlessness-** breathing distress
- **Inability to expand one or both sides of chest-** because of loss of muscle function
- **Cough with blood-** indicate injury to lung
- **Rapid and weak pulse-** sign of shock caused by bleeding and lack of O_2.
- **Cyanosis- at lips, finger nails.**

Chest injuries…

First Aid Measures

- Ensure adequate air entry, maintain an open airway
- Put in semi-sitting position, to relieve pressure on the lung from the abdominal organ

- Inclined the victim toward injured side- facilitate drainage and ease breathing
- For penetrating injury- apply a dressing
- Chest injuries require urgent medical attention

- A sucking wound of the chest is a deep open wounds of the chest wall through which air can flow in and out with breathing.
- If the wounding object is in place; leave undisturbed to prevent fatal bleeding.

Causes:

- gunshot or stab wound
  - Internal organs (lungs and heart) may have occurred.
- There might be a hole in the chest with a ‘sucking’ sound that is heard when the casualty breathes.

First Aid Measures

If the casualty is conscious:

1. Call for ambulance
2. Place the casualty in a position of comfort usually half sitting and leaning towards the injured side.
3. Place an airtight dressing over the wound hole and secure the dressing on 3 sides, leaving the bottom edge open.
4. If breathing becomes more difficult after application of the dressing, immediately remove the dressing.
5. Closely monitor vital signs.
6. Refer the victim to nearby hospital

Sucking wounds of chest …

If the casualty is unconscious:

- DR.ABCD and call for ambulance
- Place the casualty in the recovery position, lying on the injured side.

- Closely monitor vital signs
- Refer the victim urgently

Abdominal injury

- The abdomen alone may be injured or injuries elsewhere in the body may also occur.
- Injuries can be relatively mild or very severe. It often classifies abdomen injuries by the type of structure that is damaged and how the injury occurred.
- The types of structures include the
  - Abdominal wall
  - Solid organs (liver, spleen, pancreas, or kidneys)
  - Hollow organs (stomach, small intestine, colon, ureters, or bladder)
  - Blood vessels

Signs and symptoms for abdominal trauma

- Past events of damage to the abdominal cavity
- Pale, clammy skin
- Evident injuries, such as bleeding wounds
- Severe pain supplemented by muscle contractions
- Vomiting and nausea
- Contusions of the skin
- Incapable of standing up
- Incontinent (unable to control bladder or bowels)
- Other hints of internal bleeding

Abdominal injury …

First Aid cares

- Watch for severe pain, rigidity, rebound tenderness, decreased/ absent bowel sound
- Control bleeding by squeezing the edge together
- Position in semi-sitting, Keep nothing per mouth
- Do not try to replace the protruded parts. Cover the wound using a sterile dressing. If it is a protruding wound, stabilize the object using a clean material and bandage
- Do not try to remove and press protruding object
- support the abdomen while cough and vomiting
- Send the victim to hospital immediately

Learning Objectives

After completing this chapter, the student will be able to

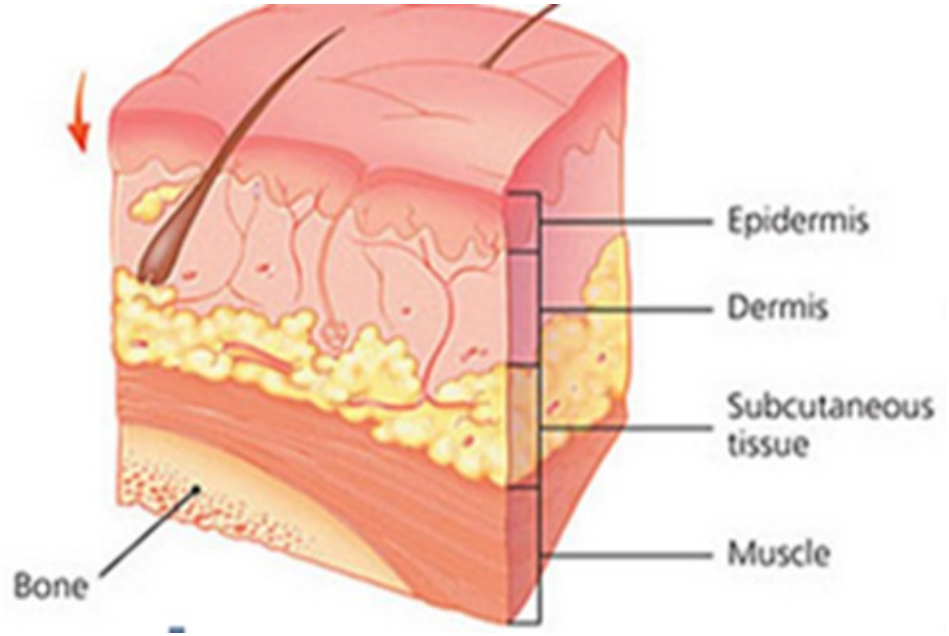
- Define burn injury
- Differentiate different causes of burn in different areas.
- Identify different classifications and degrees of burn.
- Recognize first aid measures for different degrees of burn.

BURN

BURNS…

•A burn is an **injury** of the body due to transfer of heat energy from **heat source or chemical** agents to the body.

•It may **vary** in depth, size and severity, causing injury to the cells in the affected area.



Pathophysiology of burns

- Burn injuries result in both **local** and **systemic** responses

Local response:

- There is three zones of a burn which are described by Douglas Jackson in 1953 by histology and clinical observation.

1. Central area of **Zone of coagulation/**zone of coagulative necrosis
2. Surrounding area of **Zone of stasis**
3. Outermost area of **Zone of hyperemia**

Zone of coagulation

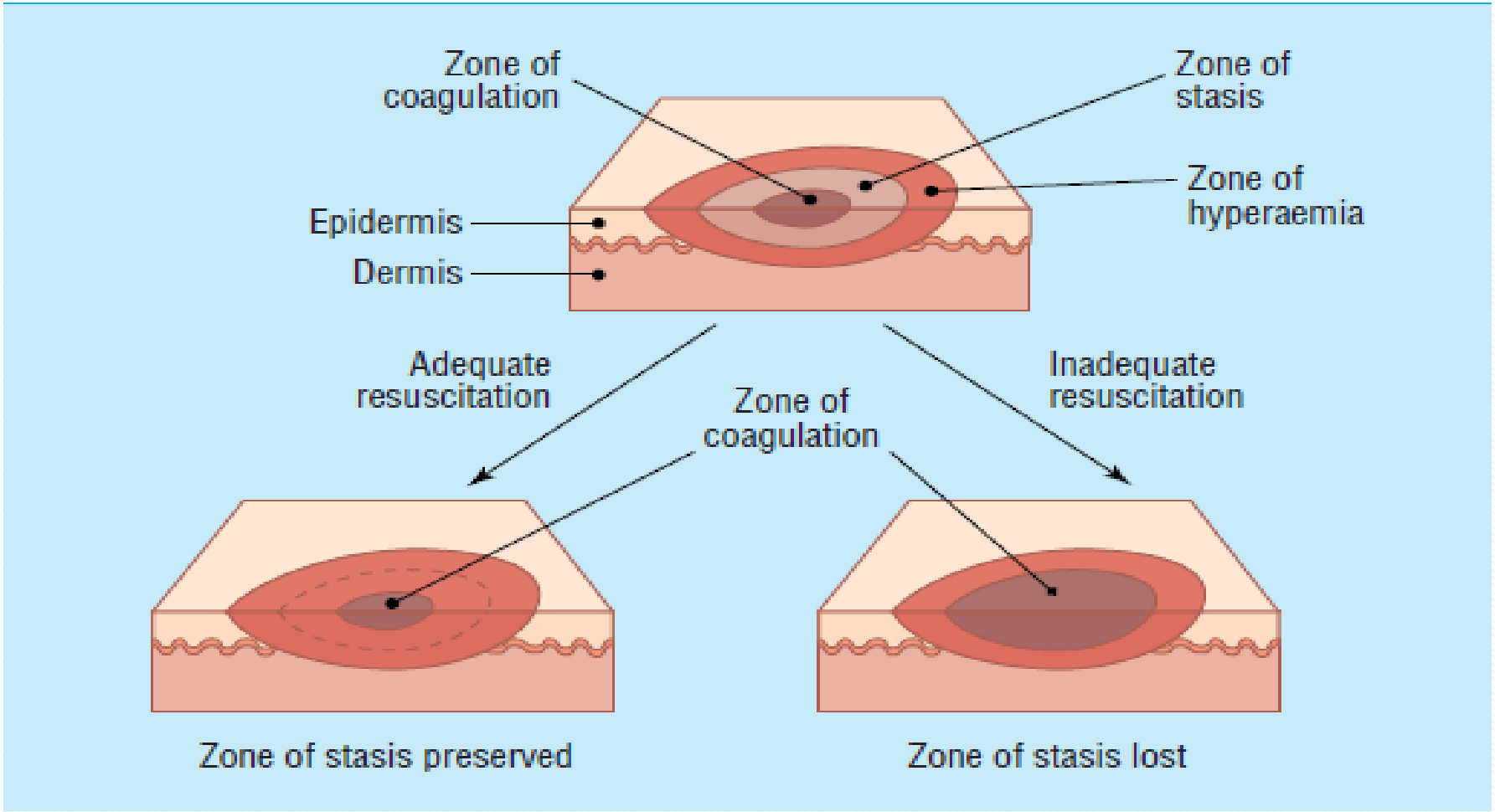
- Occurs at the point of maximum damage.
- There is **irreversible tissue loss** due to coagulation of the constituent proteins.

Zone of stasis

- Characterized by decreased tissue perfusion.
- The tissue in this zone is potentially salvageable.
- The main aim of burn resuscitation is to preserve zone of stasis and prevent it from becoming zone of coagulation.

Zone of hyperemia

- In this outer most zone tissue perfusion is increased.
- The tissue here will invariably recover unless there is **severe sepsis** or **prolonged hypoperfusion**. Such as prolonged hypotension, infection and edema.


Zone of coagulation
Zone of stasis
Zone of hyperaemia
Epidermis
Dermis
Adequate resuscitation
Inadequate resuscitation
Zone of coagulation
Zone of stasis preserved
Zone of stasis lost

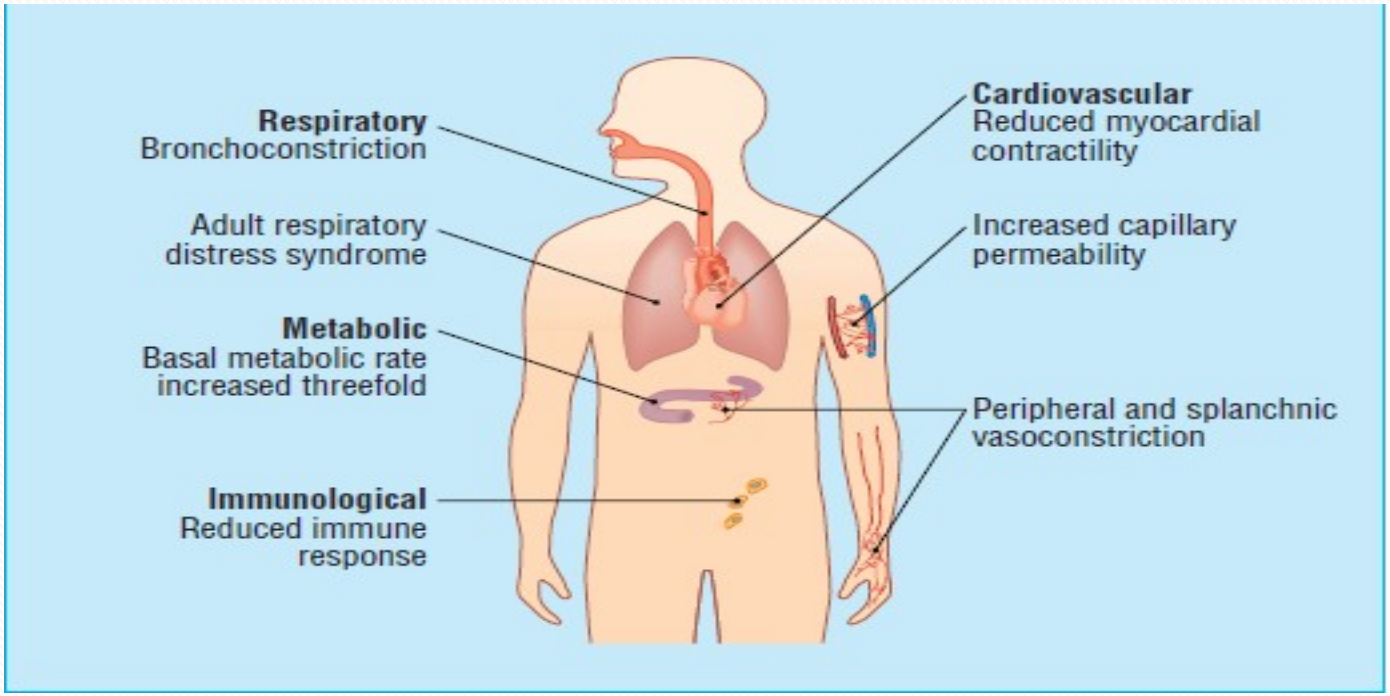
Local response

Clinical image of burn zones. There is central necrosis, surrounded by the zones of stasis and of hyperaemia.



Systemic response:

- The release of **cytokines** and other **inflammatory mediators** at the site of injury has a systemic effect.
- Systemic response occurs once a burn is greater than **30**% of total body surface area.



CVS changes

- **Capillary permeability** is increased leading to loss of intravascular **proteins** and **fluids** into the interstitial compartment.
- Peripheral and splanchnic **vasoconstriction** occurs.
- **Myocardial contractility** is decreased due to release of tumor necrosis factor.
- Fluid loss from the burn wound result in systemic hypotension and end organ hypoperfusion.

CVS cont'd

Acute (hypovolemia) phase

- ↓Blood flow
- ↓Cardiac output
- ↑Capillary permeability
- ↑Peripheral vascular resistance

Hypermetabolic phase

- ↑Blood flow
- Edema formation
- Cardiac arrhythmias
- Myocardial infarction=↓Right ventricular ejection fraction

Respiratory changes

- Release of inflammatory mediators cause **bronchoconstriction**.
- In severe burns adult respiratory distress syndrome can occur
- Hypoxemia
- Pulmonary hypertension
- ↑Airway resistance
- ↓Pulmonary compliance

Renal changes

Acute (hypovolemia) phase

- ↓Renal blood flow
- ↓GFR

Hyper metabolic phase

- ↑Renal blood flow
- ↑GFR
- Impaired tubular functions
- Acute renal failure

Immunological changes

- **Non-specific** down regulation of the immune response occurs
- Affecting both **cell mediated and humoral pathways**

BURNS…

Burns have a variety of causes, including:

- Thermal burns
- Chemical burns
- Electrical burns
- Radiation burns

Type of burn and possible causes

Type of burn	Causes
Dry burn	→ ***Flames***, contact with hot objects such as domestic appliances or cigarettes, heating, cooking and electrical equipments.
Scald	→ ***Steam***, hot liquids, such as tea and coffee.
Electric burn	→ Low voltage current, as used by domestic appliances. → High voltage current, as carried in main overhead cables. → Lightning strikes.
Chemical burn	→ Industrial chemicals → Domestic chemicals E.g. strong acids and detergents.
Radiation burn	→ sunburn → Exposure to a radioactive source, such as an x-ray.

Depth of burns

1st degree Superficial epidermis

2nd ” (Partial thickness)

* Superficial dermal: *blistering, pink, blanching, Painful & sensate.*

* *Deep dermal: brownish, mottled, & variable sensation*

3rd ” Full thickness: leathery, thick, & insensate.

4th ” *Damage to deeper structures under the skin*

BURNS…

Levels (Depth of burns) burn

Each degree is based on the severity of damage to the skin, with first-degree being the most minor and third-degree being the most severe.

- **First-degree burns:** red, non-blistered skin
- **Second-degree burns:** blisters and some thickening of the skin
- **Third-degree burns:** widespread thickness with a white, leathery appearance

BURNS…

1.First-degree burn

- It causes **minimal skin damage**. They are also called "**superficial burns"** because they affect the outermost layer of skin.
- First-degree burns usually heal within 7 to 10 days without scarring. The **signs of a first-degree** burn include:
  - Redness
  - Pain
  - Minor inflammation, or swelling
    - Dry, peeling skin occurs as the burn heals

BURNS…

First Aid Measures for a first-degree burn

- Soaking the wound in **cool water** for 5 minutes or longer
- Taking acetaminophen or ibuprofen for pain relief
- Applying lidocaine (an anesthetic) or cream to soothe the skin
- Using an antibiotic ointment and loose gauze to protect the affected area

BURNS…

Note:

- Don’t use ice, as this may make the damage worse.
- Never apply cotton balls to a burn because the small fibers can stick to the injury and increase the risk of infection.
- Avoid home remedies like butter and eggs as these are not proven to be effective

BURNS…

2.Second-degree burn

- It is more **serious** because the damage extends beyond the top layer of skin.
- This type burn causes the skin to **blister** and become extremely red and sore.
- Some blisters pop open, giving the burn a wet or weeping appearance.
- Over time, thick, soft, scab-like tissue called Fibrinous exudate may develop over the wound.

BURNS…

Signs and symptoms

- Greater depth than first degree burns
- Red or mottled appearance
- Development of blisters

- Considerable swelling over a period of several days
- Wet appearance of the surface of the skin due to the loss of plasma through the damaged layers of the skin.

BURNS…

First Aid Measures for second degree burns

- Running the skin under cool water for 15 minutes
- Apply freshly ironed cloths/dry sterile gauze as a protective bandage
- Do not break blisters & but apply antibiotic cream
- Do not use an antiseptic preparation, ointments, spray, or home remedy on a severe burn
- If the arms or legs are affected keep them elevated
- However, seek emergency medical treatment if the burn affects a widespread area, such as face, hands, buttocks, groin and feet.

BURNS…

3.Third-degree burn

•Third-degree burns are the **most severe**. With this type of burn the damage is so extensive that there may not be any pain because of **nerve damage**.

•Depending on the cause, the symptoms third-degree burns can exhibit:

- Waxy and white color
- Char
- Dark brown color
- Raised and leathery texture
- Blisters that do not develop
- Complete loss of all layers of the skin

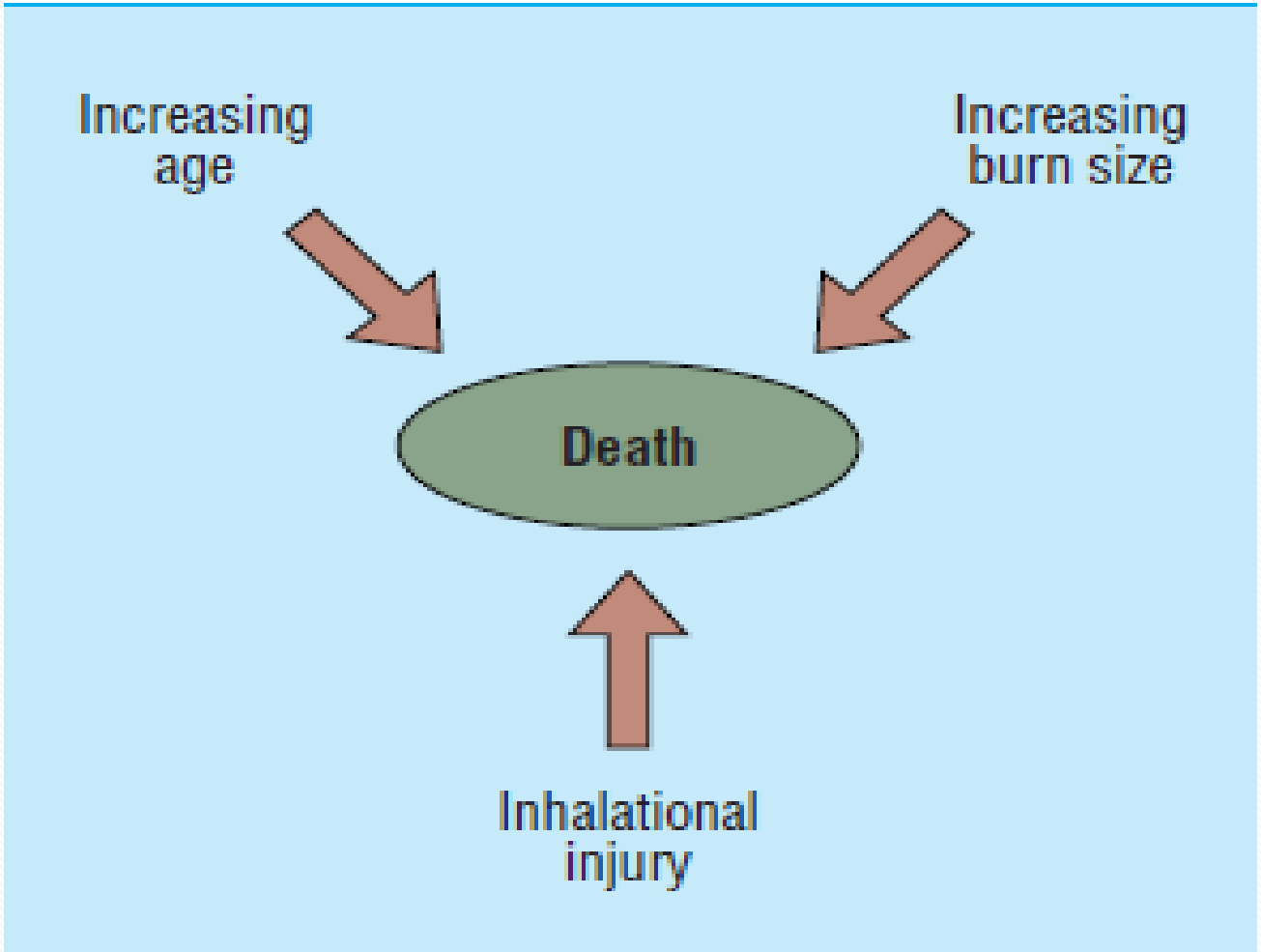
First Aid Measures

- **Do not** remove adhered particles of charred clothing.
- Cover burns with thick, sterile dressings or household linen.
- If the hands are involved, keep them above the level of the victim’s heart.
- Keep burned feet or legs elevated (not be allowed to walk).
- Have victims with face burns sit up or prop them up and keep them under continuous observation for breathing difficulty.

BURNS…

- Transport to the hospital as quickly as possible.
- If medical help delay and the victim is conscious and not vomiting give him a weak solution of salt and soda at home (ORS or Lemlem).
- Do not apply ointment, commercial preparations, grease or other home remedies.
- Do not immerse an extensive burned area or **apply ice water** over it, because cold may intensify the shock reaction.

Factors that increase the risk of death after a major burn



Assessment of burn surface area

Palmar surface-

- *Useful as quick estimation*
- *The surface area of a patient's palm (including* fingers) is roughly 0.8% of total body surface area.
- Not very accurate, can overestimate or underestimate

***Wallace rule of nines(*Rule of nine**)**

- The body is divided into areas of 9%.

Lund and Browder chart-

- *Divide the body into areas of different % of total*

- The **severity of burn injury** depends on;

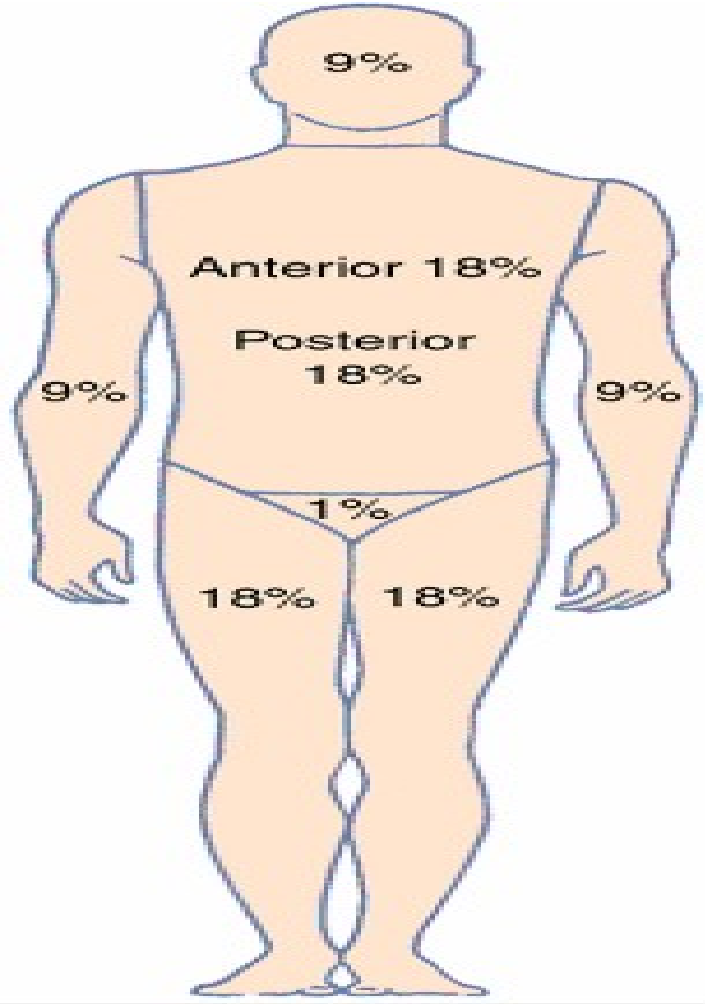
the **extent of burn, depth of burn, age, pre-existing medical problems, nutritional status & location.**

The extent of body surface area burned is commonly estimated by:

- **Palm method** – a palm size of a victim is approximately equal to 1% of TBSAB (total body surface area burned).
- **Rule of nine-** the system that assigns percent in multiple of nine to a major body areas thus:

BURNS…

Area of burns on the body Region	Area percentage
Head	9 %
Right Arm	9 %
left – Arm	9 %
Front of chest	18 %
Back of chest	18 %
Left leg	18 %
Right –leg	18 %
Genital area(perineum)	1 %
Total	100%



Note: Body surface area of > 25% in adult and > 20% in child are considered as a severe burn.

BURNS…

Classification of Extent of Burn Injury

1.Minor Burn Injury

- **Second-degree burn** of **<15%** total body surface area (TBSA) in **adults** or **<10% TBSA in children**
- **Third-degree burn** of **<2% TBSA** not involving special care areas (eyes, ears, face, hands, feet, perineum, joints)
- **Excludes** all patients with electrical injury, inhalation injury, or concurrent trauma and all poor-risk patients (e.g. extremes of age, undercurrent disease)

BURNS…

2. Moderate, Uncomplicated Burn Injury

- **Second-degree burns** of **15–25% TBSA in adults** or **10–20% in children**
- **Third-degree burns** of **<10% TBSA** not involving special care areas
- **Excludes** electrical injury, inhalation injury, or concurrent trauma and all poor-risk patients

(e.g. extremes of age, undercurrent disease)

BURNS…

3. Major Burn Injury

- **Second-degree burns >25% TBSA** in adults or **>20% in children**
- All third-degree burns **>10% TBSA**
- All burns involving eyes, ears, face, hands, feet, perineum, joints
- All inhalation injury, electrical injury, or concurrent trauma, and all poor-risk patients

BURNS…

Phase of Burn care:

Emergency/Resuscitative phase

Emergency cares at the Burn Scene

- Extinguishing of fire- When cloth catechus on Fire – drop and roll using blanket, coat or any other material to off the fire
- Remove restricting objects from the area.
- Cover the wound with stile or clean cloth.
- Irrigate chemical burn
- Maintain or ensure Air way, Breathing and Circulation.
- Prevent shock
- Prevention of respiratory distress
- Urgently refer to hospital

BURNS…

- The burned person's appearance can be frightening at first.
- The local and systemic effects pose a greater threat to life.
- Cervical spine immobilization for patients with high-voltage electrical injuries and if indicated for other injuries;
- Cardiac monitoring for patients with all electrical injuries for at least 24 hours after cessation of dysrhythmia

BURNS…

Fluid Replacement Therapy

- The adequacy of fluid resuscitation is determined by monitoring
  - Urine output totals of 30 to 50 mL/hour (0.5 to 1.0 mL/kg/hour) have been used as resuscitation goals.
  - systolic blood pressure exceeding 100 mm Hg,
  - a pulse rate less than 110 beats/minute, or both.
- Also, patients with electrical injury, pulmonary injury, or delayed fluid resuscitation may need additional fluids.

Burns…

Guidelines and Formulas for Fluid Replacement in Burn Patients

- Lactated Ringer's solution (or other balanced saline solution):

2–4 mL × kg body weight × % total body surface area (TBSA) burned. Half to be given in first 8 h; remaining half to be given over next 16 h.

- An example illustrates use of the consensus formula in a 70-kg (patient with a 50% TBSA burn

  - Consensus formula: 2 to 4 mL/kg/% TBSA
    - 2 × 70 × 50 = 7000 mL/24 hours
    - Plan to administer: first 8 hours = 3500 mL, or 437 mL/hour; next 16 hours = 3500 mL, or 219 mL/hour.

Resuscitation Regimens for major burn

Parkland formula for burns resuscitation

- Total fluid requirement in 24 hours = 4 ml×(total burn surface area (%))×(body weight (kg))
- 50% given in first 8 hours
- 50% given in next 16 hours
- Children receive maintenance fluid in addition, at hourly rate of 4 ml/kg for first 10 kg of body weight *plus* 2 ml/kg for second 10 kg of body weight *plus* 1 ml/kg for >20 kg of body weight.

End point

- Urine output of 0.5-1.0 ml/kg/hour in adults
- Urine output of 1.0-1.5 ml/kg/hour in children

- Maintenance crystalloid (usually dextrose-saline) is continued at a rate of 1.5 ml×(total burn surface area)×(body weight)

- High tension electrical injuries require substantially more fluid (9 ml×(burn area)×(body weight) in the first 24 hours) and a higher urine output (1.5-2 ml/kg/hour).

- This should be continuously adjusted according to urine output and other physiological parameters.

Principles of parkland formula

- Calculate from time of burn, not time of presentation
- Crystalloid solution is fluid of choice
- Children also require additional maintenance fluid with saline according to weight.

ICU management

Respiratory management

- The clinical manifestations are often delayed for the first few hours but are usually apparent by 24 hours
- Prophylactic **corticosteroids or antibiotics** have **no role in treatment.**
- Restricting fluids **increases mortality**
- Early intubation is much safer
- Give 100% oxygen until carbon monoxide toxicity excluded
- Ventilatory strategies to avoid lung injury (low volume or pressure)

Heart failure

- Myocardial diastolic dysfunction- myocardial oedema
- Inotropes like dobutamine after adequate fluid resuscitation for overloading large volume of fluid

Kidney failure

- delayed or inadequate fluid resuscitation and muscle break down or haemolysis are common cause of early renal failure.
- Sepsis and multi organ failure for late renal failure
- Monitor urine output and renal function test

Cerebral failure

- Hypoxic cerebral insults and closed head injuries are common cause
- Monitoring intracranial pressure may help in minimizing the adverse effects.

Nutrition

- Even small burns can be associated with **hyperpyrexia** directly due to **hypermetabolism.**

Management of hypermetabolic response

- Reduce heat loss— environmental conditioning
- Excision and closure of burn wound
- Early enteral feeding
- Recognition and treatment of infection

NG-Tube feeding

- In all patients with burns covering more than 20% of total body surface area.
- Established during initial resuscitation
- Early enteral feeding improves success in establishing feeding

Risk factors for pneumonia

- **Inhalational injury**:

a) Destruction of respiratory epithelial barrier

b) Loss of ciliary function and impaired secretion clearance.

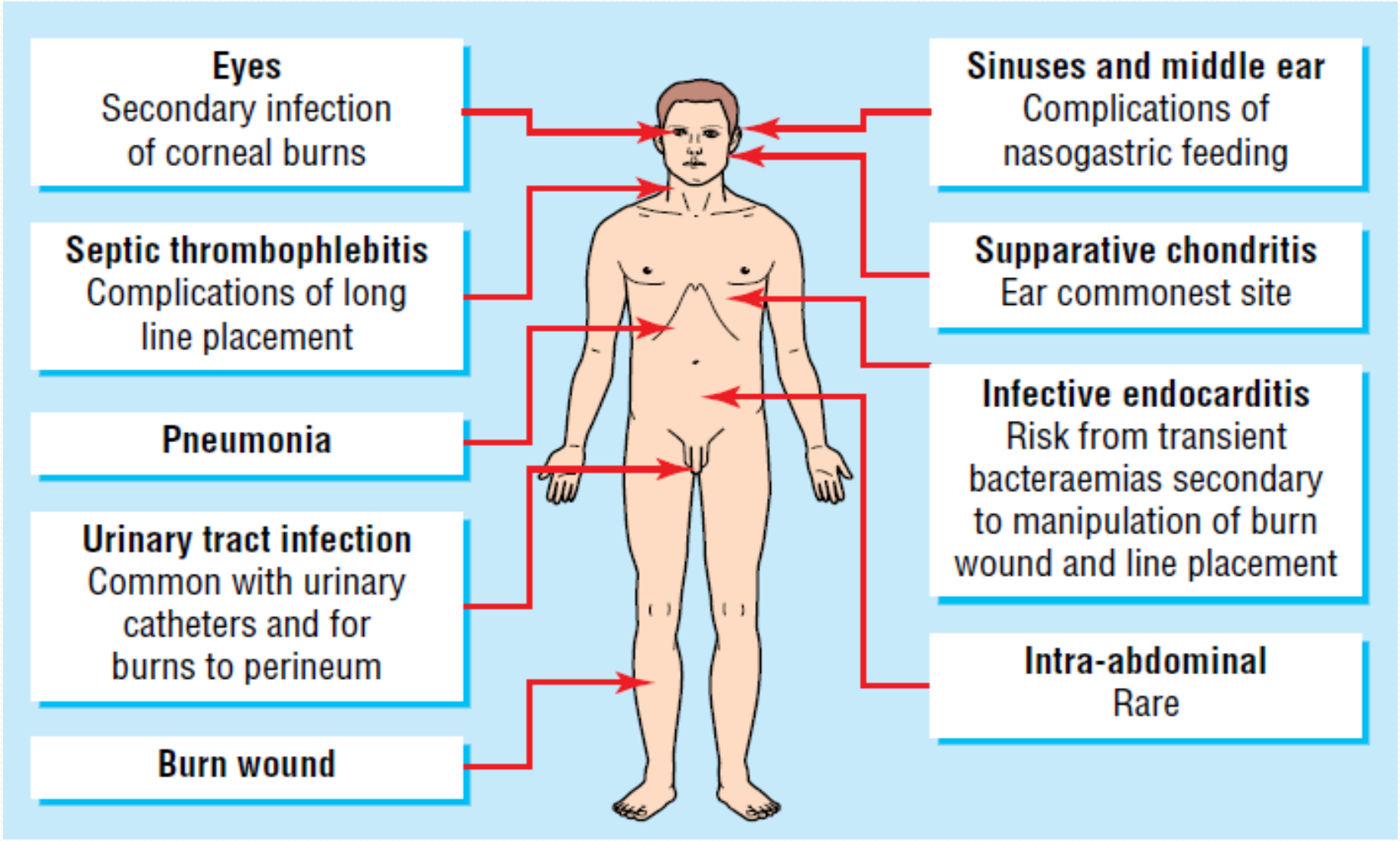
c) Bronchospasm

d) Mucus and cellular plugging

Mx= Intubation

- Circumferential, full thickness chest wall burns
- Decreased chest wall compliance
- Immobility
- Uncontrolled wound sepsis
- Can lead to secondary pneumonia from **haematogenous** spread of organisms from wound.

Sites of potential infection in a burns patient



Criteria for admission

- Inhalation injury
- %TBSA ***>10**% in children* ***>15**% in adults*
- Depth ***> 5% TBSA** deep (3rd degree)*
- Involved body part ***face, hands, feet, perineum, or genitalia***
- Associated injury
- Co-morbid state
- Special social situations

Signs of wound infection

- Change in wound appearance:

a) Discoloration of surrounding skin

b) Offensive exudates

- Delayed healing
- Graft failure
- Conversion of partial thickness wound to full thickness
- When invasive infection of a burn wound is suspected, empirical systemic antimicrobial treatment must be started.

Prevention- aggressive surgery and the use of topical antimicrobial agents are effective.

- Silver sulfadiazine is the most frequently used topical antimicrobial

THANK YOU!