

## ABCs of Emergency Burn Management



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A SEVERE BURN IS ONE OF  
THE MOST SIGNIFICANT  
TRAUMATIC EVENTS THAT  
A PERSON CAN SUFFER AND  
STILL SURVIVE

# Objectives:

- Definition of the burn
- Jackson's theory
- Anatomy of the skin
- Type of burn injuries
- Classifications of the burn
- Phases of burn injuries
- Initial rapid assessment
- Emergency management

# Epidemiology

- 2-3 mil. Thermal injuries\ year
- 100,000 requires hospitalisation
- Thermally injured patients require 1-2 hospital days/percent of TBSA burned
- This represents 1/6<sup>th</sup> of total treatment
- Most burns are caused by hot liquid scalds
- 50% occur in children
- The most common site is the kitchen >bathroom
- When clothing ignition is present, full thickness burns increase 6 times, mortality increases 4 times

# Who gets burnt?

- Very high proportion of vulnerable and disadvantaged people
- Incompetent & ignorant of risk (including children & elderly)
- Careless
- Previous medical condition (fits, strokes)
- Suicidal & mental health issues
- Drunk or drugged
- Malicious / assault / Non Accidental Injury (NAI)

# Burn

Burns is defined as a wound caused by exogenous agent leading to coagulative necrosis of the tissue.

# The effects of heat

- As temperature rises, proteins are at risk of being denatured.
- Over 40°C cells begin to malfunction, and over 45°C cellular repair mechanisms fail and cells die.
- When temperatures reach 60°C vessels thrombose and tissue becomes necrotic.
- An object heated to 70°C will cause burning within 1 second

# Jackson's theory of thermal wounds

- *Zone of Coagulation*

Area in a burn nearest the heat source that suffers the most damage as evidenced by clotted blood and thrombosed blood vessels

- *Zone of Stasis*

Area surrounding zone of coagulation characterized by decreased blood flow.

- *Zone of Hyperemia*

Peripheral area around burn that has an increased blood flow

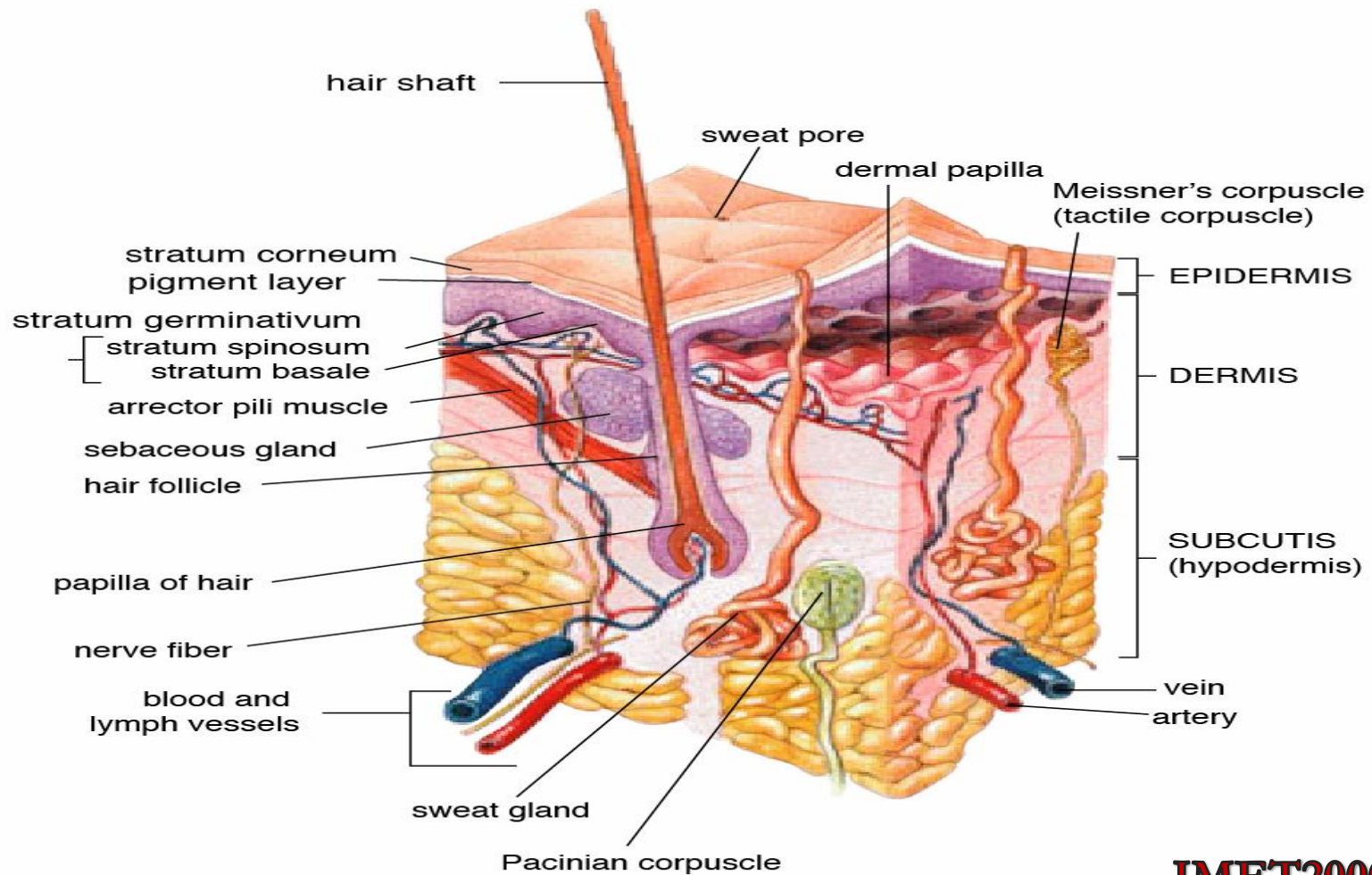


# Jackson's burns zones

Schematic representation of Jackson's burn model



# Anatomy of the skin



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# Type of burn injuries

Thermal  
injury

Electrical  
injury

Chemical  
injury

# Thermal injury

May occur in the form of flame, scald , or contact injury

Result from direct contact with heat

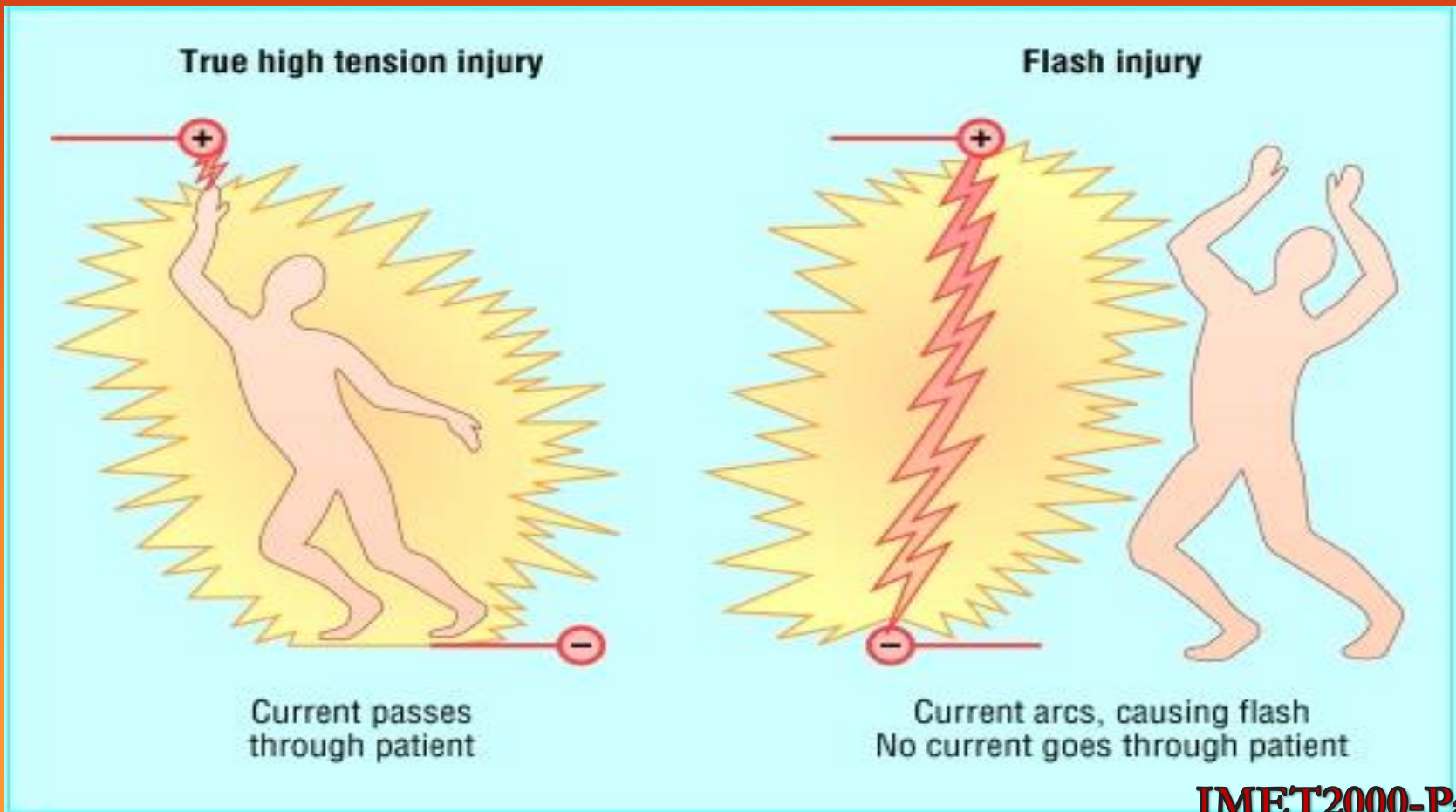
# Electrical injury

Result of heat generated by electric current passing through the tissue

May be high or low voltage

Direct current and lightning injuries are less common

## Differences between true high tension burn and flash burn



# Chemical injury

Acid chemical  
(oven cleansers,  
drain openers)

Organic  
compound  
(petroleum  
products,  
phenols)

Alkalis chemical  
(bath room  
cleansers, rust  
removers)

# TYPE OF BURN

## THERMAL

Scaled, Contact, Flame , Vapors, Flash

## CHEMICAL

Strong acids ,Strong bases ,Detergents ,Solvents

## ELECTRICAL

High voltage, Low voltage

## Radiation

UV light ,X-rays ,Sunlamps ,Radiation therapy



# Causes of burn

## Adult

- Explosion and flame 48%
- Scald 33%
- Contact 8%
- Electrical 5%
- Chemical 3%
- Friction 2%
- Sunburn 1%

## Child

- Scald 60%
- Flame 25%
- Contact 10%
- Electrical 2%
- Chemical 2%
- Sun 1%

## Hot drink scald



## Bath scald



## Hot water/food scald



## Contact burn



## Flame burn (petrol)



## Flame burn



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## Electrical burn





## Electrical Burn (low voltage)



### Potential Problems

Neurologic damage

Increased fluid  
requirement

Cardiac damage

Peripheral circulation

### Consider

A&E, Burns unit

Cardiac monitoring, ECG

Fasciotomies

Debridement – surgery

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## Electrical Burn (High Voltage)



# Chemical burn



## Chemical burn (Alkali)

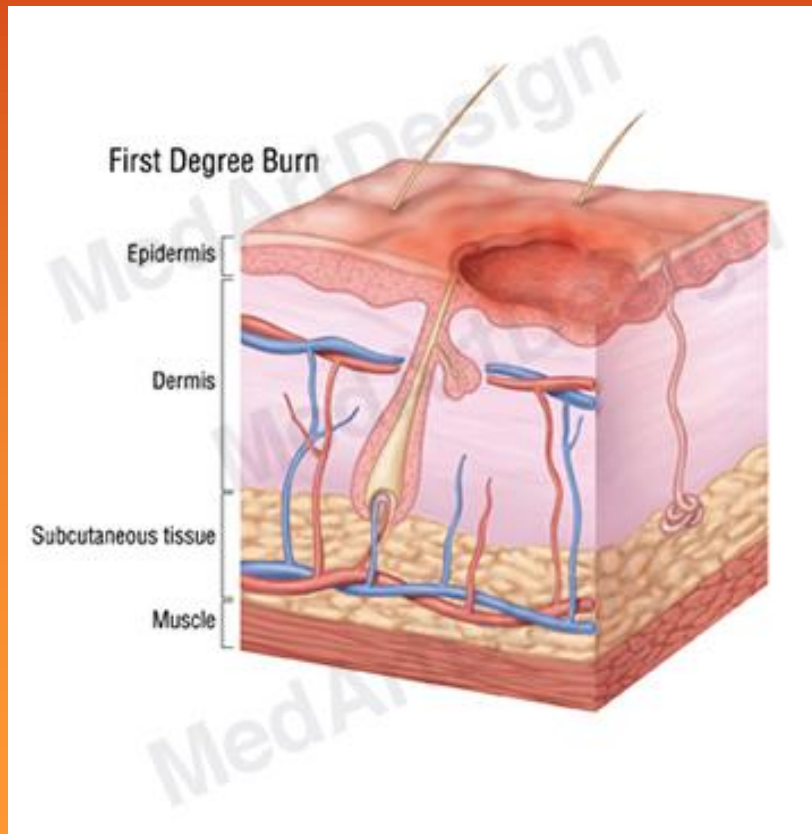


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# Burn Classification

- Superficial (1°): epidermis (sunburn)



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# Cont: burn classification

## □ Partial-thickness (2°):

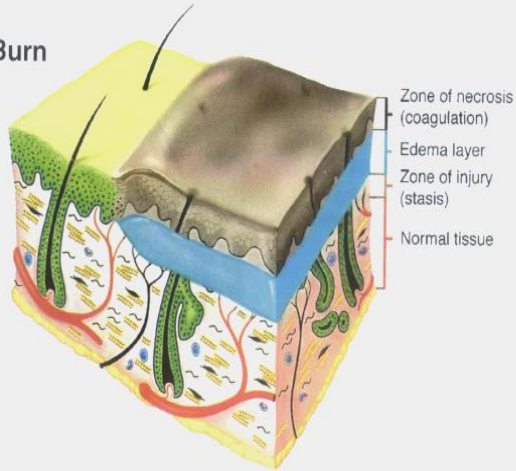
1. **Superficial partial-thickness:** papillary dermis
  - Blisters with fluid collection at the interface of the epidermis and dermis. Tissue pink & wet.  
Hair & follicles intact
2. **Deep partial-thickness:** (reticular dermis Blisters)
  - Tissue molted, dry, decreased sensation.

# Cont: 2ed degree burn

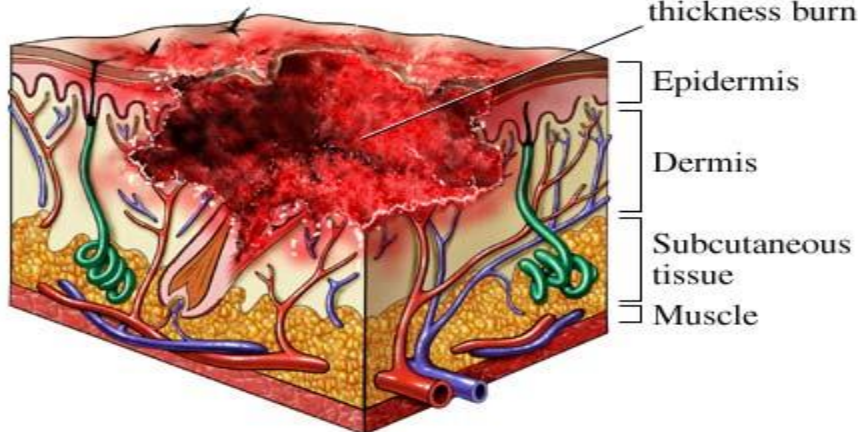
## Superficial Dermal Burn

### Characteristics

1. Necrosis confined to upper third of dermis
2. Zone of necrosis lifted off viable wound by edema
3. Small zone of injury



## Deep partial-thickness burn



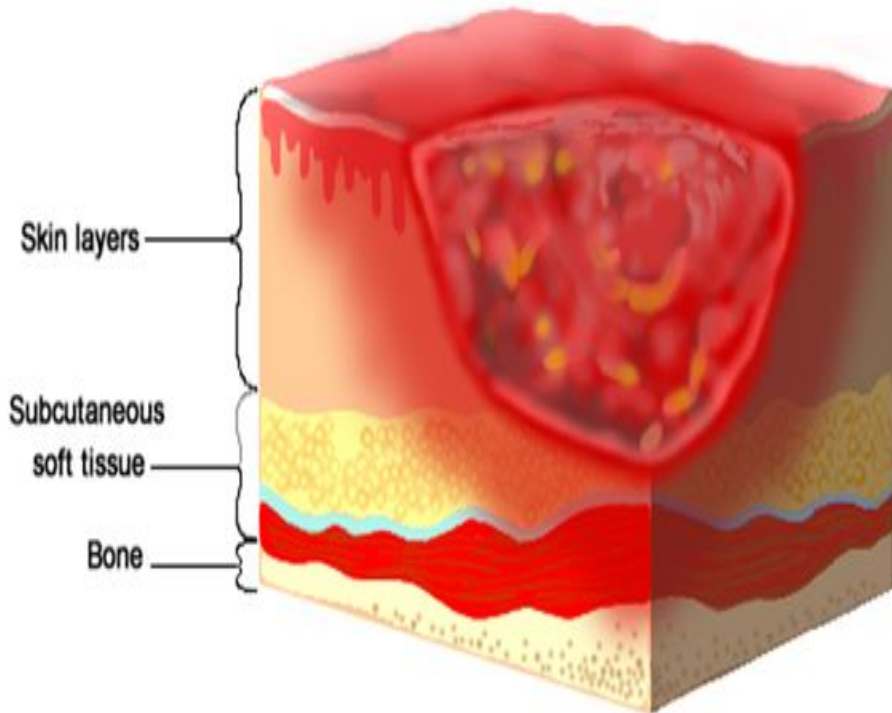
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## □ Full-thickness (3°): dermis

- Leathery, firm, insensate.

Stage 3



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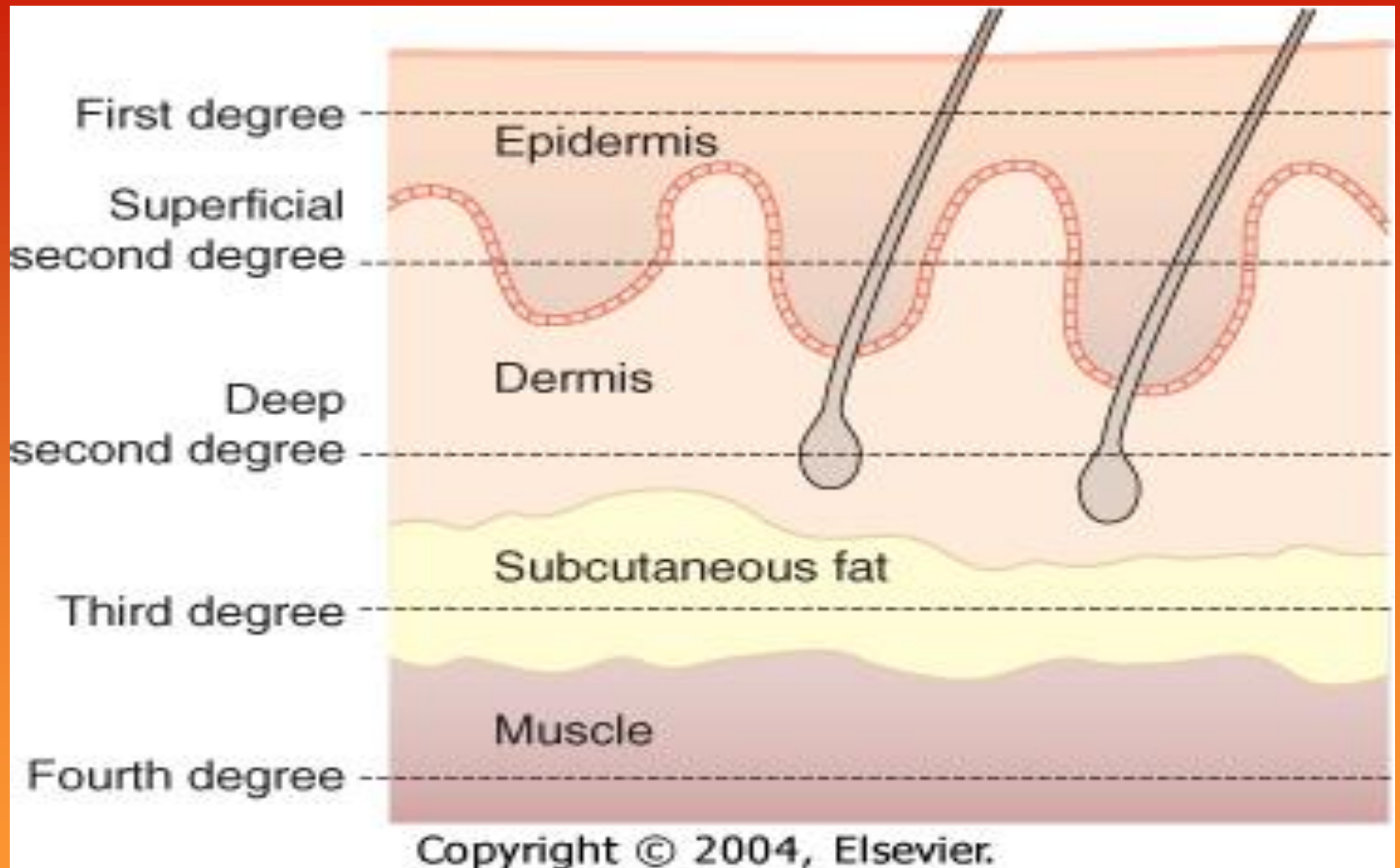


- 4th degree: skin, subcutaneous fat, muscle, bone



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# Immersion time to produce full thickness burns

<b>Time</b>	<b>Temperature(C)</b>
<b>1 sc</b>	<b>70</b>
<b>2 sc</b>	<b>66</b>
<b>10 sc</b>	<b>60</b>
<b>30 sc</b>	<b>54</b>
<b>1 min</b>	<b>52</b>

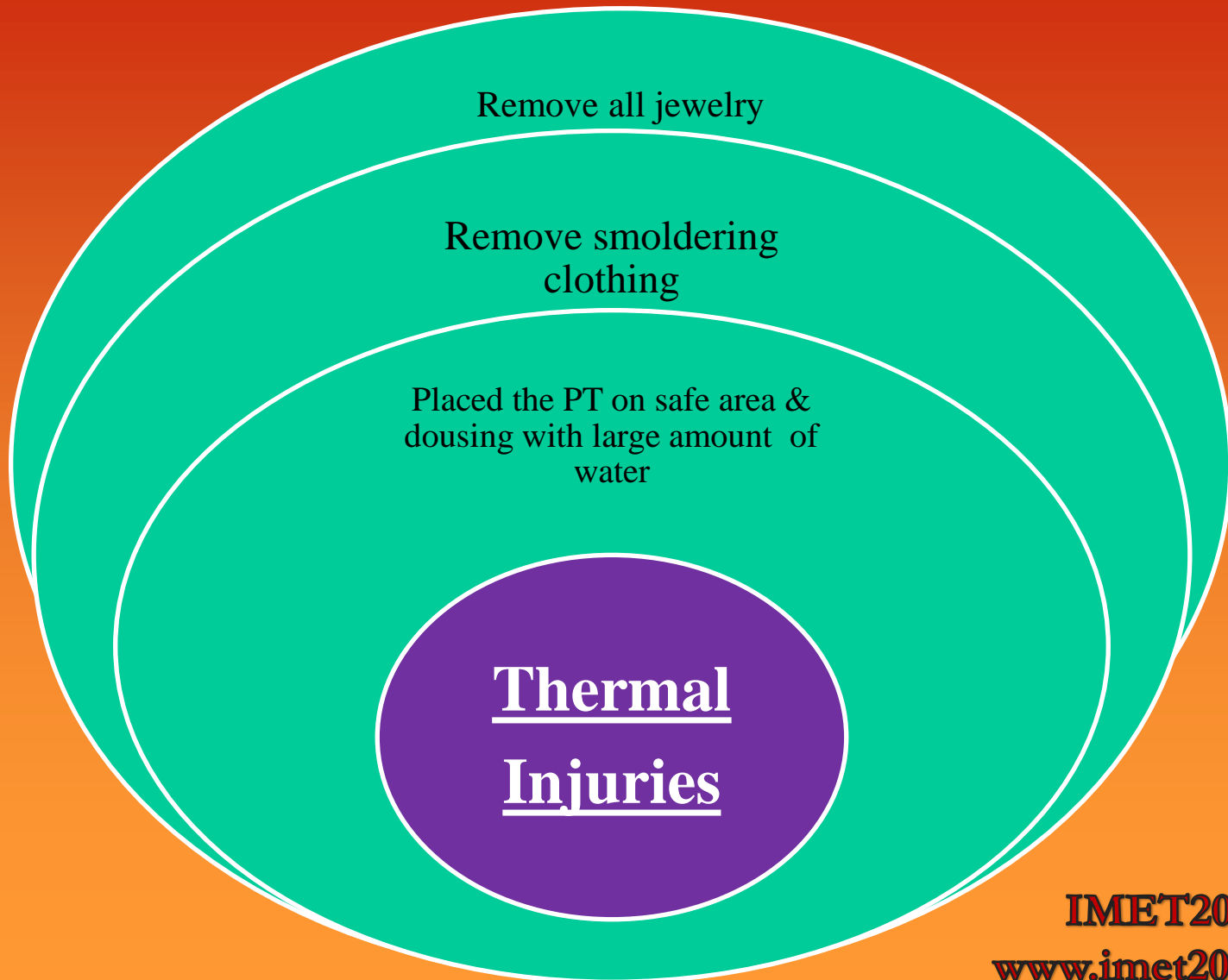
# Classification of Burn Depth

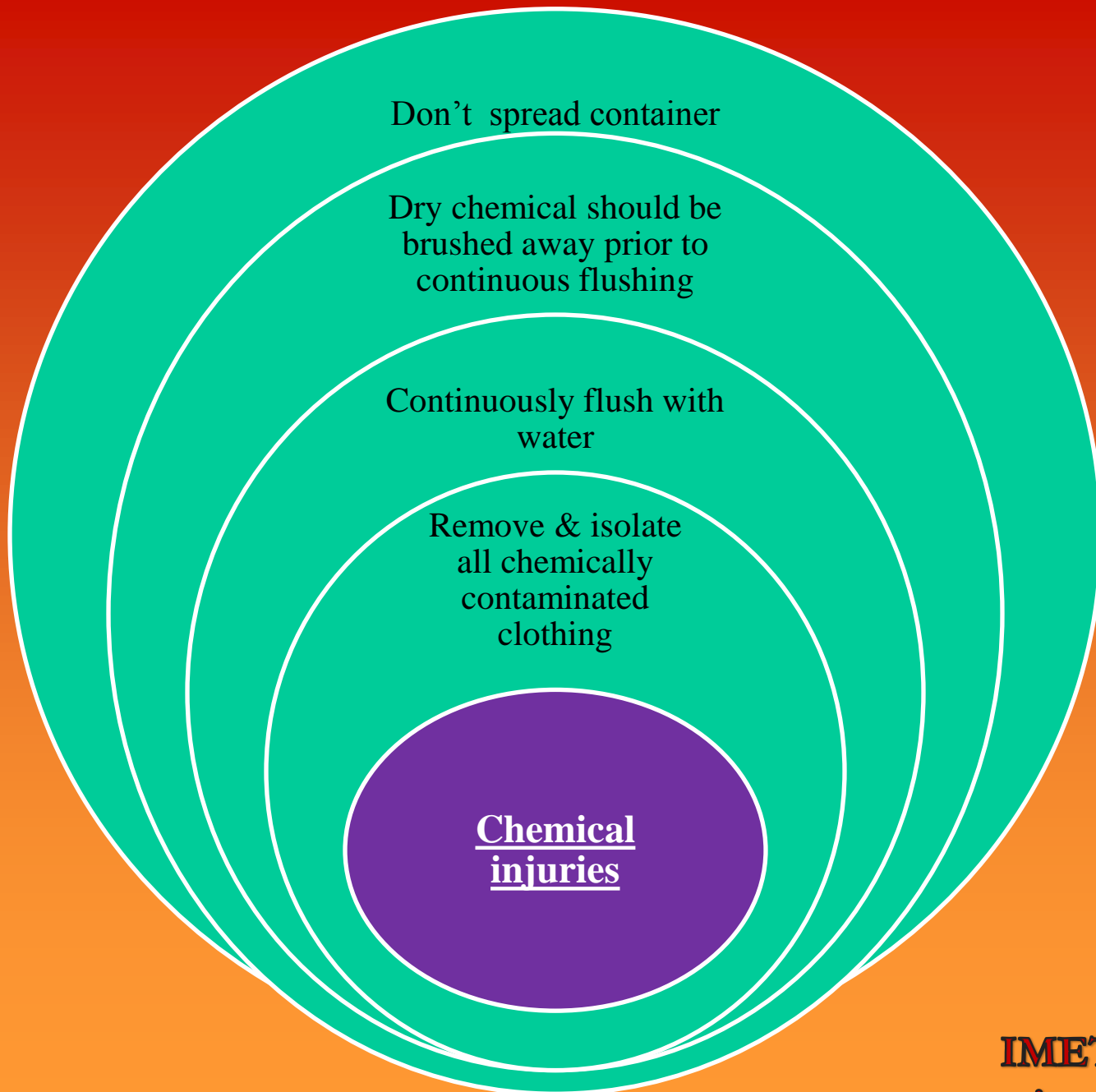
## (summary)

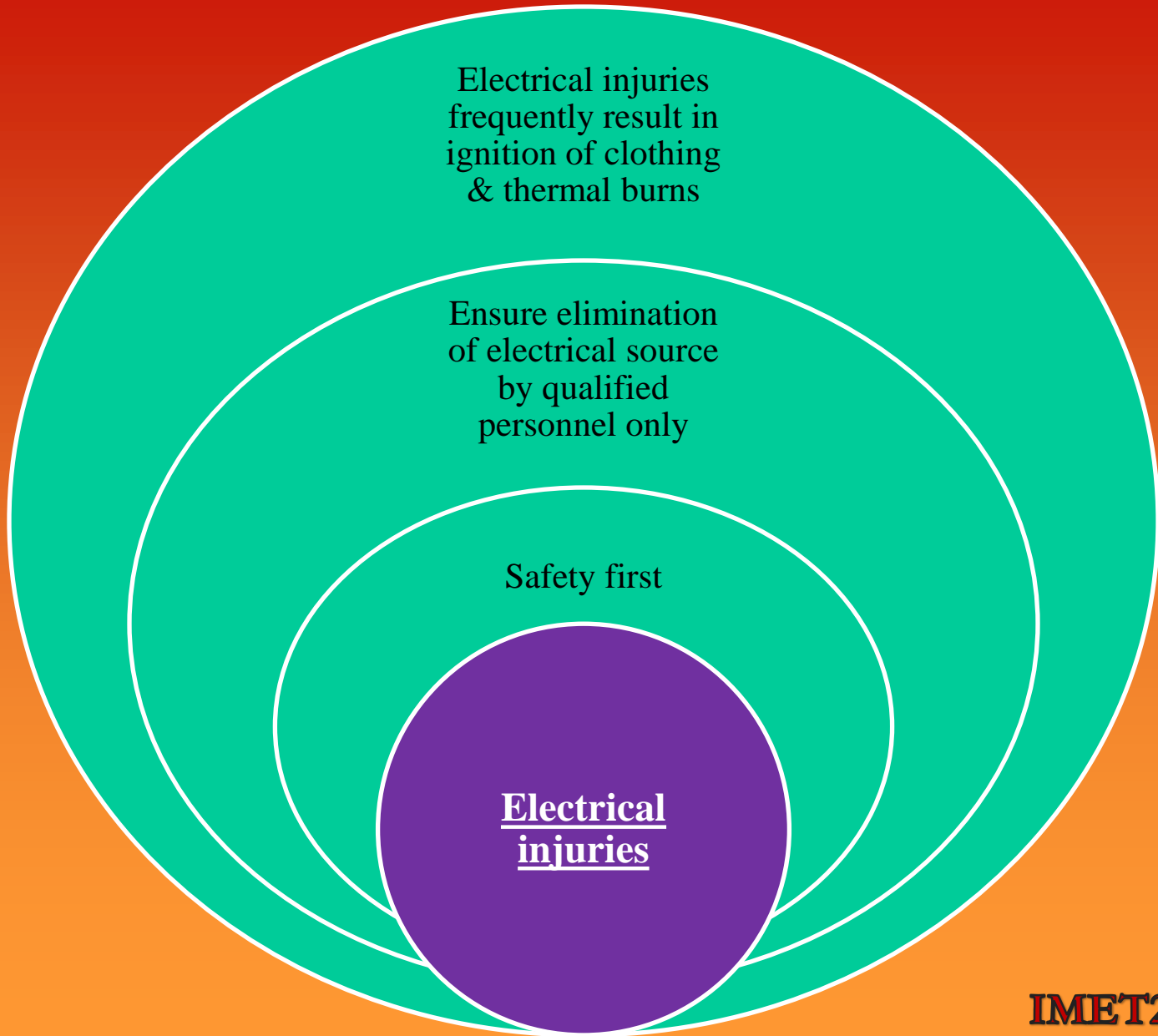
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DEPTH	EXAMPLE	PAIN/ SENSATION	APPEARANCE	HEALING	TREATMENT
<b>Erythema</b>	Sunburn	Severe	Red/pink. Blanches to touch.	24-72 hours	Symptomatic. Analgesia. Moisturising cream: Aloe vera
<b>Partial thickness</b>	Scald	Moderate	Red/pink. Blanches to touch. Moist. Blisters.	7 –14 days	Expectant-dressings. Topical agents. Symptomatic
<b>Deep dermal</b>	Contact burn, fat/hot oil burn	Mild	Red/white dermis. May blister dry.	14-28 days	Skin graft
<b>Full thickness</b>	Flame	Absent	Black/charred/white. Leathery feel. Thrombosed vessels.	Never (unless < 2-5cm diameter)	Skin graft (flap-for exposed tendons, nerves etc)

# Stop the burning process







# PHASES OF BURN INJURIES

- Emergent (24-48 hrs)
- Acute (Weeks to months)
- Rehabilitative (admission to ....)



# EMERGENT PHASE

Immediate problem is fluid loss, edema, reduced blood flow (fluid and electrolyte shifts)

## Goals:

1. Secure airway
2. Support circulation by fluid replacement
3. Keep the client comfortable with analgesics
4. Prevent infection through wound care
5. Maintain body temperature
6. Provide emotional support
7. Knowledge of circumstances surrounding the burn injury (brief history).

## **Cont: Emergent phase**

8. Obtain client's pre-burn weight (dry weight) to calculate fluid rates.
9. Calculations based on weight obtained after fluid replacement is started are not accurate because of water-induced weight gain.
10. Height is important in determining body surface area (BSA) which is used to calculate nutritional needs.
11. Know client's health history because the physiologic stress seen with a burn can make a latent disease process develop symptoms.

# ACUTE PHASE OF BURN INJURY

- Lasts until wound closure is complete.
- Care is directed toward continued assessment and maintenance of the cardiovascular and respiratory system.
- Pneumonia is a concern which can result in respiratory failure requiring mechanical ventilation.
- Infection (Topical antibiotics – Silvadene).

## Cont: Acute phase of burn injury

- Weight daily without dressings or splints and compare to pre-burn weight.
- A 2% loss of body weight indicates a mild deficit.
- A 10% or greater weight loss requires modification of calorie intake.
- Monitor for signs of infection.

# REHABILITATIVE PHASE OF BURN INJURY

- Started at the time of admission.
- Technically begins with wound closure and ends when the client returns to the highest possible level of functioning.
- Provide psychosocial support.

## Cont: Rehabilitative phase of burn injury

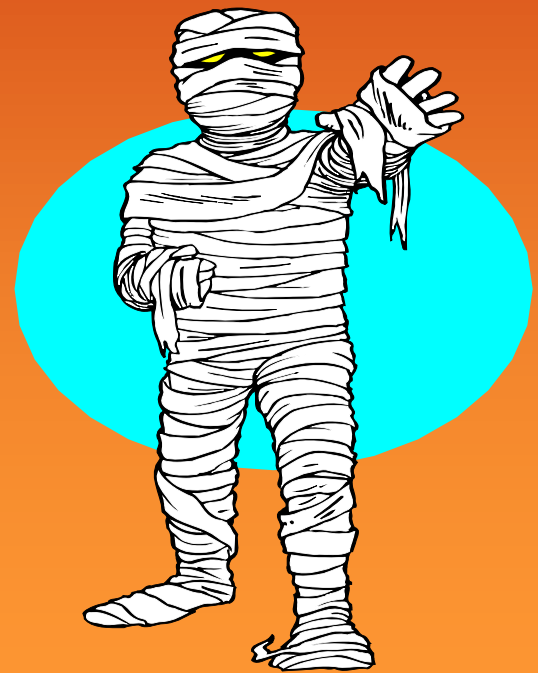
- Assess home environment, financial resources, medical equipment, prosthetic rehab.
- Health teaching should include symptoms of infection, drugs regimens, follow up appointments, comfort measures to reduce pruritus.

# Physical Wound Care

- After beginning adequate resuscitation infusions and assuming adequate ventilation, initial wound debridement and dressing is done in the burn center
- Adequate analgesia is important
- Blisters and loose skin are debrided
- After debridement of loose skin and gentle washing of the wounds, the topical agent of choice is applied
- Dressings must not be constricting; distal extremities must be available for neurovascular monitoring
- Extremities elevation

# The aims of a burn dressing

- To prevent colonisation of the wound
- To absorb exudate
- To provide a moist environment for wound healing





# Typical Burns Dressing

- ❖ Non-adherent layer
  - which should extend at least 3cm beyond wound edge
- ❖ Absorbent layer
  - e.g. gauze (3 layers) and gamgee
- ❖ Bandage to hold all in place
  - e.g. crepe



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# Topical Antibiotics

- No perfect topical antibiotic exists
- The goals for therapy are to
  1. Delay colonization of the wound.
  2. Keep the wound bacterial density lower than would otherwise occur.
  3. Keep the wound flora more homogeneous and less diverse than without therapy
- *Silver sulfadiazine*
- *Silver Nitrate (0.5% Solution)*
- *Mafenide*

# Burns dressings

- Cling Film
- Jelonet/Bactigras
- Urgotul
- Mepitel
- Betadine
- Acticoat
- Duoderm
- Flamazine
- Biobrane
- Cadaver/pigs skin
- Aquacel



# Emergency Escharotomy

## overview

- Full-thickness circumferential and near-circumferential skin burns result in the formation of a tough, inelastic mass of burnt tissue (eschar).
- The eschar, by virtue of this inelasticity, results in the burn-induced compartment syndrome.
- This is caused by the accumulation of extracellular and extravascular fluid within confined anatomic spaces of the extremities or digits.

# Cont: Emergency Escharotomy

- The excessive fluid causes the intracompartmental pressures to increase, resulting in collapse of the contained vascular and lymphatic structures and, hence, loss of tissue viability.
- The capillary closure pressure of 30 mm Hg, also measured as the compartment pressure, is accepted as that which requires intervention to prevent tissue death.

# What is Escharotomy

- Escharotomy is the surgical division of the nonviable eschar, which allows the cutaneous envelope to become more compliant.
- Hence, the underlying tissues have an increased available volume to expand into, preventing further tissue injury or functional compromise
- Escharotomy is considered an emergent procedure in burn treatment protocols.

# Cont:

- However, it rarely needs to be performed in the emergency department at the time of initial presentation of the severely burned patient.
- Advanced ventilation methods allow the patient to be stabilized to allow for expeditious transfer to the intensive care unit or the surgical suite, where the procedure can be performed under more controlled circumstances.



Escharotomies





# What Is a Skin Graft?

- A skin graft is a surgical procedure that involves removing skin from one part of your body (the donor site) and moving it, or transplanting it, to a different part.
- This surgery may be done if part of your body has lost its protective covering of skin due to injury or illness.
- Skin grafts are performed in a hospital.
- Most skin grafts are performed using general anesthesia, which means that you will sleep painlessly throughout the procedure.

# Reasons for Skin Grafts

- A skin graft is placed over an area of the body where the skin has been lost. Some common reasons for skin grafts include:
- skin infections
- deep burns
- large, open wounds
- bed sores or other ulcers on the skin that don't heal well.

# Nutritional management for burn patients

## Goals of nutritional management

- To promote optimal wound healing and rapid recovery from burn injuries.
- To minimise risk of complications, including infections during the treatment period.
- To attain and maintain normal nutritional status.
- To minimise metabolic disturbances during the treatment process.

# Cont: Nutritional management for burn patients

## Objectives of nutritional management

- Provide nutrition via enteral route within 6 - 18 hours post burn injury
- Maintain weight within 5 % - 10 % of pre-burn weight
- Prevent signs and symptoms of micronutrient deficiency
- Minimise hyperglycaemia
- Minimise hypertriglyceridaemia

# *Physical and occupational therapy*

- Physical and occupational therapy are begun at admission.
- help minimize scarring and contractures, particularly for body surfaces with high skin tension and frequent movement (eg, face, hands).
- optimize function.
- Active and passive range-of-motion exercises become easier as the initial edema subsides.

## Cont: *Physical and occupational therapy*

- They are done once or twice daily.
- After grafting, exercises are usually suspended for 3 days, then resumed.
- Extremities affected by deep partial-thickness burns or full-thickness burns are splinted in functional positions as soon as possible and kept splinted continuously (except during exercise) until the graft has been placed, healing has occurred, or both.

# **A,B,C,D,E**

# **ASSESSMENT**



# Initial rapid assessment

**A**

- Air way maintenance with c- spine protection

**B**

- Breathing & ventilation

**C**

- Circulation & cardiac status

**D**

- Disability

**E**

- Expose (undress) & examine the burn victim

focused

Detailed  
physical  
exam

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# Airway and Breathing

A and B are for *airway* and *breathing* — always the first concern in any emergency

## Overview :

- Inhalation injury is acute respiratory tract damage caused by breathing a fire's superheated steam, toxic gases and smoke particles contaminated with chemicals.
- Direct thermal injury, although uncommon, may also occur if combustion of the smoke particles is incomplete at the time of inhalation.

# Cont: Overview

- There are three types of inhalation injury: **carbon monoxide poisoning**, **inhalation injury above the glottis** and **inhalation injury below the glottis**.
- Risk factors for an inhalation injury include:
  - ✓ Fire in an **enclosed** space.
  - ✓ Exposure to **noxious** chemicals.
  - ✓ Extended **length** of entrapment.
  - ✓ Whether the victim was found **low** to the ground or **higher** where rising smoke or chemicals may be concentrated.

## Cont: Overview

- Contributing to the risk are extremes of age and concomitant medical conditions. **For example**, the level of mobility for the very young and very old may inhibit or prevent these people from extricating themselves from the fire; the immature lungs of infants and the potential cardiopulmonary disease of the elderly raise the mortality and morbidity for these populations.

# Carbon monoxide

- Carbon monoxide poisoning is the **most common cause of death** involving inhalation injury and smoke-induced inhalation injury.
- Carbon monoxide has an affinity for hemoglobin that is at least 200 times greater than that of oxygen.
- This competition leads to poor oxygenation and tissue hypoxia.
- Signs and symptoms of carbon monoxide poisoning vary with levels of carboxyhemoglobin, although a change in mental status with disorientation can be a good indication of this injury.

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## Cont: Carbon monoxide

<b>Carboxyhemoglobin Levels in Inhalation Injury<sup>2</sup></b>		
<b>COHgb</b>	<b>Severity</b>	<b>Symptoms</b>
< 10%	Normal	None
10% to 20%	Mild	Headache, dyspnea, confusion, visual changes
20% to 40%	Moderate	Nausea, irritability
40% to 60%	Severe	Hallucinations
> 60%	Fatal	Collapse, coma, death

# Site of inhalation injury

- Airway injuries above the glottis occur when superheated steam or noxious chemicals are inhaled, resulting in an inflammatory reaction.
- Edema of the epiglottis, glottis and vocal cords can lead to narrowing and obstruction of the upper airway.
- Patients should be closely observed until the period of maximal risk has elapsed 24 to 36 hours following the injury.

## Cont: Site of inhalation injury

- Burn patients should be intubated if there are any indications of upper airway obstruction, such as stridor, progressive edema, or the patient cannot maintain adequate oxygenation

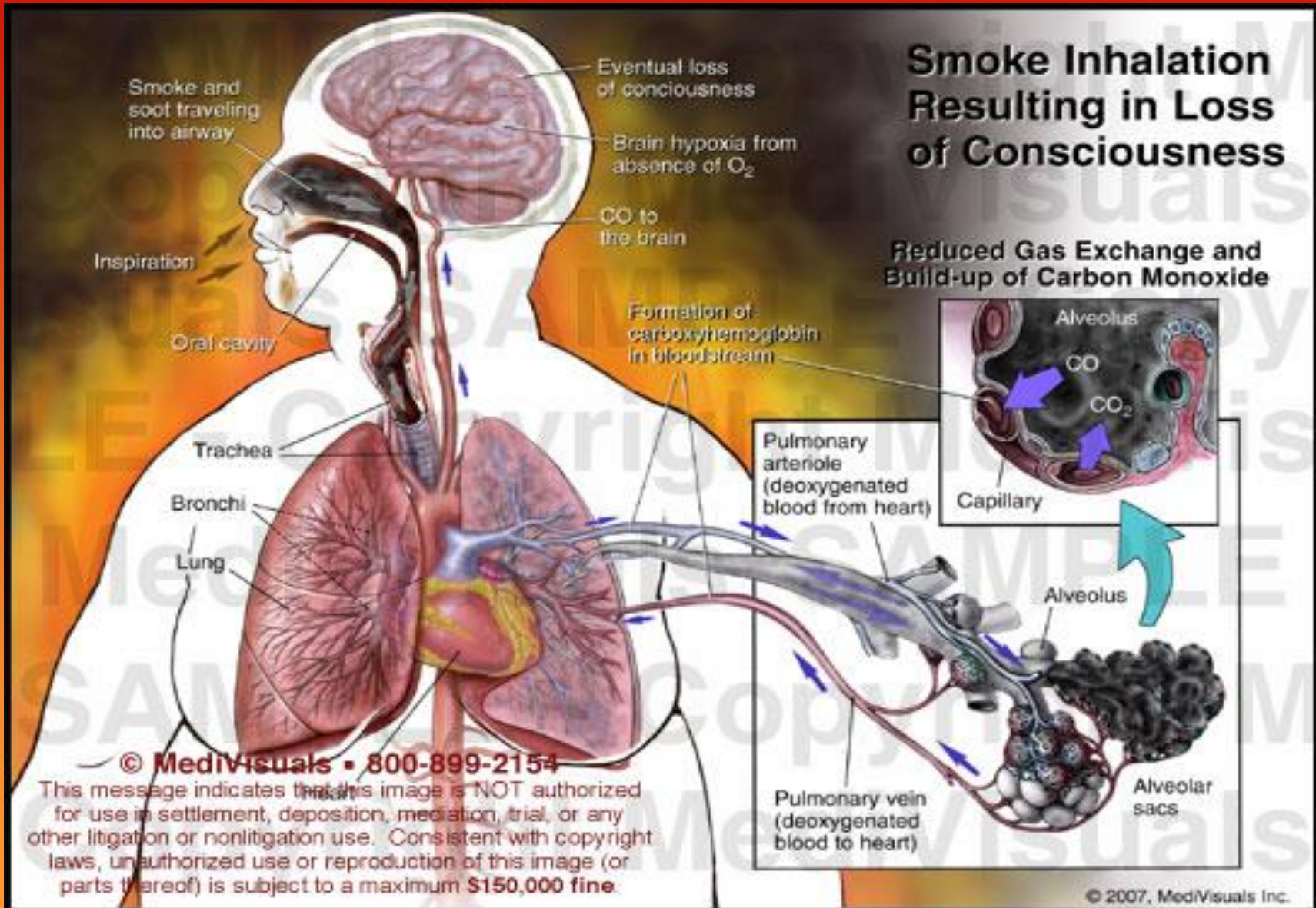


# Cont: Site of inhalation injury

- Inhalation injury below the glottis is caused by hot soot particles and the caustic effect of noxious gases, such as hydrogen cyanide, aldehydes, ammonia, phosgene, sulfur oxides and hydrogen chloride, which are byproducts of combustion.
- Inhalation of these causes direct injury to the tracheobronchial tree, loss of ciliary action, mucosal edema and diminished surfactant production.
- Pulmonary edema, chemical pneumonitis and extensive mucosal sloughing may also occur.

# Smoke Inhalation Resulting in Loss of Consciousness

## Reduced Gas Exchange and Build-up of Carbon Monoxide



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# Progressive of inhalation injury

- An inhalation injury can be complicated by restrictive defects caused by full-thickness circumferential burns around the neck and torso.
- Leathery, burned tissue, known as eschar, impedes normal elasticity and movement of the skin and limits lung expansion if the chest and abdomen are involved.
- As the burn edema progresses during the first 24 to 48 hours after the initial injury, circumferential burns can become restrictive.

# Cont: Progressive of inhalation injury

- The edema may even obstruct the airway.
- Pulmonary function may deteriorate further as fluid shifts from the vascular compartment to the interstitial space, reducing lung compliance and producing a noncardiogenic pulmonary edema and acute respiratory distress syndrome.

# diagnosis of inhalation injury

- Diagnosis of an inhalation injury depends first on obtaining details of the burn injury and assessing the patient.
- Signs indicative of damage to the airway or lungs are singed nasal and facial hair; soot around the circumoral area; obvious facial or neck burns; blisters, redness or edema of the oral and pharyngeal mucosa; hoarseness; labored breathing; stridor; dry cough; sooty or carbonaceous sputum; tachypnea; and anxiety or agitation.

# Cont: diagnosis of inhalation injury

- Measuring arterial blood gases and carboxyhemoglobin levels helps the diagnosis of inhalation injury, but chest radiography does not, although it provides baseline information for future comparison.
- A fiberoptic bronchoscopy is the gold standard for diagnosing and confirming inhalation injury.
- Direct laryngoscopy is extremely effective and important for diagnosing glottic edema and epiglottic edema and imminent, life-threatening upper airway obstruction.

# Emergency management

- Emergency management includes 100% oxygen via humidified non-rebreather facemask to combat carbon monoxide poisoning.
- Protect patients from further injury until a thorough evaluation has been completed.

## Cont: Emergency management

- For instance, maintain cervical alignment during assessment and while performing necessary interventions, such as intubation.
- Apply a cervical collar if indicated, especially with electrical injuries, as they are associated with cervical compression fractures, falls and explosive mechanisms of injury.



# Cont: Emergency management

- Endotracheal intubation may be warranted in the event of coma, airway edema with impending obstruction, extensive burns that need intensive management or circumferential burns of the chest.
- Not every suspected inhalation injury patient requires intubation.
- Patients evidencing signs and symptoms of respiratory distress should be endotracheally intubated to avoid the need for emergency tracheostomy.

# Cont: Emergency management

- The ET tube should be secured with tape if the face is clear of burns.
- Anticipate and assess the patient's need for frequent suctioning of the airway, although secretions may not be fulminate until the fluid resuscitation is well under way.



# Circulation/Cardiac Status

- *Circulation* is the next parameter that needs assessment.
- Restrictive clothing, belts, shoes and jewelry (rings, watches, bracelets, etc.) should be removed immediately to prevent them from constricting circulation as burn edema develops.
- However, clothing that adheres to the burn should be left intact until burn debridement occurs.

## Cont: Circulation/Cardiac Status

- Peripheral pulses should be checked and monitored frequently for progressive diminishing or absence.
- Additionally, burned extremities, especially those that are circumferential in presentation, should be assessed for cyanosis, deep tissue pain and altered sensation.
- Elevation of burned extremities may minimize pain and edema.

# Cont: Circulation/Cardiac Status

- Although damage may be localized in burns of less than 25% total body surface area (TBSA) or generalized in those that encompass more than 25% TBSA, all burn injuries alter capillary permeability.
- The first 24 to 48 hours post-injury is the time of maximal fluid loss, and the body may respond by going into a hypovolemic state known as burn shock.

## Cont: Circulation/Cardiac Status

- Loss of plasma protein and electrolytes can occur, resulting in reduced intravascular volume and elevated extracellular fluid
- Clinical manifestations of these changes are hypovolemia and edema.
- The blood becomes hemoconcentrated, and in severe burns, red blood cells may hemolyze.

## Cont: Circulation/Cardiac Status

- The fluid shifts cause cardiovascular changes, such as a compromised cardiac output, increased systemic vascular resistance, hypotension and reduced peripheral blood flow.
- Impaired peripheral blood flow can further damage tissue and result in metabolic acidosis.

# Circulation Status management

- Preventing burn shock starts with the placement of large-bore IV catheters.
- Optimal insertion is through unburned skin in the upper extremities, although this is not always possible, and placement through burned skin may be necessary.



## Cont: Circulation Status management

- Patients with 20% or greater TBSA burns should have fluid resuscitation.
- Routine laboratory assessment includes a complete blood count with differential, and serum levels of glucose, electrolytes, and KFT.

# Cont: Circulation Status management (fluid resuscitation)

- Fluid resuscitation prevents shock and further tissue damage.
- The primary goal is to preserve tissue perfusion and maintain vital organ function by restoring intravascular volume and avoiding the complications of inadequate or excessive fluid resuscitation.
- There are numerous ways to estimate fluid needs, for the first 24 hours post-injury, such as Parkland formula.



## Modified Parkland Formula

The Parkland formula is a guide only to assist in estimation of fluid requirements. Ongoing fluid volume replacement must be determined by clinical indicators of the adequacy of resuscitation.

**3 – 4 mls/kg/TBSA % = mls/ given in 24 hours post injury**

### **Rate:**

**1/2 total in 8 hrs post injury**

**1/2 total in 16 hrs post injury**

Hartmanns (R/L) is the preferred IV fluid for replacement.

4mls/kg/% TBSA is recommended if the patient has an inhalation injury, presentation is delayed, has associated trauma or has a high voltage electrical injury.

The calculation of fluid requirement is calculated from the time of the burn rather than the time of presentation. If the presentation is delayed, fluid may need to be given more rapidly

## Maintenance fluids in children

Maintenance fluids should also be added over and above the Modified Parklands formula for children weighing less than 30kgs. 5% Dextrose and 1/2 Normal Saline should be used for maintenance fluid

Up to 10kgs	100ml/kg/day
10 – 20kgs	1000mls plus 50ml/kg/day for each kg over 10kgs
20 – 30kgs	1500mls plus 20ml/kg/day for each kg over 20kgs

Oral fluids should be encouraged to supply maintenance fluids if the child is stable and conscious, and no interventions are planned

# Cont: Circulation Status management (fluid resuscitation)

- An isotonic solution such as lactated Ringer's is usually used.
- Colloid solutions are discouraged during early therapy because the protein molecules tend to pass through capillary membranes and elevate colloid pressure and interstitial edema.
- Colloids are recommended only after the initial 24-hour resuscitation period.

# Cont: Circulation Status management (fluid resuscitation)

- Although fluid resuscitation formulas serve as a starting point for therapy, the individual's response — especially urine output — is the ultimate guide to fluid replacement.
- Urine output should be maintained at 30 mL/hr to 50 mL/hr (0.5mL/kg/hr) for adult patients.

# Cont: Circulation Status management (fluid resuscitation)

- For patients who have sustained high-voltage electrical burn injuries, the target range for urine output should be 75 mL/hr to 100 mL/hr to prevent renal tubular obstruction from urine myoglobin.
- Diuretics, which can aggravate dehydration, should be avoided.
- In addition to output, urine specific gravity, along with the patient's vital signs and changes in mental status, are valuable indicators of the patient's response to fluid resuscitation.

# Cont: Circulation Status management (escharotomy)

- Deep partial- or full-thickness circumferential injuries of the extremities can compromise circulation.
- Burn eschar, an avascular area composed of nonviable biological material produced by the burning agent, acts as a tourniquet as edema increases.
- This effect reduces or eliminates blood supply to distal burn areas, creating the potential for tissue necrosis.



# Cont: Circulation Status management (escharotomy)

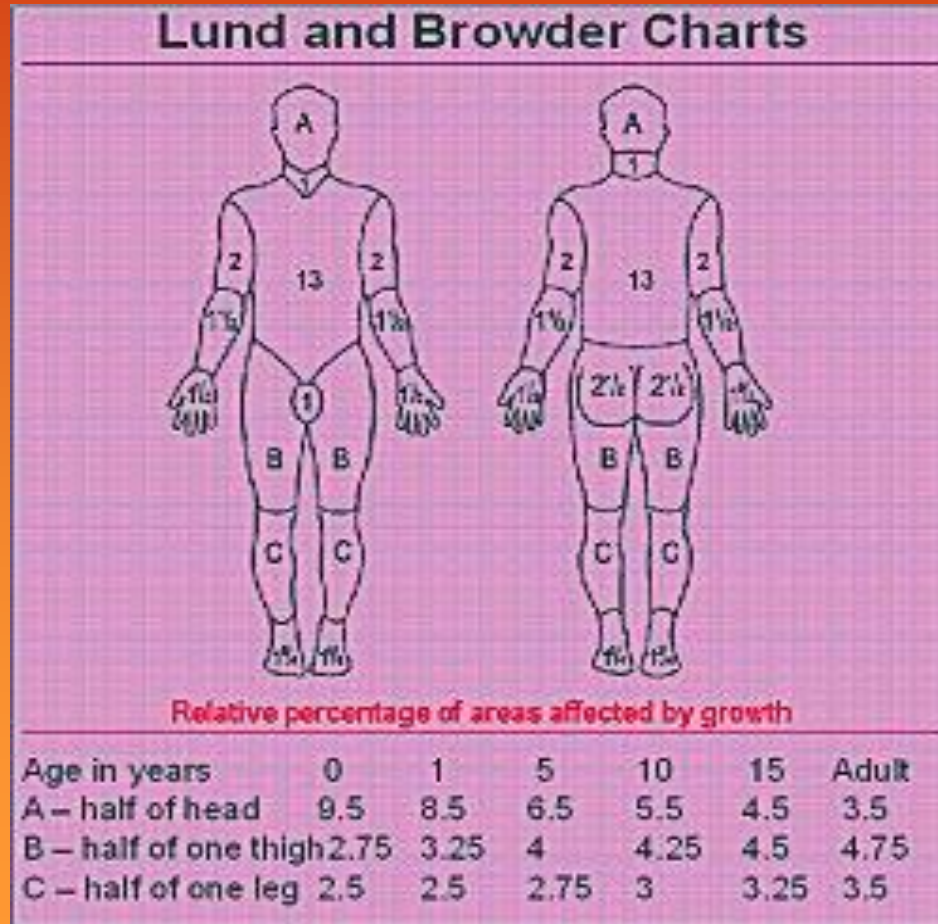
- Peripheral pulses should be assessed by palpation or Doppler ultrasound flowmeter.
- If pulses are absent, providers may elect to use electrocautery to perform an escharotomy.
- Escharotomies may cause significant morbidity and are rarely indicated prior to transfer to a burn center.
- They are typically not needed until several hours into the burn resuscitation.

# Cont: Circulation Status management (escharotomy)

- To relieve the pressure, incisions are made only through the eschar at the midaxillary line on the thorax or laterally and medially on the extremity; the subcutaneous tissue is exposed but not pierced.
- After completion, the affected extremities are elevated to minimize edema, and pulses are checked hourly.
- Most burn centers do not advocate performing escharotomies in the ED unless a significant delay in transport to the burn center is anticipated and only after direct consultation with a burn center attending

# Special Considerations in Pediatric Burn Patients

1. Always use a Lund and Browder chart to calculate TBSA.



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# Cont: Special Considerations in Pediatric Burn Patients

## 2. Use the following guidelines for fluid resuscitation:

- Obtain IV access early; attempt peripheral line placement on hands, arms or feet first, although saphenous or intraosseous cannulation may be necessary.
- Use dextrose 5% in lactated Ringer's solution for fluid resuscitation in children weighing less than 10 kg because of their poor glycogen stores.
- Check blood glucose by finger stick initially, then every six to eight hours.

# Cont: Special Considerations in Pediatric Burn Patients

- Do not assess for hypovolemia by solely relying on clinical signs, which are usually absent until a 25% loss of circulating volume has occurred.
  - Neurological response changes are better indicators than heart rate and blood pressure of impending shock.
  - Assess for fluid overload that can lead to pulmonary edema.
  - Maintain urine output at 1 mL/kg/hr for children weighing less than 50 kg.
  - In children weighing more than 50 kg, the urine output should be about 30 mL/hr to 50 mL/hr, the same as for adults.
3. Calculate pediatric morphine dose as 0.1 mg/kg IV; acetaminophen with codeine by mouth can be used for minor burns.

# Disability and Exposure

- **D** is for *disability/neurological deficit* — other injuries that may occur during the burn.
- Symptoms unrelated to burns may indicate additional injury; for example, trauma incurred by a burn victim when jumping from a burning building.
- Assess patients for head trauma, particularly those who are disoriented or unconscious in the absence of inhalation injury or carbon monoxide poisoning.

# Cont: Disability and Exposure

- **E** is for *exposure and examination* — stop the burning process.
- If the burned areas have not been cooled at the scene, cool the burn wounds with tepid water or 0.9% normal saline solution until the skin reaches normal skin temperature.
- This can be accomplished within several minutes.
- Remove all clothing to allow for a complete visual inspection of the topography to discern surface changes or damage that give clues to occult internal injury, as well as the extent and depth of the burn wounds.

# Cont: Disability and Exposure

- Hypothermia may occur from wet dressings or environmental factors.
- Frequently monitor the patient's temperature to maintain it between 98.6 F to 102 F (38 C to 39 C).
- Remove all wet dressings and materials in burns of greater than 10% TBSA and employ dry, clean blankets, Bair Huggers, plastic coverings, heat lamps/shields and warmed IV fluids.
- The ambient room temperature should be about 85 F (29.5 C) in the treatment room as well as in any transport vehicle.



# Determining Burn Severity

- The final priority in burn care is the examination of wounds to determine the depth of the burns and the TBSA involved.
- Superficial or first-degree burns involve the epidermal layers only.
- They are typically dry without blisters, erythematous, minimally or non-edematous, and very painful.
- These wounds are not incorporated into the calculation of the TBSA percentage.

# Cont: Determining Burn Severity

- Partial-thickness or second-degree burns encompass the epidermis and parts of the dermal layer.
- These wounds are moist, often blistered and extremely painful; the underlying tissue is mottled pink and white, and it may blanch if it's only a superficial, partial-thickness dermal injury.
- Deeper partial thickness burns are characteristically cherry red, devoid of blisters and weeping.

# Cont: Determining Burn Severity

- Full-thickness or third-degree burns extend to the subcutaneous tissue and may affect fascia, muscle and bone.
- These burns are insensate and covered by a dry, leathery eschar with a white, waxy, maroon or soot-stained coloring.

# Cont: Determining Burn Severity

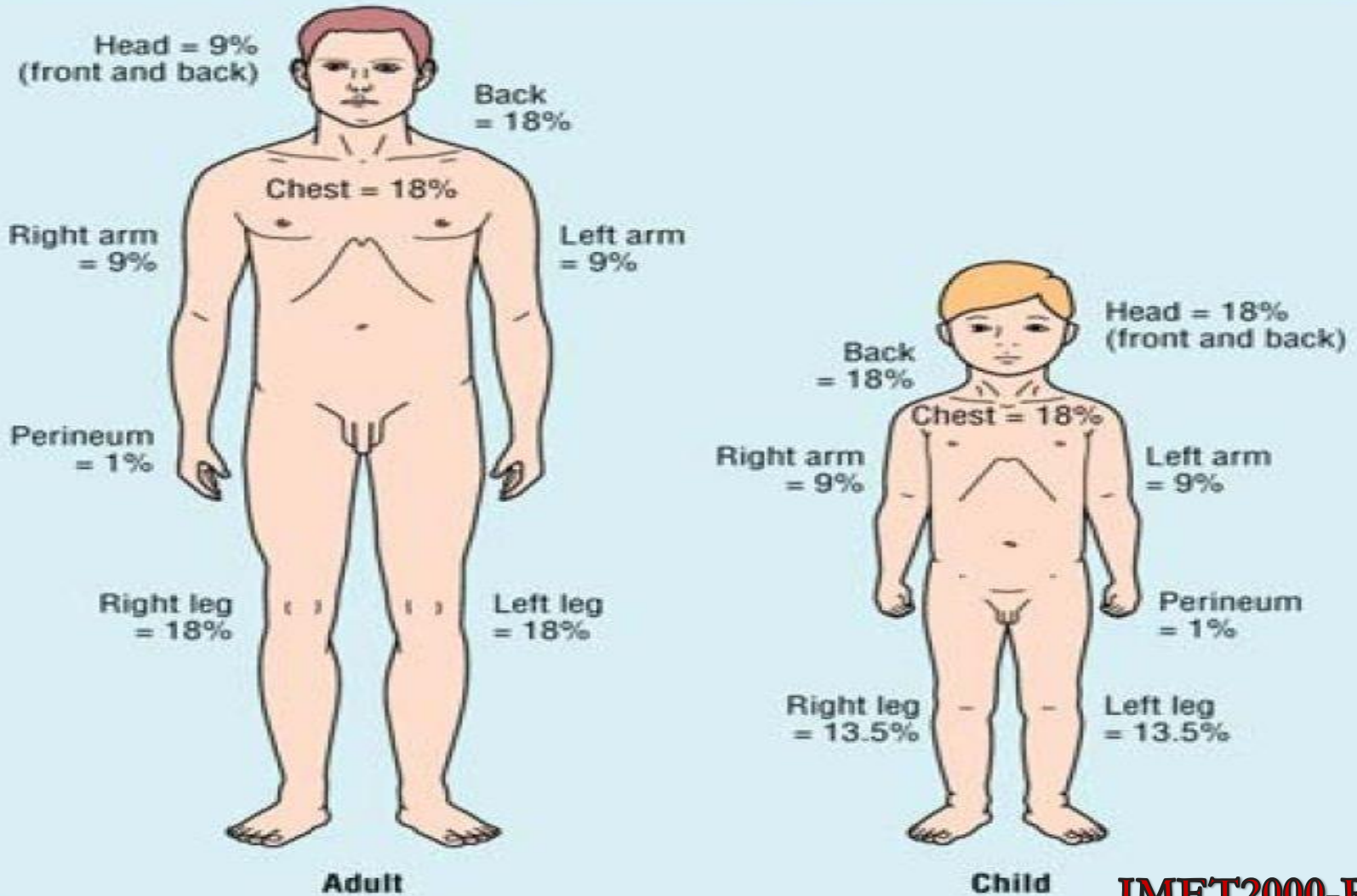
- Clinicians usually estimate the TBSA burned by applying the Rule of Nines.
- A chart divides the body into regions that are assigned multiple values of nine.
- Identifying second- and third-degree burn areas and totaling their corresponding values from the chart provides the estimate of TBSA burned.
- The most widely used method in burn centers is the Lund and Browder chart, which more accurately assesses pediatric as well as adult patients by factoring in body size and age factors.

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# The Rule Of Nine

Medscape



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# Cont: Determining Burn Severity

- Estimating the depth and extent of the burn injury not only establishes severity, but it also determines the treatment plan and the ultimate disposition of the patient, who may need the expertise of a burn center.
- No matter how extensive the injury may be, communication and support are essential elements of care to reduce the patient's fear and anxiety while the decision for transfer is being made.

## Cont: Determining Burn Severity

- Also, the patient should be kept comfortable by administering appropriate analgesia, usually IV morphine.
- Subcutaneous or intramuscular administration is not recommended for burn patients because fluid shifts interfere with absorption through those routes.
- Likewise, oral medications may be ineffective because of the transient ileus, which can accompany a burn of even seemingly insignificant extent.

# Criteria for transfer

- Partial thickness burns greater than 10% TBSA
- Burns that involve the face, hands, feet, genitalia, perineum or major joints
- Third-degree burns in any age group
- Electrical burns, including lightning injury
- Chemical burns



# Cont: Criteria for transfer

- Inhalation injury
- Burn injury in patients with pre-existing medical conditions that could complicate management, prolong recovery or affect mortality
- Any patient with burns and concomitant trauma (such as fractures) in which burn injury poses the greatest risk for morbidity or mortality.
- Burned children in hospitals without qualified personnel or equipment for the care of children

# Transportation

- Teamwork and effective communication can expedite transport to a burn center.
- The report to burn center personnel should consist:
  - ✓ Demographic profile of the patient
  - ✓ Patient's height and weight
  - ✓ Significant medical history
  - ✓ Immunization status
  - ✓ Allergies
  - ✓ Current vital signs

# Cont: transportation

- Specific to the burn injury provide as much history about:
  - ✓ Time.
  - ✓ Mechanism (fire, electrical, etc.)
  - ✓ Whether it occurred in a closed or open space
  - ✓ Type of materials and fuels ignited and type of toxins inhaled.
  - ✓ If appropriate, provide the burn center with a Materials Safety Data Sheet, which describes the hazards and identities of chemicals in a work environment.

# Cont: transportation

- ✓ Provide a summary of the systems assessment, including burn depth and extent
- ✓ laboratory values, and the current treatment regimen and patient response.
- ✓ Transport methods are used
- ✓ Severity of the injury
- ✓ The distance and time estimated for transfer

# Cont: transportation

- In preparation for transport, several factors need to be addressed:
  - ✓ Patency of airway and securing the endotracheal tube if intubated
  - ✓ Adequate oxygenation sources
  - ✓ Stability of vital signs
  - ✓ Establishment and securing of IV access and adequate fluid resuscitation with LR solution

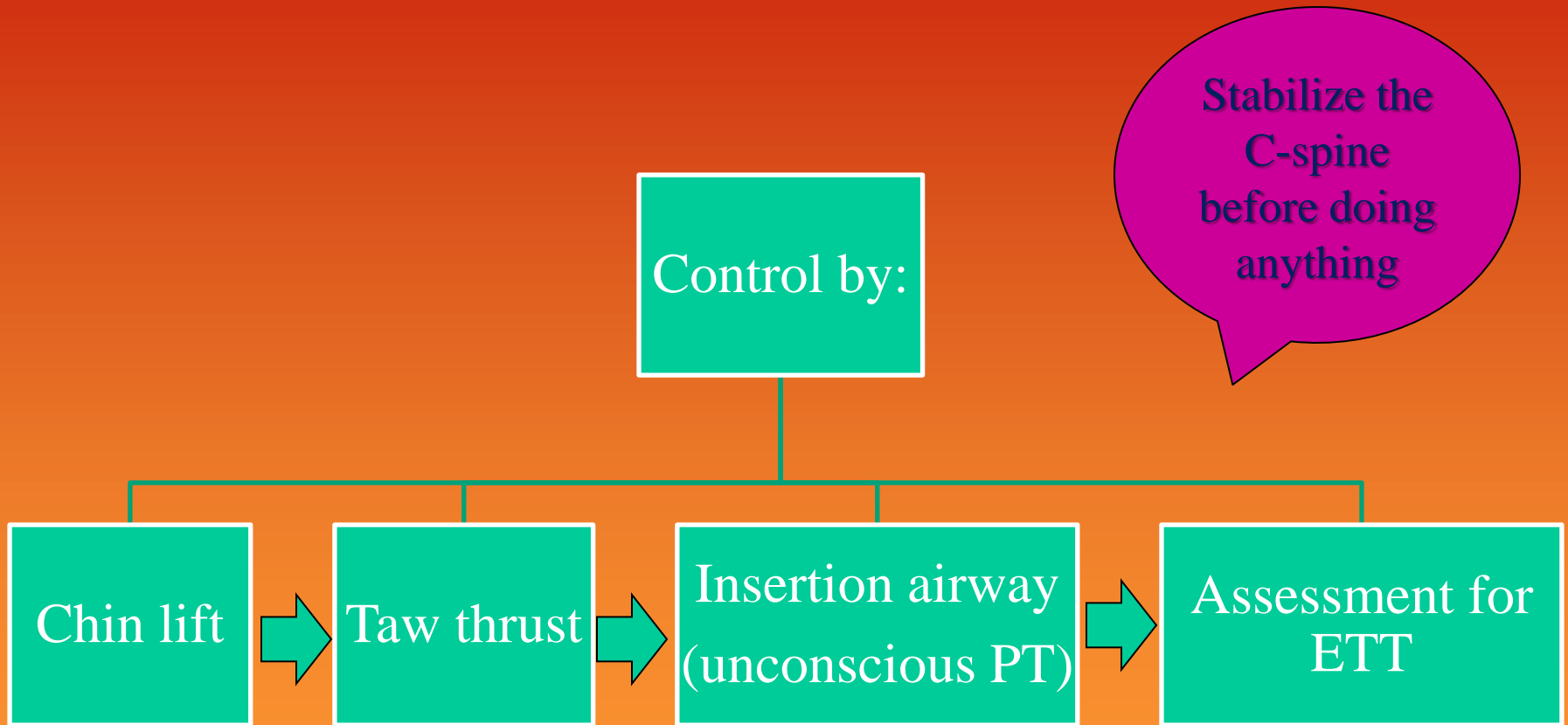
# Cont: transportation

- ✓ Stabilization of the neck with a cervical collar if a spinal injury is suspected.
- ✓ Pain management is effective
- ✓ Measurement of urine output via a Foley catheter for burns >20% TBSA

## Cont: transportation

- ✓ Withholding anything by mouth and inserting an oral gastric tube for burns  $>20\%$  TBSA
- ✓ Covering wounds with dry dressings and avoiding wet ones, which can induce hypothermia, especially in children and the elderly. A clean, dry sheet rather than a dressing can be used to cover large surface burns. Blankets over the sheet will protect the patient from hypothermia

# Airway maintenance ...c-spine

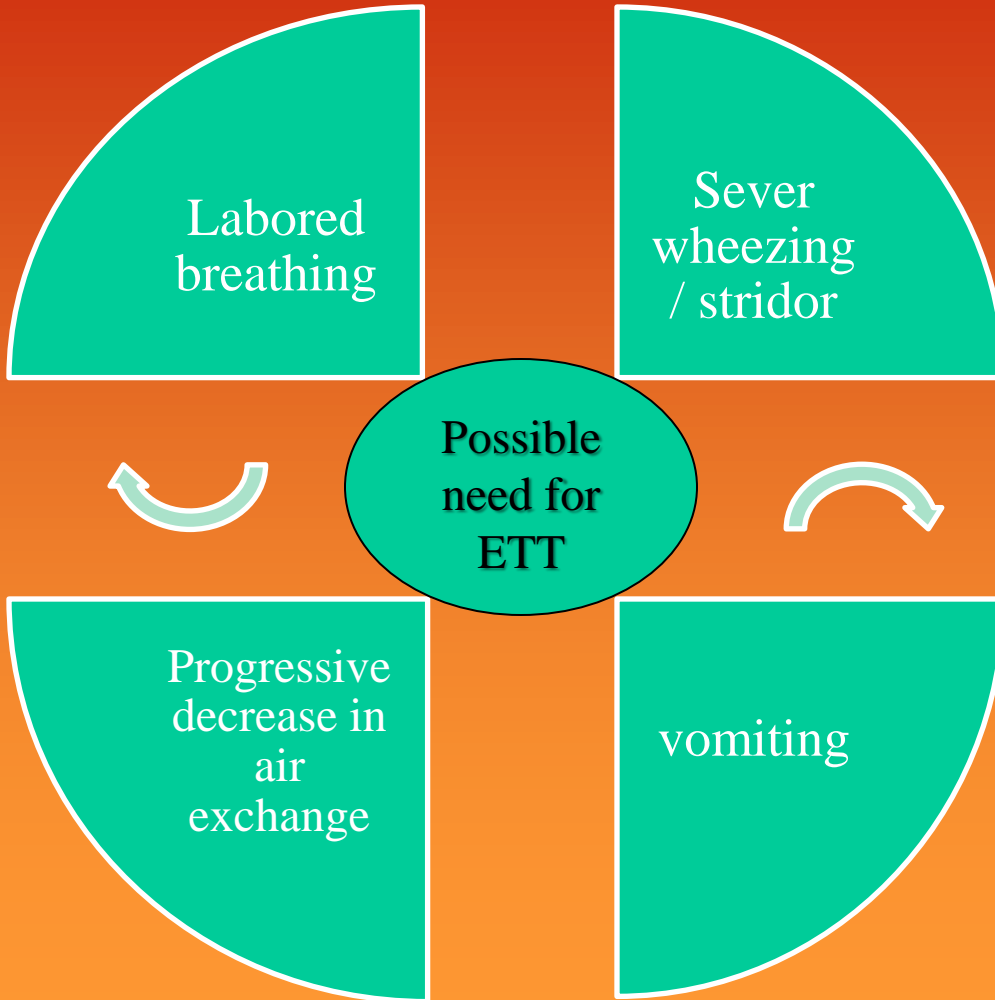




## **Indications of impending in the airway obstruction**

- Restlessness or confusion
- Blistering about the mouth
- Signed nasal hair
- Soot on tongue \ pharynx
- Carbonaceous sputum
- Excessive coughing

# Breathing



Position the PT head to allow drainage (vomiting)

Maintain airway

Do not attempt to insert NG tube

3ed degree (Chest,Abd,Neck) ...closed monitoring

# Circulation / circulation injury

.Decrease sensation  
.Diminished distal pulse  
.Slow capillary refill



Assess (brachial,  
radial, carotid)  
If no pulse, start  
CPR



Circulation may be  
impaired as a result  
of edema formation

# Disability / neurologic deficit

Begin assessment by using the AVPU method



A- level described as alert

V- responding to verbal stimuli

P- responding only to painful stimuli

U- unresponsive

*Edema formation in the extremities can impair both the venous and arterial circulation....*

# Expose & Examine

- Remove all clothing & jewelry to complete the focused and detailed physical assessment.
- Clothing adherent to the burn should be left undisrupted.
- Bleeding is not associated with burn.
- Any blood loss is a result of an associated injury and should be treated accordingly

# Fluid Resuscitation

Generalized edema formation occurs in every major burn and may contribute to morbidity.

Hypovolemia can contribute to the conversion of 2ed degree to 3ed degree burn

- ❑ The criteria for initiating (I.V.F)therapy in the field include the following:
  - Burn exceeding 20% TBSA and need greater than 60minute for transport.
  - Hypovolemic shock from associated injury.
  - Need to provide medication for life threatening ventricular dysrhythmias or to facilitate ETT.

# Associated Injuries

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## Fracture

Control of bleeding

Stabilization of fracture

Application of occlusive dressing to open wounds

## Internal injuries

Intra-Abd or intr-thoracic injury

Intensive soft tissue injury with hemorrhage

Pelvic fracture and hematoma

# Monitoring

## Vital signs

- \*Pulse on unburned extremity
- \*Blood pressure on unburned extremity

## Cardiac monitoring

- \*Dysrhythmia
- \*Hypoxia
- \*Ventricular irritability



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*Thank you for listening,  
Any Questions..?*