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ASST.PROF

ICON

BURNS

Burns is a fatal and emergency condition, needs treatment based on the degree of involvement of underlying tissues. In India 7, 00,000-8, 00,000 people sustain burn injury. The common age between 16-35 years old women reporting with burns due to unsafe kitchen and loose fitting clothes.

DEFINITION

It is an injury to the skin caused by chemicals, electricity, heat, friction and radiation

CAUSES:

List out the causes of burns

It may be caused by many external forces with varied nature. Common causes includes

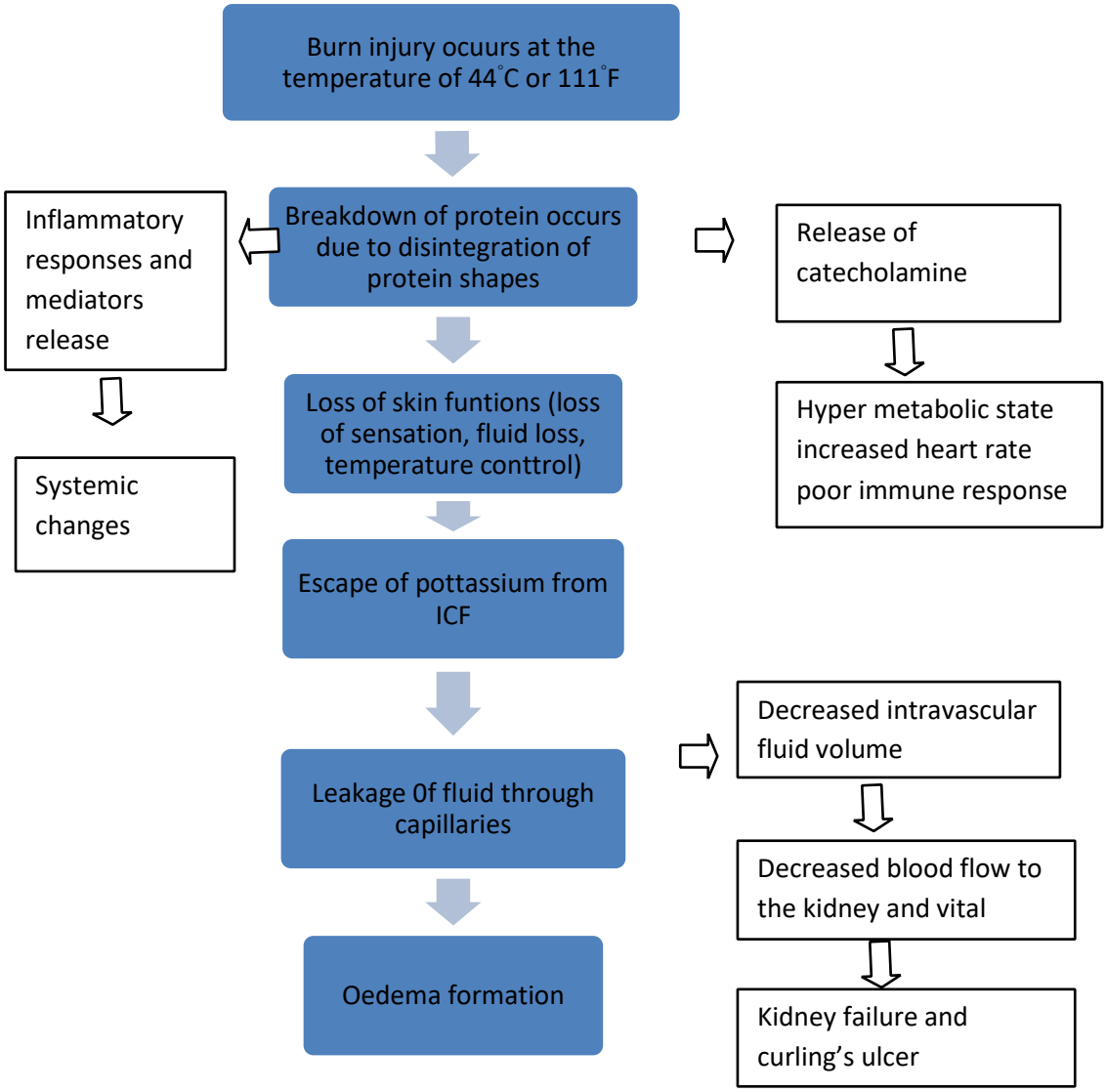
- Chemicals: Acids and alkali cause burns. Sulphuric acid(toilet cleaner), sodium hypochloride(bleach), formic acid etc.,
- Thermal : Direct heat from fire or moist heat like hot water , cooking oil are common causes of burns. Scalds results from first or second degree burns .
- Electricity: exposure to the voltage less or greater than 1000volts results in burns . Lightening can also cause burns
- Physical friction
- Radiation : prolonged exposure to ultraviolet rays from sunlight and microwave

RISK FACTORS

The burn incidence getting higher in India and in other developing country due to

- Cooking with fire hood outside
- Smoking , poor economic status
- Accidental firing
- Domestic violence
- Suicidal attempts
- Unsafe kitchen
- Wearing loose fitting clothes

PATHOPHYSIOLOGY



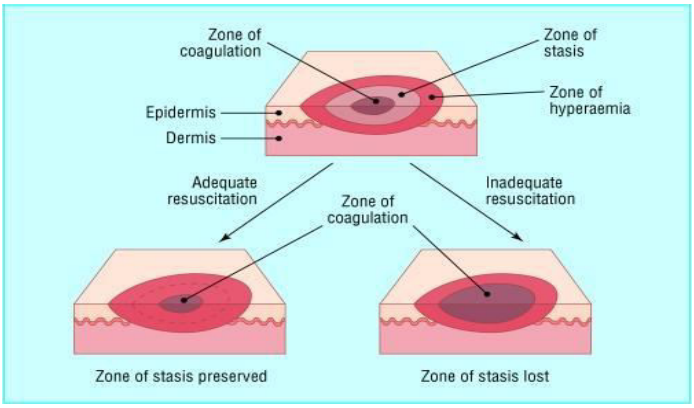
<u>Body response to burn injury:</u>

According to Jackson (1947) , three zones of responses are

Zone of Coagulation : irreversible tissue loss due to protein coagulation at the maximum damage point

Zone of stasis : tissues in this zone characterized by decreased tissue perfusion. Resuscitation with fluids prevents further irreversible death of the tissues. Infection , oedema and hypotension may increase the death of tissues in this zone which lead to deepening of the wound

Zone of Hyperaemia: tissue perfusion is increased in this zone. Hypoperfusion and infection may reduce the recovery



Systemic response to burn injury

The systemic changes brought by the cytokines and inflammatory mediators at the site of injury above 30%TBSA

Cardiovascular System

- Increased capillary permeability leads to loss of proteins and fluids from Intra vascular compartment
- Vaso constriction of Peripheral and splanchnic vessels
- Decreased myocardial contractility due to release of tumour necrosis factor
- Fluid loss from burn sound results in hypotension
- Decreased perfusion of vital organs

Respiratory System

- Adult respiratory distress syndrome resulting from bronchoconstriction by inflammatory mediators

Metabolic changes :

- Three folds increased in BMR with splanchnic hypoperfusion results in catabolism. Early enteral feeding maintain gut integrity

Renal system

- Decreased renal perfusion leads to oliguria
- Damaged RBC and myoglobin filtered through Glomerulus , get degraded and release heme pigment leads to brown colour urine

Gastrointestinal system:

- Histamine release and stress response results in curling's ulcer.
- Intra abdominal hypertension and compartment syndrome damage the gut mucosa

Neuroendocrine system

- Increased BMR to compensate hypothermia.

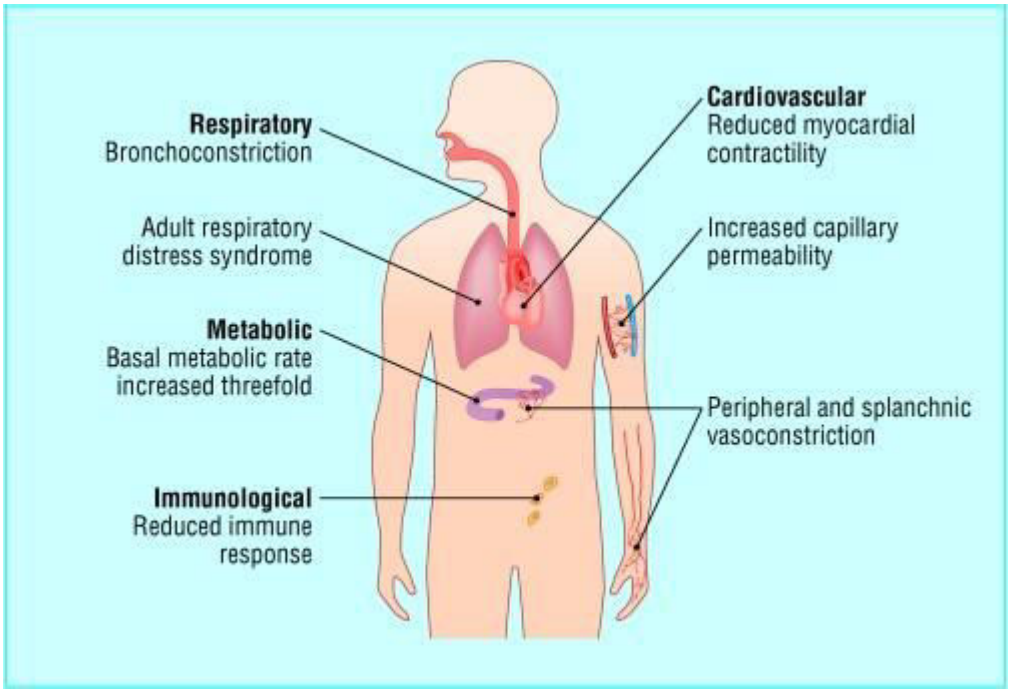
- Increased caloric needs causing catabolism and negative nitrogen balance which slows down the healing
- Increased cortisol level may cause tissue resistance to insulin leads to hyperglycemia

Immunological changes

- Poor Cell mediated and humoral immune response

CLINICAL MANIFESTATIONS

- It depends upon the degree of burns and nature of burn substance
- First degree burns: Redness of the affected area with pain
- Second degree burns : Painful, redness of the area with Blisters .Blanching while applying pressure
- Third degree burns: painless stiffness of the part, white/brown color
- Fourth degree burns : painless , black , charred with eschar



CLASSIFICATION OF BURNS

Burns classified based on the depth, mechanism of injury with involvement of associated parts.

- Superficial burns; it is first degree burns involves the epidermis layer of the skin
- Second degree: it is superficial or deep partial thickness burns involving the underlying dermis
- Third degree: it involves full dermis layer
- Fourth degree: burns involving underlying fat, muscle and bones.

Based on the severity (American Burn Severity Association Classification)

<u>Minor burns</u>

- Adult with burns <10% of Total body surface area(TBSA) with <2% full thickness of burns
- Younger or older <5% of Total body surface area(TBSA) with <2% full thickness of burns

Moderate burns

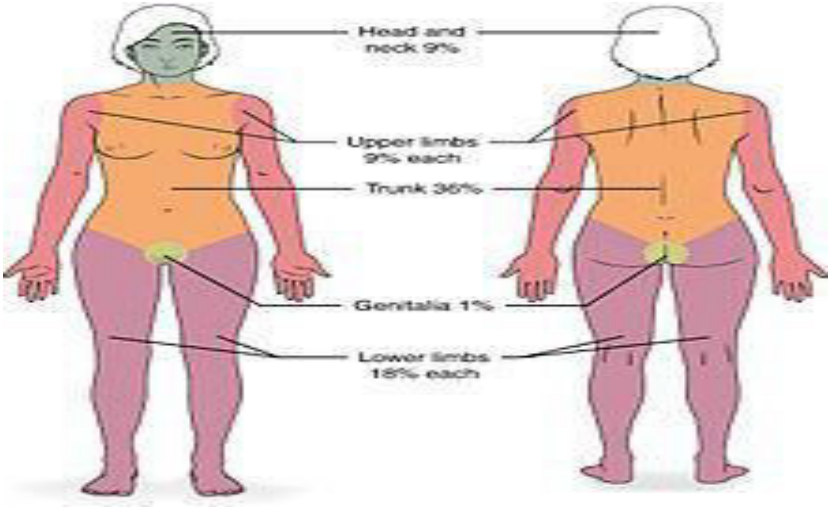
- Adult with burns 10-20% of Total body surface area(TBSA) with 2-5% full thickness of burns
- Younger or older 5-10% of Total body surface area(TBSA) with 2-5% full thickness of burns

Major burns

- Adult with burns >20% of Total body surface area(TBSA) with >5% full thickness of burns

- Younger or older >10% of Total body surface area(TBSA) with >5% full thickness of burns

Rule of Nine for burns calculation



DIAGNOSTIC TEST

- History collection about the incidence, burn materials, first aid measures attempted

- Physical Examination : Rule of nine can be used to determine the extent of burns
- Biopsy can be done to identify the organism and decide the treatment of choice.

DIAGNOSTIC TESTS FOR BURN INJURIES:

History collection:

- When obtaining the patient history, determine:
- What is the patient's chief complaint (e.g., pain, dyspnea)?
- What were the circumstances of the injury?

- Did it occur in an enclosed space?
- Were explosive forces involved?
- Were hazardous chemicals involved?
- Is there related trauma?
- What was the source of the burning agent (e.g., metal, liquid, chemical)?
- Does the patient have any significant medical history? SAMPLE
- What medication does the patient take (including recent ingestion of illegal drugs
- or alcohol)?
- Did the patient lose consciousness at any time? (Suspect inhalation injury)
- What is the status of tetanus immunization?

Physical examinations

- Obtain a complete set of vital signs
- Blood pressure should be obtained in an unburned extremity, if possible
- Patients with severe burns or preexisting cardiac or medical illness should be
- monitored by electrocardiogram (ECG)
- Determine severity of the burn
- Burn extent
- Rule of Nines
- Lund & Browder chart
- Palm method
- Burn depth

Airway with C-spine Protection

As in all trauma cases, early recognition of airway compromise followed by prompt intervention to ensure airway maintenance should be completed. If there is soot in the mouth, consider early intubation even if the patient is breathing normally. Follow ATLS guidelines and ensure the patient has a definitive airway established and continue assessments to monitor ventilation. Assessment of the airway includes

- Removing any burning agent, including chemicals.
- Inspecting for singed nasal, facial and eyebrow hairs.
- Looking for burns and edema around the head and neck.

- Determining if there are circumferential burns to the chest which may inhibit
- ventilation and require escharotomy. Breathing Determine if the patient is moving air or not. Follow ATLS guidelines.

Assessment of breathing includes:

- Auscultating breath sounds,
- Monitoring rate, depth and work of breathing, and
- Monitoring for dyspnea and stridor.

Circulation:

Monitor circulation and cardiac status with hemorrhage control. Obtain appropriate vascular access and use a device to monitor heart rate and blood pressure. Cannulate two veins with large caliber intravenous catheters and initiate warmed fluids. Avoid burned areas when possible. In large burns where the IV has been placed through burned skin, the IVs should be sutured. Insert intravenous catheters to initiate intraosseous infusion when unable to obtain vascular access. Ongoing fluid requirements are adjusted based on the individual patient's response to the resuscitation as evidenced by urinary output in addition to hemodynamic parameters.

- Assess perfusion status by the following techniques:
- Pulse check,
- Capillary refill, and
- Urinary output
- ABG analysis
- WBC count – initial increase then decrease with left shift
- Blood glucose – elevated due to stress response
- ABGs – slight hypoxemia and metabolic acidosis
- Total protein and albumin – low due to fluid loss
- CBC
- RBS,Urea and cretinine,
- ECG,
- Chest X ray

CLOTTING STUDIES:

Initial fluid shift (first 24 hr after injury)

- Hct and Hgb – elevated due to loss of fluid volume and fluid shifts into interstitial space
- (third spacing)
- Sodium – decreased due to third spacing (hyponatremia)
- Potassium – increased due to cell destruction (hyperkalemia)

- Fluid mobilization (48 to 72 hr after injury)
- Hgb and Hct – decreased due to fluid shift from interstitial space back into
- vascular fluid
- Sodium – remains decreased due to renal and wound loss
- Potassium – decreased due to renal loss and movement back into cells
- (hypokalemia)

MANAGEMENT

- First phase - Initial evaluation and resuscitation; occurs on days 1-3 and requires an accurate fluid resuscitation and thorough evaluation for other injuries and comorbid conditions
- Second phase - Initial wound excision and biologic closure; includes the maneuver that changes the natural history of the disease; this is accomplished typically by a series of staged operations that are completed during the first few days after injury
- Third phase - Definitive wound closure; involves replacement of temporary wound covers with a definitive cover; there is also closure and acute reconstruction of areas with small surface area but high complexity, such as the face and hands.
- Fourth phase - Rehabilitation, reconstruction, and reintegration; although this begins during the resuscitation period, it becomes time consuming and involved toward the end of the acute hospital stay

It requires emergency attention .

- First Aid Management
- Assess for airway, breathing and circulation
- Wash the wound with cool water if only epidermal involvement
- Wash with soap and water if it is deep partial thickness wound
- Wrap the wound with clean cloth till arrives to the hospital
- Keep the blister intact

Medical Management

- Monitor ABCDE(Aiway, Breating ,Circulation , Disability And Environment Control) and Stabilize the patient spine
    - Watch for stridor , swelling of lips and throat , circumferential neck burns , hoarseness of voice , cough
    - Watch for respiratory rate , depth, breath sounds , oxygen saturation
    - Watch for rate and rhythm of the pulse , capillary refill time, skin color, temperature
    - Use AVPU(Alert ,verbal, pain stimuli , unresponsive) scale to assess the level of consciousness, assess for hypoxia , tissue perfusion, papillary response
    - Exposure/environmental control: remove the tight clothing, jewellery, contact lenses. Cover the patient with sterile sheet to prevent further contamination
- Intubate for inhalation injury
- Insert the peripheral venous catheter

- Maintenance of fluid volume : determine the fluid recommendation for 24 hours . half isotonic solution to be given as bolus for first 8 hours, next over 16 hours

Formulas for fluid management

Parkland formula

a. Initial 24 hours: Ringer's lactated (RL) solution 4 ml/kg/% burn for adults and 3 ml/kg/% burn for children. RL solution is added for maintenance for children:
   - 4 ml/kg/hour for children weighing 0–10 kg
   - 40 ml/hour +2 ml/hour for children weighing 10–20 kg
   - 60 ml/hour + 1 ml/kg/hour for children weighing 20 kg or higher

   This formula recommends no colloid in the initial 24 hours.

b. Next 24 hours: Colloids given as 20–60% of calculated plasma volume. No crystalloids. Glucose in water is added in amounts required to maintain a urinary output of 0.5–1 ml/hour in adults and 1 ml/hour in children.

Modified Parkland formula

a. Initial 24 hours: RL 4 ml/kg/% burn (adults)
b. Next 24 hours: Begin colloid infusion of 5% albumin 0.3–1 ml/kg/% burn/16 hour

Brooke formula

a. Initial 24 hours: RL solution 1.5 ml/kg/% burn plus colloids 0.5 ml/kg/% burn plus 2000 ml glucose in water
b. Next 24 hours: RL 0.5 ml/kg/% burn, colloids 0.25 ml/kg/% burn and the same amount of glucose in water as in the first 24 hours

Modified Brooke

a. Initial 24 hours: No colloids. RL solution 2 ml/kg/% burn in adults and 3 ml/kg/% burn in children
b. Next 24 hours: Colloids at 0.3–0.5 ml/kg/% burn and no crystalloids are given. Glucose in water is added in the amounts required to maintain good urinary output.

Evans formula (1952)

a. First 24 hours: Crystalloids 1 ml/kg/% burn plus colloids at 1 ml/kg/% burn plus 2000 ml glucose in water
b. Next 24 hours: Crystalloids at 0.5 ml/kg/% burn, colloids at 0.5 ml/kg/% burn and the same amount of glucose in water as in the first 24 hours

Monafo formula

Monafo recommends using a solution containing 250 mEq Na, 150 mEq lactate and 100 mEq Cl. The amount is adjusted according to the urine output. In the following 24 hours, the solution is titrated with 1/3 normal saline according to urinary output.

Formulas developed for children

The formulas developed for children.

Shriner's cincinnati

Initial 24 hours:

a. For older children:
   Lactated Ringer's (RL) solution 4 ml/kg/% burn +1500 ml/m^2 total (1/2 of total volume over 8 hours, rest of the total volume during the following 16 hours)
b. For younger children:
   4 ml/kg/% burn +1500 ml/m^2 total, in the first 8 hours
   RL solution + 50 mEq $NaHCO_3$
   RL solution in the second 8 hours
   5% albumin in LR solution in the third 8 hours

Galveston

Initial 24 hours: RL 5000 ml/m^2 burn + 2000 ml/m^2 total (1/2 of total volume over 8 hours, rest of the total volume in 16 hours)

- Insert Indwelling catheter to monitor urinary output
- Wound care : Irrigate the wound within 30 minutes of burns with water at 10-25C(50-77F). Don't use ice water. Extensive irrigation for chemical burns
- Wound debridement and dressing the wound to prevent cross infection and further injury
- Hyperbaric Oxygen therapy

Medications:

- Antihistamines to relieve itching
- Opioids like ibuprofen and acetaminophen to relieve pain
- Calcium gluconate for hydrofluoric acid burns
- Massage and TENS for itching
- Benzodiazepines to reduce anxiety
- Use of Recombinant human growth factor to speed healing process.

Drugs name:

Sl.no	Drug name	Dose	route	action	Nursing responsibility

1.	**Ibuprofen**	**400mg**	**Oral**	**Antipyretics**	• Check that the patient is not taking any other medication containing paracetamol. • For children who may refuse medicine off a spoon try using a medicine syringe to squirt liquid slowly into the side of the child's mouth or use soluble paracetamol mixed with a drink. • Some children may be happy to take one paracetamol product but dislike the taste of another. • There are no known harmful effects when used during pregnancy.
2	cetrizine	10mg	oral	antihistamine	Assess respiratory status, such as wheeze or tightness of the chest. - Cetirizine is good at reducing rhinorrhoea and sneezing, but less effective at reducing nasal congestion. - Other products such as eyedrops and inhalers may be required to control severe hay fever.

3	Calcium glugonate	500mg	oral		• Assess for cutaneous burning sensations and peripheral vasodilation, with moderate fall in BP, during direct IV injection. • Monitor ECG during IV administration to detect evidence of hypercalcemia: decreased QT interval associated with inverted T wave. • Observe IV site closely. Extravasation may result in tissue irritation and necrosis. • Monitor for hypocalcemia and hypercalcemia (see Signs & Symptoms, Appendix F).
4	Benzodiazepines	5mg	oral	gamma-aminobutyric acid	Monitor liver and renal function, CBC during long-term therapy. Taper dosage gradually after long-term therapy, especially in epileptic patients. Arrange for epileptic patients to wear medical alert ID indicating that they are epileptics taking this medication.

Surgery:

- Escharotomy –surgical release of the skin to reduce the problems with distal circulation.
- Fasciotomy for electrical burns.
- Cosmetic and Reconstructive surgeries

  ✔ Incisional release and grafting
  ✔ Excisional release and grafting
  ✔ Z-plasty
  ✔ Random flaps

Alternative therapy:

- Use of honey over the burn wound
- Traditional herbs application

Rehabilitation

Complications of burns

- Infection of the wound if the burns >30%ofTBSA, too old or young
- Hypothermia
- Hypovolemia
- Pneumonia with inhalation injury
- Compartment Syndrome with Electrical burns and Rhabdomyolysis
- Cellulitis , urinary tract infections
- Curling's ulcer
- Respiratory and kidney failure
- Keloids formation
- Post Traumatic Stress Disorder(PTSD)
- Shock

NURSING MANAGEMENT

The nursing management should aim for the four principles in management of patients with burn injury

- Early wound care
- Prevention of Sepsis
- Adequate nutrition

- Control of external environment

Wound care

This depends upon the extent, depth, severity of the wound and associated infection

- Clean the wound daily
- Follow aseptic technique
- Cover the wound with sterile cloth
- Maintain hydration of the wound by mist theraphy

Nutritional need

The burn patient requires intensive nutritional management as earlier to prevent complications associated with poor nutrition. This aims

- 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

Interventions

- Provide nutrition via enteral route within 6 - 18 hours post burn injury to improve nitrogen balance, reduced hypermetabolic state and immunological complications
- Maintain weight within 5 % - 10 % of pre-burn weight
- Prevent signs and symptoms of micronutrient deficiency
- Minimise hyperglycaemia
- Minimise hypertriglyceridaemia
- Provide protein rich diet. Enhance 20% calories derived from protein which speeds healing process
- Provision of Vitamin A,B,C,E and Zinc to improve healing.

Hypovolemia

- The patient with >15% of burns needs fluid resuscitation to prevent shock.
- Isotonic crystalloids such as Ringer lactate , NS can be used.
- Amount of fluid infusion determined by body weight. Amount can be titrated to maintain urine output 30-50ml/hour for adults and 1ml/kg/hour in children. In electrical burn patient 75-100ml/hour.
- Monitor for vital signs , mental status ,urine specific gravity are valuable indicators
- After 8-12 hours of fluid resuscitation colloids can be given to improve oncotic pressure which reduces oedema
- Maintain intake output chart

Hypothermia

- Heat room

- Use warming air blankets
- Cover wounds to exclude air and prevent evaporative cooling with cling film.
- Use a space blanket with normal blankets over the top
- Warm intravenous fluids

Psychological

This aims at reducing the fear, anxiety and depression

Provide calm and quiet environment to promote sleep

Psychological counselling may help to get rid of the fear and anxiety

Cognitive and behavioural therapy may be helpful

Support group and peer counselling regarding the communication with burn survivors

Rehabilitation services

COSMETIC AND RECONSTRUCTIVE SURGERY

Burns is emergency condition need fluid and electrolyte stabilization. After the stabilization the wound has to be cared. The healing of wound ends with keloids and discoloured skin and formation of contractures.

DEFINITION

Operative and Non operative means of modifying or altering the scar tissues are called as reconstructive surgeries. This aims to improve the function and appearance of burn scar.

PURPOSES

- to restore the functions
- to restore the aesthetic effect

INDICATION

- Facial scarring leads to problems with the eyelids, lips, nose, or hair loss
- Scars that are abnormally thick, wide, or discoloured
- Contractures limiting the normal motion of the neck, shoulder, hands, or legs

PRECAUTION

Certain medical conditions are contraindicated for reconstructive surgeries because of

predisposed risk

- heart attack and clotting disorder
- hepatitis
- HIV infection
- Cancer
- Weight over 30%

METHODS OF RECONSTRUCTIVE SURGERY

SKIN GRAFTING : the burn wound is debrided and covered with skin to enhance function of the affected part and reduce the formation of contractures.

- ✔ **Autograft**: the skin from the non burned area of the own patient is scrapped and placed over the wound area after debridement.
  Indications :

- ✔ **Cultured Epithelial Autograft(CEA):** when there is more burned area, the biopsy specimen from the unburned area is cultured and grown the skin for grafting called as Cultured Epithelial Auto graft.
  Indications:
  Large body surface area burns
- ✔ **Artificial skin :**
  Artificial skin has two layers .Acellular dermis and silicone . it is placed over the excised wound dermal layer and wrapped with dressing. This dermal layer degrades and induce the regeneration of new dermis by the body. After 3 weeks silicone is removed by second surgery
  Indications :
  Elderly patients with high anaesthetic risk
  Deep partial burns and full thickness burns

COMMON SURGICAL PROCEDURE

Name of the surgeries	Definition
Facelift	Plastic surgery performed to remove sagging skin and wrinkles from the patient's face
Blepharoplasty	Surgical corrections of the eyelid.
Dermabrasion	technique for removing the upper layers of skin with planing wheels powered by compressed air.
Rhinoplasty	Surgery performed to change the shape of the nose.

PROCEDURE

Preoperative preparation

- Collect through medical history about the medications, allergic history

- Thorough Physical examination by surgeon for skin contour
- Outweigh benefits and complications
- Preference for Anaesthesia . General Anaethesia is most commonly preferred. Even though local anaesthesia and IV sedation can also opted
- Nil per oral 6hours prior o surgery
- Withhold aspirin one week before surgery
- Quit smoking 2weeks prior to surgery
- Education regarding the surgical outcomes , limitations in activities, precautions and followup details.

Intra operative

Non-operative therapies need collaborative approach by surgeons and occupational therapist. It involves scar massage, application of pressure garments, or other topical therapies.

Operative therapy may be performed as outpatient procedure or need inpatient treatment.

Z plasty –the scar is released and skin must be repaired with skin grafts

Post operative management

- Bolster dressing over the skin grafts for 3-5 days to enhance the graft to stick over the area
- Scar revision surgeries need small dressing over the wound
- Follow up scheduled within 2 weeks of surgery.
- Collaborative counselling with physical therapist and occupational therapist
- Body dysmorphic disorder is expected commonly due to over expectation about the surgical outcome

RISK associated with reconstructive surgeries:

General risk associated with anaesthesia are

- Pneumonia
- Wound infection
- Internal bleeding

Specific complications are

- Pain, swelling, redness over the graft area
- New scar formation
- Infection
- Rejection of the graft

REHABILITATION FOR BURNS

The burn care consists of Resuscitation, Reconstruction and Reintegration. The rehabilitation in burns should started as earlier at the resuscitation phase to prevent the development of complications which limiting the movements of the affected part. It is collaborative approach by the physiotherapist, occupational therapist, Surgeons, Psychologist and Nurses. It can started by 2 weeks of postburn and long as 7-8 months

Definition:

It is therapy for reinstituting the normal functions by preventing the formation of contractures (a condition of joint characterized by flexion and fixation) and other complications of post burn period

Goals:

- Assist the patient in resuming normal functions.
- Accomplish functional and cosmetic surgery

Indications :

Burn wound heals either by primary and secondary intention with graft. New scar tissue contains collagen which helps in wound healing. It looks flat and pink. After 4-6 weeks the area becomes raised and hyperaemic. In this stage Range of Motion exercises to be instituted to avoid shortening of the new tissues causing contractures.

Healing matures in 6months -2years, the colour fades to lighter tone, but not equal to surrounding area. Cosmetics help to even out skin colour and improves physical image.

Scarring of burns includes discoloration and contour. Contour is enlarged and elevated above the burned area. Pressure over the area can reduce the enlargement. It is advisable to wear pressure fitted garments for 24 hours except during bath.

Patient may experience itching as healing occurs. Application of moisturizers helps to relieve the symptoms. Flaking occurs with formations of new epithelium. This is more sensitive to pressure and temperature. Healed burn areas to be protected from sunlight for 6-9months to avoid hyperpigmentation and burn injury.

COMPONENTS OF REHABILITATION

- Respiratory management : should aim at removing the lung secretions, normalize breathing, preventing pneumonia
- Pain management : combined paracetamol, slow release narcotics with NSAIDs may help to reduce pain and promoting the activities and movements
- Edema management
- Positioning
- Hands on instructions regarding the wound dressing and care
- Moisturizing the skin with water based emollients must be done routinely
- Information regarding surgical measures to be given
- Exercise to prevent the contractures

- Constant encouragement and reassurance for good morale and insist that the recovery is slow
- Be sensitive to the patients emotional needs
- Provide psychological support
- Occupational modifications can be insisted
- Address the cultural needs of the patient
- Counselling the family members regarding the patient's disfigurement and their self esteem

Stages of Rehbilitation

Acute rehabilitation : it starts from the initial phase

- Passive ROM to be performed in collaboration with nurses , secure the ET tube , central catheters etc.
- Antideformity positioning and Splinting to avoid shortening of tendons and ligaments. Splinting depends upon the area of contractures. Check the splints twice daily for poor fit or over pressure
- Relationship with the patient and family members to ensure compliance

Recovering Rehabilitation:

The patient become aware of incidence and develops anxiety about the treatment outcomes. So rehabilitation aims to

- Passive ROM to be continued
- Active ROM to be increased and strengthening of muscles
- Minimize edema
- Activities of daily living (ADL) to be trained
- Scar management
- Prepare for work, play, or school

Rehabilitation at discharge:

In this phase , aims at resisted ROM, isometric exercises, active strengthening, and gait training .

Outpatient Rehabilitation

First 18months after discharge, aims at

- Identification of evolving problem areas
- Strengthening and Progressive ROM
- Specific postoperative therapy after reconstructive operations
- Scar management

Psychiatric Aspects of Recovery

Psychological health play powerful roles either helpful or destructive in a patient's physical recovery from burn injuries.

3 basic psychological stages of burn recovery, each with unique psychological implications:

- Critical illness stage of recovery
- Acute recovery phase of care
- Final stage of psychological recovery

Critical illness stage of recovery

In this stage, survival often is in doubt, and dominant psychiatric issues includes anxiety, fear, pain, delirium, sleep deprivation, and confusion.

Acute recovery phase of care

After survival is assured patients enter this phase and the intensities of surgery and intensive care diminish. It includes the noncritical remainder of acute hospitalization and is characterized by intensive physical and occupational therapy, fewer smaller surgical procedures, and the patient's growing awareness of the impact and long-term implications of burn injuries.

Patients often become depressed, and up to 30% of them experience symptoms of posttraumatic stress disorder (PTSD), such as hyperarousal, fearfulness, and sleep disturbances. Focused pharmacotherapy and individual counselling can be helpful

Final stage of psychological recovery

Psychological recovery encompasses the 1-2 years after initial hospital discharge. This time is often emotionally difficult, as patients adjust to new limitations at home and at work place

Moderate depression can be expected in many patients and may be magnified if optimal recovery potential has not been reached because of inexpert therapy. Recovery can be facilitated by a long-term therapeutic relationship.

Reintegration

Rehabilitation and reconstruction of the seriously burned patient is part of acute care. As currently defined, successful burn care requires commitment by a focused, multidisciplinary team over the continuum of care from resuscitation through reconstruction, rehabilitation, and reintegration.

The ultimate goal of all burn care is reintegration of the patient into society, and it is important not to lose sight of this goal.

PTSD is common in burn patients, so be vigilant of symptoms (eg, hyperalertness, nightmares, chronic fearfulness). Ignoring this problem compromises recovery.

Ideally, patients return to their families, schoolmates, and communities as if the injury had never occurred. Consider this goal when planning the timing and type of reconstructive operations.

The stress on families of burn patients is enormous. Family counseling and support services are important. Moreover, any help afforded to these families indirectly can aid the patient.

LEGAL ASPECTS OF BURNS

Burns occurs due to accidental or negligence. Burn trauma has suspicion of crime. The treating physician should be responsible to intimate the legal authority.

The following situations need to be notified to the police.

1. Receiving major burns.
2. Patients received dead
3. Unexplained severity, not matching with the history or circumstances
4. Mass casualties
5. Patients received after several days of burns
6. Patients received without proper treatment
7. Patients likely to succumb to the injury

As per the criminal code 39, the treating person should inform the legal authority as a citizen. In case of death, certificate of death to be issue stating the reason for the death. If cause is not clear request for medico legal post mortem through police officer.

If patient comes from distant place, the nearby police to be informed to carry out the investigation without wasting the time.

- Burn injuries in a married female:
    - If the married woman brought with burns, the police tend to mishap as a dowry problem if married lifetime is less than 10years.Unless proved with circumstantial evidence, dowry death specifies 7years of imprisonment.
- Disability and disfigurement
    - Burn disability and disfigurement causes stress and lower the self esteem and self confidence.
    - As burn specialists, we must have some understanding of the legalities of the award of disability by various competent authorities. In India, currently we have to depend mainly on the Workmen's Compensation Act of 1923 and the Motor Vehicle Insurance Act to understand the concept.

BURN SURVIVOR PLIGHT

When any earning member of the family sustains major burn injury, the entire family receives the crunch. Unlike other trauma or disease, the management of burns is long, painful and costly. The economic resources of the family get exhausted with the extent of treatment. Industrial burn accident victims are no exception. The burn survivor has to face challenges constantly even after the initial assault is over. These are listed as follows:

1. An injury that leaves one in pain
2. Physical and emotional trauma,
3. Organ damage,
4. Disfigurement,
5. Metabolic and biochemical damage and
6. Sensitivity to temperature change.

LEGAL RIGHTS OF BURN SURVIVORS TO COMPENSATION

Compensation can be claimed by the burn victim depending on the cause of the burn injury. Compensatory damages "compensate" the injured person for various kinds of losses or damages, and include current medical expenses, lost wages, anticipated future medical expenses, anticipated future loss of wages, mental or emotional pain and suffering (past and anticipated in the future), disfigurement, and any physical or mental impairment or disability.

I. Payment for treatment past and future

   Hospitalisation

   Surgical procedures

   Ongoing medical cares

   Counselling

   Scar revisions – cosmetic surgery

   Physical therapy

   Occupational therapy

II. Compensation for loss of income – past and future

III. Vocational rehabilitation (job retraining)

IV. Compensation for pain and suffering – burn survivors may be entitled to compensation for the pain and suffering that they have endured and may continue to endure as a result of their injury

V. Loss of consortium – This is a novel concept for Indian Judiciary and may soon find its place in the case laws. The spouses of a burn survivor may be entitled to compensation when an injury is so severe that it interferes with the injured party's spousal relations. The affected family member may suffer a very real detriment. Many courts recognise the right of the injured party's spouse to recover in an appropriate case for a loss of support, services, love, companionship, society, affections, sexual relations and solace in the form of a loss of consortium action. Loss of consortium is a claim separate from the injury victim's claim. It is unique to the injured party's spouse and is compensable by a separate damages recovery.

Nursing diagnosis:

- Impaired gas exchange related to carbon monoxide poisoning, smoke inhalation and upper airway obstruction.
- Ineffective airway clearance related to edema and effect of smoke inhalation.

- Pain related to tissue injury and emotional impact of injury
- Fluid volume deficit related to increased capillary permeability and evaporative losses from the burn wound.
- Impaired Nutrition: Less Than Body Requirements R/T hyper metabolic response to burns injury.

Assessment	Diagnosis	Goal	Interventions	Rational	Evaluation
Subjective data: The patient complaints of not able to breathe properly.	Impaired gas exchange related to carbon monoxide poisoning, smoke inhalation and upper airway obstruction.	Maintenance of adequate tissue oxygenation	Assess breath sound and respiratory rate, rhythm, depth and symmetry.	These factors provide baseline data for further assessment and evidence of increasing respiratory compromise.	After using following Interventions patients gas exchange is improved
Objective data: Patient feels tired, discomfort and restlessness.				Monitor the patient for signs of hypoxia (anxiousness, Tachypnea, and tachycardia).	Helps to identify respiratory status.
				Provide humidified oxygen	Humidified oxygen provides moisture to injured tissues; supplemental oxygen increases alveolar oxygenation.
				Monitor arterial blood gas values, pulse oximetry readings, and carboxyhemoglobin levels.	Increasing PCO, and decreasing PO, and O2 saturation may indicate need for mechanical ventilation.
				Prepare to assist with intubation and escharotomies.	Intubation allows mechanical ventilation. Escharotomy enables chest excursion in circumferential chest burns.

				Monitor mechanically ventilated patient closely.	Monitoring allows early detection of decreasing respiratory status or complications of mechanical ventilation.

Assessment	Diagnosis	Goal	Interventions	Rational	Evaluation
Subjective data: The patient complaints of not able to breathe properly.	Ineffective airway clearance related to edema and effect of smoke inhalation. I	Maintain patent airway and adequate airway clearance.	Maintain patent airway through proper patient positioning, removal of secretions and artificial airway if needed.	A patent airway is crucial to respiration.	After using following Interventions patients airway patency is improved
Objective data: Patient feels tired, discomfort and restlessness.			Provide humidified oxygen.	Humidified oxygen provides moisture to injured tissues; supplemental oxygen increases alveolar oxygenation. Humidity liquefies secretions and facilitates expectoration.	

			Encourage deep breathing, turning, coughing and incentive spirometry (may use sigh control on ventilator as needed). Place patient semiFowler'sposition to permit maximal chest excursions if there are contraindications, such as hypotension or trauma. Suction as needed.	These activities promote mobilization and removal of secretions.	
Assessment	Diagnosis	Goal	Interventions	Rational	Evaluation
Subjective data: The patient complaints of severe pain.	Pain related to tissue injury and emotional impact of injury	Relieving pain	Assess the level of pain by using pain intensity scale.	Pain level provides baseline for evaluating effectiveness of pain relief measures.	After using following Interventions patients pain is reduced.
Objective data: Patient feels severe pain seen through facial expression.			Administer IV opioids analgesics as prescribed. Common opioids used include morphine, fentanyl,	These can be administered by I.V. drip, patient-controlled analgesia (PCA), or enterally as well as orally	

			Administer analgesics before wound care or before particularly painful treatments. Analgesia given orally before is given 30 to 45 minutes before the procedure. Ketamine I.V. is more commonly used	Helps to reduce pain level.	
			Teach relaxation techniques, such as imagery, breathing exercises, and progressive muscle relaxation	Help the patient cope with pain.	

Assessment	Diagnosis	Goal	Interventions	Rational
Subjective data: The patient complaints of thrusting.	Fluid volume deficit related to increased capillary permeability and evaporative losses from the burn wound. .	Restoration of optimal fluid and electrolyte balance	Monitor vital signs, including apical pulse, respirations, central venous pressure, pulmonary in artery pressures, and urine output at least hourly and be alert for signs of hypovolemia or fluid overload.	Hypovolemia is a major risk immediately after the burn injury. Over resuscitation might cause fluid overload.

Objective data: Patient will be looks dulls and decrease in output.			Assess urine output at least hourly and weigh patient daily	Output and weight provide information about renal perfusion, adequacy of fluid replacement, and fluid requirement and fluid status. Maintain accurate intake and output records
			Maintain IV lines and regulate fluids at appropriate rate, as prescribed.	Adequate fluids are necessary to maintain fluid and electrolyte balance and perfusion of vital organs.
			Observe for symptoms of deficiency or excess of serum sodium, potassium, calcium, phosphorus and bicarbonate.	Rapid shifts in fluid and electrolyte status are possible in the post burn period.
			Elevate head of patient's bed and elevate burned extremities	For venous return

Assessment	Diagnosis	Goal	Interventions	Rational	Evaluation
Subjective data: The patient complaints of not able to eat properly.	Impaired Nutrition: Less Than Body Requirements R/T hyper metabolic response to burns injury. .	Ensure adequate nutrition	Weigh the patient daily with dressings removed. These measures assist in determining whether dietary needs are being met.	These measures assist in determining whether dietary needs are being met	After using following Interventions patients nutritional status is maintained.

Objective data: Patient weight was reduced.			Provide nasogastric (NG) tube feedings as prescribed, using caution to prevent aspiration by checking tube placement before each feeding and checking amount of gastric aspirate.	Nutritional techniques ensure that nutritional needs are met.	
			Administer vitamins and mineral supplements as prescribed.	These help meet additional nutritional needs; adequate vitamins and minerals are necessary for wound healing and cellular function.	
			Obtain consultation from dietitian for calculation of nutritional needs based on age, weight, height, and burn size. Two of the more popular formulas used to estimate nutritional needs are the Harrison-Benedict And Curari formulas.	Increased metabolic requirements	