Burns

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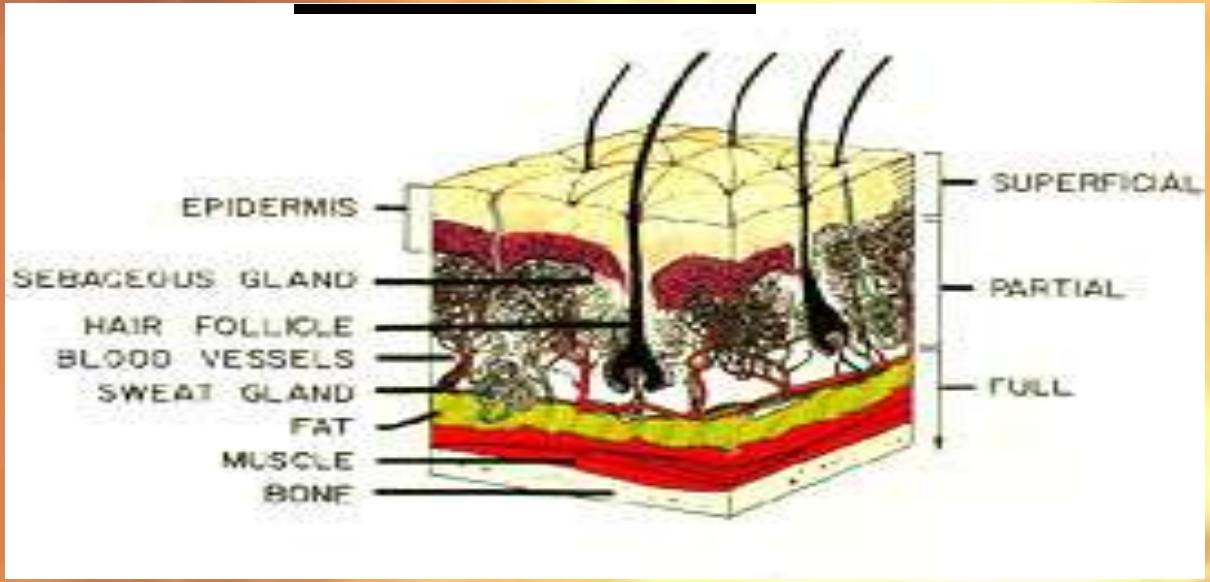
THE SKIN



The skin, the largest organ of the body, consists of two layers-the epidermis and dermis. The depth or degree of burn depends on which layers of skin are damaged or destroyed. The epidermis is the outer layer that forms the protective covering. The thicker or inner layer of the dermis contains blood vessels, hair follicles, nerve endings, sweat and sebaceous glands. When the dermis is destroyed, so are the nerve endings that allow a person to feel pain, temperature, and tactile sensation.

The most important function of the skin is to act as a barrier against infection. The skin prevents loss of body fluids, thus preventing dehydration. The skin also regulates the body temperature by controlling the amount of evaporation of fluids from the sweat glands. The skin serves a cosmetic effect by giving the body shape.

When the skin is burned, these functions are impaired or lost completely. The severity of the skin injury depends upon the size of the injury, depth of the wound, part of the body injured, age of the patient, and past medical history. Because of the importance of the skin, it becomes clear that injury can be traumatic and life threatening. Recovery from burn injury involves four major aspects: burn wound management, physical therapy, nutrition, and emotional support.

DEFINITION

- A burn is a wound in which there is coagulative necrosis of the tissue caused by heat.

- Burns never occur at temperatures less than 44*C.

PATHOPHYSIOLOGY

- The immediate effect of a burn is the destruction of the protective skin area.
- This leads to serious disruption of homeostasis as a result of increased capillary permeability, diffusion of vascular components into the extravascular tissue, imbalance of electrolytes & diminished blood volume.

PATHOPHYSIOLOGY…

- During the 48 hours immediately following the injury the patient must be monitored closely for signs of burn shock.
- The insult begins with destruction of the epidermis, the outer most layer of the skin, eliminating the body's barrier to water evaporation and allowing fluid loss.
- The greatest loss of fluid, electrolytes, and protein, however, is caused by volume shifts from the intravascular to the extravascular compartment secondary to an increase in capillary permeability.

PATHOPHYSIOLOGY…

- Heat effects and the release of vasoactive substances from the injured area add to this increase in permeability also known as capillary leaking.
- The resulting fluid shifts are directly proportional to the depth and extent of the burn.
- It is important to keep in mind that all burns are not alike.The first determination in caring for the burned patient is to determine the severity of the burn.
- Treatment/fluid therapy is going to be directly related to severity.

BURN SEVERITY

Severity is based on :-

- Size of the burn.
- Depth of the burn.
- Individual's age & past medical history.
- Part of the body that has been burned.
- The size of the burn is expressed as a percentage of total body area.

RULE OF NINES

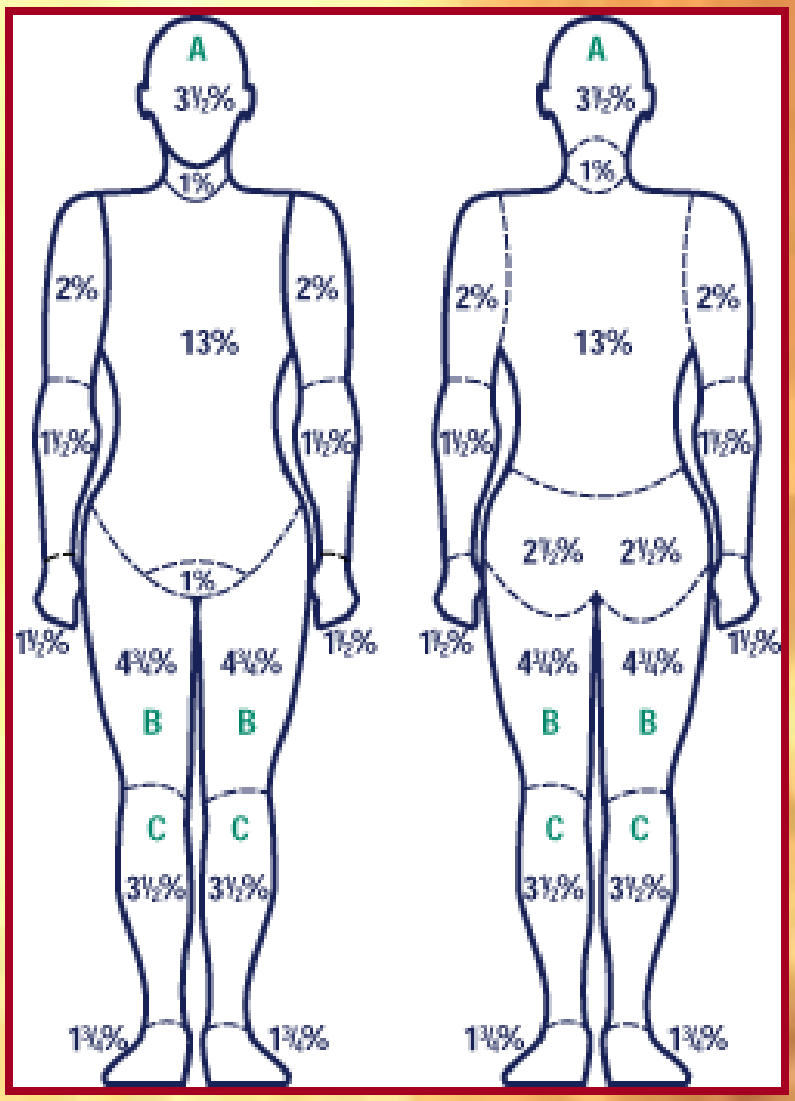
- Here the body is divided into portions totaling 100%.

  Advantage of using Rule of Nines :-

- Fairly rapid, easy.
- No charts required.

  Disadvantage :-

- It is fairly inaccurate, especially when dealing with children because it doesn't allow for body proportion differences.



DEPTH OF A BURN

- Will be dependent on the temp. & the duration of contact .

- Expressed in terms of 1st, 2nd or 3rd degree which is the older method & is presently known as Full thickness or partial thickness.

Classification of Burns

Superficial

Superficial partial-thickness

Deep partial-thickness

Full-thickness

SUPERFICIAL

- Very painful, dry, red burns which blanch with pressure.
- They usually take 3 to 7 days to heal without scarring.
- Also known as first-degree burns.
- The most common type of first-degree burn is sunburn.
- First-degree burns are limited to the epidermis, or upper layers of skin.

SUPERFICIAL PARCIAL- THICKNESS

- Very painful burns sensitive to temperature change and air exposure.
- More commonly referred to as second-degree burns.
- Typically, they blister and are moist, red, weeping burns which blanch with pressure.
- They heal in 7 to 21 days.
- Scarring is usually confined to changes in skin pigment.

DEEP PARTIAL- THICKNESS

- Blistering or easily unroofed burns which are wet or waxy dry, and are painful to pressure.
- Their color may range from patchy, cheesy white to red, and they do not blanch with pressure.
- They take over 21 days to heal and scarring may be severe.
- It is sometimes difficult to differentiate these burns from full-thickness burns.

FULL - THICKNESS

- **Burns which cause the skin to be waxy white to a charred black and tend to be painless.**
- **Healing is very slow.**
- **May require skin grafting.**
- **Severe scarring usually occurs.**

Age of the Patient

- Patients less than 2 yrs. old or those over 60 yrs. old tend to have a higher mortality rate.
- Infants tend to have a very poor antibody response & fluid requirements can be very tricky with them.
- Older patients may have illnesses that are either present or latent.
- Once a burn injury is sustained the illnesses are exacerbated and complicate the situation.

Parts Of The Body

- Burns of the head, neck, & chest can lead to a higher incidence of respiratory problems.
- Assess for signs of respiratory distress such as coughing or bronchospasm.
- Burns of the neck are prone to contractures.These patients are usually not given a pillow or made to lie flat with a towel roll under the neck.
- Burns of the perineum are very susceptible to infection.

Complications of Burns

Common Complications :-

- Septicemia (can occur at any time during convalescence)
- Renal Failure
- Pneumonia
- Heart disease
- Metabolic Complications
- Diabetes (Stress Diabetes)
- Curling's Ulcer (A stress ulcer specific to burns)
- Adrenocortical insufficiency

TREATMENT

1. **Treatment should begin immediately to cool the area of the burn. This will help alleviate pain.**
2. **For deep partial-thickness burns or full- thickness burns, begin immediate plans to transport the victim to competent medical care. For any burn involving the face, hands, feet, or completely around an extremity, or deep burns; immediate medical care should be sought. Not all burns require immediate physician care but should be evaluated within 3-5 days.**
3. **Remove any hot or burned clothing.**

TREATMENT…

4. Use cool (54 degree F.) saline solution to cool the area for 15-30 minutes. Avoid ice or freezing the injured tissue. Be certain to maintain the victim's body temperature while treating the burn.

5. Wash the area thoroughly with plain soap and water. Dry the area with a clean towel. Ruptured blisters should be removed, but the management of clean, intact blisters is controversial. You should not attempt to manage blisters but should seek competent medical help.

6. If immediate medical care is unavailable or unnecessary, antibiotic ointment may be applied after thorough cleaning and before the clean gauze dressing is applied.

Emergency Treatment for Burns

- Eliminate the heat source - Stop the burning process.
- Immerse the burned part in water, not ice water.
- Smoldering clothing should be removed if it is not adherent to the skin.
- Cover individual with a clean blanket or sheet.
- If it is a chemical burn flush the area with copious amounts of water.
- Can be made to stand in the shower for 20 min.
- Do not apply any greases or ointment to the burned area.

Emergency Treatment of Burns…

- Maintain an open airway.
- Suspect inhalation injury if any.
- The burn occurred in an enclosed area.
- Facial or chest burns.
- Exposure to noxious fumes.
- Observe for darkened mucosa in the mouth, red, swollen, mucosa.
- Assess nose for singed nasal hair.This can also be fairly indicative for inhalation injury.
- Assess for any hoarseness, sneezing, coughing.Can also indicate respiratory damage.

First Aid Measures

- Maintain a patient airway.
- Stop any bleeding.
- Treat shock.
- Not all go into burned shock but do anticipate it.
- Assess Respiratory Function.If congested, have the patient cough to clear respiratory passages.

Fluid Therapy

- Fluid therapy is the most important aspect of initial care for the burned patient during the emergent period.

  A severe burn causes many systemic changes.
- The most significant is A FLUID SHIFT.
- When burns occur there is a change in the distribution of body fluid.
- The amount of change is going to be dependent on the severity of the burn.
- With prolonged exposure to heat capillaries are damaged & they become permeable to fluid.
- They let fluid leak out of the capillaries & into the interstitial spaces resulting in edema and blister.

Fluid Therapy…

- The fluid leak, which is caused by increased capillary permeability continues for 24 to48 hrs. post burn.
- It will be during this 1st 24 to 48 hrs. that hypovolemic shock will be a risk.
- In full thickness burns, where the skin is like leather, the fluid actually does not escape the body.It is still retained, but it cannot be mobilized.
- After 48 hrs. the capillaries tend to heal & the fluid is remobilized back into the intravascular space.

Fluid Therapy…

- Fluid requirements are going to be determined by the area & the depth of the burn.
- Fluids that are used during this period will usually be.

  Lactated Ringers because of it's electrolyte concentration.
- Albumin will pull that fluid in the interstitial spaces in the intervascular.
- Whole blood is usually not given because plasma is being lost, not whole blood.
- THE PURPOSE OF FLUID THERAPY THE lST 24 to 48 HRS. IS TO PREVENT HYPOVOLEMIC.

Fluid Therapy…

Indications for Fluid Therapy :-

- Total Burn over 20%.
- Age: Less than 2 yrs. old or greater than 60 yrs. old.
- Titration of fluid Therapy.:-

  1) urine output ql hr. (between 30 to 60 cc/hr.).

  2) pulse q l hr.

  3) B/P q 1 hr.

  4) CVP.

Fluid Therapy…

- Formulas for Fluid Replacement :-

  Evans Formula.

- Colloids 1 ml./kg. of body wt/%/burn.
- Physiologic Saline 1 ml/kg. of b. wt./% of burn.
- H20 Dependent on age & insensible loss.
- 1/2 of total is given the 1st 8 hrs. and the remainder given the next 16 hrs.

Fluid Therapy…

Brooke Formula.

- Colloids .5 ml/kg/% of body surface burned.
- Lactated Ringers 1.5 ml/% of body wt/% burn.
- H20 Again dependent.
- 1/2 total amount given 1st 8 hrs.
- 1/4 of total the 2nd 8 hrs. 1/4 the third 8 hrs.

Assessment in Emergent/resuscitative Phase

- Focus and monitor ABC's.
- Vital signs.
- Peripheral pulses on burned extremeties.
- Monitor fluid intake and output.
- Body temperature,tetanus, past medical problems.

Interventions – Emergent/resuscitative Phase

- Promote gas exchange and airway clearance
- 02, turning, deep breathing, positioning
- Restore fluid and electrolyte balance
- Elevate burned extremities
- Maintain body temperature
- Heat lamps, blankets
- Minimize pain and anxiety
- IV analgesics
- Emotional support to patient and family

Interventions – Emergent/resuscitative Phase…

- Manage potential complications
- ABC
- Shock
- Renal failure
- Curlings Ulcer
- Antacids
- Histamine blockers

Wound Care

- Cleanse the wound & decrease any dead tissue & debris. Dead tissue & debris serve as a wonderful medium for bacterial growth).
- Prevent further destruction of viable skin.
- Begin preparation for a suitable grafting surface.
- Burned tissue develops Eschar (debris, dead tissue & remnants that collect on the surface of the burned area and has a whitish color).
- Before healing can take place, all of the eschar has to be removed.

Pain Relief

- It is of extreme importance.
- Partial thickness burns are extremely painful.
- Analgesics are always given IV (IM will probably not be absorbed).
- Morphine Sulfate is the drug of choice.
- Trend is to give patients continuous Morphine drip as they have a much better response.

Medications

Sulphamylon. :-

- Also effective against a wide range of bacteria, especially pseudomonas & staph.
- It is very easy to apply but it tends to be very painful & some patients complain that it burns for 15 to 16 min. after application.
- It also tends to cause metabolic acidosis.

Medications…

Silver Nitrate. :-

- Not used much any more.
- It is a liquid & requires the use of moist dressing.
- The dressings have to stay wet all of the time.
- If dressing are allowed to dry out, it further burns the skin & increases the damage that's already been done.
- Another side effect is it turns everything brown that it comes in contact with.

Choosing Candidates for Early Excision

- Any patient with burns that will take longer than three weeks to heal is considered for early excision.
- The type, extent, and location of the burn are also important.
- Excision of flat surfaces of the trunk, the arms and legs and abdomen yields the best results.
- The final decision depends on the depth of injury, the patient reponse to resuscitation, and contraindications to surgery and general anesthesia.

Closing the Burn Wound

- The best cover for a wound is the patient's own skin.
- Patients with major burns, may not have enough intact skin to serve as donor sites.
- Sometimes a small piece of skin can be meshed and expanded to cover the wound.
- Grafts can be of full thickness or split thickness.
- Full thickness grafts are more cosmetically pleasing. Split thickness grafts can cover a larger area.

Biologic Dressings

- Fresh skin from a human cadaver (homograft or allograft) is considered the best biologic substitute.
- Clean burns can be covered with homograft at the bedside or in the operating room after excision.
- The graft adheres to the wound's surface and becomes vascularized.
- It may remain in place for approximation - three to five weeks.
- In addition to providing temporary coverage, homograft can tell the likelihood of successful autografting

Biologic Dressings…

- Heterografting refers to transferring tissue between two different species.
- Pig skin is used most often.
- Frozen pigskin is less likely than fresh to be rejected but raises the risk of infection.Therefore an antimicrobial dressing may be applied.
- Heterografts may be removed every three to four days so the wound can be cleansed and evaluated.

Pig skin has many advantages. :-

- It is readily available, easily stored, and easy to apply and remove.
- It adheres well to the wound, limits pain, and prevents the loss of fluid, electrolytes, and heat.

Biologic Dressings…

Biobrane :-

- It is a biosynthetic material meets many of the requirements of an ideal skin substitute.
- It is elastic, durable, and relatively inexpensive.
- Can be stored indefinitely and can be left on for 60-80 days.

Nutrition

- Requires a tremendous amount of calories.
- Are placed on a high cal, high protein, high carbo and fat diet with vitamin supplements.
- With severe full thickness wounds there is an extremely high rate of metabolism because the body is trying to heal a wound it is literally incapable of doing.
- It is important to keep them in nitrogen balance.
- Foods & drinks containing Vit. C are good because Vitamin C aids in collagen formation.

Emotional Aspects of Burn Injury

Special considerations

Scalding-typically result from hot water, grease, oil or tar. Immersion scalds tend to be worse than spills, because the contact with the hot solution is longer. They tend to be deep and severe and should be evaluated by a physician. Cooking oil or tar (especially from the "mother pot") tends to be full-thickness requiring prolonged medical care.

a. Remove the person from the heat source.

b. Remove any wet clothing which is retaining heat.

c. With tar burns, after cooling, the tar should be removed by repeated applications of petroleum ointment and dressing every 2 hours.

Special considerations

Flame

a. Remove the person from the source of the heat.

b. If clothes are burning, make the person lie down to keep smoke away from their face.

c. Use water, blanket or roll the person on the ground to smother the flames.

d. Once the burning has stopped, remove the clothing.

e. Manage the persons airway, as anyone with a flame burn should be considered to have an inhalation injury.

Special considerations

Electrical burns: are thermal injuries resulting from high intensity heat. The skin injury area may appear small, but the underlying tissue damage may be extensive. Additionally, there may be brain or heart damage or musculoskeletal injuries associated with the electrical injuries.

a. Safely remove the person from the source of the electricity. Do not become a victim.

Special considerations

b. Check their Airway, Breathing and Circulation and if necessary begin CPR using an AED (Automatic External Defibrillator) if available and EMS is not present. If the victim is breathing, place them on their side to prevent airway obstruction.

c. Due to the possibility of vertebrae injury secondary to intense muscle contraction, you should use spinal injury precautions during resuscitation.

d. Elevate legs to 45 degrees if possible.

e. Keep the victim warm until EMS arrives.

Special considerations

Chemical burns- Most often caused by strong acids or alkalis. Unlike thermal burns, they can cause progressive injury until the agent is inactivated.

a. Flush the injured area with a copious amount of water while at the scene of the incident. Don’t delay or waste time looking for or using a neutralizing agent. These may in fact worsen the injury by producing heat or causing direct injury themselves.

दग्ध व्रण

तत्र स्निग्धं रूक्षं वाऽऽश्रित्य द्रव्यमग्निर्दहति ; अग्निसन्तप्तो हि स्नेहः सूक्ष्मसिरानुसारित्वा त्वगादीननुप्रविश्याशु दहति ; तस्मात् स्नेहदग्धेऽधिका रुजो भवन्ति ॥

Burn is due to the heat of any media,either dry or wet.

The liquids at high temperature burn the skin etc rapidly as they penetrate along the minute pores , hence burn caused by liquid media are more painful.

SIGNS OF BURNS

तत्र द्विविधम् अग्निकर्महुरेके त्वग्दग्धं मांसदग्धं च
इह तु सिरास्नायुसन्ध्यस्थिष्वपि न प्रतिषिद्धोऽग्निः ।

According to some, burn is of two types – skin and muscular.

But sushruthacharya has explained about the signs of burn of vessels, ligaments, joints and bones.

Skin burn :-

- तत्र शब्दप्रादुर्भावो दुर्गन्धता त्वक् सङ्कोचश्च त्वग्दग्धे ।

Muscle burn :-

- कपोतवर्णताऽल्पश्वयथु वेदना शुष्कसङ्कुचितव्रणता च मांसदग्धे ।

Bone and Joint burn :-

- कृष्णोन्नतव्रणता स्रावसन्निरोधश्च सिरास्नायुदग्धे रूक्षारुणता कर्कशस्थिरव्रणता च सन्धि अस्थिदग्धे ।

TYPES OF BURN

तत्र प्लुष्टं दुर्दग्धं सम्यग्दग्धमतिदग्धं चेति चतुर्विधमग्निदग्धम्।

- तत्र यद्विवर्ण प्लुष्यतेऽतिमात्रं तत् प्लुष्टं ।

  There will be discolouration and excessive shrinking of skin.
- यत्रोत्तिष्टन्तिस्फोटास्तीव्राश्चोष दाह राग पाक वेदनाश्चिराच्चोपशाम्यन्ति तत् दुर्दग्धम् ।
- There will be, formation of blisters, excessive sucking pain, burning sensation, redness, inflammation and it takes long time to subside.

सम्यग्दग्धं अनवगाढं तालफलवर्णं सुसंस्थितं पूर्वलक्षणयुक्तं च ।

Here the burn is not very deep, having colour of palm fruit.

अतिदग्धे मांसावलम्बनं गात्रविश्लेषः सिरास्नायुसन्ध्यस्थि
व्यापादनमतिमात्रं ज्वरदाहपिपासामूर्च्छाश्चोपद्रवा भवन्ति ।
व्रणश्चास्य चिरेण रोहति रूढश्च विवर्णो भवन्ति ॥

There is hanging of muscles, disorganization of the affected part, severe distruction of vessels, nerves, bones and joints is seen associated with fever, burning, thirst and unconsciousness.It takes a long time to heal.

PATHOGENESIS OF BURN

अग्नि कोपितं रक्तं भृशं जन्तोः प्रकुप्यति ।
ततस्तेनैव वेगेन पितमस्य भ्युदीर्यते ।
तुल्यवीर्य उभे ह्येते रसतो द्रव्यतस्तथा ।
तेनास्य वेदनास्तीव्राः प्रकृत्या च विदह्यते ।
स्फोटाः शीघ्रं प्रजायन्ते ज्वरस्तृष्णा च बाधते ॥

Due to heat of burn there will be vitiation of rakta and pitta, both being similar in potency cause severe pain, burning sensation, blister formation along with fever and thirst.

MANAGEMENT OF BURN

प्लुष्टस्याग्निप्रतपनं कार्यम् उष्णं तथा औषधम् ।
शरीरे स्विन्नभूयिष्टे स्विन्नं भवति शोणितम् ॥
प्रकृत्या ह्युदकं शीतं स्कन्दयत्यतिशोणितम् ।
तस्मात् सुखयति उष्णं न तु शीतं कथंचन ॥

Here the shrinken skin should be warmed and medicines having heating effects are applied.

शीतामुष्णां च दुर्दग्धे क्रियां कुर्य्याद् भिषक् पुनः
घृतालेपन सेकांस्तु शीतानेवास्य कारयेत् ।

Here both heating and cooling should be done.The application of ghee(cold) and sprinkling of cold water should be done.

- सम्यग्दधे तुगाक्षीरीप्लक्ष चन्दनगैरिकैः ।
  सामृतैः सर्पिषा स्निग्धैरालेपं कारयेद्भिषक् ॥
  ग्राम्यानूपौदकै पिष्टैर्मासैः प्रलेपयेत् ।
  पित्तविद्रधिवच्चैनं संततोष्मणमाचरेत् ॥

Here an ointment made up of तुगाक्षीरी , प्लक्ष चन्दन , गैरिक should be mixed with ghee and applied.

Paste made out of flesh of ग्राम्यानूपौदकै animals should be applied.

Further manage it simillar to that of pittaja vidradhi.

- अतिदग्धे विशीर्णानि मांसान्युद्धृत्य शीतलाम् ।
  क्रियां कुर्य्याद् भिषक् पश्चात् शालि तण्डुलकन्डनैः ॥
  तिन्दुकीत्वक्कषायैर्वा घृतमिश्रैः प्रलेपयेत् ।
  व्रणं गुडूचीपत्रैर्वा छादयेदथवौदकैः ॥
  क्रियां च निखिलां कुर्याद्भिषक् पित्तविसर्पवत् ॥

Here the excessively burnt muscle is excised and then cooling should be done.

The powder of rice mixed with pieces of the bark of tinduka or with ghee and is applied.

The wound should be covered with leaves of guduchi or by aquatic plants.

Further manage it simillar to that of pittaja visarpa.

OINTMENT – FOR ALL TYPE OF BURNS :-

- मधूच्छिष्टं समधुकं रोध्रं सर्जरसं तथा ।
  मञ्जिष्ठां चन्दनं मूर्वां पिष्ट्वा सर्पिर्विपाचयेत् ।
  सर्वेषामग्निदग्धानामेद्रोपणमुत्तमम् ॥
- It is the paste prepared by powder of मधूच्छिष्ट , मधुक , रोध्र , सर्जरस , मञ्जिष्ठा , चन्दन , मूर्वा cooked with ghee.

TREATMENT OF SCALDS :-

स्नेहदग्धे क्रियां रुक्षां विशेषेणावचारयेत् ।

Here dry treatment should be adopted.

HEAT STROKE –FROST BITE – LIGHTNING BURNS

- उष्णवातातपैर्दग्धे शीतः कार्य्यो विधिः सदा ।
  शीतवर्षानिलैर्दग्धे स्निग्धमुष्णं च शस्यते ॥
  तथाऽतितेजसा दग्धे सिद्धिर्नास्ति कथञ्चन ।
  इन्द्रवज्राग्निदग्धेऽपि जीवति प्रतिकारयेत् ।
  स्नेहाभ्यङ्गपरिषेकैः प्रदेहैश्च तथा भिषक् ॥

In persons afflicted by hot winds and sunstroke – cooling treatment should be adopted.

In frost bite – hot & oily applications.

In lightning burns – if one survives, स्नेहाभ्यङ्ग , परिषेक , प्रदेह should be adopted.

Conclusion

Burns are serious injuries. If you have received a burn injury, please seek appropriate medical attention.


THANK U::::