

**RAJIV GANDHI INSTITUTE OF MEDICAL SCIENCES :: ONGOLE  
PRAKASAM DISTRICT**

\* \* \*

The C.M.E. Programme is conducted in RIMS., Ongole on 23.07.2013 between 9.00 A.M. to 4.00 P.M.

**Speaker:** Dr.K.C.T. Naik,  
Associate Professor of Surgery.

**Chairman:** Dr.T. Rama Prasad,  
Professor of Surgery.

**Co-Chairman:** Dr.D. Lokanadham,  
Associate Professor of Surgery.

**Topic:** **ASSESSMENT, TRIAGE, AND EARLY MANAGEMENT OF  
BURNS IN CHILDREN**

**Introduction:** Burns is one of the commonest pediatric surgical emergency. It causes pain, misery, and shattered dreams of the burnt child. Burns may be suicidal, homicidal and accidental. When a person is unable to achieve the required thing in his life, he ends his life by committing suicide either by pouring kerosene or petrol. Suicide means, he is crying for help. When help is not within his reach, he tries to die by burns. Burns is one of the cruelest way of either committing suicide or it may be homicide. If the person survives, it means that he is dying every day because it causes so much of disfigurement.

The knowledge of physiologic functions of the skin, the modern burn classification system, and to discuss the early management of burns in children is very important to decrease the not only the mortality but also the morbidity.

**Human skin and its functions**

The skin, also known as the cutis or integument, is the largest and one of the most complex organs in the human body. Skin provides structural support and serves important immune and thermoregulatory functions

In children, the total body surface area is more and the skin is thinner than in adults.

It is composed of 3 distinct layers: The epidermis, dermis, and subcutaneous fat.

1. **Epidermis:** It is the outermost layer consisting of stratified squamous epithelial cells known as keratinocytes. It serves as primary protection against the entry of foreign matter and infectious agents, and minimizes heat and moisture loss from the body.

Because the epidermis is avascular, nutrients and oxygen are received from the dermis.

Keratinocytes within the epidermis undergo a continuous process of proliferation, maturation, and cell death.

During wound healing, epithelial cells migrate to the surface to help close wounds.

## 2. Dermis:

The dermis is the most physiologically active and most important for wound healing. Fibroblasts are the principle cells in this layer. They secrete collagen and elastin, which provide tensile strength elasticity to the skin.

Other important structural components of dermis are; fibronectin, tenascin, proteoglycans, and glycosaminoglycans are interwoven with the collagen lattice.

Blood vessels, lymphatic channels, nerves, sebaceous and sweat glands, hair follicles, cytokines, and growth factors.

Hair follicles does not extend beyond dermis, it is an important marker to determining burn depth and is used clinically to estimate the potential for wound healing.

Dermal components are critical for wound healing.

### Estimation of Burns

There are 3 ways of estimation of burns

#### 2. Lund – Browder chart

Anatomic Region	Age (y)				
	0-1	1-4	5-9	10- 15	Adult
Head	19	17	13	10	7
Neck	2	2	2	2	2
Anterior trunk	13	13	13	13	13
Posterior trunk	13	13	13	13	13
Right buttock	2.5	2.5	2.5	2.5	2.5
Left buttock	2.5	2.5	2.5	2.5	2.5
Genitalia	1	1	1	1	1
Right upper arm	4	4	4	4	4
Left upper arm	4	4	4	4	4
Right lower arm	3	3	3	3	3
Left lower arm	3	3	3	3	3
Right hand	2.5	2.5	2.5	2.5	2.5
Left hand	2.5	2.5	2.5	2.5	2.5
Right thigh	5.5	6.5	8.5	8.5	9.5
Left thigh	5.5	6.5	8.5	8.5	9.5
Right leg	5	5	5.5	6	7
Left leg	5	5	5.5	6	7
Right foot	3.5	3.5	3.5	3.5	3.5
Left foot	3.5	3.5	3.5	3.5	3.5

#### 3. Wallace's Rule of nine:

In children over 12 years of age and adults , burn wounds are estimated by using 'rule of nine'.

According to this rule: Head and neck	9%
Each upper extremity:	9%
Each lower extremity :	18%
Each Anterior and posterior trunk:	18%
Genitalia	1%

**4. Rule of Five: Lynch and Blocker developed a formula for estimating the extent of burns in children**

According to this rule :	Head and neck:	20%
	Anterior trunk	20%
	Posterior trunk	20%
	Each limb 10% ; 4 limbs:	40%

**5. Estimating the burn depth:**

- a) **Superficial:** A superficial burn is a burn of minor severity that affects only the epidermis and has the typical appearance of erythema without bullous formation, much like a sun burn. The injured skin is pink or red in appearance and painful, but there is no blister formation. Normally, a superficial burn heals within 1 week.
  - b) **Partial thickness :** A partial thickness burn extends through the epidermis and into the dermis.  
Depending upon depth, it is characterized as a superficial partial thickness, middermal, or deep partial thickness injury.  
Most partial thickness burns in children are caused by flame and scald injury.
- Superficial partial thickness burn is usually pink or red; deeper burns are characterized by a white or yellow appearance. Blister formation is the hallmark and helps distinguish a superficial burn from a partial thickness injury. Blisters are often present in a superficial partial thickness or middermal burn, but less often present in a deeper injury. A partial thickness burn can be very painful because nerve endings are injured.
  - Surgical debridement is necessary to remove the blisters and devitalized skin, and to allow accurate wound assessment. A superficial partial thickness and middermal burns heal within 2 to 3 weeks with local wound care.
  - Fullthickness burns : A full thickness burn extends through the entire depth of the dermis

In children, full thickness burns, usually result from flame injury, prolonged contact burns with hot surfaces. Deep burns can easily occur in children because the skin is much thinner than that of an adult.

The burnt area is white, yellow, brown, or black in appearance. There may be severe oedema, but there are no blisters and the pain may be minimal.

Most wounds require excision of the eschar and placement of a skin graft.

**a) Deep full Thickness:**

A deep full thickness ( subdermal ) burn is the most severe and extends through all layers of the skin in to underlying fascia and muscle with potential for tendon and bone damage.

In children, most of the injuries occur during house fires in which there is prolonged contact with flames.

Treatment requires immediate hospitalization at a burn center, appropriate fluid resuscitation, debridement of the wound and placement of temporary wound coverage to protect against infection and reduce inflammatory response.

A skin graft is ultimately required, and occasionally, a musculocutaneous flap is necessary for permanent wound coverage. Survival can be accompanied by significant functional and cosmetic impairment.

## Management

1. **Airway management:** Airway is the first priority in the management of a burn injured child particularly in inhalation injury, and facial and neck burns.
2. **Circulation and Fluid Resuscitation;** After assessment of the airway and respiratory status, fluid resuscitation is the next priority in the initial stages.

Calculation of fluid administration:

Parkland's formula: 4ml/Kg/ % of TBSA burn for first 24 hours.

Brooke formula: 2ml/Kg/ % of TBSA burn.

Normally, Parkland's formula is used

Fluid of choice: Ringer lactate

Mode of administration: Half of the fluid is given in first 8 hours and the remaining half is given in next 16 hours.

No. of drops / minute: Amount of fluid for 1 hour/ 3

Amount of fluid in next 24 hours: Half of the fluid to be given in next 24 hours.

The fluid can be considered is dextrose saline

Note: Ultimately, age- appropriate urine output ( 1-2 ml/Kg/h ) is the best marker for successful fluid resuscitation.

## 2. Topical Antimicrobial Agents

Traditionally burn care consists of topical antimicrobial agents applied to a burn that has been debrided of devitalized skin. These are useful to limit colonization and prevent infection because bacterial overgrowth and infection retard wound healing.

Three topical ointments are available: Bacitracin, silversulfadiazine and mefanide acetate. Among the three, silver sulfadiazine is preferred which is having wide spectrum of activity.

## 3. Skin substitute to be used

### Modern burn classification system

Burn depth	Colour	Appearance	Pain	Treatment
Superficial	Pink	(-) Blisters (-) Eschar	Mild	Analgesic & moisturizer
Superficial partial	Red	(+) Blisters	Moderate to severe	Topical antimicrobial
Deep partial	Red, white, yellow	(+/-) Blisters (+/-) Eschar	mild to moderate	Topical antimicrobial; may require skin graft
Full	Brown, black	(-) Blisters (+) Eschar	None	Topical antimicrobial;
Deep full ( subdermal)	Black	(-) Blisters (+) Eschar	None	Topical antimicrobial; skin graft or flap

- : absent; + : Present; +/- ; present or absent