BURNS

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BURNS

- DEF→ Is a tissue injury by thermal application- heat or cold or absorption of chemical energy or chemical contact. Each has distinct features & Mx problems.
- INTRODUCTION→

o Emergency condition may be lethal

o Medicolegal case- suicidal, homicidal,accidenta

o Creates a scene of tension- Due to suddenness of accident, pain, visibility of damage, fear & reduction of onlookers.

BURNS cont….

- APPROACH TO BURNS PT→
  - Assess pt condition with ass inj- polytrauma, head inj, cervical inj, other inj
  - ABC Mx-Emergency Mx
  - Detailed history of mech of burns as soon as possible
  - Assess depth & extent
  - Assess laryngeal oedema
  - Def Mx

ASSESSMENT OF AREA –EXTENT OF BURNS

- RULE OF 9

- Head & neck -9%, Front-2x9%,

Back-2x9%, UL-9% each(2x9),

LL-2x9% each (4x9), Perinium-1%== 100%

- LIMITATION→Not appl to infants & children

(* at 1 yr age head & neck constitutes 18% while each leg 14%), so WALLACE gave-pt's hand constitutes app 1%

APPLICATION→1. adult>20% & child>10% BSA require iv fluid replacement

2. Prognosis- if age+% of burns=100, its 100 % fatal. So a child can survive better with larger areas of burns as compared to old

ASSESSMENT OF DEPTH OF BURNS

- FACTORS AFFECTING→
  - Temp of burning agent
  - Mode of transmission of heat
  - Duration of contact

- SKIN ANATOMY→
  - Epidermis-stratum cornuem, granulosum, lucidum, venerum, basale
  - Dermis-papillary & reticular- hair follicles, sebaceous & sweat glands, capillaries & nerves

ASSESSMENT OF DEPTH OF BURNS cont..

- SUPERFICIAL BURNS (PARTIAL THICKNESS)→ can heal with epithelization alone without scar formation with pigmentation sometimes
  - Epidermal =1*→ red, painful, no blisters
  - Superficial dermal = 2* mild→ painful, blisters +nt

- DEEP BURNS→All adnexal structures are lost, healing by 2* intension with scarring.
  - Deep dermal = 2* sever→ blistered, blochy red, no capillary return on pressure, -nt pin prick sensation
  - Full thickness = 3*→ white or charred, -nt pin prick sensation & ESCHAR-denatured contracted dermis in charred layer

ASSESSMENT OF DEPTH OF BURNS cont..

- 1*→ Microscopic destruction of sup layers of epidermis. Hyperemia & oedema= no fluid loss, heals without scarring
- 2*→ Entire thickness of epidermis lost, hallmark-vesicles/blebs/blisters
  - Mild-superficial dermal
  - Sever-deep dermal

MECHANISM OF INJURY

- FLAME BURNS (ORDINARY)→
  - Settings- house fires, cloth fires, butane gas fires, splits of petrol on skin. ? Clothings are ignited or burnt away or not
  - Result- 2-3* burns
  - Imp- occurs in confined space so inhalational inj

- SCALDS→hot liquid=water or steam, temp=100*c constant, so duration & volume matters
  - Settings- accidental in children & drunk, hot water, tea, coffee, milk, vapour in industries
  - Result- 2* burns over face, neck, trunk, UL, LL

- FAT BURNS→
  - cooking oil temp is 180*c & it cools slowly
  - Result- deep burns 3*

MECHANISM OF INJURY

- ELECTRIC BURNS→ Passage of electric current causes heating of tissues– cellular damage

H=I2XRXt (I-current, R-resistance, t-duration of contact

Blood vessels, nerves, RBCs, muscles are good conductors- so directly damaged. Bone is bad conductors-so heated-damages surrounding soft tissue

- LOW VOLTAGE CURRENT <1000 V (domestic Supply-240v, 50 Hz)→ significant contact wounds & cardiac arrest but notdeep tissue damage
- HIGH VOLTAGE CURRENT > 1000V→ causes damage by
  - Flash- From an arc, causes cutaneous burns & ingnite clothing, but no deep damage
  - Current transmission- Cutaneous entry & exit wounds & deep tissue damage

MECHANISM OF INJURY cont..

- LIGHTING STRIKES→ High voltage very short duration

Direct strike- high mortality

Side strike- sup burns to skin & deep exit burns to feet, may be ass with resp damage & cardiac arrest

- BAR FIRE BURNS→ Child Grips Unguarded Element Of Electric Fire- Inj By Heat Alone

- FRICTION BURNS→ Tissue damage by heat+abrasion. Usually sup wounds mqy progress to deep burns. May be ass with degloving inj

MECHANISM OF INJURY cont..

- CHEMICAL BURNS→
  - Damage depends upon nature, strength, quantity of chemical & durtion of contact
  - Settings- domestic, industrial
  - Result- Inflammation, tissue necosis, systemic effects=liver, kidney etc.- formic, tannic, picric acids
  - Rx- neutralize with running water

- IONIZING RADIATION→
  - Settings- X-irradiation in medical & industrial
  - Short tem- tissue necrosis, limited area
  - Long term- Cumulative effects- skin cancers

MECHANISM OF INJURY cont..

- COLD INJURY→
- Freezing Injury–
  - Industrial setup, liquid N2
  - Direct cell damage- partial & full thickness damage
- Frostbite--
  - Prolonged exposure to cold (mountain regions or arctic conditions→ freezing+ vasospasm→Ischemic damage

CLASSIFICATION OF BURNS

TYPE OF BURN	TISSUE INJURY
Scalds	Partial thickness/ deep dermal skin loss
Fat burns	Usually full thickness skin loss
Flame burns	Patches of full & partial thickness
Electric burns	Full thickness with deep extensions
Cold injury	Ice formation, tissue freezing, vasospasm
Friction burns	Heat+ abrasion
Ionizing radiation	Early tissue necrosis, later dysplastic changes
Chemical burn	Inflammation, tissue necrosis, systemic effects

EFFECTS OF BURNS

- LOCAL→

- TISSUE DAMAGE→
  - Direct cell rupture & necrosis
  - Denaturation of collagen
  - Capillary- Thrombosis- ischemia OR > permeability- oedema, blister

- INFLAMMATION→
  - Mild- Lewis triple response, mild erythema resolves in few hours
  - Sever- prolonged inflammation- acute inflammatory- cell infiltration- < infection

- INFECTION→
  - Sets within 24-48 hrs
  - Local, regional, metastatic, septicemia
  - Organisms- staphylococci, streptococci, pseudomonas

EFFECTS OF BURNS cont…

- REGIONAL→ Circulatory compromise
  - Direct damage to large vessels- high voltage electric current
  - Venous compromise by oedema or eschar– compartment syndrome– vokemen's contracture, claw hand

- SYSTEMIC→
  - FLUID LOSS– external, internal, local, regional, whole body due to SIRS
  - MODS/ MOSF– due to– hypovolemic shock, infection, SIRS. Organs affected- kidney, liver, heart

EFFECTS OF BURNS cont…

- INHALATIONAL INJURIES→
- UPPER RESP TRACT– stridor, cough, hoarseness of voice
- LOWER RESP TRACT– Inhalation of products of combustion→ chemical burns to trachea & lungs as well as CO, HCN poisoning→ ards, resp failure, hypoxia

- SYSTEMIC EFFECTS→
- Curlings ulcer- haematemesis
- Immunosupression
- Weight loss
- UTI- indwelling catheter
- DVT & Pulmonary embolism

CLINICAL FEATURES OF BURNS INJURY

- PAIN→
  - Superficial Burns- Immediate, acute, intense
  - Deep burns- little pain

- ACUTE ANXIETY→ Distress, run about in pain or escape– secondary injury

- FLUID LOSS & DEHYDRATION→ immediate- ^ PR, hypovolemic shock

- LOCAL TISSUE OEDEMA→

  Superficial Burns- Blister, Deep burns- oedema in subcu→ swelling in head & neck= resp obstruction, limb oedema= circulatory compromise

CLINICAL FEATURES OF BURNS INJURY cont..

- SPECIAL SITES→
  - Eyes- common in explosion inj & chemical burns, uncommon with house fires
  - Nose, mouth & upper airway- in inhalational inj

- COMA→ common in house fires, causes are Asphyxia, head inj, CO or CYANIDE poisioning

INVESTIGATIONS IN A BURNS PATIENT

- CBC- inf
- HAEMATOCRIT- ^ in hypovolemic shock
- BG, CM- may need plasma as colloid or BT if ass inj
- BLOOD GASES, ELECTROLYTES- may be altered due to shock, asphyxia, acute renal failure
- LFT, RFT- MODS & MOSF
- X- RAY CHEST- ARDS, inf
- ECG- cardiac arrest in electric burns, MOSF

INVESTIGATIONS IN A BURNS PATIENT

- URINE R/M & C/S- ARF, UTI
- PUS C/S- local wound inf & Ab selection
- HIV, HBsAG- pre-operative escharectomy, skin grafting
- USG- for ass inj

Mx OF BURNS- FIRST AID

- STOP BURNING PROCESS
  - Flame- fire extinguishers, fire blanket, bystender's own clothing
  - Electric current- switch off electric supply
  - Chemical- stop chemical flow in industrial set up

- COOL BURN SURFACE→ Irrigation with running cold water, water jug temp 8-25* c pref 15* or milk. Avoid hypothermia- no ice or ice water.

- WRAP BURN→ in clean linen or plastic cling film & transfer to hospital

Mx OF BURNS- EMERGENCY

- SEDATION→ for pain & anxiety or ass inj

  Adult- morphin or pethidine(* causes vasodilatation)

  children- phenobarbitone

  head inj- phenytoin (* less resp depression)

- ESCHARECTOMY→ For circumferential scars causing circulatory compro

Mx OF BURNS- EMERGENCY cont…

- A= AIRWAY→ maintain patency—remove foreign body from mouth, nose, pharynx. Extend neck. Give O2 by ventury mask 6 lit/min
- B= BREATHING→ IPPV or Endotracheal intubation in inhalational inj or tracheostomy if needed
- C= CIRCULATION→ Hypovolemic shock, cardiogenic shock, psychogenic shock
- D= DISABILITY→ Neurological or peripheral #s
- E= EXPOSURE IN CONTROLLED ENVIRONMENT→ Avoid hypothermia
- F= FLUID RESUSCITATION & DIURETICS

Mx OF BURNS- EMERGENCY cont…

- F= FLUID RESUSCITATION→

- INDICATIONS→ Adults > 15%, child > 10%

- REQUIREMENT→ Venesection if no periferal veins accessible, wide bored needle or canula

- CHOICE OF FLUID→
  - BT- Indicated only in > 20% full thickness & > 40% partial thickness

  - COLLOIDS- plasma volume expanders, better restoration of C. O., better reperfusion
    - Natural- CPP, SDP, FFP, ALBUMINE
    - Synthetic- DEXTRAN, GELATIN, HES- hydroxy ehyle starch

  - CRYSTALLOIS- Remain in circulation for shorter than colloids
    - NS, RL, 5% D

SYNTHETIC COLLOIDS

- DEXTRAN→
  - Polysaccharide MW 40,000-1,50,000
  - 1 gm dextran binds 20 ml of water while 1 gm albumin binds 14 ml water
  - Adv- < RBC slugging- ^ perfusion
  - Disadv--

. Dist with BG, CM

. ^ Rouleaux formation if > 1 lit used

. Interfres with platelet fn

  - HMW= DEXTRAN 70= MW 70,000
  - LMW= DEXTRAN 40= RHEOMACRODEX= MW 40,000

- GELATINE→ MW 20,000-40,000, 2nd preferred agent, Duration- 4 hrs

- HES→ MW 60000-450000, Duration- 6 hrs

Mx OF BURNS- EMERGENCY cont…

- F= FLUID RESUSCITATION
- DOSE→

3-4 ml/ kg/ % burns in first 24 hrs.

½ of this in 1st 8 hrs & rest ½ in next 16 hrs.

Keep UOP 30-50 ml/hr

- DIURETICS→

o Indications→

1. ^ haemochromogen load due to- electric burns, mechanical inj, deep burns involving muscles
2. No response to fluid therapy to keep UOP- 75-100 ml/ hr

o Drugs→

1. Mannitol- 1 amp (12.5 gm) in each lit of fluid
2. Lasix- 40-50 mg iv stat repeated 4 hrly

Mx OF BURNS- EMERGENCY cont… F= FLUID RESUSCITATION→ DOSE

FORMULA	RL	NS	DEXTROSE 5%	PLASMAEXPANDER / 1/2 OF BLOOD
MOORE'S				
1ST 24 HOUR	1-4 LITRE	1 LITRE	1.5-5 LITRE	7.5% of body weight
2ND 24 HOUR	1-4 LITRE	1 LITRE	1.5-5 LITRE	2.5 % of body weight
EVAN'S				
1ST 24 HOUR	-	1M L /KG /%	2 LITRE	1ML/KG/%
2ND 24 HOUR	-	½ ML /KG /%	2LITRE	1/2ML/KG/%
BROOKE'S				
1ST 24 HOUR	1.5ML /KG /%	-	2 LITRE	0.5 ML/KG /%
2ND 24 HOUR	½ TO 3/4 OF ABOVE	-	2 LITRE	½ OF ABOVE

Mx OF BURNS
CRITERIA FOR HOSPITALIZATION

- AGE- Children or elderly
- ETIO- Electric, Chemical burns
- SITE- Face, hands, feet, perinium, genitalia
- AREA OF BURNS- >15% in adult, >10% in child
- DEPTH OF BURNS- >5% body SA full thickness burns
- Circumferential chest/ limb burns
- ASSCIATED CONDITIONS- Medical, pregnancy, polytrauma

Mx OF BURNS- GENERAL Rx

- TETANUS PROPHYLAXIS→
  - 0.5 ml tetanus toxoid.
  - If booster given > 10 yrs, add 250-500 units of tetanus human immunoglobulin

- ANTIBIOTICS→
  - Prophylactic antibiotics started within 24 hr of burns (after 2 hrs tissue becomes relatively avascular)
  - Choice- against gram +ve & -ve both, broad spectrum= penicillin+ gentamycin or cefotaxime+ amikacin
  - Purpose- To prevent
    - bacterial colonization on burns wound
    - Bronchopneumonia, UTI, Septicemia
    - Before debridement of wound

Mx OF BURNS- GENERAL Rx

- NUTRTIONAL SUPPORT→
- Burns is a catabolic state b'coz ^ BMR, ^ C.O.
- Calorie req is almost double in > 50% burns pt
- Calorie req of 40% burns is 2000 cal/ day/m2 SA
- Routes- Oral, RT feeding, Parenteral- if diarrhea or ileus= AA & fat emulsions

- GASTRIC DECOMPRESSION→ WHY ?
- Curling's ulcer in >20% burns
- Haemorrhagic gastritis
- Aspiration pneumonia
- Paralytic ileus
- Rx→ RT aspiration, H2 blockers- cimetidine, ranitidine etc.
- If bld- Medical & surgical Mx

Mx OF BURNS- LOCAL Rx

- BURN WOUND CARE

- Exposure method→
  - Head, face, neck, trunk
  - Topical antiseptic applied 12 hrly
  - 1% betadine, silvadine=SSD, 0.5% silver nitrate, sulfamylon (*pseudomonas)

- Closure method→ 3 layer dressing

  - Inner layer-
    - Non- adherent= oil based tulles, water based cream, vaseline gauze &
    - antiseptic= chlorhexidine, soframycin, nitrofurazone, 0.5% silver nitrate

  - Middle layer- gauze pad= to absorb secretions

  - Outer layer- roller bandage= to keep dressings in place, protect from dust, cosmetic look

- WOUND EXCISION-if deep infection, ESCHARECTOMY, FASCITOMY – to lay open compartment

Mx OF BURNS- LOCAL Rx cont..

- PHYSIOLOGICAL/ BIOLOGICAL DRESSING→ Heterografts- cadeveric skin, porcine skin applied to burns wound till it is ready for STG

- SYNTHETIC SKIN SUBSTITUTES→
  - Polymers of polyvinyle alcohol, bilaminate membranes, polyurethane foam, collagen films
  - Advantages—
    - Prevents Infection
    - Reduces pain
    - Protects granulation tissue
    - Protects nerves, muscles, tendons
    - Preserves joint fn

Mx OF BURNS- LOCAL Rx cont..

- SKIN GRAFTING→

- Pre-requisites→
  - Wound covered with finely granular red granulation tissue
  - Bacterial count < 100000/ sq cm of wound
  - Absence of non-viable tissue

- Types→
- STG- Taken well
- Mesh expanded graft-
  - to cover larger area with smaller graft
  - not cosmetic & can't tolerate tension,so not used on face, jts, flexers
- FTG- Good cosmetic result

Mx OF BURNS- LOCAL Rx cont..

- WOUND EXCISION & EARLY GRAFTING→
- Tangential excisions layer by layer till viable tissue with fresh capillary bleeding seen
- Adv→
  - Better cosmetic results
  - < infection
  - < pain
  - < hospitalization
- Disadv→
  - Stress
  - surgery
  - anaesthesia

Mx OF BURNS- MOBILIZATION & REHABILITATION PHYSIOTHERAPY

- EXERCISES-
  - Reduces systemic complications- DVT, Pulm embolism
  - Prevents joint stiffness, contacture
  - Reduces oedema

- SPLINTS- in anticontracture position during sleep

Mx OF BURNS- SURGICAL RECONSTRUCTION

- Hypertrophic Scar, Keloid & Linear Contractures→
- Prevention- Lycra garments, topical silicon sheeting
- Surgical reconstruction-
  - Y-v or z plasty
  - Tissue expansion
  - Grafting after excision
  - Flap surgery