BURN INJURIES IN NEONATES ADMITTED IN CHITTAGONG MEDICAL COLLEGE HOSPITAL

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Summary

Although burns are rare in neonates, in our country we see quite a number of neonatal burns and we are presenting our experience. All records of neonatal burns, from January 2005 to December 2009 were reviewed. Causes, Types, Extent, Management and Outcomes were analyzed. Total patients were 47. Male female ratio was 1:1.04. Superficial burns were eight(17%) patients , superficial dermal 19(40%), deep dermal 15(32%), and full thickness five(11%). Twenty nine(61.7%) patients had scald and 18 (38.03%) flame burn. The body surface area burned ranged from 5% to 75%. 30 patients (63.8%) had less than 10% burn and 17 (36.17%) were more than 10% burn. Four (8.5%) patients died [> 30%], due to septicaemia and multi- organ failure. 15(31.91%) patients developed burn contracture, depigmentation of the burnt area. We conclude that most burns in neonate are <10% and so preventable, besides early refferal and proper management can reduce mortality.

Keywords: Burn; neonate; scald; flame burn

Introduction

Sustaining a burn injury during one's lifetime is almost a universally shared experience. Neonates are more vulnerable due to their immature homeostatic and immune mechanism. Frequently, even a small lesion - a minor injury can lead to sepsis, which is often lethal at this age[1]. Common causes of burn are heat, electricity, chemicals, light, radiation or friction[2]. Besides epidermal tissue and dermis, deeper tissues, such as muscle, bone, and blood vessels can also be injured by burn. Burns causes intolerable pain and can result in disfiguring and scarring. Complications of Burn are shock, infection, multiple organ dysfunction syndrome, acute renal failure, electrolyte imbalance and adult respiratory distress syndrome.

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Degree of burn predicts prognosis[2]. The aim of this study was to find out the degree and factors relating to burn in neonates and to see mortality and morbidity of such less severe burn in a group of hospitalized patients.

Materials and methods

This cross sectional descriptive study was done in the department of Pediatric Surgery, Chittagong Medical College Hospital. All records of neonatal burns, from January 2005 to December 2009 were reviewed. Cause, Types, Extent, Management and Outcomes were analyzed.

All the patients received 1) I/ V Hartman's solution, 2) Oxygen inhalation for 24 to 48 hours, 3) Heparin nebulisation for 48 hours, 4) Antibiotics [I/Vamoxycillin, cloxacillin], 5) Analgesics [paracetamol / diclofenac sodium suppository], 6) Body surface area cleaned by normal saline/plain water, 54 degree Farenheight for 15 to 20 minutes and 7) Thereafter the surface area covered by 1% silver sulphadiazine and then closed by burn pad dressing, 8) Hb%, wound swab for culture and sensitivity were done weekly, 9) Multidisciplinary team [Pediatric Surgeon,Plastic Surgeon, Orthopaedic Surgeon, Ophthalmologist, ENT Surgeon] were involved.10) Removal of necrotic tissue and autograft as early as possible.For the sake of safety and security of the neonates, all neonates were treated with heparin nebulisation.In our ward, antibiotic protocol is intravenos amoxycillin and cloxacillin but when patient develops septicaemia we change according to swab c/s, blood c/s.

All patients upto 28 days of age receiving burn injuries were included. Patients above 28 days of age having burn injuries and Patients party unwilling to give conscent were excluded.

Results

We treated 47 neonatal burns, male 23 and female 24, male:female was 1:1.04, of which 29(61.7%), suffered scald. Cause was due to a) traditional heating of body surface by direct contact of hot materials (7), b) mosquito net catch fire from kupi (hurricane, kerosene lamp,etc.) were(11), c) hot water bathing (6), d) during transfer of pan, containing food cooked materials in hot liquids(13), e) use of hot water bottles to increase the temperature in the incubator(3), f) use of hot water bottles without an incubator (4), g) flame burns as housing and cooking were in the same room(3).

Fig 1 : Neonatal burn

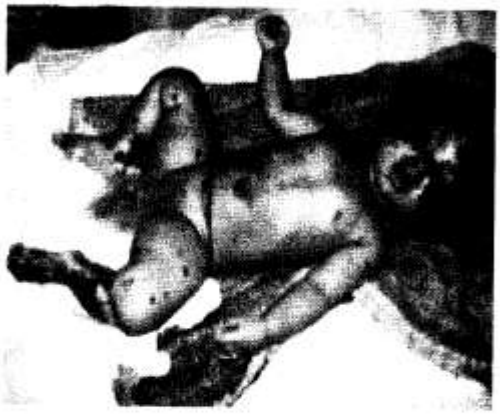

Fig 2 : Neonatal burn

Table I: Causes of neonatal burn (n=47)

Cause	Number	Percentage
Direct contact of hot materials	7	14.89%
Mosquito net catch fire	11	23.40%
Hot water bath	6	12.77%
Cooked hot food materials	13	27.65%
Hot water bottle (in incubator)	3	6.38%
Hot water bottle(not in incubator)	4	8.51%
Flame burn	3	6.38%

Out of 47 patients, 30 patients (63.8%)were less than 10% burn and 17 (36.17%) were more than 10% burn.

Table II : Percentage of total body surface area(TBSA) burnt (n=47)

Percentage of burn	Number	Percentage
<10% TBSA	30	63.8%
10-19% TBSA	9	19.15%
20-29% TBSA	4	8.51%
30-39% TBSA	2	4.26%
40-49% TBSA	1	2.13%
50% and above TBSA	1	2.13%

Superficial burns were 8(17%) patients, superficial dermal were 19(40%), deep dermal were 15(32%), and full thickness were 5(11%) in no.

Table III: Depth of Burn (n=47)

Depth of burn	Number	Percentage
Superficial	8	17%
Superficial dermal	19	40%
Deep dermal	15	32%
Full thickness	5	11%

The body surface area burned range from 5% to 75%.All patients were survived except 04(8.5%) and those were more than 30% burn,15(31.91%) patients suffered some sort of deformity like burn contracture of fingers,toes, neck,elbow knee, depigmentation, etc.Death were due to septicaemia, DIC, Cardiorespiratory failure, Renal failure.

Discussion

Burns are among the most excruciatingly painful physical injuries. Even a relatively minor burn can be intensely painful. A burn occurs when the skin, and often other bodily organs come in contact with heat, radiation, electricity or chemicals for a period long enough to cause damage. A burn injury most commonly results from the transfer of heat energy from a burning source to the skin. Human tissue cells are intolerant to temperature rises, and cellular damage in the form of protein coagulation commences when warming to 45^0C occurs. Other agents such as chemicals, exposure to cold and external force producing friction may cause skin damage producing the clinical picture of a burn injury. The severity of the injury is dependent on the amount of energy absorbed by the skin. The energy absorbed will be determined by the intensity of the burning or injurious agent, the length of exposure to the energy source and the degree of insulation or protection provided by clothing. The more energy absorbed by the skin the greater the degree of cellular disruption that will occur and the greater the depth to which the injury will extend. Burns can affect many body parts aside from the site of the burn. Nerves, blood vessels, bones, muscles and other areas may be involved when another part of the body is injured. For example, the respiratory system may be hampered or shut down from smoke inhalation and the kidneys and heart may be damaged from fluctuations in the balance of fluids and electrolytes following a burn. Usually infants and the elderly have more serious reactions to burns and also more extended healing processes.

Burns are divided into first-, second-, or third-degree[3] Burn depths are described as either superficial, superficial partial-thickness, deep partial-thickness, or full-thickness. Burn depth measurement is needed for decission to take surgical measures[4]. **First-degree** burns involve epidemis, while in **Second-degree** burns deep (reticular) dermis layer also. Deep dermal burns usually takes more than three weeks to heal, so may require excision and skin grafting. In **Third-degree burns** epidermis is lost with damage to the subcutaneous tissue. All third-degree burns are surrounded by first and second-degree burn[5].

Burns can also be assessed in terms of total body surface area (TBSA), which is the percentage affected by partial thickness or full thickness burns (erythema/superficial thickness burns are counted). The rule of nines is used as a quick and useful way to estimate the affected TBSA. More accurate estimation can be made using Lund & Browder charts which take into account the different proportions of body parts in adults ,children and infant[6]. Burns of 10% in infant or 15% in adults (or greater) are potentially life threatening injuries (because of the risk of hypovolaemic shock) and should have formal fluid resuscitation and monitoring in a burns unit. Age-related limitations of the physiological reserves of burned infant mean that the adequacy of intravenous fluid resuscitation is critical[1].

The body's response to a burn can be divided into an ebb phase and a flow phase. The ebb phase is initiated by the burn. The burn destroys the skin, disrupting its thermoregulatory and barrier function. Evaporative and heat losses are increased and bacteria have direct access to the blood stream. It is estimated that 200 ml per m^2 of burned body surface area are lost every hour. In addition, inflammatory mediators including interleukin (IL)-1, IL-6, tumor necrosis factor (TNF), prostanoids, and oxygen free radicals are released resulting in increased capillary permeability, edema, and further loss of intravascular volume. The flow phase is characterized by the body's homeostatic response to the burn. The hypothalamic temperature regulatory center is reset, leading to an increase in metabolic rate, hyperthermia, and a hyperdynamic state. Activation of the limbic system by pain, fear and thalamic relay of nocioceptive stimuli results in an increase in circulating cathecolamines. Cortisol and ACTH levels are increased leading to increased gluconeogenesis, proteolysis and lipolysis. Glucagon secretion is increased and facilitates gluconeogenesis, glycogenolysis, lipolysis and ketogenesis. Peripheral resistance to insulin can also occur.

Antidiuretic hormone (ADH) secretion is increased and the renin-angiotensin-aldosterone system is reset at an elevated level that is burn-sizedependent. The result is fluid retention, edema, and dilutional hyponatremia. Increased glomerular filtration and diuresis start 3-4 days after the injury.

The common causes of burn in infants are scalds (from steam, hot bath water, tipped-over coffee cups, hot foods, cooking fluids, etc.) or contact with flames or hot objects (from the stove, fireplace, curling iron, etc.) and overexposure to the sun[6]. All these burns are preventable by simple precautions by keeping matches, lighters, chemicals, and lit candles out of kids' reach. and covering all electrical outlets with child- safety covers.

Burns over 10% in children and 15% in adults need hospital admission and fluid resuscitation due to the risk of hypovolaemic shock[7]. Major burns should be managed using the principles of Advanced Trauma Life Support (ATLS). This consists of a primary survey to identify and treat immediately life threatening conditions and then a secondary survey. The primary survey in burns patients should follow the ABCDE guidelines (Airway & axial spine control, Breathing & ventilation, Circulation and arrest of haemorrhage, neurological Disability, Exposure to allow accurate assessment and Estimation of burn surface area and Fluid resuscitation)[8]. Regardless of the cause, the first step in managing a person with a burn is to stop the burning process at the source, and cool the burn wound. Once the burning process has been stopped, the patient should be volume resuscitated according to the Parkland formula. This formula is 4 ml lactated ringers/kg x % of Total body surface area burned, with half this volume given in the first 8 hours. Children also require the addition of maintenance fluid volume[4]. The wound is the cause of the morbidity and mortality of burn injuries and until the wound is healed the patient remains at risk of complications. The essential aspects of wound management are an initial assessment, to determine burn area and depth, and then debridement (removing devitalized tissue and contamination), cleaning and then dressings. Burn wounds are painful so analgesia (pain relief) should be given. Wounds requiring surgical closure with skin grafts or flaps should be dealt with as early as possible. One of the major advances in burn care has been the early excision and skin grafting of full thickness and deep-dermal burn wounds[1].

Advances in resuscitation, surgical management, control of infection, control of the hyper-metabolic response and rehabilitation have resulted in dramatic improvements in burn mortality and morbidity in the last 60 years.

Supervision is the very best way to help prevent kids from getting injured. However, even the most vigilant parent can't keep a child 100% safe at all times. The potential life-threatening nature of major burn injuries and the natural tendency for progressing deterioration in the burn wound underlie the importance of a clear understanding of the major aspects of burn injuries. Such knowledge forms the basis of rational management aimed at preventing complications, decreasing further tissue damage and securing early wound healing with minimization of the functional and social consequences. In our experience the most important thing is to evaluate each baby singly and to have as much experience as possible in treating all burns as well as those of surgical neonates. Treatment must be rapid because these patients are in danger of sepsis, even with more banal lesions, and not only with deep and extensive burns.

Limitation of this study is that this is a cross sectional study and we did not include whether precautional measures limit the injury.

Conclusion

Our series showed that most neonatal burns are <10% and so early refferal and proper management can save lives. As different studies showed that <10% burn are due to unawereness, most of them are preventable. Further studies are required to show how mass education can reduce this type of injury.

Disclosure

All the authors declared no competing interests.

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