

Clinical Formula for Management of Scald Burn in Children

HAMDY BASHA, M.D. and AMIR ABDELKARIM, M.D.

The Department of Burn Unit, Matareya Teaching Hospital, Cairo, Egypt

ABSTRACT

Since, 2007, 300 scald cases their age ranged from 2 months to 12 years with an average of 3.5 years, all were resuscitated and managed by a clinical formula. Male to female ratio was 1:1. 121 cases were more than 20% burn surface area and 179 ranged between 10%:20 burn surface area. 90% were superficial second degree. The results were satisfactory with 0% mortality rate, and the complications were minimized. It depends on the administration of fluids equal to the normal daily urine output in the form of intravenous ringer solution, and immediate oral fluid and nutrition adjusted by the clinical data as well as laboratory investigations and radiological studies. The material and method as well as the results were discussed.

INTRODUCTION

Thermal injuries affecting more than 20% of the total body surface area in adults and 10% in children can result in burn shock as a result of a combination of electrolyte shift [1], inflammatory response [7] and evaporate losses. This sequence of events leads to intravascular hypovolaemia and haemoconcentration that are maximal 12 hours post-injury [3,4]. Resuscitation by modified Parkland for management of burn in children is in the form of 2ml/Kg/burn surface area in the first 24 hours, as well as nothing per orum to correct the hypovolaemic shock [2]. Under resuscitation had become uncommon since the adoption of weight and injury based formulas [3]. Instead, administrations of excessive fluid volumes have been reported causing respiratory complications, water intoxication and multiple organ dysfunctions [5,6].

MATERIAL AND METHODS

300 cases of scald burn, most of them were due to boiled water, tea, or soup. Male to female ratio was 1:1. 121 cases were more than 20% surface area and 179 were 10%:20%. 90% were superficial second degree. Their age ranged between 2 months to 12 years with an average of 3.5 years. The most affected areas were chest, face, upper limbs and abdomen. The lower limbs and back were rarely affected, when injured it presented as patches of burn ulcers in the thighs or back.

In the first 24 hrs and after hospital admission; mild analgesic was used, blood sample for laboratory investigations, urinary catheter was inserted, and plain chest X-ray was done. According to age we supplied the major and moderate scald burn child by the equivalent amount to his normal urine output in the form of Ringer solution over 24 hours guided by the urine output, vital signs, and the laboratory investigations. Immediate oral feeding was standardized irrespective to the scald degree or percent. The urine output was kept at its normal figures 0.5-1ml/kg/hr (+or- 10%). The fluid balance chart included the amount of intravenous fluid therapy and the total oral fluid intake showed 10% positive balance in 100 cases, and 34 cases showed mild negative balance ranged between 10%:20%, which needed modification of the amount of fluid therapy. The respiratory rate was carefully observed and the haematocrite value was kept at 32%:35%. The central venous line was used in major burn only. In hot weather we added 1ml/kg/surface area to compensate for the evaporation or when the oral intake was not enough to keep the urine out put/hour at its normal figures. Temperature, heart rate and respiratory rate were carefully reported. In the second 24hrs, the same regimen were used and a pediatric plasma unite was supplied or when needed then after. The fluid used during resuscitation and replacement of the deficit was the ringer solution. Every other day dressing using Vaseline gauze after wash the burn ulcer by saline. Investigations were in the form of complete blood picture, arterial blood gases, total protein, renal and liver functions. Plain X-ray was done when respiratory rate showed any abnormality, or temperature showed hyperpyrexia and the temperature curve showed many peaks. After the patient bypass the shock phase, and when the haematocrite value were between 32-35%, a blood unite was supplied when the hemoglobin was less than 9 grams. A prophylactic antibiotic was used as well as paracetamole as an analgesic. Multivitamins and adjuvant oral high protein products were used also. Daily weight recording was routine measure. Two cases suffered bronchopneu-

monia and were managed by broad spectrum antibiotic in the form of Tiename. Hospitalization time ranged between 12:15 days with an average of 12 days.

RESULTS

All cases healed by conservative method except one needed split thickness skin graft to the neck and dorsum of the hands. Two cases suffered bronchopneumonia, and were early diagnosed and managed, with tiename. The face, neck and scalp were managed by moebo and wet gauze with saline was applied with complete healing of the burn ulcers. Hospital stay ranged between 10:15 days with an average of 12 days. Wound infection was occurred in 20 cases which were managed by the application of anti gram negative antibiotic as they were mainly pseudomonas or klepssila. Cicatrix was occurred in 14 cases and was managed conservatively. Two cases suffered from abdominal distension, and the abdominal ultra sonography showed fluid in the peritoneum, these responded dramatically to decrease fluid infusion started from the third day post injury and the condition resolved within 48 hours. Chest X-rays showed no significant changes as increased cardiac shadow or opacities except in two cases it showed the picture of bronchopneumonia. The intravenous fluid as well as the immediate oral feeding were sufficient to keep the urine out put and the the heart rate at their normal values. No signs of volume overload, pulmonary oedema or brain water intoxication were recorded with the application of this therapy. The mortality rate was 0%.

DISCUSSION

Three important items presents in the management of scald burn in children. The marked physiological variation in this age group, the intensity of the scalding versus direct flame, and the complications raised with the modified Parkland 2ml/kg/burn surface area [2]. The intravascular volume in this age could not compensate any overload, as well as the kidney function could not eliminate this excess volume.

The reports discussed the complications raised with modified Parkland or any other formulas using constant multiplied by body weight and burn surface area, these reports pointed out to the dangerous complications in the form of pulmonary oedema, brain oedma, and multiple organ dysfunctions [2,4,6]. The application of these mathematical formulas depending on A Constant multiplied by body weight and burn surface area, could not overcome the marked variation in the physiological aspect

as respect this age group [3]. Of course, the application of A Variable could help to solve the problem. The scald thermal wave propagation to the deep structures produces less damage in these cases compared with the direct flame burn. This is reflected on the amount of the fluid evaporated from the burn ulcer.

To overcome these three components, we elaborated this management using a variable which is the intravenous fluid equivalent to the urinary out put according to the age of the child, and immediate oral feeding and fluids. We gave our selves the right to call it The Clinical Formula for management of scald burn in children. According to our technique, all the complications as pulmonary oedema, brain oedema, or multiple organ dysfunctions never occurred. Also, the healing process was rapid, and the hospitalization time was minimized.

Conclusion:

We concluded that The Clinical Formula for management of scald burn in children is safe, easy and competent procedure which we recommend to be applied for these cases (intravenous fluid equal to the normal urine output for certain age +normal oral feeding and Fluids). Criticization and evaluation by other plastic surgeons or burn units will be excepected.

Health education programs to avoid the scalding in children must be planned and started to protect this age group from this injury.

REFERENCES

- 1- Baxter C.R. and Shires T.P.: Physiological response to crystalloid resuscitation of severe burn. *Ann. NY Acad. Sci.*, 150: 874-94, 1968.
- 2- Cartotto R.C., Innes M., Musorave M.A. and Gomez Cooder A.B.: Does the Parkland formula estimate actual fluid resuscitation volumes? *J. Burn Care Rehabil*, 23: 258-265, 2002.
- 3- Moore F.D.: The body-weight burn budget. Basic fluid therapy for the early burn. *Surg. Clin. North Am.*, 50: 1249-65, 1970.
- 4- Pham T.N., Cancio L.C. and Gibran N.S.: American Association Practice Guidelines; Burn shock resuscitation. *Journal of Burn Care & Research*, 29 (1): 257-266, 2008.
- 5- Sheridan R.L., Tompkins R.G., McManus W.F. and Priuitt B.A. Jr.: Intracompertamental sepsis in burn patients. *J. Trauma*, 36: 301-5, 1994.
- 6- Sullivan S.R., Ahmadi A.J., Singh C.N., et al.: Elevated orbital pressure; another untoward effect of massive resuscitation after burn injury. *J. Trauma*, 60: 72, 2006.
- 7- Scott J.R., Muangman P.R., Tamura R.N., et al.: Substance P level and neutral endopeptidase activity in acut burn wounds and hyper trophic scar. *Plast. Reconstr. Surg.*, 115: 1095-102, 2005.