

Resuscitation In Major Burn Injury-Experience In Tertiary Care Centre.

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Abstract

Objective Resuscitation in major burn injury-experience in tertiary care centre for better outcome. The study is a **Observational and Prospective** study of **100** cases of Thermal Burn, admitted in Subharti Medical College and Hospital, Meerut, during the period from 2015 to 2017. A total of 100 patients of acute thermal burn presenting in the first 12 hrs were included in the study.

Material and method- Patients were admitted from the triage who presented within 12 hrs after thermal burn injury with second and third degree thermal burn and excluding first degree and all other burns. Patients resuscitation done based on Parkland formula and tailored according to hourly urine output and other clinical parameters.

Result All Patients resuscitated according to parkland formulae but depending on urine output and clinical parameters. 79% patients required fluid modification out of them 69 required fluid more than the calculated and 11 required less than the calculated.

Conclusion: fluid resuscitation has to be tailored according to the hourly urine output and clinical response of the patients.

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I. Introduction

Appropriate fluid management of a major burn is of immense importance. Proper fluid management is critical for the survival of the patient of major thermal burn. Major burn injuries result in an area of necrotic zone, beneath this lies the zone of stasis and results in release of inflammatory mediators (e.g. histamine, prostaglandins, thromboxane, nitric oxide) that increase capillary permeability and lead to localised burn wound oedema.^(1,2) The steady intravascular fluid loss due to these sequences of events requires sustained replacement of intravascular volume in order to prevent end-organ hypoperfusion and ischaemia. The zone of coagulation nearest the heat source is the primary injury. This zone has irreversible tissue necrosis at the centre of the burn due to exposure to heat, chemicals or electricity. Surrounding the central zone of necrosis is a zone of ischemia in which there is reduction in dermal circulation. This is damaged but potentially viable tissue. The ischemic zone may progress to full necrosis unless the ischemia is reversed.

AIM AND OBJECTIVE

In this study, our objective/Aim was to evaluate fluid management in thermal burn patients.

II. Material And Method

INCLUSION CRITERIA:

- Patients with acute thermal burns between the age group 15 to 60 years presenting to the burn unit within 12 hours of the burn episode and assessed between 20% to 60% burns of total body surface area and with second and third degree burn on initial assessment were included in the study.

EXCLUSION CRITERIA:

- All Other burns except thermal burns.
- Patients <15 yrs or >60 yrs of age
- TBSA of <20% or >60 %
- Patients coming to burn unit after 12 hours of burn.
- Patients with any preexisting illness such as Diabetes, Hypertension.

- Patients with first degree thermal burns.
 - Patients treated with anticoagulants in last six months or taking any medication for prolonged period.
- All the patients who came to the casualty of our hospital, matching the inclusion criteria are enrolled for the study.

All the patients who included in the study are evaluated to a thorough history and physical examination. Patient's weight was checked and patient's total burn surface area was estimated using Lund and Browder Chart.

Fluid Resuscitation

After filling the proforma all the patients are resuscitated according to Parkland formula.

The Parkland formula for the total fluid requirement in 24 hours is as follows:

- 4ml x TBSA (%) x body weight (kg);
- 50% given in first eight hours;
- 50% given in next 16 hours.

Next 24 hrs : 2ml x TBSA (%) x body weight (kg)

Observations And Result

The study was conducted in department of General Surgery in Chatarpati Shivaji Subharti Hospital, Meerut. At present 100 patients were included in the study. On analysis of data it was found that majority of the patients were in the age group of 21- 30yrs (41%). The Mean age in the study was 29.88 yrs .The minimal age of the patient was 15 years and the maximum was 60years.

Majority of the burns were accidental (93%). Only 5% burns were suicidal and 2% homicidal.

Majority of the patients(38%) suffered burn with TBSA 51%-60% and minimal patients (11%) suffered burn with TBSA 20%-30%.

We observe that with adequate fluid resuscitation all laboratory parameters including Hb,electrolytes ,creatinine,BUN achieve the normal range by the 48 hrs.

Urine output was low for the first few hours which improved after fluid resuscitation. All patients achieved the urine output in the range of aim of the study to maintain it between 0.5- 1ml/kg/hr.

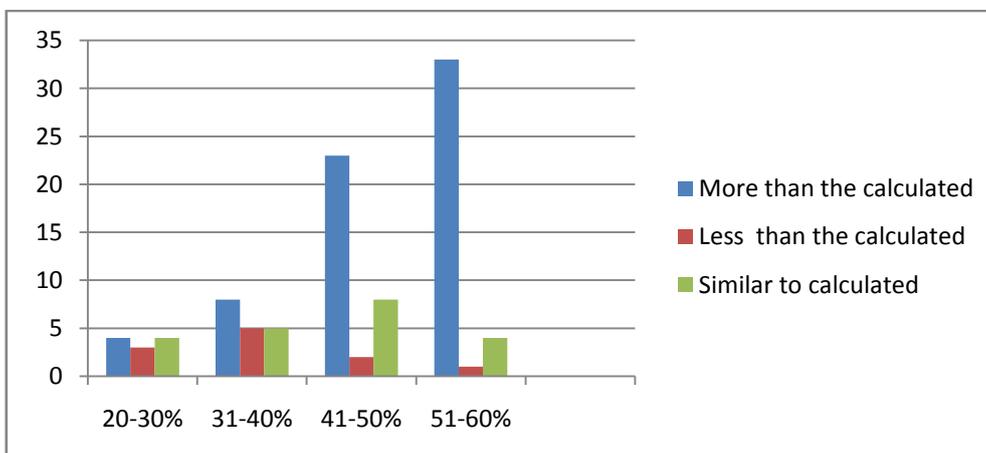
ACCORDING TO URINE OUTPUT

Time (hr)	Average value(ml/kg/hr)
1-12 hr	0.52
13-24 hr	0.64
25-36 hr	0.73
37-48 hr	0.88

This was the important change which was to be noted and the fluid was decreased or increased according to the patient need,urine output and clinical parameters.

ACCORDING TO FLUID REQUIREMENT MODIFICATION

Burn TBSA(%)	No of patients who required fluid		
	More than the calculated	Less than the calculated	Similar to calculated
20-30%	4	3	4
31-40%	8	5	5
41-50%	23	2	8
51-60%	33	1	4



In our study, out of 100 patients 79 patients required fluid modification, out of which 86% patients required more fluid than what was calculated by Parkland's Formula and 14% required fluid less than what was calculated by Parkland's Formula.

III. Discussion

One hundred patients with acute thermal burn presenting in the first 12 hrs were included in the study. All patients were resuscitated according to Parkland formula and modification in the fluid resuscitation were done according to Urine Output and Certain Clinical Parameters. The study was conducted for the initial 48 hrs of burn.

The inclusion criteria for the study were patients between 15 to 60 years with non inhalational thermal burns with TBSA of 20 to 60% reaching our casualty within first 12hrs.

A study conducted by **Earnest A et al**³ also had similar inclusion and exclusion criteria.

In our study we have used Lund and Browder chart for assessing the % of TBSA, same is used in **Earnest A et al**³ study. In **TMMU protocol**⁴ burned area was calculated according to the 'rule of nine'.

Patients were weighed on admission to our facility. Ringer lactate was the primary fluid of resuscitation and 5% dextrose was added in the next 24 hrs. Wounds were dressed with 1% silver sulfadiazine.

The majority of the patients in our study were in the age group of 21- 30yrs (41%) i.e. 41 out of 100. The Mean age was 29.88. The minimal age of the patient was 15 years and the maximum was 60 years. In **Engrav et al**⁵ study the mean age of the patients was 36 years.

Our study shows that the most productive age group (21-30yrs) sustained the thermal injuries as also in other studies.

There was almost equal participation of both male and female patients with female patients 55% (55 out of 100) and male patients 45% (45 out of 100) in our study.

Majority of the patient's weight varied from 60kg to 69kg (27%) in our study and the mean weight was 58.22 kg.

A study done by **Mats Hagstrom**⁶ of burn patient also shows an average weight of 57.7 kg.

In our study majority of the burns were accidental (93%), only 5% burns were suicidal and 2% homicidal. So our major efforts should be directed towards preventing accidental burn by educating the population.

Majority of the patient load in our study came from Meerut, Muzzafarnagar followed by Ghaziabad. Most of the patients were referred (62%) from hospitals within Meerut and Muzzafarnagar. Only 38 % patients came directly to our casualty. It suggests that most of the patients in our hospital come on referral basis from other regions. Chhaterpati Shivaji Subharti hospital is the tertiary care centre catering West UP.

Almost 44% patients reached within 4-6 hrs of the thermal burn. It is very crucial to note that if lag period is more, the chances of inadequate resuscitations are high. Majority of the patients were referred (62%) from hospitals out of which (56%) received 1-2lt fluid followed by 28% patients who received up to 1 lt of fluid.

38% patients who came directly to our institute received no fluid.

In the study by **Earnest A et al**³ the majority of patients admitted had received Fluid therapy within 2 hrs post burn but Colloids were initiated after the first 24 hrs.

Majority of the patients suffered burn between 51-60% TBSA (38%) with Mean value 46.6%.

In the study done by **Mats Hagstrom et al**⁶ of burn patient the average TBSA 23.9%. **Joel M. Dulhunty et al**⁷ retrospective study showed average %TBSA burn of 43 +/-19. **Earnest A et al**³ showed mean %TBSA of 27+/- 10% in his study.

On laboratory investigations it was observed that with adequate fluid resuscitation all laboratory parameters including Hb, electrolytes, creatinine, BUN achieve the normal range by the 48 hrs.

Nausea and vomiting was more on the day of arrival due to inadequately resuscitated patients or either the patient were reaching the casualty late with higher % TBSA burn. In our study groups tachycardia and tachypnea settled by the end of 24hrs of fluid resuscitation.

Urine output was low for the first few hours which improved after fluid resuscitation. Urine output improved from 0.48ml/kg/hr to 0.84ml/kg/hr. All the patients achieved the urine output in the range of aim of the study to maintain it between 0.5- 1ml/kg/hr.

In the study by **Earnest A et al**³ hourly urine output monitoring was the primary parameter, with attempts to maintain an output between 0.5 and 1.0 ml/kg/h as in our study too. If patients could not keep the amount of urine output as mentioned above, the rate of administration of crystalloid solution was increased until adequate urine amounts were observed.

In our study, total 79 patients required fluid modification, out of which 86% patients required more fluid than what was calculated by Parkland's Formula and 14% required fluid less than what was calculated by Parkland's Formula.

In a review of 83 patients from 1994-1995 done by **Kaups KL et al**⁸ in 1998, all patients exceeded Parkland calculations.

In a review from seven centers conducted by **Engrav et al**⁵ in 2000 on fifty patients, majority of patients (58%) required more fluid than Parkland formula calculations.

In our study, fluid required in the first 24 hours was 4.24 +/- 0.30 ml/kg/%TBSA.

In a retrospective review of patients with TBSA >25% conducted in 1985 by **Navar PD et al**⁹, 171 patients were included, 51 with inhalational burns requiring fluid vol - 5.76 +/- 0.39ml/kg/%TBSA and 120 patients with non inhalational burns requiring fluid 3.98 +/- 0.39 ml/kg/%TBSA.

In a study by **Herndon et al**¹⁰, conducted in 1988; 34 patients were included. 20 of whom had inhalational injuries requiring 3.8 +/- 1.5 ml/kg/%TBSA and 14 of whom had non inhalational injuries requiring 2.3 +/- 1.2 ml/kg/%TBSA.

In patients with higher % TBSA & higher body weight were receiving higher fluids than the calculated during the first 48hrs.

General condition of all the patients was assessed using Glasgow coma scale on admission, 24hrs and 48hrs . It was normal in all the patients at each point of observations. In this study all the 100 adult patients using both the fluid resuscitative formulae survived the first 48 hrs after thermal burn injury. None of the patients developed any obvious complications related to fluid resuscitation.

The Parkland Formula is a time honoured and effective approach to fluid resuscitation of an acutely burned patient. But the resuscitation formula modified according to urine output and clinical parameters is a feasible alternative to guide the initial 48hrs of fluid resuscitation phase post-burn injury.

IV. Conclusion

We come to conclusion from the above observation of the study that fluid resuscitation has to be carefully tailored according to the hourly urine output and clinical response of the patient, formula is only a rough guideline and not a dictum. We should also be very careful during resuscitation of patients with major burn injuries so as not to over transfuse and at the same time do not fail in adequately treating the burn shock by under transfusing the patient. In critically ill patients with major burn injuries there is very narrow margin of safety between under transfusion and over transfusion.

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