Evaluation of burn resuscitation practices at a large academic burn center

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INTRODUCTION

- Large burn resuscitation is a cornerstone of ICU care in the burn unit
- Large burns cause a systemic inflammatory response in the entire body leading to profound capillary leak, tissue edema and hemodynamic instability, a condition known as burn shock
- Different formulas have been studied to estimate fluid needs during the first 24hrs, including the Parkland formula (4ml/kg/%TBSA) and modified Brooke formula (2ml/kg/%TBSA)
- Additionally, resuscitation adjuncts including colloids and ascorbic acid infusions have been studied to decrease crystalloid requirements and prevent "fluid creep"
- Concerns of over-resuscitation include pulmonary edema and compartment syndrome
- The purpose of this study was to retrospectively evaluate burn resuscitation practices of large burns (20% TBSA and greater) and their associated outcomes at a large urban burn center

METHODS

Design

- A retrospective, IRB approved chart review of a prospectively maintained burn unit database was conducted and included adult patients admitted to the Grady Health System (GHS) burn ICU with burns of 20% TBSA or greater who survived the first 48hrs of admission
- Descriptive statistics were utilized

Primary outcome

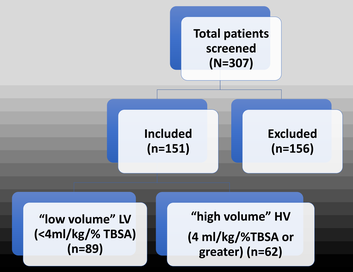
- Evaluating the percentage of patients who received resuscitation according to predetermined volume ranges (< or equal to 4ml/kg/% TBSA vs >4ml/kg/%TBSA)

Secondary outcomes

- Use of adjuncts (colloids and ascorbic acid)
- Markers of over- and under-resuscitation
- Use of perfusion markers to guide resuscitation
- ICU and hospital length of stay

RESULTS

Figure 1. Patient enrollment



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RESULTS

Patient Characteristics (N=151)	≤ 4 ml/kg/%TBSA (n=89)	> 4 ml/kg/%TBSA (n=62)	P-value
Male gender, n (%)	70 (79)	43 (62)	NS
Age in years, median [IQR]	43 [31 – 55]	49 [34 – 62]	NS
Admission weight in kg, median [IQR]	81 [68 – 106]	76 [68 – 89]	0.018
Significant co-morbidities, n (%)			
• Congestive heart failure (CHF)	1 (1)	4 (6)	NS
• End-stage renal disease (ESRD)	1 (1)	0	NS
• Chronic kidney disease (CKD)	0	2 (3)	NS
• Alcohol use	7 (8)	2 (3)	NS
Thermal burn injury, n(%)	79 (89)	59 (95)	NS
%TBSA burns, median [IQR]	36 [26 – 53]	37 [30 – 50]	NS
Inhalation injury, n (%)	29 (33)	23 (37)	NS
Type of crystalloid resuscitation, n (%)			
• Lactated Ringer's	79 (89)	60 (97)	NS
• 0.9% NaCl	32 (36)	23 (37)	NS
• Plasmalyte	2 (2)	1 (2)	NS

Primary & secondary outcomes

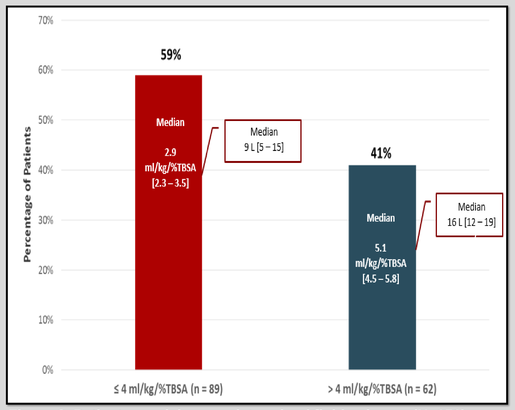

Figure 2. Patients receiving pre-determined fluid volumes (N=151)

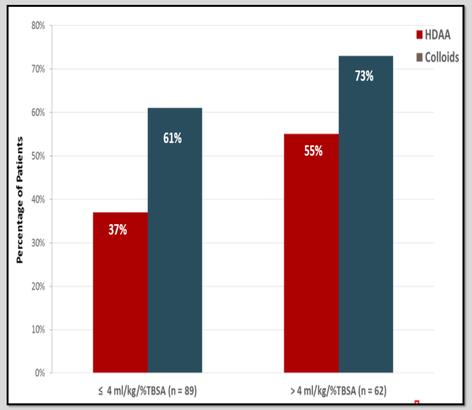

Figure 3. Use of resuscitation adjuncts (*HDAA: high dose ascorbic acid*) (N=151)

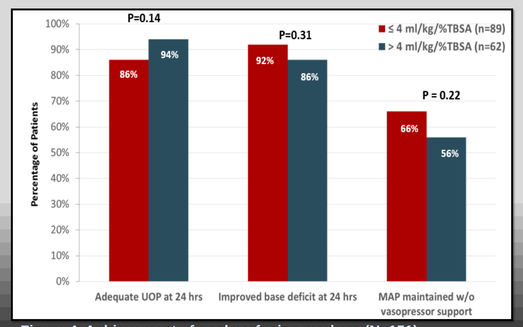

Figure 4. Achievement of goal perfusion markers (N=151)

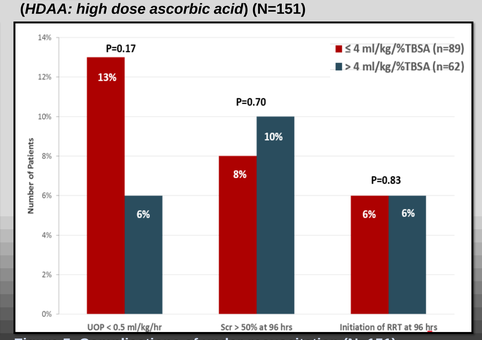

Figure 5. Complications of under-resuscitation (N=151)

RESULTS

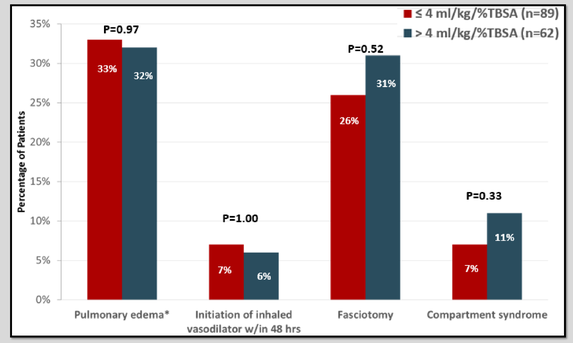

Figure 6. Complications of over-resuscitation (N=151)

Outcomes (N=151)	≤ 4 ml/kg/%TBSA (n=89)	> 4 ml/kg/%TBSA (n=62)	P-value
ICU length of stay in days, median [IQR]	16 (8 – 16)	36 (14 – 62)	0.001
Hospital length of stay in days, median [IQR]	27 [13 – 52]	39 [20 – 68]	0.007
All-cause in hospital mortality, n (%)	35 (40)	24 (39)	0.958

CONCLUSIONS

- Patients who received median resuscitation volumes of ~ 3ml/kg/%TBSA had better outcomes compared to patients who received higher volumes
- Protocolized monitoring of resuscitation markers is key to tailoring resuscitation efforts to patient's individual response. The effect of the different adjunct therapies (colloids, ascorbic acid) should be further investigated.
- Limitations of this study include its retrospective and single center nature, documentation errors (especially omissions)
- Future directions include further analyses of therapy effect of adjunct therapies (colloids and ascorbic acid)

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