الهدف الموجه لإعادة الحياة لمرضى الصدمه الناتجه عن إصابات جسيمة: دراسة مقارنه بأستخدام أثنين من السوائل الكلودية المختلفة

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GOAL ORIENTED SHOCK RESUSCITATION IN MAJOR TRAUMA PATIENT: COMPARATIVE STUDY BETWEEN TWO COLLOID SOLUTIONS

Thesis

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INTRODUCTION

Trauma is the fourth-leading cause of death in the USA.[1] Volume deficits are often present in trauma patients and may result in the development of post-trauma multiple organ failure on the intensive care unit (ICU). In addition to apparent blood loss, fluid deficits may also occur secondary to generalized alterations of the endothelial barrier resulting in diffuse capillary leakage and fluid shift from the intravascular to the interstitial compartment. Adequate volume therapy appears to be a cornerstone of managing the trauma patient. In a prospective review of 111 consecutive patients who died in hospital after admission for treatment of injuries, the most common defects in patients' management were related to inadequate fluid resuscitation.[2] Besides (hypo-, iso-, and hypertonic) crystalloids, human albumin (HA) and various synthetic colloids [e.g., dextrans, gelatins, hydroxyethyl starch (HES) preparations] are available to treat trauma-related volume deficits. In recent years, the crystalloid/colloid dispute has been enlarged to a colloid/colloid debate because, aside from the natural colloid albumin, several synthetic colloids are increasingly used as plasma substitutes in the trauma patient.

Gelatins (GEL) have the advantage of their unlimited daily dose recommendation and minimal effect on hemostasis [3]. However, they are associated with a more frequent incidence of allergic reaction [4]. Hydroxyethyl starches (HES) have the advantage of a higher plasma-expanding effect and an infrequent incidence of allergic reactions, but they have more pronounced effects on hemostasis [5]. As the HES-related effects on hemostasis appear to be related to their specifications [6], a new HES with a lower *in vivo* molecular weight (HES 130/0.4) has been introduced. This new synthetic colloid appears to have fewer effects on

hemostasis [7–9] while maintaining the same effectiveness as medium molecular weight HES [9–11].

Criteria for the severity of shock are frequently based on crude measurements, such as blood pressure and heart rate, as in the advanced trauma life support (ATLS) guidelines. But blood pressure and heart rate have been shown to be poor indicators of severity of shock or adequacy of resuscitation. In a study comparing blood pressure and heart rate to cardiac index during resuscitation from traumatic injury, Wu et al [12] showed that patients had a persistent tachycardia that was not related to corresponding cardiac index; no correlation was found between heart rate and cardiac index. The cardiac index in both survivors and nonsurvivors was initially high but subsequently decreased in nonsurvivors. Blood pressure also did not correlate with cardiac index; a decrease in MAP often lagged behind the decrease in cardiac index, and with fluid resuscitation, an increase in MAP often preceded an increase in cardiac index. Thus, relying on hypotension as an early warning sign of impending circulatory shock and reliance on normal blood pressure values as a measure of adequate fluid resuscitation or satisfactory tissue perfusion is inadequate.

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LIST OF ABBREVIATIONS

Δ Av	Change volume of the great vessels.
Δ R	Changes in resistance.
Δ V	Changes in voltage.
Δ Z	Changes in impedance.
A	Cross section area.
ACCP	American college of chest physicians.
ADP	Adenosine diphosphate.
ALI	Acute lung injury.
AMP	Adenosine mono phosphate.
APC	Antigen presenting cells.
ARD	Acute renal failure.
ARDS	Acute respiratory distress syndrome.
AT	Cross section area thorax.
ATLS	Advanced trauma life support.
ATP	Aderosine triphosphate.
Av	Cross segmental area.
BBB	Blood brain barrier.
BD	Base deficit.

BP	Blood pressure.
BSE	Bovine spongiform encephalitis.
CARS	Compansatory anti-inflammatory response syndrome.
CBC	Complete blood count.
CI	Cardiac index.
CO	Cardiac output.
CT	Computerized tomography.
CVP	Central venous pressure.
Da	Dalton.
DBP	Diastolic blood pressure.
DIC	Disseminated intravascular coagulopathy.
Do2	Oxygen delivery.
ECG	Electrocardiograph.
ED	Emergency department.
EFC	Thromboleastography. Fluid content.
FAST	Focused assessment by sonography.
FFP	Fresh frozen plasma.
GCS	Glasgo coma scale.
GI	Gastrointestinal.

G-SCF	Granulocytecolony stimulating factor.
HA	Human albumin.
Hb	Hemoglobin.
HES	Hydroxyethyl starch.
HIV	Human immunodeficiency virus.
HMGP	High mortality group protein.
HR	Heart rate.
I	Current.
ICU	Intersive care unite.
IFN	Interferons.
INR	International ratio.
ISS	Injury severity score.
Jv	Transcapillary fluid flux.
L	Length in time.
L7B4	Leucotriens B_4.
LVET	Left ventricular ejection time.
LVP	Left ventricular pressure.
LVSWI	Left ventricular stroke work index.
MAP	Mean arterial pressure.

MODS	Multiple organ dysfunction syndrome.
MOF	Multiple organ failure.
Mw	Molecular weight.
NAP	Neutrophil activity peptide.
NO	Nitric oxide.
PAF	Platelets activating factor
Pc	Capillary hydrostatic
PcWP	Pulmonary capillary wedge pressure
PEP	Preejection period.
PGE2	Prostaglandins E2.
PHi	Intramucosal PH
Pi	Interstitial hydrostatic pressure.
PL	Phospholipase.
PMNL	Polymorphonuclear leukocytes.
PTT	Partial thromboplastin time.
PVE	Plasma volume expansion
R	Resistance.
ROS	Reactive oxygen species.
RRT	Renal replacement therapy.

SAFE	Saline albumin for fluid resuscitation
SaO2	Arterial oxygen saturation.
SCCM	Society of critical car medicine.
ScvO2	Central venous oxygen saturation.
SD	Standard deviation.
SIRS	Systemic inflammatory response syndrome.
SOFA	Sequential organ failure assessment.
SV	Stroke volume.
Svo2	Mixed venous oxygen saturation.
TBSA	Total body surface area.
TEB	Thoracic electrical biompedence.
TEG	Thromboleastography.
TGF	Transforming growth factor.
TH	T-hellper cells.
TNF	Tumor necrosis factor.
TPR	Total peripheral resistance.
TXA2	Thromboxan A_2.
USA	United states of America.
V	Voltage.

VI	Velocity index.
VO2	Oxygen consumption.
vWF	Von willebrand factor.
Z	Impedance.
ZO	Basic impedance.
δ	Reflection coefficient.
π c	Intravascular oncotic pressure.
π i	Interstitial oncotic pressure.
σ	Specific resistance.
σ b	Specific resistance thorax.

MATERIAL AND METHODS

Selected Patients:

The study was conducted after approval of medical and ethical committee on all trauma patients admitted at Kasr El Aini hospital starting from January 2008 till June 2008 and have blunt or penetrating trauma that require ICU admission.

Inclusion Criteria:

1. Fifty patients with blunt or penetrating trauma were enrolled in the study**.**
2. Shock on arrival manifested by low blood pressure (mean arterial blood pressure less than 60mmHg), rapid pulse more than 100 beat/min, rapid breathing, anxiety, pale skin color (pallor) sweating, decreased or no urine output weakness, moist skin, confusion and unconsciousness.

Exclusion Criteria

1. Age less than 18 or more than 70 years.
2. Patients known to be pregnant.
3. Severe intracranial injury with Glasgow coma score less than 4.
4. Severe spinal cord injury with complete spinal cord deficit.
5. Patients who are in established renal failure on admission.
6. Patients who died within 24 hours of admission.

Randomization of the Patients:

Patients were randomly allocated to receive either 6% HES 130/0.4 (Voluven, Fresenius Kabi, Hombourg, Germany) **(HES group: *n* _ 25)** or