Comparison between damage control resuscitation and traditional treatment in resuscitation of elderly trauma patients in an Emergency Department, Egypt

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Background

In the recent decade, a new paradigm in early trauma resuscitation, especially in case of ongoing, uncontrollable bleeding, has emerged. This paradigm change stresses on damage control resuscitation, a combination process of hypotensive resuscitation, hemostatic resuscitation, damage control surgery, and damage control radiology. This study was designed to determine the effect of damage control resuscitation, especially hypotensive resuscitation, as a factor in improving the outcome in traumatized elderly patients because vigorous fluid resuscitation is associated with rebleeding and a high mortality rate.

Aim

This study was conducted to improve the resuscitation process and decrease the mortality rate of elderly patients with trauma in the Department of Emergency.

Patients and methods

This comparative cross-sectional study included elderly patients with trauma (>65 years old) presenting with traumatic hypovolemic shock who were admitted to the Department of Emergency of Suez Canal University Hospital according to the inclusion and exclusion criteria. The patients were divided into two groups: group 1 received damage control resuscitation with hypotensive resuscitation, with the targeted systolic blood pressure being 90 mmHg, and group 2 received traditional treatment, with the targeted systolic blood pressure being 100 mmHg.

Results

After resuscitation, patients in the damage control resuscitation group had significantly less severe base deficit than those in group 2 (P=0.04). Meanwhile, regarding coagulopathy, patients in the damage control resuscitation group had significantly lower international normalized ratio (<1.5) than those in group 2 (P<0.001). Moreover, we found that patients who took damage control resuscitation had less mortality in the emergency room (21.6%) than those in group 2 (35.1%) (P=0.04).

Conclusion

The study reported a lower rate of mortality and acid deficit in the group managed by damage control resuscitation. The results regarding the benefits of hypotensive resuscitation in elderly patients with trauma are optimistic. However, many confirmatory studies need to be conducted.

Keywords:
damage control resuscitation, elderly trauma, uncontrolled bleeding

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Introduction

Trauma is one of the common cause of annual mortality worldwide. World Health Organization data state that 5 million people died of injuries in 2000, accounting for 9% annual mortality [1]. In elderly patients, trauma is a leading cause of disability, morbidity, and mortality [2,3].

Unintentional injury has been listed as the ninth cause of death for elderly people [4]. Most common cause of injury is blunt trauma, resulting from falls and motor vehicle crashes. Penetrating trauma and other traumas, such as burns, account for only 4% of all traumatic injuries in the elderly [5].

Trauma in the elderly has poor outcomes in comparison with trauma in the younger population. Increase in the age and the incidence of complications are more predictive of morbidity and mortality than the severity of trauma [6].

In the past four decades, the usual treatment for patients with hypovolemic trauma due to a suspected hemorrhage has been to transfuse large amounts of fluid as soon as possible. The aim of this excessive fluid transfusion is to restore the intravascular volume and normalization of vital signs as quickly as possible while maintaining important organ perfusion. High-volume intravenous fluid bolus for hemodynamic instability has been the accepted standard in most prehospital care systems, such as the advanced trauma life support program [7].

Damage control resuscitation is a multidisciplinary strategy for treating patients with trauma with serious injuries, which begins in the emergency room and continues throughout the operating room and ICU. It involves hypotensive resuscitation [systolic blood pressure (SBP)<90], hemostatic resuscitation (early transfusion of blood component packed red blood cells (RBCs) : plasma : platelet 1 : 1 : 1), damage control surgery, and damage control radiology. Until decisive intervention, damage control resuscitation is performed to preserve circulation volume, limit hemorrhage, and rectify the 'lethal triad' of trauma (coagulopathy, acidosis, and hypothermia) [8,9].

Recently, laboratory studies and clinical trials have suggested that excessive crystalloid provided in the acute trauma setting is often associated with complications. Overresuscitation may lead to uncontrolled bleeding, coagulopathy, decrease organ perfusion, and abdominal compartment syndrome [10,11]. These complications may result in increased mortality compared with moderate resuscitation [9,11]. A recent study demonstrated that excessive fluid replacement does not improve hemodynamic parameters or regional organ perfusion [12,13]. The incidence of overresuscitation has been minimized by implementing hypotensive resuscitation [14,15].

However, in the recent decade, a new paradigm in early trauma resuscitation has emerged. This paradigm change promotes hemostatic resuscitation as early as feasible in a patient's care, employing ratios of plasma, platelets, and RBCs that mimic whole blood. Aggressive crystalloid resuscitation increases coagulopathy by dilution, contributes to acidosis through pH changes, and increases hypothermia through the infusion of high quantities of cold solutions [16].

A study found that volume replacement of 1.5 l or more in the Department of Emergency was an independent risk factor for mortality. High-volume resuscitation was associated with a higher rate of mortality, especially in older patients with trauma. Their finding supports the notion that excessive fluid resuscitation should be avoided in the Department of Emergency, and when required, operative intervention or intensive care admission should be considered [17,18].

As aggressive fluid resuscitation in elderly patients with trauma is associated with high mortality rates, this study was designed to identify the role of damage control resuscitation, especially hypotensive resuscitation (SBP of 80–90 mmHg), as target for only a short period until definitive surgery intervention to stop bleeding.

Many studies indicate the importance of hypotensive resuscitation in adult patients with trauma, but there is still a debate regarding its role in elderly patients with trauma as an effective method owing to their comorbid condition as chronic hypertensive patients.

So, this study was designed to determine the effect of hypotensive resuscitation as a part of damage control resuscitation strategy as a factor in improving the outcome in traumatized elderly patients because vigorous fluid resuscitation is associated with rebleeding and a high mortality rate.

Additionally, this study was conducted to improve the resuscitation process and decrease the mortality rate of elderly patients with trauma in an Department of Emergency.

Patients and methods

This was a comparative cross-sectional, randomized study conducted on elderly patients with trauma (>65 years old) of both sexes who presented with traumatic hypovolemic shock (class III and intravenous hypovolemic shock), SBP less than 90 mmHg, and were admitted to the Department of Emergency, Suez Canal University Hospital. Patients were selected according to the following inclusion and exclusion criteria:

Inclusion criteria

(1) Elderly trauma patients (age≥65 years old).
(2) Sex (both male and female).
(3) All types of trauma (e.g. road traffic collision, direct trauma, falling from height, and sliding).

Exclusion criteria

(1) Arrested on arrival to the Department of Emergency.

(2) Traumatic brain injury.
(3) Patients known to have heart or renal failure.
(4) Hypovolemic shock classes 1 and 2.
(5) Patients known to have bleeding disorders or those who are on anticoagulant therapy.

Data were collected in a preorganized data sheet by the researchers after approval from the Ethics Committee of the Faculty of Medicine, Suez Canal University. All patients who were included in this study underwent the following:

(1) Full history taking using a questionnaire filled by the researchers.
(2) The patients were clinically evaluated on arrival to the Department of Emergency using the airway, breathing, circulation, disability, and exposure approach.
(3) Investigations included the following:
    (a) Laboratory investigations: arterial blood gas, complete blood count, coagulation profile, and cross-matching.
    (b) Radiological investigations: radiography, focused assessment with sonography in trauma, and computed tomography, as necessary.
    (c) After resuscitating the subjects in both groups, we reassessed the vital signs and repeated the assessment every 10–15 min.
    (d) We rechecked the laboratory findings after resuscitation.
    (e) We followed up the patients in the Department of Emergency until their fate (i.e. ICU admission, surgery, internal ward admission, death, or discharged).

The study was performed from August 2019 to February 2020.

We randomly selected patients in each group based on availability of their blood component in the blood bank. If it was available, we used damage control resuscitation, and if it was not available, we used traditional treatment.

Sample size

The sample size was determined by using the following equation [19]:

$$n = \left(\frac{Z_{1-\alpha/2}}{d}\right)^2 \times p(1-p).$$

Where:

(1) n = the sample size.
(2) $Z_{1-\alpha/2}$ = the confidence interval (CI) which equals to 1.96 when type 1 error is 5%.
(3) P = percentage of elderly trauma patients equals 8.97%[20].
(4) d = Absolute error or precision, usually equals 10%.

The calculated sample size was 34 participants; however, after adding the expected (drop-out) rate (10%), the final sample size was 37 participants for each group.

Data management

Statistical analysis was done using suitable tables. Data entry and analysis were done using 'SPSS10.0' for windows program by aid of the following statistical tests;

(1) Continuous variables were presented as mean±SD.
(2) Discrete variables were expressed as frequencies and percentage.
(3) Student's t test was used for continuous variables.
(4) χ^2 was used for discrete variables.
(5) The level of significance of P value was 0.05. Results were statistically significant if P value was less than 0.05.

Presentation of statistical outcomes and tables was done using the 'Microsoft Word 2010' program.

Ethical consideration

All patients provided written consent to participate in the study without affecting their course of treatment. Institutional approvals were obtained, and the Research Ethics Committee of the Faculty of Medicine, Suez Canal University, approved this study (approval number 3832; date: April 14, 2019).

The informed consent form included detailed explanation of the study aim in a simple and clear manner to understood by the common people. There were no harmful maneuvers performed or used. There were no foreseen hazards involved. All data were considered confidential and not used outside this study.

Results

The mean age of the study sample was 69.45±3.1 years. Approximately half of the patients were manual workers, and ~28 were employers (Table 1). Regarding sex distribution, ~53% of the patients were males and 47% were females.

No statistically significant difference in the history of chronic illness was observed between the two groups (Table 2).

Table 1 Baseline characteristics of the sample under study

Variables	Total (*N*=74)	Type of resuscitation		*P* value
		Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
Age (mean±SD) (years)	69.45±3.1	68.27±1.77	70.62±3.43	0.31a
Occupation [*n* (%)]				
Housewife/not working	13 (17.6)	7 (18.9)	6 (16.2)	0.94[b]
Manual worker	40 (54.1)	20 (54.1)	20 (54.1)	
Employer	21 (28.4)	10(27)	11 (29.7)	

[a]*P* values are based on the Mann–Whitney *U* test.[b]*P* values are based on the χ^2 test. Statistical significance at *P* value less than 0.05.

Table 2 History of chronic illness among the studied sample

Variables	Total (*N*=74)	Type of resuscitation		*P* value
		Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
History of chronic illness [*n* (%)]				
Absent	49 (66.2)	27 (73)	22 (59.5)	0.22b
Present	25 (33.8)	11 (29.7)	16 (43.2)	
Diabetes	9 (12.2)	5 (13.5)	4 (10.8)	
Hypertension	9 (12.2)	4 (10.8)	5 (13.5)	
Atrial fibrillation	2 (2.7)	1 (2.7)	1 (2.7)	
CKD	5 (6.8)	2 (5.4)	3 (8.1)	

CKD, chronic kidney disease. [a]*P* values are based on the χ^2 test. Statistical significance at *P* value less than 0.05.

Table 3 Variables related to trauma characteristics of the sample under study

Variables	Type of resuscitation		*P* value
	Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
Mechanism of trauma [*n* (%)]			
Motor car accident	19 (51.3)	20 (54.1)	0.93a
Fall from height	7 (19.4)	8 (21.6)	
Sliding down	5 (13.9)	6 (16.2)	
Quarrel	5 (13.9)	3 (8.1)	
Type of trauma [*n* (%)]			
Blunt	28 (75.7)	32 (86.5)	0.48a
Penetrating	6 (16.2)	4 (10.8)	
Both	3 (8.1)	1 (2.7)	

[a]*P* values are based on Fisher's exact test. Statistical significance at *P* value less than 0.05.

The most common mechanism of trauma in both groups was motor car accident (51.3% in the hypotensive resuscitation group and 54.1% in group 2). Meanwhile, the most common type of trauma was blunt trauma in both groups (75.7% in the hypotensive resuscitation group and 86.5% in group 2). No statistically significant difference in the mechanism of trauma (*P*=0.93) or the type of trauma (*P*=0.48) was observed between the two groups (Table 3).

Moreover, no statistically significant difference in baseline systolic and diastolic blood pressure measures was observed between the two groups. However, patients in the hypotensive resuscitation group had a significantly lower mean SBP after receiving fluids than those in group 2 (*P*<0.001) (Table 4).

Furthermore, no statistically significant differences in base deficit and coagulopathy at baseline and after resuscitation were observed between both groups. However, after resuscitation, patients in the hypotensive resuscitation group had significantly less severe base deficit than those in group 2 (*P*=0.04). Meanwhile, regarding coagulopathy, patients in the hypotensive resuscitation group had significantly lower international normalized ratio (INR) level (<1.5) than those in group 2 (*P*<0.001) (Table 5).

Intraperitoneal free fluid collection was found in 70.3% of the patients in the hypotensive resuscitation group and ~84% of the patients in group 2 (*P*=0.17). Other findings included splenic injury, hemothorax, and pericardial effusion (only one case in each group) (Table 6).

Table 4 Comparison of blood pressure the hypotensive resuscitation and group 2 before and after intervention

Variables	Type of resuscitation		*P* value
	Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
Systolic blood pressure (mmHg)			
Preintervention	73.61±5.93	74.29±6.55	0.54a
Postintervention	86.62±3.87	103.51±4.54	<0.001a
Score difference	16.11±3.69	29.43±8.56	<0.001a
Diastolic blood pressure (mmHg)			
Preintervention	47.78±5.91	46.86±5.83	0.51a
Postintervention	60.81±4.93	63.51±6.76	0.12a
Score difference	13.06±7.1	16.57±8.38	0.11a

[a]*P* values are based on the Mann–Whitney *U* test. Statistical significance at *P* value less than 0.05.

Table 5 Comparison of laboratory measures between the hypotensive resuscitation and group 2 before and after intervention

Variables	Type of resuscitation		*P* value
	Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
Base deficit [*n* (%)]			
Preintervention			
Mild (<5)	4 (10.8)	5 (13.5)	0.86[a]
Moderate (6–9)	15 (40.5)	13 (35.1)	
Sever (>10)	18 (48.6)	19 (51.4)	
Postintervention			
Mild (<5)	11 (29.7)	6 (16.2)	0.04[a]
Moderate (6–9)	18 (45.7)	13 (34.1)	
Sever (>10)	8 (21.6)	18 (45.7)	
Coagulopathy (INR) [*n* (%)]			
Preintervention			
>1.5	23 (62.2)	20 (54.1)	0.47[a]
<1.5	14 (37.8)	17 (45.9)	
Postintervention			
>1.5	11 (29.7)	29 (78.4)	<0.001[a]
<1.5	26 (70.3)	8 (21.6)	

INR, international normalized ratio.[a]*P* values are based on the χ^2 test. Statistical significance at *P* value less than 0.05.

Table 6 Comparison of sonographic outcomes between the hypotensive resuscitation and group 2

Variables	Type of resuscitation		*P* value
	Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
FAST finding			
No IPFFC	11 (29.7)	6 (16.2)	0.17a
IPFFC	26 (70.3)	31 (83.8)	
Rim	12 (32.4)	11 (29.7)	
Minimal collection	4 (10.8)	8 (21.6)	
Mild collection	2 (5.4)	4 (10.8)	
Moderate collection	6 (16.2)	4 (10.8)	
Marked collection	2 (5.4)	4 (10.8)	
Other findings			
Absent	33 (89.2)	32 (75.7)	0.58a
Present	4 (10.8)	5 (13.4)	
Splenic injury	1 (2.7)	1 (2.7)	
Hemothorax	1 (2.7)	1 (2.7)	
Pneumothorax	1 (2.7)	1 (2.7)	
Hemopneumothorax	0	1 (2.7)	
Pericardial effusion	1 (2.7)	1 (2.7)	

FAST, focused assessment with sonography in trauma; IPFFC, intraperitoneal free fluid collection. [a]*P* values are based on the χ^2 test. Statistical significance at *P* value less than 0.05.

Both study groups had the same crystalloid fluid resuscitation. However, regarding the amount of fluid, group 2 had a statistically significantly higher amount (total amount of crystalloid, Ringer's lactate, and normal saline) than the hypotensive resuscitation group. In contrast, patients in the hypotensive resuscitation group received significantly more colloid fluids than those in group 2 (P<0.001). Meanwhile, the hypotensive resuscitation group had significantly higher amount of all types of colloid fluids (i.e. plasma, platelets, and packed RBCs) than the liberal group (Table 7).

Additionally, the hypotensive resuscitation group has less incidence of death in the emergency room (21.6%) than group 2 (35.1%) (P=0.04).

Logistic regression analysis was used to assess the predictors of mortality among elderly trauma patients in the emergency room. Balanced fluid resuscitation decreases the odds of mortality among patients in the emergency room by 10.9% compared with second fluid resuscitation (P<0.001) (Table 8).

Discussion

Trauma in the elderly is associated with poorer results than trauma in the younger population, with age and the occurrence of comorbidities being more predictive of morbidity and mortality than the severity of injuries [7].

This was a comparative cross-sectional study that included elderly patients with trauma presenting with traumatic hypovolemic shock admitted to the Department of Emergency, Suez Canal University Hospital. This study was designed to compare hypotensive resuscitation and usual resuscitation regimens regarding outcomes.

In this study, the study participants were managed into two ways. The first group received fluid resuscitation with the target SBP being 90 mmHg (n=37) and the second group received fluid resuscitation with the target SBP being 100 mmHg (n=37). The mean age of the study sample was 69.45±3.1 years. Approximately half of the patients were manual workers, and ~28 were employers. Additionally, no statistically significant difference in the history of chronic illness was found between the two groups.

Table 7 Comparison of fluid resuscitation between patients receiving damage control resuscitation and traditional resuscitation

Variables	Type of resuscitation		*P* value
	Hypotensive resuscitation (*N*=37)	Group 2 (*N*=37)	
Crystalloid			
No	2 (5.4)	0	0.5a
Yes	35 (94.6)	37 (100)	
Amount (mean±SD) (ml)			
Overall amount	675.14±250.8	1268.13±310.1	<0.001b
Ringer lactate	683.4±201.9	978.4±384	0.01b
Normal saline	431.6±287.6	613.78±357.5	0.04b
Colloid			
No	0	13 (35.1)	<0.001a
Yes	37 (100)	24 (64.9)	
Amount (mean±SD) (ml)			
Overall amount	2370.1±190.1	1156.2±324.5	<0.001b
Plasma	1194.5±475.1	651.7±124.6	0.002b
Platelets	649.5±325.1	341.5±155.9	0.001b
Packed red blood cells	845.4±319.1	678.9±247.1	0.03b

[a]*P* values are based on Fisher's exact test. [b]*P* values are based on the Mann–Whitney *U* test. Statistical significance at *P* value less than 0.05.

Table 8 Logistic regression analysis of determinants of mortality among elderly patients in the emergency room

Predictors	Unstandardized coefficients		Odds ratio (95% CI)	*P* value
	B	SE		
Constant	4.96	0.339		0.143
Groups				
Hypotensive resuscitation versus group 2 (R)	−1.359	0.802	0.891 (0.847–0.932)	<0.001a

[a]Statistical significance at *P* value less than 0.05.

In this study, the most common mechanism of trauma in both groups was motor car accident (51.3% in the hypotensive resuscitation group and 54.1% in group 2). Meanwhile, the most common type of trauma was blunt trauma (75.7% in the hypotensive resuscitation group and 86.5% in group 2). No statistically significant difference in the mechanism of trauma (P=0.93) or the type of trauma (P=0.48) was observed between the hypotensive resuscitation group and group 2.

Alternatively, several studies have reported that the most common mechanism of trauma in elderly was falls. Gowing *et al.* [21] have reported that the mechanisms of injury included falls (64%), motor vehicle collision (27%), injury from machinery (3%), injury from natural and environmental causes (2%), suicide or self-inflicted injury (3%), and burns (1%).

Another study on severe trauma in geriatric patients has reported that falls were the most common cause of trauma and the leading cause of trauma-related deaths in this population [7].

This contradiction may be explained by the difference in the study population, inclusion criteria, and site of the study. As this study was conducted in Suez Canal University Hospital, which is a tertiary care facility, it receives more cases of motor car accidents than usual.

In this study, no statistically significant difference in baseline systolic and diastolic blood pressure measures was observed between both groups. However, patients in the hypotensive resuscitation group had a significantly lower mean SBP after receiving fluids than those in group 2 (P<0.001).

These results are due to the effects of hypotensive resuscitation that results from balanced resuscitation, and this is why hypotensive resuscitation is not recommended in case of head trauma.

Almost all studies discussing the effects of damage control resuscitation have reported that hypotensive resuscitation results in lower blood pressure readings as it aims to keep the SBP between 80 and 90 mmHg [22,23].

Moreover, no statistically significant differences in base deficit and coagulopathy at baseline and after resuscitation were observed between the hypotensive resuscitation group and group 2. However, after resuscitation, patients in the hypotensive resuscitation group had significantly less severe base deficit than those in group 2 (P=0.04).

A large randomized, double-blind, parallel-group trial showed a higher mean improvement in base deficit excess during the first 24 h with Plasma-Lyte A than with 0.9% sodium chloride (7.5±4.7 vs. 4.4±3.9 mmol/l); difference: 3.1 (95% CI: 0.5–5.6). At 24 h, arterial pH was greater (7.41±0.06 vs. 7.37±0.07); difference: 0.05 (95% CI: 0.01–0.09) and serum chloride was lower (104±4 vs. 111±8 mEq/l); difference: −7 (95% CI: −10 to −3) with Plasma-Lyte A than with 0.9% sodium chloride [24].

In contrast, a meta-analysis discussing the use of ringer lactate versus isotonic saline in critically ill patients reported that ringer lactate and isotonic saline have no differences in various clinical outcomes, including in-hospital mortality and overall ICU mortality [25].

Meanwhile, regarding coagulopathy, patients in the hypotensive resuscitation group had significantly lower INR levels (<1.5) than group 2 (P<0.001). Similarly, a randomized control trial reported that implementing a hypotensive resuscitation strategy in patients may reduce the risk of early postoperative mortality from coagulopathic bleeding [26].

Trauma increases the risk of coagulopathy owing to acquired quantitative and qualitative platelet defects, hypocoagulable states, and dysregulation of the fibrinolytic system, a phenomenon referred to as fibrinolytic shutdown [27]. Thus, the ability to reduce INR, along with the coagulopathy risk, is a great advantage of hypotensive resuscitation as it decreases the need for crystalloid infusion.

In this study, intraperitoneal free fluid collection was found in 70.3% of the patients in the hypotensive resuscitation group and ~84% of the patients in group 2 (P=0.17). Other findings included splenic injury, hemothorax, and pericardial effusion (only one case in each group). Similarly, a study reported that excessive fluid resuscitation causes abdominal compartment syndrome among critically ill or injured patients, such as abdominal trauma, pelvic fracture, and intraabdominal organ injuries [28].

Additionally, in this study, both study groups had the same type of crystalloid fluid resuscitation, but regarding the amount of fluids administered, group 2 had a statistically significant higher amount (total amount of crystalloid, Ringer's lactate, and normal saline) to be able to maintain SBP at 100 mmHg than the hypotensive resuscitation group. In contrast, patients in the hypotensive resuscitation group received significantly more colloid fluids than those group 2 ($P<0.001$). Additionally, the hypotensive resuscitation group had a significantly higher amount of all types of colloid fluids (i.e. plasma, platelets, and packed RBC) than group 2.Furthermore, the hypotensive resuscitation group has less incidence of death in the emergency room (21.6%) than group 2 (35.1%) (P=0.04). Damage controlled resuscitation, and hypotensive resuscitation as one of its three components, decreases the odds of mortality among patients in the emergency room by 10.9% compared with usual resuscitation ($P<0.001$). Similarly, a multicenter randomized controlled trial, known as the colloids versus crystalloids for the resuscitation of the critically ill trial, has compared the mortality rate of critically ill patients who received colloids (n=1414; gelatins, dextrans, hydroxyethyl starches, or 4 or 20% albumin) with that of patients who received crystalloids (n=1443; isotonic or hypertonic saline or Ringer's lactate) for fluid resuscitation [27]. Therapy was open label, but the outcome assessment was blinded to treatment assignment. No differences in the 28-day mortality, need for renal replacement therapy, development of organ failure, and number of hospital days were observed between the two groups [29,30]. The 90-day mortality was slightly lower in patients who received colloids.

Based on the results of this study, we recommend conducting further studies to assess the effectiveness of hypotensive resuscitation in different populations and age groups. The use of damage control resuscitation in critically traumatized patients should be considered to gain the benefits of early colloid resuscitation.

The limitations of this study were as follows: (a) the small sample size may have affected the generalizability of the results. (b) We did not follow up the patients to assess the clinical outcomes at different intervals. (c) Hypothermia as an element of the lethal triad of hypothermia, coagulopathy, and acidosis was not assess owing to unavailability of a low-reading thermometer. (d) The method of randomization and selection of patient group was affected by availability of patient blood component in blood bank. (e) The topic is new regarding elderly population, so there were less number of articles used to strength the work in discussion.

Conclusion

This was a comparative cross-sectional study that reported a lower rate of mortality and acid deficit in the group managed with hypotensive resuscitation. The results are optimistic regarding the benefits of hypotensive resuscitation in elderly patients with trauma. However, many confirmatory studies should be conducted.

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Authors contribution: author contribution were as follows regarding the conception or design of the work, the acquisition, analysis, or interpretation of data for the work, and drafting the work or revising it critically for important intellectual content: M.T.I. and A.E.N. contributed 30%, and N.M.A. and N.M. A. contributed 20% each. All authors have approved the final version of the manuscript to be published and have agreed to be accountable for all aspects of the work.

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Conflicts of interest

There are no conflicts of interest.

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