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Clinical effects of two types of fluid infusion in pre-hospital care for traumatic shock.

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Abstract

Objective: The aim of this study is to discuss the clinical effects of two types of fluid infusion in pre-hospital care for traumatic shock.

Methods: A total of 100 patients with traumatic shock in our hospital from November 2016 to August 2017 were chosen and divided into the control group (n=50) and the treatment group (n=50) by random number table method. The control group was treated with the traditional fluid infusion method, and the treatment with subshock therapy. Salvage success rate, death rate, relevant clinical indexes, occurrence rate of complications, time to return of consciousness, and length of stay (LOS) between the two groups were observed and compared.

Results: The treatment group shows significantly higher salvage success rate and far lower death rate compared with the control group (P<0.05). It is significantly superior to the control group in terms of hemoglobin, blood platelet count, infusion quantity, prothrombin time, and hematocrit (P<0.05). No significant difference of systolic pressure is observed between the two groups (P>0.05). Moreover, the treatment group has far lower occurrence rate of complications than the control group (P<0.05). The control group has longer time to return of consciousness and LOS than the treatment group, showing statistically significant differences (P<0.05).

Conclusions: Subshock therapy can not only increase survival rate of patients with traumatic shock in pre-hospital care but also reduce the occurrence rate of complications and death rate. It has good prognosis and is worthy of extensive clinical promotions.

Keywords: Pre-hospital care, Traumatic shock, Two types of fluid infusion.

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Introduction

Traumatic shock is one of 10 common emergency and severe cases in clinics [1]. It is the proegumenal cause of death of patients. Trauma is accompanied with excessive bleeding, followed by a series of symptoms, such as reduction of body temperature and acidosis [2]. Therefore, delayed or inappropriate treatment will lead to missed treatment opportunities of patients with slight symptoms and threaten the life safety of patients with severe symptoms [3]. Replenishment of circulating blood volume is the first clinical treatment to traumatic shock, which aims to help patients recover normal vital signs and ensure blood perfusion to organs [4]. In this study, 100 patients with traumatic shock in our hospital from November 2016 to August 2017 were chosen as the research participants. Results are introduced in the following text.

Information and Methods

General information

A total of 100 patients with traumatic shock in our hospital from November 2016 to August 2017 were chosen and divided into the control group (n=50) and treatment group (n=50) by random number table method. The control group consisted of 27 males and 23 females aged 17-65 years, with an average of (32.7 ± 5.4) years. The time from trauma occurrence to clinic

treatment ranged between 5 and 42 min, with an average of (14.5 ± 2.5) min. Specifically, there were 15 cases of falls from high places, 30 cases of traffic accidents, and 5 cases of other causes. With respect to traumatic types, there were 12 cases of fracture and muscle tear, 18 cases of combined injury, and 20 cases of closed abdominal injury. There were 11 cases of mild shock, 17 cases of moderate shock, and 22 cases of serious shock. The treatment group consisted of 28 males and 22 females aged 18-66, with an average age of (33.6 ± 5.3) years. The time from trauma occurrence to clinic treatment ranged between 5 and 40 min, with an average of (13.6 ± 2.4) min. Specifically, there were 16 cases of falls from high places, 28 cases of traffic accidents, and 6 cases of other causes. With respect to traumatic types, there were 13 cases of fracture and muscle tear, 16 cases of combined injury, and 21 cases of closed abdominal injury. There were 10 cases of mild shock, 15 cases of moderate shock, and 25 cases of serious shock. Both groups have no statistically significant differences in general information (P>0.05), and they are comparable.

Methods

After being admitted to the hospital, two to three venous channels were constructed immediately in each patient. General conditions, such as body temperature and skin color of respirator, were observed. Treatment preparations were made initiatively. Hemorrhage was controlled, and blood loss volume was assessed. Patients with open trauma were treated with direct hemostasis through compression, pressure dressing, and hemostatics. Patients who fail to achieve significant improvement were treated with a tourniquet. Splints were used in patients with fractures to fix the affected limbs. Furthermore, secreta and blood clots in the mouth and respiratory tract were cleaned timely and thoroughly to ensure smooth breathing. Tracheal cannula was used in patients with serious dyspnea or respiratory failure.

The control group was treated by traditional fluid infusion according to the principle of "fast first and then slow, salt first and then sugar, crystal first and then glue." Balanced salt solutions such as 0.9% sodium chloride or composite sodium lactate and sorbitol composition were offered to patients at a drop rate of 20-30 mL/min. Patients with hypotension were offered hypertension drugs (e.g., dopamine) timely to keep arterial pressure at a standard of 80 mmHg. Furthermore, blood pressure changes of patients were monitored regularly. The treatment group was treated with subshock therapy and intravenous infusion of 7.5% sodium chloride at a rate of 3-4 mL/min. The average arterial pressure of patients was maintained at a standard of 30-40 mmHg to keep the body in a subshock state.

Observation indexes

Relevant clinical indexes including hemoglobin, blood platelet count, infusion quantity, prothrombin time (PT), hematocrit (HCT), and systolic pressure; salvage success rate and death rate; complications such as dysfunctions of multiple organs, disseminated intravascular coagulation (DIC), acute renal failure, and acute respiratory distress syndrome (ARDS); time to return of consciousness; and length of stay (LOS) were observed.

Statistical analysis

Relevant data were analyzed by SPSS 21.0. Relevant clinical indexes, time to return of consciousness, and LOS were described using ± s and examined by t test. Salvage success rate, death rate, and occurrence rate of complications were expressed in percentage and examined by χ^2. P<0.05 indicates statistically significant difference between the two groups.

Results

Salvage success rate and death rate

The treatment group shows significantly higher salvage success rate and far lower death rate compared with the control group (P<0.05). Results are shown in Table 1.

Table 1. *Comparison of salvage rate and death rate between the two groups [n (%)].*

Groups	Salvage success rate	Death rate
Control (n=50)	35 (70.0)	15 (30.0)
Treatment (n=50)	45 (90.0)	5 (10.0)
χ^2	6.2500	
P	0.0124	

Table 2. *Comparison of relevant clinical indexes between the two groups (x ± s).*

Groups	HCT	Blood platelet count (× 10^9/L)	PT (s)	Hemoglobin (g/L)	Systolic pressure (mmHg)	Infusion quantity (mL)
Control	0.242 ± 0.041	105.6 ± 18.2	15.4 ± 2.5	104.5 ± 17.2	75.8 ± 13.5	2145.9 ± 394.2
Treatment	0.318 ± 0.052	174.8 ± 31.3	11.3 ± 1.8	117.9 ± 23.3	72.7 ± 12.8	602.2 ± 101.6
t	8.1154	13.3583	9.4109	3.2717	1.1782	26.8142
P	0.0000	0.0000	0.0000	0.0015	0.2415	0.0000

Relevant clinical indexes

No significant difference of the systolic pressure is observed between the two groups (P>0.05). The treatment group is significantly superior to the control group in terms of hemoglobin, blood platelet count, infusion quantity, PT, and HCT (P<0.05) (Table 2).

Occurrence rate of complications

The treatment group has lower occurrence rate of complications than the control group, showing statistically significant differences (P<0.05). Results are shown in Table 3.

Time to return of consciousness and LOS

The control group has longer time to return of consciousness and LOS than the treatment group, showing statistically significant differences (P<0.05) (Table 4).

Table 3. Comparison of occurrence rate of complications between the two groups [n (%)].

Groups	Dysfunction of multiple organs	DIC	Acute renal failure	ARDS	Complications
Control (n=50)	6 (12.0)	3 (6.0)	6 (12.0)	4 (8.0)	19 (38.0)
Treatment (n=50)	2 (4.0)	1 (2.0)	3 (6.0)	2 (4.0)	8 (16.0)
χ^2					6.1390
P					0.0132

Table 4. Comparison of time to return of consciousness and LOS between the two groups ($\bar{x} \pm s$).

Groups	Time to return of consciousness (min)	LOS (day)
Control (n=50)	79.1 ± 18.3	15.9 ± 2.5
Treatment (n=50)	45.4 ± 15.8	10.3 ± 2.2
t	9.8562	11.8906
P	0.0000	0.0000

Discussion

With the recent boom of traffic and architectural industries, the quantity of patients with traumatic shock in clinics increases year by year. Most cases belong to uncontrolled hemorrhagic shock [5]. Timely and effective fluid infusion and acid correction and maintenance of smooth breathing are one of the important factors that influence the salvage success rate of traumatic shock [6]. As a direct and effective therapy, fluid infusion can influence the salvage effect and prognosis of patients directly.

In traditional rescue protocols, the basic principle in traumatic shock is to facilitate fast anabiosis of patients through early and rapid venous replenishment of fluids so as to recover circulating blood volume, keep vital signs at a normal level to the maximum extent, and maintain hemoperfusion of important organs [7]. Relevant scholars have pointed out that supply of abundant blood, crystalloid solution, and other colloidal fluid is needed immediately in patients with hemorrhagic shock, and the total fluid infusion shall be 50%-100% higher than the blood loss volume [8]. Many studies discovered that patients with shock have different physiological characteristics at different stages, which should be considered to adjust fluid supply speed and achieve the best therapeutic effect of fluid infusion. For traumatic shock patients who failed to achieve effective hemorrhage control, early therapy with fluid resuscitation will reduce coagulation function accordingly, thus eliminating the protective spasm of blood vessels and intensifying hemorrhage [9]. Moreover, it cannot significantly reduce the occurrence rate of complications and death rate. Some scholars have proved that rapid fluid resuscitation to patients with uncontrolled hemorrhagic shock may increase blood loss significantly and increase the incidence risk of dilutability coagulation disorders, thus decreasing the oxygen-carrying capacity of red blood cells [10]. It can effectively improve the anaerobic condition of tissues and will even cause metabolic acidosis. As a new therapy, subshock therapy can avoid the above problems effectively. In this therapy, the appropriate fluid is selected for patients with non-hemostasis traumatic shock, and the infusion quantity and speed are controlled reasonably to maintain blood pressure at a low level. According to literature, when the mean arterial pressure is greater than or equal to 40 mmHg, the basic hemoperfusion pressure of important organs can be maintained and protected. This can avoid various shortages of traditional fluid resuscitation therapy and enable the compensatory mechanism of the body, thus decreasing environmental interference and reducing the occurrence rates of complications. Many scholars have supported this notion after many studies and experiments. In the present study, we discovered that the treatment group shows significantly higher salvage success rate and far lower death rate compared with the control group (P<0.05). The treatment group is significantly superior than the control group in terms of hemoglobin, blood platelet count, infusion quantity, PT, and HCT (P<0.05). However, no significant difference in systolic pressure is observed between the two groups (P>0.05). Moreover, the treatment group has far lower occurrence rate of complications than the control group (P<0.05). The control group has longer time to return of consciousness and LOS than the treatment group, showing statistically significant differences (P<0.05). These results basically agree with relevant research conclusions.

Conclusion

Although subshock therapy has outstanding therapeutic effect to patients with traumatic shock, it is still not perfect. In particular, choosing the appropriate fluids is difficult and should be paid attention to in clinics.

References

1. Nongchang P, Wong WL, Pitaksanurat S, Amchai PB. Intravenous fluid administration and the survival of pre hospital resuscitated out of hospital cardiac arrest patients in Thailand. J Clin Diagn Res 2017; 11: OC29-OC32.
2. Aldabbas R, Alsaleh J. The relation between plasma levels of thrombomodulin and endothelial dysfunction in Syrian children with acute lymphoblastic leukemia. Biomed Res India 2017; 28: 7358-7360.
3. Watterson JB, Reid C, Burns BJ, Regan L. Pre-hospital advanced airway management in children: a challenge that training can handle. Scand J Trauma Resusc Emerg Med 2017; 25: 117.
4. Zhang Z, Li H, Meng X. A novel Co(II)-based coordination polymer: anti-inflammatory activity in post-traumatic osteoarthritis. Lat Am J Pharm 2016; 35: 2284-2287.
5. Scerbo MH, Holcomb JB, Taub E, Gates K, Love JD, Wade CE, Cotton BA. The trauma center is too late: Major limb trauma without a pre-hospital tourniquet has increased death from hemorrhagic shock. J Trauma Acute Care Surg 2017; 83: 1165-1172.
6. Liu Z, Bai X, Wang J. A rare case of report of primary cardiac liposarcoma infiltrating the left atrium and mitral valve. Biomed Res India 2017; 28: 7451-7453.
7. Hope AA, Adeoye O, Chuang EH, Hsieh SJ, Gershengorn HB, Gong MN. Pre-hospital frailty and hospital outcomes in adults with acute respiratory failure requiring mechanical ventilation. J Crit Care 2017; 44: 212-216.
8. Xiao W, Dai M. Formulation and characterization of biodegradable implants of ibuprofen for prolonged delivery in post traumatic spinal injuries. Lat Am J Pharm 2015; 34: 1718-1722.
9. Yang C, Gao J, Du J, Yang X, Jiang J. Clinical effects of two types of fluid infusion in pre-hospital care for traumatic shock. Int J Biol Sci 2017; 13: 1409-1419.
10. Tunthanathip T, Phuenpathom N. Clinical effects of two types of fluid infusion in pre-hospital care for traumatic shock. J Neurosci Rural Pract 2017; 8: 601-608.

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