

# Application Effect of Limited Fluid Resuscitation in Emergency Patients with Multiple Trauma Complicated with Shock

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**Abstract:** This article explores the methods and effects of limited fluid resuscitation in the treatment of hemorrhagic shock caused by multiple trauma, which is common in clinic. 80 patients with multiple trauma complicated with shock were randomly selected from the emergency department of our hospital and divided into the observation group and the control group, with 40 members in each group. Patients in the observation group were treated with limited fluid resuscitation, while those in the control group were treated with aggressive fluid resuscitation. By comparing the therapeutic effects of the two groups, it is concluded that the therapeutic effect of the observation group is significantly better than that of the control group. Therefore, adopting limited fluid resuscitation in the clinical treatment of patients with multiple trauma complicated with shock can realize faster recovery, as well as protect patients' coagulation function, effectively reducing complications and mortality. Moreover, it can also reduce the injury of trauma perfusion to the body, ensuring the recovery of patients.

**Keywords:** Limited Fluid Resuscitation; Application in Emergency Treatment; Recovery

## 1. Introduction

Multiple trauma is a common severe illness in clinic. Once onset, it is prone to cause shock and may lead to the failure of some internal organs or cause acute respiratory distress syndrome, resulting in the death of patients. Hemorrhagic shock caused by multiple trauma is even common in the world.

According to relevant reports, about 2 million patients die from hemorrhagic shock every year around the world, among which 1.6 million die from hemorrhagic shock caused by multiple trauma. Experts in this field pointed out in 2017 that there were two main treatments for hemorrhagic shock caused by multiple trauma. One is to control bleeding, and the other is to restore perfusion. Timely bleeding control and professional fluid resuscitation in clinical practice are the key methods to rescue patients with hemorrhagic shock caused by multiple

trauma, which can greatly improve the therapeutic effect<sup>[1]</sup>.

## 2. Materials and methods

### 2.1 General information

80 patients with multiple trauma complicated with hemorrhagic shock were randomly selected from the emergency department of our hospital from June 2019 to December 2019, and were divided into the observation group and the control group. The observation group consisted of 25 males and 15 females, aged from 15 to 70 years, with an average age of  $(38.25 \pm 23.78)$  years. There were 23 males and 17 females in the control group, who were aged from 18 to 65 years, with an average age of  $(40.26 \pm 23.18)$  years. The differences of patients' age and sex in the observation group and the control group have no statistical significance ( $P$  is greater than 0.05).

Collect the general information such as the name, gender and age of the patients in both groups, and compare the treatment effects under limited fluid resuscitation and aggressive fluid resuscitation respectively, and analyze the differences between them<sup>[2]</sup>.

## 2.2 Research methods

(1) The emergency department of our hospital set up a treatment project group for treating patients with multiple trauma complicated with shock, and designed a statistical scale to compare the therapeutic effects of patients under different treatment methods. Then, medical statistics and analysis were carried out<sup>[3]</sup>.

(2) Collect the general information of the two groups of patients, including their names, ages and genders, and make statistics on the emergency treatment of these patients for clinical analysis and comparison.

## 2.3 Treatment methods

Patients in the observation group and the control group were examined after admission, and were given basic rescue methods such as opening venous access, stopping bleeding and relieving pain. At the same time, routine laboratory examination was carried out on the patients, and according to the examination results, it was determined whether the patients were seriously ill and needed immediate surgical treatment. Patients in the observation group were treated with limited fluid resuscitation: limiting infusion volume and infusion speed, and maintaining their systolic blood pressure at 70–90 mmHg, and maintaining the average arterial pressure at 50–70 mmHg. Patients in the control group were treated with aggressive fluid resuscitation: giving a large amount of rapid fluid supplement to them to keep their blood pres-

sure level at 80–120 mmHg. While given recovery rescue, the two groups of patients should be treated with surgery as soon as possible to save their lives<sup>[4]</sup>.

## 2.4 Observing indexes

(1) Serum lactic acid and coagulation function

3ml of patients' peripheral blood were collected before and after 3 hours of fluid resuscitation treatment. The amount of serum lactic acid were detected by colorimetry<sup>[5]</sup>.

(2) Inflammation

Serum interleukin and tumor necrosis factor in patients' blood before and after 3 hours of treatment with means of enzyme-linked immunosorbent assay.

(3) Rescue effect

Medical statistics were made on the mortality rate of patients in the observation group and the control group, together with multiple organ failure and acute respiratory distress syndrome in 3 hours after rescue operation.

## 2.5 Statistical processing

Medical data were statistically processed by software, items denoting the statistical data, carrying out test, and percentage % denoting the counting data. The P-value less than 0.05 is statistically significant<sup>[6]</sup>.

## 3. Results

(1) Statistics results on the effects of different fluid resuscitation in the two groups are shown in **Table 1**.

(2) Statistics results of complications and mortality of the two groups of patients under different fluid resuscitation are shown in **Table 2**.

**Table 1.** Comparison of resuscitation effects between two groups after resuscitation with different fluids (Mean ± SD)

Group	Cases	Average recovery time (min)	Liquid perfusion per capita (mL)	Mean arterial pressure (mmHg)	Mean prothrombin time (s)	Activated partial thromboplastin time (s)
Observation group	40	82.57 ± 22.63	1,489 ± 197	56.24 ± 4.93	14.02 ± 1.36	36.28 ± 3.85
Control group	40	129.35 ± 27.68	2,006 ± 236	75.89 ± 7.97	17.23 ± 1.77	46.92 ± 3.58
T		12.298	10.606	12.891	10.639	15.207
P		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

**Table 2.** Complications and mortality

Group	Cases	Respiratory distress	Complication: Inflammation	Acute renal failure	Death
Observation group	40	3	2	1	3
Control group	40	9	8	6	11
X <sup>2</sup>		4.917	4.462	3.989	6.845
P		< 0.05	< 0.05	< 0.05	< 0.05

## 4. Discussion

Clinical statistics indicate that about 700,000 people die from multiple trauma every year in China. Because of various forms of trauma, the patient may suffer from shock caused by excessive blood loss, which greatly increasing the probability of death. Multiple trauma complicated with shock are mainly caused by the decrease of blood circulation in the patient's body in a short period of time, which leads to ischemic injury of some important organs including heart, liver and kidney, resulting in organ failure and death. According to the traditional treatment concept, for treating patients with multiple trauma complicated with shock, it is necessary to establish venous channels and add fluid in time in order to restore normal blood circulation and ensure blood irrigation and oxygen supply of important organs. However, this treatment can easily lead to insufficient al blood perfusion, increasing the burden on visceral organs, leading to ineffective treatment and even threatening the life of patients<sup>[7]</sup>.

Researches in recent years have shown that the most important thing to rescue patients with hemorrhagic shock is to stop bleeding quickly, and at the same time, to carry out appropriate fluid resuscitation according to the blood pressure of patients, so as to keep the arterial pressure in a stable state, minimize the damage to important organs of patients, thus improving the therapeutic effect.

A "golden hour" rapid treatment plan has been proposed by clinical experts to treat patients with multiple injuries complicated with shock, which has been recognized by the medical community. A large amount of clinical practices have proved that the therapeutic goal of limited fluid resuscitation is to find a proper way for patients' resuscitation, that is, to improve the blood irrigation of important organs without affecting the compensatory mechanism and visceral organs of patients. It has effectively improved the rescue effect.

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Serum lactic acid is the best index to monitor the shock of patients, directly reflecting the anaerobic metabolism of patients, the low irrigation of blood circulation in various organs and tissues, and the shock caused by blood loss. It can effectively predict the therapeutic effect and mortality of patients. According to relevant medical reports, the standard value of the serum lactic acid is 2 nunol/L. If this index of the patient can return to normal within one day, the survival rate is 100%, followed by 80% of survival rate if the value returns to normal within one to two days, the survival rate is 15%<sup>[8]</sup>.

Monokines (TNF-a) are involved in multiple physiological and pathological processes of patients, and they can activate the coagulation system in patients and accelerate the release of thrombopoietic-stimulating factor and prostaglandin. When the patient suffers from blood perfusion injury due to hemorrhagic shock, it will cause a large increase in inflammatory factors, aggravate organ damage and increase the mortality.

Our clinical medical research indicates that the levels of serum lactic acid, interleukin-6 and monokines in the observation group are lower than those in the control group after 3 hours of limited fluid resuscitation, while international normalized ratio (INR) and activated partial thromboplastin time (APTT) were shorter than those in the control group. According to the clinical results, using limited fluid resuscitation to treat patients with multiple trauma complicated with shock can obviously reduce the serum lactic acid level, the inflammatory factors, and shorten the prothrombin time and activated partial prothrombin time, further improving the coagulation function of patients, improving the therapeutic effect, and increasing the survival probability of patients<sup>[9]</sup>.

Limited fluid resuscitation is also a kind of hypotension fluid resuscitation, that is, to control the speed of fluid input reasonably when the patient is in hemorrhagic shock due to trauma, so that the blood pressure can be

controlled in a small range until the blood stops completely. In addition, the blood will not be excessively diluted due to a large amount of liquid supplementation in the rescue process, and the accumulation and the oxygen content of red blood cells can be effectively improved<sup>[10]</sup>.

Furthermore, the above treatment can quickly restore the myocardial oxygen supply speed of patients, accelerate the blood supply to the heart, relieve the clinical symptoms, improve the rescue effect, and greatly increase the survival rate of patients. Researches have pointed out that limited fluid resuscitation can greatly shorten the recovery time of patients' physical mechanism, reduce the amount of fluid input, adjust the coagulation function of patients, improve their immune mechanism and increase the survival rate.

In this clinical investigation, the incidence rates of respiratory distress, inflammatory reaction and acute renal insufficiency in the observation group were 8.2%, 5.1% and 2.7% respectively, while the figures in the control group were 23.1%, 21.2% and 15.3% respectively. The mortality rate of the observation group was 6.9%, and that of the control group was 26.7%. respectively. Therefore, limited fluid resuscitation has better treatment effect than aggressive fluid resuscitation in reducing complications and mortality.

## 5. Conclusion

To sum up, limited fluid resuscitation has better effect than general fluid resuscitation in rescuing patients with multiple trauma and shock. That is because the former can greatly reduce the serum lactic acid level of patients, effectively reduce inflammatory factors, and enable patients to recover their physical mechanisms in a short period of time. It can increase their chances of survival, and ensure their life safety, making it a highly reliable treatment method that can be widely applied in

clinical emergency treatment.

## References

1. Zhang L, Li Y. Progress of traumatic hemorrhagic shock. *Journal of Clinical Emergency* 2017; 19(3): 145–148.
2. Emergency Branch of Chinese Medical Doctor Association, *et al.* Chinese emergency medicine expert consensus on diagnosis and treatment of traumatic hemorrhagic shock. *Journal of Clinical Emergency* 2017; 18(2): 881–889.
3. Zhang Y, Wu Y, Shen Z, *et al.* Discussion on a multidisciplinary integration mode of emergency treatment in multiple trauma. *Chinese Journal of Disaster Medicine* 2017; 5(2): 712–715.
4. Wang B, Liu C, Zhang J, *et al.* Curative effects of restrictive liquid resuscitation in patients with hemorrhagic traumatic shock: A clinical study. *China Journal of Emergency Resuscitation and Disaster Medicine* 2016; 11(9): 849–851.
5. Luo Y. Application of limited fluid resuscitation in the treatment of obstetric hemorrhagic shock (in Chinese). *Chinese Community Doctors* 2019; 35(5): 54, 56.
6. Shi Z. Curative effects of limited fluid resuscitation in 42 emergency patients with traumatic shock (in Chinese). *Contemporary Medical Symposium* 2019; 17(4): 92–93.
7. Hu X. Effects of different fluid resuscitation strategies in the early stage of traumatic hemorrhagic shock on TNF- $\alpha$  and IL-6 in serum of SD rats [Master's thesis]. Shenyang: China Medical University 2019.
8. Li K, Wen H, Li D, *et al.* Fluid resuscitation in diagnosing and treating hemorrhagic shock caused by traumatic rupture of liver and spleen (in Chinese). *Shenzhen Journal of Integrated Traditional Chinese and Western Medicine* 2019; 29(1): 115–116.
9. Li S. Effect of limited fluid resuscitation combined with interventional therapy on traumatic retroperitoneal hematoma. *International Medicine and Health Guidance News* 2019; (2): 246–248.
10. Li Z, Li X, Gong D, *et al.* The clinical application of restrictive fluid resuscitation in traumatic hemorrhagic shock treated by chest trauma. *Journal of North Sichuan Medical College* 2018; 33(6): 844–846.