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限制性液体复苏对多发性骨折合并创伤失血性休克患者凝血功能、心肌损害指标及预后的影响*

韩 力 赵建文 王晓伟 何红英 吴 卓 张建政△

（中国人民解放军总医院第七医学中心骨科 北京 100700）

摘要 目的:探讨限制性液体复苏对多发性骨折合并创伤失血性休克患者凝血功能、心肌损害指标及预后的影响。**方法:**选取我院收治的多发性骨折合并创伤失血性休克患者77例,分为研究组(n=39)、对照组(n=38),对照组给予常规液体复苏,研究组给予限制性液体复苏,比较两组患者凝血功能、心肌损害指标、输液量、失血量、输血量、并发症发生率及病死率。**结果:**研究组的输液量、失血量、输血量均少于对照组(P<0.05)。与复苏前相比,两组患者复苏1 h后凝血酶原时间(PT)、凝血活酶时间(APTT)、凝血酶时间(TT)均延长,且研究组长于对照组(P<0.05);两组患者复苏1 h后肌酸激酶(CK)、肌酸激酶-同工酶(CK-MB)、肌钙蛋白T(CTnT)水平均下降,且研究组低于对照组(P<0.05)。研究组复苏期间并发症发生率、病死率均低于对照组(P<0.05)。**结论:**限制性液体复苏治疗多发性骨折合并创伤失血性休克患者,可改善患者凝血功能和预后,降低并发症发生率,同时还可减轻心肌损害。

关键词:限制性液体复苏;多发性骨折;创伤失血性休克;凝血功能;心肌损害;预后

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The Effect of Limited Fluid Resuscitation on Coagulation Function, Myocardial Damage Indexes and Prognosis in Patients with Multiple Fractures and Traumatic Hemorrhagic Shock*

HAN Li, ZHAO Jian-wen, WANG Xiao-wei, HE Hong-ying, WU Zhuo, ZHANG Jian-zheng△

(Department of Orthopaedics, The Seventh Medical Center of Chinese People's Liberation Army General Hospital, Beijing, 100700, China)

ABSTRACT Objective: To explore the effect of limited fluid resuscitation on coagulation function, myocardial damage indexes and prognosis in patients with multiple fractures and traumatic hemorrhagic shock. **Methods:** 77 patients with multiple fractures and traumatic hemorrhagic shock who were admitted to our hospital were selected. According to the method of random number table, they were divided into control group(n=38) and study group(n=39). The control group was given routine fluid resuscitation, and the study group was given limited fluid resuscitation. The coagulation function, myocardial damage index, transfusion volume, blood loss volume, blood transfusion volume, complication rate and mortality rate were compared between the two groups. **Results:** The transfusion volume, blood loss volume and blood transfusion volume in the study group were less than those in the control group (P<0.05). The prothrombin time (PT), prothrombin time (APTT) and thrombin time (TT) in the two groups were all increased at 1 hour after resuscitation, and those in the study group were longer than those in the control group (P<0.05). Creatine kinase (CK), creatine kinase isoenzyme (CK-MB) and troponin T (cTnT) were all decreased in the two groups at 1 hour after resuscitation, and those in the study group were lower than those in the control group(P<0.05). The complication rate and mortality rate in the study group were lower than those in the control group(P<0.05). **Conclusion:** Limited fluid resuscitation in the treatment of multiple fractures with traumatic hemorrhagic shock can improve coagulation function and prognosis in patients with multiple fractures and traumatic hemorrhagic shock, which can reduce the incidence of complications and myocardial damage.

Key words: Limited fluid resuscitation; Multiple fractures; Traumatic hemorrhagic shock; Coagulation function; Myocardial damage index; Prognosis

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前言

多发性骨折是骨科的常见疾病,多因交通事故、暴力撞击、高处坠落、机器损伤所引起,而创伤失血性休克是多发性骨折

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作者简介:韩力(1980-),男,本科,主治医师,研究方向:创伤骨科,E-mail: hanli9950110@126.com

△ 通讯作者:张建政(1973-),男,博士,主任医师,研究方向:骨盆髋臼,E-mail: drzhangjianzheng@126.com

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患者最为常见且最严重的并发症[1,2]。创伤失血性休克作为一种全身性的急性缺血缺氧性病理损害，内源性血管活性物质大量分泌，微血管出现麻痹性扩张或失去反应性，严重者导致患者死亡[3-5]。据统计[6]，因创伤失血性休克导致死亡的患者约占创伤致死的 1/3。可见，早期给予有效的治疗对于改善多发性骨折合并创伤失血性休克患者预后具有积极的临床意义。现临床针对该病的治疗主要给予大量液体复苏以尽快恢复患者生命体征。有临床实践证实大量的液体复苏可导致患者出血症状加重，影响治疗效果[7,8]。限制性液体复苏是指复苏过程中通过限制输入量，以保证患者血压维持稳定状态[9]。本研究通过对我院收治的多发性骨折合并创伤失血性休克患者给予限制性液体复苏治疗，疗效满意，现整理如下。

1 资料与方法

1.1 基线资料

2016 年 4 月 ~2019 年 4 月期间选取我院收治的 77 例多发性骨折合并创伤失血性休克患者，纳入标准：(1)经 CT 或磁共振成像检查显示患者发生两个或两个以上部位骨折；(2)均符合创伤失血性休克标准[10]：收缩压≤ 90 mmHg，损伤严重程度评分(ISS)≥ 16 分，创伤指数(Ts)≥ 10；(3)患者的家属知情本研究且签署同意书；(4)入院抢救后存活时间超过 12 h。排除标准：(1)合并严重心脑血管障碍者；(2)治疗前即存在弥漫性血管内凝血者；(3)合并脑挫裂伤，既往高血压、冠心病等有基础性疾病患者；(4)妊娠及哺乳期妇女。根据随机数字表法分为研究组(n=39)、对照组(n=38)，其中对照组女 17 例，男 21 例，年龄 24~68 岁，平均(42.39± 4.51)岁；致伤原因：高空坠落 9 例，交通事故 15 例，机器损伤 7 例，暴力撞击 7 例；休克程度：轻度 13 例，中度 16 例，重度 9 例。研究组女 16 例，男 23 例，年龄 22~69 岁，平均(42.61± 5.38)岁；致伤原因：高空坠落 9 例，交通事故 17 例，机器损伤 8 例，暴力撞击 5 例；休克程度：重度 9 例，中度 17 例，轻度 13 例。两组一般资料对比未见差异(P>0.05)，具有可比性。

1.2 方法

入院后均给予心电监护，行常规检查，评估病情，给予吸氧、止痛、固定骨折肢体、止血等基础性措施。所有患者均给予 6%右旋糖酐 +7.5%高渗盐液 250 mL，缓慢静脉滴注，10~15 min 内输完，随后给予比例为 1:1 的浓缩红细胞与冰冻血浆。在此基础上，对照组给予常规液体复苏治疗，维持血压 120 /80 mmHg 左右。研究组则给予限制性液体复苏治疗，在未行手术彻底止血前，维持平均动脉压 50~60 mmHg、收缩压 70~90 mmHg，并限制输液量及输液速度。两组患者在复苏抢救的同时，尽快给予相关手术治疗。

1.3 观察指标

(1)于复苏前、复苏后 1 h 抽取患者肘静脉血 4 mL，经离心半径 15 cm，4200 r/min 离心 13 min，分离待测。采用法国 STAGO 诊断技术有限公司生产的 STA-R Evolution 全自动凝血分析仪检测凝血功能指标：凝血酶原时间(PT)、凝血活酶时间(APTT)、凝血酶时间(TT)。采用速率法检测肌酸激酶(CK)，采用免疫抑制法检测肌酸激酶 - 同工酶(CK-MB)，采用化学发光法检测肌钙蛋白 T(CTnT)，严格遵守试剂盒(上海酶联生物科技有限公司)说明书进行操作。(2)记录两组并发症发生率、病死率情况。(3)记录两组治疗过程中输液量、失血量、输血量。

1.4 统计学方法

研究数据录入 SPSS24.0 软件处理。计数资料以率表示，行卡方检验。计量资料用均数± 标准差($\bar{x}\pm s$)表示，行 t 检验。α=0.05 为检验水准。

2 结果

2.1 输液量、失血量、输血量比较

研究组的输液量、失血量、输血量均少于对照组(P<0.05)；详见表 1。

表 1 输液量、失血量、输血量比较($\bar{x}\pm s$，mL)

Table 1 Comparison of transfusion volume, blood loss volume and blood transfusion volume($\bar{x}\pm s$, mL)

Groups	Transfusion volume	Blood loss volume	Blood transfusion volume
Control group(n=38)	2946.37± 129.62	1388.27± 137.58	1864.41± 193.85
Study group(n=39)	2109.28± 137.95	1045.26± 158.63	1494.98± 236.82
t	27.425	10.125	7.480
P	0.000	0.000	0.000

2.2 凝血功能指标的比较

两组复苏前 PT、APTT、TT 比较无差异(P>0.05)；两组复苏 1 h 后 PT、APTT、TT 均延长，且研究组长于对照组(P<0.05)；详见表 2。

2.3 两组患者心肌损害指标比较

两组患者复苏前 CK、CK-MB、CTnT 水平比较无差异(P>0.05)；两组患者复苏 1 h 后 CK、CK-MB、CTnT 水平均下降，且研究组低于对照组(P<0.05)；详见表 3。

2.4 并发症、病死率比较

研究组复苏期间并发症发生率 7.69%、病死率 5.13%均低于对照组的 26.32%、23.68%，差异有统计学意义(P<0.05)；详见表 4。

3 讨论

多发性骨折患者的出血点数量多，出血空间大，加之出血部位隐匿，造成有些部位无法有效加压止血，产生多种并发症[11,12]，而创伤性失血休克患者机体在短期内即出现大量失血情况，造成多个器官组织功能受损，若此病理过程未能及时逆转，病情严重者可引起患者器官功能衰竭[13,14]。心脏是人体的重要器官之一，同时也是创伤性失血休克最易受累的器官之一，

其引起的功能障碍在造成心功能不全的同时，还可引起其他脏器的血流灌注不足[15]。既往不少报道均已证实休克早期机体存在一定程度的心肌损伤。既往临床认为创伤性失血休克治疗的关键在于为患者快速、大量的输液，以使患者血液恢复正常，并保持有效的血液循环[16,17]。近些年来不少临床实践证实[18,19]，大量的补液可能会对创伤性失血休克患者的失血代偿机制造成干扰，引发弥漫性血管内凝血、多器官功能障碍综合征等并发症，由此限制性液体复苏理念顺势而生，该理念认为应对液体输入量加以控制，仅维持在患者的基本需求程度即可，并保持这一状态直至止血完成，对于失血性休克且未能有效控制者更应如此[20]。

表 2 两组患者凝血功能指标的比较($\bar{x}\pm s$，s)

Table 2 Comparison of coagulation indexes between the two groups($\bar{x}\pm s$, s)

Groups	PT		APTT		TT	
	Before resuscitation	1 h after resuscitation	Before resuscitation	1 h after resuscitation	Before resuscitation	1 h after resuscitation
Control group(n=38)	10.86± 1.15	14.35± 1.22[a]	31.38± 3.57	36.78± 3.25[a]	12.23± 2.25	16.53± 2.87[a]
Study group(n=39)	11.05± 1.21	19.94± 1.78[a]	31.12± 4.33	41.69± 4.27[a]	12.71± 2.36	20.98± 2.95[a]
t	0.706	16.033	0.287	5.667	0.913	6.707
P	0.482	0.000	0.775	0.000	0.364	0.000

Note: compared with before resuscitation, [a]*P*<0.05.

表 3 两组患者心肌损害指标比较($\bar{x}\pm s$)

Table 3 Comparison of myocardial damage indexes between the two groups($\bar{x}\pm s$)

Groups	CK(U/L)		CK-MB(U/L)		CTnT(ng/mL)	
	Before resuscitation	1 h after resuscitation	Before resuscitation	1 h after resuscitation	Before resuscitation	1 h after resuscitation
Control group(n=38)	43.16± 4.21	32.49± 4.24[a]	52.26± 6.35	36.95± 6.04[a]	3.75± 0.53	2.84± 0.41[a]
Study group(n=39)	43.24± 3.45	21.38± 3.04[a]	53.73± 7.85	22.31± 7.51[a]	3.86± 0.64	2.02± 0.35[a]
t	0.091	13.240	0.902	9.411	0.820	9.447
P	0.927	0.000	0.730	0.000	0.415	0.000

Note: compared with before resuscitation, [a]*P*<0.05.

表 4 两组患者并发症发生率、病死率比较 [n(%)]

Table 4 Comparison of the complication rate and mortality rate between the two groups [n(%)]

Groups	Complication			Mortality rate
	Multiple organ dysfunction syndrome	Disseminated intravascular coagulation	Total incidence rate	
Control group(n=38)	4(10.53)	6(15.79)	10(26.32)	9(23.68)
Study group(n=39)	1(2.56)	2(5.13)	3(7.69)	2(5.13)
x^2		4.757		5.412
P		0.029		0.020

本研究中研究组的输液量、失血量、输血量均少于对照组，同时其并发症发生率、病死率均低于对照组，可见限制性液体复苏治疗可帮助患者迅速止血，提高复苏效果，降低患者并发症发生率，改善预后。究其原因，限制性液体复苏治疗先采用快速补液法，当患者各项功能趋于正常时再行缓慢补液，在保证早期液体充足的同时，降低了因液体量过度增加而引起一系列并发症的发生率[21,22]，而限制性液体复苏方案可实现快速止血的目的，降低病死率。以往研究证实[23]，对伴有活动性出血的机体快速输入大量液体，不但影响脏器的血液供给，还会因为液体持续大量输注引起血管收缩，导致无法有效形成凝血块，加重出血，引起凝血功能障碍。本研究中两组患者凝血功能均有所改善，且限制性液体复苏者改善效果更佳，这可能是因为早期阶段，常规液体复苏会造成创面静脉压力状况，促进血凝块移动，不利于患者止血，而限制性液体复苏则可在适当恢复机体血液循环的基础上，避免机体出现代偿机制紊乱以及凝血功能障碍[24,25]。CTnT 是心肌细胞的特异性抗原，只存在于心肌细胞，而当机体心肌受损时，则被释放入血[26]。CK、CK-MB 主要分布于心脏、肝脏细胞中，在心肌细胞中含量最高，当心肌受损时，其水平会迅速升高，两者均是检测机体心脏功能的重要指标[27]。本研究中两组患者复苏 1 h 后 CK、CK-MB、CTnT 水平均下降，且限制性液体复苏治疗的患者心肌损害更轻，可能是限制性液体复苏治疗可通过减少输液量及维持低血压的状态，较

好促进患者循环代谢趋于正常，并提高红细胞压积及其携氧能力，快速恢复心肌细胞氧供，从而发挥心肌保护作用[28-30]。

综上所述，多发性骨折合并创伤失血性休克患者经限制性液体复苏治疗的止血复苏效果较好，减轻心肌损害的同时还可改善患者凝血功能及预后。

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