

论著·临床研究

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多学科联合急救系统在血流动力学不稳定 骨盆骨折患者的临床应用*

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[摘要] **目的** 评估多学科联合急救系统在动脉出血所致血流动力学不稳定的骨盆骨折中的诊治作用。

方法 收集该院 2016 年 2 月至 2019 年 11 月收治的 91 例动脉出血造成血流动力学不稳定的骨盆骨折患者的临床资料,其中经多学科联合急救系统进行救治的 23 例患者纳入试验组,经传统会诊分诊系统进行救治的 68 例患者纳入对照组。比较两组患者一般资料、损伤严重程度评分(ISS)、改良创伤评分(RTS)、严重创伤生存概率评分[Ps(TRISS)],120 呼叫至到达急诊室时间、到达急诊室至诊断时间、诊断至实施 AE 时间、AE 手术时间,患者到达时外科医师、放射医师到场情况,以及 24 h 内使用悬浮红细胞(RBC)、新鲜冰冻血浆(FFP)、血小板情况等资料。**结果** 试验组 RTS 明显高于对照组[7.8(2.4,7.9)分 vs. 6.0(2.4,7.8)分, $P<0.01$],Ps(TRISS)明显低于对照组[60(1,98)分 vs. 80(1,96)分, $P<0.01$],两组 ISS 无明显差异($P=0.13$)。两组 120 呼叫至到达急诊室时间、AE 手术时间无明显差异($P>0.05$)。试验组到达急诊室至诊断时间、诊断至实施 AE 时间较对照组明显缩短[23(15,39)min vs. 40(34,63)min,15(9,23)min vs. 25(22,51)min, $P<0.05$]。试验组到达时外科医师存在、到达时放射医师存在、到达时外科和放射医师均存在患者比例均明显高于对照组(73.9% vs. 27.9%,78.3% vs. 30.9%,65.2% vs. 19.1%, $P<0.05$)。试验组住院死亡率明显低于对照组(8.7% vs. 27.9%, $P<0.05$)。**结论** 多学科联合急救系统可改善诊治动脉出血所致血流动力学不稳定的骨盆骨折的及时性,降低患者死亡率。

[关键词] 多学科联合;急救;血流动力学不稳定;骨盆骨折

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Clinical application of multidisciplinary combined first aid system in patients with hemodynamically unstable pelvic fractures*

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[Abstract] **Objective** To evaluate the diagnostic and treatment role of the multidisciplinary combined

first aid system in hemodynamically unstable pelvic fractures caused by arterial bleeding. **Methods** The clinical data of 91 cases of hemodynamically unstable pelvic fractures caused by arterial bleeding treated in this hospital from February 2016 to November 2019 were collected. Among them, 23 cases treated by the multidisciplinary combined first aid system were included into the experimental group, and 68 cases treated by the traditional consultation and triage system were included into the control group. The general data, injury severity score (ISS), revised trauma score (RTS), survival probability score for severe trauma [Ps(TRISS)], time of calling 120 to the emergency room, time from arrival in the emergency room to diagnosis, time from diagnosis to implementing AE, AE operation time, presence of surgeon and radiologist when patient arrival, use of suspended red blood cells (RBC), fresh frozen plasma (FFP) and platelets within 24 h, etc. were compared between the two groups. **Results** The RTS score of the experimental group was significantly higher than that of the control group [7.8 (2.4, 7.9) points vs. 6.0 (2.4, 7.8) points, $P<0.01$]. The Ps(TRISS) score of the experimental group was significantly lower than that of the control group [60 (1, 98) points vs. 80 (1, 96) points, $P<0.01$]. There was no significant difference in the ISS score between the two groups ($P=0.13$). There was no significant difference in the time from calling 120 to the emergency room and AE operation time between

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the two groups ($P > 0.05$). The time from the arrival in the emergency room to diagnosis and the time from diagnosis to implementation of AE in the experimental group were significantly shortened, compared with the control group [23 (15, 39) min vs. 40 (34, 63) min, 15 (9, 23) min vs. 25 (22, 51) min, $P < 0.05$]. The proportion of the patients when the patients arrived at the emergency room with the presence of surgeons, the presence of radiologists, the presence of both surgeons and radiologists in the experimental group were significantly higher than those in the control group (73.9% vs. 27.9%, 78.3% vs. 30.9%, 65.2% vs. 19.1%, $P < 0.05$). The hospitalization mortality rate of the experimental group was significantly lower than that of the control group (8.7% vs. 27.9%, $P < 0.05$). **Conclusion** The multidisciplinary combined first aid system could improve the timeliness of hemodynamically unstable pelvic fractures caused by arterial bleeding, and can reduce the patients mortality.

[Key words] multidisciplinary joint; first aid; hemodynamic instability; pelvic fracture

骨盆骨折每年发病率为 20.0/10 万~35.2/10 万,病死率高达 5%~20%,开放性骨盆骨折病死率将进一步上升到 55%。出血是造成约 42% 骨盆骨折患者死亡的主要因素,而骨盆骨折伴血流动力学不稳定约 86% 是由动脉出血造成^[1-5]。血管栓塞(angioembolization, AE)是控制骨盆骨折动脉出血的有效方法之一。及时实施 AE 将降低此类患者的死亡率。但由于相关外科医师及放射科医师未能及时到达,以及相关配套设施的缺乏使得及时实施以上两种技术相当困难^[6-7]。本院于 2016 年 1 月构建多学科联合急救系统,为血流动力学不稳定的骨盆骨折及其他严重创伤患者配备专业的外科医师、放射科医师及相应的配套设施,旨在提高此类患者救治的及时性^[8-9]。本文比较多学科联合急救系统与传统会诊分诊系统在救治动脉出血所致血流动力学不稳定的骨盆骨折患者中准备及实施 AE 的时间等相关指标,以评估两种系统救治的及时性,为临床治疗此类患者提供指导。

1 资料与方法

1.1 一般资料

收集本院 2016 年 2 月至 2019 年 11 月救治的动脉出血所致血流动力学不稳定的骨盆骨折患者 91 例;其中经多学科联合急救系统进行救治的 23 例患者纳入试验组,经传统会诊分诊系统进行救治的 68 例患者纳入对照组。纳入标准:(1)血流动力学不稳定的骨盆骨折;(2)CT 动脉造影显示动脉出血;(3)患者实施 AE 控制出血。血流动力学不稳定的定义:(1)入院时收缩压小于 90 mm Hg,收缩压大于 90 mm Hg 但需要输液(输血)或输入血管升压药物;(2)入院显著碱缺失(剩余碱小于或等于 -6 mmol/L);(3)休克指数 > 1,满足以上任意一条可诊断为血流动力学不稳定^[10]。排除标准:(1)血流动力学稳定的骨盆骨折患者;(2)未实施动脉造影的患者;(3)未实施 AE 控制出血的患者;(4)无法完成相关资料收集的患者。所有患者资料的获取均取得本人或直系亲属的知情同意,本研究通过本院伦理审查委员会审查。

1.2 方法

收集患者的一般资料、损伤严重程度评分(injury severity score, ISS)、改良创伤评分(Revised Trauma Score RTS)、严重创伤生存概率评分[probability of survival by the trauma and injury severity score method, Ps(TRISS)], 120 呼叫至到达急诊室时间、到达急诊室至诊断时间、诊断至实施 AE 时间、AE 手术时间;患者到达时外科医师、放射医师到场情况,以及 24 h 内使用悬浮红细胞(red blood cells suspension, RBC)、新鲜冰冻血浆(fresh frozen plasma, FFP)、血小板情况等相关资料^[11-12]。

1.3 统计学处理

所有资料采用 SPSS21.0 软件进行统计分析。计数资料采取例数或百分比表示,组间比较使用 χ^2 检验;因两组计量资料不符合正态分布,采用中位数及四分位间距 [$M(P_{25}, P_{75})$] 表示,组间比较用非参数 Mann-Whitney U 检验。双侧检验,以 $P < 0.05$ 为差异有统计学意义。

2 结果

试验组患者年龄明显小于对照组 ($P < 0.05$),两组患者性别无明显差异 ($P > 0.05$)。试验组 RTS 高于对照组,差异有统计学意义 ($P < 0.01$); Ps(TRISS) 低于对照组,差异有统计学意义 ($P < 0.01$); 两组 ISS 比较,差异无统计学意义 ($P = 0.13$)。试验组格拉斯哥昏迷评分(Glasgow coma scale, GCS) ≤ 8 分者比例高于对照组,差异有统计学意义 ($P = 0.03$)。两组骨盆骨折 Tile 分型 A、B、C 型患者比例无明显差异 ($P > 0.05$)。两组患者 120 呼叫至到达急诊室时间及 AE 手术时间无明显差异 ($P > 0.05$)。试验组到达急诊室至诊断时间、诊断至实施 AE 时间较对照组明显缩短 ($P < 0.05$)。试验组到达时外科医师存在、到达时放射医师存在、到达时外科和放射医师均存在患者比例均高于对照组,差异有统计学意义 ($P < 0.05$)。两组 24 h 内使用 RBC、24 h 内使用 FFP、24 h 内使用血小板患者比例相比,差异均无统计学意义 ($P > 0.05$)。试验组住院死亡率低于对照组,差异有统计学意义 ($P = 0.04$)。见表 1。

表 1 两组患者一般资料及临床资料比较

项目	试验组($n=23$)	对照组($n=68$)	P
年龄[$M(P_{25}, P_{75})$, 岁]	38(18, 72)	47(20, 83)	0.01
男性[$n(\%)$]	13(56.5)	40(58.8)	0.84
ISS[$M(P_{25}, P_{75})$, 分]	37(21, 59)	32(13, 55)	0.13
RTS[$M(P_{25}, P_{75})$, 分]	7.8(2.4, 7.9)	6.0(2.4, 7.8)	<0.01
Ps(TRISS)[$M(P_{25}, P_{75})$, %]	60(1, 98)	80(1, 96)	<0.01
GCS ≤ 8 分[$n(\%)$]	9(39.1)	12(17.6)	0.03
Tile A 型[$n(\%)$]	8(34.8)	21(30.9)	0.72
Tile B 型[$n(\%)$]	6(26.1)	16(23.5)	0.80
Tile C 型[$n(\%)$]	9(39.1)	31(45.6)	0.59
120 呼叫至到达急诊室时间[$M(P_{25}, P_{75})$, min]	51(21, 92)	52(15, 107)	0.75
到达急诊室至诊断时间[$M(P_{25}, P_{75})$, min]	23(15, 39)	40(34, 63)	<0.01
诊断至实施 AE 时间[$M(P_{25}, P_{75})$, min]	15(9, 23)	25(22, 51)	<0.01
AE 手术时间[$M(P_{25}, P_{75})$, min]	25(20, 39)	27(20, 41)	1.06
到达时外科医师存在[$n(\%)$]	17(73.9)	19(27.9)	<0.01
到达时放射医师存在[$n(\%)$]	18(78.3)	21(30.9)	<0.01
到达时外科和放射医师均存在[$n(\%)$]	15(65.2)	13(19.1)	<0.01
24 h 内使用 RBC[$n(\%)$]	18(78.3)	50(73.5)	0.65
24 h 内使用 FFP[$n(\%)$]	8(34.8)	20(29.4)	0.63
24 h 内使用血小板[$n(\%)$]	10(43.5)	26(38.2)	0.65
住院死亡率[$n(\%)$]	2(8.7)	19(27.9)	0.04

3 讨 论

对血流动力学不稳定的骨盆骨折患者,常规的救治方案是首先进行控制性液体复苏,再行超声检查的创伤评估和床边骨盆 X 线片检查,摄片提示 Tile B、C 型者,确保迅速行骨盆外固定手术。超声检查的创伤评估阳性者行剖腹探查,腹膜外填塞,盆腔填塞,骨盆外固定支架综合救治。经过以上繁复的治疗后血流动力学仍不稳定再行 AE 或复苏性主动脉腔内球囊阻断术(REBOA)止血,耗时相当长^[13]。研究显示,减少骨盆体积及外固定支架稳定骨折不足以控制动脉出血;骨盆骨折伴有血流动力学不稳定约 86% 由于动脉出血,AE 目前被认为是控制骨盆骨折持续性动脉出血最有效的办法;一些学者认为,血流动力学不稳定的骨盆骨折患者应该在 90 min 内实施 AE^[12-19]。如果使用以上常规流程救治由于动脉出血造成血流动力学不稳定的骨盆骨折患者,往往已失去最佳的抢救时机。

本院于 2016 年 1 月构建多学科联合急救系统,为血流动力学不稳定的骨盆骨折及其他严重创伤患者配备专业的外科医师、放射科医师及相应的配套设施(CT、荧光检查设备、手术室等)。据报道,CT 动脉造影是发现动脉出血的可靠方法,其灵敏度为 66%~90%,特异度为 85%~98%,准确度为 87%~98%,其灵敏度与特异度均优于超声,而且 CT 检查可以更

好地评估骨折的移位^[16,20]。在救护车上初步判断是否为血流动力学不稳定的骨盆骨折,来院即时行 CT 检查及 CT 动脉造影,判定动脉出血后立即完善准备,实施 AE。美国相关研究报道,骨盆骨折患者准备及实施 AE 用时为 120~300 min^[6-7,21-22]。日本使用相似的多学科联合急救系统来提高对骨盆骨折患者救治的及时性,并将其命名为混合急救系统(hybrid emergency room system, HERS)。日本相关研究显示,试验组准备及实施 AE 时间为 60~90 min,明显优于对照组^[8,11,23]。本文试验组到达急诊室至诊断时间、诊断至实施 AE 时间较对照组明显缩短[23(15, 39) min vs. 40(34, 63)min, 15(9, 23)min vs. 25(22, 51)min, $P < 0.05$],与日本学者结果相近。与美国学者报道的结果相比,本研究准备及实施 AE 的时间明显缩短,说明多学科联合急救系统提高了对血流动力学不稳定的骨盆骨折患者的救治及时性。两组患者实施 AE 的时间无明显差异($P > 0.05$),可能与实施 AE 的医师相同有关。本研究试验组到达时外科医师存在、到达时放射医师存在、到达时外科和放射医师均存在患者比例明显高于对照组(73.9% vs. 27.9%, 78.3% vs. 30.9%, 65.2% vs. 19.1%, $P < 0.05$),说明多学科联合急救系统提高了相关人力动员方面的有效性,相关人员迅速到位进一步提高了准备及实施 AE 的及时性。由于救治的及时性,试验组

住院死亡率明显低于对照组(8.7% vs. 27.9%, $P < 0.05$)。

血流动力学不稳定的骨盆骨折患者首先因进行控制性液体复苏,血制品的输入是液体复苏中的重要手段。目前专家共识推荐输入 RBC、FFP、血小板来控制凝血功能障碍。本研究使用 RBC、FFP、血小板控制患者的血流动力学,两组 24 h 内使用 RBC、FFP、血小板患者比例无明显差异($P > 0.05$)。此外据报道,氨甲环酸可以减少这类患者的输血需求^[3,24-28]。

综上所述,多学科联合急救系统通过 AE 方法,能够更及时地控制血流动力学不稳定的骨盆骨折患者动脉出血,提高患者的存活率。本研究尚存在一定局限性:(1)采用回顾性分析且病例较少;(2)本研究为单中心研究,这种方法在其他创伤中心的应用可能受到限制。

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