

# 年龄休克指数预测急性消化道出血患者不良结局的价值研究



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甘君英, 许和平\*, 吴开芳, 陈芸妹, 叶小娟

**【摘要】** 背景 急性消化道出血是急诊患者就诊的常见急症之一, 如何快速、准确地对急性消化道出血患者进行危险分层, 对于改善其预后至关重要。目的 比较休克指数(SI)、年龄休克指数(Age-SI)和改良休克指数(MSI)对急性消化道出血患者不良结局的预测价值。方法 选取2019—2020年因急性消化道出血就诊于海南省人民医院急诊科的患者进行回顾性研究。急诊科分诊护士测量患者的生命体征, 并计算SI、Age-SI和MSI。分析SI、Age-SI和MSI预测急性消化道出血患者不良结局〔入住ICU、接受输血治疗、接受内镜/结肠镜(E/C)干预和死亡〕的价值。结果 共纳入302例患者, 其中158例(52.32%)至少有1种不良结局, 38例(12.58%)入住ICU, 136例(45.03%)接受输血治疗, 54例(17.88%)接受E/C干预, 12例(3.97%)死亡。有不良结局的患者SI、Age-SI和MSI均高于无不良结局的患者( $P<0.05$ )。SI、Age-SI和MSI预测急性消化道出血患者不良结局均有统计学意义( $P<0.05$ ); 且Age-SI预测急性消化道出血患者不良结局的受试者工作特征曲线下面积(AUC)高于SI( $P=0.013$ )和MSI( $P=0.024$ ); SI和MSI预测急性消化道出血患者不良结局的AUC比较, 差异无统计学意义( $P=0.985$ )。SI、Age-SI预测急性消化道出血患者入住ICU均有统计学意义( $P<0.05$ )。SI、Age-SI和MSI预测急性消化道出血患者接受输血治疗均有统计学意义( $P<0.05$ )。SI预测急性消化道出血患者接受E/C干预有统计学意义( $P<0.05$ )。Age-SI预测急性消化道出血患者不良结局的临界值为45.12。Spearman秩相关分析结果显示, 急性消化道出血患者不良结局数量与SI( $r_s=0.255$ ,  $P=0.002$ )、Age-SI( $r_s=0.360$ ,  $P<0.001$ )和MSI( $r_s=0.246$ ,  $P=0.002$ )呈正相关。结论 Age-SI预测急性消化道出血患者出现不良结局的价值优于SI和MSI, 且Age-SI在分诊中易于计算。

**【关键词】** 消化道出血; 年龄休克指数; 休克指数; 改良休克指数; 不良结局; 急诊

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## Predictive Value of Age Shock Index for Adverse Outcomes in Patients with Acute Gastrointestinal Bleeding

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**【Abstract】** **Background** Acute gastrointestinal bleeding (AGB) is one of the common emergencies for patients of emergency department. How to quickly and accurately stratify the risk of AGB is essential to improving the prognosis. Therefore, a simple, fast and easy-to-operate method is needed to early detect emergency patients at high-risk of AGB. **Objective** To compare the predictive value of shock index (SI), age shock index (ASI) and modified shock index (MSI) in the stratification of adverse outcomes in patients with AGB. **Methods** A retrospective design was used. Participants with AGB were selected from Department of Emergency, Hainan General Hospital from 2019 to 2020. Vital signs and calculated SI, ASI and MSI of patients were collected by the triage nurse, and their predictive values for the admission to the ICU, blood transfusion, endoscopic/colonoscopy (E/C) intervention and death were comparatively analyzed. **Results** Altogether, 302 cases were enrolled. Among them, 158 (52.32%) had at least one adverse outcome, 38 (12.58%) were admitted to the ICU, 136 (45.03%) received blood transfusion, 54 (17.88%) received E/C intervention, and 12 (3.97%) died. The average SI, ASI and MSI of patients with adverse outcomes were all higher than those without ( $P<0.05$ ). SI, ASI and MSI were all of statistical significance

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in predicting the adverse outcomes ( $P<0.05$ ). Specifically, ASI had a larger AUC than SI ( $P=0.013$ ) and MSI ( $P=0.024$ ) for predicting adverse outcomes in AGB, but the AUC of SI was similar to that of MSI ( $P=0.985$ ). Both SI and ASI were of statistical significance in predicting the admission to the ICU ( $P<0.05$ ). SI, ASI and MSI were all of statistical significance in predicting the requirement for blood transfusion ( $P<0.05$ ). SI was of statistical significance in predicting the requirement for E/C intervention ( $P<0.05$ ). The cut-off point of ASI predicting adverse outcomes in AGB was 45.12. Spearman correlation analysis indicated that the number of adverse outcomes in AGB had a positive relation with SI ( $r_s=0.255$ ,  $P=0.002$ ), ASI ( $r_s=0.360$ ,  $P<0.001$ ) and MSI ( $r_s=0.246$ ,  $P=0.002$ ). **Conclusion** ASI is easy to be calculated during the triage phase, and it may be superior to both SI and MSI in terms of predicting adverse outcomes in AGB.

**【Key words】** Gastrointestinal bleeding; Age shock index; Shock index; Modified shock index; Adverse outcomes; Emergency

急性消化道出血患者病情危重,发病率和病死率均较高,临床症状从咖啡样呕吐物到低血压,甚至昏迷<sup>[1]</sup>。对于首次急诊就诊的急性消化道出血患者,迅速而准确地确定危险分层对于输血治疗、内镜检查的时机、住院决定(重症监护或病房)以及高危患者的密切随访非常重要。各种急性消化道出血评分系统,如 Glasgow-Blatchford 评分(GBS)、AIMS65、Rockall 评分系统,已经在既往研究中得到开发和验证。然而,这些评分系统计算复杂,对实验室检查结果要求高,甚至需要内镜结果。因此在急诊科中,需要简单、快速、易行的评估方法,以发现早期急性消化道出血高风险患者。休克指数(SI)是一个简单的参数,通过心率除以收缩压(SBP)计算得出,与单独使用心率和 SBP 相比,可以更好地显示血流动力学状态,参考范围为 0.5~0.7<sup>[2]</sup>。由心率/动脉压(MAP)计算得出的改良休克指数(MSI)和年龄乘以 SI 计算得出的年龄休克指数(Age-SI)是由 SI 衍生而来的指标,近年来被广泛应用于急性消化道出血危重患者的预后评估。研究表明,MSI 和 Age-SI 比心率、SBP、舒张压(DBP)或 SI 更能有效地预测急性消化道出血病死率<sup>[3]</sup>。本研究旨在探讨 Age-SI 在判断急性消化道出血患者不良结局的价值,以期有效评价急性消化道出血的危险分层提供依据。

## 1 对象与方法

1.1 研究对象 选取 2019—2020 年因急性消化道出血就诊于海南省人民医院急诊科的 438 例患者进行回顾性研究。纳入标准:(1)患者出现呕血和黑便症状,伴或不伴头晕、心悸、面色苍白、心率增快、血压降低等周围循环衰竭征象;(2)无口服阿司匹林或其他引起消化道出血药物服用史;(3)年龄 $\geq 18$ 岁;(4)愿意参与本研究。排除标准:大面积烧伤、创伤、急性心肌梗死等引起的应激性溃疡出血,疾病未得到完全控制即出院和血液系统疾病引起的急性上消化道出血,入院检查结果不完善。最终纳入 302 例研究对象。

1.2 数据收集 急诊科分诊护士对患者的生命体征(SBP、DBP、MAP、心率)进行测量,并计算 SI、Age-SI 和 MSI,其中 SI=心率/SBP, Age-SI=年龄 $\times$ SI,

MSI=心率/MAP。此外,检查患者急诊入院时的症状以及初始血红蛋白(Hb)、血细胞比容(HCT)、血尿素氮和血肌酐。收集患者转归,包括出院、门诊和入住 ICU 情况。

1.3 不良结局定义 若患者出现入住 ICU、接受输血治疗、接受内镜/结肠镜(E/C)干预、死亡任意表现之一,则定义为出现不良结局。其中 E/C 干预是指对患者进行的栓塞、套扎、硬化治疗和止血夹应用等手术。

1.4 统计学方法 采用 SPSS 22.0 软件进行统计学分析,采用 Shapiro-Wilk 检验用于检验变量的正态性,符合正态分布的计量资料以( $\bar{x} \pm s$ )表示,非正态分布的计量资料以  $M(P_{25}, P_{75})$  表示,两组间比较采用 Mann-Whitney  $U$  检验;计数资料以百分数表示;绘制受试者工作特征(ROC)曲线评价诊断标志物的性能;采用 Delong 非参数法比较不同诊断标志物的 ROC 曲线下面积(AUC);采用 Spearman 秩相关分析探究变量间的相关性。以  $P<0.05$  为差异有统计学意义。

## 2 结果

2.1 一般资料 共纳入 302 例患者,其中男 202 例(66.89%),女 100 例(33.11%);中位年龄 71(19, 102)岁;250 例(82.78%)上消化道出血,52 例(17.22%)下消化道出血;SBP( $126 \pm 27$ ) mm Hg(1 mm Hg=0.133 kPa);中位 DBP 70(40, 120) mm Hg;中位心率 87(52, 141)次/min;呕血 72 例(26.10%),黑便 96 例(34.80%),便血 56 例(20.30%),呕血和黑便 52 例(18.80%);血红蛋白( $100.1 \pm 30.8$ ) g/L;中位 HCT 30(0~78)%;中位血尿素氮 20.66(0, 106.21) mmol/L;中位血肌酐 88.4(0, 556.9) mmol/L;101 例(66.88%)住院治疗;158 例(52.32%)至少有 1 种不良结局,其中 38 例(12.58%)入住 ICU,136 例(45.03%)接受输血治疗,54 例(17.88%)接受 E/C 干预,12 例(3.97%)死亡;中位 SI 0.70(0.36, 1.59);中位 Age-SI 48.45(13.00, 133.64);中位 MSI 0.99(0.53, 2.05)。

2.2 急性消化道出血有无不良结局的患者 SI、Age-SI 和 MSI 比较 有不良结局的患者 SI、Age-SI 和 MSI 均

高于无不良结局的患者，差异有统计学意义 ( $P < 0.05$ )，见表1。

2.3 SI、Age-SI和MSI预测急性消化道出血患者不良结局的价值比较 绘制SI、Age-SI和MSI预测急性消化道出血患者不良结局的ROC曲线，结果显示，SI、Age-SI和MSI预测急性消化道出血患者不良结局均有统计学意义 ( $P < 0.05$ )，见表2、图1；且Age-SI预测急性消化道出血患者不良结局的AUC高于SI ( $Z = -3.499, P = 0.013$ ) 和MSI ( $Z = -3.006, P = 0.024$ )，差异均有统计学意义；SI和MSI预测急性消化道出血患者不良结局的AUC比较，差异无统计学意义 ( $Z = -0.145, P = 0.985$ )。

SI、Age-SI预测急性消化道出血患者入住ICU均有统计学意义 ( $P < 0.05$ )；SI、Age-SI和MSI预测急性消化道出血患者接受输血治疗均有统计学意义 ( $P < 0.05$ )；SI预测急性消化道出血患者E/C干预有统计学意义 ( $P < 0.05$ )，见表2。

2.4 SI、Age-SI和MSI预测急性消化道出血患者不良结局的价值 SI、Age-SI和MSI预测急性消化道出血患者不良结局的临界值、准确度、灵敏度、特异度、阳性

预测值和阴性预测值见表3。

2.5 急性消化道出血患者不良结局数量与SI、Age-SI和MSI的相关性 Spearman秩相关分析结果显示，急性消化道出血患者不良结局数量与SI ( $r_s = 0.255, P = 0.002$ )、Age-SI ( $r_s = 0.360, P < 0.001$ )和MSI ( $r_s = 0.246, P = 0.002$ )呈正相关。

表1 有无不良结局的患者SI、Age-SI和MSI比较 [ $M(P_{25}, P_{75})$ ]  
Table 1 Comparison of shock index, age shock index and modified shock index in acute gastrointestinal bleeding patients with or without adverse outcomes

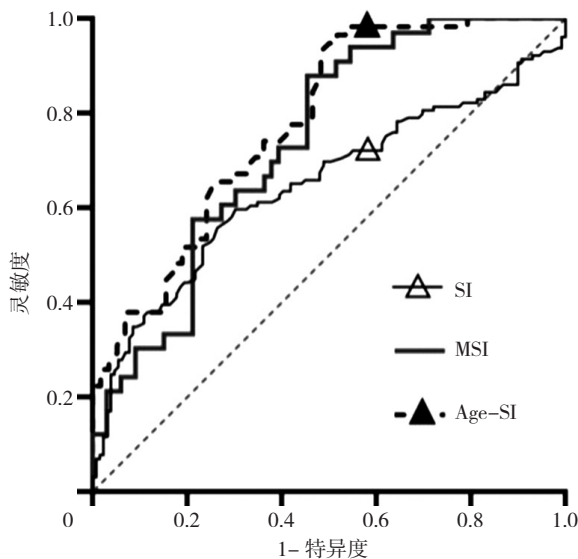
不良结局	例数	SI	Age-SI	MSI
有	158	0.72 (0.39, 1.59)	53.60 (26.82, 133.64)	1.02 (0.60, 2.05)
无	144	0.66 (0.36, 1.20)	42.01 (13.00, 80.40)	0.95 (0.53, 1.69)
Z值		-3.482	-8.741	-3.003
P值		0.012	<0.001	0.023

注：SI= 休克指数，Age-SI= 年龄休克指数，MSI= 改良休克指数

表2 SI、Age-SI和MSI预测急性消化道出血患者不良结局的AUC  
Table 2 The area under the ROC curve of shock index, age shock index and modified shock index predicting adverse outcomes in patients with acute gastrointestinal bleeding

结局	AUC (95%CI)	P值
不良结局		
SI	0.616 (0.534, 0.694)	0.012
Age-SI	0.711 (0.631, 0.781)	<0.001
MSI	0.617 (0.534, 0.695)	0.013
入住ICU		
SI	0.643 (0.561, 0.719)	0.033
Age-SI	0.670 (0.589, 0.745)	0.004
MSI	0.625 (0.543, 0.703)	0.075
接受输血治疗		
SI	0.619 (0.537, 0.697)	0.008
Age-SI	0.712 (0.633, 0.783)	<0.001
MSI	0.626 (0.544, 0.703)	0.007
接受E/C干预		
SI	0.620 (0.537, 0.697)	0.028
Age-SI	0.568 (0.485, 0.648)	0.296
MSI	0.606 (0.523, 0.684)	0.056
死亡		
SI	0.582 (0.499, 0.661)	0.593
Age-SI	0.636 (0.553, 0.712)	0.348
MSI	0.570 (0.487, 0.650)	0.622

注：AUC= 受试者工作特征曲线下面积



注：SI= 休克指数，MSI= 改良休克指数，Age-SI= 年龄休克指数

图1 SI、Age-SI和MSI预测急性消化道出血患者不良结局的ROC曲线

Figure 1 ROC curves of shock index, age shock index and modified shock index predicting adverse outcomes in patients with acute gastrointestinal bleeding

表3 SI、Age-SI和MSI预测急性消化道出血患者不良结局的价值

参数	临界值	准确度 (%)	灵敏度 (95%CI) (%)	特异度 (95%CI) (%)	阳性预测值 (95%CI) (%)	阴性预测值 (95%CI) (%)
SI	0.67	58.94	68.4 (56.9, 78.4)	52.8 (40.7, 64.7)	61.4 (54.4, 71.6)	60.3 (47.2, 72.4)
Age-SI	45.12	57.61	76.0 (65.0, 84.9)	62.5 (50.3, 73.6)	69.0 (58.1, 78.5)	70.3 (57.5, 81.2)
MSI	0.83	74.83	84.8 (75.0, 91.9)	38.9 (27.6, 51.1)	60.4 (50.6, 69.5)	70.0 (53.5, 83.4)



### 3 讨论

急性消化道出血患者的早期干预、重症监护和密切随访对其预后具有重要意义。急诊危重患者危险分层的评分(如GBS、AIMS65、Rockall评分和ABC评分)既困难又复杂,使其在急诊实践中的快速应用受到限制。SI、MSI和Age-SI是简单实用的参数,可以快速进行计算。SI已被有效地用于区分急诊就诊的危重患者,如创伤、低血容量、心肌梗死和败血症。然而,关于其在评估急性消化道出血的患者预后方面的有效性,目前有不同结果的研究。例如,ZHAO等<sup>[4]</sup>指出,上消化道出血患者的SI>0.7,可有效预测不良结局,如需要重症监护、输血和内镜治疗。此外,ZHANG等<sup>[5]</sup>还发现SI与上消化道出血的血管造影外渗有关。与上述研究结果相反,有研究认为SI不是急性消化道出血患者有用的预测指标<sup>[6]</sup>。然而,关于Age-SI在急性消化道出血患者中的应用报道较少,因此,本研究分析Age-SI判断急性消化道出血患者不良结局的价值,并将其与SI和MSI进行比较。

有研究发现,男性急性消化道出血发病率较高<sup>[7]</sup>,在本研究中,66.9%的患者是男性。YOUSSOUF等<sup>[8]</sup>发现,SI预测上消化道出血患者需要大量输血(4个单位红细胞悬液)的AUC为0.655。本研究结果显示,SI预测急性消化道出血患者输血的AUC为0.619( $P=0.009$ )。MSI和Age-SI的AUC分别为0.626( $P=0.006$ )和0.712( $P<0.001$ )。虽然Age-SI明显优于其他两项指标,但这3项指标均是预测急性消化道出血患者是否需要输血治疗的重要指标。

CHEN等<sup>[9]</sup>研究发现SI预测急性消化道出血患者E/C干预的AUC为0.606。同样,本研究发现SI预测急性消化道出血患者E/C干预的AUC为0.620( $P=0.028$ )。YADAV等<sup>[10]</sup>将SI和MSI与稳定型上消化道出血患者的评分系统进行了比较,发现SI和MSI预测急性消化道出血患者需要重症监护的AUC分别为0.544和0.552。YANG等<sup>[11]</sup>在一项类似的研究中发现,SI和MSI预测急性消化道出血患者住院死亡的AUC分别为0.601和0.585。本研究结果显示,SI、MSI和Age-SI预测急性消化道出血患者死亡的AUC分别为0.582、0.570和0.636( $P$ 值均>0.05)。但上述3个指标不足以预测死亡,与BHANDARKAR等<sup>[12]</sup>的研究结果一致。有学者对1233例上消化道出血稳定的患者进行了研究,发现461例(37.4%)患者出现重症监护入院、复发性胃出血和死亡,低于本研究数据(52.32%),产生这种差异的原因是不良结局标准不同。

对Age-SI预测非急性消化道出血患者不良结局的文献研究发现,Age-SI在预测死亡方面优于SI和MSI<sup>[13]</sup>。WU等<sup>[14]</sup>对3375例三级急诊患者进行的研

究表明,Age-SI在预测死亡方面优于SI和MSI。WEI等<sup>[15]</sup>比较了这3个指标对急性心肌梗死患者死亡的预测,发现Age-SI比SI和MSI更显著,Age-SI的临界值为41,灵敏度和特异度分别为59%和72%。

综上,在预测急性消化道出血患者的不良结局方面,Age-SI优于SI和MSI。不同于其他复杂的评分系统,Age-SI易于计算,单独使用或将其纳入新的评分系统可能有助于检测急性消化道出血的危重患者。

作者贡献:甘君英进行文章的构思与设计,撰写论文和论文的修订,对文章整体负责,监督管理;许和平进行研究的实施与统计学处理,结果的分析与解释,负责文章的质量控制及审校;吴开芳、陈芸妹进行数据收集;甘君英、叶小娟进行数据整理。

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