·临床研究·

ACEF评分对老年ST段抬高型心肌梗死经皮冠状动脉介入治疗的预后预测价值

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【摘 要】 目的 探讨年龄、肌酐和射血分数(ACEF)评分对年龄≥75岁急性ST段抬高型心肌梗死(STEMI)患者经皮冠状动脉介入治疗(PCI)后1年内发生心源性死亡和心脏不良事件的预测价值。**方法** 回顾性分析2015年1月至2020年6月于厦门大学附属东南医院接受PCI的432例ST段抬高型心肌梗死患者的临床资料。根据PCI治疗前ACEF评分,将患者分为中低危组(ACEF≤1.3分,$n=96$)和高危组(ACEF>1.3分,$n=336$)。收集患者PCI治疗后1年内心源性死亡和心脏不良事件发生情况,采用Cox风险比例回归模型分析影响患者PCI治疗后1年心源性死亡和心脏不良事件发生情况的危险因素。并采用受试者工作特征(ROC)曲线分析ACEF评分对其预测价值。采用SPSS 20.0软件进行数据分析。根据数据类型,组间比较分别采用t检验及χ^2检验。**结果** 高危组的年龄、心率均显著高于中低危组,差异均有统计学意义[(81.02±4.33)和(78.94±3.05)岁,(76.94±18.67)和(71.36±16.84)次/min;均$P<0.05$]。中低危组的左室射血分数水平显著高于高危组,差异有统计学意义[(59.12±21.38)%和(43.88±16.17)%,$P<0.05$];估算的肾小球滤过率水平优于高危组($P<0.05$)。中低危组的完全血运重建率低于高危组,差异有统计学意义[10例(10.42%)和67例(19.94%),$P<0.05$];其他治疗相关参数比较,差异均无统计学意义。Cox回归显示,ACEF评分是影响患者1年内心源性死亡($RR=1.557$,$P=0.000$)和心脏不良事件($RR=1.626$,$P=0.000$)的独立危险因素。ACEF评分预测PCI术后1年内心源性死亡的ROC曲线下面积为0.846,最佳截断点为1.61;预测心脏不良事件的ROC曲线下面积为0.891,最佳截断点为1.47。**结论** 术前ACEF评分可预测年龄≥75岁STEMI患者急诊PCI术后1年的心源性死亡和心脏不良事件。

【关键词】 老年人;心肌梗死;预后;ACEF评分

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Prognostic value of ACEF score for percutaneous coronary intervention in elderly patients with ST-segment elevation myocardial infarction

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【Abstract】 Objective To investigate the predictive value of age, creatinine and ejection fraction (ACEF) score for cardiac death and adverse cardiac events in patients over 75 years old with acute ST-segment elevation myocardial infarction (STEMI) within 1 year after percutaneous coronary intervention (PCI). **Methods** The clinical data of 432 STEMI patients undergoing PCI in the Dongnan Hospital from January 2015 to June 2020 were collected and analyzed retrospectively. According to their ACEF score before PCI, the patients were divided into low to moderate risk group (ACEF≤1.3 points, $n=96$) and high risk group (ACEF>1.3 points, $n=336$). The incidences of cardiac death and adverse cardiac events within 1 year after PCI were observed. Cox hazard proportional regression analysis was used to analyze the risk factors influencing the occurrence of cardiac death and adverse cardiac events within 1 year after PCI in the patients, and receiver operating characteristic (ROC) curve was drawn to evaluate the predictive value of ACEF score. SPSS statistics 20.0 was used for statistical analysis. Data comparison between 2 groups was performed using student's t test, or *Chi*-square test depending on data type. **Results** The age was obviously older and the heart rate was significantly higher in the high

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risk group than the low to moderate risk group [(81.02±4.33) *vs* (78.94±3.05) years, (76.94±18.67) *vs* (71.36±16.84) times/min, $P<0.05$]. The low to moderate risk group had significantly higher left ventricular ejection fraction [(59.12±21.38)% *vs* (43.88±16.17)%, $P<0.05$] and better estimated glomerular filtration rate ($P<0.05$) than the high risk group. The rate of complete revascularization was statistically lower in the low to moderate risk group than the high risk group [10 cases (10.42%) *vs* 67 cases (19.94%), $P<0.05$]. But no remarkable differences were seen in other treatment-related parameters. Cox regression showed that ACEF score was an independent risk factor affecting cardiac death and adverse cardiac events within 1 year in patients ($RR=1.557$, 1.626; $P=0.000$, 0.000). The area under ROC curve predicted by ACEF score for cardiac death 1 year after PCI was 0.846, and the best cut-off point for diagnosis was 1.61. The area under the ROC curve for predicting adverse cardiac events was 0.891, and the best cut-off point for diagnosis was 1.47. **Conclusion** Preoperative ACEF score can predict cardiac death and adverse cardiac events within 1 year after emergency PCI in STEMI patients over 75 years old.

【Key words】 aged; myocardial infarction; prognosis; ACEF score

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随着社会老龄化进展,≥75岁的老年人群中心肌梗死的发病率逐渐升高。既往研究表明,急性冠脉综合征患者人群中≥75岁的患者约占1/3[1]。直接经皮冠状动脉介入(percutaneous coronary intervention, PCI)治疗可显著降低ST段抬高型心肌梗死(ST-segment elevation myocardial infarction, STEMI)患者的死亡率,改善临床预后[2]。但对于老年急性STEMI患者,PCI治疗带来的风险和获益仍需要进一步分层评估[3,4]。近年来,基于年龄、肌酐和射血分数(age, creatinine, and ejection fraction, ACEF)评分在行冠状动脉旁路移植术前患者的分层治疗和预后判断中体现出一定优势[4]。然而,ACEF评分能否应用于急性STEMI患者的预后判断仍缺少验证。基于此,本研究旨在探讨ACEF评分对PCI患者术后1个月和1年预后的预测价值,以期为STEMI患者治疗决策提供帮助。

1 对象与方法

1.1 研究对象

回顾性收集2015年1月至2020年6月于厦门大学附属东南医院接受PCI的老年STEMI患者资料。根据PCI治疗前ACEF评分,将患者分为中低危组(ACEF≤1.3分)和高危组(ACEF>1.3分)。纳入标准:(1)患者年龄≥75岁,发病时间12 h内;(2)满足《中国急性ST段抬高型心肌梗死诊断治疗指南》诊断标准[5];(3)存在典型胸痛症状,持续时间>30 min;(4)入院后接受PCI治疗。排除标准:(1)存在严重贫血及甲亢患者;(2)合并先天性心脏病或既往PCI治疗;(3)为肾小球滤过率(estimated glomerular filtration rate, eGFR)<15 ml/(min·1.73m^2)、肌肉萎缩,入院前3个月内使用严重肾毒性药物;(4)合并肿瘤;(5)PCI术后1年内缺少随访结果。本研究获得了医院伦理委员会批准。

1.2 方法

收集患者入院时的年龄、性别、既往史、血糖、血脂、肝功能、肾功能及心肌酶等资料;收集患者心电图、超声心动图检查结果;收集患者在治疗后的门诊及住院系统的随访结果。主要事件是术后1年内发生的心源性死亡,次要事件为心脏不良事件包括卒中、全因死亡、再发心肌梗死、支架血栓形成及恶性心律失常。

吸烟的定义为每天吸烟超过1支并持续吸烟超过1年。eGFR由简化肾脏病饮食改良研究(the modification of diet in renal disease equation, MDRD)公式估算:eGFR ml/(min·1.73m^2) = 170×(SCr)-1.234×(年龄)-0.179×(0.79女性)。

1.3 ACEF评分计算

ACEF评分根据以下公式计算:ACEF=年龄/左心室射血分数(%)+1(当肌酐>2.0 mg/dl)。根据ACEF评分将所有患者分为3层[6]:ACEF≤1.0分为低风险,分1.0分<ACEF≤1.3分为中风险,ACEF>1.3分为高风险。

1.4 统计学处理

采用SPSS 20.0统计软件进行数据分析。计量资料用均数±标准差($\bar{x}\pm s$)表示,采用t检验;计数资料用例数(百分率)表示,采用χ^2检验。$P<0.05$为差异有统计学意义。采用Cox风险比例回归模型分析影响患者PCI治疗后1年心源性死亡和心脏不良事件发生情况的危险因素。采用受试者工作特征(receiver operating characteristic, ROC)曲线分析ACEF评分预测患者PCI术后1年心源性死亡和心脏不良事件发生情况。$P<0.05$为差异有统计学意义。

2 结 果

2.1 2组患者一般资料比较

本研究共收集432例接受PCI治疗的STEMI

患者,其中男性 257 例,女性 175 例。根据入院时的 ACEF 评分,由于低危组例数较少,合并与中危组一起计算为中低危组,共 96 例;高危组 336 例。

PCI 治疗前中低危组的平均年龄及心率均低于高危组,左心室射血分数(left ventricular ejection fraction, LVEF)水平显著高于高危组,差异均有统计学意义(均 $P<0.05$)。中低危组 eGFR 低者水平优于高危组($P=0.002$)。中低危组和高危组的性别比例、高血压病史、中风、心肌梗死、糖尿病、房颤、贫血和心源性休克病史比较,差异均无统计学意义(均 $P>0.05$;表 1)。

2.2 2 组患者 PCI 治疗相关参数比较

在所有 PCI 参数中,中低危组的完全血运重建率低于高危组,差异有统计学意义($P<0.05$)。其他治疗相关参数,如梗死相关血管位置、主动脉内球囊反搏、完全血运重建、动脉穿刺路径、平均支架个数及支架长度比较,差异均无统计学意义(均 $P>0.05$;表 2)。

2.3 ACEF 评分与患者预后关系

全部患者 PCI 治疗 1 年内发生心源性死亡 34 例(7.87%),其中中低危组 2 例(2.08%),高危组 32 例(7.87%)。发生本研究所定义的心脏不良事件共 82 例(18.89%),其中全因死亡 41 例(9.49%),卒中 8 例(1.85%),再发心肌梗死 24 例(5.56%),支架血栓形成 5 例(1.16%),恶性心律失常 4 例(0.93%)。

采用 Cox 风险比例回归分析发现,ACEF 评分是影响患者 1 年内心源性死亡($RR=1.557$, $P=0.000$)和心脏不良事件($RR=1.626$, $P=0.000$)的独立危险因素(表 3)。

表 1 2 组患者 PCI 治疗前基线资料比较

Table 1 Comparison of baseline data before PCI treatment between two groups

Variable	Low-intermediate risk group ($n=96$)	High-risk group ($n=336$)	t/χ^2	P value
Age(years, $\bar{x}\pm s$)	78.94±3.05	81.02±4.33	4.403	<0.001
Male[n(%)]	63(65.63)	194(57.74)	1.927	0.165
Heart rate(beats/min)	71.36±16.84	76.94±18.67	2.637	0.009
LVEF(%)	59.12±21.38	43.88±16.17	7.544	<0.001
History of hypertension[n(%)]	56(58.33)	198(58.93)	0.011	0.917
History of stroke[n(%)]	20(20.83)	77(22.92)	0.186	0.666
History of myocardial infarction[n(%)]	5(5.21)	33(9.82)	1.981	0.159
History of diabetes mellitus[n(%)]	27(28.13)	87(25.89)	0.192	0.662
eGFR[n(%)]			12.416	0.002
eGFR≤30ml/(min·1.73m^2)	1(1.04)	26(7.74)		
30 ml/(min·1.73m^2)< eGFR≤60 ml/(min·1.73m^2)	17(17.71)	97(28.87)		
eGFR>60 ml/(min·1.73m^2)	78(81.25)	213(63.39)		
Atrial fibrillation[n(%)]	10(10.42)	37(11.01)	0.027	0.869
Anemia[n(%)]	19(19.79)	90(26.79)	1.936	0.164
Cardiogenic shock[n(%)]	5(5.21)	40(11.90)	3.588	0.058

PCI: percutaneous coronary intervention; LVEF: left ventricular ejection fraction; eGFR: estimated glomerular filtration rate.

表 2 2 组患者 PCI 治疗相关参数比较

Table 2 Comparison of PCI treatment-related parameters between two groups

Variable	Low-intermediate risk group ($n=96$)	High-risk group ($n=336$)	t/χ^2	P value
Infarct related artery[n(%)]			7.213	0.065
Left main coronary artery	1(1.04)	3(0.89)		
Left front downdraft	40(41.67)	189(56.25)		
Left circumgyrating branch	25(26.04)	56(16.67)		
Right coronary artery	30(31.25)	88(26.19)		
Intra-aortic balloon counterpulsation[n(%)]	41(42.71)	127(37.80)	0.758	0.384
Complete revascularization[n(%)]	10(10.42)	67(19.94)	4.624	0.032
Path of arterial puncture[n(%)]			0.022	0.989
Radial artery	84(87.50)	293(87.20)		
Brachial artery	9(9.38)	33(9.82)		
Femoral artery	3(3.13)	10(2.98)		
Average number of supports(n, $\bar{x}\pm s$)	1.44±0.48	1.49±0.51	0.858	0.391
Average support length(mm, $\bar{x}\pm s$)	41.68±15.92	40.29±14.83	0.797	0.426

PCI: percutaneous coronary intervention.

表3 影响老年PCI治疗患者术后1年内心源性死亡及心脏不良事件的Cox风险比例回归

Table 3 Cox hazard proportional regression affecting cardiac death and cardiac adverse events in 1 year after PCI in elderly patients

Factor	*B*	*SE*	Wald	*P* value	*RR*	95%*CI*
Cardiac death						
Age	0.232	0.036	41.497	0.000	1.261	1.175-1.353
ACEF score	0.443	0.109	16.500	0.000	1.557	1.257-1.928
LEVF	0.190	0.119	2.544	0.161	1.209	0.957-1.527
Heart rate	0.235	0.209	1.265	0.390	1.265	0.840-1.905
eGFR	0.087	0.417	0.044	0.907	1.091	0.482-2.470
Complete revascularization	-0.231	0.325	0.504	0.660	0.794	0.420-1.501
Adverse cardiac events						
Age	0.290	0.036	64.749	0.000	1.336	1.245-1.434
ACEF score	0.486	0.109	19.890	0.000	1.626	1.313-2.013
LEVF	0.308	0.086	12.845	0.000	1.361	1.150-1.611
Heart rate	0.147	0.815	0.032	0.914	1.158	0.234-5.721
eGFR	0.138	0.366	0.142	0.847	1.148	0.560-2.352
Complete revascularization	-0.173	0.325	0.284	0.768	0.841	0.445-1.590

PCI: percutaneous coronary intervention; ACEF: age, creatinine, and ejection fraction; LVEF: left ventricular ejection fraction; eGFR: estimated glomerular filtration rate.

2.4 ACEF评分对患者预后的预测价值

分别采用ACEF评分构建老年患者预测PCI术后1年内的心源性死亡和1年内心脏不良事件的ROC曲线。结果可见，ACEF评分预测PCI术后1年内的心源性死亡的ROC曲线下面积为0.846，最佳截断点为1.61，灵敏度为93%，特异度为66%（图1A）。ACEF评分预测PCI术后1年内的心脏不良事件发生的ROC曲线下面积为0.891，最佳截断点为1.47，灵敏度为83%，特异度为78%（图1B）。

3 讨 论

人口老龄化带来的冠心病发生率及病死率升高，已是我国面对的现实问题。随着对PCI治疗的不断研究和适应证的拓展，临床上接受PCI的患者年龄也不断增加[7]。PCI患者术后主要心血管不良事件总发生率的风险评估，特别是在老年患者PCI术后死亡率已成为临床治疗的关注重点。针对PCI患者术后风险，既往已经有如欧洲心脏手术风险评估系统、支架置入术与心脏外科手术协作研究评分等多种预测模型或方法在临床应用，并体现了较好的预测价值[8-10]。但这些积分模型多依赖于患者的冠状动脉解剖学改变。然而对于老年患者，尤其是肾功能不全的患者，其冠状动脉可能有更多的钙化病变和更广泛的疾病[11]。因此，既往模型和方法中对于老年患者的预测准确度和拟合度效能一直受到质疑。

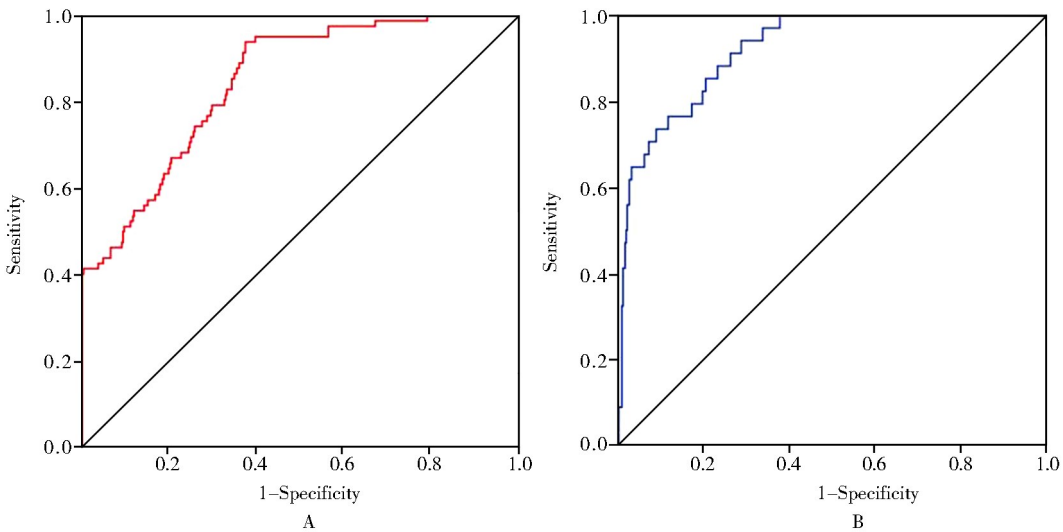


图1 ACEF评分预测老年PCI治疗患者术预后价值

Figure 1 Postoperative prognosis predictive value of ACEF score in elderly patients treated with PCI

A: ROC curve for ACEF score to predict cardiac death within 1 year; B: ROC curve for ACEF score to predict adverse cardiac events within 1 year ACEF: age, creatinine, and ejection fraction; PCI: percutaneous coronary intervention; ROC: receiver operating characteristic.

ACEF 评分由年龄、肌酐和 LVEF 三个重要参数组成,应用简单方便,且体现了对患者术后 1 年的预后较高预测价值。既往 Kalayci 等[12]应用改进的 ACEF 评分系统评估 STEMI 患者发现,该评分可预测心脏病患者术后 1 年内的发病率和死亡率。Pyxaras 等[13]同样也证明,ACEF 评分可以预测支架植入后 1 年内冠状动脉严重钙化患者的主要心血管不良事件。本研究中使用 ROC 曲线验证发现,对于接受 PCI 治疗的老年患者,ACEF 评分同样具有较高的预后预测效能,尤其对于术后 1 年内的心脏不良事件预测的 ROC 曲线下面积较大。

尽管 ACEF 评分最早应用于对冠状动脉旁路移植患者术前评估,但近年来多个研究表明了 ACEF 在 PCI 治疗术后的预测效能。年龄、肌酐和 LVEF 三者都已经表明是 PCI 术后预后不良的危险因素[14-16]。本研究通过比较不同 ACEF 分层患者发现,与中低危组患者相比,高危组患者的年龄更大、心率更快。患者年龄在一定程度上是病程长短的反映,对于同一个体随着患者年龄增加其冠状动脉发生钙化、病变的风险也越高。此外,随着年龄增加、肌少症的发生,老年人的肾脏功能逐渐衰退,肾单位不断减少,这主要表现在与年轻时相比,成年人的 eGFR 水平降低,肌酐水平升高[17]。三者联合的 ACEF 评分对不同类型的 PCI 患者治疗预后都体现了较好预测价值。如 Di Serafino 等[18]的研究还证实 ACEF 评分也适用于慢性完全冠状动脉闭塞的 PCI 治疗患者。Dziewierz 等[19]证明,ACEF 评分不仅可以预测急性冠脉综合征患者的死亡率,还可以预测包括出血等众多严重不良事件的发生。需要指出的是,中低危组的患者完全血运重建率相对较低,这可能与下列因素有关。(1)本研究根据 ACEF 评分对患者进行分层,而 ACEF 评分只涉及年龄、LVEF 和肌酐三个参数。这就导致高危组患者的 LVEF 相对较低,多支血管病变程度相对更重。因此,这可能观察到高危组患者完全血运重建比例相对较高的一个原因。(2)可能与回顾性研究无法干预手术医师当时的策略有关。尽管高危组的完全血运重建率相对略高,但分析患者预后可见,其 1 年内的心源性死亡和心脏不良事件的发生比例也均更高。这从侧面也进一步体现了 ACEF 评分对 PCI 患者预后的判断价值。

本研究存在一定局限性。首先,本研究为单中心的回顾性研究,受限于患者门诊和住院资料中随访资料完整性,纳入患者资料有限。其次,纳入患者均为老年患者,其 PCI 术后 1 年心脏不良事件发生比例略高,是因为与本院为当地较高水平医院,患者多数由二级医院转诊而来,病情相对较重,可能导致一定患者选择偏倚;最后,由于 ACEF 评分中低风险患者比例较少,本研究将中低风险患者合并到一起进行了一般资料比较,也未对不同 ACEF 风险人群验证 PCI 术后 1 年的预测效能。今后仍需要进行前瞻性、大样本的多中心研究,以进一步探讨 ACEF 评分对 PCI 治疗老年患者远期预后的预测价值。

综上,本研究发现 ACEF 评分对老年 PCI 患者术后 1 年心源性死亡和心脏不良事件的发生具有较高预测价值,值得今后进一步研究和推广。此外,对于 PCI 术后 ACEF 的改变及其与患者预后的关系,也是值得研究的话题。

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