

· 临床研究 ·

左主干急性闭塞心肌梗死患者院内死亡的危险因素

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【摘要】目的 探讨行急诊经皮冠状动脉介入治疗(PCI)的冠状动脉左主干急性闭塞患者发生院内死亡的危险因素。**方法** 回顾性分析 2011 年 1 月至 2021 年 1 月于中国人民解放军总医院第一医学中心急诊绿色通道行冠状动脉造影检查确诊为左主干急性闭塞引起心肌梗死的患者的临床资料。根据患者住院期间是否死亡分为死亡组和存活组, 比较 2 组患者临床和影像学资料, 分析不同观察指标对患者住院期间死亡率的影响, 并筛选危险因素。采用 SPSS 19.0 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、秩和检验及 χ^2 检验。多变量分析采用 logistic 回归。**结果** 22 例左主干急性闭塞患者均为右优势型。死亡组患者无右冠提供侧支循环及术后血流心肌梗死溶栓治疗(TIMI)0~2 级发生情况显著高于存活组, 差异均有统计学意义[6 例(85.71%) 和 1 例(6.67%), 5 例(71.43%) 和 4 例(26.67%); 均 $P < 0.05$]; 其他指标比较, 差异均无统计学意义。电话随访存活患者, 其中 20 d 后死于再次心肌梗死患者 1 例(4.54%), 3 个月后再次住院行右冠状动脉介入治疗患者 1 例(4.54%), 分别于术后第 4 个月、第 4 年因左主干支架内再狭窄行介入治疗患者 2 例(9.09%), 于术后第 6 年死于肺癌患者 1 例(4.54%), 未出现严重的心血管不良事件患者 10 例(45.45%)。logistic 单因素回归分析结果显示, 入院时心源性休克、无右冠提供侧支循环、术后血流 TIMI 0~2 级是患者住院期间死亡的危险因素($P < 0.05$); 多因素回归分析结果显示, 无右冠侧支循环是左主干急性闭塞患者住院期间死亡的重要预测因素($P < 0.05$)。结论 入院时发生心源性休克, 无右冠提供侧支循环、术后血流 TIMI 0~2 级是接受急诊 PCI 治疗的左主干急性闭塞患者住院期间死亡的重要预测因素, 右冠提供侧支循环是患者发生院内死亡的保护因素。

【关键词】 急性心肌梗死; 冠状动脉左主干; 经皮冠状动脉介入治疗; 院内死亡; 危险因素

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Risk factors of in-hospital death in patients with acute myocardial infarction caused by acute left main stem occlusion

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【Abstract】 Objective To investigate the risk factors of in-hospital deaths in the patients undergoing emergency percutaneous coronary intervention due to acute occlusion of the left main coronary artery. **Methods** This study retrospectively analyzed the clinical data of patients diagnosed with myocardial infarction caused by acute occlusion of the left main stem, who were admitted to Chinese PLA General Hospital through the emergency green channel coronary angiography examination from January 2011 to January 2021. According to the death of the participant during hospitalization, they were divided into death group and survival group. By comparing the clinical data and coronary imaging reading of the two groups and analyzing the association between various clinical variables and mortality of patients during hospitalization, the risk factors was screened. SPSS 19.0 was used for statistical analysis. Data comparison between two groups was performed using *t*-test, rank sum test or χ^2 test depending on data type. Multivariate analysis was performed using logistic regression. **Results** Of all patients with acute occlusion of the left main stem, 22 were right-dominant. The death group

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had more patients with no right coronary to provide collateral circulation and with postoperative thrombolysis in myocardial infarction (TIMI) level 0-2 blood flow, the difference being statistically significant [6 (85.71%) vs 1 (6.67%), 5 (71.43%) vs 4 (26.67%); both $P < 0.05$]. There was no significant difference in other indicators. Telephone follow-up confirmed 1 death (4.54%) after 20 days, interventional treatment of the right coronary artery in 1 rehospitalized patient (4.54%) at 3 postoperative months, interventional treatment of in-stent restenosis in the left main coronary artery in 2 patients (9.09%) at postoperative 4 and 6 years respectively, and 1 death (4.54%) due to lung cancer at postoperative 6 years, and no severe adverse cardiovascular events in 10 patients (45.45%). Logistic univariate regression analysis showed that cardiogenic shock on admission, no right coronary collateral circulation, and postoperative TIMI level 0-2 blood flow were risk factors for death during hospitalization ($P < 0.05$). Multivariate regression analysis showed no right coronary collateral circulation was an important predictive factor for death due to acute occlusion of the left main coronary artery during hospitalization. **Conclusion** Cardiogenic shock on admission, no right coronary to provide collateral circulation, postoperative TIMI flow level 0-2 are important predictors of death during hospitalization in patients receiving emergency percutaneous coronary intervention for acute occlusion of the left main stem, and right coronary collateral circulation is a protective factor for patients with in-hospital death.

【Key words】 acute myocardial infarction; left main coronary artery; percutaneous coronary intervention; hospital death; risk factors

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冠状动脉左主干闭塞是左主干病变中最严重的类型,左主干急性闭塞所导致的急性心肌梗死病情极度凶险,多数患者死于院外,真实发病率难以统计,因单中心病例较少,影响患者院内死亡的因素尚不明确^[1]。本研究通过分析中国人民解放军总医院第一医学中心收治的22例行急诊冠状动脉造影检查确定为左主干急性闭塞致急性心肌梗死患者的临床和影像学资料,探讨此类患者住院期间死亡的危险因素,寻找有效的治疗方法,以期改善患者的预后。

1 对象与方法

1.1 研究对象

选择2011年1月至2021年1月于中国人民解放军总医院第一医学中心行急诊冠状动脉造影确诊为左主干急性闭塞导致急性心肌梗死22例患者的临床资料。根据患者住院期间是否死亡分为死亡组和存活组。本研究通过中国人民解放军总医院伦理中心批准,全部患者均签署知情同意书。

纳入标准:(1)符合急性心肌梗死的诊断标准(典型心肌缺血的临床症状、心电图特征性ST-T改变及心肌酶动态改变);(2)急诊冠状动脉造影检查提示左主干100%闭塞,前向血流心肌梗死溶栓治疗(thrombolysis in myocardial infarction, TIMI) 0级。排除标准:临床资料不详细。

1.2 冠状动脉造影情况及PCI术

所有患者均经“绿色通道”行急诊冠状动脉造影检查并接受经皮冠状动脉介入治疗(percutaneous coronary intervention, PCI),术前均给予负荷剂量口

服阿司匹林300 mg,替格瑞洛180 mg(或氯比格雷600 mg)。术中静脉注射肝素100 U/kg,并根据血栓负荷决定是否应用抽吸导管及替罗非班,根据病情决定是否使用主动脉球囊反搏(intra aortic balloon pump, IABP)辅助治疗,术后全部转入冠心病监护病房(coronary care unit, CCU)并给予阿司匹林100 mg,口服,每日1次;替格瑞洛90 mg,口服,每日2次(或氯吡格雷75 mg,口服,每日1次)。所有患者均严格进行冠心病二级预防。

1.3 收集患者资料

分析患者临床和影像资料,对比2组患者一般情况、血液学指标、合并疾病及术后血流等资料。对存活患者进行电话随访,随访时间6~120个月,记录全因性死亡、非致死性心肌梗死及再次冠状动脉血运重建等主要心血管不良事件的发生情况及时间。

1.4 统计学处理

采用SPSS 19.0统计软件进行数据分析。符合正态分布的计量资料用均数±标准差($\bar{x} \pm s$)表示,采用 t 检验;非正态分布的计量资料,用中位数(四分位数间距)[$M(Q_1, Q_3)$]表示,采用秩和检验。计数资料用例数(百分率)表示,采用 χ^2 检验。多变量分析采用logistic回归。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 2组患者基本资料及入院时情况比较

本研究入选经急诊冠状动脉造影确诊为左主

干急性闭塞患者 22 例,根据患者住院期间是否死亡分为死亡组($n=7$)和存活组($n=15$)。存活组患者术前收缩压、舒张压显著高于死亡组,而心源性休克的发生率低于死亡组,差异均有统计学意义(均 $P<0.05$);其他指标比较,差异均无统计学意义(表 1)。

2.2 2 组患者急诊冠状动脉造影情况及 PCI 治疗情况

全部患者急诊冠状动脉造影提示左主干前向血流 TIMI 0 级,均为右冠优势型。冠状动脉造影检查情况及 PCI 治疗情况分析,其中无右冠提供侧支循环以及术后血流 TIMI 0~2 级在死亡组患者中的发生率显著高于存活组,差异有统计学意义($P<0.05$);其他指标比较,差异均无统计学意义(表 2)。

2.3 存活患者出院后随访情况

电话随访存活患者,其中 20 d 后死于再次心肌梗死患者 1 例(4.54%),3 个月后再住院行右冠状动脉介入治疗患者 1 例(4.54%),分别于术后第 4 个月、第 4 年因左主干支架内再狭窄行介入治疗患者 2 例(9.09%),于术后第 6 年死于肺癌患者 1 例(4.54%),未出现严重的心血管不良事件患者 10 例(45.45%)。

2.4 影响住院期间死亡率的因素分析

logistic 单因素回归分析结果显示,入院时心源性休克、无右冠提供侧支循环、术后血流 TIMI 0~2 级是患者住院期间死亡的危险因素($P<0.05$);多因素回归分析结果显示,无右冠侧支循环是左主干急性闭塞患者住院期间死亡的重要预测因素($P<0.05$;表 3)。

表 1 2 组患者基本资料及入院时情况比较

Table 1 Comparison of basic data and conditions at admission between two groups

Item	Total($n=22$)	Death group($n=7$)	Survival group($n=15$)	P value
Age(years, $\bar{x}\pm s$)	58.14 \pm 10.14	64.00 \pm 12.92	55.40 \pm 7.58	0.062
Male[$n(\%)$]	16(72.73)	5(71.43)	11(73.33)	0.926
BMI($\text{kg}/\text{m}^2, \bar{x}\pm s$)	26.61 \pm 3.53	26.84 \pm 2.47	26.51 \pm 4.00	0.841
Smoking[$n(\%)$]	10(45.45)	4(57.14)	6(40.00)	0.452
Drinking[$n(\%)$]	8(36.36)	4(57.14)	4(26.67)	0.166
Hypertension[$n(\%)$]	14(63.64)	5(71.43)	9(60.00)	0.604
Diabetes mellitus[$n(\%)$]	5(22.73)	2(28.57)	3(20.00)	0.655
Hyperlipidemia[$n(\%)$]	14(63.64)	5(71.43)	9(60.00)	0.166
Family disease history[$n(\%)$]	9(40.91)	2(28.57)	7(46.67)	0.421
Chest pain to admission duration(h, $\bar{x}\pm s$)	6.3 \pm 3.8	5.6 \pm 4.7	6.7 \pm 3.5	0.573
Heart rate(beats/min, $\bar{x}\pm s$)	83.36 \pm 16.27	75.43 \pm 11.40	87.07 \pm 17.18	0.120
SBP(mmHg, $\bar{x}\pm s$)	107.55 \pm 22.99	83.71 \pm 13.07	118.67 \pm 17.42	<0.001
DBP(mmHg, $\bar{x}\pm s$)	66.73 \pm 18.27	47.29 \pm 13.44	75.80 \pm 12.09	<0.001
Cardiogenic shock[$n(\%)$]	7(31.82)	5(71.43)	2(13.33)	0.006
STEMI[$n(\%)$]	14(63.64)	6(85.71)	8(53.33)	0.141
HB($\text{g}/\text{L}, \bar{x}\pm s$)	137.73 \pm 13.61	140.14 \pm 9.15	136.60 \pm 15.41	0.582
PLT($\times 10^9/\text{L}, \bar{x}\pm s$)	218.45 \pm 67.99	235.57 \pm 77.08	210.47 \pm 64.60	0.433
WBC($\times 10^9/\text{L}, \bar{x}\pm s$)	10.14 \pm 5.64	9.50 \pm 2.03	10.44 \pm 6.76	0.726
Neutrophil($\%, \bar{x}\pm s$)	0.66 \pm 0.16	0.58 \pm 0.15	0.70 \pm 0.16	0.123
CRP[mg/L, $M(Q_1, Q_3)$]	0.85(0.27, 3.37)	1.10(0.22, 2.95)	0.60(0.47, 3.76)	0.807
D-dimer[mg/L, $M(Q_1, Q_3)$]	0.55(0.43, 1.49)	0.65(0.49, 1.29)	0.49(0.34, 1.26)	0.845
CK[U/L, $M(Q_1, Q_3)$]	257.00(102.27, 775.35)	487.00(104.75, 1465.75)	209.60(107.45, 455.90)	0.172
CK-MB[U/L, $M(Q_1, Q_3)$]	12.07(1.95, 85.50)	18.90(3.46, 171.65)	6.33(1.64, 16.30)	0.125
CTnT[ng/ml, $M(Q_1, Q_3)$]	0.38(0.09, 1.56)	1.15(0.13, 4.05)	0.22(0.06, 0.57)	0.210
NT-proBNP[pg/dl, $M(Q_1, Q_3)$]	1150.00(297.15, 3115.25)	1309.00(706.00, 6370.50)	200.00(93.85, 1250.00)	0.106
LVEF($\%, \bar{x}\pm s$)	0.41 \pm 0.14	0.39 \pm 0.14	0.43 \pm 0.14	0.578

BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; STEMI: ST-segment elevation myocardial infarction; HB: hemoglobin; PLT: platelet; WBC: white blood cell; CRP: C-reactive protein; CK: creatine kinase; CTnT: cardiotroponinT; NT-proBNP: N-terminal pro-B-type natriuretic-peptide; LVEF: left ventricular ejection fraction. 1 mmHg=0.133 kPa.

表2 2组冠状动脉造影检查情况及PCI治疗情况比较

Table 2 Comparison of coronary angiography and PCI treatment between two groups [n(%)]

Item	Total (n=22)	Death group (n=7)	Survival group (n=15)	P value
Right-dominant	22(100)	7(100)	15(100)	0.508
Percutaneous coronary angioplasty	4(18.18)	2(28.57)	2(13.33)	0.388
Percutaneous coronary stenting	18(81.82)	5(71.43)	13(86.67)	0.565
No collateral circulation	7(31.8)	6(85.71)	1(6.67)	<0.001
Post-PCI TIMI flow-distal 0-2	9(40.91)	5(71.43)	4(26.67)	0.047
IABP	16(72.73)	7(100.00)	9(60.00)	0.050

PCI: percutaneous coronary intervention; TIMI: thrombolysis in myocardial infarction; IABP: intra aortic balloon pump.

表3 单因素及多因素回归分析

Table 3 Univariate and multivariate regression analysis

Variable	Univariate		Multivariate	
	OR(95%CI)	P value	OR(95%CI)	P value
No collateral circulation	84.00(4.48-1576.60)	0.003	12.35(2.37-756.35)	0.013
Cardiogenic shock	16.25(1.77-148.85)	0.014	-	0.087
Post-PCI TIMI flow-distal 0-2	16.50(1.49-183.07)	0.039	-	0.332

PCI: percutaneous coronary intervention; TIMI: thrombolysis in myocardial infarction; -: no datum.

3 讨论

冠状动脉左主干对左心室提供约75%血供^[2],发生急性闭塞导致心肌损伤及坏死面积广,特别是合并心源性休克的患者,病死率高^[3]。因此,明确该类患者的临床与冠状动脉影像特点,筛选影响患者住院期间死亡的危险因素,早期识别高危患者,探讨有效的预防和治疗策略,尤为重要。既往研究表明,心源性休克、急性肺水肿、STEMI以及高龄为死亡的预测因素^[4]。冠状动脉介入手术中患者侧支循环情况和术后即刻血流分级程度与患者预后的关系尚不明确。本研究发现左主干急性闭塞的心肌梗死患者中,右冠侧支循环的建立是患者存活的保护性因素,术后即刻TIMI3级血流的恢复是患者存活的重要因素。

在接受PCI治疗的STEMI患者中,右冠优势比左冠优势的患者预后更好^[5]。本研究中22例(100%)患者均为右冠优势,而左冠优势患者在进入导管室之前可能全部死亡^[6]。本研究中,多因素回归分析显示,无右冠提供侧支循环是左主干急性闭塞患者院内死亡的重要预测因素。右冠提供良好的侧支循环是患者住院期间死亡的保护因素,侧支循环的建立能为患者提供缺血预适应,增加冠状动脉血流储备,减小左主干急性闭塞后心肌坏死面积,降低死亡率^[7,8]。

本研究进一步分析,死亡组PCI术后血流TIMI 0~2级比例明显高于存活组,提示术后慢血流和无

复流的发生与患者住院期间死亡显著相关。在接受再灌注治疗的STEMI患者中,TIMI血流分级对患者预后具有重要意义^[9]。有研究表明,STEMI患者中更易出现慢血流及无复流^[10],住院期间具有更高的死亡率^[11]。

本研究发现死亡组患者入院时血压明显低于存活组,心源性休克的发生率高于存活组,提示死亡组患者坏死心肌面积更广泛,易出现恶性心律失常及泵衰竭^[4,10]。本研究中单因素分析提示心源性休克是住院期间死亡率的危险因素,多因素分析中未得出统计学差异,可能与样本量较少有关。

本研究发现术中植入IABP患者死亡率更高,这可能与植入IABP的患者一般情况更差、病情更重有关。尽管有研究发现在急性心肌梗死或不伴心源性休克患者中,使用IABP辅助治疗不能减少主要不良心血管事件发生率,且增加死亡率^[12,13],但是在特定情况下IABP可以给予有效的血液动力学支持,保持机体各器官有效灌注,仍然是不容忽视的治疗方法^[14]。

综上,无右冠提供侧支循环、术后血流TIMI 0~2级、心源性休克,是接受急诊PCI治疗的左主干急性闭塞患者住院期间死亡的重要预测因素,右冠提供侧支循环是患者院内死亡的保护因素。本研究的局限性在于单中心的回顾性研究,样本量偏少,大规模、多中心、前瞻性研究将为进一步探索这类患者临床特点、治疗措施以及如何改善预后提供更多指导。

【参考文献】

- [1] Édes IF, Ruzsa Z, Lux Á, *et al.* Acute total occlusion of the left main stem; coronary intervention options, outcomes, and recommendations[J]. *Postepy Kardiol Interwencyjnej*, 2018, 14(3): 233–239. DOI: 10.5114/aic.2018.78325.
- [2] Glazier JJ, Ramos-Parra B, Kaki A, *et al.* Therapeutic options for left main, left main equivalent, and three-vessel disease[J]. *Int J Angiol*, 2021, 30(1): 76–82. DOI: 10.1055/s-0041-1723977.
- [3] Alaour B, Onwordi E, Khan A, *et al.* Outcome of left main stem percutaneous coronary intervention in a UK nonsurgical center; a 5-year clinical experience[J]. *Catheter Cardiovasc Interv*, 2022, 99(3): 601–606. DOI: 10.1002/ccd.29530.
- [4] Sadowski M, Gutkowski W, Janion-Sadowska A, *et al.* Acute myocardial infarction due to left main coronary artery disease: a large multicenter national registry[J]. *Cardiol J*, 2013, 20(2): 190–196. DOI: 10.5603/CJ.2013.0033.
- [5] Abu-Assi E, Castiñeira-Busto M, González-Salvado V, *et al.* Coronary artery dominance and long-term prognosis in patients with ST-segment elevation myocardial infarction treated with primary angioplasty[J]. *Rev Esp Cardiol*, 2016, 69(1): 19–27. DOI: 10.1016/j.rec.2015.04.010.
- [6] ÉdesBoam IF, Ruzsa Z, Gellér L, *et al.* Acute total occlusion of the left main stem; coronary intervention options, outcomes, and recommendations[J]. *Postepy Kardiol Interwencyjnej*, 2018, 14(3): 233–239. DOI: 10.5114/aic.2018.78325.
- [7] Nickolay T, Nichols S, Ingle L, *et al.* Exercise training as a mediator for enhancing coronary collateral circulation; a review of the evidence[J]. *Curr Cardiol Rev*, 2020, 16(3): 212–220. DOI: 10.2174/1573403X15666190819144336.
- [8] Gutiérrez-Barrios A, Cañadas-Pruaño D, Bretones-Del Pino T, *et al.* Early recruitment of coronary collateral circulation; impact in late presentation nonreperfused acute coronary occlusion[J]. *Coron Artery Dis*, 2018, 29(7): 550–556. DOI: 10.1097/MCA.0000000000000647.
- [9] Stone GW, Kappetein AP, Sabik JF, *et al.* Five-year outcomes after PCI or CABG for left main coronary disease[J]. *N Engl J Med*, 2019, 381(19): 1820–1830. DOI: 10.1056/NEJMoa1909406.
- [10] Yamamoto K, Sakakura K, Tsukui T, *et al.* Clinical factors associated with slow flow in left main coronary artery-acute coronary syndrome without cardiogenic shock[J]. *Cardiovasc Interv Ther*, 2021, 36(4): 452–461. DOI: 10.1007/s12928-020-00717-8.
- [11] Garadah TS, Thani KB, Sulibech L, *et al.* Risk stratification and in-hospital mortality in patients presenting with acute coronary syndrome (ACS) in Bahrain[J]. *Open Cardiovasc Med J*, 2018, 21(12): 7–17. DOI: 10.2174/1874192401812010007.
- [12] Thiele H, Zeymer U, Thelemann N, *et al.* Intraaortic balloon pump in cardiogenic shock complicating acute myocardial infarction; long-term 6-year outcome of the randomized IABP-SHOCK II trial[J]. *Circulation*, 2019, 139(3): 395–403. DOI: 10.1161/CIRCULATIONAHA.118.038201.
- [13] Schrage B, Ibrahim K, Loehn T, *et al.* Impella support for acute myocardial infarction complicated by cardiogenic shock[J]. *Circulation*, 2019, 139(10): 1249–1258. DOI: 10.1161/CIRCULATIONAHA.118.036614.
- [14] 中华医学会心血管病分会, 中华心血管病杂志编辑委员会. 急性ST段抬高型心肌梗死诊断和治疗指南(2019)[J]. *中华心血管病杂志*, 2019, 47(10): 766–783. DOI: 10.3760/cma.j.issn.0253-3758.2019.10.003. Chinese Society of Cardiology of Chinese Medical Association, Editorial Board of Chinese Journal of Cardiology. Guidelines for diagnosis and treatment of acute ST segment elevation myocardial infarction(2019)[J]. *Chin J Cardiol*, 2019, 47(10): 766–783. DOI: 10.3760/cma.j.issn.0253-3758.2019.10.003.

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