doi: 10.13241/j.cnki.pmb.2024.19.028

急性脑梗死血清 LDL、Hcy 及血脂与病情严重程度和预后的关系 *

贾 培 王笑蕾 周学培 刘 龙 张 波

（安徽理工大学附属淮南新华医院神经内科 安徽 淮南 232032）

摘要 目的：探讨血清低密度脂蛋白（LDL）、同型半胱氨酸（Hcy）及血脂在急性脑梗死中的表达及其与病情严重程度和预后的关系。**方法：**研究对象选择 2021 年 1 月至 2023 年 1 月于我院就诊的 85 例急性脑梗死患者，设为病例组，并选择我院同期体检健康者 80 例作为对照组，分析血清 LDL、Hcy、总胆固醇（TC）、甘油三酯（TG）及高密度脂蛋白胆固醇（HDL-L）变化情况及与病情严重程度和预后的相关性。**结果：**与对照组相比，病例组患者血清 LDL、Hcy、TC 及 TG 水平升高，HDL-L 水平降低，差异显著（$P<0.05$）；轻度患者血清 LDL、Hcy、TC 及 TG 水平显著低于中度、重度患者，HDL-L 水平显著高于中度、重度患者，中度患者血清 LDL、Hcy、TC 及 TG 水平显著低于重度患者，HDL-L 水平显著高于重度患者（$P<0.05$）；预后良好组患者血清 LDL、Hcy、TC 及 TG 水平显著低于预后不良组，HDL-L 水平显著高于预后不良组，差异显著（$P<0.05$）；血清 LDL、Hcy、TC 及 TG 水平和病情严重程度和预后之间均呈正相关，HDL-L 水平和病情严重程度和预后之间均呈负相关（$P<0.05$）。**结论：**在急性脑梗死患者中血清 LDL、Hcy 及血脂的表达和病情严重程度和预后具有相关性，关注相关指标变化对于一定的临床应用价值。

关键词：低密度脂蛋白；同型半胱氨酸；血脂；急性脑梗死；病情严重程度；预后

中图分类号：R743.32 **文献标识码：**A **文章编号：**1673-6273(2024)19-3707-04

The Relationship between Serum LDL, Hcy, and Blood Lipids with Severity and Prognosis of Acute Cerebral Infarction*

JIA Pei, WANG Xiao-lei, ZHOU Xue-pei, LIU Long, ZHANG Bo

(Neurology, Xinhua Hospital, Xinhua Medical Group, Huai'nan, Anhui, 232032, China)

ABSTRACT Objective: To study Analysis of the expression of serum Low density lipoprotein (LDL), homocysteine (Hcy) and lipid in acute cerebral infarction and their relationship with the severity and prognosis. **Methods:** 85 patients with acute cerebral infarction treated in our hospital from January 2021 to January 2023 were selected as the study object and set as the case group, and 80 healthy patients in our hospital during the same period were selected as the control group. The changes of serum LDL, Hcy, total cholesterol (TC), triglyceride (TG) and high density lipoprotein cholesterol (HDL-L) were analyzed and the correlation with the severity and prognosis of the disease was analyzed. **Results:** Serum levels of LDL, Hcy, TC and TG in case group were significantly higher than those in control group, while HDL-L level was significantly lower than that in control group, with significant differences ($P<0.05$); Serum LDL, Hcy, TC and TG levels in mild patients were significantly lower than those in moderate and severe patients, and HDL-L levels were significantly higher than those in moderate and severe patients, serum LDL, Hcy, TC and TG levels in moderate patients were significantly lower than those in severe patients, and HDL-L levels were significantly higher than those in severe patients ($P<0.05$). Serum levels of LDL, Hcy, TC and TG in good prognosis group were significantly lower than those in poor prognosis group, and HDL-L level was significantly higher than that in poor prognosis group, the difference was significant ($P<0.05$). The severity of the disease and the prognosis were taken as dependent variables, and serum LDL, Hcy and blood lipid were taken as independent variables, respectively. The correlation analysis results showed that serum LDL, Hcy, TC and TG levels were positively correlated with the severity of the disease and the prognosis, while HDL-L levels were negatively correlated with the severity of the disease and the prognosis ($P<0.05$). **Conclusion:** There is a close relationship between the expression of serum LDL, Hcy and lipid in patients with acute cerebral infarction and the severity and prognosis of the disease, which can promote the progression of the disease. This study also provides a new idea for the treatment of acute cerebral infarction with targeted drugs, and has high clinical application value.

Key words: Low density lipoprotein; Homocysteine; Blood lipid; Acute cerebral infarction; The severity of the illness; Prognosis

Chinese Library Classification(CLC): R743.32 Document code: A

Article ID: 1673-6273(2024)19-3707-04

前言

急性脑梗死是常见的脑血管疾病，脑血供突然中断后所致

* 基金项目：安徽省卫生健康委员会项目（AWJ2020089）

作者简介：贾培（1979-），男，本科，主治医师，从事神经内科方向工作，E-mail: 15855460906@163.com

（收稿日期：2024-04-23 接受日期：2024-05-18）

的脑组织坏死引起的，发病率占脑血管疾病的 75%~80%，起病急，致残率高，临床表现为头晕头昏、肢体麻木或无力等症状，诱发感觉及运动异常，甚至意识障碍，据统计，近五分之三以上患者有后遗症，严重影响患者生活质量[1-3]。近年来，有研究显示，在脑梗死的发病过程中会释放多种活性物质，导致多种血清指标发生异常变化[4,5]。血清 LDL 是运输内源性胆固醇的主要载体，是动脉粥样硬化发生的关键步骤，而动脉粥样硬化是急性脑梗死的病理基础；Hcy 指血同型半胱氨酸，是蛋氨酸和半胱氨酸代谢过程中产生的重要中间产物，可破坏人体凝血机制，损伤脑部血管，增加血栓形成风险[6-8]。血脂作为细胞重要代谢物质基础，其在多种疾病中表达异常[9]。本研究旨在观察血清 LDL、Hcy 及血脂在急性脑梗死中的表达，并分析其与病情严重程度和预后的关系。

1 资料与方法

1.1 一般资料

选取 2021 年 1 月至 2023 年 1 月于我院接受治疗的 85 例急性脑梗死患者设为病例组，男 48 例，女 37 例，年龄 45～80 岁，平均（62.56± 5.07）岁，梗死部位：后循环 54 例，前循环 31 例；根据 NIHSS 评分，＜3 分为轻度 27 例，4~15 分为中度 41 例，＞16 分为重度神经功能缺损 17 例；对照组选择同期体检健康受试者 80 例，男 44 例，女 36 例，年龄 44~78 岁，平均（62.46± 5.11）岁。两组患者其年龄、性别占比方面具有可比性（P>0.05）。

诊断标准：参照《中国急性缺血性脑卒中诊治指南 2018》[10]。

纳入标准：（1）急性脑梗死患者；（2）局灶性脑梗死；（3）首次发病；（4）入组前未进行相关治疗。排除标准：（1）排除伴有恶性肿瘤者；（2）排除伴有脑出血者；（3）排除合并肝肾功能严重不全者、严重自身免疫性疾病者；（4）排除存在药物、酒精滥用史患者；（5）排除中途退出研究者、临床资料不全者、依从性较差者；（6）排除近半年存在住院史者；（7）排除对本研究药物过敏者。

1.2 方法与评价标准

采集两组研究对象次日清晨空腹静脉血，离心后 -20℃备用采用酶联免疫吸附法测定血清 LDL、Hcy、TC、TG 及 HDL-L 水平，试剂盒由深圳晶美生物技术有限公司生产，仪器均使用贝克曼 AU5800，操作严格按试剂盒说明进行。

1.3 统计学分析

采用 SPSS 24.0 软件包处理数据，计量资料用均数± 标准差（$\bar{x}\pm s$）表示，独立样本 t 检验相关性分析使用 Spearman 相关系数，P<0.05 为差异具有统计学意义。

2 结果

2.1 两组血清生化指标水平比较

相较于对照组，病例组患者血清 LDL、Hcy、TC 及 TG 水平升高，HDL-L 水平降低，差异显著（P＜0.05）见表 1。

表 1 两组血清生化指标水平比较（$\bar{x}\pm s$）

Table 1 Comparison of serumbiochemical indicators between the two groups（$\bar{x}\pm s$）

Groups	n	LDL(mmol/L)	Hcy(μmol/L)	TC(mmol/L)	TG(mmol/L)	HDL-L(mmol/L)
Case group	85	3.74± 1.01	28.47± 4.27	6.02± 1.21	2.36± 0.78	0.80± 0.21
Control group	80	2.88± 0.78	11.38± 3.23	3.41± 0.75	1.61± 0.54	1.37± 0.34
t value		6.095	28.859	16.533	7.139	13.039
P value		0.000	0.000	0.000	0.000	0.000

2.2 不同疾病严重程度血清生化指标水平比较

轻度患者血清 LDL、Hcy、TC 及 TG 水平显著低于中度、重度患者，HDL-L 水平显著高于中度、重度患者，中度患者血清 LDL、Hcy、TC 及 TG 水平显著低于重度患者，HDL-L 水平显著高于重度患者，（P＜0.05）见表 2。

表 2 不同疾病严重程度血清生化指标水平比较（$\bar{x}\pm s$）

Table 2 Comparison of serum biochemical indicators in different disease severity（$\bar{x}\pm s$）

Groups	n	LDL(mmol/L)	Hcy(μmol/L)	TC(mmol/L)	TG(mmol/L)	HDL-L(mmol/L)
Mild	27	3.41± 1.02	22.25± 3.89	5.54± 1.08	2.05± 0.69	0.96± 0.18
Moderate	41	3.70± 1.13	28.31± 4.05	6.03± 1.12	2.33± 0.82	0.80± 0.24
Severe	17	4.36± 1.12	38.73± 5.69	6.76± 1.02	2.92± 0.93	0.55± 0.17
F value		3.984	74.155	6.556	6.147	19.923
P value		0.022	0.000	0.002	0.003	0.000

2.3 不同预后血清 LDL、Hcy 及血脂水平比较

相较于预后不良组，预后良好组患者血清 LDL、Hcy、TC 及 TG 水平降低，HDL-L 水平升高，差异显著（P＜0.05）见表 3。

2.4 血清 LDL、Hcy 及血脂水平与病情严重程度和预后的相关性分析

相关性分析结果中显示，血清 LDL、Hcy、TC 及 TG 水平和病情严重程度和预后之间均呈正相关，HDL-L 水平和病情严重程度和预后之间均呈负相关，（P＜0.05）见表 4。

表 3 不同预后血清 LDL、Hcy 及血脂水平比较($\bar{x}\pm s$)

Table 3 Comparison of serum LDL, Hcy and lipid levels in different prognosis($\bar{x}\pm s$)

Groups	n	LDL(mmol/L)	Hcy(μmol/L)	TC(mmol/L)	TG(mmol/L)	HDL-L(mmol/L)
Good prognosis group	59	3.25± 0.98	26.55± 4.35	5.67± 1.06	2.04± 0.83	1.06± 0.30
Poor prognosis group	26	4.85± 1.10	32.83± 4.56	6.81± 1.12	3.09± 0.93	0.21± 0.08
t value		6.679	6.044	4.491	5.179	14.183
P value		0.000	0.000	0.000	0.000	0.000

表 4 血清 LDL、Hcy 及血脂水平与病情严重程度和预后的相关性分析

Table 4 Correlation analysis of serum LDL, Hcy and lipid levels with the severity of the disease and prognosis

Item	Severity of illness		Prognosis	
	r value	*P* value	r value	*P* value
LDL	0.415	0.015	0.394	0.031
Hcy	0.501	0.000	0.428	0.005
TC	0.511	0.000	0.560	0.000
TG	0.610	0.000	0.418	0.006
HDL-L	-0.553	0.000	-0.512	0.000

3 讨论

急性脑梗死是一种发病机制复杂的脑血管疾病，因脑组织微循环障碍出现致使脑动脉内膜损伤进而管腔狭窄、脑组织缺血，进一步导致神经功能障碍，常伴有致残后遗症，给患者及家属造成严重负担[11-13]。急性脑梗死在中老年人群中多发，近年来其发病率有上升趋势，严重影响患者生活质量[14,15]。相关研究显示，脑梗死由遗传及环境等多种因素诱发，与高血压、糖尿病、吸烟、嗜酒和肥胖等多种危险因素有关，且超过 20%急性脑梗死患者合并脑内微出血[16]。脑内微出血是由小血管红细胞渗漏诱发的脑实质亚临床损伤，可导致急性脑梗死患者发生血性转化，影响患者预后[17,18]。因此，寻找与疾病相关的血清指标，评价患者病情严重程度，在疾病早期防治、改善预后等方面尤为重要。

血清 LDL 是一种运载胆固醇进入外周组织细胞的脂蛋白颗粒，能诱使血管内皮细胞发生凋亡，促进动脉粥样硬化、脑梗死的形成与发展[19-21]。研究显示，当机体产生大量 LDL，可使体内的抗氧化能力减弱，携带胆固醇积累在动脉壁上，增加对 LDL 的摄取，诱发动脉硬化，促进了动脉粥样硬化的发生及血栓的形成[22]。Hcy 是一种含硫氨基酸，属于反应性血管损伤氨基酸，可破坏生物膜，促进单核巨噬细胞与血管平滑肌细胞变为泡沫细胞，增加血管内皮细胞毒性，加重血管损伤，导致大量血小板聚集，从而损伤人体的抗氧化[23-25]。有研究显示，Hcy 会影响血小板集聚，造成动脉粥样硬化形成，能反映人体动脉粥样硬化病变情况[26]。血脂异常与动脉粥样硬化、心脑血管疾病的发生密切相关，血脂异常可表现 TC 及 TG 升高，HDL-L 降低，HDL-L 降低会增加外周血胆固醇浓度，沉积在血管壁，引起动脉粥样硬化[27]。本研究结果显示，本研究结果显示，急性脑梗死患者血清 LDL、Hcy、TC 及 TG 水平较健康人群高，轻度患者血清 LDL、Hcy、TC 及 TG 水平显著低于中度、重度患者，中度患者血清 LDL、Hcy、TC 及 TG 水平显著低于重度患者，且预后良好组患者血清 LDL 水平显著低于预后不良组。结果提示，血清 LDL、Hcy、TC 及 TG 在急性脑梗死中呈高表达，且随着疾病的严重程度而升高，对患者预后判断可能也有一定的意义，可为临床早期诊断提供依据。主要原因为：① LDL 可以活化巨噬细胞，并促进炎症因子分泌，促进脂肪斑形成，使血管功能障碍，导致动脉粥样硬化斑块的形成；② Hcy 是一种反应性血管损伤氨基酸，当血管受损时其水平升高，促进氧化物的形成，诱导血管平滑肌细胞增殖，导致内皮细胞受损，加重急性脑梗死的进一步发展；Cui B[28]等研究也显示，Hcy 可介导炎症因子和自由基的生成，引发机体的炎症反应和氧化应激增加，损害血管内皮细胞，其水平越高，患者神经功能损伤越严重，从而加剧病情进展。③ 作为反馈回路，脑梗死患者因血小板黏附性升高致使血管斑块增加，进一步损伤内皮细胞，致使血脂水平持续异常。

本研究结果分析发现，血清 LDL、Hcy、TC 及 TG 水平和病情严重程度和预后之间均呈正相关，HDL-L 水平和病情严重程度和预后之间均呈负相关，结果提示，血清 LDL、Hcy、TC 及 TG 升高可加重急性脑梗死病情严重程度，增加不良预后的发生率。应强化对其临床动态监测，采取针对性防治，以改善患者预后状况。本研究不足之处在于，样本量较少，存在偏倚的可能性，今后有待予以完善。

综上所述，在急性脑梗死患者中血清 LDL、Hcy 及血脂的表达和病情严重程度和预后之间存在相关性，临床动态检测对于改善患者预后具有临床价值。

参 考 文 献(References)

[1] Edwards MD, Hughes TAT. Managing blood pressure in acute cerebral infarction[J]. J Neurol, 2021, 268(6): 2294-2296.

[2] Shao Y, Zhang Y, Wu R, et al. Network pharmacology approach to investigate the multitarget mechanisms of Zhishi Rhubarb Soup on

acute cerebral infarction[J]. Pharm Biol, 2022, 60(1): 1394-1406.

[3] Masson A, Boulouis G, Janot K, et al. Acute hydrocephalus and delayed cerebral infarction after aneurysmal subarachnoid hemorrhage[J]. Acta Neurochir (Wien), 2022, 164(9): 2401-2408.

[4] Gong W, Zhou L, Shang L, et al. Cerebral infarction and risk factors in acute type A aortic dissection with arch branch extension [J]. Echocardiography, 2022, 39(8): 1113-1121.

[5] Bao L, Zhang S, Gong X, et al. Trousseau Syndrome Related Cerebral Infarction: Clinical Manifestations, Laboratory Findings and Radiological Features [J]. J Stroke Cerebrovasc Dis, 2020, 29 (9): 104891.

[6] Zhao Y, Zhang Y, Yang Y. Acute cerebral infarction with adenomyosis in a patient with fever: a case report [J]. BMC Neurol, 2020, 20(1): 210.

[7] Xu ZM, Liang X, Dai LL, et al. Evidence of clinical randomized controlled trial study in treatment of acute cerebral infarction with traditional Chinese medicine in recent five years[J]. Zhongguo Zhong Yao Za Zhi, 2021, 46(12): 2942-2948.

[8] Chen J, Li R, Chen J, et al. Acute cerebral infarction with acute myocardial infarction due to patent foramen ovale: A case report[J]. Medicine (Baltimore), 2020, 99(19): e20054.

[9] Min L, Wenning Z, Wei W, et al. Acute progressive large-area cerebral infarction caused by wasp sting: a case report[J]. Neurocase, 2022, 28 (4): 364-368.

[10] Shamsaeic G R, Rafie S, Rahimi Z. Investigating the Effect and Immunity of Tissue Plasminogen Activator in the Treatment of Acute Ischemic Stroke [J]. Journal of Intellectual Disability - Diagnosis and Treatment, 2020, 8(2): 100-106.

[11] Zhang H, Qin Y, Gao S, et al. Correlation analysis of Trial of Org 10172 in acute stroke treatment classification and National Institutes of Health Stroke Scale score in acute cerebral infarction with risk factors[J]. Rev Assoc Med Bras (1992), 2022, 68(1): 44-49.

[12] Wu W, Qiu C, Feng X, et al. Protective Effect of Paeoniflorin on Acute Cerebral Infarction in Rats [J]. Curr Pharm Biotechnol, 2020, 21(8): 702-709.

[13] Chen LL, Wang WT, Zhang S, et al. Cohort study on the prognosis of acute cerebral infarction in different circulatory systems at 1-year follow-up[J]. BMC Cardiovasc Disord, 2021, 21(1): 521.

[14] Ng TP, Wong C, Leong ELE, et al. Simultaneous cardio-cerebral infarction: a meta-analysis[J]. QJM, 2022, 115(6): 374-380.

[15] Liu F, Jin M, Zhang Z, et al. Platelet-to-Neutrophil Ratio is Related to Hemorrhagic Transformation in Patients With Acute Cerebral Infarction[J]. Neurologist, 2022, 27(5): 230-234.

[16] Wen H, Lv M. Correlation analysis between serum procalcitonin and infarct volume in young patients with acute cerebral infarction [J]. Neurol Sci, 2021, 42(8): 3189-3196.

[17] Wang Q, Yu D, Liang J, et al. Significance of expression of AIM2, IL-1β, and IL-18 in plasma of patients with acute cerebral infarction [J]. Zhong Nan Da Xue Xue Bao Yi Xue Ban, 2021, 46(2): 149-155.

[18] Li G, Han C, Xia X, et al. Relationship of uric acid, C-reactive protein, and N-terminal pro-B-type natriuretic peptide with acute cerebral infarction [J]. Rev Assoc Med Bras (1992), 2021, 67(11): 1639-1643.

[19] Kao CN, Liu YW. Acute cerebral infarction caused by atrial thrombus originating from left upper pulmonary vein stump after left upper lobe trisegmentectomy [J]. Gen Thorac Cardiovasc Surg, 2020, 68(2): 206-207.

[20] Lin B, Wang C, Lu N, et al. Reversible cerebral vasoconstriction syndrome with cerebral infarction caused by acute high-level vapor exposure of ethylene oxide: a case report [J]. BMC Neurol, 2021, 21 (1): 391.

[21] Wang ZY, Wang M, Guo JJ, et al. Acute bilateral cerebral infarction in the presence of neuromyelitis optica spectrum disorder: A case report[J]. Medicine (Baltimore), 2020, 99(40): e22616.

[22] Shang W, Zhang Y, Xue L, et al. Evaluation of collateral circulation and short-term prognosis of patients with acute cerebral infarction by perfusion-weighted MRI[J]. Ann Palliat Med, 2022, 11(4): 1351-1359.

[23] Li XX, Liu SH, Zhuang SJ, et al. Effects of intravenous thrombolysis with alteplase combined with edaravone on cerebral hemodynamics and T lymphocyte level in patients with acute cerebral infarction[J]. Medicine (Baltimore), 2020, 99(50): e23414.

[24] Chihi M, Darkwah Oppong M, Pierscianek D, et al. Analysis of Brain Natriuretic Peptide Levels after Traumatic Acute Subdural Hematoma and the Risk of Post-Operative Cerebral Infarction[J]. J Neurotrauma, 2021, 38(22): 3068-3076.

[25] Wu T, Li P, Sun D. Assessing the Clinical Efficacy of Recombinant Tissue Plasminogen Activator on Acute Cerebral Infarction [J]. J Nanosci Nanotechnol, 2020, 20(12): 7781-7786.

[26] Xiujuan D, Chaoming G. Symptom relief for Parkinson's disease with acute cerebral infarction[J]. Asian J Surg, 2023, 46(6): 2523-2524.

[27] Huang P, He XY, Xu M. Effect of Argatroban Injection on Clinical Efficacy in Patients with Acute Cerebral Infarction: Preliminary Findings[J]. Eur Neurol, 2021, 84(1): 38-42.

[28] Cui B, Yang D, Zheng W, et al. Plaque enhancement in multi-cerebrovascular beds associates with acute cerebral infarction [J]. Acta Radiol, 2021, 62(1): 102-112.