

· 论 著 ·

# 不同部位脑梗死对心脏自主神经功能的影响

刘宏鸣\*, 樊济海, 刘晓英, 顾秀莲, 卢 静, 李亚维, 王 玲, 彭 华

(解放军第 455 医院心内科, 上海 200052)

**[摘要]** 目的: 通过测定心率变异性(heart rate variability, HRV)参数观察不同部位脑梗死对心脏自主神经功能的影响。方法: 对经 CT 和 MRI 证实的 108 例脑梗死患者[男 62 例, 女 46 例, 平均年龄(66.5 ± 10.1)岁]和 70 例健康志愿者[男 42 例, 女 28 例, 平均年龄(64.8 ± 11.7)岁]的 HRV 各指标进行分析, 包括 SDNN (24 h 内全部窦性 R-R 周期的标准差)、SDANN (24 h 内每 5 min 节段窦性 R-R 周期平均值的标准差)、SDNN<sub>index</sub> (24 h 内每 5 min 窦性 R-R 周期标准差的平均值)、RMSSD (24 h 内全部窦性 R-R 周期差值的均方根)、PNN<sub>50</sub> (24 h 内相邻两正常窦性 R-R 周期差值大于 50 ms 的个数所占的百分数)以及 HRV TI (心率变异三角指数)。将脑梗死组分为: 半球梗死组 (73 例, 左侧组 35 例, 右侧组 38 例)、脑干梗死组 (35 例, 延髓组 17 例, 桥脑组 10 例和中脑组 8 例), 并分别进行比较。结果: 脑梗死组及半球梗死、脑干梗死的 HRV 各参数与对照组比较均显著降低 ( $P < 0.05$ )。对半球左、右两侧梗死进行比较, 右侧各参数在半球中最低。延髓各指标均低于对照组, SDNN、RMSSD、PNN<sub>50</sub> 显著低于桥脑和中脑; 桥脑和中脑的 SDANN、SDNN<sub>index</sub> 与延髓组比显著降低 ( $P < 0.05$ )。结论: 不同部位脑梗死对心脏自主神经功能具有不同的影响, 右侧半球及脑干 (尤其延髓) 梗死患者的影响最显著, 尤应加强心脏监护。

**[关键词]** 脑梗死; 心率变异性; 自主神经功能

**[中图分类号]** R 743.3 **[文献标识码]** A **[文章编号]** 0258-879X (2004) 09-0994-03

## Localization of ischemic stroke may have different effects on autonomic function

LIU Hong-Ming\*, FAN Ji-Hai, LIU Xiao-Ying, GU Xiu-Lian, LU Jing, LI Ya-Wei, WANG Ling, PENG Hua (Department of Cardiology, No. 455 Hospital of PLA, Shanghai 200052, China)

**[ABSTRACT]** **Objective:** To demonstrate the effects of different ischemic stroke localization on autonomic function parameters assessed by heart rate variability (HRV). **Methods:** Totally 108 patients with ischemic stroke (62 male and 46 female, mean age 66.5 ± 10.1 years) and 70 healthy volunteers (42 male and 28 female, mean age 64.8 ± 11.7 years) underwent cranial MRI and CT, and their HRV parameters, including SDNN (the standard deviations of R-R interval over 24-hour Holter recordings), SDANN (the standard deviations of the normal mean R-R interval obtained from successive 5-minute periods over 24-hour Holter recordings), SDNN<sub>index</sub> (the normal mean of the standard deviations R-R interval obtained from successive 5-minute periods over 24-hour Holter), RMSSD (the root-mean square of the difference of successive R-R intervals), PNN<sub>50</sub> (the number of instances per hour in which 2 consecutive R-R intervals differ by more than 50 ms over 24-hours) and HRV TI (HRV triangular index), were analyzed. Patients with ischemic stroke were assigned into 2 groups: hemisphere infarction group, consisting 73 patients, were further divided into right and left hemisphere group; brainstem infarction group, consisting 35 patients, were further divided into the medullary oblongata, pontine and midbrain groups. **Results:** In ischemic stroke group, hemisphere infarction group and brainstem infarction group, HRV parameters were much reduced compared with those in the control subjects ( $P < 0.05$ ). It was also found that HRV was lower in patients with right hemisphere lesions than with left hemisphere lesions. HRV decreased in patients with medullary oblongata infarction group; SDNN, RMSSD, and PNN<sub>50</sub> were reduced significantly in the pontine and midbrain. SDANN and SDNN<sub>index</sub> were significantly lower in the pontine and midbrain infarction groups ( $P < 0.05$ ). **Conclusion:** The localization of ischemic stroke may have different effects on autonomic function. Patients with right hemisphere infarction, especially the medullary oblongata infarction may require more intensive monitoring.

**[KEY WORDS]** brain infarction; heart rate variability; autonomic function

[Acad J Sec Mil Med Univ, 2004, 25(9): 994-996]

\* 文献<sup>[1,2]</sup>表明脑血管病与心脏自主神经功能调节密切相关。脑梗死可引起心脏自主神经调节的改变, 从而提高心率失常的发生率, 导致猝死的危险性升高。心率变异性(heart rate variability, HRV)已被公认在评估心脏疾病, 尤其是冠心病的交感神经

和副交感神经影响, 预测远期猝死率方面有肯定的价值。本研究的目的是通过测定 HRV 论证脑卒中

\* [作者简介] 刘宏鸣(1955-), 女(汉族), 副主任医师  
\* Corresponding author: E-mail: hm\_luyang@126.com



的特定部位对心脏自主神经功能的不同影响。

## 1 对象和方法

1.1 对象及分组 1998年5月至2004年5月首次患急性脑梗死的住院患者218例,根据下列选择标准:(1)接受重复头颅CT及MRI证实(大脑中动脉区域)及脑干部位急性梗死病灶,临床表现与病灶定位一致;(2)无影响HRV参数的共存疾病,如扩张性或肥厚性心肌病,急性冠状动脉综合征(包括急性心梗、不稳定性心绞痛),3~4级充血性心衰,肾病,肺部疾病,糖尿病,乙醇中毒,电解质紊乱及机械通气;(3)未服用影响心脏自主神经的药物(如 $\beta$ 阻滞剂、洋地黄等);(4)无房颤,并剔除在HRV测定期间发生发热、低氧血症及严重高血压(BP>170/100 mmHg, 1 mmHg=0.133 kPa)的患者。共108例满足标准,男62例,女46例,平均年龄(66.5±10.1)岁。根据梗死部位将梗死患者分为半球梗死组(73例,其中左半球35例,右半球38例)和脑干梗死组(35例,其中延髓17例,桥脑10例,中脑8例)。脑梗死后3d内测定HRV,发病后的第2个星期重复头颅CT或头颅MRI。健康对照组70例,其中男42例,女28例,平均年龄(64.8±11.7)岁。

1.2 方法 采用美国P1200型3通道Holter分析系统,连续监测24h心电信号。采用专人分析,人机对话方式识别各种心律失常,剔除异位搏动及伪差。采用由欧洲心血管学会和北美起搏电生理学会组成的HRV专题委员会推荐的方法及指标<sup>[3]</sup>,并参照中华医学会HRV协作组规定的统一方法<sup>[4,5]</sup>,由计算机自动计算正常窦性心搏R-R间期,并计算出以下时域指标:(1)SDNN (standard deviations of R-R interval over 24 h Holter recordings): 24 h内全部窦性R-R周期的标准差;(2)SDANN (standard de-

viations of the normal mean R-R interval obtained from successive 5 min periods over 24 h Holter recordings): 24 h内每5 min节段窦性R-R周期平均值的标准差;(3)SDNN<sub>Index</sub> (normal mean of the standard deviations R-R interval obtained from successive 5 min periods over 24 h Holter): 24 h内每5 min窦性R-R周期标准差的平均值;(4)RMSSD (root mean square of the difference of successive R-R intervals): 24 h内全部窦性R-R周期差值的均方根;(5)PNN<sub>50</sub> (number of instances per hour in which two consecutive R-R intervals differ by more than 50 ms over 24 h): 24 h内相邻两正常窦性R-R周期差值大于50 ms的个数所占的百分数;(6)心率变异三角指数(HRV triangular index, HRV TI): 窦性R-R周期的总个数除以窦性R-R周期直方图的高度。

1.3 统计学处理 所有数据以 $\bar{x} \pm s$ 表示,采用*t*检验

## 2 结果

见表1。梗死组的SDNN、SDANN、SDNN<sub>Index</sub>、RMSSD、PNN<sub>50</sub>、HRV TI各参数与对照组比较均显著降低( $P < 0.05$ )。半球梗死组、脑干梗死组的SDNN、SDANN、SDNN<sub>Index</sub>、RMSSD、PNN<sub>50</sub>、HRV TI各参数与对照组比较均显著降低( $P < 0.05$ ),两组之间无差别。右侧各HRV参数在半球中最低( $P < 0.05$ ),左右半球两组比较,其中SDNN、HRV TI、RMSSD、PNN<sub>50</sub>差别显著( $P < 0.05$ );对半球左、右两侧梗死患者的年龄进行了比较,结果无差别。脑干损害3组中,延髓各指标均低于对照组,SDNN、RMSSD、PNN<sub>50</sub>显著低于桥脑和中脑两组( $P < 0.05$ ),桥脑和中脑的SDANN、SDNN<sub>Index</sub>与延髓组比较显著降低( $P < 0.05$ )。

表1 脑梗死组与对照组HRV测值的比较

Tab 1 Comparison of HRV parameters between cerebral infarction and control groups

Group	n	Age (year)	SDNN (t/m s)	SDANN (t/m s)	SDNN <sub>Index</sub> (t/m s)	RMSSD (t/m s)	PNN <sub>50</sub> (%)	HRV TI
Control	70	64.8±11.7	139.28±38.42	126.54±33.12	53.98±16.11	26.98±13.16	15.45±8.71	36.81±12.45
Cerebral infarction	108	66.5±10.1	101.52±36.45*	89.64±31.41*	40.19±15.53*	22.08±12.44*	11.17±8.35*	29.18±11.89*
Hemisphere	73	67.1±11.4	100.71±37.42*	87.38±31.79*	40.13±15.78*	22.32±12.91*	11.89±8.21*	29.44±12.37*
Left	35	68.4±9.6	111.79±32.25	95.92±32.14	44.41±16.12	23.46±12.45	15.09±8.46	32.65±12.16
Right	38	65.9±12.3	90.51±38.75	79.52±34.41	36.72±14.47	19.42±10.92	10.87±7.94	26.48±11.81
Brainstem	35	65.2±9.9	114.15±34.32*	94.36±31.92*	40.32±15.52*	21.59±12.08*	11.56±8.45*	28.66±12.07*
Medullary oblongata	17	66.7±8.7	89.82±32.75	110.12±31.52	46.97±14.31	15.88±11.87	8.21±7.67	26.45±11.92
Pons	10	64.1±12.5	116.43±33.41	78.92±32.34	34.45±15.74	26.64±12.95	15.12±8.25	30.42±12.34
Midbrain	8	63.6±14.4	119.23±31.23	80.15±33.17	33.51±16.31	27.45±13.14	14.24±9.14	31.16±12.81

\*  $P < 0.05$  vs control group;  $P < 0.05$  vs left hemisphere group;  $P < 0.05$  vs medullary oblongata group

### 3 讨论

HRV 分析是判断心脏自主神经活动的常用定量指标,已被应用于心脏疾病及代谢系统疾病的预后研究。冠心病和糖尿病 5 年病死率的升高与 HRV 受抑密切相关,尤其在心梗后心律失常猝死的危险度升高<sup>[6]</sup>。近期已有报道<sup>[1,2]</sup>,脑血管病能改变自主神经功能。而自主神经功能降低可引起心肌损害和血浆肌钙蛋白升高<sup>[7]</sup>,使心律失常的发病率升高。据报道,在急性脑梗死发生猝死的患者中,约 6% 由心律失常引起<sup>[8]</sup>。因此,脑梗死影响心血管自主神经受到关注。但是有关脑梗死的不同部位可能对自主神经功能产生不同的影响罕见报道。本研究结果显示,脑梗死患者的 HRV 各参数均低于对照组,证明了脑组织受损能使心脏自主神经功能发生变化,支持大脑半球的某些部位(如岛叶<sup>[9]</sup>、下丘脑)和脑干存在心血管的交感神经和副交感神经最重要的调节中枢的推测<sup>[10]</sup>。本研究结果提示半球左、右两侧参数有明显差别,右侧均低于左侧,尤其是反映自主神经系统功能总的张力大小的指标 SDNN、HRV TI 和反映副交感神经张力的指标 RMSSD、PNN<sub>50</sub> 右侧显著低于左侧。而评估交感神经功能的指标,当交感神经张力增高时其值降低的 SDANN 和 SDNN<sub>index</sub>, 右侧也低于左侧,但差别不显著。有人<sup>[10]</sup>发现右侧半球梗死与室速发生有关,故推测右半球梗死可能引起心脏副交感神经活力降低,而交感神经调节相应升高,主要是半球支配区域常累及的岛叶是控制自主神经调节的一个重要解剖区域。对 35 例孤立的脑干病灶(isolated brainstem lesion, BL) 患者进行 HRV 测定分析发现,与对照组比较 HRV 参数均降低。又根据脑干不同解剖水平分为 3 个亚组。延髓梗死的 BL 引起心脏自主神经功能的改变,显示这个区域在调节交感和副交感神经功能上的重要性,尤其是副交感神经中枢位于延髓背侧迷走神经核。但延髓并非脑干中惟一对心脏自主神经调节起作用的部位。桥脑和中脑亚组与延髓亚组比较发现,SDANN 和 SDNN<sub>index</sub> 均明显降低,证明交感神经传出纤维的起始神经核弥散在脑桥和中脑外侧部的网状结构<sup>[11]</sup>,当它们受损时较明显的引起交感神经调节障碍。脑干交感和副交感神经与其他神经中枢存在广泛的联络,它们还接受从周围机械和化学感受器的传入刺激<sup>[12,13]</sup>。因此,脑干也是调节心脏自主

神经功能的重要部位。

总之,不同部位的脑梗死对心脏自主神经功能有不同的影响,半球的偏侧性和 BL 与猝死心律失常的风险相关,在右侧半球及脑干,尤其是延髓区域梗死的心脏自主神经功能异常提示预后不良,这些患者更需要加强心脏监护,必要时给予预防性的治疗以防止心律失常和猝死的发生。

### [参考文献]

- [1] Klingelhofer J, Sander D. Cardiovascular consequences of clinical stroke[J]. *Baillière's Clin Neurol*, 1997, 6(2): 310-335.
  - [2] Lindgren A, Wohlfart B, Pahlm O, et al. Electrocardiographic changes in stroke patients without primary heart disease[J]. *Clin Physiol*, 1994, 14(2): 223-231.
  - [3] Wit AL, Hsivano T, Tang T, et al. Electrophysiology and pharmacology of cardiac arrhythmias. IX. Cardiac electrophysiologic effects of beta adrenergic receptor stimulation and blockade, Part A [J]. *Am Heart J*, 1975, 90(4): 521.
  - [4] 戚文航. 心率变异性测定在心血管疾病应用中的展望[J]. *中华心血管病杂志*, 1995, 23(1): 7.
  - [5] 中华心血管病杂志编委会. 心率变异性对策专题组. 心率变异性检测临床应用的建议[J]. *中华心血管病杂志*, 1998, 26(4): 252-255.
  - [6] Korpelainen JT, Huikuri HV, Sotaniemi KA, et al. Abnormal heart rate variability reflecting autonomic dysfunction in brainstem infarction[J]. *Acta Neurol Scand*, 1996, 94(5): 337-342.
  - [7] James P, Ellis CJ, Whitlock RM, et al. Relation between Troponin T concentration and mortality in patients presenting with an acute stroke: observational study[J]. *BMJ*, 2000, 320(7248): 1502-1504.
  - [8] Silver FL, Norris JW, Lewis AJ, et al. Early mortality following stroke: a prospective review[J]. *Stroke*, 1984, 15(3): 492-496.
  - [9] Naver HK, Blomstrand C, Wallin BG. Reduced heart rate variability after right-sided stroke[J]. *Stroke*, 1996, 27(2): 247-251.
  - [10] Tokgozoglul SL, Batur MK, Topuoglu MA, et al. Effects of stroke localization on cardiac autonomic balance and sudden [J]. *Stroke*, 1999, 30(7): 1307-1311.
  - [11] Loewy AD. Central autonomic pathways[A]. In: Loewy AD, Spyer KM. *Central regulation of autonomic functions*[M]. New York: Oxford University Press, 1990: 88-103.
  - [12] Dampney RA. Functional organization of central cardiovascular pathways[J]. *Clin Exp Pharmacol Physiol*, 1981, 8(3): 241-259.
  - [13] Loewy AD. Descending pathways to the sympathetic preganglionic neurons[J]. *Prog Brain Res*, 1982, 57: 267-277.
- [收稿日期] 2004-01-29 [修回日期] 2004-07-05  
[本文编辑] 孙岩