经颅彩色多普勒超声监测下 GHOST-CAP 管理策略对重症脑出血患者神经功能的影响

摘　　要

目的：探究 GHOST-CAP 管理策略对重症脑出血患者神经功能预后的影响，应用经颅彩色多普勒超声监测重症脑出血患者脑血流变化特点，评估脑血流参数与神经功能预后的关系。

方法：收集 2022.06-2023.11 就诊于河北医科大学第二医院重症医学科的重症脑出血患者，按照随机数字表法分为常规治疗组（对照组）和 GHOST-CAP 管理策略组（实验组）各 50 人。常规治疗组给予脑出血常规治疗；GHOST-CAP 管理策略组在常规治疗的基础上，严格遵循 GHOST-CAP 管理策略。两组患者分别于入院后前 7 天每日进行经颅彩色多普勒超声脑血流动力学监测，收集两组患者一般临床资料、重症量表评分、持续机械通气时间、28 天病死率、ICU 住院时间、总住院时间。随访患者入院后 30 天和 90 天时格拉斯哥预后评分，评估患者神经功能预后。

结果：以入院后 90 天格拉斯哥预后评分评估患者长期神经功能预后，GHOST-CAP 管理策略组预后良好患者（56%）多于常规治疗组（40%），但差异无统计学意义（X^2=2.564，p=0.109）。GHOST-CAP 管理策略组 28 天病死率（22%）明显低于常规治疗组（42%），差异有统计学意义（X^2=4.596，p=0.032）。生存组患者入院时血细胞比容（34.57±5.60）%、入院时细胞因子白介素 6 水平[24.56（10.3，87.4）]、入院时急性生理与慢性健康评分（24.87±5.43）、入院时序贯性器官功能衰竭评分[7.00（7.0，8.0）]、入院后前 7 天序贯性器官功能衰竭评分均值[7.00（6.3，8.0）]低于死亡组，差异有统计学意义（t=-2.677，p=0.009；z=-2.572，p=0.010；t=-3.704，p=0.000；z=-2.263，p=0.024；z=-4.405, p=0.000）。生存组患者入院后前 7 天格拉斯哥昏迷评分均值[5.00（3.0，7.4）]高于死亡组,差异有统计学意义（z=-2.770，p=0.006）。以 28 天死亡作为因变量将单因素分析中 p<0.05 的变量纳入多因素 logistic 回归模型，仅入院时血

细胞比容（OR1.15, CI1.04-1.27, p=0.005）、入院时白介素-6 水平（OR1.01, CI1.01-1.01, p=0.009）、和入院后前 7 天序贯性器官功能衰竭评分均值（ OR1.48, CI1.15-1.89, p=0.002）与 28 天死亡情况显著相关。长期神经功能预后良好组入院后前 7 日大脑中动脉平均流速均值（45.51±2.51）cm/s、舒张末期流速均值（27.02±2.58）cm/s 大于预后不良组，差异有统计学意义（p=0.035；p=0.000）；长期神经功能预后良好组入院后前 7 日大脑中动脉搏动指数均值（1.22±0.16）、阻力指数均值（0.67±0.05）小于预后不良组，具有统计学差异（p=0.001；p=0.001）。

结论：GHOST-CAP 管理策略能够降低重症脑出血患者 28 天病死率，但对长期神经功能预后的影响需进一步研究；经颅彩色多普勒超声相关参数在评估重症脑出血患者神经功能预后方面具有参考价值。

关键词：重症脑出血；GHOST-CAP 管理策略；经颅彩色多普勒超声；神经功能预后。

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Effect of GHOST-CAP management strategy on neurological function of patients with severe intracerebral hemorrhage under transcranial color-coded duplex ultrasound monitoring

ABSTRACT

Objective: This study aims to investigate the impact of the GHOST-CAP management strategy on the prognosis of neurological function in patients with severe intracerebral hemorrhage, while also evaluating the relationship between the parameter characteristics of Transcranial color-coded duplex and neurological function.

Methods: Patients with severe intracerebral hemorrhage admitted to the Intensive Care Unit of the Second Hospital of Hebei Medical University between June 2022 and November 2023 were enrolled in this study. They were divided into two groups with random number table method: the control group (n=50) receiving conventional treatment for intracerebral hemorrhage, and the experimental group (n=50) strictly adhering to the GHOST-CAP management strategy. Daily TCCD cerebral hemodynamic monitoring was conducted during the first 7 days after admission for both groups. General clinical data, severity scores, duration of mechanical ventilation, 28-day mortality rate, ICU stay, and total hospital stay were collected. Follow-up assessments using the Glasgow Outcome Scale were performed at 30 and 90 days post-admission to evaluate neurological function prognosis.

Results: The long-term prognosis of neurological function, assessed by the GOS score at 90 days post-admission, revealed a higher proportion of favorable outcomes in the GHOST-CAP management strategy group (56%) compared to the conventional treatment group (40%), although this difference did not reach statistical significance ($\chi2=2.564$, $p=0.109$). In contrast, the 28-day mortality rate was significantly lower in the GHOST-CAP management strategy group (22%) than in the conventional treatment group (42%), with a statistically significant distinction observed ($\chi2=4.596$, $p=0.032$).

Survivors exhibited significantly lower hematocrit levels (34.57±5.60) compared to non-survivors, with a statistically significant difference (t=-2.677, p=0.009). Similarly, survivors had lower interleukin-6 levels at admission [24.56 (10.3,87.4)] compared to non-survivors (z=-2.572, p=0.010). Additionally, survivors presented lower AP score at admission (24.87±5.43) and SOFA score at admission [7.00(7.0,8.0)], as well as average SOFA score during the first 7 days before admission [7.00(6.3–8.0)] ，all of which showed statistically significant differences when compared to non-survivors (t=-3.704,p=0.000; z=-2.263,p=0.024; z=-4.405,p=0.000;).Survivors exhibited significantly higher average GCS score during the first 7 days before admission [5.000(3.0–7.4)],compared to non-survivors, with a statistically significant difference （ z=-2.770,p=0.006).Multivariate logistic regression analysis was performed using variables that demonstrated statistical significance in the univariate analysis with a p-value<0.05. The results revealed that only hematocrit at admission (OR1.15, CI1.04-1.27, p=0.005), interleukin-6 levels at admission (OR1.01, CI1.01-1.01, p=0.009), and the average SOFA score during the first 7 days before admission (OR1.48， CI1.15-1.89，p=0.002) were significantly associated with death at 28-day. The good prognosis group had higher mean value of average flow velocity (45.51±2.51) cm/s, end-diastolic minimum velocity (27.02±2.58) cm/s during the first 7 days before admission, compared to the poor prognosis group, with statistically significant differences (p=0.035； p=0.000). The good prognosis group had lower mean value of average pulsitility index (1.22±0.16) cm/s, resistance index (0.67±0.05) cm/s during the first 7 days before admission, compared to the poor prognosis group, with statistically significant differences (p=0.001; p=0.001).

Conclusions: The TCCD parameters play a pivotal role in evaluating the prognosis of neurological function in patients with severe intracerebral hemorrhage. Although the GHOST-CAP management strategy can effectively reduce the 28-day mortality rate in these patients, further research is warranted to assess its impact on long-term neurological function prognosis.

Keywords: Severe intracerebral hemorrhage; GHOST-CAP management strategy; TCCD; Neurofunctional prognosis.

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