

Time window for blood-brain barrier disruption as triggers of vasogenic cerebral oedema in hypoxic-ischemic brain injury after cardiac arrest

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Argomento: Neuroanestesia e neuroranimazione

Aims

This study aimed to investigate the time for development of blood-brain barrier (BBB) disruption for 24 h after return of spontaneous circulation (ROSC) after cardiac arrest in patients with hypoxic-ischemic encephalopathy.

Methods

This prospectively observational study was performed between October 2017 and February 2023. Adult patients (>18 years) who underwent post-cardiac arrest care and lumbar catheter placement were included in this study. The BBB status of patients was assessed at 2-hour intervals for 24 h after ROSC, and then compared between vasogenic and non-vasogenic groups. Results were confirmed with brain image studies performed after post-cardiac arrest care. The BBB status was measured using albumin quotient (Qa [cerebrospinal fluid albumin/serum albumin]). Severe BBB disruption was defined as $Qa > 0.02$.

Results

Of the total cohort (n = 26), 15 (57.7%) patients showed vasogenic oedema on imaging after post-cardiac arrest care. The significant difference in Qa levels between groups began 10 h from ROSC, and the difference continued to increase until 24 h. Severe BBB disruption was observed in the vasogenic oedema group at 16 h, and this disruption gradually intensified until 24 h. In contrast, the non-vasogenic oedema group did not exhibit severe BBB disruption for the entire 24 h period.

Conclusions

This study demonstrated that development of BBB disruption was evident at 10 h in vasogenic edema group, which is highly associated with brain oedema. Furthermore, our finding suggests that this BBB disruption can progress to an inevitable stage at 16 h after ROSC, which can strongly lead to poor neurological outcome in patients with post-cardiac arrest care. Thus, this time window between 10 and 16 h from ROSC can be underscore for implementing timely individualized intervention in post-cardiac arrest care for the patients with out-of-hospital cardiac arrest.

A

B

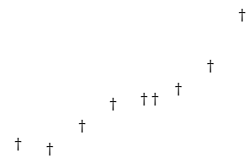


Figure Intra and intergroup comparison of blood brain barrier (BBB) status in patients with cardiac arrest care after full hospital cardiac arrest. [A] Proportions of each BBB status (1 mild disruption, moderate disruption, or severe disruption) in vasogenic edema group from 4 h to 24 h after of spontaneous circulation (ROSC). [B] Generalized Estimating Equation (GEE) analysis between groups.

- * $p < 0.05$ in intergroup comparison
- ** $p < 0.01$ in intergroup comparison
- † $p < 0.05$ in intergroup comparison
- †† $p < 0.01$ in intergroup comparison