Hypoxic-ischemic encephalopathy

Severe perinatal asphyxia results in multiple organ involvement, neonate hospitalization, and eventual death.

A study of Basiri et al. aimed to investigate the predictive factors of death in newborns with hypoxic ischemic encephalopathy (HIE) receiving selective brain cooling.

This cross-sectional descriptive retrospective study was conducted from 2013 to 2018 in Fatemieh Hospital of Hamadan and included 51 newborns who were admitted to the neonatal intensive care unit with a diagnosis of HIE. Selective head cooling for patients with moderate to severe HIE began within 6 hours of birth and continued for 72 hours. The required data for the predictive factors of death were extracted from the patients' medical files, recorded on a premade form, and analyzed using SPSS 16.

Of the 51 neonates with moderate to severe HIE who were treated with selective head cooling, 16 (31%) died. There were significant relationships between death and the need for advanced neonatal resuscitation ($p = 0.002$), need for mechanical ventilation ($p = 0.016$), 1-minute Apgar score ($p = 0.040$), and severely abnormal amplitude-integrated electroencephalography (a-EEG) ($p = 0.047$). Multiple regression of variables or data showed that the need for advanced neonatal resuscitation was an independent predictive factor of death ($p = 0.0075$) and severely abnormal a-EEG was an independent predictive factor of asphyxia severity ($p = 0.0001$).

All cases of neonatal death in the study were severe HIE (stage 3). Advanced neonatal resuscitation was an independent predictor of death, while a severely abnormal a-EEG was an independent predictor of asphyxia severity in infants with HIE [1)].

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previously reported that preconditioning of mesenchymal stem cells (MSCs) with hydrogen sulfide (H2S) improved their therapeutic potential in cerebral ischemia. However, the mechanisms involved with this effect have not been determined. As one approach to address this issue, we focused on a neuroprotective role of modification of MSCs-derived extracellular vesicles (EVs) with H2S treatment, and further examined the underlying mechanisms during hypoxia-ischemia (HI) injury in neonatal mice. At 24 h following HI insult, neonatal mice received either systemically administered EVs (derived from MSCs) or H2S-EVs (derived from NaHS-preconditioned MSCs). Both treatments reached the injured region of the ipsilateral hemisphere within 2 h after administration and were incorporated into microglia and neurons. Mice receiving H2S-EVs exhibited substantially lower amounts of brain tissue loss, decreased levels of pro-inflammatory mediators, and a skewed distribution of CD45low microglia and CD45high brain mononuclear phagocytes toward a more anti-inflammatory condition as compared with that in mice receiving only EVs. Moreover, these neuroprotective and anti-inflammatory effects of H2S-EVs were accompanied with long-term preservation of cognitive and memory functions, in contrast to the functional deficits observed in mice receiving only EVs. This H2S preconditioning upregulated miR-7b-5p levels in EVs as determined with next-generation sequencing, while knockdown analyses revealed that inducing miR-7b-5p expression and targeting FOS in the ipsilateral cortex were essential for the neuroprotective and anti-inflammatory effects of H2S-EVs following HI exposure. Taken together, these results demonstrate that miR-7b-5p transferred by H2S-EVs into the ipsilateral hemisphere further induced miR-7b-5p expression, which promoted CD45low microglia and CD45high brain mononuclear phagocytes toward a beneficial phenotype and improved HI-induced cognitive impairments in neonatal mice [2)].

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Basiri B, Sabzehei M, Sabahi M. Predictive Factors of Death in Neonates with Hypoxic Ischemic Encephalopathy Receiving Selective Head Cooling [published online ahead of print, 2020 Aug 27]. Clin Exp Pediatr. 2020;10.3345/cep.2019.01382. doi:10.3345/cep.2019.01382
2)
Chu X, Liu D, Li T, et al. Hydrogen sulfide-modified extracellular vesicles from mesenchymal stem cells for treatment of hypoxic-ischemic brain injury [published online ahead of print, 2020 Aug 26]. J Control Release. 2020;328:13-27. doi:10.1016/j.jconrel.2020.08.037