Regenerative therapy for cerebral palsy: transplantation of umbilical cord blood stem cells and umbilical cord mesenchymal stromal cells

H. Shintaku[1], M. Nabetani[2], S. Kusuda[3], T. Hamazaki[1], M. Tamura[4], S. Watabe[5], M. Hayakawa[6], Y. Sato[6], M. Tsuji[7], A. Taguchi[8], H. Ichiba[9], A. Oka[10], R. Mori[11], A. Taki[12], T. Mukai[13], T. Nagamura-Inoue[13]
[1]*Pediatrics, Osaka City University Graduate School of Medicine, Japan*
[2]*Pediatrics, Yodogawa Christian Hospital, Japan*
[3]*Neonatology, Maternal and perinatal Center, Tokyo Women's Medical University, Japan*
[4]*Neonatal Medicine, Center for Maternal, Fetal and Neonatal Medicine, Saitama Medical University, Japan*
[5]*Neonatal Intensive Care, Kurashiki Central Hospital, Japan*
[6]*Neonatology, Center for Maternal-Neonatal Care, Nagoya University Hospital, Japan*
[7]*Regenerative Medicine and Tissue Engineering, National Cerebral and Cardiovascular Center, Japan*
[8]*Regenerative Medicine Research, Institute of Biomedical Research and Innovation, Japan*
[9]*Neonatology, Osaka City General Hospital, Japan*
[10]*Pediatrics, The Tokyo University, Graduate School of Medicine, Japan*
[11]*Health Policy and of Clinical Epidemiology, National Center for Child Health and Development, Japan*
[12]*Pediatrics, Tokyo Medical and Dental University, Japan*
[13]*Cell Processing and Transfusion, Research Hospital, Institute of Medical Science, University of Tokyo, Japan*

Objective: Regenerative therapy for prevention of cerebral palsy (CP) has been initiated in Japan. Hypoxic-ischemic encephalopathy (HIE) leads to CP. We already started umbilical cord (UC) blood stem cells (UCBSCs) therapy for neonatal HIE in addition to Therapeutic hypothermia (TH). We also have been preparing to start a clinical trial of UC mesenchymal stromal cells (UCMSCs) therapy for patients who did not have a sufficient effect or could not take the UC blood. Methods: UCBSCs was collected aseptically and prepared by using SEPAX. UC-MSCs were collected aseptically from UC and cryopreserved after culture. Infants admitted to the NICU of 6 hospitals in our research group will be eligible if they are ≥36 weeks' gestational age and birth weight ≥1800 g with HIE and meet the cooling criteria. Results: UCBSCs therapy for neonatal HIE in addition to TH was performed in 4 newborn patients. All of them have survived from 7 months for 1.9 years. UC-MSCs have been defined and characterized as follows; (1) abundant sources and ease of collection, storage, and transport; (2) little ethical controversy; (3) multipotency to differentiate into various cell types; and (4) low immunogenicity with significant immunosuppressive ability. Conclusions: Good results in combination therapy of UCBSCs and TH for newborn HIE were obtained in our 4 patients. UC-MSCs therapy will give the possibility of treatment to patients who could not take UC blood.