Optimal delivery route of bone marrow stromal cells for rat infarct brain
– A study using non-invasive optical imaging

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BACKGROUND

Recent studies have indicated that bone marrow stromal cells (BMSC) have the potential to improve neurological function when transplanted into animal model of central nervous system (CNS) disorders. However, there still exist several questions to solved prior to clinical application. In this study, therefore, we aimed to clarify the optimal delivery route of BMSC transplantation over a reasonable time window.

MATERIALS AND METHODS

The rats were subjected to permanent middle cerebral artery occlusion. The BMSC were labeled with quantum dot (QD) 800. The labeled BMSC were transplanted into the infarct brain directly or intravenously at 7 days after the insult. Motor function was serially assessed. The BMSC were also tracked using near infrared (NIR) fluorescence imaging technique every week. The fate of the transplanted BMSC was examined at 5 weeks after transplantation, using Immunohistochemistry.

RESULTS:

Direct, but not intravenous, transplantation of BMSC significantly enhanced functional recovery. NIR fluorescence imaging could visualize their migration towards cerebral infarct in directly, but not intravenously, injected animals. The findings were supported on histological analysis. Thus, the BMSC were widely engrafted in the infarct brain in the directly injected animals, but few BMSC were observed in the intravenously injected ones.

CONCLUSION

This study strongly suggests that direct transplantation of BMSC may be more beneficial in treating patients with ischemic stroke than their intravenous transplantation. Therapeutic time window must be called into account when considering the route of BMSC transplantation.