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Systemic Transplantation of Bone Marrow Mononuclear Cells Promotes Axonal Regeneration and Analgesia in a Model of Wallerian Degeneration

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Abstract

Background

Reinnervation timing after nerve injury is critical for favorable axonal regeneration, remyelination, and clinical improvement. Considering bone marrow mononuclear cells (BMMC) are easily obtained and readily available for transplant, this work analyzed the effect of BMMC systemic administration on nerve repair and pain behavior.

Methods

Adult rats with sciatic nerve crush were immediately and systemically injected BMMC through the caudal artery. Nontreated, sham and naïve rats were also included.

Histological, immunohistochemical, biochemical, functional, and behavioral analyses were performed in nerves harvested from each group at different survival times.

Results

Axons in BMMC-treated rats exhibited a more conserved morphological appearance than those in nontreated rats, as observed at different survival times both in semithin sections and ultrastructural analysis. BMMC-treated rats also showed a reduction in major myelin protein immunoreactive clusters 7 and 14 days postinjury, as compared with nontreated rats. Electrophysiological analysis showed BMMC treatment to slightly improve the amplitude of compound muscle action potential starting at 14 days postinjury. Finally, mechanical withdrawal threshold revealed a full preventive action against transient mechanical hypersensitivity in BMMC-treated rats.

Conclusions

These data demonstrate the efficiency of BMMC, systemically and noninvasively transplanted, in correcting morphological, functional and behavioral alterations resulting from peripheral nerve injury.

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