Transplantation of embryonic fibroblast treated with platelet-rich plasma induces osteogenesis in SAMP8 mice monitored by molecular imaging

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摘要

Abstract

The aim of this study was to develop a cell-based bone-regeneration approach evaluated by molecular imaging and immunohistochemistry. Methods: Genetically modified NIH3T3 embryonic fibroblasts carrying enhanced green fluorescent protein (NIH3T3-G) were predifferentiated into osteoblastlike cells using platelet-rich plasma (PRP) medium, followed by intraosseous transplantation into ovariectomized senescence-accelerated mouse prone substrain 8 (OVX-SAMP8 mice). Results: PRP-conditioned NIH3T3-G (PRP/NIH3T3-G) engraftment prevented the development of osteoporosis. Molecular imaging and immunohistochemistry demonstrated the migration of NIH3T3-G cells from the implantation site throughout the skeleton. In situ analyses revealed coexpression of osteopontin and green fluorescent protein in the newly formed bone tissue, demonstrating that the transplant restored the bone trabecular architecture and mineral density in treated OVX-SAMP8 mice. Interestingly, the life span of OVX-SAMP8 mice receiving PRP/NIH3T3-G transplantation was significantly prolonged and similar to that of the congenic senescence-resistant strain of mice. Conclusion: This unique and yet simple approach could potentially be applied to the treatment of senile postmenopausal osteoporosis and perhaps inborn genetic syndromes associated with accelerated aging, such as Hutchinson – Gilford progeria syndrome, and for the prolongation of life expectancy in general.