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Facial-nerve regeneration ability of a hybrid artificial nerve conduit containing uncultured adipose-derived stromal vascular fraction

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This study investigated the potential of uncultured-Stromal-Vascular-Fraction (SVF) cells in promoting facial nerve regeneration in a rat model. A 7 mm nerve defect was created in the buccal branch of facial nerve in five groups of Lewis rats (total n=30, n=6 per group). A silicone tube, infused with three types of solutions with different syngeneic uncultured SVF cell numbers; 1×10^3 cells (1×10^3 cell group, n=6), 1×10^5 cells (1×10^5 cell group, n=6) and 1×10^7 cells (1×10^7 cell group, n=6) was implanted into the facial nerve defect. The silicone tube transplantation was performed by the previously reported two-point mattress suture method, a 1 mm length of nerve stump being inserted into the tube by pulling both sutures. Nerves were examined at 13 weeks after the surgery. The findings were compared to the autograft and collagen-alone groups with Facial Palsy Score (FPS), the number of myelinated fibers, fiber diameter, axon diameter, myelin thickness and g ratio. There was no significant difference in FPS between autograft and 1×10^5 cell groups at 13 weeks after surgery and FPS values of these two groups were significantly higher than those of the other three groups ($P<0.01$). Axon diameter significantly increased in the 1×10^5 cell group compared with the 1×10^3 ($P<0.05$) and 1×10^7 cell groups ($p<0.01$). Myelin thickness was found to be the highest in the autograft group followed by the 1×10^5, 1×10^3, 1×10^7 cell and negative control groups and there were significantly differences among all groups ($P<0.01$). The infusion of uncultured-SVF into the artificial nerve conduit promoted optimal nerve regeneration that was significantly better than nerve conduit alone.

References

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Biography

Patrick Rhodius is presently working at Harvard Medical School, Boston, where he continues his experimental research at the HMS Tissue Engineering and Wound Healing Laboratory. He is routinely into clinical and surgical procedures, assisting a broad spectrum of peripheral-nerve microsurgery procedures including hand surgery and reconstructive facial surgery operations. He is also the integral Biomedical Engineering Specialist of the HMS lipografting studies team, playing a vital role from the beginning of a study to its conclusion.

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