Facial nerve repair with Gore-Tex tube and adipose-derived stem cells: an animal study in dogs.

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Abstract

PURPOSE:

Synthetic conduits have been considered a viable option in nerve reconstructive procedures. They address the goal of entubulization and eliminate the disadvantages of autografts. However, despite all successful reports, none has contained regeneration characteristics, such as growth factors or essential cells, for nerve repair. The authors evaluated the capability of adipose-derived stem cells in Gore-Tex tubes to enhance facial nerve repair.

MATERIALS AND METHODS:

Undifferentiated mesenchymal stem cells were extracted from the autogenous adipose tissues of 7 mongrel dogs. The frontal branch of the facial nerve was transected. A gap size of 7 mm was repaired with an expanded polytetrafluoroethylene tube filled with undifferentiated adipose-derived stem cells encapsulated in alginate hydrogel. The control sides were repaired with the tube and alginate alone. The healing phase was 12 weeks.

RESULTS:

Except in 2 control sides, an organized neural tissue was formed within the tubes. Compared with the normal nerve diameter, there was a decreased ratio of 29% and 39% in the experimental and control groups, respectively. Neurofilament-positive axon counts were 67% of normal values in the 2 groups. There was no significant difference between groups in histomorphometric parameters. Nerve conduction velocity in the experimental group (28.5 ± 3.5 m/s) was significantly greater than in the control group (16.2 ± 7 m/s). The experimental group also exhibited a greater maximal amplitude of action potential (1.86 ± 0.24 mV) than the control group (1.45 ± 0.49 mV).

CONCLUSIONS:

Addition of stem cells in the Gore-Tex tube enhanced the neural repair from a functional standpoint. However, for better functional and histologic results, differentiated Schwann cells and other mediators may be warranted.

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