

Custom made fibrin glue nerve conduits optimize the repair of peripheral nerves in a sciatic nerve graft model in rats.

Authors: Mayer J.M., Krug C., Holzbach T., Giunta R.

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Abstract:

Background: Incomplete nerve regeneration after injuries to the peripheral nervous system remains a significant problem in clinical routine and raises the need for supportive strategies. In this study we examined the effect of an additional fibrin glue conduit in the model of a peripheral nerve defect in the rat treated with an autologous nerve transplant. **Materials and Methods:** In this study we examined the effect of a custom made fibrin glue conduit as additional nerve guide for an autologous nerve autograft in a 20 mm sciatic nerve defect model. Here a 20 mm segment was resected in the course of the right sciatic nerve of the rat ($n = 18$) and reversely coapted under the microscope in terms of an autologous interposition. In the experimental group ($n = 9$) the autograft was additionally incased in nerve guide made of two-compound fibrin glue (ARTISS Fa. Baxter) measuring 25 mm in length, with a 2-mm lumen and 2-mm wall thickness covering both coaptation sites. During the trial period of 16 weeks we conducted walkingtrack and static foot-print-analyses weekly. After 16 weeks the gastrocnemius muscle was weighed. Morphometric evaluation including histology, axon counts and measurement of axonal thickness was carried out 16 weeks post-op. **Results:** Functional analysis in terms of SFI (sciatic function index) showed significant differences between the groups ($p < 0.05$) indicating faster functional regeneration in the fibrin glue conduit group. The gastrocnemius muscle's weight was significantly increased (68% vs. 54% of contralateral side; $p < 0.05$). Conduit-treated animals showed a higher fraction of large axons, while at the same time presenting lower levels of nerve tissue fibrosis in all segments of the operated side. The proportion of large axons as a fraction of the total number of axons was significantly higher in the

distal 1/3 of the nerve grafts ($p < 0.05$) in the conduit group compared to controls. Correspondingly the fraction of small axons was significantly higher in the distal half of nerve grafts in control group.

Conclusion: These results indicate the beneficial effect of a custom made fibrin glue nerve guide in addition to microsurgical nerve repair in the model of an autologous nerve transplant in the rat, yet the underlying mechanisms need to be further investigated.