Local application of fibrin glue in peripheral nerve regeneration. [Chinese]

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Abstract:

Aim: To observe the effect of fibrin glue at local use on the regeneration of peripheral nerve based on the suture. Methods: The experiment was conducted in the Central Laboratory of Dalian Medical University between March and July in 2005. Experimental materials: fibrin glue (Guangzhou Bioseal Biotech Co. Ltd. main component includes 50-70 mg/injection fibrinogen and 400 U/injection thrombin, purified from mammal blood, sterilized and freeze dried, without pyrogen). A total of 48 SD rats were randomly assigned into suture group and combination of suture and fibrin glue group, with 24 rats in each. All the rats were anesthetized to expose sciatic nerve by a 2-cm incision posterior to lateral left thigh, and sciatic nerve was cut off from 1.5 cm distally pidformis muscle and epineurial neurorrhaphy was performed with 10-0 non-trauma thread, with the interval of 1-2 mm. Combination group: Fibrin glue was injected into peripheral muscle of 2 symmetric sutures to produce the gel ring, the mixture curing lead to regeneration division. Suture group: Epineurial neurorrhaphy was performed only. Animal ethology was observed continuously postoperation: movement of lateral hind limb and toes, ulceration, ulcer healing of toes and toe nail, reflection of unfold claws. Four rats from each group were selected for electrophysiologic study and detect the nerve conduction velocity and latency at 8 weeks postoperation. At 2, 4, 6, 8 weeks postoperation, two rats of each group stained with hematoxylin-eosin were observed under light microscope for nerve regeneration. Eight weeks postoperation, four rats of each group was adopted to analyze the number and diameter of axon in toluidine blue-stained nerve tissue slices by means of LUZEX-F color image analyzer, determine the axonal regeneration in slices that were stained with both lead citrate and uranyl

acetate using Philip-10 transmission electron microscope, and assay the motor neuron in anterior cornu of medullar spinalis, which was labeled with horseradish peroxidase (HRP), respectively. Results: All the 48 rats were involved in the result analysis. 1 Animal ethology: Except a little toe ptosis and flexion 8 weeks postoperation, the gait, reflection of unfold claws and activity of hind limb were found in the combination group, while those of suture group were fair. 2 Electrophysiologic analysis: At 8 weeks postoperation, the nerve conduction velocity of combination group was significantly higher and latency was shorter than that of the suture group [(11.13+/- 0.37), (9.26+/-0.44) m/s, (1.83+/-0.18), (2.17+/-0.19) ms, F=27.78, 5.53, P < 0.05]. 3 Neural regeneration under light microscope: Myelinated nerve fiber presented thick myelin sheath, long diameter, tight arrangement and good regeneration in the combination group, whereas unsatisfactory effect was found in the suture group. 4 Axonal number and diameter was more in the combination group than in the suture group [(2 187+/-107), (1 847+/-96) axons/400 field of vision; (2.79+/-0.15), (2.05+/-0.17) mum], with the significant difference (F=80.70, 42.92, P < 0.05). 5 Axonal regeneration was observed under transmission electron microscope: At 8 weeks postoperation, the regenerative axon grow well and arranged orderly in the combination group, additionally both the axonal diameter and myelin sheath thickness were identical, axons were evenly staining, Schwann cellular nucleus in oval shape was also presented. While in the suture group, axonal growth was different, their arrangement was in disorder, and the myelin sheath was thin, accompanying the vascular dilation and partly area of bleeding and edema. 6 HRP-labeled motor neuron in anterior cornu of medullar spinalis: HRP-labeled motor neurons were found in anterior cornu at a greater quantity in the combination group, whereas few in the suture group. Conclusion: Fibrin glue can obviously improve the repair and regeneration of injured peripheral nerve, and the effect is superior to that of simple suture.