Preparation of Acellular Skeletal Muscle and Preliminary Investigation of Its Use in the Repair of Peripheral Nerve Defect

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For repairing of peripheral nerve defects, besides the use of autogenous nerves, other materials like silicon tubes, vein, living or heat treated skeletal muscles, and tendon etc were reported. Besides autogenous nerve, the effect of using other substitutes in repairing the nerve defect had not been fully investigated.

Experiment I: adductor muscles of rats were cut into several muscle bundles each of 1 cm long, 3mm in diameter, and were divided into two groups. The experimental group was treated with refrigerated distill water, calcium chloride and imidazole solution potassium chloride and 3-ethanolamine etc., and placed and compressed slightly between two slides; the control group was put in boiling water to give heat treatment. Muscle bundles of the two groups were fixed, embedded in paraffin and sectioned transversely, and HE stained. The results were: In the experimental group, sacroplasm under sarcolemma was markedly reduced, only about 1/2 of the control group; nucleus was scarce, sarcolemma was intact and curve in shape, loosely wrapping around the sacroplasm; the space between myofibrils was widened, about three times of the control group. In the control group, the sacroplasm was intact, the nuclei were relatively abundant. The sarcolemma was straight and tightly wrapped around sacroplasm. Intervals between myofibrils were relatively small.

Experiment II: SD rats were divided randomly into two groups, each with 8 animals. In each animal, the adductor muscles were taken with 1 cm in length and 3 mm in diameter. The experimental group received extracellular acytoplasmic treatment; while the control group was processed with heat treatment. Under operating microscopy, a segment, 1 mm in length, of the left sciatic nerve was resected, and the cut ends of the nerve were reconnected by the muscle bundles in the experimental and control group. After 6 month postoperation, the stretching response of denatured muscle was tested, and the conduction velocity of sciatic nerve was determined using a personal computer with CNSA.EXE physiological signal processing system, and to compare the axon myelin ratio in the proximal and distal stumps of the cut nerve. All these results indicated that recovery in the experimental group is better than the control group. From these results, we concluded that the regenerated axons have less resistance to grow through the extracellular acytoplasmic skeletal muscles, and can grow through the bridge and innervate the distal stump, and so enhance the regeneration and maturation of the lesioned peripheral nerve.