Efficacy of cold and cryo-preserved nerve allografts with low-dose FK506 for motor nerve regeneration: a preclinical study

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INTRODUCTION:
Despite their ability to regenerate as well as autografts, the use of nerve allografts is limited by the need for immunosuppression and the risk of disease transmission. Further, decellularized allografts lacking Schwann cells limit axonal regeneration in long nerve defects. This study evaluated sciatic nerve regeneration in rats implanted with cold- or cryopreserved allografts, and examined the effects of FK506, an immunosuppressant that targets calcineurin function, on motor recovery.

METHODS:
Sixty□five male Lewis rats were divided into five groups of 13, each with a 10-mm sciatic nerve gap. Group I received an autograft, whereas Groups II and III received allografts pretreated with cryopreservation and cold preservation, respectively. Groups IV and V were also implanted with cryo- and cold-preserved allografts, but were treated with a low dose of FK506. Motor regeneration was assessed at 20 weeks by the measurement of ankle contracture, compound muscle action potential, maximal isometric tetanic force, wet muscle weight of the tibialis anterior, peroneal nerve histomorphometry, and immunohistochemistry of the reconstructed sciatic nerve.

RESULTS:
Similar motor recovery was observed between the autografts and both types of allografts. The groups treated with FK506 showed improved recovery, particularly in terms of ankle angle and tibialis anterior muscle weight. Histomorphometry revealed a superior myelinated fiber area and nerve ratio in the cold-preserved allograft group, while Group II displayed a less well-organized morphology.

DISCUSSION AND CONCLUSION:
This study demonstrates that cold- or cryopreserved nerve allografts represent effective alternatives to autografts for peripheral nerve reconstruction, with low-dose FK506 enhancing motor recovery without necessitating immunosuppression.