Comparison of Two Different Methods for Processing Acellular Nerve Allografts

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Background
Peripheral nerve injuries affect a large proportion of the global population, often causing significant morbidity and loss of function. Processed nerve allografts offer a promising alternative to nerve autografts in the surgical management of peripheral nerve injuries where short deficits exist. The aim of this study was to compare the effect of the detergent-processed nerve allografts by a novel protocol utilizing nuclease with another protocol in a rat model.

Material & Methods
Functional and histomorphometric outcomes of two different acellular nerve allografts produced by two different detergent-process were compared in a sciatic nerve defect rat model. Twelve adult male rats, weighing 225-250 g (Harlan Sprague-Dawley), were utilized as donors for two different detergent-processed nerve allografts. Twenty-four adult male rats were divided into two groups of 12 animals each. In recipient animals, the right sciatic nerve was exposed, transected and 10 mm of nerve was removed. Then 15-mm processed nerve allografts were implanted. In group I, sciatic nerve defects were repaired with detergent-processed nerve allografts which were made by conventional Hudson method using Triton X-100, SB-10 and SB-16. In group II, newly developed detergent-processed nerve allografts described by Wilshaw et al utilizing SDS (Sodium dodecyl sulfate), Benzonase (Nuclease), EDTA (Ethylenediaminetetraacetic acid) and Aprotinin. At 12 weeks postoperatively, we analyzed the muscle mass, evoked muscle force and ankle contracture angle as functional parameters and histomorphometric findings to compare the effect of nerve regeneration.

Results
No significant difference was observed in muscle mass (Group I; 58.02±7.01%, Group II; 57.99±4.85%, p=0.99), maximum isometric tetanic force (Group I; 46.05±19.55%, Group II; 58.89±16.15, p=0.1) and ankle contracture angle (Group I; 28.82±4.96°, Group II; 31.27±5.62°, p=0.29). Also, population of axons that successfully crossed interposed nerve graft was not significantly different.

Conclusions
A novel method for detergent-processed nerve allografts described by Wilshaw et al utilizing sodium dodecyl sulfate (SDS; Sigma) and nuclease was not inferior to conventional Hudson method and it could substitute existing method.

References
Zilic L, Wilshaw SP, Haycock JW. Decellularisation and histological characterisation of porcine peripheral nerves. Biotechnol Bioeng. 2016 Sep;113(9):2041-53