

Loop Nerve Graft Prefabrication In Peripheral Nerve Defect Reconstruction

Sinan Öksüz, MD; Fikret Eren, MD; Ceyhun Cesur, MD; Merve Açikel Elmas, MSc; Mustafa Tansel Kendirli, MD; Serap Şirvancı, MD

Disclosure/Financial Support: The authors do not have any conflict of interest or funding to disclose.

INTRODUCTION: Bridging strategies are inevitable to repair nerve defects and nerve grafts are the treatment of choice in reconstruction.^{1,2} In this study, we prefabricated a loop nerve graft through combination of end-to-end and end-to-side coaptation³ methods in a staged peripheral nerve defect repair model. We investigated feasibility of improving and accelerating regeneration in conventional interpositional autologous nerve grafts with loop nerve graft prefabrication.

MATERIALS AND METHODS: Twenty-four Sprague-Dawley rats were allocated into 3 experimental groups to evaluate regeneration in a 1.5 cm long peroneal nerve defect: Single-stage conventional interpositional nerve graft (Group 1), staged loop nerve graft prefabrication (Group 2), staged conventional interpositional nerve graft (Group 3). In loop nerve graft prefabrication group (Group 2) grafts were sutured end-to-end to the proximal peroneal nerve stumps. Distal ends of the grafts were sutured end-to-side to the peroneal nerve stumps proximal to the end to end repair sites in first stage. In second stage distal ends of the prefabricated grafts were transposed and sutured to distal nerve stumps. Peroneal function index (PFI), electrophysiology and histological assessments were performed. $p < 0.05$ was considered significant for statistical analysis.

RESULTS: PFI results of group 1 (-22.75 ± 5.76) and group 2 (-22.08 ± 6) did not show statistical difference ($p > 0.05$). Group 3 presented poorest PFI value (-33.64 ± 6.4) compared to other groups ($p < 0.05$). Nerve conduction amplitudes for groups 1, 2 and 3 were 16.19 ± 2.15 mV, 15.95 ± 2.82 mV and 10.44 ± 1.96 mV, whereas velocity values were 1.16 ± 0.21 ms, 1.17 ± 0.16 ms and 1.51 ± 0.15 ms respectively. Electrophysiological assessments of group 1 and group 2 did not present statistical difference ($p > 0.05$), however both groups had a statistical difference compared to group 3 ($p < 0.05$). Axon counts of group 1 (2227 ± 260.4) and group 3 (2194 ± 201.1) did not show difference ($p > 0.05$). Group 2 showed highest axon count (2531 ± 91.18) compared to group 1 and 3 ($p < 0.05$).

CONCLUSION: Loop nerve graft prefabrication improves axonal regeneration. Loop nerve graft prefabrication in two-stages yields a favorable nerve healing, comparable to a single-stage nerve graft repair. Loop nerve graft prefabrication can be used efficiently to promote healing particularly for the injuries indicating a delayed nerve graft reconstruction.

REFERENCES:

1. Krarup C, Archibald SJ, Madison RD. Factors that influence peripheral nerve regeneration: an electrophysiological study of the monkey median nerve. *Ann Neurol.* 2002;51:69-81.
2. Mackinnon SE, Colbert SH. Principles and Techniques of Peripheral Nerve Repair, Grafts, and Transfers. In: Thorne CH, editor. *Grabb and Smith's Plastic Surgery* (7th ed). Philadelphia: Lippincott Williams & Wilkins; 2014. p:77-86.
3. Viterbo F, Amr AH, Stipp EJ, Reis FJ. End-to-side neurorrhaphy: past, present, and future. *Plast Reconstr Surg.* 2009;124:e351-8.