

ELUCIDATING THE ROLE OF PLGA FIBERS ALIGNMENT AND DENTAL PULP STEM CELLS IN RECOVERY OF PERIPHERAL NERVE INJURED RAT

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INTRODUCTION: Peripheral nerve injuries results in morbidity such as sensory loss, paralysis, and neuropathic pain. Nerve conduits is used to bridge a nerve gap and guide axonal regeneration¹. However, it has limited length and functional outcome and does not prevent neuropathic pain². This study aims to elucidate the role of aligned nano-structure of nerve conduits seeded with Schwann cell-like cells derived from mesenchymal stem cells (MSC) in the reduction of neuropathic pain and inflammation along with nerve recovery.

METHODS: The in vitro phase comprised of isolation and characterization of MSCs. The in vivo phase involved 18 adult rats with sciatic nerve defects which was divided into 3 groups (aligned Polylactic co glycolic acid (PLGA), random PLGA and no conduits (control)). Observations done after 2 weeks, 4 weeks, 8 weeks and 12 weeks. One-way Anova and Post-hoc tests were used for the analysis. After 12 weeks of implantation, the rats will be sacrificed by drug overdose. The rats are assessed for axonal regeneration and myelination.

RESULTS:

Table 1: One-way Anova test results for the behaviour after 2 weeks, 4 weeks, 8 weeks and 12 weeks

	F (week2)	p value	F (week 4)	p value	F (week 8)	p value	F (week 12)	p value
Amplitude - Left Gluteal Fold	1.950	0.177	2.323	0.132	0.823	0.459	1.089	0.368
Amplitude - Left Popliteal Fossa	3.403	0.060	2.788	0.095	0.446	0.649	1.567	0.246
Conduction Velocity - Left Popliteal Fossa	0.292	0.751	1.339	0.292	0.373	0.695	1.908	0.188
Stride Width	0.277	0.762	1.637	0.227	3.444	0.061	1.025	0.388
Stride Length	5.745	0.014	4.911	0.023	6.194	0.012	14.040	0.001
Amplitude - Right Gluteal Fold			2.917	0.016				
Amplitude - Right Popliteal Fossa			2.625	0.028				
Conduction Velocity - Right Popliteal Fossa			1.277	0.231				

Table 2: Post-hoc test results for the behaviour after 2 weeks, 4 weeks, 8 weeks and 12 weeks

Group	Group	Mean Difference (week2)	p value	Mean Difference (week4)	p value	Mean Difference (week8)	p value	Mean Difference (week12)	p value
Control	Align w Stem	-3.96667	0.012	-4.18333	0.023	-3.06667	0.012	-4.28333	0.001
	Random w Stem	-1.97500	0.336	-2.81667	0.169	-2.15333	0.112	-4.43333	0.005
Align w Stem	Control	3.96667	0.012	4.18333	0.023	3.06667	0.012	4.28333	0.001
	Random w Stem	1.99167	0.328	1.36667	0.994	91333	1.000	-0.15000	1.000
Random w Stem	Control	1.97500	0.336	2.81667	0.169	2.15333	0.112	4.43333	0.005
	Align w Stem	-1.99167	0.328	-1.36667	0.994	-91333	1.000	0.15000	1.000

DISCUSSION:

- MSCs could interact with immune cells in both the innate and adaptive immune systems by secreting multiple soluble immune factors to induce MSC-regulated immunosuppression³.
- The inflammatory response is pivotal for MSCs to exert effects on immunomodulation, owing to an inflammatory cytokine-licensing process by MSCs³.

CONCLUSION: The recovery rate in repairing nerve injury with critical gap of 10mm in Sprague Dawley rat has a better outcome with aligned nerve conduit seeded with dental pulp stem cells than grafting with random nerve conduit with dental pulp stem cells in terms of amplitude of nerve conduction study.

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