Supplementary Material

Use of Urinary Bladder Matrix Conduits in a Rat Model of Sciatic Nerve Regeneration after Nerve Transection Injury

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ARTICLE INFO

ABSTRACT

Previous research has demonstrated the use of single-channel porcine-derived urinary bladder matrix (UBM) conduits in segmental-loss, peripheral nerve repairs as comparable to criterion-standard nerve autografts. This study aimed to replicate and expand upon this research with additional novel UBM conduits and coupled therapies. Fifty-four Wistar Albino rats were divided into 6 groups, and each underwent a surgical neurectomy to remove a 7-millimeter section of the sciatic nerve. Bridging of this nerve gap and treatment for each group was as follows: i) reverse autograft—the segmented nerve was reversed 180 degrees and used to reconnect the proximal and distal nerve stumps; ii) the nerve gap was bridged via a silicone conduit; iii) a single-channel UBM conduit; iv) a multi-channel UBM conduit; v) a single-channel UBM conduit identical to group 3 coupled with fortnightly transcutaneous electrical nerve stimulation (TENS); vi) or, a multi-channel UBM conduit identical to group 4 coupled with fortnightly TENS. The extent of nerve recovery was assessed by behavioural parameters: foot fault asymmetry scoring measured weekly for six weeks; electrophysiological parameters: compound muscle action potential (CMAP) amplitudes, measured at weeks 0 and 6; and morphological parameters: total fascicle areas, myelinated fiber counts, fiber densities, and fiber sizes measured at week 6. All the above parameters demonstrated recovery of the test groups (3-6) as being either comparable or less than that of reverse autograft, but none were shown to outperform reverse autograft. As such, UBM conduits may yet prove to be an effective treatment to repair relatively short segmental peripheral nerve injuries, but further research is required to demonstrate greater efficacy over nerve autografts.

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Supplementary Table 1: Weekly mean pain and distress scores for each group.

Group	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
RA	1.921	2.095	1.978	1.805	1.738	1.694
MC	2.427	2.009	2.064	1.931	1.935	1.784
SC	2.355	2.378	2.296	2.115	1.848	1.463
TM	1.538	1.761	1.545	1.028	1.118	1.374
TS	1.185	1.700	1.560	1.691	1.604	0.982
SI	2.098	2.628	2.426	2.259	2.185	2.865

Supplementary Table 2: Weekly mean FF scores and associated p-values for each group.

Group	Week 1		Week 2		Week 3	
	FF Score	*p-value*	*FF Score*	*p-value*	*FF Score*	*p-value*
RA	1.000	9.870E-05	1.000		1.000	
MC	1.049	1.638E-05	1.134		1.183	4.900E-04
SC	1.013	1.534E-04	1.171		1.096	
TS	1.374	1.264E-07	1.182		1.090	
TM	1.393	6.185E-08	1.215		1.276	1.801E-04
Group	**Week 4**		**Week 5**		**Week 6**	
	FF Score	*p-value*	*FF Score*	*p-value*	*FF Score*	*p-value*
RA	1.000		1.000	3.765E-08	1.000	1.208E-08
MC	1.181	2.147E-04	1.125	2.009E-09	1.216	7.111E-11
SC	1.018		1.029	2.690E-08	1.014	5.803E-08
TS	1.434	2.593E-05	0.783	2.639E-05	0.950	1.140E-06
TM	1.458	9.512E-06	0.840	2.496E-06	0.837	2.067E-04

Supplementary Table 3: Recovery of CMAP amplitudes normalized by the mean difference of week 0 and week 6 amplitudes of the SC group to the RA group and ranged 0 to 1, represented as the mean ± SEM, and associated p-value.

Group	CMAP Amplitude with outlier	p-Value with outlier	CMAP Amplitude w/out outlier	p-Value w/out outlier
RA	0.926 ± 0.252	0.009	0.928 ± 0.224	0.0025
SC	0.782 ± 0.255	0.0421	0.768 ± 0.226	0.019