AAHS/ASPN/ASRM Joint Outstanding Paper Session
Saturday, January 14, 2017, 11:00am – 12:00pm

1. Trainee Selection and Correlation with Cognitive and Microsurgical Technical Skills

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BACKGROUND: The selection process for surgical trainees aims to identify those who will perform best during training and have the greatest potential as future surgeons. Better understanding the predictive relationship between interview performance, level of technical skill, and performance during training will allow optimisation of the interview and evaluation process to identify the best candidates.

METHODS: Three annual cohorts of Reconstructive Microsurgery fellows at MD Anderson Cancer Center, comprising 20 trainees, were included in the study. At interview, subjects were rated using seven criteria, as well as given a score for overall impression. At the start and end of the fellowship, microsurgical technical skill was assessed both in the laboratory and OR using a validated tool. At the end of the fellowship there was a final evaluation of performance using criteria adapted from the six Accreditation Council for Graduate Medical Education (ACGME) core competencies. Scores at interview, technical skill assessment, and final evaluation scores were all compared in multiple ways to determine associations and predictive factors.

RESULTS: Microsurgical skill assessment in the OR at the start of training correlated with all domains evaluated at interview, most closely with Plastic Surgery Training Experience. Microsurgical skill assessment in the OR at the end of training also correlated with scores on the majority of final assessment criteria based on ACGME core competencies, with the highest correlations with Patient Care and Medical Knowledge. Assessment of microsurgical skill in the laboratory at the start of the fellowship did not improve the predictive relationship between interview scores and ACGME core competency evaluations.

CONCLUSIONS: Microsurgical technical skill in the OR tracked with all domains evaluated at interview, and also with all ACGME core competency evaluations. These results validate the use of the current selection process in choosing candidates with the highest level of both cognitive

and technical skill, and also support the effectiveness of the one-year microsurgical fellowship in improving microsurgical skill in all trainees.

2. Muscle Graft Volume Implanted in Regenerative Peripheral Nerve Interfaces Influences Electrical Signal Transduction

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Introduction: Regenerative Peripheral Nerve Interfaces (RPNIs) for interfacing to prostheses are formed by combining biology, biomedical abiotic products, muscle regeneration, nerve reinnervation, and tissue revascularization. An RPNI unit is a small muscle graft which is moved to the end of a transected residual nerve. The nerve fascicle is implanted / neurotized into the grafted muscle and electrodes are implanted with the muscle graft. Standard RPNI small muscle grafts have weighed approximately 150 mg with dimensions of 3 cm long by 1 cm diameter. In rat studies, RPNIs maintained muscle volume and signaling capacities for at least 9 months once healing processes stabilized at 3 months post implant. Though small muscle grafts conserve skeletal muscle, there are advantages to grafting larger volumes. Our purpose was to evaluate RPNI signaling capacity with respect: a) to increasing grafted skeletal muscle volume and b) to time of implantation.

Methods: F344 male rats (n=30) were assigned to 1 of 4 groups defined by RPNI muscle graft volume: 150mg (RPNI-150), 300 mg (RPNI-300), 600 mg (RPNI-600) or 1200 mg (RPNI-1200). Each RPNI consisted of a semimembranosus allograft to the upper thigh and neurotized by the transected peroneal nerve. All grafts were 3 cm in length. Group 1-4 RPNIs recovered for 3 months while a second 1200 mg group 5 (RPNI-1200yr) recovered for 1 year post-surgery. Compound muscle action potential (CMAP), RPNI contractile force, and RPNI histology were evaluated.

Results: All rats were healthy with RPNIs that were well vascularized and responded to stimuli applied to the implanted peroneal nerve. Data are summarized in Table 1. At evaluation, RPNIs of heavier graft volume still weighed more than the lighter RPNIs; however, heavier grafts retained less of their original muscle mass (Fig 1). Signaling capacities or the magnitude of electrophysiology (CMAP) and force measurements were inversely related to the volume of the muscle graft. Extending recuperation time for large volume grafts did not improve signaling.

Conclusions: RPNIs with muscle grafts weighing between 150 and 300 mg are optimal for signal production in the rat model. One year for recuperation did not benefit RPNIs implanted with heavier grafts.

Table 1: Summary for RPNIs of four volumes and two time points and ANOVA results

	RPNI SURGICAL GROUPS				
	RPNI-150	**RPNI-300**	**RPNI-600**	**RPNI-1200**	**RPNI-1200yr**
Muscle mass (mg) implanted	171±16	329±16	614±24	1211±48	1056±294
Number of rats	6/6	6/6	5/6	4/6	4/4
Time implanted	3 months	3 months	3 months	3 months	1 year
Body mass (g); end	385±14	381±14	386±11	379±6.8	438±8.6*
Muscle mass (mg) end	72±7	98±4	140±11	184±36**	275±114*
Muscle mass retained	41%	29%**	23%**	15%***	25%**
CSA (mm^2) end	7.04±1.9	9.54±0.71**	13.31±1.7**	13.34±2.52**	16.05±3.19*
CMAP (mVms)	5.4±2.02	4.6±2.5	3.4±1.3	2.9±1.7	1.6±0.74***
Amplitude (mV)	6.6±3.2	4.7±1.9	3.1±1.3	2.7±1.5	1.4±0.73***
Max Force (mN)	289±106	259±122**	235±169**	91±43****	117±118**

Values are mean ± 1 standard deviation. Abbreviations: imp, implanted; end, at final evaluation; g, grams; mg, milligrams; CSA, muscle cross sectional area; *different from RPNI-150, RPNI-300, and RPNI-600; **different from RPNI-150; *** different from RPNI150 and RPNI-300, **** different from all other groups. Level of significance was $p<0.05$.

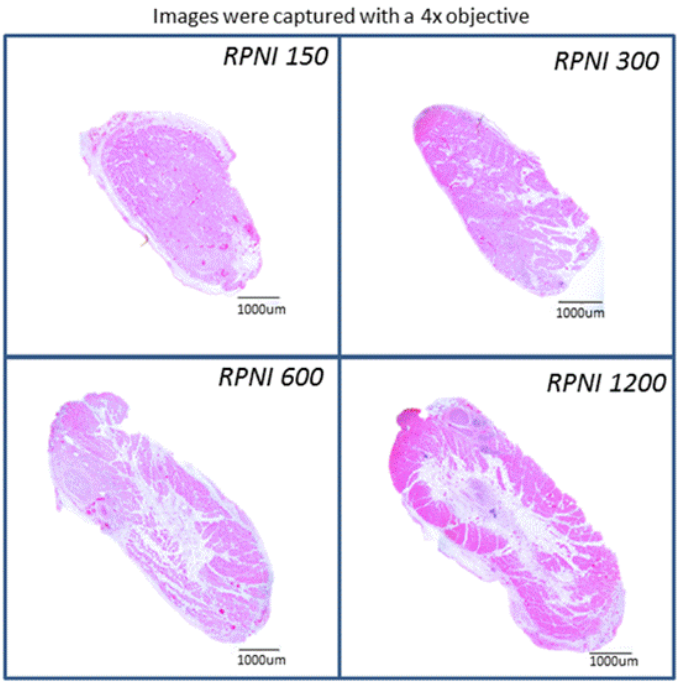

Figure 1. Representative H&E stained cross sections from RPNI muscles implanted for 3 months. Note the lack of muscle fiber regeneration in the centers of the RPNI-600 and RPNI-1200.