Microvascular arterial anastomosis simulation using a chicken thigh model: interval vs. massed training

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Introduction
The importance of surgical simulation has increased substantially in recent years as resident operative time has decreased due to both work hour restrictions and concern for patient safety. Several models have been shown to be effective in training surgical techniques. In teaching microvascular surgery, multiple models have been shown to be effective, particularly for novices. Since the technique is different from standard suturing, practice outside the operating room is essential. Cheung and Kenny trained residents in suturing and showed an increase in resident learning, confidence, and performance. In a blinded study, residents who performed 5 min of suturing practice outside the operating room had improved confidence. Those who did not performed traditional surgical training, which included live animal, cadaver, and computer simulation.

Objective
Use a randomized prospective approach to compare the effectiveness of interval vs. massed training for teaching residents microvascular suturing using a chicken thigh artery model.

Methods
Residents were randomly assigned to interval or massed training (Fig. 2). The “Interval” group had 3 distinct 30 minute practice sessions, each separated by at least 1 week. The “Massed” group had a single 90 minute practice session. Participants watched a 15 min training video and were given written instructions before recording a 5 min pre-test.

Following completion of the final session, a 5 min post-test was recorded. The videos were graded by two blinded expert reviewers using a validated microvascular Objective Structured Assessment of Technical Skill (OSATS) tool (Fig. 3), which includes 2 components:

- Task specific score (TSS)
- Global rating scale (GRS)

Case numbers for 4 key indicator cases (thymanoplasting, mastiodectomy, stapedectomy, and parotidectomy) were compared with pre- and post-test TSS and GRS as a proxy for microsurgical experience. Figs. 10 and 11 show post-test TSS and GRS (R^2 = 0.45 and 0.48). Pre-test TSS and GRS (R^2 = 0.02 and 0.11) and net improvement in TSS and GRS (R^2 = 0.21 and 0.26) were not as well correlated.

Statistical analysis included t-tests, Pearson correlation coefficients and linear regression.

Results
While the only significant difference between senior (PGY-4/5) and junior (PGY-1/2/3) residents was post-test GRS, the improvement from pre-test to post-test scores was significantly greater among senior residents than junior residents.

Both within groups and overall, subjects had improved confidence in handling micro-instruments, performing microvascular anastomosis, and operative microscopy (p<0.001).

Summary
- Microvascular practice, regardless of timing, produces improvement in technique as rated by a validated OSATS tool
- While both approaches improved scores and confidence, only interval training produced statistically significant improvement
- Senior residents, who had much more case experience, improved significantly more than junior residents
- Significant subjective confidence is built regardless of training time allotted
- Residents value the opportunity to practice in a low-pressure, simulated environment
- Training can be effective without an expert present
- Impact of simulated microvascular training using this method has yet to be shown to improve clinical performance

Conclusions
Contrasted to massed training, interval training results in greater improvement in early development of microvascular anastomosis skills. Self-directed learning using a chicken thigh artery model improves microsurgical skills, competence, and confidence for resident surgeons.

References