

# DEVELOPMENT OF HIGH-FIDELITY SIMULATED HUMAN TISSUE FOR SURGICAL RESIDENT TRAINING

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## Introduction

We have questioned the fidelity and practicality of currently available synthetic and animal tissue models for intestinal anastomosis. We used a new multi-layer small intestinal (SI) model emphasizing realistic tactile characteristics of normal human tissue, and report impressions of initial use among experienced general surgeons in comparison to two existing models.

## Methods

During a 1-hour lab session, 7 experienced surgeons performed 1-and 2-layered hand-sewn anastomoses with segments of (A) porcine SI tissue, (B) simulated SI (*Simulab*, Seattle, WA), and (C) simulated SI (*Tactility*, Great Barrington, MA). Surgeons were blinded to the identity of the synthetic bowel specimens. Simulated SI specimen C had been developed in collaborative effort between Baystate surgeons and Tactility engineers (Figures 1 - 4). All surgeons completed a 6-item survey (Table 1) for each SI model. Survey responses for each question were compared by one-way ANOVA with internal comparisons by Tukey-Kramer method.



Figure 1. Surgical Resident Open Intestinal Anastomosis Training, Baystate Simulation Center, Baystate Medical Center, Springfield, MA



Figure 2. Tactility Simulated Small Intestinal Tissue, The Chamberlain Group, Great Barrington, MA



Figure 3. Tactility Simulated Small Intestinal Tissue, The Chamberlain Group, Great Barrington, MA



Figure 4. Tactility Simulated Small Intestinal Tissue, The Chamberlain Group, Great Barrington, MA

Table 1. Study Survey

I.	How realistic are the general tactile characteristics (texture, "feel", handling) of this specimen?
II.	How realistic is this model in reproducing accurate resistance to needle passage?
III.	How well does the simulated bowel hold suture and "turn in" with seromuscular bites?
IV.	How well does the material resist tearing or cutting through using normal needle maneuvers and knot tension?
V.	How realistic were the individual mucosal and seromuscular layers of the bowel model?
VI.	Overall, how would you rate this model as a potential educational tool?

1 - completely realistic 2 - very realistic 3 - somewhat realistic 4 - not very realistic 5 - completely unrealistic

## Results

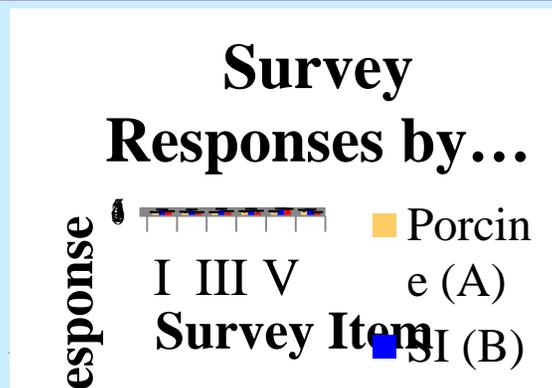


Figure 5. Study Survey Results

## Results

Comparisons of individual survey items: Perceived realism of porcine SI was significantly greater than simulated SI (B) for all survey items (Figure 5). There were no significant differences between simulated SI (C) and porcine SI survey responses except for item V (realism of individual mucosal and seromuscular layers), where realism of porcine SI was greater ( $p < 0.01$ ).

## Conclusion

- The use of simulated SI tissue was acceptable to surgeons in this study.
- SI model (C) (Tactility) and Porcine SI tissue were felt to offer similar levels of fidelity to human SI and a greater level of realism than SI model (B).
- We conclude that a high level of fidelity to actual tissue can be achieved with a synthetic intestinal model.
- Further work on specimen-C is necessary to increase perception of realism of separate bowel wall layers.
- Future studies are planned to determine educational and cost impact of the use of simulated tissues during formative training.