



INTRODUCTION

Background

Proficiency in the field of orthopedics depends upon a high degree of technical skill. While the traditional apprenticeship model for teaching surgical skills is widely accepted, additional more time-effective and standardized methods are needed. The American Board of Orthopedic Surgery has mandated the use of surgical skill simulation labs for orthopedic surgery residents nationwide (1). Simulations allow residents and medical students to hone technical skills outside of the operating room in a safe and time-efficient manner.

Study Purpose

We sought to determine the effectiveness of a video tutorial in the acquisition of surgical skills in medical students utilizing a flexor tendon repair model; which is both economically favorable and objectively testable.

MATERIALS AND METHODS

Medical Student Pilot Study

- ❖ N=12 3rd and 4th year medical students pursuing a surgical specialty participated in an IRB approved pilot study.
- ❖ Independently viewed a video tutorial and attempted a zone II flexor tendon repair on fresh frozen cadaveric flexor tendons.
- ❖ Completed post-tutorial questionnaire and open-ended feedback session reviewing quality of video content and surgical simulation.
- ❖ From the pilot study, the video tutorial will be refined for use during resident instruction.

Resident Study

- ❖ UMass Orthopedic Surgery residents (n=25) will be recruited and enrolled in this IRB approved study.
- ❖ Residents of all levels of training will be randomized into two groups: video or one-on-one tutorial.
- ❖ Residents will perform pre- and post-tutorial zone II flexor tendon repairs on fresh frozen cadaveric flexor tendons.

MTS Testing

- ❖ Biomechanical testing of the tendon repair strength will be performed for 2-mm gap strength and ultimate load strength on an MTS testing machine (MTS Systems Corp., Eden Prairie, MN) (Figure 2).
- ❖ Specimens will be preloaded with 1 N of force, followed by distraction at a static rate of 20 mm/minute to repair failure.
- ❖ Load deformation data from pre-tutorial, post-tutorial, and 6-month re-test time points will be compared statistically.

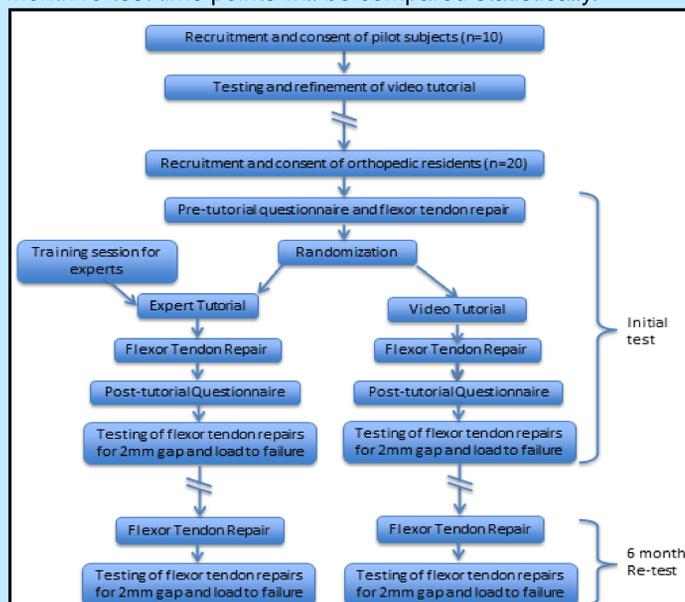


Figure 1: Overall Study Design

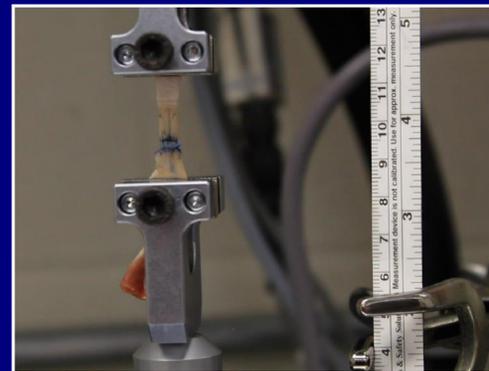


Figure 2: Flexor tendon repair mounted on MTS machine for testing of 2-mm gap strength and ultimate load strength.

Figure 3: Load to 2 mm Gapping and Failure of Pilot Study Post-tutorial Flexor Tendon Repairs

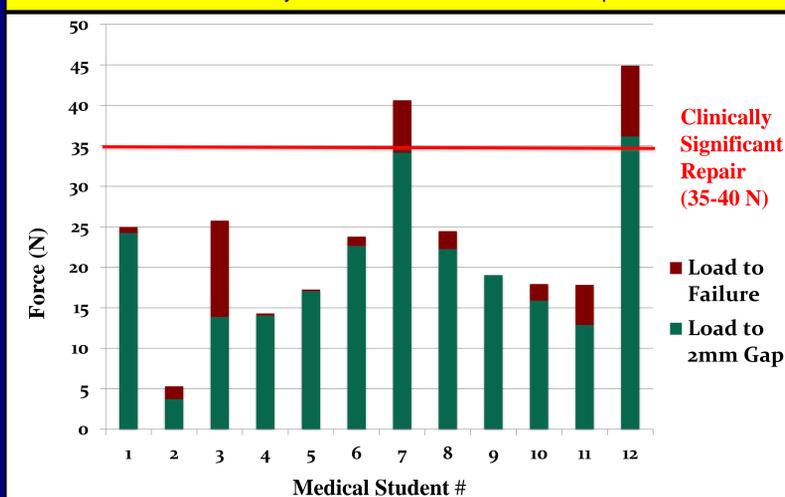


Figure 4: How well do you feel the video prepared you to complete a zone II flexor tendon repair?

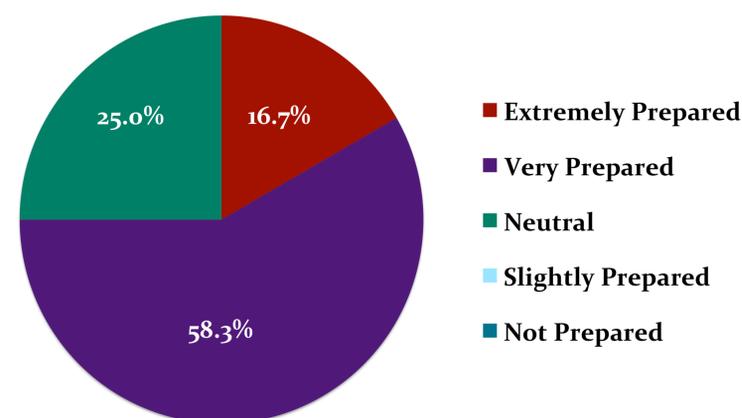
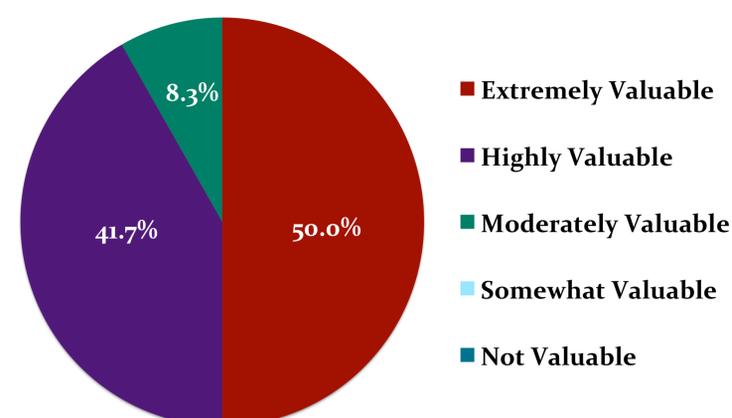


Figure 5: How valuable would surgical simulation videos be to your future education as a surgical resident?



PILOT STUDY RESULTS

Pilot Study

- ❖ Post-tutorial flexor tendon repairs on average required 19.7 ± 9.1 N of force to create a 2-mm gap.
- ❖ Mean force required for repair failure by suture pullout or rupture was 23.0 ± 10.9 N.
- ❖ 16.7% of post-tutorial repairs were clinically significant with a load to failure ≥ 35 N (Figure 3).

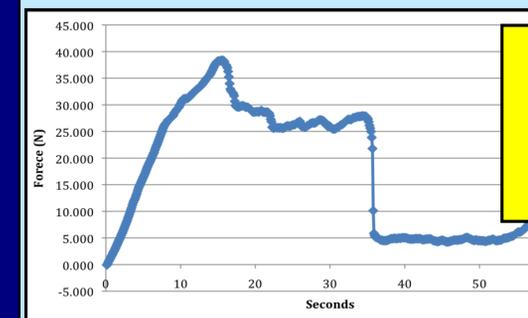


Figure 6: Load deformation curve of flexor tendon repair showing maximum load to failure at ~40 N.

DISCUSSION

- ◆ Although 75% of medical students thought the video tutorial was an effective teaching tool for learning zone II flexor tendon repair technique, only 16.7% produced clinically significant repairs.
- ◆ Video tutorials may be insufficient to teach medical students advanced surgical skills.
 - Technically challenging procedure.
 - Mixture of 3rd and 4th year students, with different levels of surgical experience and pursuing a variety of surgical specialties.
- ◆ Despite the misperception of the medical students' ability to perform a clinically significant repair, over 90% felt surgical simulation videos would be a valuable asset to their future surgical residency curriculum.
- ◆ Pilot study demonstrated efficient study design for future use on residents.

SUMMARY

- ◆ While the apprenticeship model is established, it is time-intensive and instructor-dependent.
- ◆ With limited time during residency, effective and reliable teaching tools for surgical skills must be available that are independent of patient care.
- ◆ This study may guide future work towards developing video aids for residents and students in training that can ensure a standard of technical expertise.

REFERENCES

1. The American Board of Orthopaedic Surgery. *ABOS Surgical Skills Modules for PGY-1 Residents 2013*
2. Bari AS, Woon CY, Pridgen B, Chang J. 2012. Overcoming the learning curve: a curriculum-based model for teaching zone II flexor tendon repairs. *PRS Journal* 130(2): 381-388.

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