



Project 5

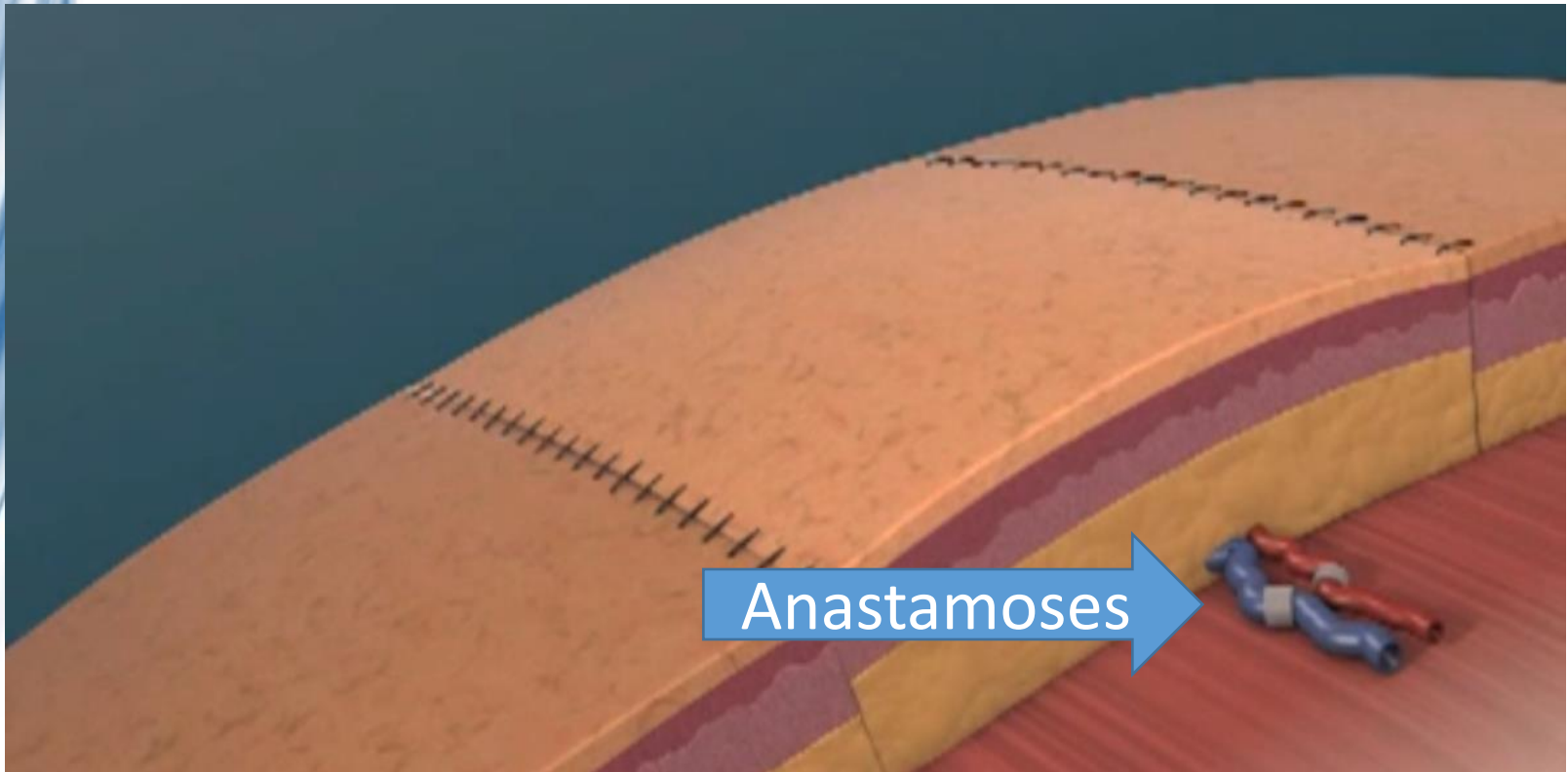
EchoSure

Detecting Blood-Clots Post-Operatively
In Blood Vessel Anastomoses

Students: Michael Ketcha
Alessandro Asoni
David Lee

Mentors: Dr. Jerry Prince
Dr. Emad Boctor
Dr. Nathanael Kuo

Background and Importance



Background and Importance

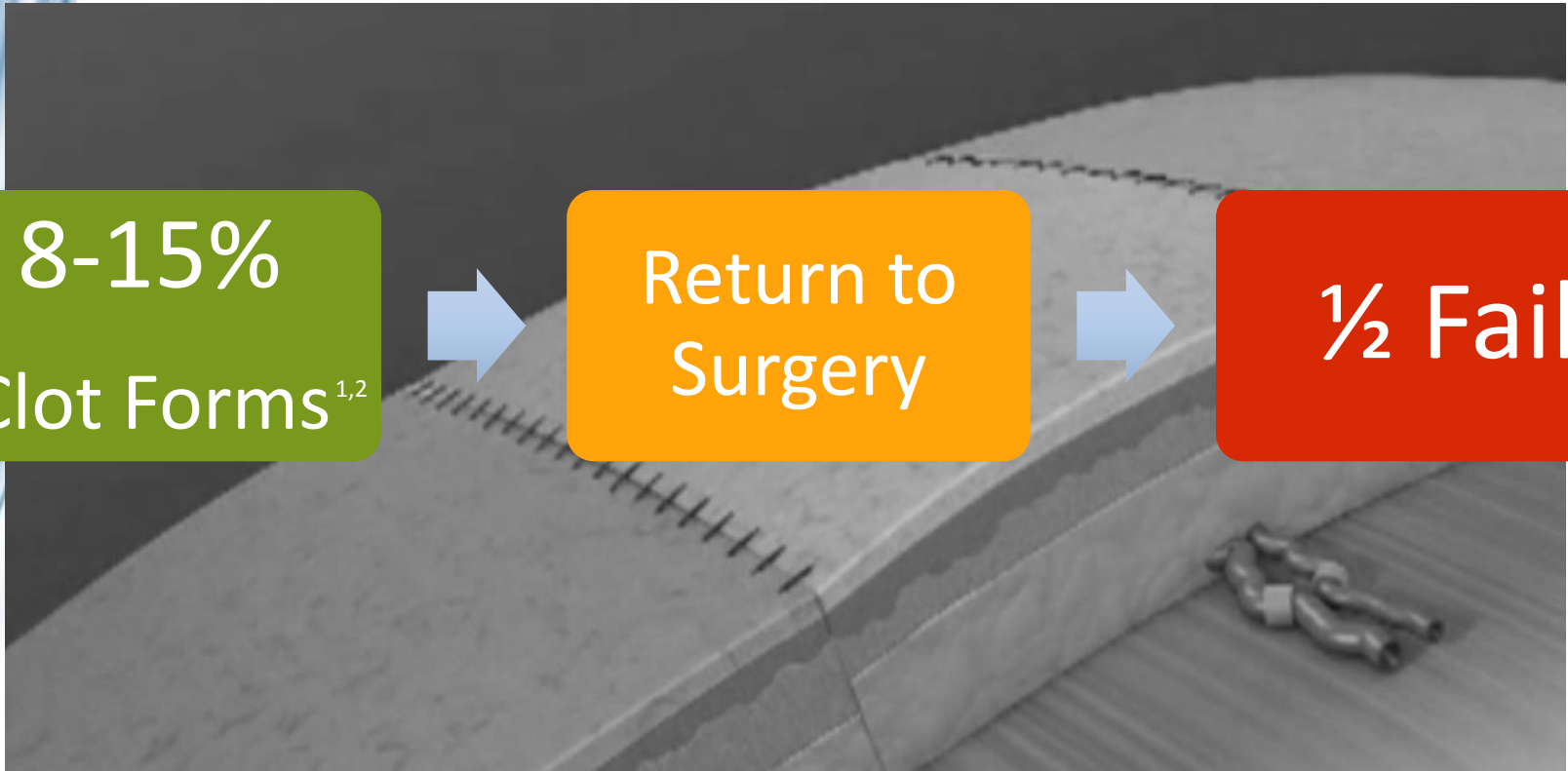
8-15%
Clot Forms^{1,2}



Return to
Surgery



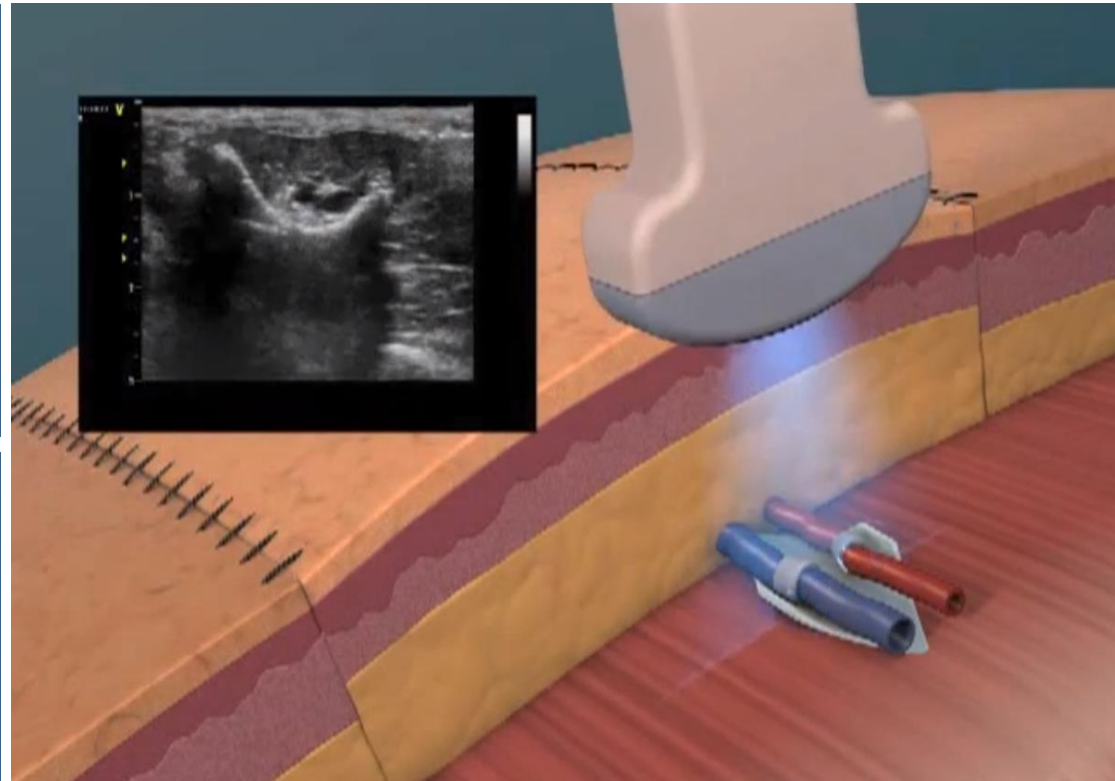
½ Fail



Our Approach

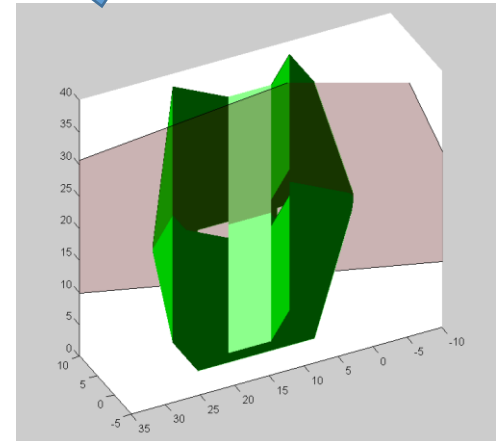
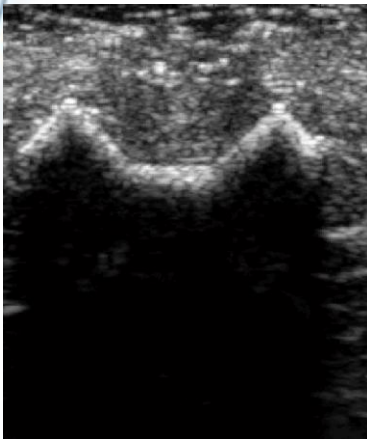
Ultrasound Doppler Imaging for Tracking Changes in Blood Flow Velocity

Biodegradable Plastic Fiducial for Supplying Reliable Pose



Goal for Project

- Accurate User Guidance
 - Detection
 - Pose Estimation
 - Object Tracking / Video Processing



Deliverables

- Expected
 - Robust algorithm for detecting the fiducial and estimating pose: > 70% accuracy fiducial detection
 - Tracking algorithm for video processing to update pose
 - Ultrasound video/image processing and object tracking software packages
- Max
 - Real time tracking
 - > 90% accuracy fiducial detection
 - Evaluation of fiducial shapes
 - GUI Integration
- Min
 - Slow frame rate pose tracking
 - > 50% accuracy fiducial detection

Key Dates

- 2/18, Reading list developed and project proposal submitted
- By end of February: obtained phantom data for artificial moving slice. Started working on object tracking with this data.
- By Mid-March: a detection algorithm working for necessary input of object tracking and pose estimation
- By end of March: tracking system and pose estimation working for phantom data
- By end of April: detection and tracking routines combined and working on test data
- By Poster Session: Clean and optimize code; Improve robustness

Dependencies

- Access to 3D printing for rapid prototyping
 - Wyman Basement Access with Budget Code (Project already has funding)
- Access to ultrasound machine for gathering test data
 - Dr. Boctor's MUSIIC Lab
- Access to computer for developing and testing algorithms
 - Personal Laptops; Dr. Prince's servers if necessary

Management Plan

- Weekly meeting with mentors
- Systematic testing of multiple algorithms
 - Optimal solution
- Focus Areas
 - Michael Ketcha: Detection
 - Alessandro Asoni: Object Tracking / Video Processing
 - David Lee: Pose Estimation

Reading List:

- Object Tracking and Video Processing Paper
- Template Matching Paper
- Corner/Edge Detection
- Pose Estimation for 2D slices of 3D of objects



Questions?

Appendix

1. Nakatsuka T et. al. (2003). Analytic Review of 2372 Free Flap Transfers for Reconstruction Following Cancer Resection. *Journal of Reconstructive Microsurgery*, 19(6): 363-368.
2. Bui DT et al. (2007). Free Flap Reexploration; Indications, Treatment, and Outcomes in 1,193 Free Flaps. *J of Plastics and Reconstructive Surgery*, 119(7): 2092-2100.