

Arterial Coupler Re-Design: Adjustable Stent/Cuff Anastomosis

Progress Report 10: 11/13/2025

Client: Dr. Jasmine Craig

Advisor: Prof. Darilis Suarez-Gonzalez

Team:

- Leader: Allison (Ally) Rausch
- Communicator: Jacqueline (Jackie) Behring
- BWIG: Sofia Decicco
- BPAG: Arshiya (Ria) Chugh
- BSAC: Daniel Pies

Problem Statement: Microsurgical arterial anastomosis is a cornerstone of reconstructive surgery, enabling tissue transfer and limb salvage. Current techniques are highly time consuming, technically demanding, and are highly dependent on surgeon expertise. Suturing vessels as small as 1 mm can take even the most experienced surgeons 30-60 minutes, extending operating times and jeopardizing tissue viability. Existing stent-based approaches introduce complications by contracting the vessel lumen and lack adaptability across the wide range of vessel diameters encountered in clinical practice. There is a critical need for a biocompatible, adjustable, and easy-to-use device that can reliably reduce operative time while maintaining vessel integrity and minimizing complications.

Brief Team Status Update: This week, the team made significant progress in preparing for feasibility testing. Members finalized the draft testing protocol, coordinated communication with the client for review, and began preparing materials and stent samples for physical testing. Parallel efforts in COMSOL modeling continued, focusing on defining vascular flow and structural parameters for simulation validation. The group also collaborated to align the physical and computational testing methods to ensure consistency in data analysis for the upcoming poster presentation.

Summary of Weekly Individual Design Accomplishments:

- Allison (Ally) Rausch:
 - Aid in finalizing testing plans
 - Researched biocompatible material alternatives for small-scale stent prototyping
 - Researched key mechanical testing parameters for stent expansion and vessel fit
- Jacqueline (Jackie) Behring:
 - Met with the team to outline testing protocols and planned evaluation methods
 - Drafted testing protocol for SolidWorks FEA.
- Sofia Decicco:
 - Reached out to Dr.P to see if there are options to allocate a nitinol stent through the university
 - Drafted testing protocol for feasibility testing
 - Met with team to finalize testing plans and ensure we meet design requirements prior to the end of the semester
- Arshiya (Ria) Chugh:
 - Met with the team to outline the testing protocol and discuss feasibility considerations.
 - Researched COMSOL Multiphysics to draft a preliminary protocol and provide a foundational understanding for upcoming simulations.

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- Identified the cardiovascular fluid dynamics lab as a potential resource and plan to reach out for guidance on vascular simulation testing.
- Daniel Pies:
 - Met with team to discuss testing protocols and methods
 - Gathered preliminary experience/research into COMSOL testing

Weekly/Ongoing Difficulties: No current difficulties.

Upcoming Team Goals: Next week, the team aims to begin feasibility and mechanical testing using the finalized protocol and available stent samples. The group will also gather preliminary data to validate test methods, integrate findings into COMSOL simulations, and start compiling results for the final report. Additionally, the team will refine poster layouts and prepare visual data representations to summarize testing outcomes and design iterations.

Upcoming Individual Goals:

- Allison (Ally) Rausch:
 - Implement finalized testing protocol once approved by the client
 - Work on Mechanical and Feasibility testing
 - Compile initial testing results and document methodology
 - Research more into COMSOL testing
- Jacqueline (Jackie) Behring:
 - Fabricate jig for stent assembly
 - Gathered and procured required materials for testing
 - Set up the testing sequence and organized the order of planned tests
- Sofia Decicco:
 - Conduct feasibility testing with the team and client
 - Perform radial compression testing on nitinol stent if we gain access
 - Start implementing feedback from preliminary report into final draft
- Arshiya (Ria) Chugh:
 - Implement the COMSOL testing protocol and generate preliminary simulation results.
 - Complete all testing with the team and produce physical testing data for the poster presentation.
 - Quantify outcomes from both simulations and physical tests, and perform a comprehensive analysis.
- Daniel Pies:
 - Arrange a time to meet with microfluidics professor to discuss feasibility of COMSOL testing for arterial recoupler
 - Meet with team and client for feasibility testing with sample materials

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Project Goal	Deadline	Team Assigned	State of Completion
Initial Research	9/8	All	The team will continuously research throughout the semester.
Product Design Specification (PDS) Draft	9/19	All	Completed
Design Matrix Criteria and Design Ideas	9/26	All	Completed
Preliminary Oral Presentation	10/3	All	Completed
Preliminary Report	10/9	All	Completed
Final Design Selection	10/10	All	Completed
Fabrication and Prototyping	10/16	All	In Progress
Final Poster Presentation	12/5	All	

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TOTAL:	\$0.00
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