

Arterial Coupler Re-Design: Adjustable Stent/Cuff Anastomosis

Progress Report 4: 10/2/2025

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: The team finalized the preliminary design matrix and presented preliminary designs to the client on Wednesday (09/24). The team is continually doing research on mechanisms and design considerations to continue iterating the design matrix. The team prepared and delivered the preliminary presentation on Friday (10/03).

Summary of Weekly Individual Design Accomplishments:

- Allison (Ally) Rausch:
 - Authored and practiced preliminary presentation sections (Problem Statement, Societal Impact, Introduction, and Background)
 - Incorporated client feedback into design matrix
 - Draft weighted criteria for the design matrix
- Jacqueline (Jackie) Behring:
 - Completed assigned sections in preliminary presentation
 - Continued research on material sources and manufacturing
 - Helped to refine and rank design matrix
 - 3D printed stent model in resin to help demonstrate design
- Sofia Decicco:
 - Continued to design a refined prototype for client
 - Focused on nitinol and PTFE/polyurethane material research
 - Met with an engineer from Resonetics to get feedback on nitinol machining
 - Worked on design matrix and final prototype justification within preliminary presentation
- Arshiya (Ria) Chugh:
 - Searched for and compiled peer-reviewed sources to support testing methods
 - Helped refine design matrices and ranked design criteria with the team

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- Worked with team to complete and share the preliminary presentation
- Daniel Pies:
 - Practiced and presented preliminary presentation sections designs 1 and 2
 - Contributions to design matrix and criteria
 - Researched suture usage cases in anastomosis procedures

Weekly/Ongoing Difficulties: No notable difficulties.

Upcoming Team Goals: Next week, the team will transition from concept evaluation to early development by selecting the most promising preliminary designs identified in the matrix. The team will begin creating SolidWorks models to better visualize mechanisms and dimensions, while also identifying suitable materials (preferably FDA approved) and fabrication methods for initial prototyping. In parallel, the team will draft a preliminary testing framework to evaluate expansion performance, vessel compatibility, and ease of use. Feedback from the recent client meeting will be incorporated to refine design directions and ensure alignment with clinical priorities.

Upcoming Individual Goals:

- Allison (Ally) Rausch:
 - Begin SolidWorks models of preliminary designs to visualize mechanisms and dimensions
 - Begin writing testing protocols
 - Begin writing fabrication protocols
 - Explore alternate expansion mechanisms (ring-based, stent-like, hinge/clamp designs)
- Jacqueline (Jackie) Behring:
 - Finalize SolidWorks model to print prototype to scale
 - Meet with client to discuss presentation, future goals, and any prototypes
 - Begin drafting preliminary report and continue research
- Sofia Decicco:
 - Understand the geometry of the nitinol stent that would best support our design
 - Finalize design dimension with clients to build stent in Solidworks and print a prototype
 - Start drafting preliminary report
- Arshiya (Ria) Chugh:
 - Work with team to further develop the SolidWorks model and finalize device geometry
 - Draft the preliminary report and brainstorm detailed plans for testing and fabrication
 - Identify appropriate prototyping materials and determine sourcing options
- Daniel Pies:
 - Begin work on preliminary deliverables
 - Contributions to testing and fabrication protocols
 - Continue research for application as needed

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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	In Progress
Final Design Selection	10/10	All	
Poster Presentations	12/5	All	

Item	Description	Manufacturer	Part Number	Date	QTY	Cost Each	Total	Link
Component 1								
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL:								\$0.00