Arterial Coupler Re-Design: Adjustable Stent/Cuff Anastomosis
Progress Report 5: 10/9/2025

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 focused on finalizing the Preliminary Report following the successful Preliminary Presentation delivered last Friday (10/3). Each member contributed to editing, citations, and section writing to meet report quality and submission standards. The team also revisited client and advisor feedback to ensure alignment with design priorities before advancing to detailed modeling and prototyping phases.

Summary of Weekly Individual Design Accomplishments:

- Allison (Ally) Rausch:
    - Authored and finalized my respective sections for the Preliminary Report
    - Reviewed and learned from advisor feedback on Preliminary Presentation
    - Collaborate with team to integrate feedback into the final report
    - Began outlining and sketching SolidWorks concepts for potential expansion mechanisms to prepare for the next phase of model development
- Jacqueline (Jackie) Behring:
    - Completed assigned sections for the preliminary report
    - Reviewed and wrote team and personal feedback
    - Designated preliminary dimensions to the design to being fabricating a prototype
- Sofia Decicco:
    - Applied takeaways from preliminary presentations into design development and explanation
    - Integrated the design matrix justification, final design selection, and relevant biology and physiology research into preliminary report
    - Explored online companies in which existing nitinol stents similar to our design can be sourced for prototyping
    - Completed team feedback

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- Arshiya (Ria) Chugh:
    - Collaborated with team to draft and refine the preliminary report
    - Researched testing methods for stents and couplers, including deployment trials, flow testing, and lumen patency evaluation techniques
- Daniel Pies:
    - Collaborate with team in drafting preliminary report sections
    - Conducted research on biomaterials to be used in selected design
    - Attend BSAC meeting and convey ideas to team

Weekly/Ongoing Difficulties: No notable difficulties.

Upcoming Team Goals: Next week, the team will transition from report writing to hands-on design development. The primary focus will be on creating detailed SolidWorks models of the most promising arterial coupler concepts identified in the design matrix. In parallel, the team will establish a preliminary testing and fabrication plan, determining suitable materials, vessel analogs, and experimental conditions for benchtop validation. A development timeline will be drafted to ensure that prototype fabrication and testing align with upcoming mid-semester milestones. Additionally, the team plans to conduct a brief client check-in to present the finalized preliminary report, discuss the selected design direction, and receive feedback to guide modeling and prototyping efforts moving forward.

Upcoming Individual Goals:
- Allison (Ally) Rausch:
    - Begin Solidworks models for preliminary design
    - Draft early testing and fabrication protocols
    - Update team lab archives & individual lab archives
- Jacqueline (Jackie) Behring:
    - 3D print first working prototype to show the client
    - Schedule next client meeting to show them preliminary prototype
    - Continue to research and obtain materials
- Sofia Decicco:
    - Decide on a few nitinol stent geometries the team can prototype and test
    - Figure out options for the team to source PTFE lining and draft fabrication protocols
- Arshiya (Ria) Chugh:
    - Identify and order materials for the coupler, loader tube, and prototype assembly (e.g., nitinol, PTFE, or PLA)
    - Verify material compatibility with the fabrication methods and sterilization processes
- Daniel Pies:
    - Collaborate with team in preliminary prototyping
    - Continue researching materials, fabrication, testing as needed

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Project Timeline

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	
Poster Presentations	12/5	All	

Expenses

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**