

Arterial Coupler Re-Design: Adjustable Stent/Cuff Anastomosis

Progress Report 9: 11/6/2025

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 attended Show and Tell on 10/31 and received feedback from piers on fabrication, testing, and visualization software. The team met with Jesse from TeamLabs to discuss manufacturing concerns for the stent. The team decided to progress with materials other than Nitinol initially for testing and manufacturing. A final prototype will be ordered next semester with the Nitinol material. The team met with the client on 11/05 and discussed the projected timeline for the rest of the semester and ensured all parties are on the same page with the project plans.

Summary of Weekly Individual Design Accomplishments:

- Allison (Ally) Rausch:
 - Review feedback from Show and Tell
 - Researched imaging softwares for blood pressure and arterial hemodynamics
 - Met with client to ensure alignment on project timeline and next steps
 - Research into obtaining pediatric arterial stents and pediatric stents in general to see mechanisms and materials for creating stents at such a small scale
 - Research materials that would be viable for testing and manufacturable at such a small scale
- Jacqueline (Jackie) Behring:
 - Reviewed and followed up on Show & Tell action items
 - Attended consultation meeting with Jesse to gather feedback about fabricating issues
 - Met with client to update them on project shift and order materials
 - Followed up with medical sales reps to obtain information and quote on medical stents
 - Contacted the UW Health Cardiology Division Chief to inquire about pediatric vascular stent availability and size options
 - 3D print flexible resin for mock tubing
- Sofia Decicco:

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- Consider show and tell feedback and see how team can implement in coming weeks
 - Met with Jesse in the Teamlab to get a second option on testing methods that do not involve use of a nitinol stent material
 - Ordered metal tubing discussed by the team and client that will represent a rigid state of the stent for feasibility testing
 - Reached out to professor that may be able to help the team with simulating nitinol material in a modeling platform
- Arshiya (Ria) Chugh:
 - Reviewed feedback from the Show & Tell presentation and began exploring methods for testing.
 - Researched software platforms and simulation tools for assessing stent hemodynamics, identifying key parameters and usability considerations.
 - Collaborated with the team to discuss client feedback and design consultation takeaways for the materials order
 - Updated the project expense sheet to maintain accurate budgeting and financial tracking
- Daniel Pies:
 - Met with Jesse from the TeamLab for a design consultation on both device design and material sourcing for a loading tube and stent-like materials
 - Collaborated with team to integrate Show-and-Tell feedback into future design iterations
 - Makerspace meeting with team for review of fabrication methods for preliminary testing

Weekly/Ongoing Difficulties: The team is currently trying to remain within the set budget of \$1000. The team is also trying to feasibly manufacture the stent while Nitinol sourcing and the small stent size are causing logistical problems. The team must evaluate if Nitinol is feasible for this project and if 3D printing at such a small scale is possible.

Upcoming Team Goals: The team is trying to find a viable replacement material for our preliminary testing. The team will then have to research how to fabricate that material at such a small scale. The team will order our initial materials and simultaneously create a testing plan to send to the client for feedback.

Upcoming Individual Goals:

- Allison (Ally) Rausch:
 - Continue to research pediatric arterial stents and small scale stents in general to see mechanisms and materials for creating stents at such a small scale
 - Research materials that would be viable for testing and manufacturable at such a small scale
 - Finalize tests to run and testing protocol
 - Send to the client for feedback
- Jacqueline (Jackie) Behring:
 - Obtain ordered materials from McMaster
 - Complete testing protocol and send to client to review
 - Meet in person next week to test concepts
 - Cut down metal tubing to correct lengths

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- Sofia Decicco:
 - Write testing protocol with team that will prep us and the client for testing
 - Cut down metal tubing that was ordered to the anticipated stent height
 - Test tubing in chicken artery model and adjust stent dimension pending feedback
 - More literature research on radial strength of nitinol stent and testing the team could perform to collect data on this front
- Arshiya (Ria) Chugh:
 - Plan to collaborate with the team to cut metal tubing to the required dimensions
 - Develop comprehensive testing and fabrication protocols
 - Work with a team for testing and coordinate testing with the client.
- Daniel Pies:
 - Work with team to develop testing protocols for the coming weeks
 - Conduct research as needed for design fabrication
 - Manufacturing of the preliminary stent prototype once materials arrive

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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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