Arterial Coupler Re-Design: Adjustable Stent/Cuff Anastomosis
Progress Report 11: 11/20/2025

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 met with Jesse and Mike in the Teamlab to machine a stainless steel rig with screws in the sides to thread the Nitinol wire around. The team then wrapped the nitinol around the rig and heat treated it to create a large scale stent prototype. The team cut each of the three tubings ordered into three 1-inch pieces in order to conduct feasibility testing with the client. The team met with the client to test the tubings with the chicken thigh arteries, took and processed feedback, and set up another feasibility testing on Monday, November 24th. Lastly, the team worked on an outreach event, coordinating activities and tours for high school students in order to increase BME engagement.

Summary of Weekly Individual Design Accomplishments:
- Allison (Ally) Rausch:
    - Met with the client to feasibility test stainless steel stent
        - Practiced microsurgical sutures as well as artery inversion
    - Researched stent designs/ geometries
    - Acquire nitinol and IMUs from ECB lab
- Jacqueline (Jackie) Behring:
    - Met with Jesse, Mike, and Sofia to brainstorm and design final fabrication plan for stent
    - Cut and sanded purchased tubing using bandsaw and assisted in procurement of parts to finalize fabrication of stent
    - Assisted in weaving the stent geometry and heating the stent with Mike
    - Went to the hospital to perform feasibility testing
- Sofia Decicco:
    - Met with Jesse, Mike, and Jackie to design final fabrication plan for stent
    - Machined stent rig out of brass and stainless steel in team lab
    - Weaved stent geometry and located an oven that could heat set the nitinol material
    - Performed feasibility testing as one the the final outputs with clients

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- Arshiya (Ria) Chugh:
    - Collaborated with the team to machine and trim the tubing to the required dimensions.
    - Assisted in constructing the nitinol stent using the provided nitinol wire and submitted the completed stent for heat treatment.
    - Participated in a client meeting with the team and documented all feedback regarding the current tubing prototype.
- Daniel Pies:
    - Completed CAD design for virtual testing
    - Began testing protocol for COMSOL/SolidWorks modeling
    - Reviewed feedback from feasibility testing and consulted with team
    - Research clinical/material properties for arteries and nitinol for modeling

Weekly/Ongoing Difficulties: The team must find an ideal stent geometry. The team struggled to cut the tubing to a small enough length for artery inversion. Concerned about wall thickness as well as artery strain during inversion. The team is struggling to find a way to make the steel prototype expandable.

Upcoming Team Goals: Next week, the team aims to meet with the client again and perform a feasibility test at a smaller stent length (approximately 3 - 5 mm). The team is hoping to have chosen a preliminary stent geometry and will work to perfect the geometry as well as produce a heat treated nitinol stent. The team will then work on scaling the prototype down.

Upcoming Individual Goals:
- Allison (Ally) Rausch:
    - Continue to research stent designs
    - Research how to make the stainless steel prototype expandable
    - Research how nitinol stent would be manufactured and hold up at varying lengths
- Jacqueline (Jackie) Behring:
    - Compile and analyze data gathered
    - Reach back out to Mike to obtain heat treated stent element
    - Start to write testing protocols for stent prototype
- Sofia Decicco:
    - Potentially attempt to heat treat a new stent
    - Start revising preliminary report feedback and working on final poster
    - Solidify teams quantifiable data for final deliverables
    - Update Labarchives with fabrication images and team progress
- Arshiya (Ria) Chugh:
    - Assess the performance and quality of the heat-treated stent, and outline a testing plan for the large-scale stent prototype following heat treatment.
    - Review feedback from upcoming feasibility testing, particularly regarding the refined tubing inversion mechanism.
    - Consolidate all testing results and perform a comprehensive analysis to prepare for the final poster presentation.
- Daniel Pies:
    - Continue feasibility with client and get more testing results

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- Compile testing results for final poster presentation

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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	Completed
Fabrication and Prototyping	10/16	All	In Progress
Testing and Results	11/10	All	In Progress
Final Poster Presentation	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**