Arterial coupler re-design: Adjustable stent/cuff anastomosis

Client: Dr. Jasmine Craig and Dr. Weifeng Zeng

Advisor: Prof. Justin Williams

Team:

Simon Fetherston (Leader)
Catie King (communicator)
Megan Lee (BWIG)
Lydia Miller (BSAC)
Drew Hay (BPAG)

Date: October 23, 2026 - October 29, 2026

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 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 status update

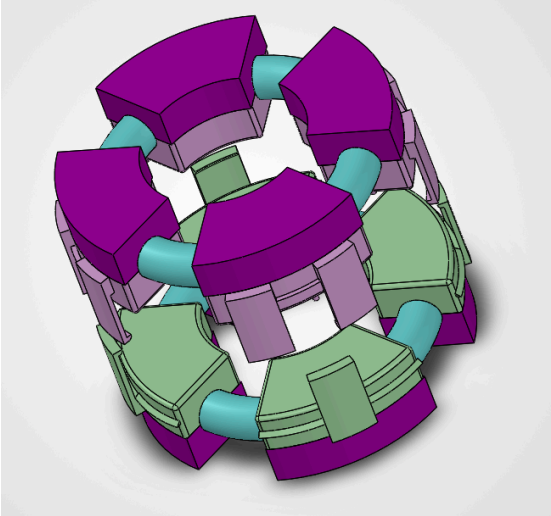
The team is continuing to develop prototypes of the design. Each iteration is bringing in different ideas. The team used a resin printer to achieve better resolution on a smaller scale model. This model will be analyzed and shown during show and tell.

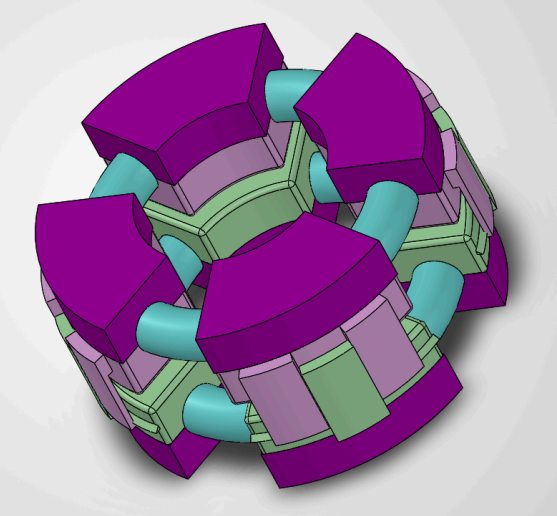
Difficulties/advice requests

The team is currently developing a testing plan. Guidance on ordering materials and creating a testing apparatus would be helpful.

Current design

The team has chosen a preliminary design based on feedback and ideation from Dean. The SolidWorks snapshots below show an expanded and clamped view of the final design pieces





Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									$0.00	
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$0.00**	

Major team goals for the next week

1. Design a testing apparatus
2. Use feedback from show and tell to continue iterating the design
3. Determine a durable clamp iteration that can improve the current design

Next week's individual goals

- Simon Fetherston
    - Create atraumatic surface on the opposing ring (only one ring has it currently)

    - Design a gravity flow testing apparatus
    - Use feedback from show and tell to iterate design (focusing on the clamp design)
- Catie King
    - Model earring design in solidworks
    - Prototype iteration
    - Develop testing plan
- Megan Lee
    - Create testing plan
    - Create solidworks model of new coupling design idea
    - Brainstorm new ring design
- Lydia Miller
    - Develop testing plan
    - Continue to iterate prototype designs
    - Work on “earring” design idea
- Drew Hay
    - Confirm which Silicone material Dean currently has in stock
    - Order other forms of silicone for testing
    - Brainstorm other design concepts
    - Develop testing plan

Timeline

Task	Sep			Oct					Nov				Dec
	10	17	24	1	8	15	22	29	5	12	19	26	3
Project R&D													
Empathize	X	X	X										
Background…	X	X	X	X	X	X	X	X					
Prototyping						X	X	X					
Testings													
Deliverables													
Progress Reports	X	X	X		X	X	X	X					
Prelim presentation				X									
Final Poster													
Meetings													
Client		X		X									
Advisor	X	X	X	X	X	X	X	X					
Website													
Update	X	X	X	X	X	X	X	X					

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Individual:
  - Simon Fetherston
    - Generated questions to ask at show and tell
    - Worked on adjusting clamp size and atraumatic surface of the clamp
    - Met with team to work on Solidworks designs and print further prototypes
  - Catie King
    - Met with team to work on solidworks modeling and printing for show and tell
    - Met with clients to discuss prototype and hear feedback
    - Discussed testing and fabrication plans
    - Drew up earring design idea and other ways to clamp coupler
  - Lydia Miller
    - Continue prototype iteration in preparation for show and tell
    - Finalize fabrication plan document
    - Discuss use of secondary "tool" for use with the coupler
    - Discuss testing plans
  - Megan Lee
    - Brainstormed new coupling methods
    - Met with team to work on SolidWorks modeling
    - Met with clients to discuss prototype and get feedback
  - Drew Hay
    - Wrote an explanation of the math/physics of the expandable ring
    - Created a custom mold for pourable silicone in SolidWorks
- Team:
  - 3D printed ring molds and new clamps to bring to show and tell
  - Discussed alternative clamp ideas that will be presented at show and tell
  - Prepared for show and tell

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Simon Fetherston	10/23-10/29	- Generated questions on prototype and testing plan to bring to show and tell - Worked on Solidworks models - Met with team to discuss/adjust/scale solidworks models and print prototypes for show and tell	0.5 2 2	4.5	29.5
Catie King	10/23-10/29	- Met with team to work on solidworks and print for show and tell - Met with clients to discuss prototype and hear feedback - Drew up earring design - Drew up other mechanisms to clamp coupler	2 1.5 1 1	5.5	28.5

Megan Lee	10/23-10/29	- Created new coupling design ideas - Met with team to prototype new SolidWorks desgin	2 2	4	29
Lydia Miller	10/23-10/29	- Create solidworks modify with new clips - Met with team to discuss new prototypes and plan for show/tell	2.5 2	4.5	29
Drew Hay	10/23-10/29	- Wrote an explanation of the math/physics of the expandable ring - Created a custom mold for pourable silicone in SolidWorks	2 2	4	30