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 30, 2026 - November 5, 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

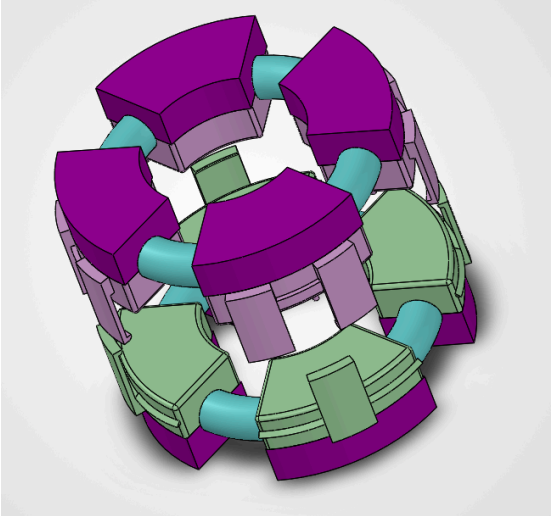
The team is continuing to develop prototypes of the design. Each iteration is bringing in different ideas. The team successfully printed prototypes that are 5 times the size needed for arteries. This design was printed in flexible 80A and does not have a functional clamping mechanism. The team is working on alternate locking mechanisms and molds to fabricate a full model. The team is also working on fabricating a silicone ring that has acceptable mechanical properties.

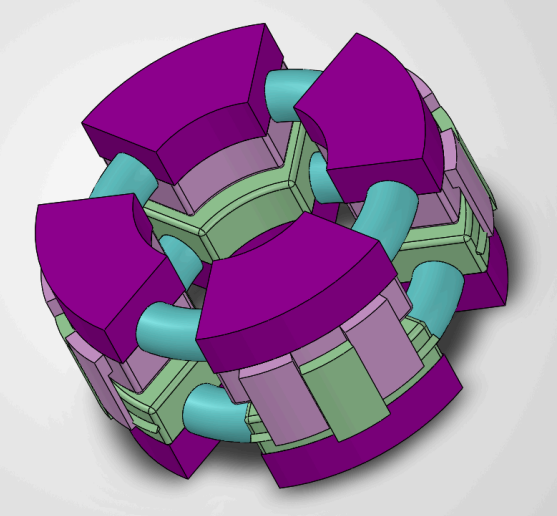
Difficulties/advice requests

The team is considering changing the locking mechanism for the design. The team wants to know if using only pins to lock the device is a possibility. The team also needs to clarify how the drip testing mechanism will work.

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. Fabricate low durometer silicone rings
2. Clarify and finalize a locking mechanism between the clasps
3. Gather materials for testing apparatus

Next week's individual goals

- Simon Fetherston
    - Print modified molds and begin fabricating complete designs

    - Iterate mold if silicone does not fill properly
    - Find items for testing that need to be ordered/picked up
    - Iterate design of rigid pieces based on client feedback
- Catie King
    - Start fabrication process with new molds
    - Print top and bottom rings as single pieces to try with molds
    - Continue iterating based on client feedback
    - Begin writing testing plan and coordinating with med school on supplies and apparatuses
- Megan Lee
    - Use new molds to create the next prototype
    - Continue to iterate molds and rigid pieces based on results and client feedback
    - Begin thinking about best ways to fabricate device with pins added
- Lydia Miller
    - Use pourable silicone in the new mold design
    - Write testing plan and find resources to use
    - Utilize feedback from client meeting to continue iteration
- Drew Hay
    - Fabricate new client design
    - Solidify testing plans
    - Continue iteration

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	X				
Testings													
Deliverables													
Progress Reports	X	X	X		X	X	X	X	X				
Prelim presentation				X									
Final Poster													
Meetings													
Client		X		X					X				
Advisor	X	X	X	X	X	X	X	X	X				
Website													
Update	X	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
    - Researched biocompatible/implantable silicones with mechanical properties similar to EcoFlex 10
    - Modified silicone ring mold to be a complete fabrication device with the rigid pieces
    - Met with team to discuss design and final fabrication
  - Catie King
    - Mew with team to discuss design and final fabrication
    - Drafted list of questions with team to ask clients about design and testing
  - Lydia Miller
    - Create solidworks modify with new clips
    - Met with team to discuss new prototypes and plan for show/tell
  - Megan Lee
    - Met with team to discuss design and 3d print new iterations
    - Created new coupling design ideas
  - Drew Hay
    - Poured silicone into ring mold with clients
    - Met with team to discuss/print further designs
- Team:
  -

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Simon Fetherston		- Worked on mold Solidworks files to include rigid pieces - Researched biocompatible silicone alternatives for long term safety - Met with team to discuss design - Met with client to discuss design	2 1 1 0.5	4.5	34
Catie King		- Met with team to discuss design - 3D printed rings in flexible resin - 3D printed rigid pieces with stiffer material - Met with client to discuss designs	1 0.5 0.5 1	2	30.5
Megan Lee	10/30 - 11/5	- Met with team to discuss design - 3D printed new rigid pieces with a stiffer material - Met with client to discuss design - Researched hydrostatic testing mechanisms	1 0.5 0.5 0.5	2.5	31.5

Lydia Miller	10/30-11/5	- Met with team to discuss design - Print new rigid pieces using tough resin - Met with client to discuss design	1 .5 1	2.5	31.5
Drew Hay		- Poured silicone rings - Met with team to discuss design - Met with client to discuss design	2 1 1	4	34